

Technical Manual

911 Carrera (996)

Technical Information

Repair

Contents:

Group 0

Diagnosis

Part 2 (as of Repair Group 61)

Foreword

The workshop documentation for the 911 Carrera (1996) model has the designation

"911 Carrera (1996)" Technical Manual

and contains **Technical Information** as well as instructions on **Repairs**.

The integration of the technical information published in the "911 Carrera (1996)" Technical Manual with the instructions on repairs provides the user with a complex reference work that combines into one book associated or cross-referenced material of relevance to workshops and originating from various information media.

The "911 Carrera (1996)" Technical Manual consists of 15 folders, subdivided into the following Groups

0	Entire vehicle – General
0	Diagnosis, part 1 (up to Repair Group 45) * ¹
0	Diagnosis, part 2 (as of Repair Group 61) * ²
1	Engine, part 1 (up to Repair Group 13) * ³
1	Engine, part 2 (as of Repair Group 15) * ⁴
2	Fuel, exhaust, engine electronics
3	Transmission, manual transmission
3	Transmission, automatic transmission
4	Running gear
5	Body
6	Body equipment, exterior
7	Body equipment, interior
8 / 9	Air conditioning / Electrics
9	Circuit diagrams, part 1 (up to and including the '99 model) * ⁵
9	Circuit diagrams, part 2 (as of the '00 model) * ⁶

*¹ The two folders with Group 0 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 0 – Diagnosis, part 1" (**up to Repair Group 45**).

*² The **second folder** "Group 0 – Diagnosis, part 2" (**as of Repair Group 61**) includes the further Repair Groups belonging to Group 0.

*³ The two folders with Group 1 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 1 – Engine, part 1" (**up to Repair Group 13**).

*⁴ The **second folder** "Group 1 – Engine, part 2" (**as of Repair Group 15**) includes the further Repair Groups belonging to Group 1.

- | *5 The two folders with Group 9 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 9 – Circuit diagrams, part 1" (**up to and including the '99 model**).
- | *6 The **second folder** "Group 9 – Circuit diagrams, part 2" (**as of the '00 model**) includes the further circuit diagrams belonging to Group 9.

The "911 Carrera (996)" Technical Manual has the same structure in each folder, with the following breakdown for all Groups:

Title page: "911 Carrera (996)" Technical Manual

> Foreword

Title page: "Technical Information"

> Table of Contents, Technical information

> Technical information

Title page: "Repair"

> Repair Groups: overview

> Table of Contents, repairs

> General / technical data

> Instructions on repairs

As can be seen from the breakdown, the published Technical Information is in the front part of each folder – numbered according to the Groups. The Table of Contents assigned to each Group will be periodically updated.

Following the Technical Information, separated by a title page, the instructions on repairs – assigned according to the Groups or broken down into Repair Groups – are included in the folders.

The instructions on repairs will be extended and updated by means of supplements.

Note

Sheets that already exist in the "911 Carrera (996)" Technical Manual and are updated or revised and thereby exchanged by a supplement are designated "replacement sheet". Revisions or technical modifications on pages of these replacement sheets are identified for the user with a vertical bar at the margin.

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61 01 **Diagnosis/troubleshooting, convertible top (information)**

Diagnosis/Troubleshooting

Convertible Top

System 3.2

Contents overview

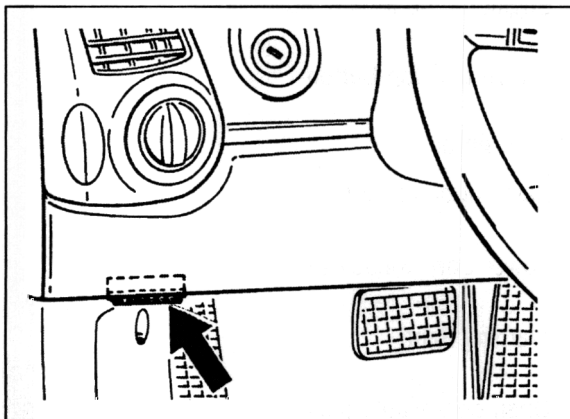
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General information

Diagnosis

The monitoring of signals by the convertible-top control module enables the system to perform reliable, precise diagnosis. Further, certain additional functions, such as e.g. test of drive links and of input signals can be activated using the Porsche System Tester 2 and their function checked.

The fault memory can be read out and erased with the Porsche System Tester 2. The diagnostic socket is located below the knee guard on the driver's side.



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General information

Convertible-top control

Each single step of the opening/closing process is only executed on condition that the preceding step was performed correctly.

If a single step is not confirmed within a given time, the actuation of the drive motor is interrupted.

At the beginning of a process, the limit switch or potentiometer values have a particular configuration, which is examined by the control module.

The control module monitors itself and the connected components. The results are read out via the diagnostic interface.

Menu

Overview of possible menus

- Unlock latch

Identification

Convertible top

Convertible-top compartment lid

Fault memory

- Side flap, top right

Erase fault memory

- Side flap, bottom right

Actual values

- Side flap, top left

- Supply voltage

- Side flap, bottom left

Warning light on

- Speed

- Actuation counter 1

Parking brake

- Actuation counter 2

- Latching hook

- Calibration counter

- Engine compartment lid

- Pot. 1, convertible top

- Convertible-top button

- Pot. 1, calibration value1

- Pot. 1, calibration value2

- Pot. 1, calibration value3

- Pot. 1, calibration value4

- Pot. 1, calibration value5

- Pot. 1, calibration value6

Drive links

- Raise door windows

- Lower door windows

Warning light

Open convertible top

- Pot. 2, convertible-top compartment lid

- Pot. 2, calibration value1

- Pot. 2, calibration value2

- Pot. 2, calibration value3

- Pot. 2, calibration value4

- Close convertible top

Calibration

Calibration recognition

Input signals

Reset actuation counter 2

- Lock latch

Reset warning light

System description

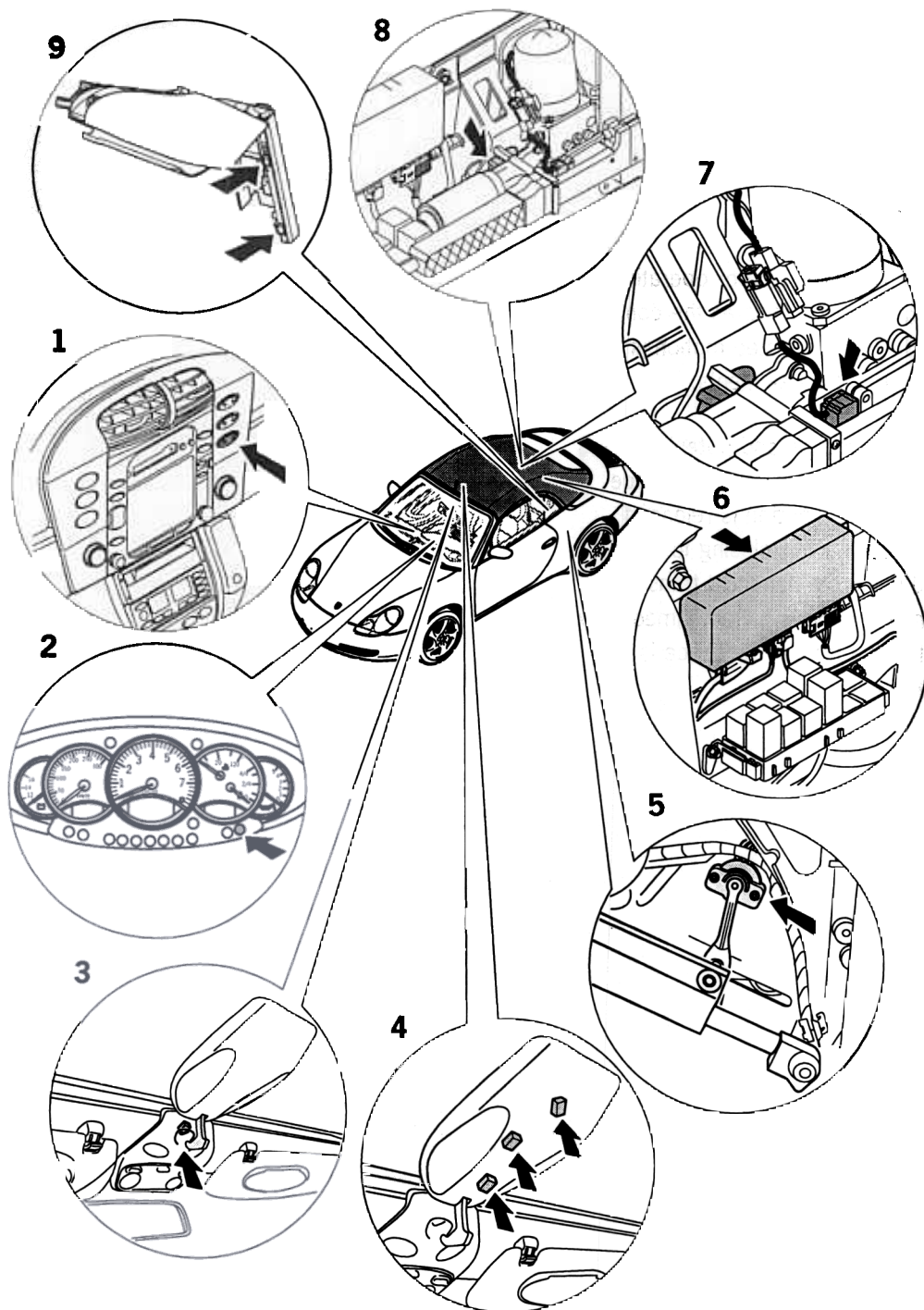
For the 996 Cabriolet, a fully automatic convertible-top drive has been developed.

The opening and closing processes are fully automatic.

Pressing the rocker switch or operating the handheld transmitter activates the control module and the preselected motion is executed by the drive elements.

Various micro-switches and potentiometers ensure that these processes take place smoothly. When the button is released or the comfort opening/closing function interrupted using the handheld transmitter, the motion sequence is halted immediately. A reversal of the motion sequence is possible at any time.

Overview of convertible-top components



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Overview of convertible-top components

- 1 Rocker switch
- 2 Warning light
- 3 Micro-switch, latching hook (windscreen frame)
- 4 Micro-switch, convertible-top latch (convertible-top side)
- 5 Potentiometer, convertible-top interrogation
- 6 Control module
- 7 Micro-switch, convertible-top compartment lid (locked)
- 8 Potentiometer, convertible-top compartment lid interrogation
- 9 Micro-switch, left/right rear section flap up and down

The convertible top is actuated if:

Terminal 15 is connected via ignition.

The parking brake input is connected to ground (parking brake engaged).

No speedometer signals greater than 5 km/h (3 mph) are present.

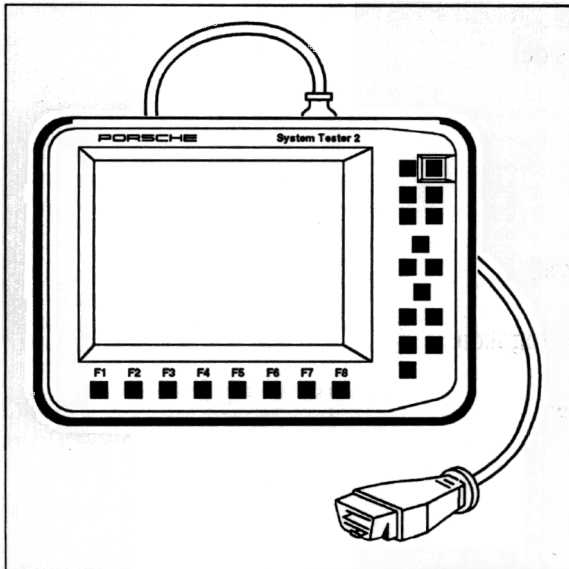
Engine compartment lid is closed (input not at ground potential).

Tools

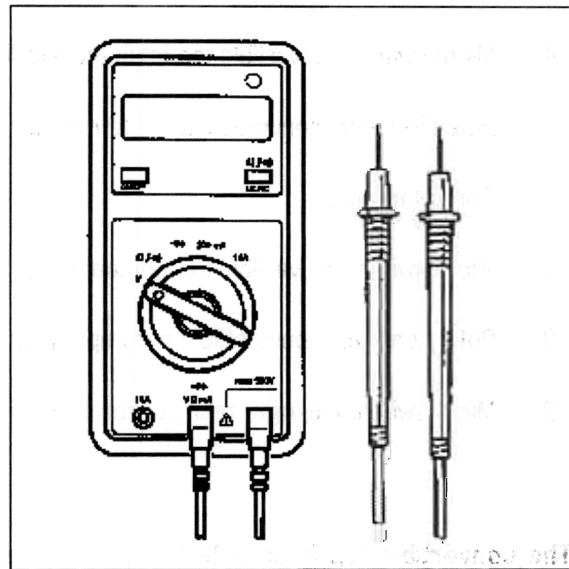
The following equipment is required for troubleshooting:

1. Porsche System Tester 2

2. Commercially available digital multimeter



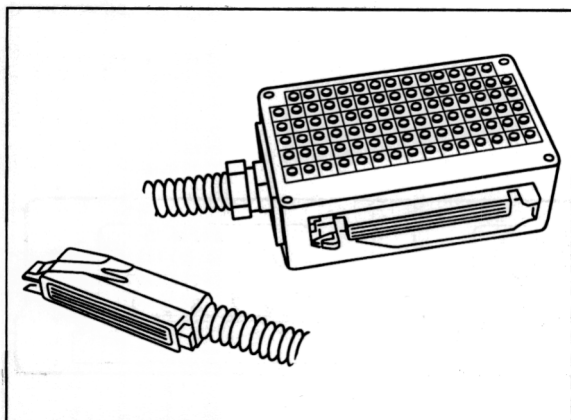
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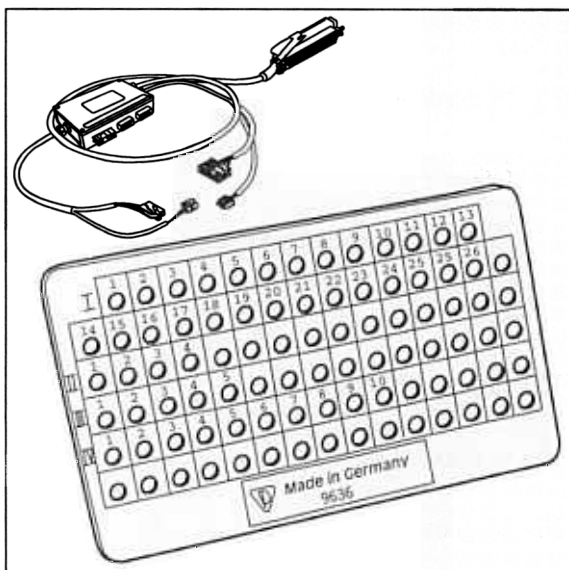
3. Test adapter 9616

Test adapter mounting instructions



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4. Test adapter 9636 and pin template 9636



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The test adapter 9616 must be used for all tests on electrical wiring (e.g. convertible-top control module connectors/micro-switches/potentiometers).

It does not damage the plug-in (miniature) contacts and facilitates location of the individual pins.

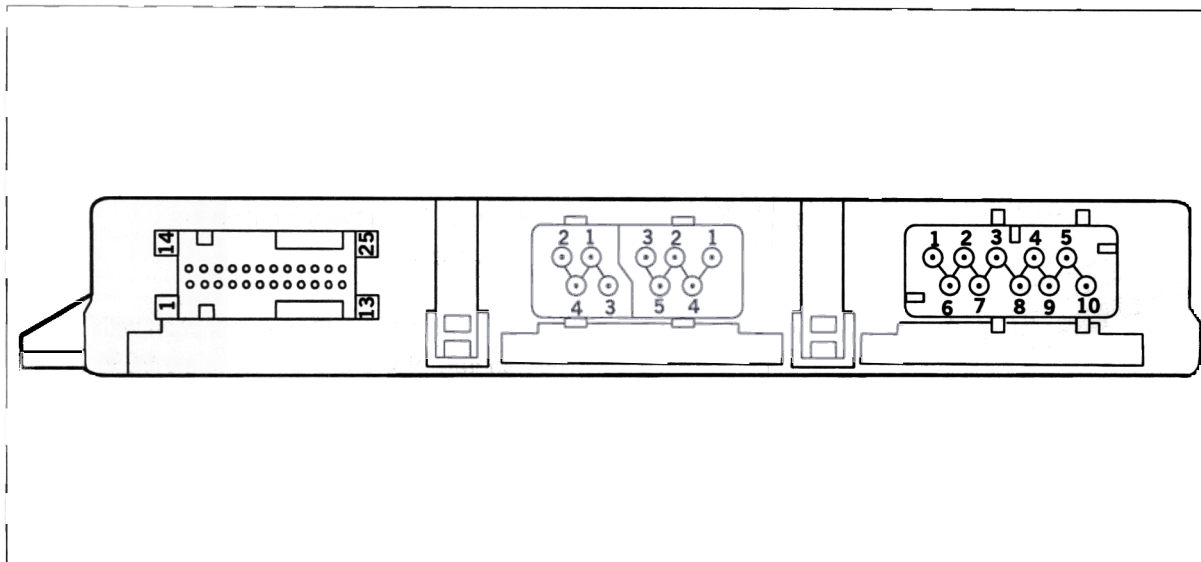
Use test adapter 9636 in conjunction with test adapter 9616 and pin template 9636.

Disconnect the vehicle wiring harness from the convertible-top control module.

Connect test adapter **9636** to the convertible-top control module and the vehicle wiring harness.

Connect the 88-pole connector of test adapter **9636** to test adapter **9616**. Lay pin template **9636** on top of test adapter **9616**.

Connector assignment, control module



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Connector 1

- | | |
|---------------------------------------|---|
| 1 - "Open" button | 10 - Raise door windows |
| 2 - Comfort opening | 11 - Alarm CM |
| 3 - Hardtop status | 12 - Convertible-top potentiometer, negative |
| 4 - Not used | 13 - Speed |
| 5 - Convertible top locked | 14 - "Close" button |
| 6 - Terminal 15 | 15 - Comfort closing |
| 7 - Not used | 16 - Diagnosis K-line |
| 8 - Switch for engine compartment lid | 17 - Not used |
| 9 - Convertible top raised | 18 - Parking brake |
| | 19 - Micro-switch for convertible-top compartment lid (CTCL) locked |

Connector 1 continued

- 20 - Convertible top unlocked
- 21 - Signal from convertible-top potentiometer
- 22 - Lower door windows
- 23 - Convertible-top pilot
- 24 - Convertible-top potentiometer, positive
- 25 - Electronic ground
- 26 - Terminal 30

Connector 2

- 1 - Drive for locking roof frame
- 2 - Drive for unlocking roof frame
- 3 - Terminal 31
- 4 - Terminal 30

Connector 3

- 1 - CTCL potentiometer, positive
- 2 - CTCL motor to positive
- 3 - Signal from CTCL potentiometer
- 4 - CTCL motor at positive
- 5 - CTCL potentiometer, negative

Connector 4

- 1 - Open convertible top
- 3 - Motor to extend right rear section flap
- 3 - Motor to extend left rear section flap
- 4 - Motor to retract left rear section flap
- 5 - Motor to retract right rear section flap
- 6 - Close convertible top
- 7 - Micro-switch, right rear section flap up
- 8 - Micro-switch, right rear section flap down
- 9 - Micro-switch, left rear section flap up
- 10 - Micro-switch, left rear section flap down

Fault memory

Overview of possible faults

- 1 Switch position implausible
- 2 Button short to ground
- 3 Convertible-top pot. fault
- 4 CTCL pot. fault
- 5 Timeout error
- 6 Calibration necessary
- 7 Supply voltage

Nominal values

With the ignition switched on

Supply voltage 11.5 to 13.5 volts

Pot. 1, convertible top

The values between pot. 1, calibration value 1, and pot. 1, calibration value 6, are calculated as percentage by the convertible-top control module.

If the actual values (measured values) of calibration values 1 and 6 differ, the convertible-top potentiometer must be replaced. Refer to Serv. No. 61 66 19

- Pot. 1 calibration value 1 Tester display must be smaller than < 1.6 volts
- Pot. 1 calibration value 2
- Pot. 1 calibration value 3
- Pot. 1 calibration value 4
- Pot. 1 calibration value 5
- Pot. 1 calibration value 6 Tester display must be greater than > 3.0 volts

Voltage measurement of convertible-top potentiometer

Switch on the ignition and measure voltage with test adapters 9619 and 9636 and the pin template 9636 and measure row 1, pins 12 and 21, with the voltmeter. Nominal value 0.4 - 4.4 volts.

Pot. 2, convertible-top compartment lid

The values between pot. 2, calibration value 1, and pot. 2, calibration value 4, are calculated as percentage by the convertible-top control module.

If the actual values (measured values) of calibration values 1 and 4 differ, the CTCL potentiometer must be adjusted. Refer to Serv. No. 61 70 19

- Pot. 2 calibration value 1 Tester display must be greater than > 1.0 volts
- Pot. 2 calibration value 2
- Pot. 2 calibration value 3
- Pot. 2 calibration value 4 Tester display must be smaller than < 3.9 volts

Voltage measurement of convertible-top compartment potentiometer

Switch on the ignition and measure voltage with test adapters 9619 and 9636 and the pin template 9636 and measure row 3, pins 1 and 3, with the voltmeter. Nominal value 0.5 - 4.4 volts.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Test point 1

Switch position implausible

Fault code 01

This fault is only stored in the memory when an operation has taken place (button or comfort function with the key).

1. Check response of micro-switches of rear section flaps left and right. A defective micro-switch must be replaced.
Refer to Serv. No. 61 41 19
2. Check response of micro-switch in convertible-top latch.
If the micro-switch is defective, replace the convertible-top latch.

Test point 2

Button short to ground

Fault code 02

1. Check pin 1 to pin 4 for continuity (bitmap on "close" switch), check button pin 2 to pin 4 for continuity (bitmap on "open" switch).
2. Measure resistance of wires 1 and 2 to one another with the ohmmeter. Display 1.8 – 2.0 K Ω

Fault, Fault code**Possible causes, elimination, notes****Test point 3**

Convertible-top pot. fault

Fault code 03

This fault is only stored in the memory if the voltage at the input of the convertible-top potentiometer exceeds or falls below the operating range.

1. Switch ignition off and remove ignition key. With test adapter 9619, 9636 and pin template 9636, measure the resistance of the convertible-top potentiometer at row 1, pins 12, 21 and 24 with the ohmmeter. If the display $\infty \Omega$ appears, the convertible-top potentiometer must be replaced.
Refer to Serv. No. 61 66 19
2. Switch on the ignition and measure at row 1, pins 12 and 21, with the voltmeter; nominal value (display) 0.4 - 4.4 volts.
If there is no voltage display, replace the control module.
3. Calibrate the convertible top

Test point 4

CTCL pot. fault

Fault code 04

This fault is only stored in the memory if the voltage at the input of the convertible-top compartment lid potentiometer exceeds or falls below the operating range.

1. Switch ignition off and remove ignition key. With test adapter 9619, 9636 and pin template 9636, measure the resistance of the convertible-top compartment lid potentiometer at row 1, pins 1, 3 and 5 with the ohmmeter. If the display $\infty \Omega$ appears, the potentiometer and drive motor must be replaced.
Refer to Serv. No. 61 70 19
2. Switch on the ignition and measure at row 3, pins 1 and 3, with the voltmeter; nominal value (display) 0.5 - 4.4 volts.
If there is no voltage display, replace the control module.
3. Calibrate the convertible top



Fault, Fault code

Possible causes, elimination, notes

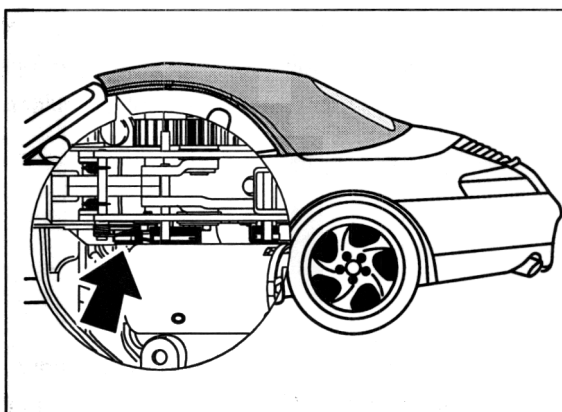
Test point 5

Timeout error

Fault code 05

This fault is only stored in the memory if an electric motor is actuated and does not reach the limit position within 6 seconds, or the potentiometers of the convertible top and CTCL do not show any change in voltage within 3 seconds.

To check the micro-switch input signals, select the input signals which appear in the menu: Latch locked, Latch unlocked, Convertible top, Convertible-top compartment lid side flaps, Latching hook. Actuate the micro-switch manually (press it) to read the response in the bitmap positions of the tester display.

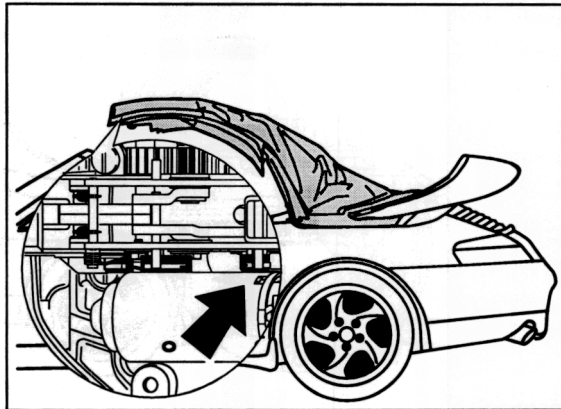


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If the convertible top is between "Convertible top closed" and "Convertible top forward" and if the "Convertible top raised" input is connected to ground (contact for micro-switch of convertible-top latch does not lie against the top edge of the cowl panel and does not switch), examine the tension of the convertible-top covering using the left and right tension cables or, if necessary, loosen by 1 or 2 turns so that the contact lies against the top edge of the cowl panel and switches.

Fault, Fault code

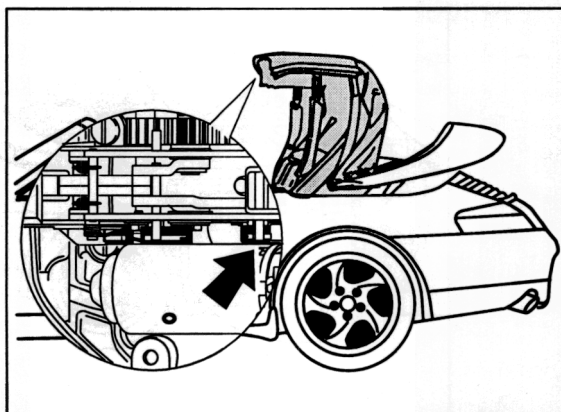
Possible causes, elimination, notes



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If the convertible top is in the forward position (diagram) on closing, check the response of the micro-switch - unlocked or not unlocked (small diagram) - in the convertible-top latch.

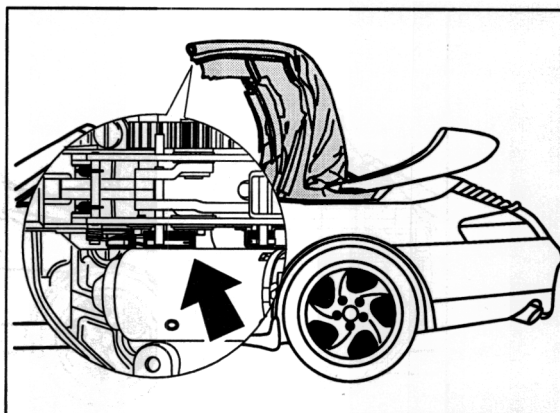
If the micro-switch is defective, replace the convertible-top latch.



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If the convertible top is in the rear position (diagram) on opening, check the response of the micro-switch - unlocked or not unlocked (small diagram) - in the convertible-top latch.

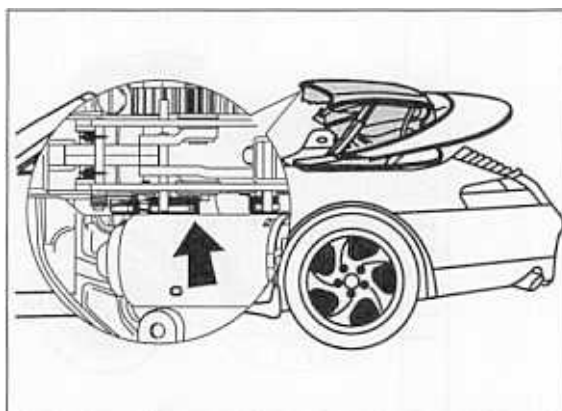
If the micro-switch is defective, replace the convertible-top latch.

Fault, Fault code**Possible causes, elimination, notes**

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If the convertible top is in the centre front position (diagram) on closing, check the response of the micro-switch - not locked or locked (small diagram) - in the convertible-top latch.

If the micro-switch is defective, replace the convertible-top latch.



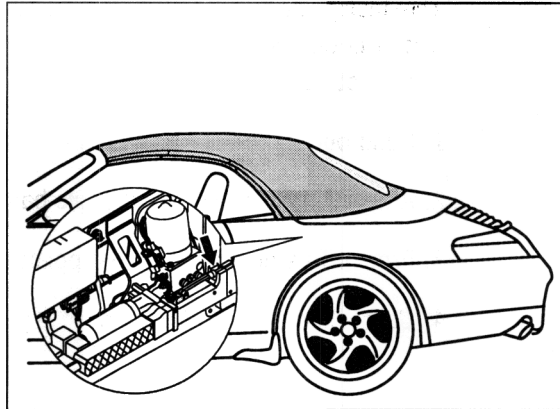
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If the convertible top is in the centre rear position (diagram) on opening, check the response of the micro-switch - not locked or locked (small diagram) - in the convertible-top latch.

If the micro-switch is defective, replace the convertible-top latch.

Fault, Fault code

Possible causes, elimination, notes



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If the convertible top is in the closed position (diagram) and the latching hook has been actuated, check the response of the convertible top (CTCL) micro-switch or adjust the Bowden cable of the central locking hook in such a way that the micro-switch switches.

A defective micro-switch must be replaced.

Refer to Serv. No. 61 81 19

If the convertible top remains in a position not described here:

6. Switch ignition off and remove ignition key. With test adapter 9619, 9636 and pin template 9636, measure the resistance of the convertible-top compartment lid potentiometer at row 3, pins 1, 3 and 5 with the ohmmeter. If the display $\infty \Omega$ appears the potentiometer and drive motor must be replaced.
Refer to Serv. No. 61 70 19
7. Switch ignition off and remove ignition key. With test adapter 9619, 9636 and pin template 9636, measure the resistance of the convertible-top potentiometer at row 1, pins 12, 21 and 24 with the ohmmeter. If the display $\infty \Omega$ appears, the convertible-top potentiometer must be replaced.
Refer to Serv. No. 61 66 19

Test point 6

Calibration necessary

Fault code 06

This fault is stored in the memory after 1000 actuations or if fault code 03, convertible-top pot. fault, or fault code 04, CTCL pot. fault, is entered.

1. Read out and delete actuation counter 2.
2. A newly installed control module has not been calibrated.
3. Proceed as described in test points 3 or 4.
4. Calibrate the convertible top

Test point 7

Supply voltage

Fault code 07

1. Check the battery or alternator.
2. Inspect the plug connection on the control module for corrosion.

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Diagnosis/Troubleshooting

Airbag

System B 04

Contents overview

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General instructions

The airbag system is constantly monitored by a diagnosis unit in the triggering unit. Any fault is signalled by a warning light.

The warning light for the airbag system lights up in the event of a fault.

The airbag warning light lights for approx. 3 seconds after the ignition is switched on and goes out if no fault has been entered in the fault memory.

If it lights up again, this indicates a fault in the system. The fault can be read out with the Porsche System Tester 2.

The following components must be removed and replaced following an accident in which the airbag system was triggered:

Contact unit

Triggered airbag unit(s)

The triggering unit must be replaced after the airbag is triggered for the third time.

Note

A period of 10 seconds is required to enable the triggering unit to identify all faults in the system. In order to guarantee that every possible fault source is checked during the vehicle check, the ignition must be switched on for at least 10 seconds.

The fault memory must be cleared following a fault in the airbag system and after it has been remedied.

The replacement of a component must be noted in the Guarantee and Maintenance booklet. To do this, attach the documentation number in a free panel intended for that purpose. The documentation number is attached to the replacement part as a sticker.

Menu

Overview of the possible menus

Fault memory

Events

Locking

Checking the coding

Changing the coding

Fault memory: see Page 69 - D 11

Events: see Page 69 - D 19

Locking see Page 69 - D 20

Checking the coding: see Page 69 - D 21

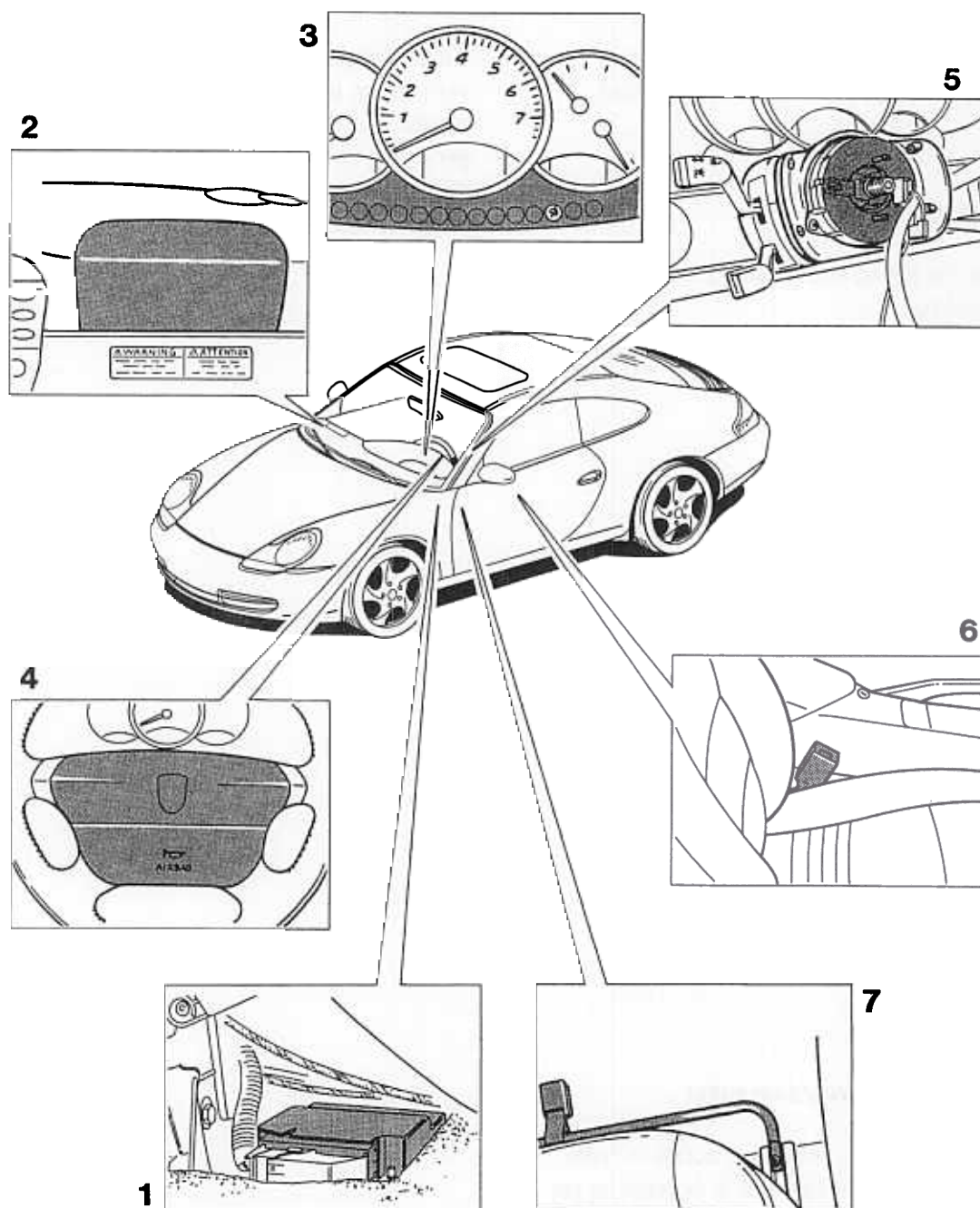
Changing the coding: see Page 69 - D 22

Note

Observe the safety regulations when working on the airbag system.



Component arrangement



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Function, individual components**1. Triggering unit**

Processes the incoming signals and triggers the airbag system when an accident is identified.

2. Passenger's airbag unit

Contains the airbag and the gas generator for the passenger.

3. Warning light

1. System readiness indicator.
2. Fault indication.

4. Driver's airbag unit

Contains the airbag and the gas generator for the driver.

5. Contact unit

Connection between the triggering unit and driver's airbag unit.

6. Belt buckle, driver/passenger

A switch is installed in each belt buckle in order to detect whether the seat belt is fastened or not.

7. Plug connection, child restraint system

If a child restraint system is used, the passenger's airbag unit must be deactivated. A plug connection (buckle) is installed under the passenger's seat for this purpose. The tongue of the child restraint system must be inserted into this plug connection.

System description

The airbag system consists of the following components: triggering unit, contact unit, driver's airbag unit, passenger's airbag unit, child restraint system plug connection, belt buckle for driver, belt buckle for passenger and the warning light. A system self-test is performed after the ignition is switched on. The warning light is switched on during the self-test. If no faults are stored in the fault memory, the warning light goes out after approx. 3 seconds.

Up to max. 10 faults can be stored. A start and stop fault clock is kept for each fault.

The triggering unit has the following functions:

- Crash recognition and triggering time calculation

- Triggering the airbag system

- Recording the event data

- Self-test and permanent monitoring of the airbag system

- Fault storage

- Fault display

- Fault output

- System readiness display

If the triggering unit is replaced, the data record for the appropriate vehicle must be loaded with the Porsche System Tester 2 and the triggering unit must be locked.

The warning light flashes before locking.

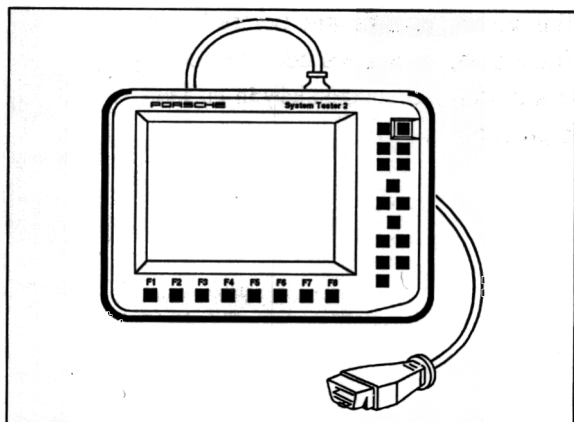
The warning light goes out after locking was performed successfully (if no fault is present).

The triggering unit need not be replaced until after the third time the airbag is triggered or if the fault memory can no longer be cleared.

Tools

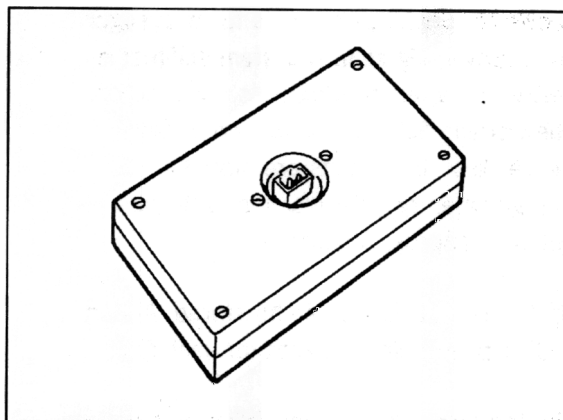
The following equipment is required for troubleshooting:

1. Porsche System Tester 2



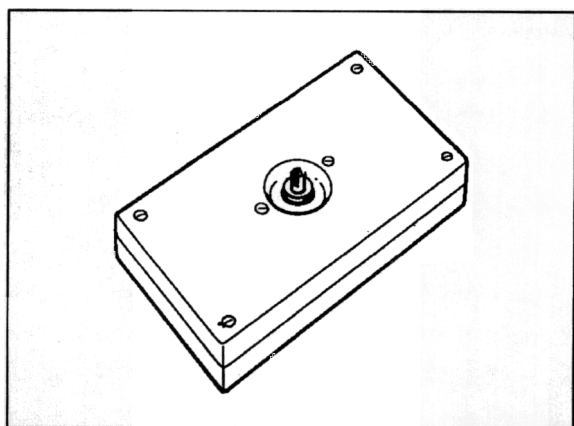
547_96

3. Special tool 9516/1



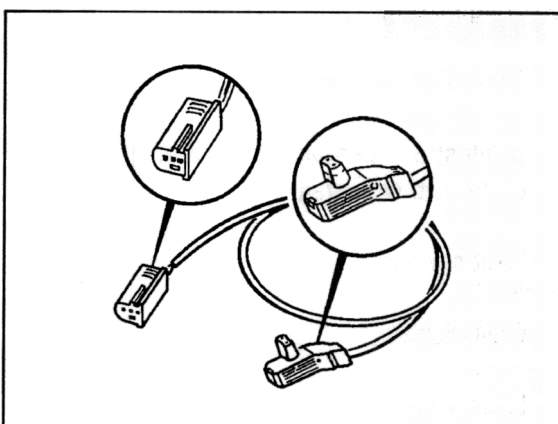
561_96

2. Special tool 9516



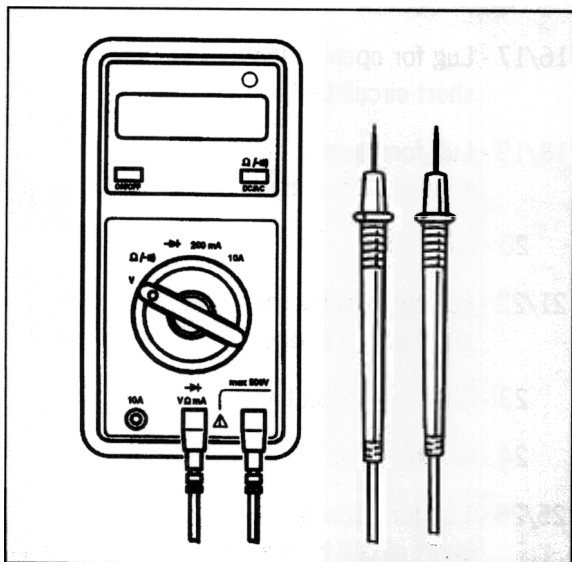
560_68

4. Special tool 9566



1798_68

5. Commercially available digital multimeter



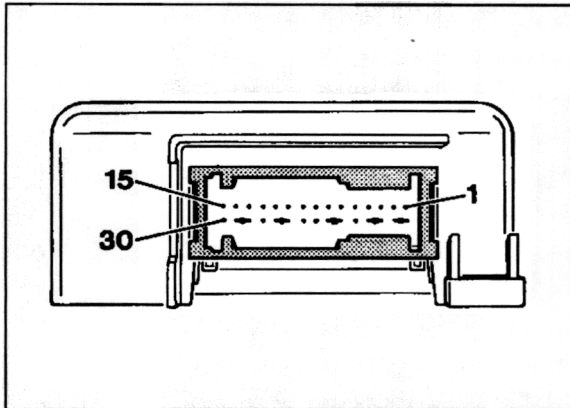
2178 - 28

Note

The special tools are used to check the ignition pill circuits.

For safety reasons, it is not permissible to drive with special tools attached instead of the airbag units.

Connector assignment, triggering unit



1838 - 68

- | | |
|--|--|
| 1 - Free | 16/17 - Lug for opening the short circuit bridge |
| 2 - Free | 18/19 - Lug for opening the short circuit bridge |
| 3 - Free | 20 - Free |
| 4 - Free | 21/22 - Lug for opening the short circuit bridge |
| 5 - Terminal 15 | 23 - Child seat detection |
| 6 - Terminal 31 | 24 - Crash output |
| 7 - Warning light | 25/26 - Lug for opening the short circuit bridge |
| 8 - Buckle, passenger | 27 - Free |
| 9 - K-line | 28/29 - Lug for opening the short circuit bridge |
| 10 - Driver's ignition pill, positive | 30 - Free |
| 11 - Driver's ignition pill, negative | |
| 12 - Buckle, driver | |
| 13 - Passenger's ignition pill, positive | |
| 14 - Passenger's ignition pill, negative | |
| 15 - Free | |

Fault memory

Overview of possible faults

Warning light, airbag

Supply voltage

Firing circuit, driver

Firing circuit, passenger

Buckle, driver

Buckle, passenger

Child seat detection

Control unit faulty

Note

A plus sign (+) present in the line or not present indicates a loose contact. A counter is started when the symbol changes from not present to present. This counter indicates how often the change took place from present to not present.

When a fault is identified, a fault start clock is started. The fault start clock shows the time in hours, minutes and seconds that has passed since the fault first occurred.

When a changeover occurs from present to not present, a fault stop clock is started. The fault stop clock shows the time which has passed since the fault was no longer present. However, with both clocks, only ignition on times are shown. This means that the clocks are stopped when the ignition is switched off.

Fault overview

Test point	Fault code	Fault effect	Page
1	04, 05, 20, 21, 36	Fault memory	69 - D 13
2	10, 11, 26, 27, 39	Fault memory	69 - D 14
3	03	Fault memory ^①	69 - D 15
4	01, 02	Fault memory ^②	69 - D 15
5	44, 45, 46, 50	Fault memory ^③	69 - D 16
6	47, 48, 49, 51	Fault memory ^③	69 - D 16
7	70, 71, 72, 73	Fault memory ^①	69 - D 17
8	>= 100	Fault memory ^④	69 - D 17
9	XXX	Fault memory	69 - D 18

① The warning light is on as long as the limit value is exceeded or not reached.

② The warning light is not on.

③ In the case of fault code 50 or 51, the warning light is on as long as the limit value is exceeded or not reached.

④ The fault memory cannot be cleared. The triggering unit must be replaced.

Fault, Fault code

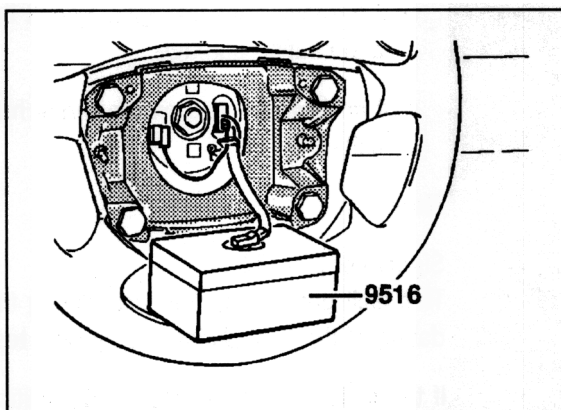
Possible causes, elimination, notes

Test point 1

Firing circuit, driver

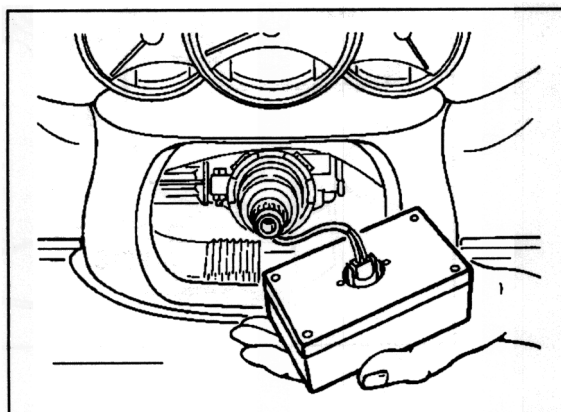
Fault codes 04, 05, 20, 21, 36

1. Remove driver's airbag unit.
2. Attach the special tool 9516 instead of the airbag unit.



135 - 96

3. Clear the fault memory
4. Check whether the fault appears again.
 - a) If the fault does not appear again, replace the airbag unit.
 - b) If the fault appears again, disconnect plug connection to the contact unit and attach special tool 9516/1.



129 - 96

Fault, Fault code	Possible causes, elimination, notes
	5. Clear the fault memory
	6. Check whether the fault appears again.
	a) If the fault does not appear again, replace the contact unit.
	b) If the fault appears again, check the wiring harness for pinches and chafing damage.
	c) If no fault is found on the wiring harness, replace the triggering unit.

Note

Signal not plausible.

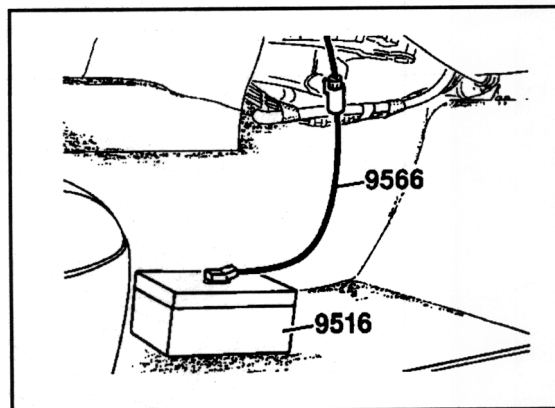
This fault path is checked only during the triggering unit self-test, i.e. updating of the fault during the cyclical tests does not take place.

If the fault memory is erased, the ignition must be switched off, the ignition key removed and the ignition switched on again in order to check the fault path. Only in this way is another self-test carried out.

Test point 2

Firing circuit, passenger
Fault codes 10, 11,
26, 27, 39

1. Disconnect the plug connection to the passenger's airbag unit.
2. Attach the special tool 9516 in conjunction with special tool 9566.



130 - 96

Fault, Fault code**Possible causes, elimination, notes**

3. Clear the fault memory.
4. Check whether the fault appears again.
 - a) If the fault does not appear again, replace the passenger's airbag unit.
 - b) If the fault appears again, check the wiring harness for pinches and chafing damage.
 - c) If no fault is found on the wiring harness, replace the triggering unit.

Note

Signal not plausible.

This fault path is checked only during the self-test of the triggering unit, i.e. updating of the fault during the cyclical tests does not take place.

If the fault memory is cleared, the ignition must be switched off, the ignition key removed and the ignition switched on again in order to check the fault path. Only in this way is another self-test carried out.

Test point 3

Supply voltage

Fault code 03

1. Inspect the battery and generator.
2. Inspect the plug connection on the triggering unit for corrosion.

Test point 4

Warning light, airbag

Fault codes 01, 02

1. Inspect the fuse for the supply voltage (terminal 15) for the instrument cluster.
2. Inspect the bulb and replace it if necessary.
3. Inspect the line from the triggering unit pin 7 to the warning light for continuity and short circuit to positive or negative.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Test point 5

Buckle, driver

Fault codes 44, 45, 46, 50**Note**

Only on USA vehicles:

1. Disconnect the plug connection X16.
2. Connect ohmmeter on the pin side on pins B7 and B8.
Display: approx. 400 Ω

Note

The belt tongue must not be inserted in the buckle.

3. Connect ohmmeter on the pin side on pin B7 and ground.
Display: $\infty \Omega$
4. Connect ohmmeter on the pin side on pins B7 and B8.
Insert the belt tongue in the buckle.
Display: approx. 100 Ω
5. Inspect the wiring harness to the triggering unit for pinches and chafing damage.

Test point 6

Buckle, passenger

Fault codes 47, 48, 49, 51**Note**

Only on USA vehicles:

1. Disconnect the plug connection X17.
2. Connect ohmmeter on the pin side on pins B7 and B8.
Display: approx. 400 Ω

Note

The belt tongue must not be inserted in the buckle.

3. Connect ohmmeter on the pin side on pin B7 and ground.
Display: $\infty \Omega$

Fault, Fault code	Possible causes, elimination, notes
	4. Connect ohmmeter on the pin side on pins B7 and B8. Insert the belt tongue in the buckle. Display: approx. 100 Ω
	5. Inspect the wiring harness to the triggering unit for pinches and chafing damage.

Test point 7

Child seat detection

**Fault codes 70, 71,
72, 73**

1. Disconnect the plug on the triggering unit.
2. Connect ohmmeter to plug, pin 23 and ground.
Plug of child seat not inserted.
Display: approx. 2 k Ω

Plug of child seat inserted.
Display: approx. 260 Ω
3. Inspect the wiring harness to the triggering unit for pinches and chafing damage.

Test point 8

Control unit

Fault code ≥ 100

Replace the triggering unit.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Test point 9

Unknown fault code

Fault code XXX

1. Inspect the ground points for corrosion.
2. Inspect the ignition on the secondary side.
3. Clear the fault memory.

Events

Event data can be read out under the menu item "Events". Up to max. three events can be stored. Each event covers 16 bytes.

The triggering unit must be replaced after the third event, since the airbag warning light lights up continuously and the events cannot be deleted.

Locking

An unlocked triggering unit can be locked under the menu item "Locking".

A locked triggering unit **cannot be unlocked again**.

If a triggering unit is unlocked, the airbag warning light flashes. The triggering unit must then be locked.

Triggering units from the Parts Service are delivered in an unlocked state.

1. Select Driver's/Passenger's airbag or Driver's airbag according to the vehicle equipment.
2. Select vehicle type.

Note

The vehicle type cannot be changed again.

3. Select Locking.

If there is no fault, the following message is displayed after a short waiting period:

Airbag was locked

This ends locking.

The following messages can be displayed in a fault state:

Airbag was already locked

No Porsche control unit

Wrong vehicle type

Wrong data record version

Wrong equipment

In the event of a fault, the triggering unit cannot be locked.

In the case of the "wrong equipment" message, select the correct equipment.

Replace the triggering unit in the case of the other messages.

Calibrating convertible top

Calibration of the Cabriolet convertible top and the convertible top compartment lid is carried out with the Porsche System Tester 2 diagnosis. The respective potentiometer values (convertible top and convertible top compartment lid) are established during calibration. If the potentiometer values are plausible, the values are stored.

The calibration values can then be calculated as a percentage by the convertible top control module from the potentiometer values.

The following preconditions must be met in order to enable successful calibration.

1. The convertible-top latch must be repaired (after an emergency operation).
Refer to Serv. No. 61 01 41
2. The convertible-top compartment lid drive must be repaired (after an emergency operation).
Refer to Serv. No. 61 01 41
3. The valve screw of the hydraulic pump must be closed.
4. The parking brake must be engaged.
5. The engine compartment lid must be closed
6. The potentiometer values of the convertible top and the convertible top compartment lid lie between the nominal values specified.
See Serv. No. 61 01 Diagnosis/troubleshooting convertible top (nominal values). Read out fault memory if necessary and proceed according to Serv. No. 61 00 Diagnosis/troubleshooting convertible top.

7. The upper microswitches of the left and right rear side section flaps are actuated when the opened convertible top is set down
See under Input signals in the Tester: Bitmap position (left side flap up or right side flap up).
Read out fault memory if necessary and proceed according to Serv. No. 61 00
Diagnosis/troubleshooting convertible top

8. The lower microswitches of the left and right rear side section flaps are actuated when the convertible top is closed. See under Input signals in the Tester: Bitmap position (left side flap down or right side flap down).
Read out fault memory if necessary and proceed according to Serv. No. 61 00
Diagnosis/troubleshooting convertible top

9. The convertible top compartment lid microswitch must be unlocked when the convertible top compartment lid is open. See under Input signals in the Tester: Bit map position (convertible top compartment lid unlocked)
The microswitch must be locked when the convertible top compartment lid is closed. See under Input signals in the Tester: Bit map position (convertible top compartment lid locked).
Read out fault memory if necessary and proceed according to Serv. No. 61 00
Diagnosis/troubleshooting convertible top

Information:

The actuation counter 2 is reset during calibration.

Calibration is not counted as actuation.

Calibration can be interrupted at any time with the Tester **F8** key.

69 71 **Diagnosis/troubleshooting, roll-over protection system**

Diagnosis/Troubleshooting

Roll-over protection system

System UEB11

Contents overview

	Page
Menu (overview of possible menus)	69 - D 25
Notes on possible dangers	69 - D 26
Tools	69 - D 27
Component arrangement	69 - D 28
System description	69 - D 29
Connector assignment, connector A, subframe	69 - D 34
Connector assignment, connector B, control module	69 - D 35
Fault overview	69 - D 36
Test points / diagnosis	69 - D 37

Menu

Overview of possible menus

	Page
Identification	69 - D 42
Fault memory	69 - D 42
Erase fault memory	69 - D 42
Actual values	69 - D 42
Input signals	69 - D 42
Drive links	69 - D 42
Events	69 - D 42
Transport lock	69 - D 43
Change coding	69 - D 43
Lock	69 - D 43



CAUTION:

Risk of injury if the roll-over bar is triggered!

- > All persons must remain out of the operating range of the roll-over bar during diagnosis.
- > Always keep the operating range of the roll-over bar free (do not leave tools there).
- > Install, remove and transport the roll-over bar only when it is extended (triggered).
- > Repairs to the roll-over bar and actuators are not permitted



CAUTION:

- > The roll-over bar must be triggered during every inspection, but every two years at the latest, using the Porsche System Tester 2.



“WARNING”

Risk of damage!

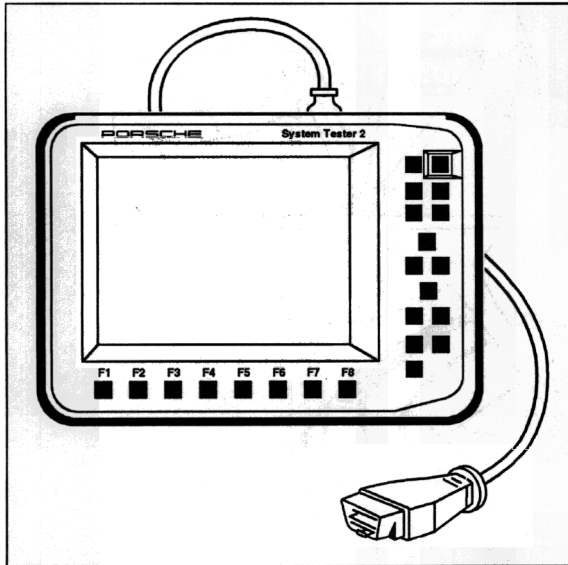
- > Only connect the diagnostic module when the ignition is off.

Tools

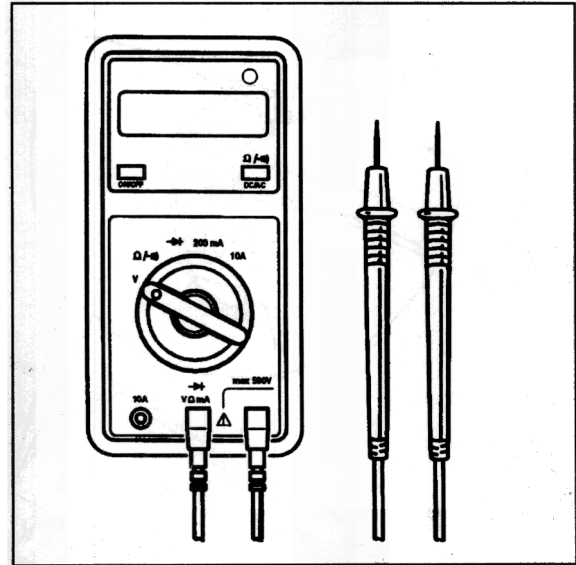
The following equipment is required for troubleshooting:

1. Porsche System Tester 2

2. Commercially available digital multimeter

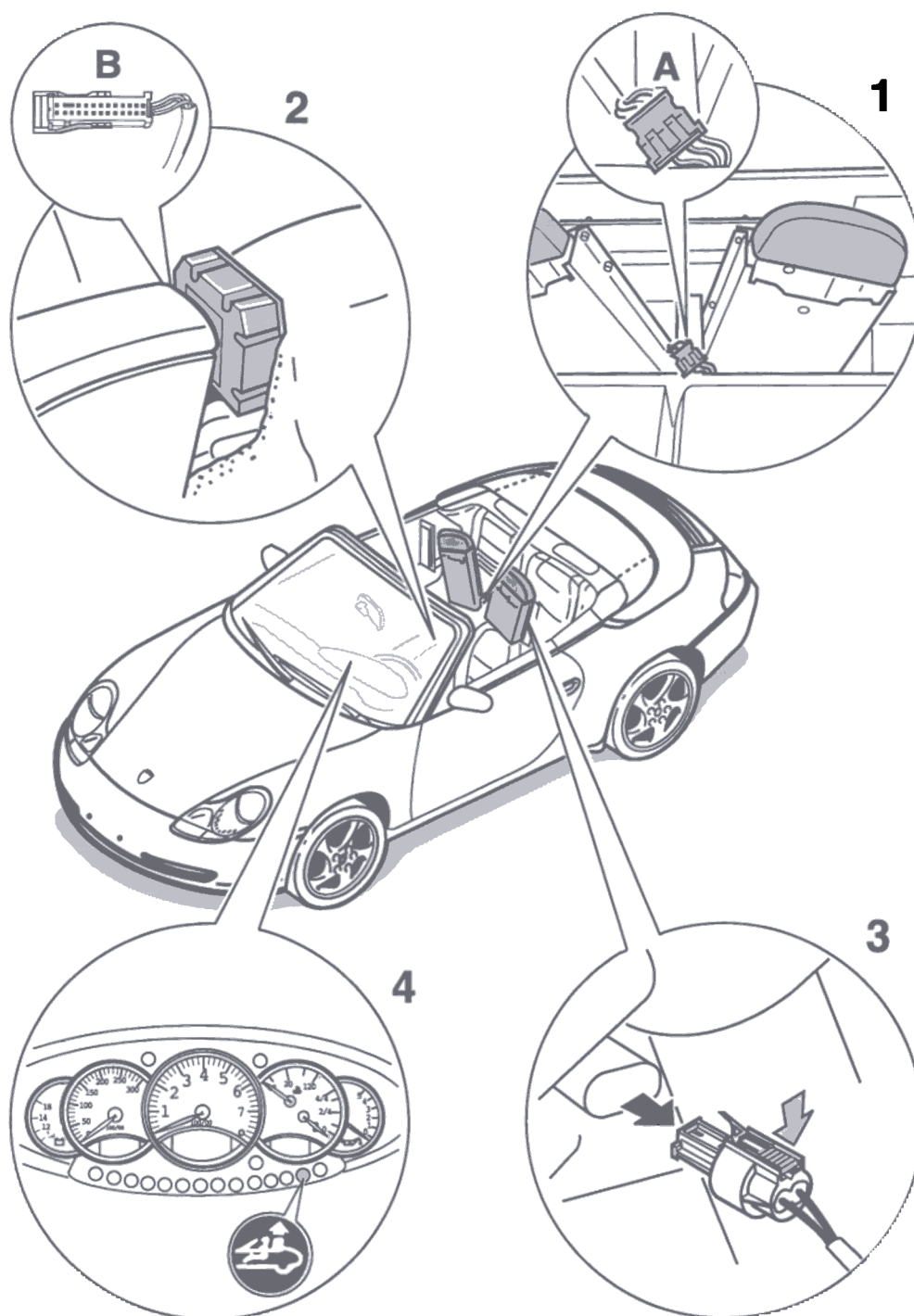


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2178_28

Component arrangement



175_98

System description

In conjunction with the windscreen frame, the roll-over protection system protects passengers, particularly on the rear seat, if the car should roll over.

The roll-over protection system consists of the following components:

Two interchangeable modules each with a triggerable roll-over bar and an actuator

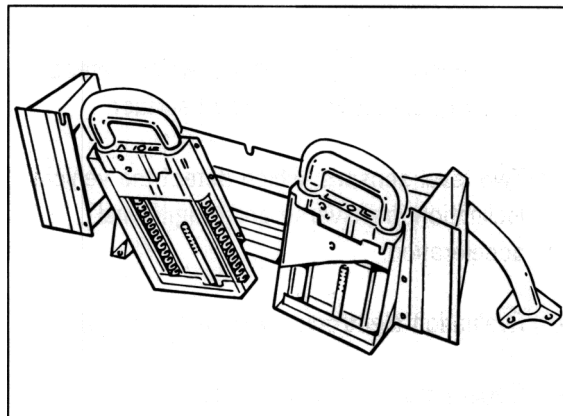
The control module with integrated g sensor and level sensor

Warning light in instrument cluster

1. Roll-over bars

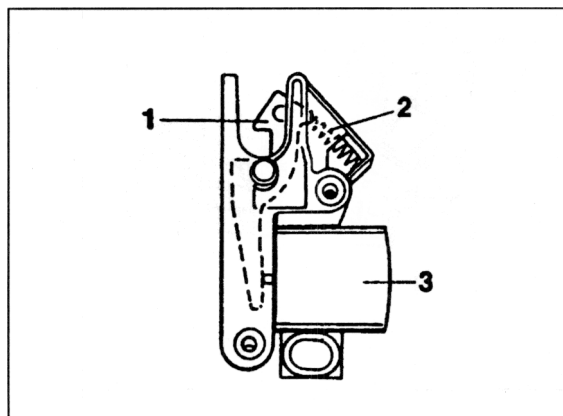
The two roll-over bars and modules are attached to a subframe behind the rear seat.

If the sensors detect a roll-over situation, the roll-over bars are extended through spring force.



248_98

The actuators consist, among other things, of solenoids which directly actuate the trigger lever.



229_98

1. Trigger lever
2. Compression spring
3. Solenoid

2. The control module

The control module consists of:

A g-sensor (g = gravitation), which detects loss of contact with the road surface

Two level sensors, which detect the vehicle inclination, transverse and longitudinal acceleration

Evaluation electronics with self-diagnosis

Capacitors to provide reserve power if the battery voltage fails.

3. Electrical plug connection of the roll-over bar

The plug connections are situated on the rear side of the roll-over bar. Before connecting and disconnecting the plug connection, first unscrew the six fastening screws of the roll-over bars.

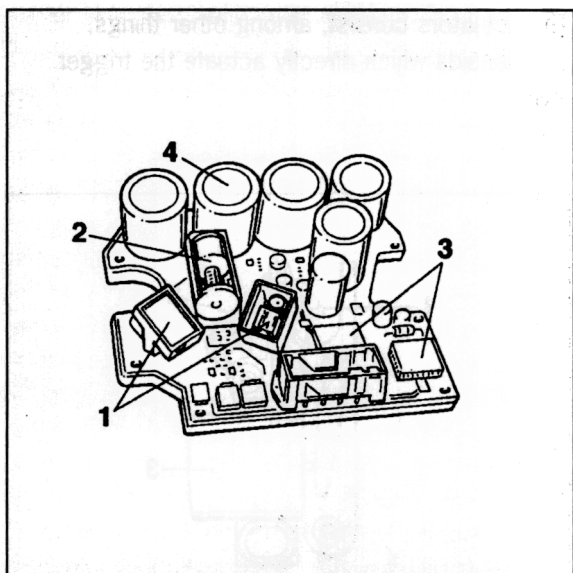
4. Warning light of roll-over protection system

After the ignition has been switched on, the warning light lights up for five seconds.

In the event of a fault, the warning light briefly goes out and then comes back on continuously.

Note

The warning light also lights up if the transport lock has been activated via the diagnostic module.



231_98

1. Level sensors
2. g-sensor
3. Evaluation electronics
4. Capacitors

The level sensor

The following parameters can be measured with the aid of the level sensor:

Vehicle inclination

Transverse acceleration

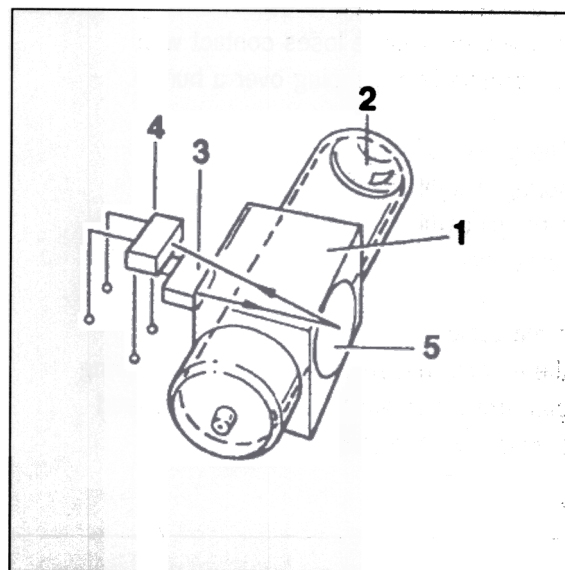
Longitudinal acceleration

The level sensor consists of the following components:

Spirit level housing which is filled with fluid and contains an air bubble

Light-emitting diode (LED) (sender function)

Phototransistor (receiver function)



230_98

1. Spirit level housing
2. Air bubble
3. LED (sender)
4. Phototransistor (receiver)
5. Mirror

If the vehicle exceeds the set limit values during transverse or longitudinal acceleration or pitches around the longitudinal axis by more than the limit value, the air bubble passes through the visual send and receive section.

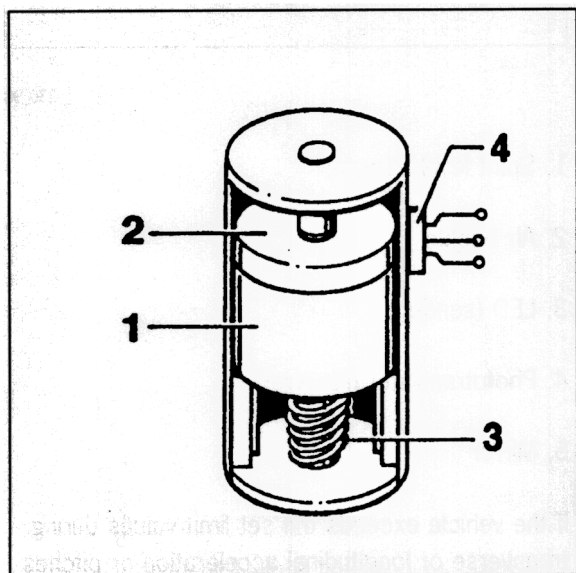
This movement of the air bubble is detected by the receiver and the system is triggered.

Gravitation sensor (g-sensor)

The g-sensor is used to detect driving situations in which the vehicle loses contact with the ground (e.g. jumping over a bump).

The g-sensor function is based on a spring/weight system. As a weight, a magnet which counteracts the spring force with the force of its weight is used.

If the vehicle lifts up from the ground, the magnet becomes lighter and the spring can press it upward. This closes the reed contact and triggers the system.



228_98

1. Weight
2. Magnet
3. Compression spring
4. Reed contact

Self-test

The roll-over protection system performs its own diagnosis, and carries out a self-test for 5 seconds after the ignition is switched on. The red indicator light in the instrument cluster goes out if no faults are detected during the self-test.

Detected faults are stored and can be read out using the diagnostic module.

Emergency triggering

If the roll-over bars cannot be triggered using the diagnostic module, they can be triggered mechanically via a sealed hole in the actuator.



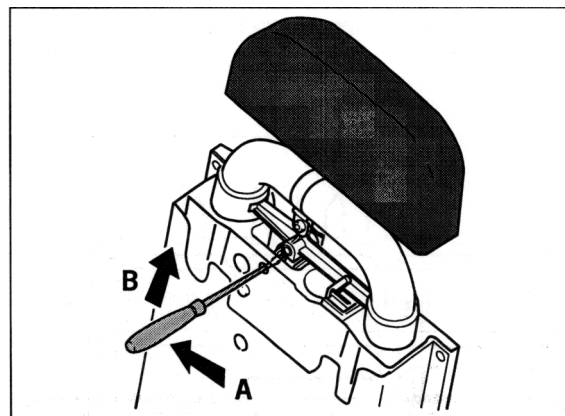
CAUTION:

Risk of injury if the roll-over bar is triggered!

- > The range of movement of the roll-over protection system must be kept clear during emergency triggering.

Procedure

1. Insert a screwdriver into the hole in the module and press it against the top edge of the pawl.
2. Press the screwdriver to the left (**arrow A**) and hold it while pressing down (**arrow B**). The roll-over bar is triggered.



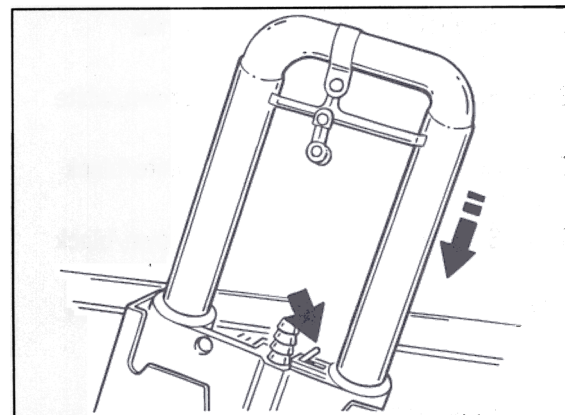
119_98

Retracting the roll-over bars

The roll-over bars can be retracted by hand.

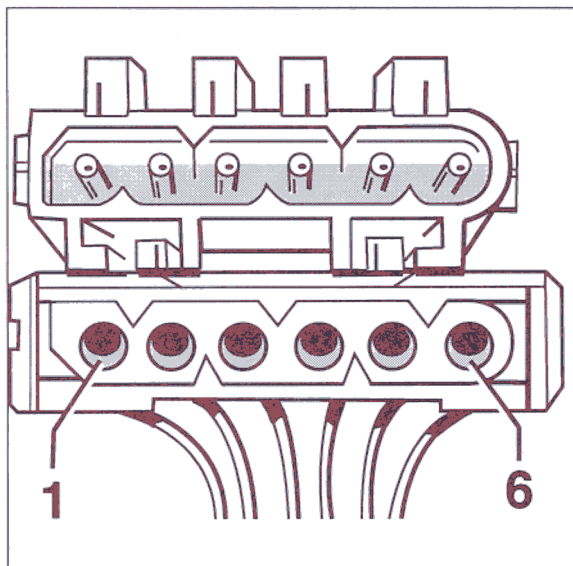
Procedure

1. Press the pawl to the right.
2. Press the roll-over bar down with your hand.



247_98

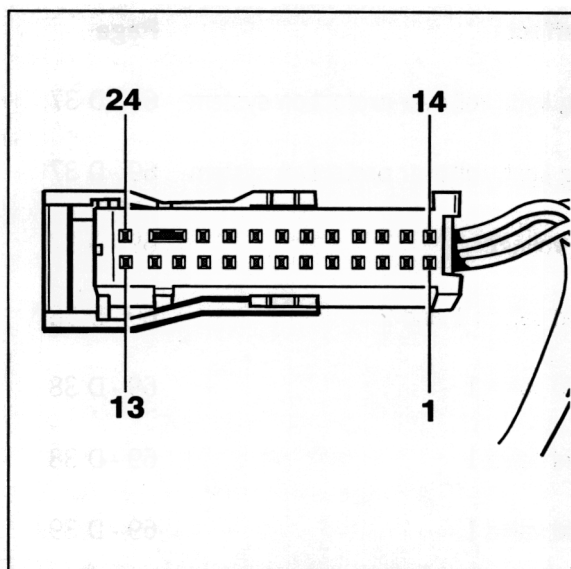
**Connector assignment, connector A
(subframe)**



178_98

Pin No.		Colour of wire
1	Solenoid valve 1 +	white
2	- Solenoid valve 1 +	brown/white
3	- Solenoid valve 1 +	white/black
4	- Solenoid valve 1 +	brown/black
5	- Mirror heating pin b (right and left)	grey/green
6	- Terminal 31 control module Electric-motor driven convertible-top drive	brown

Connector assignment, connector B (control module)



176_98

Pin No.	Colour of wire	Pin No.	Colour of wire
1 - Not used		12 - Warning light	yellow/black
2 - Not used		13 - Not used	
3 - Not used		14 - Not used	
4 - Solenoid valve 1 -	brown/white	15 - Not used	
5 - Solenoid valve 1 +	white	16 - Not used	
6 - Not used		17 - Solenoid valve 2 +	brown/black
7 - Not used		18 - Not used	
8 - Not used		19 - Not used	
9 - Not used		20 - Diagnosis	orange/blue
10 - Not used		21 - Solenoid valve 2 -	white/black
11 - Terminal 31	brown		

Fault overview

Test point	Fault code	Fault effect	Page
	1	Warning light, roll-over protection system	69 - D 37
2	2	Warning light, roll-over protection system	69 - D 37
3	3	Supply voltage	69 - D 37
4	4	Solenoid valves 1 and 2	69 - D 38
5	5	Solenoid valve 1	69 - D 38
6	6	Solenoid valve 1	69 - D 38
7	7	Solenoid valve 1	69 - D 39
8	9	Solenoid valve 2	69 - D 39
9	10	Solenoid valve 2	69 - D 39
10	11	Solenoid valve 2	69 - D 40
11	12	Trigger counter	69 - D 40
12	20, 21, 22, 23	Spirit level 1	69 - D 40
13	24, 25, 26, 27	Spirit level 2	69 - D 40
14	28	Acceleration sensor	69 - D 41
15	100	Solenoid valve 1, actuation	69 - D 41
16	101	Solenoid valve 2, actuation	69 - D 41
17	129 195, 196, 200 - 204 209 - 213, 219 - 229 230 - 235	Control module faulty	69 - D 41

Fault, Fault code

Possible causes, elimination, notes

Test point 1

Warning light of roll-over protection

Open circuit

Short to ground

Fault code 1

This fault is stored in the memory if there is an open circuit or short to ground in the supply lead to the warning light in the instrument cluster.

Open circuit

1. Check bulb and replace if necessary.
2. Check wire to pin 12 for open circuit. Pull plug off the roll-over protection control module. Pull off plug III on the instrument cluster. Measure resistance between plug on roll-over protection control module pin 12 and plug III on instrument cluster pin 16
Ohmmeter display: $< 5 \Omega$

Short to ground

Measure resistance between plug on roll-over protection control module pin 12 and ground
Ohmmeter display: $\infty \Omega$

Test point 2

Warning light of roll-over protection

Short to B+

Fault code 2

This fault is stored in the memory if there is a short to B+ of the supply lead to the warning light in the instrument cluster.

1. Pull off plug on control module and plug III on instrument cluster. Check wire to pin 12 for short to B+. Switch ignition on. Measure voltage between plug on roll-over protection control module pin 12 and ground
Voltmeter display: 0 V

Test point 3

Supply voltage

Fault code 3

This fault is stored in the memory if the supply voltage is insufficient.

1. Examine battery and alternator.
2. Inspect the plug connection on the control module for corrosion.

Fault, Fault code	Possible causes, elimination, notes
Test point 4 Solenoid valves 1 and 2 Leakage resistance/short circuit Fault code 4	This fault is stored in the memory if the supply leads of solenoid valves 1 and 2 have a mutual short circuit or leakage resistance. Pull off plugs on control module and on solenoid valves 1 and 2. Check lines to solenoid valves 1 and 2 for shorts to each other.
Test point 5 Solenoid valve 1 Short to ground Fault code 5	This fault is stored in the memory in the event of a short to ground in the supply lead of solenoid valve 1. Pull off plug on solenoid valve 1 and plug on control module. 3. Measure resistance between plug on control module pin 4 and ground Display: $\infty \Omega$ Measure resistance between the plug on the control module pin 4 and the plug on solenoid valve 1 pin 2 Display: $< 5 \Omega$
Test point 6 Solenoid valve 1 Open circuit Fault code 6	This fault is stored in the memory if there is an open circuit in the supply leads to solenoid valve 1. Pull off plug on control module and on solenoid valve 1 Measure resistance between plug on control module pin 4 and plug on solenoid valve 1 pin 2 Display: $< 5 \Omega$ Measure resistance between the plug on the control module pin 5 and the plug on solenoid valve 1 pin 1 Display: $< 5 \Omega$ Push plug onto solenoid valve 2 again. Unplug connector X10 from the subframe. Measure resistance between pins 1 and 2 Ohmmeter display: 4 to 6 Ω at 20° C

Fault, Fault code	Possible causes, elimination, notes
Test point 7 Solenoid valve 1 Short to B+ Fault code 7	<p>This fault is stored in the memory in the event of a short to B+ in the supply lead of solenoid valve 1 (triggers roll-over bar).</p> <p>1. Pull off plugs on control module and on solenoid valves 1 and switch on the ignition. Measure voltage between plug on control module pin 4 and ground Voltmeter display: 0 V</p>
Test point 8 Solenoid valve 2 Short to ground Fault code 9	<p>This fault is stored in the event of a short to ground in the lead of solenoid valve 2.</p> <p>Pull off plug on control module and on solenoid valve 2. Measure resistance between plug on control module pin 17 and ground Ohmmeter display: $\infty \Omega$ Push plug onto solenoid valve 2 again. Unplug connector X10 from the subframe. Measure resistance between pins 3 and 4 Ohmmeter display: 4 to 6 Ω at 20° C</p>
Test point 9 Solenoid valve 2 Open circuit Fault code 10	<p>This fault is stored in the memory if there is an open circuit in the supply lead to solenoid valve 2.</p> <p>1. Pull off plug on control module and on solenoid valve 2 Measure resistance between plug on control module pin 17 and plug on solenoid valve 2 pin 2 Ohmmeter display: < 5 Ω</p> <p>2. Measure resistance between the plug on the control module pin 21 and the plug on solenoid valve 2 pin 1 Ohmmeter display: < 5 Ω Push plug onto solenoid valve 2 again. Unplug connector X10 from the subframe. Measure resistance between pins 3 and 4 Ohmmeter display: 4 to 6 Ω at 20° C</p>

Fault, Fault code	Possible causes, elimination, notes
Test point 10 Solenoid valve 2 Short to B+ Fault code 11	This fault is stored in the memory in the event of a short to B+ in the supply lead of solenoid valve 2 (triggers roll-over bar). 1. Pull off plugs on control module and on solenoid valve 1 and switch on the ignition. Measure voltage between plug on control module pin 17 and ground Voltmeter display: 0 V
Test point 11 Trigger counter Fault code 13	This fault is stored in the memory when the roll-over bar has been triggered more than 200 times. The fault can initially be erased using the Porsche System Tester 2, but reappears as soon as the ignition is switched off and on again. Replace roll-over bars. Replace control module.
Test point 12 Spirit level 1 Fault code 20, 21, 22, 23	This fault is stored in the memory if a defect is detected in level sensor 1. Replace control unit.
Test point 13 Spirit level 2 Fault code 24, 25, 26, 27	This fault is stored in the memory if a defect is detected in level sensor 2. Replace control unit.

Fault, Fault code	Possible causes, elimination, notes
Test point 14 Acceleration sensor Fault code 28	<p>This fault is stored in the memory if a defect is detected in the acceleration sensor.</p> <p>Replace control module.</p>
Test point 15 Solenoid valve 1, actuation Fault code 100	<p>This fault is stored in the memory in the event of a short circuit in the supply lead of solenoid valve 1 during triggering.</p> <ol style="list-style-type: none"> 1. Check supply lead of solenoid valve for short circuit. 2. After eliminating the fault, replace control module. <p>Note</p> <p>This fault cannot be erased with the Porsche System Tester 2</p>
Test point 16 Solenoid valve 2, actuation Fault code 101	<p>This fault is stored in the memory in the event of a short circuit in the supply lead of solenoid valve 2 during triggering.</p> <ol style="list-style-type: none"> 1. Check supply lead of solenoid valve for short circuit. 2. After eliminating the fault, replace control module. <p>Note</p> <p>This fault cannot be erased with the Porsche System Tester 2.</p>
Test point 17 Control module faulty Fault codes 129, 195, 196, 200-204, 209-213, 219-229, 230-235	<p>These faults are stored in the memory if a defect is detected in the control module.</p> <p>Replace control module.</p>

Identification

The diagnosis software number and control module part number can be read out under the "Identification" menu item.

Fault memory

Stored faults can be read out under the "Fault memory" menu item. If a fault is displayed in the Porsche System Tester 2, more detailed information about the fault can be obtained with the F8 key as of software version 3.0.

Erase fault memory

Faults stored in the control module can be erased under the "Erase fault memory" menu item. Here, all stored faults are erased.

Actual values

In the "Actual values" menu item, the current values of the following parameters can be read out.

Operating time

Number of times bars were triggered

Input signals

In the "Input signals" menu item, the current status of the acceleration sensor (active or not active) can be read out.

Drive links

In the "Drive links" menu item, the roll-over bars can be extended.

Events

The number of events as well as the values of the individual sensors which triggered the system can be read out under the menu item "Events". When the roll-over bars have been triggered 200 times, fault code 13, "Trigger counter", is stored in the control module.

Transport lock

The transport lock can be activated or deactivated under the "Transport lock" menu item. If the transport lock is activated, the system cannot be triggered and the warning light in the instrument cluster lights up continuously. The transport lock is activated if the vehicle is transported or e.g. loaded or unloaded onto a truck, in order to prevent the system from being triggered.

Extract coding

Information retrieval for the following statuses can take place under the "Extract coding" menu item.

- Status of transport lock

Vehicle type

- Locked by

Lock

In the "Lock" menu item, a new control module can be activated. If the control module is replaced, it must be locked to enable it to function.

69 01 **Diagnosis/troubleshooting, airbag**

Diagnosis/troubleshooting

Airbag

System B 05

Contents overview

	Page
General information	69 - D 47
Menu (overview of the possible menus)	69 - D 48
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System description	69 - D 51
Tools	69 - D 52
Connector assignment, triggering unit	69 - D 54
Fault memory (overview of the possible faults)	69 - D 55
Fault overview	69 - D 56
Test points	69 - D 57
Events	69 - D 64
Lock	69 - D 65
Extract coding	69 - D 66
Modify coding	69 - D 67

General information

The airbag system is constantly monitored by a diagnosis unit in the triggering unit. Any fault is signalled by a warning light.

The warning light for the airbag system lights up in the event of a fault.

The airbag warning light lights for approx. 3 seconds after the ignition is switched on and goes out if no fault has been entered in the fault memory.

If it lights up again, this indicates a fault in the system. The fault can be read out with the Porsche System Tester 2.

Note

A period of 10 seconds is required to enable the triggering unit to identify all faults in the system. In order to guarantee that every possible fault source is checked during the vehicle test, the ignition must be switched on for at least 10 seconds.

The fault memory must be cleared following a fault in the airbag system and after it has been remedied.

The replacement of a component must be noted in the Guarantee and Maintenance booklet. To do this, attach the documentation number in a free panel intended for that purpose. The documentation number is attached to the replacement part as a tear-off sticker.

The following components must be removed and replaced following an accident in which the airbag system was triggered:

Contact unit

Triggered airbag unit(s)

The triggering unit must be replaced after the airbag is triggered for the third time.



Warning:

Danger of injury

- > Observe safety instructions when working on the airbag system (see Serv. No. 69).

Menu

Overview of the possible menus

Fault memory:	see Page 69 - D 55
Events:	see Page 69 - D 64
Lock:	see Page 69 - D 65
Extract coding:	see Page 69 - D 66
Modify coding:	see Page 69 - D 67

System description

The airbag system consists of the following components:

Triggering unit

Contact unit

Driver's airbag unit

Passenger's airbag unit

Side airbags

Sensors for airbag (side-airbag sensors)

Plug connection, child restraint system

Belt buckle for driver

Belt buckle for passenger

Warning light

Self-test and permanent monitoring of the airbag system

Fault storage

Fault display

Fault output

System readiness display

The triggering unit need not be replaced until after the third time the airbag is triggered or if the fault memory can no longer be cleared.

If the triggering unit is replaced, the data record for the appropriate vehicle must be loaded with the Porsche System Tester 2 and the triggering unit must be locked.

The warning light flashes before locking. The warning light goes out after locking was performed successfully (if no fault is present).

A system self-test is performed after the ignition is switched on. The warning light is switched on during the self-test. If no faults are stored in the fault memory, the warning light goes out after approx. 3 seconds.

Up to max. 10 faults can be stored. A start and stop fault clock is kept for each fault.

The triggering unit has the following functions:

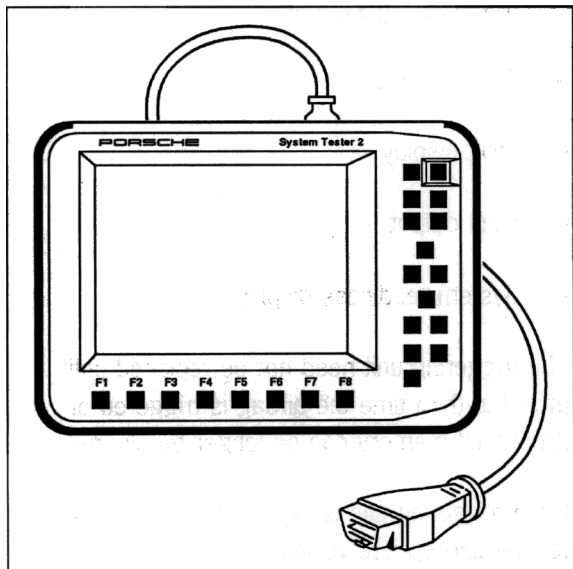
Crash recognition and triggering time calculation

Triggering the airbag system

Recording the event data

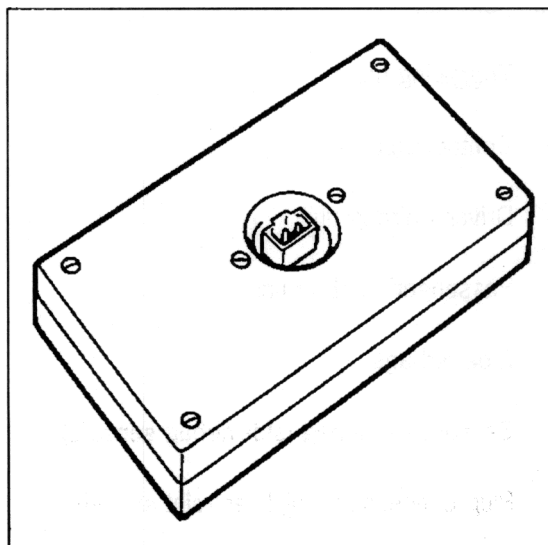
Tools

The following equipment is required for troubleshooting:



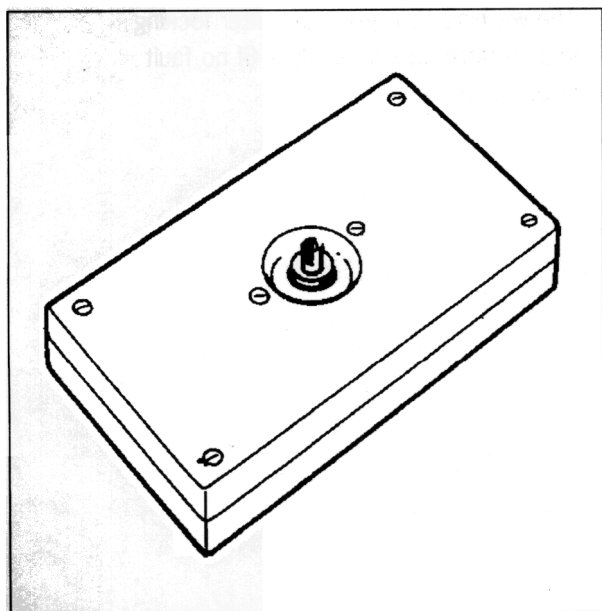
Porsche System Tester 2

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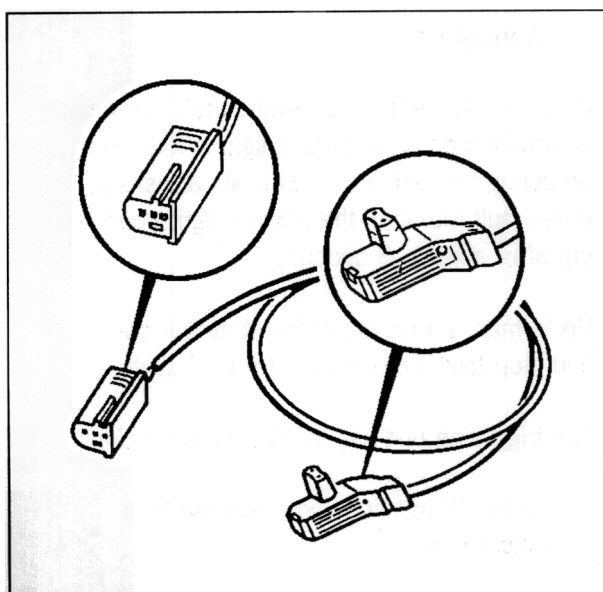
Special tool 9516/1

561_68



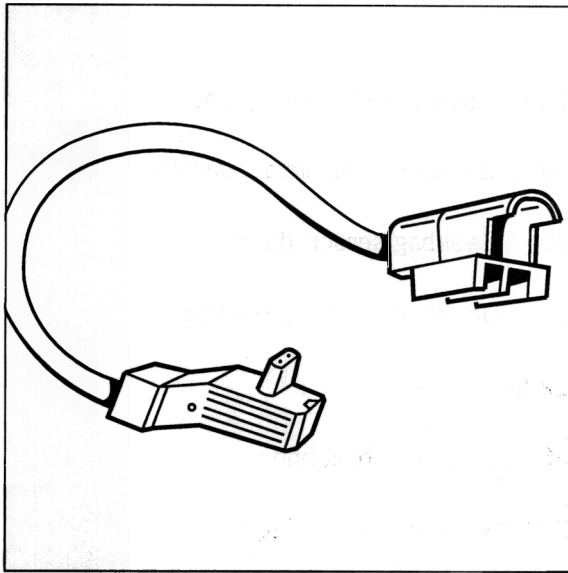
Special tool 9516

560_68



Special tool 9566

1798_68



Special tool 9516/2

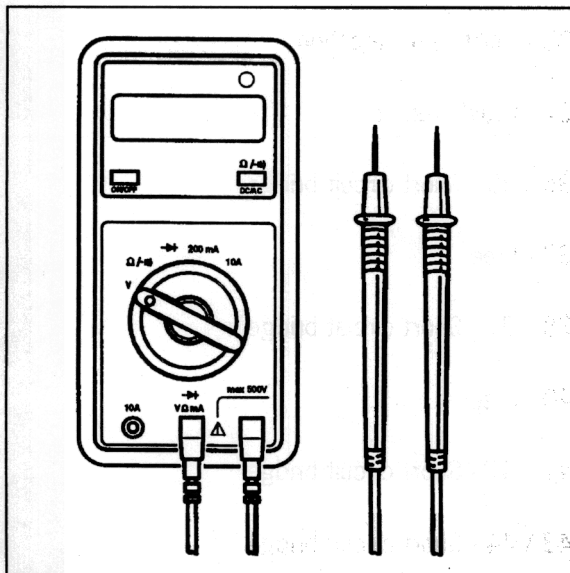
311_98



Warning

Danger of injury if vehicle is driven with the special tools in place!

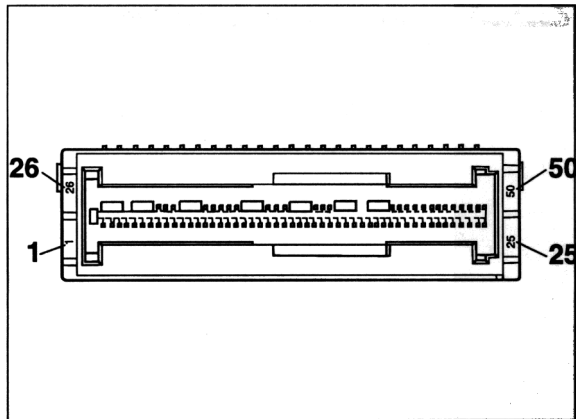
> Never drive with special tools attached instead of the airbag units.



Commercially available digital multimeter

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Connector assignment, triggering unit



313_98

- | | |
|--|--|
| 1 to 4 - Free | 18 - Passenger's side airbag, positive |
| 5 - Terminal 86 | 19 - Passenger's side airbag, negative |
| 6 - Terminal 31 | 20 - Side-airbag sensor, driver |
| 7 - Warning light | 21 - Side-airbag sensor, passenger |
| 8 - Buckle, passenger | 22 to 25 - Free |
| 9 - K-line | 26 \ 27 - Short circuit bridge |
| 10 - Driver's ignition pill, positive | 28 \ 29 - Short circuit bridge |
| 11 - Driver's ignition pill, negative | 30 - Free |
| 12 - Buckle, driver | 31 \ 32 - Short circuit bridge |
| 13 - Passenger's ignition pill, positive | 33 - Child seat detection |
| 14 - Passenger's ignition pill, negative | 34 - Crash output |
| 15 - Free | 35 \ 36 - Short circuit bridge |
| 16 - Driver's side airbag, positive | 37 - Free |
| 17 - Driver's side airbag, negative | 38 \ 39 - Short circuit bridge |
| | 40 - Free |
| | 41 \ 42 - Short circuit bridge |
| | 43 \ 44 - Short circuit bridge |
| | 45 to 50 - Free |

Fault memory

Overview of possible faults

Airbag warning light

Supply voltage

Ignition circuit, driver

Ignition circuit, passenger

Ignition circuit, side airbag

Side-airbag sensor

Belt buckle, driver

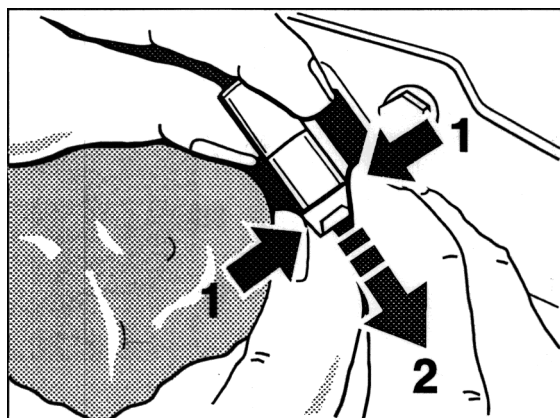
Belt buckle, passenger

Child seat detection

When a changeover occurs from *present* to *not present*, a fault stop clock is started. The fault stop clock shows the time which has passed since the fault was no longer present. However, with both clocks, only ignition on times are shown. This means that the clocks are stopped when the ignition is switched off.

Unplugging the side-airbag plug

Press the locking tabs on both sides on the plug together and simultaneously pull out the plug



Unplugging the side-airbag plug

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Note

If the fault memory cannot be erased, it is necessary to check whether the coding corresponds to the vehicle equipment.

When a fault is stored, the Porsche System Tester 2 can provide more information about the fault if the F8 key is pressed. A counter is started when the symbol changes from *not present* to *present*. This counter indicates how often the change took place from *present* to *not present*. At this changeover, the display simultaneously changes from *static* to *sporadic*, which indicates a **loose contact**.

When a fault is identified, a fault start clock is started. The fault start clock shows the time in hours, minutes and seconds that has passed since the fault first occurred.

Fault overview

Test point	Fault code	Fault effect	Page
	04, 05, 20, 21, 36	Fault memory	69 - D 57
2	10, 11, 26, 27, 39	Fault memory	69 - D 58
3	03	Fault memory	69 - D 59
4	01, 02	Fault memory	69 - D 59
5	44, 45, 46, 50	Fault memory	69 - D 60
6	47, 48, 49, 51	Fault memory	69 - D 60
7	70, 71, 72, 73	Fault memory	69 - D 61
8	12, 13, 14, 15 28, 29, 30, 31 40, 41	Fault memory	69 - D 61
9	85, 87	Fault memory	69 - D 62
10	86, 88	Fault memory	69 - D 62
11	53, 56	Fault memory	69 - D 62
12	XXX	Fault memory	69 - D 63

Note

Fault codes 100 and higher are internal control module faults. The fault memory cannot be cleared. The control module must be replaced.

Fault, fault code

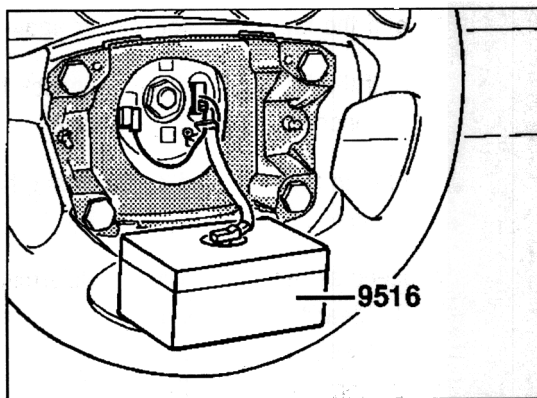
Possible causes, elimination, notes

Test point 1

Ignition circuit, driver

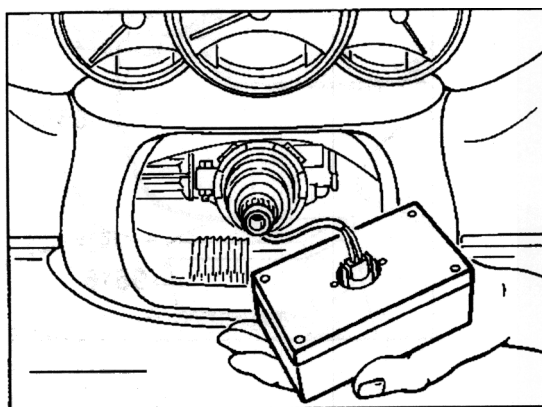
Fault codes 04, 05,
20, 21, 36

1. Remove driver's airbag unit.
2. Attach the special tool 9516 instead of the airbag unit.



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3. Clear the fault memory.
4. Check whether the fault appears again.
 - a) If the fault does not appear again, replace the airbag unit.
 - b) If the fault appears again, disconnect plug connection to the contact unit and attach special tool 9516/1.



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Fault, fault code

Possible causes, elimination, notes

5. Clear the fault memory.
6. Check whether the fault appears again.
 - a) If the fault does not appear again, replace the contact unit.
 - b) If the fault appears again, check the wiring harness for pinches and chafing damage.
 - c) If no fault is found on the wiring harness, replace the triggering unit.

Proceed as described below to determine whether the fault was eliminated:

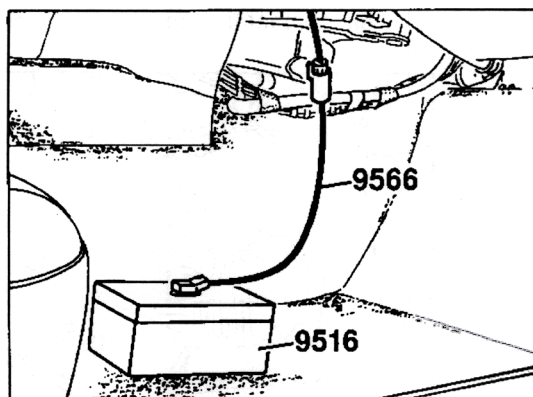
1. Clear the fault memory.
2. Switch off ignition.
3. Remove ignition key.
4. Switch on ignition.

Test point 2

Ignition circuit, passenger

Fault codes 10, 11, 26, 27, 39

1. Disconnect the plug connection to the passenger's airbag unit.
2. Attach the special tool 9516 in conjunction with special tool 9566.



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Fault, fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

3. Clear the fault memory.
4. Check whether the fault appears again
 - a) If the fault does not appear again, replace the passenger's airbag unit.
 - b) If the fault appears again, check the wiring harness for pinches and chafing damage.
 - c) If no fault is found on the wiring harness, replace the triggering unit.

Proceed as described below to determine whether the fault was eliminated

1. Clear the fault memory.
2. Switch off ignition.
3. Remove ignition key.
4. Switch on ignition.

Test point 3

Supply voltage

Fault code 03

1. Inspect the battery and generator.
2. Inspect the plug connection on the triggering unit for corrosion.

Note

The warning light is on as long as the limit value is exceeded or not reached.

Test point 4

Airbag warning light

Fault codes 01, 02

1. Inspect the fuse for the supply voltage (terminal 15) for the instrument cluster.
2. Inspect the bulb and replace it if necessary.
3. Inspect the lead from the triggering unit pin 7 to the warning light for continuity and short circuit to positive.

Fault, fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Test point 5

Belt buckle, driver

Fault codes 44, 45, 46, 50

1. Disconnect the plug connection X16.
2. Connect ohmmeter on the pin side on pins B7 and B8.
Display: approx. 400 Ω

Note

The belt tongue must not be inserted in the buckle.

3. Connect ohmmeter on the pin side on pin B7 and ground.
Display: $\infty \Omega$
4. Connect ohmmeter on the pin side on pins B7 and B8.
Insert the belt tongue in the buckle.
Display: approx. 100 Ω
5. Inspect the wiring harness to the triggering unit for pinches and chafing damage.

Note

The warning light is on as long as the limit value is exceeded or not reached.

Test point 6

Belt buckle, passenger

Fault codes 47, 48, 49, 51

1. Disconnect the plug connection X17.
2. Connect ohmmeter on the pin side on pins B7 and B8.
Display: approx. 400 Ω

Note

The belt tongue must not be inserted in the buckle.

3. Connect ohmmeter on the pin side on pin B7 and ground.
Display: $\infty \Omega$
4. Connect ohmmeter on the pin side on pins B7 and B8.
Insert the belt tongue in the buckle.
Display: approx. 100 Ω
5. Inspect the wiring harness to the triggering unit for pinches and chafing damage.

Fault, Fault code

Possible causes, elimination, notes

Test point 7

Child seat detection

**Fault codes 70, 71,
72, 73**

1. Pull plug off the control module.
2. Connect ohmmeter to plug, pin 23 and ground.
Plug of child seat not inserted.
Display: approx. 2 k Ω

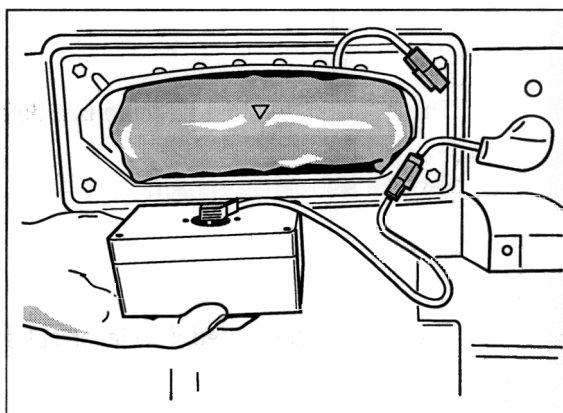
Plug of child seat inserted.
Display: approx. 260 Ω
3. Inspect the wiring harness to the control module for pinches and chafing damage.

Test point 8

Ignition circuit, side airbag

**Fault codes 12, 13, 14,
15, 28, 29, 30, 31, 40, 41**

1. Pull off plug on the side airbag unit.
2. Connect special tools 9516 and 9516/2.
3. Clear fault memory.



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4. Check whether the fault appears again.
 - a) If the fault does not appear again, replace the side airbag.
 - b) If the fault appears again with the special tool, check the wiring harness for pinches and chafing damage.
 - c) If no faults are found on the wiring harness, replace the control module.

Test point 9

Side-airbag sensor
(sensor for airbag)

Fault codes 85, 87

These fault is stored in the following cases:

1. There is an open circuit in the wire to the sensor.
2. There is a short to ground / B+ between pin 3 *Sensor for airbag* and control module pin 20 or pin 21.
3. The sensor or control module is faulty.

Check wire to the sensor for open circuit / leakage resistance. If no fault is detected in the wire, replace sensor.

Test point 10

Side-airbag sensor
(sensor for airbag)

Fault codes 86, 88

These faults are stored if there is a defect in the sensor.

Replace side-airbag sensor.

Test point 11

Side-airbag sensor
(sensor for airbag)

Fault codes 53, 56

These faults are stored if an incorrect side-airbag sensor is installed.

Replace side-airbag sensor.

Test point 12

Unknown fault code

Fault code XXX

1. Inspect the ground points for corrosion.
2. Inspect the ignition on the secondary side.
3. Clear fault memory.

Events

Event data can be read out under the menu item **Events**. Up to max. three events can be stored. Each event covers 16 bytes. The triggering unit must be replaced after the third event, since the airbag warning light lights up continuously and the events cannot be deleted.

Lock

An unlocked triggering unit can be locked under the menu item **Lock**.

A locked triggering unit **cannot be unlocked again**.

If a triggering unit is unlocked, the airbag warning light flashes. The triggering unit must then be locked.

Replacement triggering units are supplied unlocked.

1. Select Driver's/Passenger's airbag or Driver's airbag according to the vehicle equipment.
2. Select vehicle type.

Note

The vehicle type cannot be changed again.

3. Select **Lock**.

If there is no fault, the following message is displayed after a short waiting period:

Airbag was locked

This ends locking.

The following messages can be displayed in a fault state:

Airbag was already locked

No Porsche control unit

Incorrect vehicle type

Incorrect database version

Incorrect equipment

In the event of a fault, the triggering unit cannot be locked.

In the case of the "wrong equipment" message, select the correct equipment.

Replace the triggering unit in the case of the other messages.

Extract coding

Under the menu item `Extract coding`, you can read out which equipment features are activated and which are not. Also, it is possible to read out the vehicle type and the data record version, and where the airbag triggering unit was locked.

The following equipment features can be read out:

Driver's/passenger's airbag

Driver's airbag only

Buckle (detects whether seat belt is fastened)

Child seat occupancy (detects whether a child seat is being used on the passenger's side)

USA (vehicles)

Modify coding

Under the menu item `Modify coding`, you can adapt the airbag triggering unit to the vehicle equipment.

After the airbag triggering unit is replaced, the coding must be adapted to the vehicle equipment.

The following equipment features can be changed:

- Driver's/passenger's airbag

- Buckle

- Seat occupancy (passenger)

- Child seat occupancy (passenger)

- USA vehicles

Note

If the coding does not agree with the vehicle equipment, faults will be displayed that do not really exist.

The ignition must be switched off and the ignition key removed after the coding is changed.

72 98 **Diagnosis/troubleshooting, seat memory (System S 01)**

Diagnosis/Troubleshooting

Seat memory

System S 01

Contents overview

	Page
Menu (overview of the possible menus)	72 - D 3
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Tools	72 - D 6
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Function of individual components	72 - D 8
Connector assignment	72 - D 11
Connector overview (plugs on control module)	72 - D 13
Fault overview	72 - D 15
Activating the parking aid	72 - D 41

Menu

Overview of possible menus

	Page
Identification	72 - D 37
Fault memory	72 - D 37
Erase fault memory	72 - D 37
Actual values	72 - D 37
Switch inputs	72 - D 38
Drive links	72 - D 39
Modify coding	72 - D 40

System description

The seat memory is installed in the vehicle as optional equipment in connection with electrically adjustable seats and rearview mirrors.

The advantage in comparison with the base version is that there are three memory locations to store the set positions. The stored positions can then be called up at the push of a button. If the vehicle is used by several persons, the seat and mirror positions must only be set once and stored in the system.

System readiness

The system allows the position to be changed if at least one of the following requirements is fulfilled:

Term. 15 is switched on or

The driver's door is opened

Operational readiness is maintained for an after-running time of 60 s after the key has been removed or the door has been closed. If the position is changed during the after-running time, then the after-running time is started again. If the position is not changed during the after-running time, then the system switches to inactive state, thus reducing power consumption.

Note:

Term. 15 must be switched on for communication with the PST 2.

System components

The system consists of the following components:

Lumbar support

Motor for lumbar support (lumbar pump)

Switch for seat adjustment

Electric motor for seat adjustment

Electric motor for front height adjustment

Electric motor for rear height adjustment

Electric motor for backrest adjustment

Control module for memory seat adjustment

Switch for memory seat adjustment

Switch for rearview mirrors (door mirrors)

Changeover switch for rearview mirrors (door mirrors)

Right and left rearview mirrors (door mirrors)

The system enables the following system components to be adjusted individually:

Front seat height

Rear seat height

Backrest angle

Left rearview mirror

Right rearview mirror

Lumbar support

Fore-and-aft adjustment

Storing the positions

1. Adjust the rearview mirrors, seat height, backrest angle and lumbar support to the desired positions.
2. Hold down switch **M** and push one of the switches for memory seat adjustment (1, 2 or 3) at the same time.

The positions are now stored under the number selected.

Diagnosis

The following components are monitored by the system:

Lumbar pressure sensor (regulating switch)

Potentiometer voltage of both rearview mirrors

Hall-effect sensor for backrest adjustment

Hall-effect sensor for fore-and-aft adjustment

Hall-effect sensor for height adjustment

Functioning of the control module (EPROM, A/D converter, main relay)

Switch for memory seat adjustment and switch for seat adjustment

When the switch for memory seat adjustment or the switch for seat adjustment are actuated, the faulty component is stored in the fault memory. In this case the word **present** also appears on the screen, e.g.:

"Open circuit **present** in Hall-effect sensor for fore-and-aft adjustment"

If the cause of the fault is eliminated, then the switch for memory seat adjustment or the switch for seat adjustment must be actuated again. If the cause of the fault has really been eliminated, the text in the fault memory changes from **present** to **not present**.

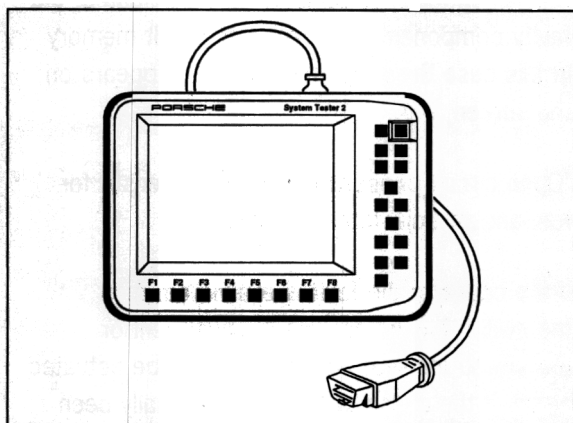
Note

The fault memory must always be read out and any faults which may have been stored must always be deleted after diagnosis.

Tools

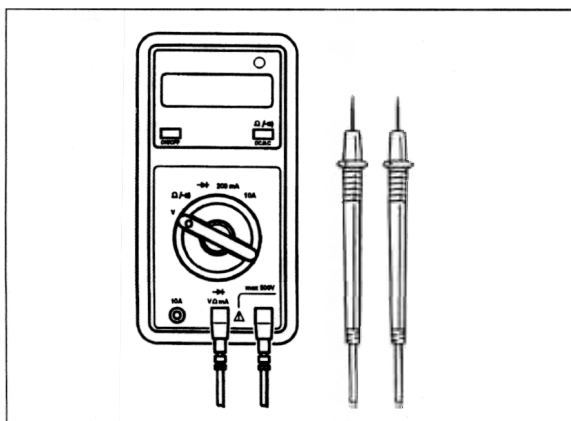
The following equipment is required for troubleshooting:

1. Porsche System Tester 2



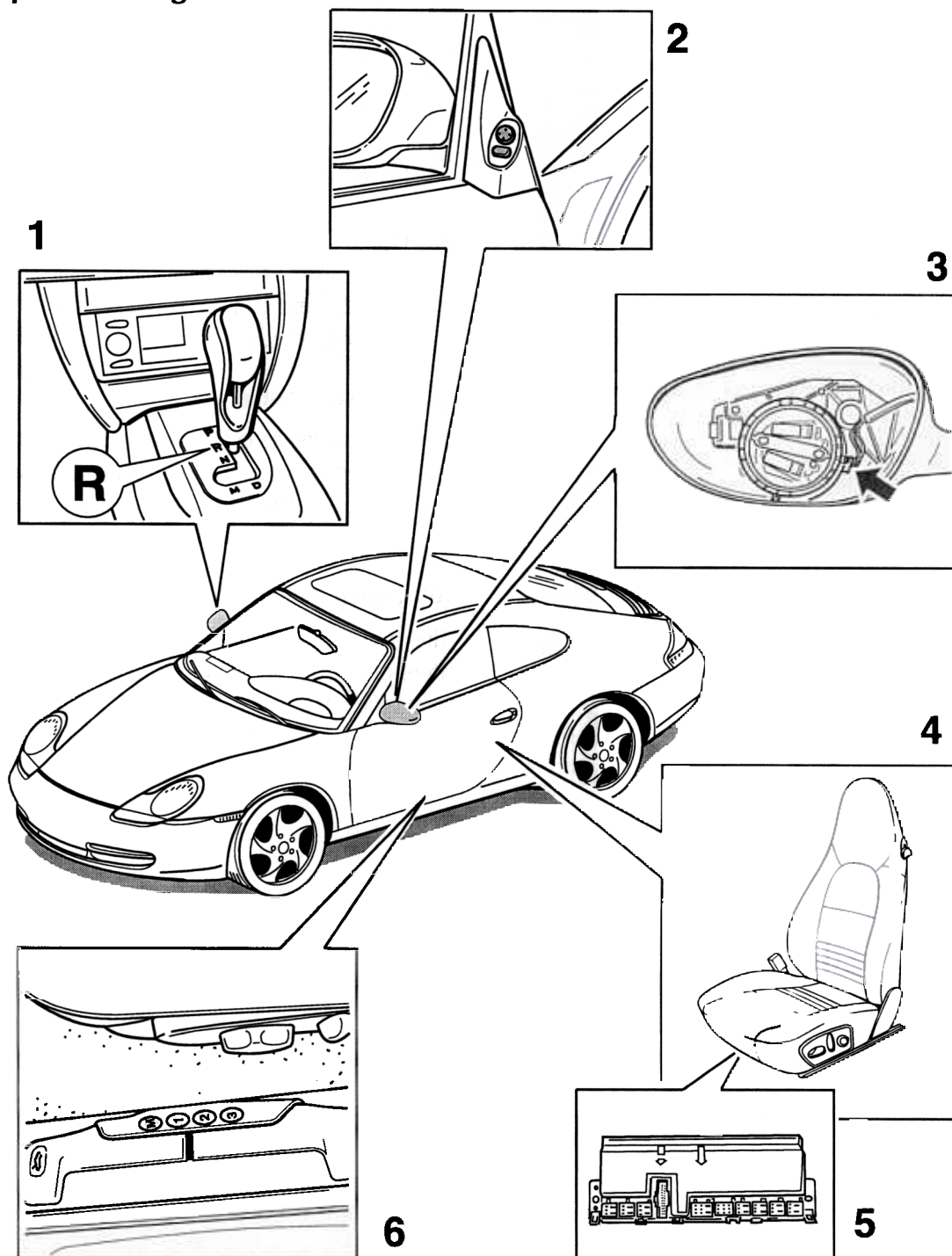
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2. Commercially available digital multimeter



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Component arrangement



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Function of individual components

[1]- Parking aid

When reverse gear is engaged, the corresponding rearview mirror (right-hand drive or left-hand drive according to coding) is lowered by the angle stored. Manual adjustment of the seatmotors is carried out parallel to the lowering of the rearview mirror. Automatic adjustment interrupts the lowering procedure. If reverse gear is still engaged after automatic adjustment is complete, the rearview mirror is lowered again.

[2]- Rearview mirrors

Manual adjustment of both rearview mirrors is carried out with the *switch for rearview mirrors* or *changeover switch for rearview mirrors*. When the desired positions have been adjusted and stored by means of the *switch for memory seat adjustment*, automatic adjustment of the rearview mirrors is carried out by actuating the corresponding switch (1, 2 or 3)

[3]- Support with transmission

The support with transmission consists of the following components:

Two electric motors with a potentiometer

Transmission

[4]- Front seat

The following are the possibilities for adjusting the front seat:

Backrest

Front height

Rear height

Longitudinal direction

Upper lumbar

Lower lumbar

When the desired positions have been found and stored by means of the *switch for memory seat adjustment*, they can be called up at the push of a button when required.

[5]- Control module

The control module is fastened under the front seat (driver's side) with two screws. There is a total of 10 connection points on the control module.

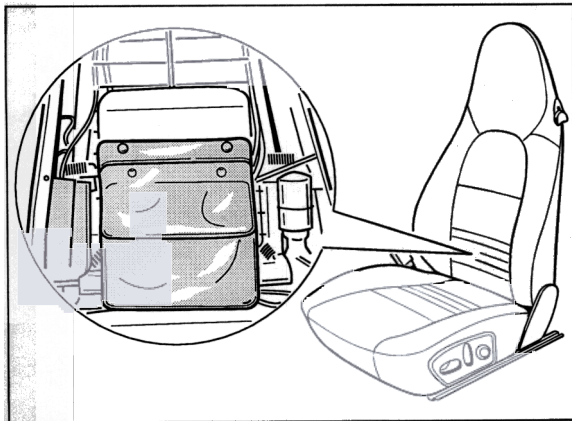
[6]- Switch for memory seat adjustment

These switches **[M, 1, 2, 3]** can be used to store or call up the optimum positions once they have been found. The system enables adjustment values for three persons to be stored.

Lumbar support

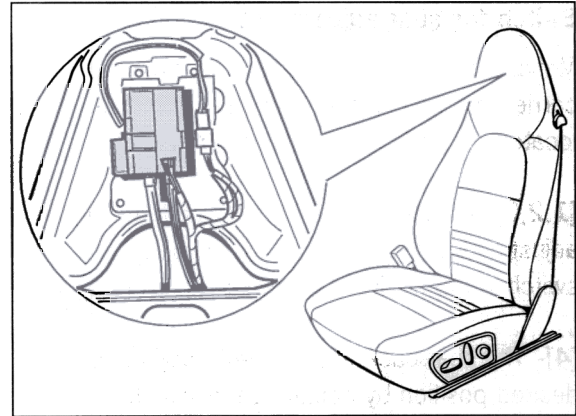
The lumbar support consists of two cushions which are inflated by means of a *motor for lumbar support*. The cushions are inflated or deflated to the required pressure one after the other beginning with the upper cushion. The pressure in the cushions is measured using a pressure sensor (regulating switch). The pressure sensor is located at the same height as the headrest and is integrated into the *lumbar adjustment*. Automatic adjustment of the lumbar support is carried out by actuating the switch for memory seat adjustment. The motor for lumbar adjustment is shown in Figure 611_98 together with both lumbar cushions. Automatic adjustment of the lumbar support is divided into two phases.

1. If the seat motors have not yet reached their required position, adjustment of the lumbar support is interrupted by releasing the switch for memory seat adjustment.
2. If the seat motors have reached their required position, adjustment of the lumbar support is completed after the switch for memory seat adjustment is released.



Arrangement of the lumbar support

611_98

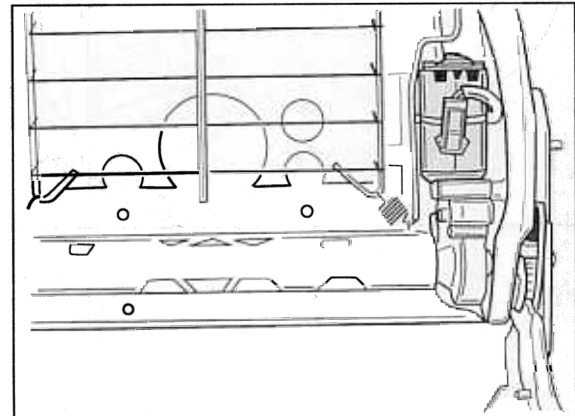


Arrangement of the lumbar adjustment

612_98

Electric motor for backrest adjustment

The backrest is adjusted by an electric motor with transmission. A Hall-effect sensor is integrated into the electric motor which measures the actual position.



Electric motor for backrest adjustment

610_98

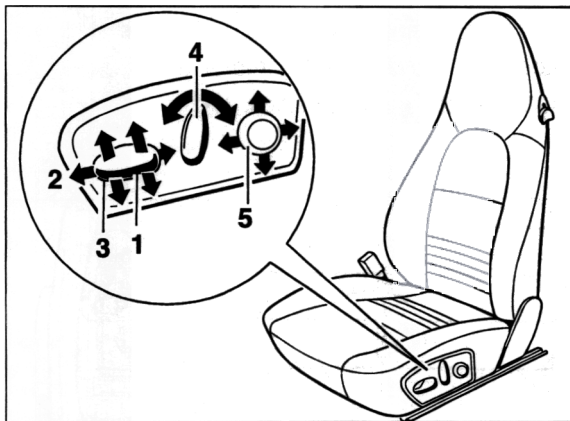
Switch for seat adjustment

Manual adjustment of the seat positions is carried out by actuating the three switches located on the driver's seat (front seat).

[1,2,3]- Fore-and-aft adjustment and height adjustment are carried out by actuating the switch in the positions shown in Figure 615_98.

[4]- The seat backrest can be brought into desired position by actuating the switch.

[5]- The lumbar support is inflated or deflated by actuating the switch.



615_98

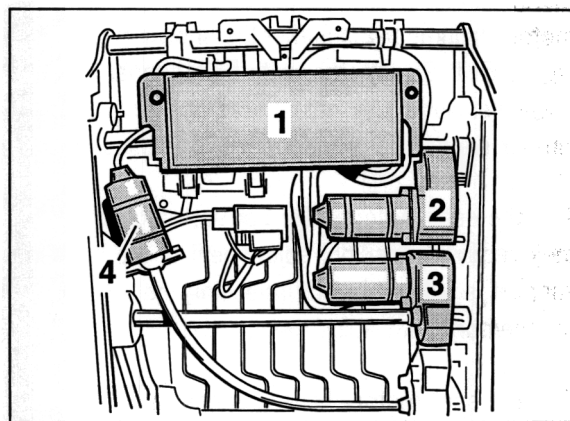
Figure 613_98 shows how the following system components are arranged under the front seat.

[1]- Control module

[2]- Electric motor for front height adjustment

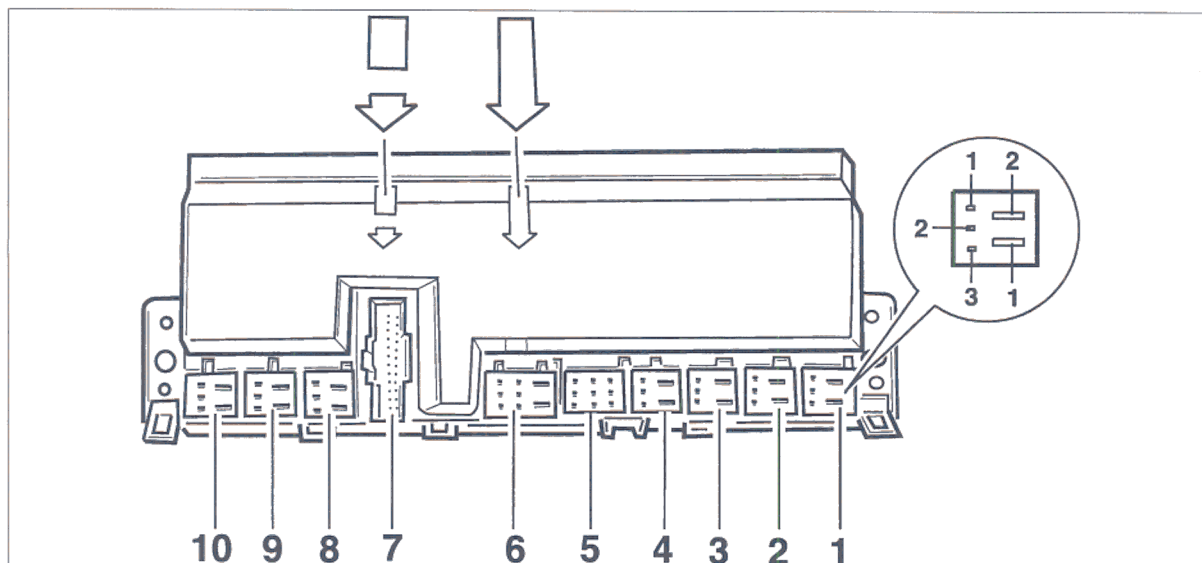
[3]- Electric motor for seat adjustment

[4]- Electric motor for rear height adjustment



613_98

Connector assignment



614_98

Plug 1, 5-pole

Pin No.	Designation
1,2	Electric motor for backrest adjustment Load circuit
2,3	Backrest Hall-effect sensor Signal circuit

Plug 3, 5-pole

Pin No.	Designation
1,2	Electric motor for front height adjustment Load circuit
2,3	Hall-effect sensor for front height adjustment Signal circuit

Plug 2, 5-pole

Pin No.	Designation
1,2	Electric motor for rear height adjustment Load circuit
2,3	Hall-effect sensor for rear height adjustment Signal circuit

Plug 4, 5-pole

Pin No.	Designation
1,2	Electric motor for seat adjustment (longitudinal) Load circuit
2,3	Hall-effect sensor for seat adjustment Signal circuit

Plug 5, 9-pole

Pin No.	Designation
	Switch for seat adjustment

Plug 6, 8-pole

Pin No.	Designation
colour	black
1	Term. 31 load
2	Term. 30 load
Pin No.	Designation
colour	black
1	Term. 30 electronics
2	Term. 15
3	Term. 31 electronics

Pin No.	Designation
colour	blue

1	Diagnosis
2	Door contact
3	Not used

Plug 7, 26-pole

Pin No.	Designation
1	Switch for memory seat adjustment (P3)
2	Switch for memory seat adjustment (MEM)
3	GFM connection
4	System ground pot. 2 rearview mirror
5	+5V pot. rearview mirror

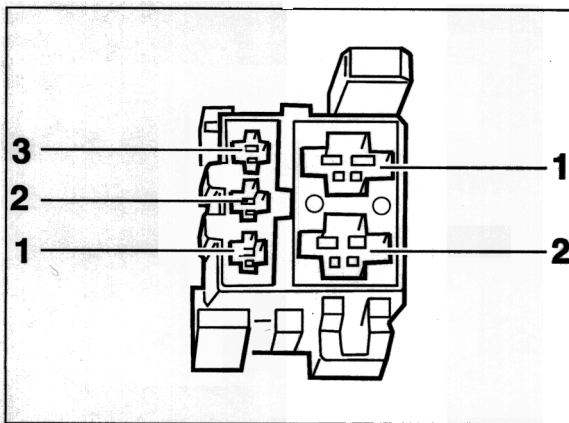
6	Voltage pot. right (left/right)
Pin No.	Designation
7	Voltage pot. right (up/down)
8	Not used
9	Not used
10	Voltage pot. left (left/right)
11	Voltage pot. left (up/down)
12	Reverse-gear signal
13	Common rearview mirror motor connection
14	Switch for memory seat adjustment (P2)
15	Switch for memory seat adjustment (P1)
16	Not used
17	Not used
18	Not used
19	Not used
20	Not used
21	Left motor (left/right)
22	Left motor (up/down)
23	Not used
24	Not used
25	Right motor (left/right)
26	Right motor (up/down)

Connector overview

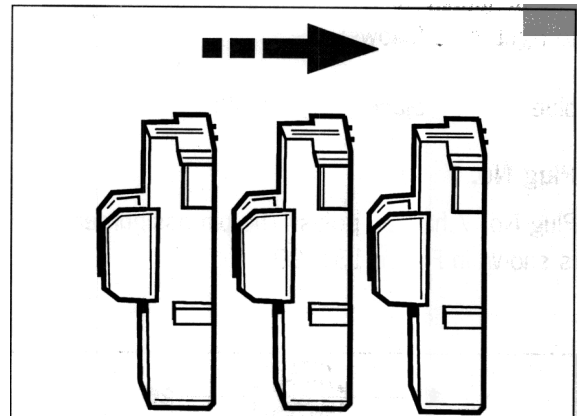
Plugs on control module

Plug Nos. 1 to 4

The plugs each consist of two individual plugs which are clipped together (Figure 134_99). The 2-pole plug is intended for the load circuit (motor). The 3-pole plug is the signal circuit connection (Hall-effect sensor). When they are clipped together, plug nos. 1 to 4 each have **5 poles**.



134_99



132_99

See the 3-pole plug in Figure 133_99 for pin assignment. The pin numbers are printed on the side of the plugs.

Plug No. 6

The plug consists of three individual plugs which are clipped together (Figure 133_99). Two individual plugs have 3 poles each, the third has 2 poles. When it is clipped together, plug no. 6 has **8 poles**.

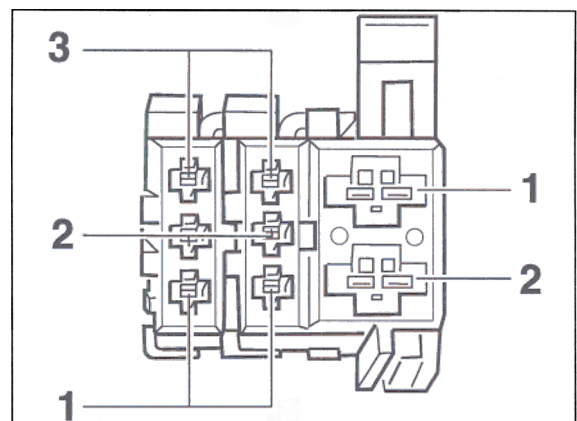
Plug No. 5

The plug consists of three individual plugs which are clipped together (Figure 132_99). Each individual plug has 3 poles. When it is clipped together, plug no. 5 has **9 poles**.

Sequence of the individual plugs

The sequence of the individual plugs from left to right is as follows:

natural blue black



133_99

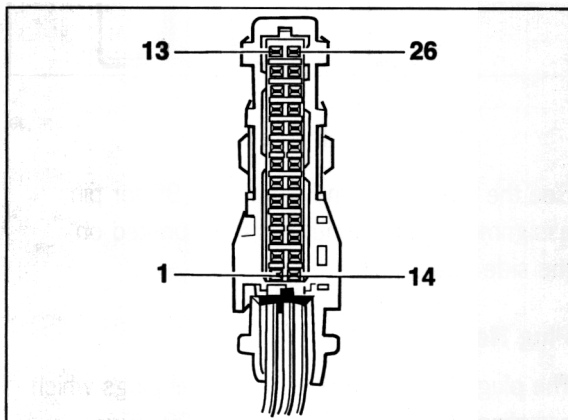
Sequence of the individual plugs

The sequence of the individual plugs from left to right is as follows:

blue black black

Plug No. 7

Plug No. 7 has 26 poles. The pin assignment is shown in Figure 131_99.



131_99

Plug Nos. 8 to 10

See Plug Nos. 1 to 4

Fault overview

Test point	Fault code	Fault effect	Page
1	1	No adjustment possible	72 - D 17
2	2	No adjustment possible	72 - D 17
3	3	No adjustment possible	72 - D 18
4	4		72 - D 18
5	5	No automatic adjustment possible	72 - D 19
6	6	No automatic adjustment possible	72 - D 19
7	7	No automatic adjustment possible	72 - D 19
8	8	No automatic adjustment possible, manual only 500 ms	72 - D 20
9	9	No automatic adjustment possible, manual only 500 ms	72 - D 21
10	10	No automatic adjustment possible, manual only 500 ms	72 - D 21
11	11	No automatic adjustment possible, manual only 500 ms	72 - D 22
12	12	No automatic adjustment possible, manual only 500 ms	72 - D 23
13	13	No automatic adjustment possible, manual only 500 ms	72 - D 23
14	14	No automatic adjustment possible, manual only 500 ms	72 - D 24
15	15	No automatic adjustment possible, manual only 500 ms	72 - D 25
16	18	No automatic adjustment of the lumbar supports possible	72 - D 25
17	19	No automatic adjustment of the lumbar supports possible	72 - D 26
18	20	No automatic adjustment possible	72 - D 27

Test point	Fault code	Fault effect	Page
19	21	No automatic adjustment possible	72 - D 28
20	22	No automatic adjustment possible	72 - D 29
21	23	No automatic adjustment possible	72 - D 30
22	24	No automatic adjustment possible	72 - D 31
23	25	No automatic adjustment possible	72 - D 32
24	26	No automatic adjustment possible	72 - D 33
25	27	No automatic adjustment possible	72 - D 34
26	32	Switch is ignored, all further adjustments are jerky	72 - D 35

Fault, Fault code	Possible causes, elimination, notes
Test point 1 Control module faulty Main relay does not drop out Fault code 1	<p>This fault is stored in the following cases:</p> <ol style="list-style-type: none">1. The control module is faulty2. Temporary system error <p>Elimination:</p> <p>Clear fault memory.</p> <p>Read out fault memory.</p> <p>If the fault does not appear again, check that all system components such as seat adjustment, mirror adjustment, memory function, etc. are functioning correctly.</p> <p>If the fault appears again, replace the control module.</p>
Test point 2 Control module faulty Main relay does not pick up Fault code 2	<p>This fault is stored in the following cases:</p> <ol style="list-style-type: none">1. The control module is faulty2. Temporary system error <p>Elimination:</p> <ol style="list-style-type: none">1. Clear fault memory.2. Read out fault memory.3. If the fault does not appear again, check that all system components such as seat adjustment, mirror adjustment, memory function, etc. are functioning correctly. <p>If the fault appears again, replace the control module.</p>

Fault, Fault code**Possible causes, elimination, notes**

Test point 3

A/D converter faulty

Fault code 3

This fault is stored in the following cases:

1. The control module is faulty
2. Temporary system error.

Elimination:

Clear fault memory.

Read out fault memory.

If the fault does not appear again, check that all system components such as seat adjustment, mirror adjustment, memory function, etc. are functioning correctly.

If the fault appears again, replace the control module.

Test point 4EEPROM fault
(Checksum)**Fault code 4**

This fault is stored in the following case:

The control module is faulty

Elimination:

Replace the control module.

Fault, Fault code**Possible causes, elimination, notes**

Test point 5

Required position 1
(Checksum)

Fault code 5

This fault is stored in the following case:

The control module is faulty

Elimination:

Replace the control module.

Test point 6

Required position 2
(Checksum)

Fault code 6

This fault is stored in the following case:

The control module is faulty

Elimination:

Replace the control module.

Test point 7

Required position 3
(Checksum)

Fault code 7

This fault is stored in the following case:

The control module is faulty

Elimination:

Replace the control module.

Fault, Fault code	Possible causes, elimination, notes
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Test point 8

Hall-effect sensor fore-and-aft adjustment, open circuit

Fault code 8

This fault is stored in the following cases:

1. There is an open circuit in the wire to the Hall-effect sensor fore-and-aft adjustment.
2. The Hall-effect sensor is faulty.
3. The control module is faulty.

Elimination:

Check plug on control module for contact and damage

Check wire to sensor for damage.

Once the cause of the fault has been found and eliminated, actuate the fore-and-aft adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If no fault is detected in the wire on the sensor, replace the electric motor for seat adjustment.

If the fault is still **present**, replace control module.

Fault, Fault code**Possible causes, elimination, notes****Test point 9**

Hall-effect sensor fore-and-aft adjustment, short circuit

Fault code 9

This fault is stored in the following cases:

1. There is a short circuit in the wires to the Hall-effect sensor.
2. The Hall-effect sensor is faulty.
3. The control module is faulty

Elimination:

Disconnect plug from control module, check for continuity with ohmmeter on Pin 2 and Pin 3.

If a short circuit is found, check the sensor wires first. If no fault is detected in the wire, replace the electric motor for seat adjustment. Once the cause of the fault has been found and eliminated, actuate the fore-and-aft adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Test point 10

Hall-effect sensor backrest adjustment, open circuit

Fault code 10

This fault is stored in the following cases:

1. There is an open circuit in the wire to the Hall-effect sensor for backrest adjustment.
2. The Hall-effect sensor is faulty.
3. The control module is faulty.

Elimination:

Check plug on control module for contact and damage.

Check wire to sensor for damage.

Fault, Fault code

Possible causes, elimination, notes

Once the cause of the fault has been found and eliminated, actuate the fore-and-aft adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If no fault is detected in the wire, replace the electric motor for seat adjustment.

If the fault is still **present**, replace control module.

Test point 11

Hall-effect sensor backrest adjustment, short circuit

Fault code 11

This fault is stored in the following cases:

1. There is a short circuit in the wires to the Hall-effect sensor.
2. The Hall-effect sensor is faulty.
3. The control module is faulty.

Elimination:

Disconnect plug from control module, check for continuity with ohmmeter on Pin 2 and Pin 3.

If a short circuit is found, check the sensor wires first.

If no fault is detected in the wire, replace the electric motor for backrest adjustment.

Once the cause of the fault has been found and eliminated, actuate the fore-and-aft adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Fault, Fault code**Possible causes, elimination, notes**

Test point 12

Hall-effect sensor height adjustment, open circuit

Fault code 12

This fault is stored in the following cases:

1. There is an open circuit in the wire to the Hall-effect sensor fore-and-aft adjustment.
2. The Hall-effect sensor is faulty.
3. The control module is faulty.

Elimination:

Check plug on control module for contact and damage

Check wire to sensor for damage.

Once the cause of the fault has been found and eliminated, actuate the height adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If no fault is detected in the wire on the sensor, replace the electric motor for height adjustment.

If the fault is still **present**, replace control module

Test point 13

Hall-effect sensor front height adjustment, short circuit

Fault code 13

This fault is stored in the following cases:

1. There is a short circuit in the wires to the Hall-effect sensor.
2. The Hall-effect sensor is faulty
3. The control module is faulty.

Fault, Fault code

Possible causes, elimination, notes

Elimination:

Disconnect plug from control module, check for continuity with ohmmeter on Pin 2 and Pin 3.

If a short circuit is found, check the sensor wires first.

If no fault is detected in the wire, replace sensor. Once the cause of the fault has been found and eliminated, actuate the fore-and-aft adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Test point 14

Hall-effect sensor rear height adjustment, open circuit

Fault code 14

This fault is stored in the following cases:

1. There is an open circuit in the wire to the Hall-effect sensor fore-and-aft adjustment.
2. The Hall-effect sensor is faulty.
3. The control module is faulty.

Elimination:

Check plug on control module for contact and damage.

Check wire to sensor for damage.

Once the cause of the fault has been found and eliminated, actuate the height adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Fault, Fault code**Possible causes, elimination, notes**

Test point 15

Hall-effect sensor rear height adjustment, short circuit

Fault code 15

This fault is stored in the following cases:

1. There is a short circuit in the wires to the Hall-effect sensor.
2. The Hall-effect sensor is faulty.
3. The control module is faulty.

Elimination:

Disconnect plug from control module, check for continuity with ohmmeter on Pin 2 and Pin 3.

If a short circuit is found, check the sensor wires first.

If no fault is detected in the wire, replace the *electric motor for height adjustment*.

Once the cause of the fault has been found and eliminated, actuate the height adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Test point 16

Lumbar pressure sensor open circuit

Fault code 18

This fault is stored in the following cases:

1. There is an open circuit in the wire to the *lumbar pressure sensor*.
2. The pressure sensor is faulty.
3. The control module is faulty.

Elimination:

Check plug on control module for contact and damage

Check wire to sensor for damage.

Fault, Fault code	Possible causes, elimination, notes
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If no fault is detected in the wire, replace *lumbar adjustment*.

Once the cause of the fault has been found and eliminated, actuate the lumbar adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Test point 17

Lumbar pressure sensor
short circuit

Fault code 19

This fault is stored in the following cases:

There is a short circuit in the wires to the pressure sensor.

The pressure sensor is faulty.

The control module is faulty.

Elimination:

Disconnect plug from control module, check for continuity with ohmmeter on Pin 2 and Pin 3, and on Pin 1 and Pin 3.

If a short circuit is found, check the sensor wires first.

If no fault is detected in the wire, replace *lumbar adjustment*.

Once the cause of the fault has been found and eliminated, actuate the lumbar adjustment switch. The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, replace control module.

Fault, Fault code	Possible causes, elimination, notes
Test point 18 Pot. mirror right horizontal open circuit Fault code 20	<p>This fault is stored in the following cases:</p> <ol style="list-style-type: none"> 1. There is an open circuit in the wire to the <i>pot. right rearview mirror</i>. 2. The potentiometer is faulty 3. The control module is faulty. <p>Elimination</p> <p>Replace <i>support with transmission</i>.</p> <p>Actuate switch for memory seat adjustment</p> <p>The text in the fault memory changes from present to not present if the cause of the fault has really been eliminated.</p> <p>If the fault is no longer present, erase the fault memory</p> <p>If the fault is still present, there is a fault in the wire.</p> <p>For a fault in the wire, proceed as described below:</p> <p>Disconnect <i>mirror plug</i> from the control module.</p> <p>Disconnect <i>support with transmission plug</i>.</p> <p>Use an ohmmeter to check for open circuit on the <i>support plug</i> Pin 5 and the <i>mirror plug</i> on the control module Pin 11. Ohmmeter display $<5\Omega$</p> <p>Use an ohmmeter to check for open circuit on the <i>support plug</i> Pin 7 and the <i>mirror plug</i> on the control module Pin 4. Ohmmeter display $<5\Omega$</p> <p>Use an ohmmeter to check for continuity on the <i>support plug</i> Pin 3 and Pin 5.</p> <p>If no fault is detected in the wire, replace the control module.</p>



Fault, Fault code

Possible causes, elimination, notes

Test point 19

Pot. mirror right horizontal
short circuit

Fault code 21

This fault is stored in the following cases:

1. There is a short circuit in the wire to the *pot. right rearview mirror*.
2. The potentiometer is faulty.
3. The control module is faulty.

Elimination:

1. Replace support with transmission.
2. Actuate switch for memory seat adjustment.

The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, there is a fault in the wire.

For a fault in the wire, proceed as described below:

Disconnect plug at *support with transmission*.

Disconnect *mirror* plug from the control module.

Use an ohmmeter to check for short circuit on the *support* plug
Pin 5, wire colour yellow, and Pin 7, wire colour pink.

If no short circuit is detected:

Use an ohmmeter to check for open circuit on the *support* plug
Pin 3 and the *mirror* plug on the control module Pin 5

Ohmmeter display $<5\Omega$

If the fault is still **present**, replace control module.

Fault, Fault code

Possible causes, elimination, notes

Test point 20

Pot. mirror right vertical
open circuit

Fault code 22

This fault is stored in the following cases:

1. There is an open circuit in the wire to the *pot. right rearview mirror*.
2. The potentiometer is faulty.
3. The control module is faulty.

Elimination:

Replace support with transmission.

Actuate switch for memory seat adjustment.

The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is no longer **present**, erase the fault memory.

If the fault is still **present**, there is a fault in the wire.

For a fault in the wire, proceed as described below:

Disconnect *mirror* plug from the control module.

Disconnect plug at *support with transmission*.

Use an ohmmeter to check for open circuit on the *support plug* Pin 5 and the *mirror plug* on the control module Pin 11

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for open circuit on the *support plug* Pin 7 and the *mirror plug* on the control module Pin 4.

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for continuity on the *support plug* Pin 1 and Pin 3.

If no fault is detected in the wire, replace the control module.

Fault, Fault code

Possible causes, elimination, notes

Test point 21

Pot. mirror right vertical
short circuit

Fault code 23

This fault is stored in the following cases:

1. There is a short circuit in the wire to the *pot. right rearview mirror*.
2. The potentiometer is faulty.
3. The control module is faulty.

Elimination:

Replace support with transmission.

Actuate switch for memory seat adjustment.

The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is still **present**, there is a fault in the wire.

For a fault in the wire, proceed as described below:

Disconnect plug at *support with transmission*.

Disconnect *mirror* plug from the control module.

Use an ohmmeter to check for short circuit on the *support* plug Pin 1, wire colour grey, and Pin 7, wire colour pink. No continuity must be measured! If no short circuit is detected:

Use an ohmmeter to check for open circuit on the *support* plug Pin 3 and the *mirror* plug on the control module Pin 5

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for continuity on the *support* plug Pin 1 and Pin 7.

If no fault is detected in the wire but the fault is still **present**, replace the control module.

Fault, Fault code

Possible causes, elimination, notes

Test point 22

Pot. mirror left horizontal
open circuit

Fault code 24

This fault is stored in the following cases:

1. There is an open circuit in the wire to the *pot. left rearview mirror*.
2. The potentiometer is faulty.
3. The control module is faulty.

Elimination:

Replace support with gear unit.

Actuate switch for memory seat adjustment.

The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is no longer **present**, erase the fault memory.

If the fault is still **present**, there is a fault in the wire.

For a fault in the wire, proceed as described below:

Disconnect *mirror plug* from the control module.

Disconnect plug at *support with gear unit*.

Use an ohmmeter to check for open circuit on the *support plug*
Pin 1 and the *mirror plug* on the control module Pin 10

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for open circuit on the *support plug*
Pin 7 and the *mirror plug* on the control module Pin 4.

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for continuity on the *support plug* Pin 1
and Pin 3.

If no fault is detected in the wire, replace the control module.

Fault, Fault code	Possible causes, elimination, notes
Test point 23 Pot. mirror left horizontal short circuit Fault code 25	<p>This fault is stored in the following cases:</p> <ol style="list-style-type: none"> 1. There is a short circuit in the wire to the <i>pot. left rearview mirror</i>. 2. The potentiometer is faulty. 3. The control module is faulty. <p>Elimination:</p> <p>Replace support with gear unit.</p> <p>Actuate switch for memory seat adjustment.</p> <p>The text in the fault memory changes from present to not present if the cause of the fault has really been eliminated.</p> <p>If the fault is no longer present, erase the fault memory.</p> <p>If the fault is still present, there is a fault in the wire.</p> <p>For a fault in the wire, proceed as described below:</p> <p>Disconnect plug at <i>support with gear unit</i>.</p> <p>Disconnect <i>mirror</i> plug from the control module.</p> <p>Use an ohmmeter to check for continuity on the <i>support plug</i> Pin 1 and Pin 7.</p> <p>Use an ohmmeter to check for open circuit on the <i>support plug</i> Pin 3 and the <i>mirror plug</i> on the control module Pin 5</p> <p>Ohmmeter display $<5\Omega$</p> <p>If no fault is detected in the wire but the fault is still present, replace the control module.</p>

Fault, Fault code

Possible causes, elimination, notes

Test point 24

Pot. mirror left vertical
open circuit

Fault code 26

This fault is stored in the following cases:

1. There is an open circuit in the wire to the *pot. left rearview mirror*.
2. The potentiometer is faulty.
3. The control module is faulty.

Elimination:

Replace support with gear unit.

Actuate switch for memory seat adjustment.

The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is no longer **present**, erase the fault memory.

If the fault is still **present**, there is a fault in the wire.

For a fault in the wire, proceed as described below:

Disconnect *mirror* plug from the control module.

Disconnect plug at *support with gear unit*.

Use an ohmmeter to check for open circuit on the *support plug* Pin 5 and the *mirror plug* on the control module Pin 11

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for open circuit on the *support plug* Pin 7 and the *mirror plug* on the control module Pin 4.

Ohmmeter display $<5\Omega$

Use an ohmmeter to check for continuity on the *support plug* Pin 3 and Pin 5.

If no fault is detected in the wire, replace the control module.

Fault, Fault code

Possible causes, elimination, notes

Test point 25

Pot. mirror left vertical
short circuit

Fault code 27

This fault is stored in the following cases:

1. There is a short circuit in the wire to the *pot. left rearview mirror*.
2. The potentiometer is faulty.
3. The control module is faulty

Elimination:

Replace support with gear unit.

Actuate switch for memory seat adjustment.

The text in the fault memory changes from **present** to **not present** if the cause of the fault has really been eliminated.

If the fault is no longer **present**, erase the fault memory.

If the fault is still **present**, there is a fault in the wire.

For a fault in the wire, proceed as described below:

Disconnect plug at *support with gear unit*.

Disconnect *mirror plug* from the control module.

Use an ohmmeter to check for continuity on the *support plug* Pin 5 and Pin 7.

Use an ohmmeter to check for open circuit on the *support plug* Pin 3 and the *mirror plug* on the control module Pin 5

Ohmmeter display $<5\Omega$

If no fault is detected in the wire but the fault is still **present**, replace the control module.

Fault, Fault code

Possible causes, elimination, notes

Test point 26

Button M, 1, 2, 3 or
operating buttons
actuated for longer than 60 s

Fault code 32

This fault is stored in the following case:

Switch for memory seat adjustment (1, 2, or 3), or switch for seat adjustment (e.g. *Fore-and-aft adjustment forward*) is continuously switched.

Elimination:

Erase fault memory and read out again.

If the fault appears again, proceed as described below:

Select menu item *Input signals*.

The following button positions can be read out in the menu item *Input signals*.

Button M

Button 1

Button 2

Button 3

Fore-and-aft adjustment forward

Fore-and-aft adjustment backward

Backrest forward

Backrest backward

Front height upward

Front height downward

Rear height upward

Rear height downward

Backrest forward

Backrest backward

Fault, Fault code	Possible causes, elimination, notes
	Button up
	Button down
	Button backward
	Button forward
	Select a maximum of 8 button positions.
	Search for the key on the screen that is continuously actuated. A comparison table can be found on Page 72 - D 38.
	If a key is detected as faulty, replace the switch for memory seat adjustment or the switch for seat adjustment as appropriate.

Identification

The diagnosis software number and control module part number can be read out under the *Identification* menu item.

Fault memory

Stored faults can be read out under the *Fault memory* menu item.

Clear the fault memory

Faults stored in the control module can be erased under the *Erase fault memory* menu item. Here, all stored faults are erased.

Actual values

In the *Actual values* menu item, the current values of the following parameters can be read out.

Voltage of terminal 30

Voltage of Hall-effect sensor for fore-and-aft adjustment

Voltage of Hall-effect sensor for backrest

Voltage of Hall-effect sensor for front height

Voltage of Hall-effect sensor for rear height

Voltage of pressure sensor

Voltage of right horizontal mirror potentiometer

Voltage of right vertical mirror potentiometer

Voltage of left horizontal mirror potentiometer

Voltage of left vertical mirror potentiometer

Input signals

This menu item enables input signals of the system to be read out by the Porsche System Tester 2. This allows the function of the individual components to be assessed very quickly.

Comparison table of input signals

In the comparison table, the following applies for the tester display:

Boundary conditions

Terminal 15 switched on and reverse gear not engaged

Switch for memory seat adjustment not actuated

The system is in perfect condition

Tester display	Status
M Button	M button not actuated
Button 1	Button 1 not actuated
Button 2	Button 2 not actuated
Button 3	Button 3 not actuated
Reverse gear engaged	Reverse gear not engaged
Door contact closed (door open)	Depends on door position
Supply voltage (terminal 15)	Terminal 15 signal present
Cancel parking aid	Cancel parking aid
Fore-and-aft adjustment forward	Switch sign "open"
Fore-and-aft adjustment backward	Switch sign "open"
Front height upward	Switch sign "open"
Front height downward	Switch sign "open"
Rear height upward	Switch sign "open"
Rear height downward	Switch sign "open"
Backrest forward	Switch sign "open"
Backrest backward	Switch sign "open"
Lumbar pump	Lumbar pump not active
Fill upper valve	Fill upper valve not active
Bleed upper valve	Bleed upper valve not active
Fill lower valve	Fill lower valve not active

Tester display	Status
Bleed lower valve	Bleed lower valve not active
Button up	Button up open
Button down	Button down open
Button backward	Button backward open
Button forward	Button forward open
Left mirror to right	Left mirror to right not active
Left mirror to left	Left mirror to left not active
Left mirror upward	Left mirror upward not active
Left mirror downward	Left mirror downward not active
Right mirror to right	Right mirror to right not active
Right mirror to left	Right mirror to left not active
Right mirror upward	Right mirror upward not active
Right mirror downward	Right mirror downward not active

Drive links

The menu item *Drive links* enables the following system functions to be checked.

Fore-and-aft adjustment forward	Store position 1
Fore-and-aft adjustment backward	Store position 2
Backrest forward	Store position 3
Backrest backward	Approach required position 1
Front height upward	Approach required position 2
Front height downward	Approach required position 3
Rear height downward	Note: The drive links are not activated until the switch M is depressed continuously.
Rear height upward	
Left mirror to right	
Left mirror to left	
Left mirror upward	
Left mirror downward	
Right mirror to right	
Right mirror to left	
Right mirror upward	
Right mirror downward	
Fill upper valve	
Bleed upper valve	
Fill lower valve	

Modify coding

The following settings can be selected from the menu and encoded under the menu item *Modify coding*.

Coding	Setting
Parking aid	active/ not active
Upper lumbar	present/ not present
Lower lumbar	present/ not present
Parking aid on door mirror	right/ left
Lowering	10 to 120 degrees

Procedure:

1. Select vehicle type.
2. Select *Seat memory* control module
3. Select menu item *Modify coding*.
4. Select desired coding as described above and press the double arrow key.
5. Select the desired setting with the arrow keys and press the **F8** key.

Note:

The procedure for activating the parking aid is described in detail on Page 72 - 41

Activating the parking aid

General

The automatic lowering of the rearview mirror aids the driver during parking manoeuvres. The rearview mirror is lowered by the set value as soon as reverse gear is engaged. If reverse gear is disengaged again or the *rearview mirror switch* touched with reverse gear still engaged, the rearview mirror returns to its stored position.

Note:

This function is only available in vehicles with seat memory.

The following settings can be selected from the menu and encoded using the Porsche System Tester 2.

Parking aid (active or not active)

Parking aid with rearview mirror (right or left)

Lowering

The system function can be activated or deactivated under menu item *Parking aid*.

Either the right-hand or left-hand rearview mirror is selected and activated under the menu item *Parking aid with rearview mirror*.

The degree to which the rearview mirror is lowered is set under the menu item *Lowering*.

Activating the parking aid

1. Connect the PST 2 with the ignition off, then switch the ignition on
2. Switch on the PST 2 and wait for the start-up screen
3. Press the [>>] key to go to the next level
4. Select the vehicle type 911 (996) in the left-hand window using the [√] key
5. With the [√] key, select the *Seat memory* control module and press the [>>] key to go to the next level
6. With the [√] key, select the *Coding* control module and press the [>>] key to go to the next level
7. The *Parking aid* menu item is already highlighted on your screen. Press the [>>] key to alter the coding
8. Select the menu item *active* using the [√] key
9. Press key F8 (coding)

The parking aid is now activated

10. Press the [<<] key to switch between the right-hand or left-hand door mirror
11. With the [v] key, select *Parking aid with rearview mirror* and press the [>>] key to alter the coding
12. Select the desired page *right* or *left* using key [v] or [^]
13. Press key F8 (coding)

The selected rearview mirror is now activated

14. Press the [<<] key to set the degree of lowering of the door mirror
15. With the [v] key, select *Lowering* and press the [>>] key to alter the coding
16. Select the desired degree of lowering using key [v] or [^]
17. Press key F8 (coding)

The selected degree of lowering has now been stored.

18. Press the [Esc] key 2x to quit this level

Setting of the system is now complete.

80 01 Diagnosis/troubleshooting, heating

Diagnosis/Troubleshooting

Heating

System H 01

Contents overview

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System description

Heating section

The heating system is controlled on the air side, i.e. coolant continuously flows through the heat exchanger. The heating is regulated via the position of the temperature mixing valve.

Depending on the position of the temperature mixing valve, a certain portion of warmed air is mixed with the fresh air from the outside.

Air-conditioning section

The preselected temperature is controlled automatically. The interior temperature and air flow can be adjusted manually via two pushbuttons. The changes are shown in the display. Information from the outside temperature sensors, interior temperature sensor and the sun sensor is processed to regulate the interior temperature.

The system can respond to rapid changes in the outside temperature and also takes into account that the intensity of sunlight has a major influence on the subjective temperature perception of passengers.

The fully automatic control system influences the temperature distribution between the upper and lower areas of the passenger compartment to suit the desires of the passengers in most cases. It is nevertheless possible to control this distribution manually by means of the corresponding push buttons. As in other Porsche cars, the air-conditioning system of the 911 Carrera (1996) is equipped with a "Defrost" button, which ensures maximum window defrosting efficiency by suitable control of the heating and blowing power and air distribution. In the interest of simpler use,

only one button has to be operated here to direct the full heating power to the windows in order to ensure rapid defrosting when the vehicle is operated in wintry conditions.

A quantity-controlled compressor produces the cooling power of the air conditioning.

With this demand-dependent quantity control, the compressor makes a contribution towards energy savings. When the compressor is switched on, only approx. 6 % of the refrigerant quantity is pumped. The start-up jerk that occurs with uncontrolled compressors can largely be avoided in this way.

General information

Function of auto recirculation

At outside temperatures of $> 26^{\circ}\text{C}$, following an initial system ventilation time of 30 seconds, the program switches to recirculation mode in order to accelerate the cooling phase.

Control of the air-conditioning compressor

Activation of the air-conditioning compressor depends on the outside temperature, intake air temperature and coolant temperature.

Activation:

- Outside temperature $\geq 5^{\circ}\text{C}$
- Intake air temperature $> 3^{\circ}\text{C}$
- Coolant temperature $< 115^{\circ}\text{C}$
- Ignition on

The air-conditioning compressor is switched on 7 seconds after the engine is started, at the earliest.

Switch-on conditions for coolant or condenser blower motors

Stage 1 is switched on when the coolant temperature is $> 100^{\circ}\text{C}$

or

there is an A/C demand, the intake air temperature is $> 8^{\circ}\text{C}$ and terminal 15 is switched on.

Stage 2 is switched on when the coolant temperature is $> 105^{\circ}\text{C}$

or

the refrigerant pressure is $> 16\text{ bar}$.

Switch-on conditions for engine compartment fan

The engine compartment fan is switched on when the engine compartment temperature is $> 80^{\circ}\text{C}$

or

the coolant temperature is $> 102^{\circ}\text{C}$.

After-running of engine compartment fan

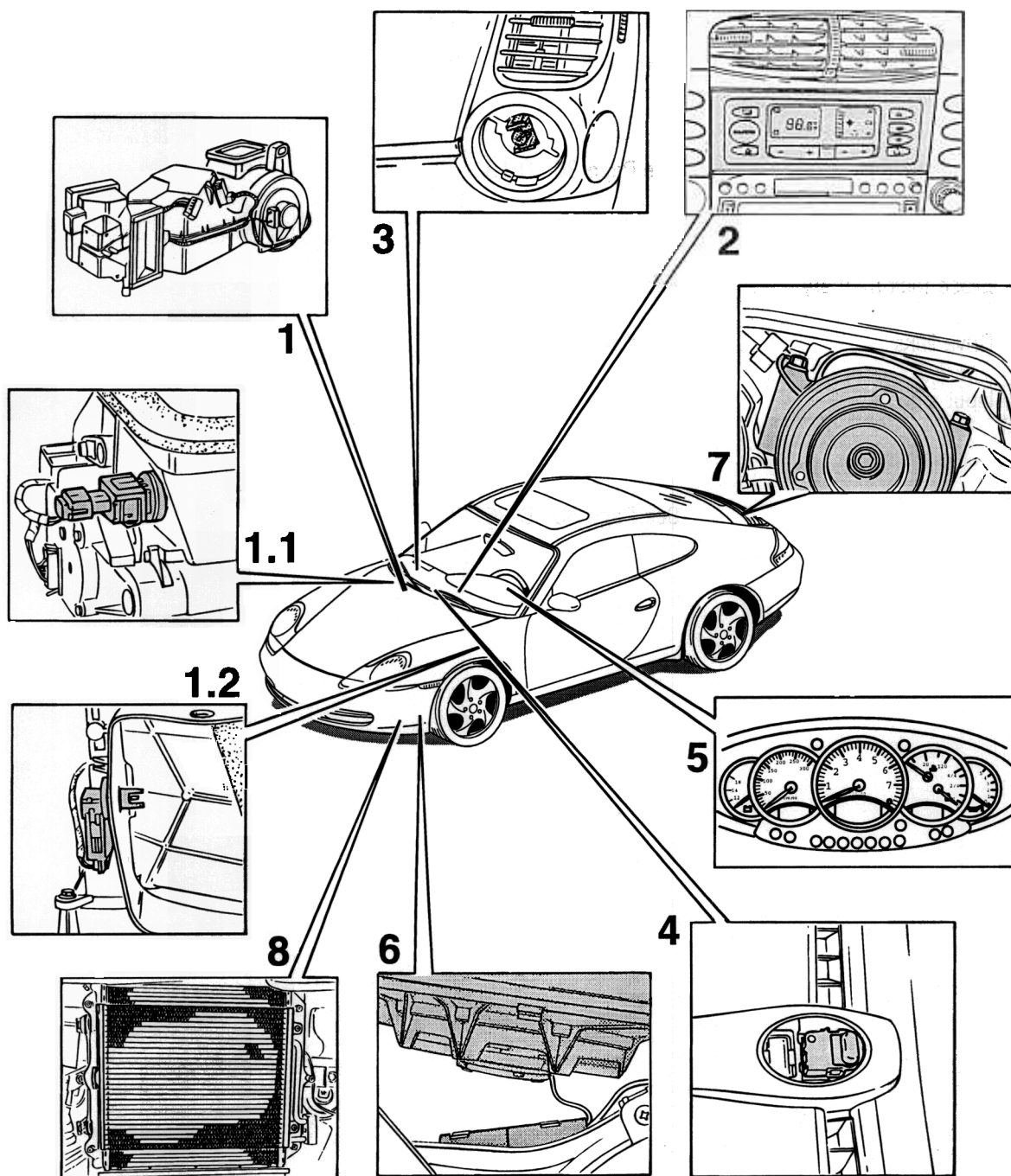
If the ignition is switched off and the engine compartment temperature is more than 60°C , the DME control module remains in readiness for another 20 minutes. During this time, the engine compartment temperature is retrieved every 10 seconds. If the engine compartment temperature is $> 85^{\circ}\text{C}$, the engine compartment fan is switched on for 20 seconds. If the engine compartment temperature is still $> 85^{\circ}\text{C}$ after this time, the fan remains on for a further 30 seconds.

Main menu

Overview of possible menus

Identification	See Page 80 - D 13
Fault memory	See Page 80 - D 14
Erase fault memory	See Page 80 - D 32
Drive links	See Page 80 - D 33
Input signals	See Page 80 - D 34
Actual values	See Page 80 - D 35
System test	See Page 80 - D 36

Component arrangement



141_98

Function, individual components

1. Heating/air-conditioning unit

The heating/air-conditioning unit includes:

- Heat exchanger (to heat the air)
- Temperature mixing valve
(to control the interior temperature)
- Central valve (to control the air flow)
- Outside air / recirculation valve
(to compensate for the dynamic pressure,
or recirculation control)
- Fresh-air blower
- Outside sensor
(to measure the intake air temperature)
- Blower outlet sensor
(to measure the footwell temperature)
- Driver (to control the fresh-air blower speed)
- Evaporator (to cool the air)
- Expansion valve

The outside air is heated or cooled in the heating/air-conditioning unit and distributed to the air vents.

1.1 Outside sensor

The outside sensor measures the temperature of the incoming air.

1.2 Blower outlet sensor

The blower outlet sensor measures the temperature of air emerging into the footwell.

2. Heating/ air-conditioning control

The heating/air-conditioning control includes the closed and open-loop control electronics, as well as switches for manual influence on automatic program control.

The heating/air-conditioning control regulates the different valves according to the set temperature, the interior temperature, the outside temperature, the vehicle speed and the intensity of sunlight shining into the vehicle.

3. Interior sensor

The interior sensor measures the temperature of the passenger compartment.

4. Sun sensor

The sun sensor measures the intensity of sunlight shining into the vehicle.

5. Instrument cluster

The instrument cluster provides the following system parameters for control of the heater/air-conditioning system:

Outside temperature
(measured below the bumper)

Coolant temperature

Vehicle speed

Engine speed

Time since the ignition was switched off

6. Electric fan with ballast resistor

Fan to cool the condenser.

The ballast resistor reduces the fan speed in the first stage.

7. Air-conditioning compressor

The air-conditioning compressor sucks the gaseous refrigerant from the evaporator and compresses the refrigerant.

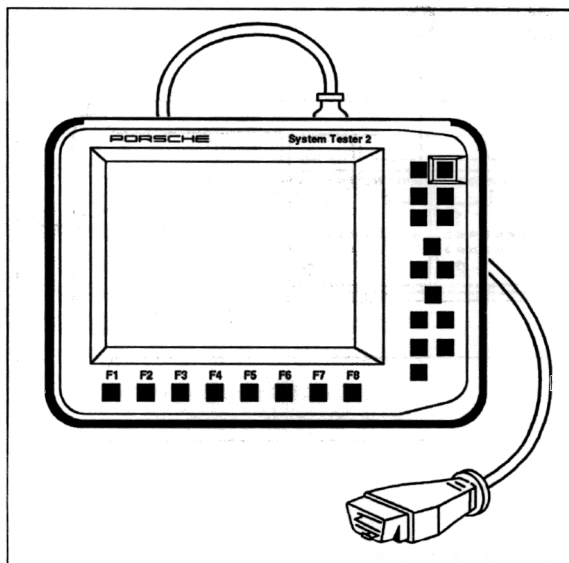
8. Condenser

The compressed refrigerant is cooled down in the condenser.

Tools

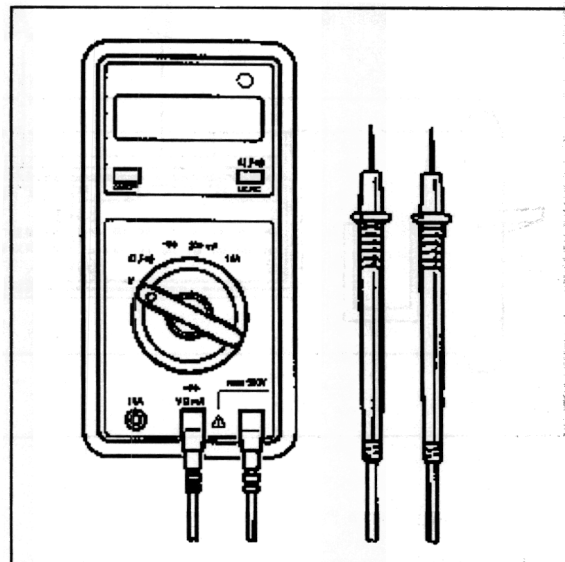
The following equipment is required for troubleshooting:

1. Porsche System Tester 2

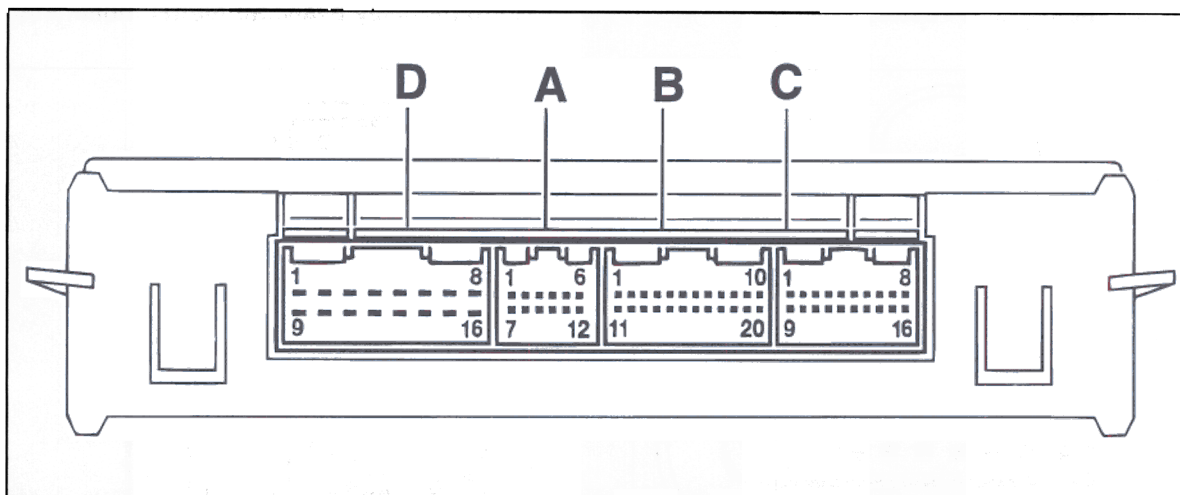


547_96

2. Commercially available digital multimeter



2178_28

Connector assignment, heating/air-conditioning control

526_96

Connector A (black)

- | | |
|-------------------|--|
| 1 – K-lead | 7 – Outside temperature sensor |
| 2 – Not used | 8 – Not used |
| 3 – Not used | 9 – Not used |
| 4 – Not used | 10 – Interior temperature sensor |
| 5 – Terminal 58 d | 11 – Not used |
| 6 – Not used | 12 – Ground for sensors and potentiometers |

Connector B (red)

- 1 – Not used
- 2 – Not used
- 3 – Not used
- 4 – Not used
- 5 – Footwell blower outlet sensor
- 6 – Not used
- 7 – Not used
- 8 – Position of temperature mixing valve
- 9 – Position of central valve
- 10 – Position of footwell / defrost valve
- 11 – Not used
- 12 – Not used
- 13 – Interface, instrument cluster
- 14 – Not used
- 15 – Not used
- 16 – Not used
- 17 – Position of outside air / recirculation valve
- 18 – Sun sensor
- 19 – Not used
- 20 – Not used

Connector C (beige)

- 1 – Not used
- 2 – Feedback signal, compressor
- 3 – Not used
- 4 – Not used
- 5 – Not used
- 6 – Not used
- 7 – Terminal 58
- 8 – Output + 5 volts
- 9 – Not used
- 10 – Not used
- 11 – Feedback signal, fresh-air blower, negative
- 12 – Not used
- 13 – Not used
- 14 – Feedback signal, fresh-air blower, positive
- 15 – Not used
- 16 – Actuation of fresh-air blower (driver)

Connector D (black)

- 1 – Not used
- 2 – Temperature mixing valve motor
- 3 – Footwell / defrost valve motor
- 4 – Central valve motor
- 5 – Outside air / recirculation valve motor
- 6 – Air-conditioning compressor demand on
- 7 – Not used
- 8 – Not used
- 9 – Terminal 15
- 10 – Temperature mixing valve motor
- 11 – Footwell / defrost valve motor
- 12 – Central valve motor
- 13 – Outside air / recirculation valve motor
- 14 – Not used
- 15 – Terminal 31
- 16 – Not used

Identification

Control module identification data can be read out with this menu item.

The following information is displayed:

Porsche Part No.

Hardware version

Software version

Date of production

Serial number in week

Production data

Diagnostic software number

Fault memory

Overview of possible faults

Interface to the instrument cluster

Outside temperature sensor

Interior temperature sensor

Blower outlet sensor

Supply voltage (terminal 15)

Supply voltage (5 volts)

Motor, temperature mixing valve

Motor, central valve

Motor, footwell / defrost valve

Motor, outside air / recirculation valve

A/C (air-conditioning compressor demand)

Motor, fresh-air blower

Control module faulty

Sun sensor

Note

The fault counter is set to 50 the first time a fault occurs.

The fault counter is reduced by 1 (decremented) if the fault is no longer present and the diagnosis conditions exist.

The fault is erased from the memory when the fault counter reaches 0.

Fault overview

Test point	Fault code	Fault effect	Page
	20	Substitute values	80 – D 16
2	21	Substitute value: 10 °C	80 – D 17
3	22	Substitute value: 22 °C	80 – D 18
4	23	Substitute value: 50 °C	80 – D 19
5	24		80 – D 20
6	25		80 – D 21
7	26	Valve cannot be adjusted	80 – D 22
8	27	Valve cannot be adjusted	80 – D 23
9	28	Valve cannot be adjusted	80 – D 25
10	29	Valve cannot be adjusted	80 – D 26
11	30		80 – D 27
12	31		80 – D 28
13	32	No regulation	80 – D 30
14	33	Substitute value: 150 W/m ²	80 – D 30

Fault, Fault code	Possible causes, elimination, notes
Test point 1	
Interface to instrument cluster	Diagnosis conditions No control module fault stored. No fault with supply voltage (terminal 15).
Open circuit	Open circuit
Short to ground	<ol style="list-style-type: none"> 1. Unplug connector B from the heating/air-conditioning control. 2. Unplug connector III from the instrument cluster. 3. Connect ohmmeter to connector B 13 and to connector III pin 26. Display < 5 Ω
Fault code 20	Note The wire is routed via the 12-pole plug connection on the heating/air-conditioning unit.
	Short to ground <ol style="list-style-type: none"> 1. Unplug connector B from the heating/air-conditioning control. 2. Unplug connector III from the instrument cluster. 3. Connect ohmmeter to connector B 13 and ground. Display: $\infty \Omega$ <p>If 0 - 5 Ω is displayed, check wiring harness for pinching and chafing damage.</p>

Fault, Fault code**Possible causes, elimination, notes****Test point 2**

Outside temperature sensor

Open circuit

Short to ground

Fault code 21**Diagnosis conditions**

No control module fault stored.

No fault with supply voltage (5 volts).

Open circuit

1. Unplug connector A from the heating/air-conditioning control.
2. Connect ohmmeter to connectors A 7 and A 12.
Display: approx. 1.2 k Ω at 23 °C
3. Unplug connector from the outside temperature sensor.
4. Connect ohmmeter to connector A 7 and pin 1
(connector of outside temperature sensor).
Display: 0 - 5 Ω
5. Connect ohmmeter to connector A 12 and pin 2
(connector of outside temperature sensor).
Display: 0 - 5 Ω
6. Connect voltmeter to connector A 7 and ground.
Switch on ignition.
Display: 0 volts

If approx. 5 volts are displayed, check wiring harness for pinching and chafing damage.

Short to ground

1. Unplug connector A from the heating/air-conditioning control.
2. Connect ohmmeter to connector A 7 and ground
Display: $\infty \Omega$

If 0 - 5 Ω is displayed, check wiring harness for pinching and chafing damage.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Test point 3

Interior temperature sensor

Open circuit

Short to ground

Fault code 22**Diagnosis conditions**

No control module fault stored.

No fault with supply voltage (5 volts).

Outside temperature higher than -40°C .**Open circuit**

1. Unplug connector A from the heating/air-conditioning control.

2. Connect ohmmeter to connectors A 10 and A 12.

Display: approx. $3\text{ k}\Omega$ at 23°C **Note**

The wires to the interior temperature sensor are routed via two additional plug connections on the heating/air-conditioning control.

3. Unplug connector from the interior temperature sensor.

4. Connect ohmmeter to connector A 10 and interior sensor connector pin 5.

Display: $< 5\ \Omega$

5. Connect ohmmeter to connector A 12 and interior sensor connector pin 4.

Display: $< 5\ \Omega$

6. Connect voltmeter to connector A 10 and ground.

Switch on ignition.

Display: 0 volts

If approx. 5 volts are displayed, check wiring harness for pinching and chafing damage.

Fault, Fault code**Possible causes, elimination, notes****Short to ground**

1. Unplug connector A from the heating/air-conditioning control.
 2. Connect ohmmeter to connector A 7 and ground.
Display: $\infty \Omega$
- If 0 - 5 Ω is displayed, check wiring harness for pinching and chafing damage.

Test point 4

Footwell blower outlet sensor

Diagnosis conditions

Open circuit
Short to ground
Fault code 23

No control module fault stored.
No fault with supply voltage (5 volts).
Outside temperature higher than - 30 °C.

Open circuit

1. Unplug connectors A and B from the heating/air-conditioning control.
 2. Connect ohmmeter to connectors A 12 and B 5.
Display: approx. 2.8 k Ω at 23 °C
 3. Unplug connector from blower outlet sensor.
 4. Connect ohmmeter to connector A 12 and blower outlet sensor connector pin 2.
Display: < 5 Ω
 5. Connect ohmmeter to connector B 5 and blower outlet sensor connector pin 1.
Display: < 5 Ω
 6. Connect voltmeter to connector B 5 and ground.
Switch on ignition.
Display: 0 volts
- If approx. 5 volts are displayed, check wiring harness for pinching and chafing damage.

Fault, Fault code	Possible causes, elimination, notes
	<p>Short to ground</p> <ol style="list-style-type: none"> 1. Unplug connector B from the heating/air-conditioning control. 2. Connect ohmmeter to connector B 5 and ground Display: $\infty \Omega$ <p>If 0 - 5 Ω is displayed, check wiring harness for pinching and chafing damage.</p>
<p>Test point 5 Supply voltage (terminal 15) Voltage too high Voltage too low Fault code 24</p>	<p>Diagnosis conditions No control module fault stored.</p> <p>Voltage too high Check the alternator.</p> <p>Voltage too low</p> <ol style="list-style-type: none"> 1. Check the alternator. 2. Check or charge the battery. 3. Check contact resistance of wire connections.

Fault, Fault code**Possible causes, elimination, notes****Test point 6**

Supply voltage
(5 volts)

Voltage too high

Voltage too low

Fault code 25

Diagnosis conditions

No control module fault stored.

Voltage too high

1. Unplug connector C from the heating/air-conditioning control.

2. Connect voltmeter to C 8 and ground.

Switch on ignition.

Display: 0 volts

If the battery voltage is displayed, check the wiring harness for pinching and chafing damage.

3. Push on connector C

4. Connect voltmeter to C 8 and ground.

Switch on ignition.

Display: 5 ± 0.5 volts

If more than 5.5 volts are displayed, replace the heating/air-conditioning control.

Voltage too low

1. Unplug connector C from the heating/air-conditioning control.

2. Unplug all connectors from the valve drive motors.

3. Connect ohmmeter to connector C 8 and ground.

Display: $\infty \Omega$

If 0 - 5 Ω is displayed, check wiring harness for pinching and chafing damage.

Fault, Fault code	Possible causes, elimination, notes
	<p>4. Check potentiometer in the drive motors.</p> <p>Temperature mixing valve: Connect ohmmeter to pins 1 and 3. Display: 4 - 5 kΩ at 23 °C</p> <p>Footwell / defrost valve: Connect ohmmeter to pins 1 and 3. Display: 4 - 5 kΩ at 23 °C</p> <p>Central valve: Connect ohmmeter to pins 1 and 3. Display: 4 - 5 kΩ at 23 °C</p> <p>Outside air / recirculation valve: Connect ohmmeter to pins 4 and 5. Display: 4 - 5 kΩ at 23 °C</p>

Test point 7

Motor of temperature
mixing valve

Signal implausible

Fault code 26

Diagnosis conditions

No control module fault stored.

No fault with supply voltage (5 volts).

Signal implausible

1. Check temperature mixing valve for smooth operation.
2. Unplug connectors A, B, C and D from the heating/air-conditioning control.
3. Unplug connector from the temperature mixing valve drive motor.
4. Connect ohmmeter to connector C 8 and drive motor connector pin 1.
 Display: < 5 Ω

 Connect ohmmeter to connector B 8 and drive motor connector pin 2.
 Display: < 5 Ω

Fault, Fault code	Possible causes, elimination, notes
	Connect ohmmeter to connector A 12 and drive motor connector pin 3. Display: < 5 Ω
	Connect ohmmeter to connector D 10 and drive motor connector pin 4. Display: < 5 Ω
	Connect ohmmeter to connector D 2 and drive motor connector pin 5. Display: < 5 Ω
	5. Check wire from connector C 8 to drive motor pin 1 for short to B+ and short to ground.
	6. Check wire from connector B 8 to drive motor pin 2 for short to B+ and short to ground.
	7. Check wire from connector A 12 to drive motor pin 3 for short to B+.
	8. Check wire from connector D 10 to drive motor pin 4 for short to B+ and short to ground.
	9. Check wire from connector D 2 to drive motor pin 5 for short to B+ and short to ground.

Test point 8

Motor of central
valve

Signal implausible

Fault code 27

Diagnosis conditions

No control module fault stored.

No fault with supply voltage (5 volts).

Signal implausible

1. Check central valve for smooth operation.
2. Unplug connectors A, B, C and D from the heating/air-conditioning control.

Fault, Fault code	Possible causes, elimination, notes
	3. Unplug connector from central valve drive motor.
	4. Connect ohmmeter to connector A 12 and drive motor connector pin 1. Display: < 5 Ω
	Connect ohmmeter to connector B 9 and drive motor connector pin 2. Display: < 5 Ω
	Connect ohmmeter to connector C 8 and drive motor connector pin 3. Display: < 5 Ω
	Connect ohmmeter to connector D 4 and drive motor connector pin 4. Display: < 5 Ω
	Connect ohmmeter to connector D 12 and drive motor connector pin 5. Display: < 5 Ω
	5. Check wire from connector A 12 to drive motor pin 1 for short to B+.
	6. Check wire from connector B 9 to drive motor pin 2 for short to B+ and short to ground.
	7. Check wire from connector C 8 to drive motor pin 3 for short to B+ and short to ground.
	8. Check wire from connector D 4 to drive motor pin 4 for short to B+ and short to ground.
	9. Check wire from connector D 12 to drive motor pin 5 for short to B+ and short to ground.

Fault, Fault code**Possible causes, elimination, notes****Test point 9**

Motor of footwell /
defrost valve

Signal implausible

Fault code 28**Diagnosis conditions**

No control module fault stored.

No fault with supply voltage (5 volts).

Signal implausible

1. Check footwell / defrost valve for smooth operation.
2. Unplug connectors A, B, C and D from the heating/air-conditioning control.
3. Unplug connector from footwell / defrost valve drive motor.
4. Connect ohmmeter to connector C 8 and drive motor connector pin 1.
Display: < 5 Ω
- Connect ohmmeter to connector B 10 and drive motor connector pin 2.
Display: < 5 Ω
- Connect ohmmeter to connector A 12 and drive motor connector pin 3.
Display: < 5 Ω
- Connect ohmmeter to connector D 11 and drive motor connector pin 4
Display: < 5 Ω
- Connect ohmmeter to connector D 3 and drive motor connector pin 5
Display: < 5 Ω
5. Check wire from connector C 8 to drive motor pin 1 for short to B+ and short to ground.
6. Check wire from connector B 10 to drive motor pin 2 for short to B+ and short to ground.
7. Check wire from connector A 12 to drive motor pin 3 for short to B+
8. Check wire from connector D 11 to drive motor pin 4 for short to B+ and short to ground.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

- | | |
|--|--|
| | 9. Check wire from connector D 3 to drive motor pin 5 for short to B+ and short to ground. |
|--|--|

Test point 10

Motor of outside air /
recirculation valve

Signal implausible

Fault code 29

Diagnosis conditions

No control module fault stored.
No fault with supply voltage (5 volts).

Signal implausible

1. Check outside air / recirculation valve for smooth operation.
2. Unplug connectors A, B, C and D from the heating/air-conditioning control.
3. Unplug connector from outside air / recirculation valve drive motor.
4. Connect ohmmeter to connector D 13 and drive motor connector pin 1.
Display: < 5 Ω
- Connect ohmmeter to connector D 5 and drive motor connector pin 2.
Display: < 5 Ω
- Connect ohmmeter to connector B 17 and drive motor connector pin 3.
Display: < 5 Ω
- Connect ohmmeter to connector C 8 and drive motor connector pin 4.
Display: < 5 Ω
- Connect ohmmeter to connector A 12 and drive motor connector pin 5.
Display: < 5 Ω
5. Check wire from connector D 13 to drive motor pin 1 for short to B+ and short to ground.
6. Check wire from connector D 5 to drive motor pin 2 for short to B+ and short to ground.

Fault, Fault code**Possible causes, elimination, notes**

7. Check wire from connector B 17 to drive motor pin 3 for short to B+ and short to ground.
8. Check wire from connector C 8 to drive motor pin 4 for short to B+ and short to ground.
9. Check wire from connector A 12 to drive motor pin 5 for short to B+ and short to ground.

Test point 11

A/C

Signal implausible

Fault code 30**Note**

This fault can be determined only during the system test.

Signal implausible

1. Check refrigerant pressure (see Page 87 - 13).
2. Check high/low pressure switch.

Battery positive voltage must be present at terminal 1 on the high/low pressure switch (with ignition on) if there is sufficient refrigerant in the system.

3. Check the heating activation relay.

Battery positive voltage must be present at terminal 87 when the ignition is switched on.

4. Check the air-conditioning compressor relay.

Battery positive voltage must be present at terminal 30 (with the ignition on) and the high/low pressure switch actuated.

Terminal 31 must be connected to ground.

Battery positive voltage must be present at terminal 86 when the engine is started.

Terminal 85 must be connected to ground when the DME switches on the air-conditioning compressor (7-second delay).

5. Unplug connector D from the heating/air-conditioning control.

Fault, Fault code	Possible causes, elimination, notes
	<p>6. Unplug the DME (ECM) connector.</p> <p>7. Connect ohmmeter to D 6 and DME connector pin 69. Display: < 5 Ω</p> <p>Note</p> <p>The wire is routed via two plug connections.</p> <p>8. Remove the air-conditioning compressor relay.</p> <p>9. Connect ohmmeter to terminal 85 and DME connector pin 62. Display: < 5 Ω</p> <p>Note</p> <p>The wire is routed via one plug connection.</p>

Test point 12

Motor of fresh-air blower

Voltage too low

Voltage too high

Fault code 31**Diagnosis conditions**

No control module fault stored.

Supply voltage OK.

Nominal blower voltage > 3 volts.

Nominal blower voltage stabilised.

Voltage too low**Note**

Voltage too low means that the measured blower voltage lies below the nominal blower voltage.

1. Check the heating activation relay.
Battery positive voltage must be present at terminal 87 when the ignition is switched on.
2. Unplug connector C from the heating/air-conditioning control.

Fault, Fault code	Possible causes, elimination, notes
	<p>3. Connect voltmeter to C 14 (positive) and ground. Switch on ignition. Display: Battery voltage</p> <p>4. Push connector C on the heating/air-conditioning control.</p> <p>5. Connect voltmeter to C 14 (positive) and C 11 (negative). Maximum blower speed Display: approx. 12 V</p> <p>Minimum blower speed Display: approx. 0 V</p> <p>6. Connect voltmeter to C 14 (positive) and C 16 (negative). Maximum blower speed Display: approx. 5 V</p> <p>Minimum blower speed Display: approx. 9 V</p> <p>7. Check driver. Connect voltmeter to positive and pin 3 on driver connector. Display: Battery voltage</p> <p>Connect voltmeter to positive and pin 1 on driver connector. Maximum blower speed Display: approx. 5 V</p> <p>Minimum blower speed Display: approx. 9 V</p> <p>Connect voltmeter to positive and pin 2 on the driver connector. Maximum blower speed Display: approx. 12 V</p> <p>Minimum blower speed Display: approx. 0 V</p> <p>8. Check wiring from heating/air-conditioning control to driver for continuity.</p> <p>9. Check blower motor.</p>

Fault, Fault code	Possible causes, elimination, notes
	Voltage too high
	Note
	A higher blower voltage can only be caused by a short to ground on the wires to pins 1 or 2 of the driver.
	1. Unplug connector C from the heating/air-conditioning control.
	2. Unplug connector from the driver.
	3. Connect ohmmeter to C 16 and ground. Display: $\infty \Omega$
	4. Unplug connector from the fan motor.
	5. Connect ohmmeter to driver connector pin 2 and ground. Display: $\infty \Omega$

Test point 13

Control module

Replace the heating/air-conditioning control

Control module faulty

Fault code 32**Test point 14**

Sun sensor

Diagnosis conditions

No control module fault stored.

No fault with supply voltage (5 volts).

Short to B+

Short to ground

Fault code 33**Short to B+ / Short to ground**

1. Remove sun sensor.
2. Remove plug connection from sun sensor.

Fault, Fault code	Possible causes, elimination, notes
	<p>3. Connect voltmeter on sleeve side to pin 2 (negative) and pin 3 (positive). Switch on ignition. Display: approx. 4.5 - 5 volts</p> <p>If 0 volts is displayed, check wiring to the heating/air-conditioning control A 12 and B 18 for continuity. Check wiring to the heating/air-conditioning control B 18 for short to ground.</p> <p>Note</p> <p>The wiring to the heating/air-conditioning unit is routed via two plug connections. If the wiring is OK, replace the heating/air-conditioning control.</p> <p>4. Connect ohmmeter to sun sensor pins 2 and 3. Sun sensor not in darkness Display: approx. 1.3 MΩ</p> <p>Sun sensor in darkness Display: approx. 240 kΩ</p>

Erasing the fault memory

Note

The fault memory can be erased only if it was first read out at least once.

The entire fault memory is always erased.

Drive links

With this menu item, it is possible to activate drive links of the heating/air-conditioning system using the Porsche System Tester 2. This allows the function of the drive links to be assessed very quickly.

The following drive links can be activated:

Motor, temperature mixing valve

Motor, central valve

Motor, footwell / defrost valve

Motor, outside air / recirculation valve

A/C button

Fresh-air blower



Input signals

With this menu item, input signals of the heating/air-conditioning system can be read in using the Porsche System Tester 2. This allows the function of the input signals to be assessed very quickly.

The following input signals can be read in:

A/C button

Compressor voltage

Engine signal (indication of engine start)

Terminal 58 (lighting)



Actual values

Values currently under test can be read out via this menu item.

The following values can be called up:

Outside temperature
(from the instrument cluster)

Outside temperature
(from the heating/air conditioning)

Interior temperature

Blower outlet temperature

Engine temperature

Position of temperature mixing valve

Position of central valve

Position of footwell / defrost valve

Position of outside air / recirculation valve

Fresh-air blower voltage

Supply voltage (terminal 15)

Supply voltage (5 volts)

Vehicle speed

Engine speed

Sun intensity

Dimming display

Idle period

Parameter code

System test

Special diagnosis routines can be run with this menu item.

The following conditions must be observed for the system test:

Vehicle speed < 10 km/h

Engine start detected and 10 seconds elapsed since engine start

Terminal 15 supply voltage OK

5-volt supply voltage OK

Engine temperature < 110 °C

Outside temperature > 3 °C

The following tests are performed:

Display of all segments in the control module

The drive motors are traversed across the entire range once

The measured positioning travel is subjected to a plausibility test and stored as a fault if necessary

Two different voltage values are set on the fresh-air blower and tested

The A/C circuit is tested via the DME

All fault paths are tested, and any faults are stored

After the system test, the heating/air conditioning reverts to the state it was in before the test.

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System description

Control module

The immobilizer, central locking system, convertible top comfort control, radio remote control and monitoring of the vehicle interior functions are integrated in the alarm system. The control module is fitted under the driver's seat. There are 4 versions of the control module:

Versions	Integrated functions
1. Comfort system 433 MHz	<ul style="list-style-type: none"> - immobilizer with signal converter - central locking system - interior lighting - power window enabling - power window comfort function - load disconnection - alarm system and IR sensor - hand-held transmitter
2. Comfort system 315 MHz	same as comfort system 433 MHz, but with 315 MHz hand-held transmitter
3. Comfort system 433 MHz with tilt sensor	same as comfort system 433 MHz, but with integrated tilt sensor
4. Comfort system 315 MHz with tilt sensor	same as comfort system 315 MHz, but with integrated tilt sensor

The alarm system monitors the vehicle's outer panels by way of contact switches on the lids and in the doors. Attempted break-ins should be recognised and indicated by audible and visual signals.

The alarm horn, hazard warning lights and interior lights are activated for alarm output.

The system can be extended by connecting additional sensors (glass breakage sensor, tilt sensor).

Central locking

Unlike the previous systems, a two-motor lock is used here.

locked motor

safe motor

The locked motor switches the central locking system from unlocked to locked or vice versa.

The safe motor switches the central locking system from locked to safe or vice versa.

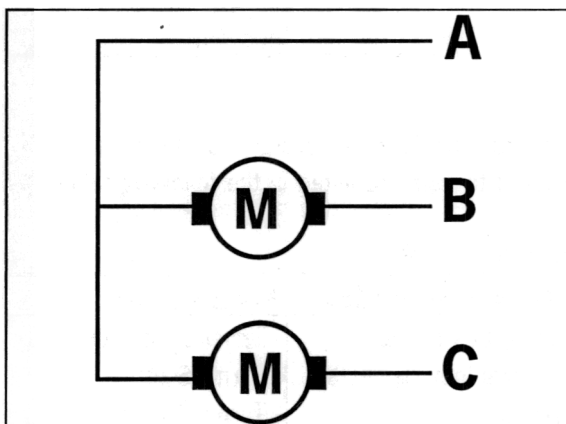
The central locking system provides for three different locking conditions:

Action 1: If the lock is activated once, the so-called "Safe locking – door secured" function is activated.

The doors can be opened only with the key, but not with the inside door handles.

Action 2: If the door lock is activated twice within 1 second, the vehicle is not accessible from the outside, but can be unlocked via the inside door handles.

Emergency locking The possibility of activating the door lock three times represents an emergency function. If the functional capability of the overall system is impaired because, for example, one door cannot be closed, it is possible in this way to still activate the other security functions. Point 1 is activated when the system is operated via the handheld transmitter. The position of the doors is checked by limit switches in the lock.



A = Unlock/unsafe central locking system motor output

B = Lock central locking system motor output

C = Safe central locking system motor output

The conditions for a locking process from unlocked to locked are listed in the following table.

unlocked → locked

Triggering condition	Requirement
Door lock barrel: Central locking system Action 2	- driver's door closed - Term. S off - Term. 15 off - no valid transponder
Radio transmitter: Central locking system Action 2	- driver's door closed - Term. S off - Term. 15 off - no valid transponder
Door lock barrel: Emergency locking	- possible at any time
Central locking button: Operation actuated towards closed	- driver and passenger doors closed - terminals S and 15 were deactivated for at least 2 seconds after crash unlocking
Speed > v_{gr} (variant coding)	driver and passenger doors closed - Term. 15 - Term. S - terminals S and 15 were deactivated for at least 2 seconds after crash unlocking
Term. 15 on (variant coding)	- driver and passenger doors closed - terminals S and 15 were deactivated for at least 2 seconds after crash unlocking

Triggering condition	Requirement
For all triggering conditions from unlocked → safe for central locking elements without safe position (national variants)	see unlocked → safe
t_{wv1} after central locking system radio unlocking	after radio actuation <ul style="list-style-type: none"> - no door was opened - no Term. S was recognised - no Term. 15 was recognised - no further central locking system actions were carried out Central locking system was in safe position or locked before radio actuation

t_{wv1} = Re-locking time, codable

The conditions for a locking process from unlocked to safe are listed in the following table.

unlocked → safe

Triggering condition	Requirement
Door lock barrel: Central locking system Action 1	<ul style="list-style-type: none"> - Driver's door closed - Term. S off - Term. 15 off - no valid transponder Not possible for central locking element coding without safe position
Radio transmitter: Central locking system Action 1	<ul style="list-style-type: none"> - driver's door closed - no valid transponder - Term. S off (at least 2 seconds) - Term. 15 off Not possible for central locking element coding without safe position

The conditions for a locking process from locked to safe are listed in the following table.

locked → safe

Triggering condition	Requirement
Door lock barrel: Central locking system Action 1	<ul style="list-style-type: none"> - Driver's door closed - Term. S off - Term. 15 off - no valid transponder Not possible for central locking element coding without safe position

The conditions for a locking process from safe to locked are listed in the following table.

safe → locked

Triggering condition	Requirement
Central locking system was unlocked, door lock barrel or radio transmitter are actuated twice in 1 second, the central locking system lock is already in safe position after the first actuation, before the second actuation is detected	same as unlocked → safe
Central locking system already in safe position and door lock barrel is actuated towards closed twice in 1 second	same as unlocked → safe
During Term.15 the safe position of a door is recognised	- Term. 15 - at least one door in safe position - alarm system is not activated
Term.S on	within 10 seconds or in the inactive period after the locking command is given once
Term. 15 on or valid transponder	
Recognition of a valid transponder	alarm system is activated - one door was mechanically unlocked - other door is in safe position
IR sensor detects movement	system is in the time window for movement detection

locked → unlocked

Triggering condition	Requirement
Door lock barrel: Actuation towards open	not for coding variant "deactivate only via radio", if alarm system is activated
Radio transmitter: actuated once	- Term. S off (at least 2 seconds) - Term. 15 off - no valid transponder
Central locking button actuated towards open	- both doors closed and locking performed either with central locking button or - after recognising a valid transponder or - after locking with Term. 15 on or - after locking via speed signal
Unlocking a door via inner actuating mechanism	- locking performed either with central locking button or - after recognising a valid transponder or - after locking with Term. 15 on or - after locking via speed signal
Crash signal	- Term. S or - Term. 15
Desired locked position is not achieved	not for emergency function or actuation of the central locking button

safe → unlocked

Triggering condition	Requirement
Door lock barrel: Actuated towards open	not for coding variant "deactivate only via radio", if alarm system is activated
Radio transmitter: actuated once	- Term. S off (at least 2 seconds) - Term. 15 off - no valid transponder
Desired locked position is not achieved	

Controlling the interior lights

The interior lights are not controlled directly by the door contacts. The interior lights are switched on:

When the central locking system is unlocked with a key or via radio transmitter.

When the doors are opened.

When Term. S is switched off.

The lighting stays on for approx. 30 seconds.

The interior lights are switched off (doors closed):

30 seconds after the central locking system is unlocked with a key or via radio transmitter.

30 seconds after the last open door has been closed with Term. 15 and Term. S switched off.

If both doors are closed with Term. 15 and Term. S switched on.

When the last open door has been closed with Term. 15 and Term. S switched on.

When the central locking system is actuated toward position *locked* or *safe* via handheld transmitter or door lock barrel and with both doors closed.

When the last door has been closed, if one door was still open when the central locking system was actuated toward position *locked* or *safe* via handheld transmitter or door lock barrel.

The interior lights are switched on and off dimmed.

Opening and closing the convertible top of the 996 Cabriolet

The second button of the handheld transmitter can be used as a remote control for the convertible top provided that:

Vehicle is unlocked and deactivated and

Term. S is switched off for at least 2 seconds and

Term. 15 is switched off and

No valid transponder is recognised

If the convertible top is opened or closed, the convertible top control module output is activated first and then (with a 200 ms delay) the comfort opening or comfort closing output.

Load disconnection

If the vehicle is locked up, some loads are disconnected from the supply voltage in order to conserve the battery. Load deactivation is activated if at least one of the following requirements is fulfilled:

10 minutes after locking up the vehicle via hand-held transmitter or door lock as well as after re-locking

2 hours after term. S is switched off

2 hours after the central locking system is unlocked via door lock or hand-held transmitter

2 hours after alarm output

Play prevention

If the central locking system is actuated 11 times in less than 5 seconds, further operation is blocked for 30 seconds. If the last command before play prevention activation was a command to open the central locking system, then it is possible to give a further command which is independent from play prevention to close the system. For every further time that play prevention is activated the blocking time is doubled, up to a maximum of 240 seconds. The blocking time is cleared when a door is opened, and if play prevention is activated again, blocking time starts at 30 seconds.

Crash signal

The airbag control module emits a signal to the alarm system control module no later than 35 seconds after Term. S is switched on and until Term. S is switched off again. This signal

has a frequency of 10 Hz and indicates two states - normal state (live signal) and crash state. The two states differ in the pulse/duty ratio of the signal:

Live signal 20% high 80% low

Crash signal 80% high 20% low

Signal evaluation begins 45 seconds after term. S is switched on. If no signal is detected from the airbag control module, a corresponding fault is entered into the fault memory.

Undervoltage

If the battery voltage falls below 8.5 V, undervoltage occurs. If the battery voltage exceeds 9 V, the undervoltage is no longer present. If undervoltage occurs, the inputs *Door lock barrel open* and *Door lock barrel closed* are evaluated as inactive irrespective of their state. It is not possible to activate the central locking system via the door lock barrel when undervoltage occurs. The alarm system cannot be activated in the case of undervoltage.

Lid release locking

Electric locking of the rear lid release has been omitted as of the production launch of the '98 series. Front lid release locking is still carried out electrically.

Electric locking is carried out by the alarm system control module and is valid for the following country codings:

USA, England and Belgium

Load disconnection is deactivated if at least one of the following requirements is fulfilled:

Term. S is switched on

Term. 15 is switched on

A valid transponder is recognised

The vehicle is unlocked or locked via hand-held transmitter or door lock

A door is opened

Alarm output

Power window control

The control centre not only enables power-window control, but also controls the comfort functions. If the central locking button on the hand-held transmitter is still pressed after an unlocking command has been given, the windows are controlled in the direction *open*. For a locking command with the central locking button on the hand-held transmitter, if the button is still pressed, the windows are controlled in the direction *closed* (national variant).

Power-on behaviour

After the operating voltage is switched on, the system is set to the operating state which it was in before the supply voltage was switched off.

For this purpose, all necessary operating parameters are stored in a permanent memory. If the system was disconnected from the supply in the armed state, this is entered as a fault in

the status memory. The same applies if the system is disconnected from the supply voltage during an alarm output. The alarm output is continued as soon as the necessary supply voltage is available.

Activating and deactivating alarm system

The alarm system is activated by a ground signal at the activation input or by an activation signal from the hand-held transmitter.

The activation of the system is ignored if terminal 86 S, terminal 15 or a valid transponder key is recognised.

If for some reason it is not possible to lock the central locking system with a single locking command, the alarm system is not activated. Activation of the alarm system cannot be achieved until the central locking system is locked (if necessary manually) and a new activation command is issued or only locking is performed three times in quick succession. The interval between two locking operations must not be more than 1 second in this case. If the system is activated by this emergency function, the central locking system is locked without checking whether it can be completely locked.

The system saves the type of activation in a status memory. If an alarm is triggered, this information is written into the alarm memory together with the alarm coding.

When the alarm system is activated, the inactive level of all inputs is checked for an inactive period of 10 seconds. Only inputs which are inactive for the entire inactive period can trigger the alarm after the end of the inactive period. All other inputs are blocked for alarm triggering for as long as they are in the active state. If the inactive state occurs at blocked inputs, the inactive period is started for them individually. All inputs which remain in the inactive state during the inactive period are then included in the alarm evaluation.

The inactive period commences immediately after activation:

if it is apparent that the central locking system is locked or if locking occurred three times in succession

and

if the signal "activate " is no longer present.
(A second activation command for cancelling the anti-theft protection restarts the inactive period.)

In the case of an active signal at the inputs terminal 86 S, terminal 15 or if a valid transponder key is recognised, no activation is possible. If one of these inputs is active at the time of locking, control of the central locking system does not take place. The central locking system is opened if one of these inputs becomes active during the inactive period, since in this case the alarm system is also deactivated.

If, when the vehicle is locked, a door is unlocked after expiry of the 10 second inactive period, this is immediately controlled in the direction "closed". An alarm is triggered at the same time. If, when the vehicle is locked, a door is unlocked from the inside during the inactive period, the central locking system is unlocked and the alarm system is deactivated. (Protection against unintentional locking/activation).

If, within 15 seconds after switching-on of the output External Electronics, movements in the vehicle are detected by the passenger compartment monitor, the central locking system is moved to the locked position and the alarm system is deactivated.

After expiry of the inactive period, the output "External Electronics" is switched on if the alarm-triggering inputs for the doors, convertible top, convertible top compartment cover, front luggage compartment and rear engine compartment were inactive for the entire inactive period. If one of these inputs is active, the output "External electronics" is not switched on until this input becomes inactive and remains in this state for at least 10 seconds. The switched-on output "External Electronics" cannot be deactivated again by activating one of the above inputs. The output is switched off when deactivation takes place.

If, within a period of less than 1 second after the first activation pulse, a second activation command is issued, the output "External Electronics" is not switched on for one activation cycle. In this case, the central locking system is not secured, but only locked. This is acknowledged by signal 1 at the alarm horn and at the direction indicator light output, as well as during

the deactivation period by the display type 3 at the alarm readiness display output and at the display output "Door locked". An opening command deletes the switch-off command.

If activation occurs by way of the emergency function (locking 3 times quickly), the output "External Electronics" is not switched on for this activation cycle. This is acknowledged by signal 1 at the alarm horn and direction indicator light output, as well as by display type 2 at the alarm readiness display output. A deactivation command deletes this command.

If terminal 86 S, terminal 15 or a valid transponder key is recognised during the deactivation period, the alarm system is deactivated (protection against unintentional activation). The central locking system is opened in this case.

A system self-test is carried out upon activation. The result of this test is acknowledged via the alarm readiness light and the display "Door locked" and can be called up from the status memory via the diagnosis function. Equipment faults are written into the fault memory. Faults are indicated at the alarm horn and direction indicator light outputs by signal 2.

The alarm system is deactivated by a ground signal at the input "Deactivate" or by a deactivation signal from the handheld transmitter. If a valid transponder key is recognised, the alarm system is also deactivated.

Tilt sensor

The integrated tilt sensor is active analogously to the output *Control of External Electronics*. During this time, a change in the vehicle tilt triggers an alarm. The current tilt of the vehicle is stored as a reference value during a calibration phase defined for the tilt sensor. The system has an alarm siren with a rechargeable battery supply which can emit an alarm if the vehicle battery is removed.

Behaviour in the case of servicing

When removing

the vehicle battery

the alarm siren

the alarm control centre

an activated tilt sensor will trigger an alarm. In order to carry out servicing work the alarm siren must be switched off before the work is commenced. To switch it off, insert the vehicle key with valid transponder into the steering lock and rotate to actuate the buzzer contact. Components can be removed with triggering the alarm as long as the vehicle key remains inserted.

Function display and audible checkback

The operating state of the central locking system is fed back via the output "Door locked" and by corresponding activation of the interior light (signals 1 to 3). The operating state of the alarm system is also indicated during the inactive period by the alarm readiness display (display types 1 to 6) and exclusively by the alarm readiness display following expiry of the inactive period. Displayed system faults are always current faults. Previous system faults entered in the status memory have no influence on the function display.

Display type 1 (normal flashing)

Requirement: Alarm system primed
no alarm output or
no active alarm input
after re-locking if
no alarm input is active

Duration: until deactivation,
then Display type 6

LED flashes with a frequency of 0.5 Hz
On time = 100 ms
Off time = 1900 ms

Display type 2 (double flashing)

Requirement: after alarm output or
active alarm input
after activation
or re-locking

Duration: until deactivation,
then Display type 6

LED flashes with a frequency of 0.5 Hz

On time 1,2 = 100 ms

Off time 1 = 200 ms

Off time 2 = 1700 ms

Display type 3 (rapid flashing)

Requirement: alarm system primed
no active alarm inputs

Duration: inactive period,
then display type 1

LED flashes with a frequency of 2 Hz

On time = 100 ms

Off time = 400 ms

Display type 4 (rapid flashing)

Requirement: Reception of an adapted
handheld transmitter

Duration: push of the button

LED flashes with a frequency of 10 Hz

On time = 50 ms

Off time = 50 ms

Display type 5 (on)

Requirement: after central locking
system emergency
locking or after locking
command is given twice
via handheld transmitter
or door lock

Duration: in the case of central
locking system emergency
locking, inactive period
then display type 2
in the case of locking
command given twice,
inactive period
then display type 1

The LED is continuously on

Display type 6 (OFF)

The LED is not switched on

In addition, the checkback of faults and of the standard status is performed with signal 3 at the interior light output. An audible checkback via the alarm horn output also takes place at the alarm centre, together with a visual checkback via the outputs for the direction indicator lights.

The following signals are defined:

Signal 1

The outputs are triggered once

On time = 50 ms

Signal 2

The outputs are triggered twice

On time 1,2 = 50 ms

Off time = 200 ms

Signal 3

The outputs are triggered once

On time = 2500 ms

These functions can be switched on and off with the Porsche System Tester 2, depending on the national variants. The times are freely programmable.

Assignment of the display type of the alarm readiness light for the operating state

Operating conditions	Type of display	Operating state
during inactive period		
Self-test ok, central locking system locked and secured, all inputs in normal position, not locked 3 x	Rapid flashing (3)	Not primed
Self-test ok, central locking system locked, all inputs in normal position, not locked 3 x	On (5)	Not primed
Self-test not in order		Not primed
Self-test in order, central locking system cannot be locked, not locked 3 x		Not primed
Self-test ok, central locking system locked, active inputs	Off (6)	Not primed
Self-test ok, locking/priming by locking 3 x		Not primed
Inactive period expired		
All inputs inactive, central locking system locked and secured, not locked 3 x, no alarm	Normal flashing (1)	Primed
All inputs inactive, central locking system locked, no alarm, not locked 3 x	Normal flashing (1)	Primed
Inputs active	Double flashing (2)	Primed for all non-active inputs
During or after alarm output	Double flashing (2)	Primed
Priming/locking command by 3 x rapid locking of the system	Double flashing (2)	Primed
Self-test not in order	Off (6)	Not primed

If a control command is issued via the handheld transmitter, this is confirmed with display type 4 for the duration of the operation. This display has priority.

Alarm triggering and alarm output

The alarm functions can be triggered only in the primed state.

A non-blocked alarm input triggers an alarm in the primed state with an active signal.

The alarm-triggering input then remains blocked for further alarm triggering until it returns to the inactive state. Then, following expiry of the inactive period of 10 seconds, it is again included in the alarm evaluation, provided that it was inactive for the entire inactive period.

In a priming cycle, the inputs Passenger compartment monitor, External 1 and External 2 trigger a maximum of three alarms.

The alarm output is via:

Horn	depending on the country coding
Horn	depending on the country coding
Interior lights	asynchronous with the direction indicator lights, depending on the country coding

The alarm output with all associated actions is interrupted immediately in the event of deactivation.

Radio remote control

If a command is issued via the handheld transmitter, this is acknowledged with display type 4 at the alarm readiness display for the duration of the operation.

Commands triggered and correctly executed via the handheld transmitter are acknowledged as follows at the output for the direction indicator lights:

Secure with signal 2

Lock with signal 3

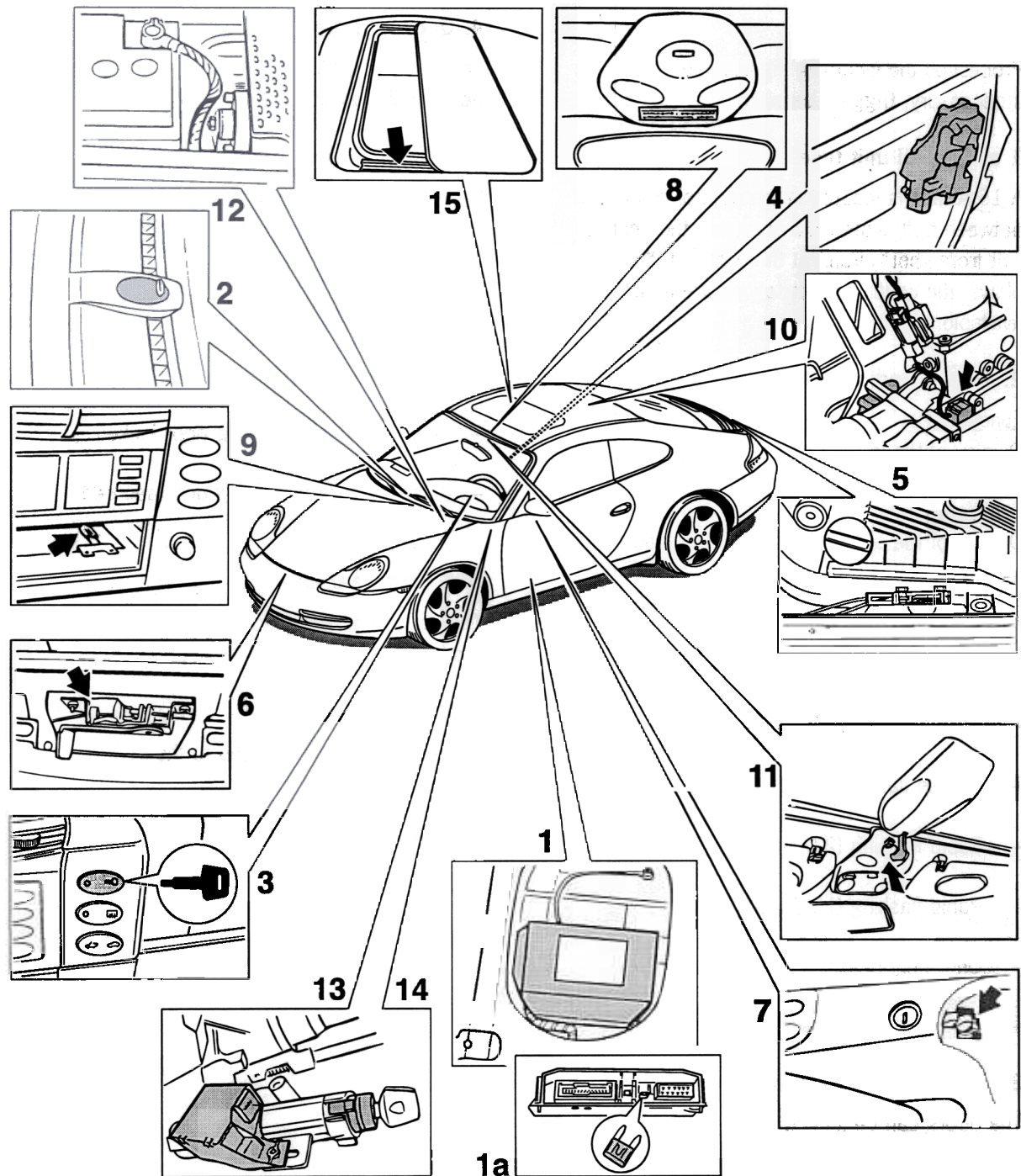
Unlock with signal 1

Depending on the country, the checkback signal can be programmed via the Porsche System Tester 2.

All other functions such as interior light control are controlled in the same way as with the vehicle key.

If operating commands are simultaneously present from the handheld transmitter and the door lock barrels, the signal recognised first has priority.

Component arrangement



Function of individual components

1. Control module

Processes the incoming signals and, if necessary, triggers an alarm.

1 a. Control unit fuse

A 15 A fuse is located in the control unit between both slots which protects the control unit from short circuit at the output. If this fuse blows, the control unit functions are no longer available.

2. Alarm readiness light

Function 1

Display of the locking state.

Function 2

Display of the operating state of the alarm system.

Six display types are possible:

Normal flashing (0.5 Hz)

Double flashing (0.5 Hz)

Rapid flashing (2.0 Hz)

Rapid flashing (10.0 Hz)

On

Off

3. Central locking button

The doors can be locked and unlocked with the central locking button.

4. Door lock module

The door lock modules (driver's/passenger's door) each contain 5 micro switches:

1 switch for priming the system (ground pulse).

1 switch for deactivating the system (ground pulse).

1 switch for recognising door closed.

1 switch for recognising door locked.

1 switch for recognising door secured.

5. Switch, rear lid

The switch connects ground to the control module.

6. Switch, front lid

The switch connects ground to the control module.

7. Switch, oddments tray

The switch connects ground to the control module when the oddments tray is opened

8. Passenger compartment monitoring sensor

The passenger compartment monitoring sensor connects ground to the control module when movement is detected in the vehicle.

9. Radio alarm contact

The alarm contact on the radio mounting frame connects ground to the control module when the radio is removed from the frame.

10. Switch, convertible top compartment cover

The switch connects ground to the control module.

11. Switch, convertible top closed

The switch connects ground to the control module.

12. Alarm horn

In the event of an alarm, the horn is supplied with positive potential by the control module.

Note

If the positive supply for the alarm horn is interrupted, the visual alarm is triggered via the direction indicator lights and the interior lights.

13. Signal converter

The signal converter obtains the transponder code from the signals sent by the transponder, and then sends this code on to the alarm control module. With the help of Porsche System Tester 2 the transponder of a key which is inserted in the ignition can be adapted to one of the 4 memory locations for transponders. The first time the transponder is adapted, its *Secret Key* is programmed.

The *Secret Key* of the transponder can no longer be overwritten, i.e. a programmed and adapted transponder is permanently assigned to one vehicle.

14. Transponder coil

The transponder coil reads the transponder code out of the transponder.

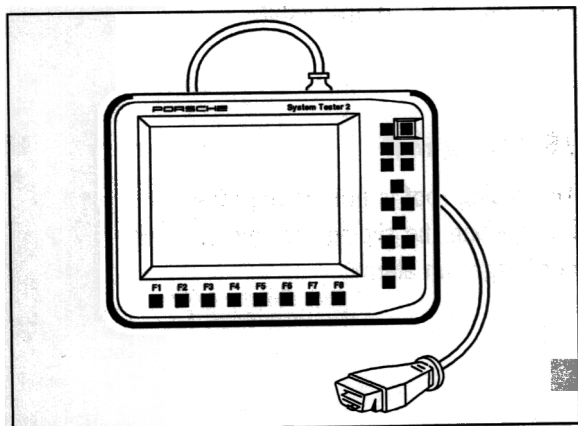
15. Sliding roof

The sliding roof is not alarm-protected, i.e. opening the sliding roof by force will not trigger an alarm.

Tools

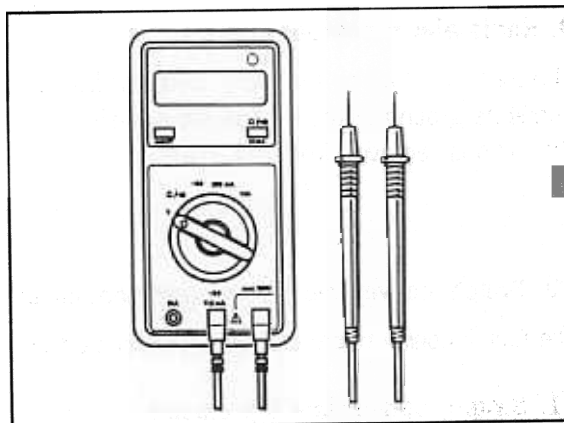
The following equipment is required for troubleshooting:

1. Porsche System Tester 2



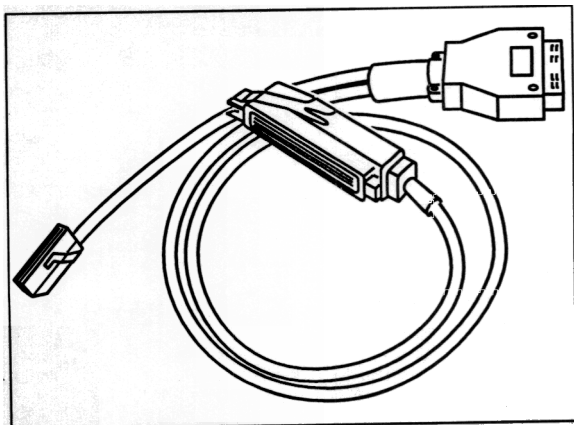
547_96

3. Commercially available digital multimeter



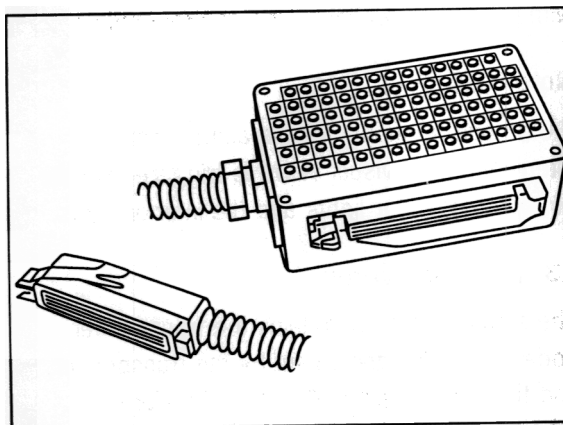
2178_28

2. Special tool 9617



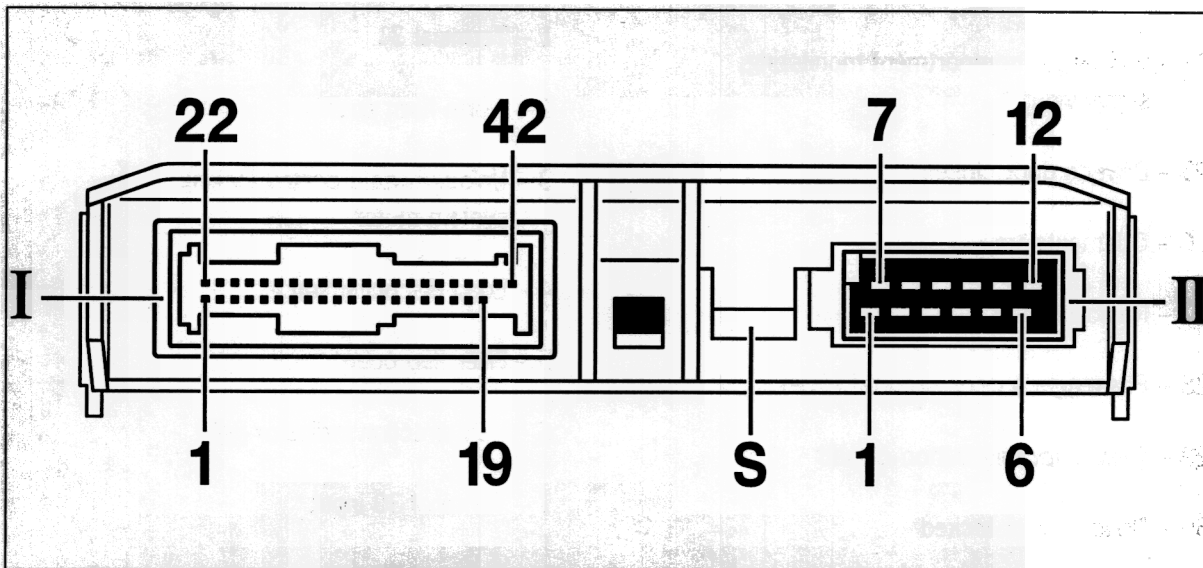
9617_97

4. Special tool 9616



569_97

Connector assignment, control module



208_96

Plug I (42 pole)

Terminal:

– Antenna	11 – External input 1
2 – Diagnosis K-line	12 – Free
3 – Immobilizer data	13 – Rear lid
4 – Immobilizer control	14 – Speed signal
5 – Driver's door secured (safe)	15 – Door lock barrel open
6 – Sliding/Convertible roof	16 – Terminal 86 S (buzzer contact)
7 – Passenger's door closed	17 – Luggage compartment light, rear
8 – Passenger compartment monitoring on	18 – Power window control
9 – Convertible top compartment lid	19 – Safe central locking system motor
10 – Central locking button open	20 – Free
	21 – Free

- 22 – Antenna shield
- 23 – Diagnosis Wlead
- 24 – Passenger compartment monitoring, signal input
- 25 – Driver's door closed
- 26 – Oddments tray
- 27 – Radio contact
- 28 – Passenger's door secured (safe)
- 29 – Central locking button closed
- 30 – Driver's door locked
- 31 – Front lid
- 32 – Passenger's door locked
- 33 – Input, crash sensor
- 34 – Release, rear lid
- 35 – Door lock barrel closed
- 36 – Terminal 15
- 37 – Luggage compartment light, front
- 38 – Control, external electronics
- 39 – Alarm readiness light
- 40 – Comfort opening
- 41 – Indicator, door locked
- 42 – Comfort closing

Plug II (12 pole)

Terminal:

- 1 – Terminal 31
- 2 – Alarm horn positive
- 3 – Unlock/unsafe central locking system motor
- 4 – Load disconnection
- 5 – Filler flap open
- 6 – Left direction indicator light
- 7 – Terminal 30 input
- 8 – Terminal 30 output
- 9 – Lock central locking system motor
- 10 – Filler flap closed
- 11 – Interior light
- 12 – Direction indicator light, right

Fault memory

Overview of possible faults

Door(s) secured and terminal 15 on	Power window control
Door lock barrel closed, activated longer than 60 s	Short to ground
Door lock barrel open, activated longer than 60 s	Status lead, signal converter
Door lock barrel closed	Short to B+
Short to ground	Status lead, signal converter
Door lock barrel open	Short to ground
Short to ground	W-lead (DME – immobilizer) interruption
Door lock barrel open/closed	Passenger compartment monitoring sensor, short to ground
Short to ground	W-lead (DME – immobilizer) short to B+
Button, central locking system closed	No terminal 86 S recognised
Short to B+	Variant fault
Button, central locking system open	(new coding required)
Short to B+	Transponder
Button, central locking system open/closed	(re-teaching required)
Short to B+	Passenger compartment monitoring sensor
Power failure, terminal 30 with active alarm system	Short to B+ or faulty
Power failure during alarm output	Passenger compartment monitoring sensor faulty
Wrong door lock module	Signal converter faulty
Door on left secured but not locked	Signal converter, coil fault
Door on right secured but not locked	Transponder pill faulty or not present
Control module faulty	Wrong key or wrong transponder pill
Signal from airbag	Release on passenger's side jams
Short to B+	Release on driver's side jams
Signal from airbag	Short to B+ on a drive motor
Short to ground	

Central locking system synchronisation

Signal from airbag detected

K-line

Radio transmitter code

Alarm siren

Door lock barrel open, activated longer than
60 s

EPROM fault (Checksum)

Tilt sensor not in normal position

No current in tank drive motor despite
relay actuation

Central locking end position safe not reached

Central locking end position locked not
reached

Central locking end position unlocked not
reached

Unknown fault code

Fault overview

Test point	Fault code	Fault effect	Page
1	01		90 - D 28
2	02		90 - D 28
3	03		90 - D 29
4	04	No central locking possible	90 - D 30
5	05	No central unlocking possible	90 - D 31
6	06	Central locking or unlocking not possible	90 - D 31
7	07	Same as test point 4	90 - D 32
8	08	Same as test point 5	90 - D 33
9	09	Same as test point 6	90 - D 33
10	10	Alarm system/central locking system without function	90 - D 34
11	11	Interruption of alarm output	90 - D 34
12	12		90 - D 34
13	13		90 - D 35
14	14		90 - D 35
15	15	No function	90 - D 36
16	16	No unlocking of doors in the event of an accident	90 - D 36
17	17	Same as test point 16	90 - D 36
18	18	Power window control without function	90 - D 37
19	19	No engine start possible	90 - D 37
20	20	Same as test point 19	90 - D 38
21	21	Same as test point 19	90 - D 38
22	22	No passenger compartment monitoring	90 - D 39
23	23		90 - D 39

Test point	Fault code	Fault effect	Page
24	24	No engine start possible	90 - D 39
25	25		90 - D 39
26	26		90 - D 40
27	27		90 - D 40
28	28		90 - D 40
29	29		90 - D 40
30	30		90 - D 40
31	31	No engine start possible	90 - D 41
32	32	No passenger compartment monitoring	90 - D 41
33	33	Same as test point 32	90 - D 41
34	34	Same as test point 32	90 - D 42
35	35	Same as test point 32	90 - D 42
36	36	Same as test point 32	90 - D 42
37	37	Same as test point 32	90 - D 43
38	39	No engine start possible	90 - D 43
39	40	Same as test point 38	90 - D 43
40	41	Same as test point 38	90 - D 44
41	42	Same as test point 38	90 - D 44
42	43	No central locking possible	90 - D 45
43	44	No central locking possible	90 - D 47
44	45	Central locking or unlocking not possible	90 - D 48

Note

Frequency counter

The frequency counter is set to 1 the first time a fault occurs. At every changeover from not present to present, the counter is increased by 1.

Test point	Fault code	Fault effect	Page
45	46,47	No central locking possible	90 - D 49
46	48		90 - D 51
47	49	No communication with PST 2	90 - D 51
48	50		90 - D 52
49	51		90 - D 52
50	52		90 - D 52
51	53		90 - D 53
52	54		90 - D 53
53	58		90 - D 53
54	59		90 - D 54
55	60		90 - D 56
56	61		90 - D 58
57	XX		90 - D 61

Note

After a fault occurs in the alarm system and is remedied, the fault memory **must** be cleared.

Fault, Fault code**Possible causes, elimination, notes****Test point 1**

Door(s) secured and
terminal 15 on

Fault code 01

1. Disconnect plug connection X 11 (driver's side).
2. Check the lead from X 11 pin A1 (pin side) to the alarm control module plug I, pin 5, for continuity.
3. Check the leads from X 11 pin A1 and pin 26 (sleeve side) for continuity.

Note

There is another plug connection in the door on the door lock module.

4. Disconnect the plug connection X 12 (passenger's side).
5. Check the lead from X 12 pin A1 (pin side) to the alarm control module plug I, pin 28, for continuity.
6. Check the leads from X 12 pin A1 and pin 26 (sleeve side) for continuity.

Test point 2

Door lock barrel closed,
activated longer than 60 s

Fault code 02**Note**

This fault can also be caused by incorrect operation (door lock actuated toward "Closed" direction for longer than 60 seconds).

1. Pull off plug I on the alarm control module.
2. Disconnect plug connection X 11 (driver's side).
3. Disconnect the plug connection X 12 (passenger's side).

Fault, Fault code	Possible causes, elimination, notes
	<p>4. Check the leads from the alarm control module plug I pin 35 to the door lock modules for short to ground.</p> <p>Ohmmeter on alarm control module plug I pin 35 and ground. Display: $\infty \Omega$</p> <p>5. Check driver's side door lock module switch contact.</p> <p>Ohmmeter at plug connection X 11 pin A2 (sleeve side) and ground. Door lock not actuated. Display: $\infty \Omega$</p> <p>Door lock actuated towards "Closed". Display: $< 5 \Omega$</p> <p>6. Check passenger's side door lock module switch contact.</p> <p>Ohmmeter at plug connection X 12 pin A2 (sleeve side) and ground. Door lock not actuated. Display: $\infty \Omega$</p> <p>Door lock actuated towards "Closed". Display: $< 5 \Omega$</p>

Test point 3

Door lock barrel open,
actuated for longer than 60 s

Fault code 03**Note**

This fault can also be caused by incorrect operation (door lock actuated toward "Open" direction for longer than 60 seconds).

1. Pull off plug I on the alarm control module.
2. Disconnect plug connection X 11 (driver's side).
3. Disconnect the plug connection X 12 (passenger's side).
4. Check the leads from the alarm control module plug I pin 15 to the door lock modules for short to ground.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Ohmmeter on alarm control module plug I pin 15 and ground
Display: $\infty \Omega$

5. Check driver's side door lock module switch contact.

Ohmmeter at plug connection X 11 pin A6 (sleeve side) and ground
Door lock not actuated.
Display: $\infty \Omega$

Door lock actuated towards "Open"
Display: $< 5 \Omega$

6. Check passenger's side door lock module switch contact.

Ohmmeter at plug connection X 12 pin A6 (sleeve side) and ground
Door lock not actuated.
Display: $\infty \Omega$

Door lock actuated towards "Open"
Display: $< 5 \Omega$

Test point 4

Door lock barrel closed
Short to ground

Fault code 04

Troubleshooting in accordance with test point 2.

Fault, Fault code	Possible causes, elimination, Notes
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Test point 5

Door lock barrel open
Short to ground

Fault code 05

Troubleshooting in accordance with test point 3

Test point 6

Door lock barrel
open/closed
Short to ground

Fault code 06

1. Pull off plug I on the alarm control module.
2. Disconnect plug connection X 11 (driver's side).
3. Disconnect the plug connection X 12 (passenger's side).
4. Check the leads from the alarm control module plug I pin 35 to the door lock modules for short to ground.

Ohmmeter at alarm control module plug I pin 35 and ground
Display: $\infty \Omega$

5. Check driver's side door lock module switch contact.

Ohmmeter at plug connection X 11 pin A4 (sleeve side) and ground.
Door lock not actuated.
Display: $\infty \Omega$

Door lock actuated towards "Closed".
Display: $< 5 \Omega$

6. Check passenger's side door lock module switch contact.

Ohmmeter at plug connection X 12 pin A4 (sleeve side) and ground.
Door lock not actuated.
Display: $\infty \Omega$

Door lock actuated towards "Closed"
Display: $< 5 \Omega$

7. Check the leads from the alarm control module plug I pin 15 to the door lock modules for short to ground.

Fault, Fault code	Possible causes, elimination, Notes
	<p>Ohmmeter on alarm control module plug I pin 15 and ground. Display: $\infty \Omega$</p> <p>8. Check driver's side door lock module switch contact.</p> <p>Ohmmeter at plug connection X 11 pin A6 (sleeve side) and ground. Door lock not actuated. Display: $\infty \Omega$</p> <p>Door lock actuated towards "Open". Display: $< 5 \Omega$</p> <p>9. Check passenger's side door lock module switch contact.</p> <p>Ohmmeter at plug connection X 12 pin A6 (sleeve side) and ground. Door lock not actuated. Display: $\infty \Omega$</p> <p>Door lock actuated towards "Open". Display: $< 5 \Omega$</p>
Test point 7 Central locking button closed Short to B+ Fault code 07	<p>1. Pull off plug I on the alarm control module.</p> <p>2. Check the central locking button.</p> <p>Voltmeter at plug I pin 29 and ground. Central locking button not actuated. Display: 0 V</p> <p>Central locking button actuated towards "Closed". Display: Battery voltage.</p> <p>3. Disconnect the plug connection at the central locking button.</p> <p>4. Check the lead from the alarm control module to the central locking button for short to B+.</p> <p>Voltmeter at plug I pin 29 and ground. Display: 0 V</p>

Fault, Fault code**Possible causes, elimination, Notes****Test point 8**

Central locking

button open

Short to B+

Fault code 08

1. Pull off plug I on the alarm control module.

2. Check the central locking button.

Voltmeter at plug I pin 10 and ground.

Central locking button not actuated.

Display: 0 V

Central locking button actuated towards "Open".

Display: Battery voltage

3. Disconnect the plug connection at the central locking button.

4. Check the lead from the alarm control module to the central locking button for short to B+.

Voltmeter at plug I pin 10 and ground.

Display: 0 V

Test point 9

Central locking

button open/closed

Short to B+

Fault code 09

1. Pull off plug I on the alarm control module.

2. Check the central locking button.

Voltmeter at plug I pin 29 and ground.

Central locking button not actuated.

Display: 0 V

Central locking button actuated towards "Closed".

Display: Battery voltage.

Voltmeter at plug I pin 10 and ground.

Central locking button not actuated.

Display: 0 V

Central locking button actuated towards "Open"

Display: Battery voltage

3. Disconnect the plug connection at the central locking button.

4. Check the leads from the alarm control module to the central locking button for short to B+.

Fault, Fault code	Possible causes, elimination, Notes
-------------------	-------------------------------------

Voltmeter at plug I pin 29 and ground.

Display: 0 V

Voltmeter at plug I pin 10 and ground.

Display: 0 V

Test point 10

Power failure,
terminal 30 with
active alarm system

Fault code 10

1. Check battery.

2. Check the alarm control module power supply.

Voltmeter at alarm control module plug II pin 1 (negative)
and pin 7 (positive).

Display: Battery voltage.

Note

The positive lead (terminal 30) is fused in the distribution board
with an 80 A fuse.

Test point 11

Power failure during
alarm output

Fault code 11

Troubleshooting in accordance with test point 10.

Test point 12

Wrong door lock
module

Fault code 12

Note

This fault concerns only USA vehicles. USA - vehicles do not have
the "Door secured" function.

1. Check the driver's side / passenger's side door lock module and,
if necessary, replace it with a door lock module for USA vehicles.

Fault, Fault code

Possible causes, elimination, Notes

Test point 13

Left door secured
but not locked

Fault code 13

1. Pull off plug I on the alarm control module.
2. Disconnect plug connection X 11 (driver's side).
3. Check the lead from the alarm control module plug I pin 30 to the door lock module for short to ground.

Ohmmeter on alarm control module plug I pin 30 and ground.
Display: $\infty \Omega$
4. Check driver's side door lock module switch contact.

Ohmmeter at plug connection X 11 pin A5 (sleeve side) and ground.
Door locked
Display: $\infty \Omega$

Door not locked
Display: $< 5 \Omega$

Test point 14

Right door secured
but not locked

Fault code 14

1. Pull off plug I on the alarm control module.
2. Disconnect the plug connection X 12 (passenger's side).
3. Check the lead from the alarm control module plug I pin 32 to the door lock module for short to ground.

Ohmmeter at alarm control module plug I pin 32 and ground
Display: $\infty \Omega$
4. Check passenger's side door lock module switch contact.

Ohmmeter at plug connection X 12 pin A5 (sleeve side) and ground.
Door locked.
Display: $\infty \Omega$

Door not locked.
Display: $< 5 \Omega$

Fault, Fault code	Possible causes, elimination, Notes
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Test point 15

Control module faulty

Fault code 15

Replace alarm control module.

Test point 16

Signal from the airbag

Short to B+

Fault code 16

1. Pull off plug I on the alarm control module.
 2. Unplug the DME (ECM) connector.
 3. Pull off the airbag control module plug.
 4. Voltmeter at alarm control module plug I pin 33 and ground.
Display: 0 Volt
 5. If no fault can be detected on the wiring harness, reattach the plug to the alarm control module and the airbag control module.
 6. Switch on the ignition and clear the fault memory of the alarm system.
- If the fault no longer occurs, the DME control module is faulty.
- If the fault occurs again, detach the plug on the airbag control module.
7. Clear the fault memory of the airbag system.
- If the fault no longer occurs, the airbag control module is faulty.
- If the fault occurs again, the alarm system control module is faulty.

Test point 17

Signal from airbag

Short to B+

Fault code 17

1. Pull off plug I on the alarm control module.
2. Unplug the DME (ECM) connector.
3. Pull off the airbag control module plug.
4. Voltmeter at alarm control module plug I pin 33 and positive.
Display: 0 Volt

Fault, Fault code	Possible causes, elimination, notes
	<p>5. If no fault can be detected on the wiring harness, reattach the plug to the alarm control module and the airbag control module.</p> <p>6. Switch on the ignition and clear the fault memory of the alarm system.</p> <p>If the fault no longer occurs, the DME control module is faulty.</p> <p>If the fault occurs again, detach the plug on the airbag control module.</p> <p>7. Clear the fault memory of the airbag system.</p> <p>If the fault no longer occurs, the airbag control module is faulty.</p> <p>If the fault occurs again, the alarm system control module is faulty.</p>

Test point 18

Power window control

Short to ground

Fault code 18

1. Pull off plug I on the alarm control module.
2. Pull off plug I on the convertible top control module.
3. Ohmmeter on alarm control module plug I pin 18 and ground.
Display: $\infty \Omega$

If display $< 5 \Omega$, check wiring harness for chafing and pinching damage.

Test point 19

Status lead,

signal converter

Short to B+

Fault code 19

1. Pull off plug I on the alarm control module.
2. Pull off the plug on the signal converter for the transponder.
3. Voltmeter at plug I alarm control module pin 12 and ground.
Switch ignition on.
Display: 0 Volt

If battery voltage is displayed, check the wiring harness for pinches and chafing damage.

Fault, Fault code	Possible causes, elimination, notes
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Test point 20

Status lead,
signal converter
Short to ground

Fault code 20

1. Pull off plug I on the alarm control module.
2. Pull off the plug on the signal converter for the transponder.
3. Ohmmeter on alarm control module plug I pin 12 and ground.
Display: $\infty \Omega$

If display $< 5 \Omega$, check wiring harness for chafing and pinching damage.

Test point 21

W-lead (DME –
immobilizer)
Open circuit

Fault code 21

1. Pull off plug I on the alarm control module.
2. Unplug the DME (ECM) connector.
3. Ohmmeter at plug I, alarm control module pin 23, and
DME plug pin 88.
Display: $< 5 \Omega$

Note

The lead is routed via plug connection X 3/1 pin 14.

4. Ohmmeter on alarm control module plug I pin 23 and ground.
Display: $\infty \Omega$
5. Voltmeter at plug I alarm control module pin 23 and ground.
Switch ignition on.
Display: 0 Volt

If no fault can be detected in the wires, either the DME control module or the alarm system control module is faulty.

Fault, Fault code	Possible causes, elimination, Notes
Test point 22 Passenger compartment monitoring sensor Short to ground Fault code 22	<ol style="list-style-type: none">1. Pull off plug I on the alarm control module.2. Pull off the plug at the passenger compartment monitoring sensor.3. Ohmmeter on alarm control module plug I pin 24 and ground. Display: $\infty \Omega$ If display $< 5 \Omega$, check wiring harness for chafing and pinching damage.
Test point 23 W-lead (DME - immobilizer) Short to B+ Fault code 23	See test point 21, point 5.
Test point 24 Control module faulty Fault code 24	Replace control module.
Test point 25 No terminal 86 S recognised Fault code 25	<ol style="list-style-type: none">1. Check the fuse F 5/1.2. Pull off plug I on the alarm control module.3. Voltmeter at plug I alarm control module pin 16 and ground. Insert the ignition key into the ignition lock. Display: Battery voltage4. Pull off the plug on the ignition lock.5. Ohmmeter at ignition lock plug pin 86 S and plug I, alarm control module pin 16. Display: $< 5 \Omega$6. If no fault is detected, replace the electrical contact part of the ignition lock.

Fault, Fault code	Possible causes, elimination, Notes
<hr/>	
Test point 26	
Variant fault (new coding required)	Recode equipment variant.
Fault code 26	
Test point 27	
Control module faulty	Replace control module.
Fault code 27	
Test point 28	
Control module faulty	Replace control module.
Fault code 28	
Test point 29	
Control module faulty	Replace control module.
Fault code 29	
Test point 30	
Control module faulty	Replace control module.
Fault code 30	

Fault, Fault code**Possible causes, elimination, Notes**

Test point 31

Transponder
(re-teaching
necessary)

Re-teach key.

Fault code 31

Test point 32

Passenger compartment
monitoring sensor
Short to B+ or faulty

Fault code 32

1. Check power supply for passenger compartment monitoring sensor.

Disconnect plug connection to the passenger compartment monitoring sensor.

Voltmeter at plug connection, passenger compartment sensor monitoring pin 1 (positive) and pin 4 (negative).

Display: Battery voltage

2. Pull off plug I on the alarm control module.

3. Voltmeter at plug I alarm control module pin 24 and ground.

Display: 0 Volt

If battery voltage is displayed, check the wiring harness for pinches and chafing damage.

4. If no fault is detected, replace the alarm control module.

Test point 33

Passenger compartment
monitoring sensor
faulty

Fault code 33

Replace passenger compartment monitoring sensor.

Fault, Fault code	Possible causes, elimination, Notes
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Test point 34

Passenger compartment
monitoring sensor
Short to B+ or faulty

Fault code 34

1. Pull off plug I on the alarm control module.
 2. Pull off the plug at the passenger compartment monitoring sensor.
 3. Voltmeter at plug I alarm control module pin 24 and ground.
Switch ignition on.
Display: 0 Volt
If battery voltage is displayed, check the wiring harness
for pinches and chafing damage.
- If no fault is detected in the wiring, replace the passenger
compartment monitoring sensor.

Test point 35

Passenger compartment
monitoring sensor
faulty

Fault code 35

See test point 34.

Test point 36

Passenger compartment
monitoring sensor
Short to B+ or faulty

Fault code 36

Replace passenger compartment monitoring sensor.

Fault, Fault code	Possible causes, elimination, notes
Test point 37 Passenger compartment monitoring sensor faulty Fault code 37	Replace passenger compartment monitoring sensor.
Test point 38 Signal converter faulty Fault code 39	<ol style="list-style-type: none"> 1. Check the power supply for the signal converter: Disconnect the plug on the signal converter. Voltmeter at plug housing pin 4 (negative) and pin 5 (positive). Ignition key inserted. Display: Battery voltage. 2. Check the control lead for the signal converter (pin 6) to the alarm control module plug I pin 4 for continuity, short to B+ and short to ground. 3. Check the status lead for the signal converter (pin 7) to the alarm control module plug I pin 12 for continuity, short to B+ and short to ground. 4. Check the data lead for the signal converter (pin 8) to the alarm control module plug I pin 3 for continuity, short to B+ and short to ground.
Test point 39 Signal converter, coil fault Fault code 40	Check the transponder coil: Disconnect the plug on the signal converter. Connect ohmmeter to pins 1 and 2 Display: 20 - 25 Ω at 20 °C Connect ohmmeter to pin 1 and ground Display: $\infty \Omega$



Fault, Fault code	Possible causes, elimination, notes
Test point 40 Transponder pill faulty or not present Fault code 41	<ol style="list-style-type: none"> 1. Check transponder for presence in the key. 2. Replace the transponder.
Test point 41 Wrong key or wrong transponder pill Fault code 42	<ol style="list-style-type: none"> 1. Check transponder for presence in the key. 2. Wrong transponder – not adapted to the vehicle – teach the transponder. 3. Check the control lead for the signal converter (pin 6) to the alarm system control module plug I pin 4 for open circuit, short to ground and short to B+. Pull plug I off the alarm system control module Pull plug off the signal converter Voltmeter at alarm system control module plug I pin 4 and ground Voltmeter display: 0 V Ohmmeter at alarm system control module plug I pin 4 and ground Ohmmeter display: $\infty \Omega$ Ohmmeter at alarm system control module plug I pin 4 and signal converter plug pin 6 Ohmmeter display: $< 5 \Omega$ 4. Check the control lead for the signal converter (pin 8) to the alarm system control module plug I pin 3 for open circuit, short to ground and short to B+. Pull plug I off the alarm system control module Pull plug off the signal converter Voltmeter at alarm system control module plug I pin 3 and ground Voltmeter display: 0 V

Fault, Fault code	Possible causes, elimination, notes
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	<p>Ohmmeter at alarm system control module plug I pin 3 and ground</p> <p>Ohmmeter display: $\infty \Omega$</p>
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	<p>Ohmmeter at alarm system control module plug I pin 3 and signal converter plug pin 8</p> <p>Ohmmeter display: $< 5 \Omega$</p>
--	---

If no faults are detected in the wire, replace the signal converter.

Test point 42

Release on passenger's side jams

Fault code 43

This fault is stored if the safe drive motor cannot be actuated, the safe contact (microswitch) is not connected to ground after release, or the alarm system control module is coded incorrectly (country coding).

1. Check the country coding in the menu item *Coding*
2. Select (Drive links) "Secure doors" with PST 2, and check whether the drive motors react.
If the drive motors react, select "Driver's side secured" and "Passenger's side secured" in the menu item *Input signals*, and close the doors.

Vehicle not secured

PST2 display	<p>Driver's side not secured</p> <p>Passenger's side not secured</p>
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If the display of the PST2 deviates from this information or if the drive motor does not react, a fault is present in the supply lead or in the door lock (microswitch, drive motor).

Pull plugs I and II off the control module
Pull plug off door lock on passenger's side

<p>Voltmeter at alarm system control module plug II pin 3 and ground</p> <p>Voltmeter display: 0 V</p>
--

Ohmmeter at alarm system control module plug II pin 3 and ground
Ohmmeter display: $\infty \Omega$

Ohmmeter on alarm system control module plug II pin 3 and plug on
passenger side door lock pin 1
Ohmmeter display: $< 5 \Omega$

Voltmeter at alarm system control module plug I pin 28 and ground
Voltmeter display: 0 V

Ohmmeter at alarm system control module plug I pin 28 and ground
Ohmmeter display: $\infty \Omega$

Ohmmeter at alarm system control module plug I pin 28 and plug on
passenger side door lock pin 7
Ohmmeter display: $< 5 \Omega$

Pull plug off switch for central locking

Voltmeter at alarm system control module plug I pin 29 and ground
Voltmeter display: 0 V

Ohmmeter at alarm system control module plug I pin 29 and ground
Ohmmeter display: $\infty \Omega$

Ohmmeter at alarm system control module plug I pin 29 and plug on
switch for central locking pin 1
Ohmmeter display: $< 5 \Omega$

If no faults are detected in the wire, replace the door lock on the
passenger's side.

Fault, Fault code**Possible causes, elimination, notes****Test point 43**

Release on driver's side jams

Fault code 44

This fault is stored if the safe drive motor cannot be actuated, the safe contact (microswitch) is not connected to ground after release, or the alarm system control module is coded incorrectly (country coding).

1. Check the country coding in the menu item *Coding*
2. Select (Drive links) "Secure doors" with PST 2, and check whether the drive motors react.
If the drive motors react, select "Driver's side secured" and "Passenger's side secured" in the menu item *Input signals*, and close the doors

Vehicle not secured

PST2 display:

Driver's side not secured

Passenger's side not secured

If the display of the PST2 deviates from this information or if the drive motor does not react, a fault is present in the supply lead or in the door lock (microswitch, drive motor)

Pull plugs I and II off the control module

Pull plug off door lock on driver's side

Voltmeter at alarm system control module plug II pin 3 and ground

Voltmeter display:

0 V

Ohmmeter at alarm system control module plug II pin 3 and ground

Ohmmeter display:

 $\infty \Omega$

Ohmmeter at alarm system control module plug II pin 3 and plug on driver side door lock pin 1

Ohmmeter display:

< 5 Ω

Fault, Fault code	Possible causes, elimination, notes
	Voltmeter at alarm system control module plug I pin 5 and ground Voltmeter display: 0 V
	Ohmmeter at alarm system control module plug I pin 5 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter at alarm system control module plug I pin 5 and plug on driver side door lock pin 7 Ohmmeter display: $< 5 \Omega$
	Ohmmeter at alarm system control module plug I pin 28 and plug on door lock pin 7 Ohmmeter display: $< 5 \Omega$
	If no faults are detected in the wire, replace the door lock on the driver's side.

Test point 44

Drive motor, central
locking system
Short to B+

Fault code 45

1. Pull plug II off the alarm system control module.
 2. Disconnect plug connection X 11 (driver's side).
 3. Disconnect plug connection X 12 (passenger's side).
 4. Switch ignition on.
 5. Connect voltmeter to plug II pin 9 and ground.
Display: 0 volts
 6. Connect voltmeter to plug II pin 3 and ground.
Display: 0 volts
 7. Switch off ignition.
 8. Ohmmeter at plug X 11 pin S 11 and pin S24 (sleeve side).
Display: 5 - 7 Ω at 20° C
 9. Ohmmeter at plug X 11 pin S 11 and pin S17 (sleeve side).
Display: 5 - 7 Ω at 20° C
- Ohmmeter at plug connection X 12 pin 11 and pin 24 (sleeve side).
Display: 5 - 7 Ω at 20° C

Fault, Fault code**Possible causes, elimination, notes****Test point 45**

Central locking system
synchronisation

Fault code 46, 47

These faults are stored in the memory if at least one safe contact does not reach the safe position after two synchronisation actuations towards safe.

1. With PST 2 (drive links), check whether the drive motor reacts with the door closed.

If the drive motors react, select "Driver's side locked" and "Passenger's side locked" in the menu item *Input signals*, and close the doors

Vehicle not locked

PST2 display

Driver's side not locked

Passenger's side not locked

If the display of the PST2 deviates from this information or if the drive motors do not react, a fault is present in the supply lead or in the door lock module (microswitch, drive motor)

Pull plug I off the alarm system control module

Pull plug off door lock (driver's side / passenger's side)

Voltmeter at alarm system control module plug I pin 5 and ground

Voltmeter display: 0 V

Ohmmeter at alarm system control module plug I pin 5 and ground

Ohmmeter display: $\infty \Omega$

Ohmmeter on alarm system control module plug I pin 5 and plug on driver side door lock pin 7

Ohmmeter display: $< 5 \Omega$

Fault, Fault code	Possible causes, elimination, notes
	<p>Voltmeter at alarm system control module plug I pin 28 and ground Voltmeter display: 0 V</p> <p>Ohmmeter at alarm system control module plug I pin 28 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter at alarm system control module plug I pin 28 and plug on passenger side door lock pin 7 Ohmmeter display: $< 5 \Omega$</p> <p>Pull plug off switch for central locking</p> <p>Voltmeter at alarm system control module plug I pin 29 and ground Voltmeter display: 0 V</p> <p>Ohmmeter at alarm system control module plug I pin 29 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter at alarm system control module plug I pin 29 and plug on switch for central locking pin 1 Ohmmeter display: $< 5 \Omega$</p> <p>Voltmeter at alarm system control module plug I pin 30 and ground Voltmeter display: 0 V</p> <p>Ohmmeter at alarm system control module plug I pin 30 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter at alarm system control module plug I pin 30 and plug on driver side door lock pin 3 Ohmmeter display: $< 5 \Omega$</p>



Fault, Fault code**Possible causes, elimination, notes**

Voltmeter at alarm system control module plug I pin 32 and ground

Voltmeter display: 0 V

Ohmmeter at alarm system control module plug I pin 32 and ground

Ohmmeter display: $\infty \Omega$

Ohmmeter at alarm system control module plug I pin 32 and plug on driver/passenger side door lock pin 3

Ohmmeter display: $< 5 \Omega$

If no faults are detected in the wire, replace the door lock.

Test point 46

Signal from airbag detected

Fault code 48

This fault is stored in the memory if the airbag control module transmits a signal to the alarm system control module after the airbag has been triggered. This is a triggering log.

1. Clear fault memory.

Switch ignition off and then on again.

Check whether the fault appears again.

If the fault reappears, pull off plug II on alarm system control module.

Ohmmeter on alarm system control module plug II pin 1 and ground

Ohmmeter display: $< 5 \Omega$

Check the entire system for operation.

Test point 47

K-lead

Fault code 49

This fault is stored in the memory if the K-lead has a short to ground for at least 2 s when the ignition is switched on.

Connect special tools 9616 and 9617 and switch on ignition.

Connect ohmmeter to special tool 9616, pin 2 and to ground to check for open circuit.

Fault, Fault code	Possible causes, elimination, notes
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Test point 48

Radio transmitter code

Fault code 50

This fault is stored in the memory if the radio transmitter is detected as unknown after the button is pressed.

1. Check if the hand-held transmitter is adapted correctly.
2. Check if the second hand-held transmitter is detected by the control module.
3. If the second hand-held transmitter does not perform the function either, replace the control module.

Test point 49

Alarm siren

Fault code 51

This fault is stored in the memory if an internal control module fault is present.

1. Delete fault memory and check whether the fault appears again. If the fault reappears, replace the control module.
2. If the fault does not reappear, switch off the ignition, switch it on again and check the function of the system.

Test point 50

Door lock barrel open,
actuated for longer than 60 s

Fault code 52

This fault is stored in the following case:

Short circuit to ground in the supply lead between
plug I pin 15 on the control module and door lock pin 6.

The control module is faulty

1. Pull plug I off the control module
2. Pull plug off the door lock
3. Measure the resistance between plug I pin 15 and ground

Ohmmeter display:

$\infty \Omega$



Fault, Fault code	Possible causes, elimination, notes
Test point 51 EPROM fault Checksum Fault code 53	This fault is stored in the following case: The control module is faulty Replace control module.
Test point 52 Tilt sensor not in normal position Fault code 54	This fault is stored in the following cases: Additional alarm system (alarm siren with tilt sensor) is not installed correctly Additional alarm system (tilt sensor) is faulty Check installation position and position of the tilt sensor.
Test point 53 No current in tank drive motor despite relay actuation Fault code 58	This fault is stored in the following cases: Short circuit to ground or open circuit between plug II on control module pin 5 or 10, and tank cap actuator pin 1 or 2 or faulty shift elements for tank cap. In the menu item <i>Drive links</i> , select "Tank locking" and carry out the drive link test. If the shift element for the tank cap does not react: Pull plugs I and II off the alarm system control module Ohmmeter at alarm system control module plug II pin 1 and ground Ohmmeter display: $< 5 \Omega$ Pull plug off actuator for tank cap.

Fault, Fault code	Possible causes, elimination, notes
	Voltmeter at alarm system control module plug II pin 10 and ground Voltmeter display: 0 V
	Voltmeter at alarm system control module plug II pin 5 and ground Voltmeter display: 0 V
	Ohmmeter on alarm system control module plug I pin 10 and plug on shift element for tank cap pin 1 Ohmmeter display: < 5 Ω
	Ohmmeter at alarm system control module plug I pin 10 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter on alarm system control module plug I pin 5 and plug on shift element for tank cap pin 2 Ohmmeter display: < 5 Ω
	Ohmmeter at alarm system control module plug I pin 5 and ground Ohmmeter display: $\infty \Omega$
	If no faults are detected in the wire, replace the shift element for the tank cap.

Test point 54

Central locking end position
safe not reached

Fault code 59

This fault is stored in the following cases:

Open circuit in the supply lead to plug II pin 1 (terminal 31)

Short to ground or open circuit in the supply lead to plug II pin 8

Short circuit to voltage/ground or open circuit in the supply lead to plug II pin 9

Fault, Fault code	Possible causes, elimination, notes
	Short circuit to voltage/ground or open circuit in plug II pin 19
	Door lock (driver/passenger) is faulty
	Elimination:
	In the menu item <i>Drive links</i> , select "Secure doors" and carry out the function test
	In the menu item <i>Input signals</i> , select "Driver's side secured" and "Passenger's side secured" and compare the switch positions with the input signals table.
	Pull plugs I and II off the alarm system control module
	Ohmmeter on plug II pin 1 and ground Ohmmeter display: < 5 Ω
	Voltmeter at plug II pin 8 and ground Voltmeter display: Battery voltage If 0 V is displayed, check fuse C3
	Voltmeter at plug II pin 9 and ground Voltmeter display: 0 V
	Ohmmeter on plug II pin 9 ground Ohmmeter display: $\infty \Omega$
	Ohmmeter on plug II pin 9 and plug on door lock (driver's side / passenger's side) pin 2 Ohmmeter display: < 5 Ω
	Voltmeter at plug I pin 19 and ground Voltmeter display: 0 V
	Ohmmeter at plug I pin 19 and ground Ohmmeter display: $\infty \Omega$

Fault, Fault code

Possible causes, elimination, notes

Test point 55

Central locking end position
locked not reached

Fault code 60

This fault is stored in the following cases:

Switch for central locking is faulty

Open circuit in the supply lead to plug II pin 8 (terminal 30)

Short circuit to voltage/ground or open circuit in the supply lead to
plug II pin 9

Short circuit to voltage/ground or open circuit in plug I pin 5

Short circuit to voltage/ground or open circuit in plug I pin 28

Short circuit to voltage/ground or open circuit in plug I pin 29

Door lock (driver's side / passenger's side) is faulty

In the menu item *Input signals*, select "Central locking button", close
doors, actuate the switch for central locking and check whether the
switch operates.

In the menu item *Drive links*, select "Lock doors" and carry out the
function test.

Fault, Fault code	Possible causes, elimination, notes
	In the menu item <i>Input signals</i> , select "Driver's side locked" and "Passenger's side locked" and compare the switch positions with the input signals table.
	Pull plugs I and II off the alarm system control module
	Pull plug off door lock (driver's side passenger's side)
	Pull plug off <i>Switch for central locking</i>
	Voltmeter at plug I pin 29 and ground Voltmeter display: 0 V
	Ohmmeter at alarm system control module plug I pin 29 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter on alarm system control module plug I pin 29 and plug on switch for central locking pin 1 Ohmmeter display: $< 5 \Omega$
	Voltmeter at plug II pin 8 and ground Voltmeter display: Battery voltage If 0 V is displayed, check fuse C3
	Voltmeter at plug II pin 9 and ground Voltmeter display: 0 V
	Ohmmeter on alarm system control module plug II pin 9 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter on alarm system control module plug II pin 9 and pin 2 of both plugs on door lock (driver's side / passenger's side) Ohmmeter display: $< 5 \Omega$
	Voltmeter at plug I pin 5 and ground Voltmeter display: 0 V

Fault, Fault code	Possible causes, elimination, notes
	Ohmmeter at alarm system control module plug I pin 5 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter on alarm system control module plug I pin 5, and pin 7 of both plugs on door lock (driver's side / passenger's side) Ohmmeter display: $< 5 \Omega$
	Voltmeter at plug I pin 19 and ground Voltmeter display: 0 V
	Ohmmeter at plug I pin 19 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter on plug I pin 19 and door lock (driver's side / passenger's side) pin 9 Ohmmeter display: $< 5 \Omega$

Test point 56

Central locking end position
unlocked not reached

Fault code 61

This fault is stored in the following cases:

Short circuit to voltage/ground or open circuit in the supply lead to plug II pin 3

Short circuit to voltage/ground or open circuit in the supply lead to plug I pin 5

Short circuit to voltage/ground or open circuit in the supply lead to plug I pin 28

Short circuit to voltage/ground or open circuit in plug I pin 29

Fault, Fault code	Possible causes, elimination, notes
	Short-circuit to voltage/ground or open circuit in plug I pin 30
	Short-circuit to voltage/ground or open circuit in plug I pin 32
	Door lock (driver/passenger) is faulty
	Wrong country coding: Check coding
	Pull plug I off the alarm system control module
	Pull plug off <i>Switch for central locking</i> and switch on ignition
	Voltmeter at plug I pin 29 and ground Voltmeter display: 0 V
	Ohmmeter at alarm system control module plug I pin 29 and ground Ohmmeter display: $\infty \Omega$
	Ohmmeter at alarm system control module plug I pin 29 and plug on switch for central locking pin 1 Ohmmeter display: $< 5 \Omega$
	Pull plug off door lock (driver's side / passenger's side)
	Voltmeter at plug I pin 5 and ground, ignition on Voltmeter display: 0 V
	Ohmmeter at alarm system control module plug I pin 5 and ground Ignition off, ohmmeter display: $\infty \Omega$
	Ohmmeter at alarm system control module plug I pin 5 and pin 7 of both plugs on driver/passenger side door lock Ohmmeter display: $< 5 \Omega$

Fault, Fault code	Possible causes, elimination, notes
	<p>Voltmeter at plug I pin 28 and ground, ignition on Voltmeter display: 0 V</p> <p>Ohmmeter at alarm system control module plug I pin 28 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter at alarm system control module plug I pin 30 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter at alarm system control module plug I pin 30 and pin 3 of both plugs on driver's side / passenger side door lock Ohmmeter display: $< 5 \Omega$</p> <p>Voltmeter at plug I pin 32 and ground Voltmeter display: 0 V</p> <p>Ohmmeter at alarm system control module plug I pin 32 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter at alarm system control module plug I pin 32 and pin 3 of both plugs on driver/passenger side door lock Ohmmeter display: $< 5 \Omega$</p> <p>Pull plug II off the alarm system control module</p> <p>Voltmeter at plug II pin 3 and ground Voltmeter display: 0 V</p> <p>Ohmmeter at alarm system control module plug II pin 3 and ground Ohmmeter display: $\infty \Omega$</p> <p>Ohmmeter on alarm system control module plug II pin 3 and pin 1 of both plugs on door lock (driver's side / passenger's side) Ohmmeter display: $< 5 \Omega$</p>

Fault, Fault code

Possible causes, elimination, notes

Test point 57

Unknown fault code

Fault code XX

1. Inspect the ground points for corrosion.
2. Clear fault memory.

Event memory

The event memory stores the contact or triggering type that triggered the alarm. The priming type also is saved.

A maximum of 10 events can be saved. If another event is added, the oldest one is deleted. The event with the highest number is the most current one.

An alarm can be triggered by the following components:

- Door contact, driver
- Door contact, passenger
- Central locking contact "locked", driver
- Central locking contact "locked", passenger
- Front lid
- Rear lid
- Radio contact
- External switch contact 1
- External switch contact 2
- Oddments tray
- Switch, convertible top/sliding roof
- Switch, convertible top compartment lid
- Alarm horn
- Passenger compartment monitoring

Terminal 15 on**Note**

Up to three alarm triggering possibilities exist via the passenger compartment monitoring system and the external switching contacts.

With the priming type, a distinction is made between:

- Locked via lock
- Emergency-locked
- Locked via radio
- Self-primed
- System test
- Primed after battery connection
- Secured via lock
- Secured via radio



Priming status memory

The alarm-triggering components that are in the non-active state during priming and that are therefore blocked for alarm triggering are stored in the priming status memory. The priming type also is saved.

Function indicator

Control, external output

Alarm horn

Direction indicator lights, left/right

External output

Drive links

With this menu item, it is possible to activate drive links of the alarm system using the Porsche System Tester 2. This allows the function of the drive links to be assessed very quickly.

The following drive links can be actuated:

Comfort closing

Comfort opening

Power window control

Indicator, door locked

Locking closed

Locking open

Tank cap closed

Tank cap open

Interior light

Load disconnection

Luggage compartment, rear

Note

The radio unit or the PCM operator control unit are connected to an auxiliary frame by the *Radio contact*. The radio contact area on the radio unit or PCM operator control unit has an insulating strip. If this insulating strip wears through the contact tab, ground contact can occur. In the case of maintained contact no alarm is triggered. This is because all active inputs (ground connection) are blocked when activated to trigger an alarm. In the case of a loose contact, an alarm may be triggered. Under the menu item *Events*, the PST 2 can be used to read out the cause of the alarm being triggered. Under the menu item *Input signals*, the status of the radio contact can be read out.

Input signals

This menu item enables input signals of the alarm system to be read in by the Porsche System Tester 2. This allows the function of the input signals to be assessed very quickly.

The following input signals can be read in:

Driver's side secured

Passenger's side secured

Driver's side locked

Passenger's side locked

Door contact, driver's side

Door contact, passenger's side

Door lock barrel (open)

Door lock barrel (closed)

Button, central locking system (open)

Button, central locking system (closed)

Terminal 86 S

Terminal 15

Immobilizer deactivated

Crash input

Luggage compartment, front

Luggage compartment, rear

Convertible top/sunroof

Oddments tray

Convertible top compartment lid

External input 1

External input 2

Radio contact

Alarm horn

Radio transmitter: Button 1

Radio transmitter: Button 2

Coding

Under the menu item *Coding* there is a choice of four functions:

Country coding

Variant coding

Vehicle re-locking

Alarm siren/tilt sensor

Country coding

The country in which the vehicle is used in as well as the vehicle design (sliding roof, convertible) can be coded using the Porsche System Tester 2. The type of alarm output and its duration depend on the country codes.

	Activation	Duration	Country
Alarm horn	pulsed with 2.5 Hz, pulse/duty ratio 1:1	4 min \pm 5 s	USA, AUS, BRA
		30 s	FRG, UK, B
	continuous tone	30 s	CH
Direction indicator lights	pulsed with 2.5 Hz, pulse/duty ratio 1:1	5 min \pm 5 s	FRG, UK, B
		4 min \pm 5 s	USA, AUS, BRA
	no activation	–	CH
Interior light	in opposite cycle to direction indicator lights	5 min \pm 5 s	FRG, UK, B
		4 min \pm 5 s	USA, AUS, BRA
	no activation	–	CH
Alarm siren	triggered at the beginning of the alarm output		UK, B

Variant coding

Under the menu item *Version coding* there is a choice of four functions.

Variant 1

The doors are automatically locked as soon as the ignition is switched on.

Variant 2

The doors are automatically locked if the vehicle exceeds a limit speed of 5 km/h.

Variant 3

The doors are automatically locked as soon as the ignition is switched on. If the doors are opened while the engine is running, automatic re-locking takes place if the vehicle exceeds a limit speed of 5 km/h.

Variant 4

The doors are not locked automatically.

Note

By actuating the central locking button or by pulling the door handle twice, doors which were locked automatically can be opened.

System test

All components of the alarm system (except for terminal 15) can be checked for operation under menu item *System test*. During the system test a bar runs across the screen, and if, for example, the oddments tray is opened, an alarm is triggered. This alarm output differs from the usual alarm output in that the alarm horn is activated only for a short time. The alarm output is accompanied by interior lighting and direction indicator lights.

Note

The event memory must be cleared after the system test, since the test is saved in the event memory.

Passenger compartment monitor

The function of the passenger compartment monitoring sensor can be checked under menu item *Passenger compartment monitor*. When movement is detected in the passenger compartment, the alarm horn is activated briefly while the interior lighting and direction indicator lights go on continuously.

Learning functions

Immobilizer

The immobilizer code can be entered under menu item *Learning functions/immobilizer* after the alarm control module is replaced.

Caution!



The immobilizer code cannot be deleted or changed again. An incorrect input will render the control module useless.

- > Input and check immobilizer code carefully.

Transponder key

A new remote control can be adapted for the vehicle under menu item *Learning functions/transponder key*. After the alarm system control module is replaced and the immobilizer code is entered, the old transponders can be adapted to the new control module. Refer to *Teaching hand-held transmitter* on Page 90 - D 68 and *Reading out and transferring remote control* on Page 90 - D 71.

Remote control

Up to four remote controls can be adapted to the control module under menu item *Learning functions/remote control*. After the alarm system control module is replaced and the immobilizer code is entered, the old remote controls can be adapted to the new control module (refer to *Reading out and transferring remote control* on Page 90 - D 71 and *Teaching hand-held transmitter* on Page 90 - D 68).

Reading out remote controls

Under the menu item *Reading out remote controls*, the data of the remote controls can be read out after the alarm system control module is replaced. If it is not possible to read out and transfer the remote controls (e.g. no communication with the control module), the old remote controls can be adapted to the new control module (teaching hand-held transmitter).

Transferring remote controls

Under the menu item *Transferring remote controls*, the data read out from the remote controls can be transferred to the new control module.

Teaching hand-held transmitter

General

Up to four hand-held transmitters can be adapted to the control module. The hand-held transmitter can be used to activate the central locking and the convertible top (for 996 Cabrio, country-specific version). Another function is the immobilizer by means of the integrated transponder coil.

Work preparation

The following information is required to teach the hand-held transmitter:

Key learning code from IPAS

24 digit Code No. (see barcode label on key grip)

If the key is stolen or the hand-held transmitter is faulty, all keys still in the customer's possession will be required.

Note:

During maintenance work, please bear in mind that the transmission frequency of the hand-held transmitter is different according to the country of use. The corresponding reception frequency is printed on the alarm system control module.

This reception frequency is either:

433 MHz with M-number M534

or

315 MHz with M-number M535

Procedure

1. Connect the vehicle keys and the new hand-held transmitter and insert in the ignition.
2. Connect PST 2 and switch on ignition.

3. Select *Alarm system* in the menu and press the double arrow key [>>].
4. Select *Learning function* in the menu and press the double arrow key [>>].
5. Select menu item *Transponder key* and press the double arrow key [>>].
6. The following message appears on the screen: "Input key learning code". With the arrow keys [<] or [>], input the key learning code and press the double arrow key [>>].
7. The following message appears on the screen: "Please confirm input". Check the input and press the [F7] key to confirm the input.
8. Distinguish between loss and fault and additional hand-held transmitter for the transponder.

a) Teaching an additional hand-held transmitter

With the arrow key [>] select a free position (1, 2, 3 or 4) and press the [F8] key.

Now the transponder code is saved in the selected position. Note the **position** of the new transponder code.

- b) Teaching in the case of a lost or faulty hand-held transmitter:



Caution!

Risk of theft due to the lost hand-held transmitter !

- > It is essential to identify and delete the transponder code of the lost hand-held transmitter as described in step 8 b).
- > It is essential to identify and delete the radio code of the lost hand-held transmitter as described in step 12 b).

In this case, it is first necessary to identify and delete the stored transponder code of the lost hand-held transmitter. The remaining vehicle keys are required for this purpose. One after the other, insert the keys into the ignition lock, switch the ignition on and establish communication with the control module. **Current transponder** shows the transponder code of the vehicle key that is presently inserted in the ignition lock. Compare this transponder code with the transponder codes at positions 1 to 4. This comparison allows the position of the lost hand-held transmitter (transponder code) to be identified, as one transponder code is ultimately left over at positions 1 to 4. Insert the vehicle key equipped with the new hand-held transmitter into the ignition lock and switch on the ignition. Establish communication between the PST2 and the control module. Select the identified position using the arrow keys [↖] and [↘], then delete the transponder code with key [F3]. Then press the [F8] key.

9. Press the double arrow key [<<], select menu item *Remote control* and press the double arrow key [>>].

10. "Input key learning code" appears on the screen. With the arrow keys [↖] or [↘], input the key learning code and press the double arrow key [>>].

11. The following message appears on the screen: "Please confirm input". Check the input and press the [F7] key to confirm the input.

12. Distinguish between loss and fault and additional hand-held transmitter for the radio code.

- a) Teaching an additional hand-held transmitter:

Select the same position (1 to 4) as for the transponder key and press the [F8] key.

- b) Teaching in the case of a lost or faulty hand-held transmitter:

In this case, it is first necessary to identify and delete the stored "radio code" of the lost hand-held transmitter. The remaining hand-held transmitters are required for this purpose. Press the locking button on the hand-held transmitter and then insert the vehicle key into the ignition lock, switch on the ignition and re-establish communication with the control module. **Current radio key** shows the "radio code" of the vehicle key that is presently inserted in the ignition lock.

Compare this radio code with the radio codes at positions 1 to 4. This comparison allows the position of the lost hand-held transmitter (radio code) to be identified, as one "radio code" is ultimately left over at positions 1 to 4.

Insert the vehicle key equipped with the new hand-held transmitter into the ignition lock and switch on the ignition. Establish communication with the control module. Select the identified position using the arrow keys [^] and [v], then delete the radio code with key [F3]. Then press the [F8] key.

13. Carefully input the 24-digit code number with the arrow keys [^] or [v] and press the double arrow key [>>].
14. The following message appears on the screen: "Please confirm input". Check the input and press the [F7] key.
15. Now the hand-held transmitter is taught. Go back to the menu item *Learning function*, remove the key and switch on the ignition again. Once the key has been removed again, the hand-held transmitter is ready for use. Check hand-held transmitter for operation.

Reading out and transferring remote control

General

When replacing the alarm system control module, it is possible to read out remote controls from the old control module and transfer them to the new control module. In this way, the hand-held transmitters (remote controls and transponders) can be retained. In other words, it is not necessary to change the hand-held transmitter when replacing the alarm system control module.

Requirement:

- Communication can be set up between the PST2 and alarm system control module.

The remote controls and transponder coils are correct and functional.

Note:

When the remote control is read out and transferred, only the **remote control data** are read out and transferred.

The transponder coil of the individual keys must be adapted to the control module. Four positions are available for this purpose in menu item *Transponder key*. This function is described from step 19 onward.

Work preparation:

The following information is required from the IPAS for reading out and transferring remote controls:

Key learning code

Immobilizer code

Procedure:

1. Connect PST2 to the data link connector, and switch on the ignition.
2. Switch on the PST2, select vehicle type 911 (1996) and start the automatic control module search with the double arrow key [> >].
3. After a brief search, the PST2 reports: "Fault memory reading completed".
4. Select *Alarm system* in the menu and press the double arrow key [> >].
5. Select *Learning functions* from the selection list and press the double arrow key [> >].
6. Select menu item *Read out remote control* and press the double arrow key [> >].
7. The following message appears on the screen:
"Input key learning code".
Input the key learning code with the arrow keys [v] or [^] and press the double arrow key [> >].
8. The following message appears on the screen:
"Please confirm input".
Check the input key learning code and press the key [F7].
9. The following message appears on the screen:
"Remote controls were read out".
Press the double arrow key [< <] twice to change to the control module overview.
Switch the ignition off, remove the old control module, install the new control module and switch the ignition on again.

10. Press the double arrow key [>>] to set up communication with the new control module.
11. Select menu item *Learning functions* with the arrow key [v] and press the double arrow key [>>].
12. The menu item *Immobilizer* is already selected. Press the double arrow key [>>].

**Caution!**

The immobilizer code can be input only once. An incorrect input will render the control module useless.

> Input and check immobilizer code carefully

13. The following message appears on the screen:
"Input immobilizer code".
Input the immobilizer code with the arrow keys [v] or [^] and press the double arrow key [>>].
14. The following message appears on the screen:
"Please confirm input".
Check the input immobilizer code and press the key [F7].
15. Select menu item *Remote control transfer* with the arrow key [v] and press the double arrow key [>>].
16. The following message appears on the screen:
"Input key learning code".
Input the key learning code with the arrow keys [v] or [^] and press the double arrow key [>>].
17. The following message appears on the screen:
"Please confirm input".
Check the input key learning code and press the key [F7].
18. The following message appears on the screen:
"Remote controls were transferred"
19. Select menu item *Transponder key* with the arrow key [^] and press the double arrow key [>>].
20. The following message appears on the screen:
"Input key learning code".
Input the key learning code with the arrow keys [v] or [^] and press the double arrow key [>>].
21. The following message appears on the screen:
"Please confirm input".
Check the input key learning code and press the key [F7].

Note:

As the transponder coils must be taught individually, make sure that the allocation of the locations is the same as described under *Transponder code* on the IPAS printout (see Step 22).

22. Four unoccupied locations are displayed, and location 1 is marked in black. Additionally, the transponder code is displayed under **current key**. This code must be stored in the same location as specified in the IPAS printout.

Select the locations and press the [F8] key – the location will be allocated the associated transponder code.

23. Withdraw the key and repeat Steps 19 to 22 for the remaining keys.

All remote controls have now been transferred from the old control module to the new control module, and the transponders adapted to the new control module.

Check all hand-held transmitters for operation (lock and unlock the vehicle)

Check functioning of all transponder coils (engine start)

Read out fault memory and delete any stored faults.

Comparison table of input signals

The following table represents a comparison point to the data read out from PST 2 on the vehicle, and should simplify diagnosis and troubleshooting.

Boundary conditions

- Both doors closed

Ignition switched on

Central locking system variant code in variant 4

Doors not locked

Switch position	Text
open	radio contact open
open	input 1 open
closed	terminal 15 signal available
closed	alarm horn connected
closed	driver's side not secured
closed	passenger's side not secured
closed	driver's side not locked
closed	passenger's side not locked
open	door on driver's side closed
open	door on passenger's side closed
open	door lock barrel not actuated
open	central locking system not actuated

Switch position	Text
closed	terminal 86 S signal available
closed	immobilizer active
open	signal from airbag not available
open	front luggage compartment closed (front lid)
open	rear luggage compartment closed (rear lid)
open	convertible top/sliding roof closed
open	oddments tray open
open	convertible top compartment lid open
open	button 1 on the radio transmitter not actuated
open	button 2 on the radio transmitter not actuated

Note

The information in the comparison table applies for vehicles with the safe function. The safe function is not provided for all countries (e.g. USA). In this case *Driver's side secured* and *Passenger's side secured* will be displayed in the PST 2. In vehicles with the safe function, this display would indicate an error in the door lock module or its wiring.

90 25 **Diagnosis/Troubleshooting, instrument cluster**

Diagnosis/Troubleshooting

Instrument cluster

System K 0X

Contents overview

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Modify coding	90 - D 125
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Control module replacement	90 - D 128

Introduction

The manual contains the diagnosis for the following system:

Instrument cluster

Electrical power supply – general

Work instructions after disconnecting the battery

Effects of disconnection or total discharge of the battery on electrical systems in the vehicle, subsequent measures:

Never disconnect battery with engine running.

Never start engine without securely connected battery.

Never use a boost charger to start the engine.

Whenever possible, use jump leads with overvoltage protection.

Plug connectors of control modules or other electronic components must never be connected or disconnected with the ignition switched on. Exception: vehicles with the additional equipment M 536 (alarm siren with tilt sensor).

Note concerning M 536:

In order to avoid triggering the alarm siren (installed on right next to the battery) of vehicles with M 536, terminal 86 S of the battery must be disconnected with the ignition on (all loads must be switched off beforehand).

Instrument cluster

The trip counter is set to 0 when the power supply is disconnected.

Clock:

Depending on the software version, the clock is set to 12:00 a.m. or 1:00 a.m. when the power supply is disconnected.

Remedy:

Enter the current time again.

On-board computer

Disconnection of the vehicle battery deletes the memories for average speed and average consumption. As a result, the displayed range on remaining fuel can be markedly different or even 0. The outside temperature indicator loses its memory effect. In other words, the indicated outside temperature can be too high due to the heat radiated when the vehicle is hot.

Fuel level display

Only 911 Carrera 4 (996) and GT3 are affected:

If the power supply is interrupted due to a discharged or disconnected battery and a quantity of less than 19 l remains in the tank, the calculated value for the range on remaining fuel will be deleted or falsified in the instrument cluster.

If less than 10 l of fuel remains in the tank, the fuel level warning light might not be activated.

If the power supply is restored with the fuel level at less than 19 l, it is possible that the fuel level display may subsequently display too much in some 996 Carrera 4 and GT3 vehicles.

This may lead to the vehicle breaking down.

Remedy in these vehicles:

Refill at least 19 l of fuel. The fuel level sensor is then in operating range and its display precision is guaranteed.

Note: 911 Carrera (996) Technical Manual, Group 2, Tl. No. 9/99.

Radio

The radio reverts to the Code function when the battery is disconnected and is thus no longer ready for operation.

Remedy:

Input the radio code. If the code card is unavailable, the radio code can be read from the DME control module (under "Vehicle data"). This code is also available from the Porsche IPAS.

PCM

- The PCM reverts to the *Code* function when the battery is disconnected and is thus no longer ready for operation.

When the power supply is disconnected, the built-in GPS receiver loses the so-called *almanac* containing the satellite orbital paths.

The date and time are no longer displayed on the display after the power supply is disconnected.

If the telephone card was inserted and the telephone was ready for operation, the telephone is subsequently disabled.

Remedy

Input the PCM code. If the code card is unavailable, the PCM code can also be read from the DME control module (under "Vehicle data"). This code is also available from the Porsche IPAS.

Switch on the PCM with a free panoramic view for approx. 20 minutes (to load GPS almanac).

The date and time are also adopted once the GPS almanac has been loaded; it may be necessary to change over to summer time (daylight-saving time). This time is transferred to the instrument cluster. If the time is then manually changed by means of the instrument cluster, this time is adopted by the PCM and synchronised with GPS time.

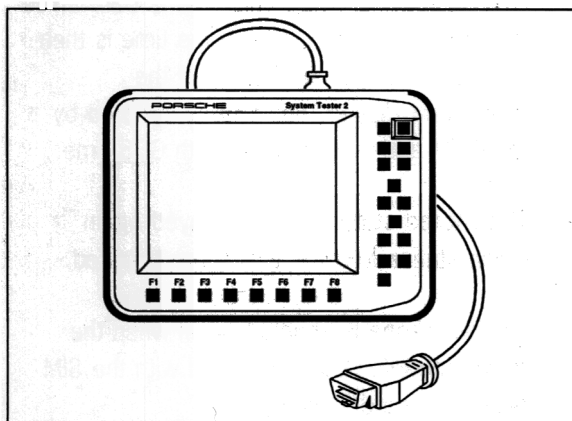
The stored stations are displayed again when station buttons 1 to 6 are pressed.

The telephone is enabled again when the telephone PIN code is entered with the SIM telephone card inserted.

2. Tools

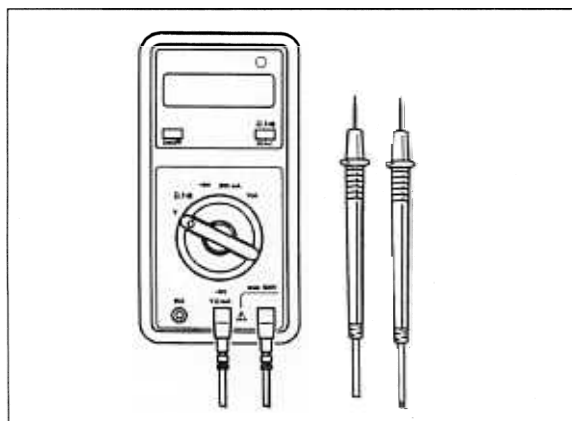
The following testers are required for vehicle diagnosis:

Porsche System Tester 2 (PST 2)



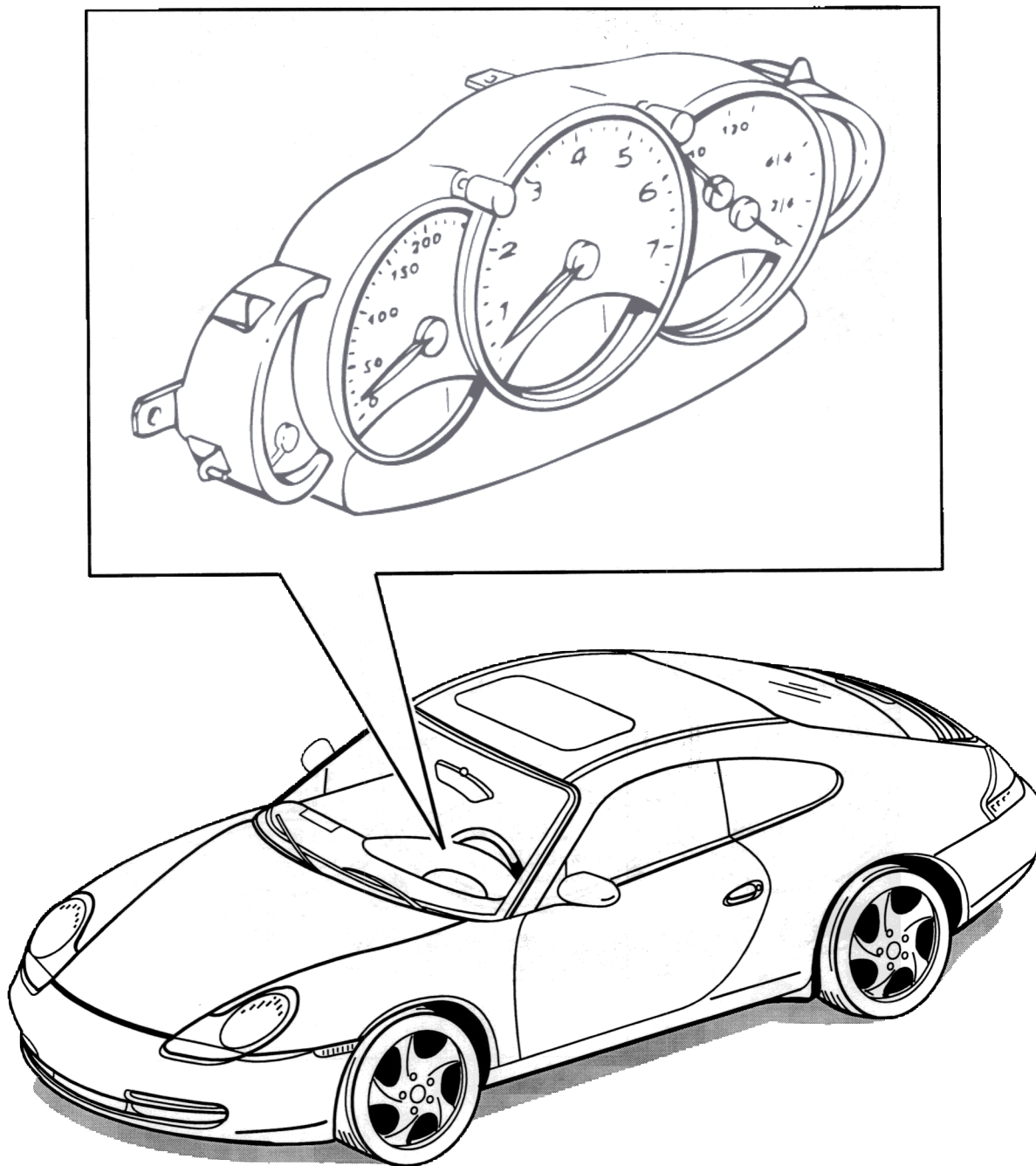
547_96

Commercially available digital multimeter

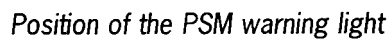


2178_28

3. Component arrangement



90250001



90250008

Function of the instrument panels

1. Voltmeter

Installation position: outside left of instrument cluster

It indicates the voltage. The battery warning light also lights up with the ignition on. If the warning light is lit with the engine switched on, the battery charging system is defective or the drive belt is torn.

2. Speedometer with analog display

Installation position: to the right of the voltmeter

Electrical signals from the ABS/ASR or PSM are converted and emitted in analog form.

3. Cruise control indicator light

Installation position: in the speedometer dial with analog display

Displays cruise control readiness.

4. Odometer/trip counter

Installation position: in the speedometer dial with analog display

Electrical signals from the ABS/ASR or PSM are converted to speeds which are then converted to distances and are displayed as kilometres travelled on the odometer or trip counter.

5. Individual button for instrument illumination and trip counter

Installation position: Between analog speedometer and tachometer

The individual button can be used to dim the instrument and switch brightness by hand when the vehicle lighting is switched on, and to reset the trip counter to zero.

6. Tachometer

Installation position: in the centre of the instrument cluster

Electrical signals from the DME are converted and emitted analogously via the tachometer.

7. Left direction indicator pilot light

Installation position: in the tachometer dial

Flashes on when the direction indicator switch activates the left direction indicator. It also flashes when the hazard warning light is switched on. The left direction indicator pilot light flashes with the same rhythm as the direction indicator lights which are switched on. If the rhythm deviates, the direction indicator lights must be checked.

8. Speedometer with analog display; on-board computer (range on remaining fuel, outside temperature, speed signal (gong), average consumption, average speed)

Installation position: beneath the tachometer

Speedometer: electrical signals from the ABS/ASR or PSM are converted and emitted in digital form.

On-board computer: The on-board computer calculates the range on remaining fuel, average speed/consumption and outside temperature from the current fuel capacity levels, the current speed/acceleration and the outside temperature sensor. The individual functions can be checked by operating the lever on the steering column.

9. High beam headlight indicator light

Installation position: upper half of the tachometer

The indicator light lights up if the high beam headlight is switched on or the headlight flasher is actuated.

10. Right direction indicator pilot light

Installation position: in the tachometer dial

Flashes on when the direction indicator switch activates the right direction indicator. It also flashes when the hazard warning light is switched on. The right direction indicator pilot light flashes with the same rhythm as the direction indicator lights which are switched on. If the rhythm deviates, the direction indicator lights must be checked.

11. Light sensor for instrument illumination

Installation position: on the right beneath the rpm band in the tachometer

Illumination of the instruments is adapted automatically according to the surrounding brightness via the light sensor.

12. Individual button for clock and display setting

Installation position: between tachometer and cooling system temperature display

The individual button is used to set the time in the display beneath the Tiptronic display. Additionally, the individual button can be used to switch between kilometres and miles for the speed and odometer.

13. Clock, engine oil level display

Installation position: beneath the fuel display

When the ignition is switched on, the time display temporarily changes into standby mode for the oil level measurement.

14. Tiptronic display

Installation position: beside the tachometer on the right

The engaged selector level positions are displayed. In the selector lever positions "M" and "D", the gears presently engaged are also displayed.

15. Cooling system temperature gauge, warning light

Installation position: beside the tachometer and above the Tiptronic display

Signals from the temperature sensor are converted, and the current "engine temperature" is output via the temperature gauge. The warning light lights up if the coolant temperature is too high. The warning light also flashes if the coolant level is too low or the engine-compartment blower is not functioning.

16. Fuel level display, warning light

Installation position: on the right beside the Tiptronic display

Electrical signals from the fuel level sensor are converted and the display shows an almost correct value for the current fuel level in the tank. The warning light lights if the fuel level is too low.

17. Engine oil pressure display

Installation position: outside right of instrument cluster

Signals from the oil pressure sensor are converted and output via the engine oil pressure display.

Function of the warning lights/indicator lights

A] Traction Control warning light

Only model with ABS 5.3 (Carrera 2): Lights up as a check when the ignition is switched on together with the rocker switch. During the journey, the warning light shows that the driving stability control is switched off. It also lights up if the Traction Control is faulty.

B] Traction Control/ Porsche Stability Management (PSM) information light

Lights up as a check when the ignition is switched on.

For models with ABS 5.3 (Carrera 2): When driving, the information light displays a control process, even when driving stability control is switched off.

For models with PSM (standard on Carrera 4, option on Carrera 2): When driving, the information light displays a control process, even when PSM is switched off.

C] Porsche Stability Management (PSM) Warning light

Lights up as a check when the ignition is switched on together with the rocker switch. During the journey, the warning light shows that the PSM system is switched off. It also lights up in the event of a defect in the PSM system.

D] Extending rear spoiler warning light

Lights up as a check when the ignition is switched on and goes out after the vehicle moves off. The warning light lights up when driving if the spoiler does not extend or reach its end position above 120 km/h or if a malfunction exists.

E] Brake pad wear warning light

Lights up as a check when the ignition is switched on. Lights up when driving if the wear limit of the brake pads is reached.

F] Parking brake warning light

Lights when the parking brake is engaged and goes out when the parking brake is completely released.

G] Brake fluid level warning light

Lights up if the brake fluid level is too low and – in connection with a longer pedal travel – if the break circuit fails.

H] ABS warning light

If the light lights up with the engine running, the ABS has switched off due to a fault.

I] Engine oil pressure warning light

Lights up as a check when the ignition is switched on. If it lights up with the engine running, stop the vehicle immediately and switch off the engine. Either the oil level is too low or there is a danger of engine damage.

K] Battery warning light

Lights up as a check when the ignition is switched on. If it lights up with the engine running, stop the vehicle immediately and switch off the engine. The cause can be a fault in the battery charging device and/or a torn drive belt.

L Washer fluid level warning light

Lights up as a check when the ignition is switched on. Lights up at a remaining quantity of 0.5 l.

M Seat belt warning light

Lights up when the ignition is switched on until the buckle of the seat belt is inserted into the belt buckle.

N Airbag warning light

Lights up as a check when the ignition is switched on. If it lights with the engine running, there is a fault in the airbag system. The warning light flashes for 10 seconds when the ignition is switched on if a child restraint system is detected on the passenger side or if the airbag has been switched off by a child restraint system.

O Emission control warning light

Lights up as a check when the ignition is switched on and goes out approx. 4 seconds after the engine is started. Displays faults by flashing or lighting up permanently and stores these faults in the fault memory of the control module.

P Roll-over protection warning light

Lights up as a check when the ignition is switched on. If the warning light should light up with the engine running or when the vehicle is in motion, this could indicate a fault in the system.

Q Convertible top warning light

Lights up as a check when the ignition is switched on. If the warning light lights up with the engine running, the convertible top is not correctly closed / opened. If the warning light does not go out in the end position, a fault could be present or it may be necessary to adjust the convertible top.

System description

The instrument cluster has two basic functions. It provides the driver with information and it also reports faults and malfunctions in the vehicle system.

The information includes visual display of the speed via the analog and digital speedometer, analog display of the engine speed as well as information about the coolant temperature and tank status. The right digital display in the instrument cluster shows the time, and displays the engine oil level when the ignition is switched on. In addition, a visual display shows which gear or which transmission range the transmission is in, and also displays cruise control readiness.

In connection with an on-board computer (optional), the average speed, average consumption, range on remaining fuel, outside temperature and a speed signal can be output via the instrument cluster.

Messages regarding faults or malfunctions can be divided into acoustic and visual warning signals.

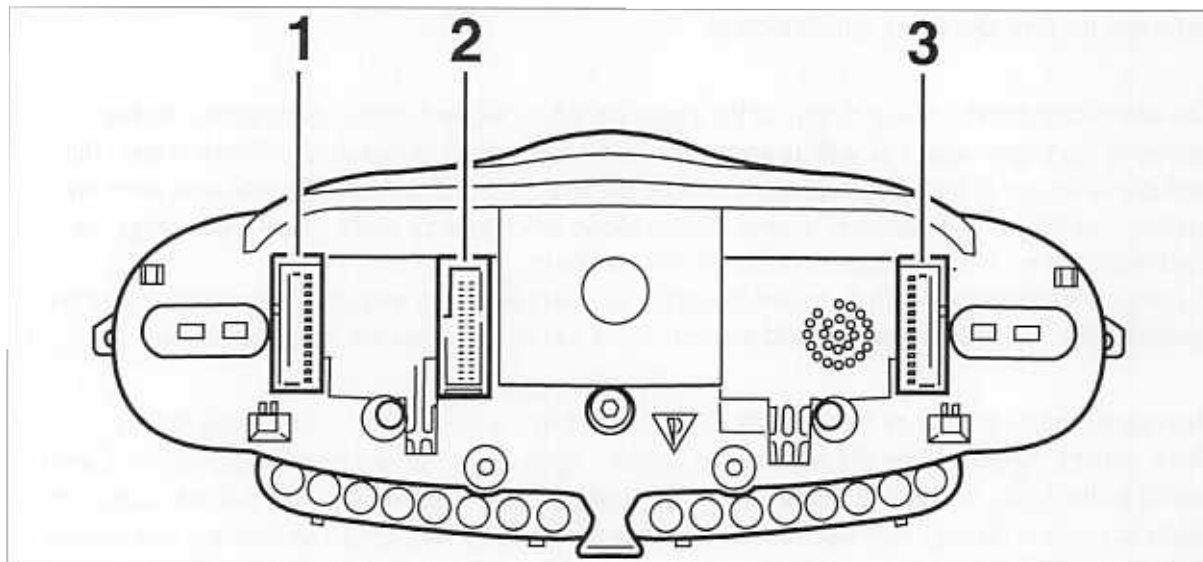
Visual warning signals include the warning and indicator lights. These show whether faults have occurred related to the brake system (ABS, brake pad wear, brake fluid level, parking brake), Traction Control, the safety of persons (airbag, seat belt), battery charging, emission control, the convertible top and roll-over protection system. They also give warnings for critical fluid circumstances (tank status, coolant temperature, washer fluid level, oil pressure).

The acoustic warning signals signalise that the key has been left in position or that the light is on although the engine is switched off. Additionally, a speed signal can be activated which emits a warning tone if a certain speed – determined by the user – is reached or exceeded. A warning signal is also emitted if the seat belt has not been put on yet. One other variable warning signal can also be programmed (e.g. warning tone for parking aid).

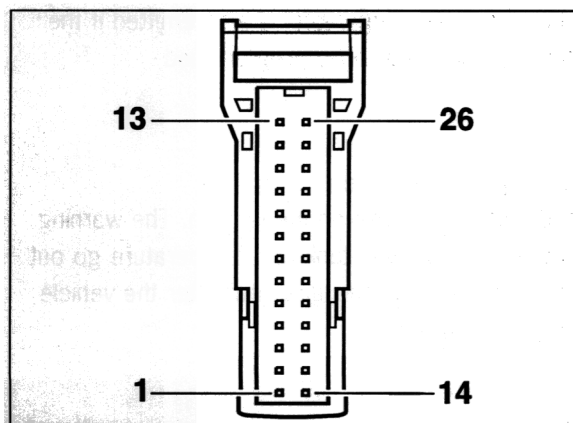
The warning lights go out after different intervals when the ignition is switched on.

The convertible top warning light goes out approx. 5 seconds after switching on the ignition. The warning lights for brake pad wear, brake fluid level, parking brake, washer fluid level, tank and temperature go out after a further 30 seconds approximately. The warning light for the gurney flap goes out after the vehicle moves off. The remaining warning lights go out after the engine is started.

Connector assignment, control module



90250002



Connectors on instrument cluster

90250003

Three colour-coded 26-pole connectors are connected to the instrument cluster.

Assignment of plug I (blue)		22	Tank status
Assignment of plug I (blue)		23	Brake pad wear
Pin	Designation	24	Analog ground
1	ABS-SILA	25	Retract spoiler relay
2	Parking brake	26	Engine run signal
3	ASR/ABO Info, PSM	Assignment of plug II (white)	
4	ASR/ABO-SILA (TC)	2	Tiptronic POS. LTG. 4
5	PSM OFF	3	Tiptronic POS. LTG. 3
6	Left indicator light	4	Brake fluid level
7	Right indicator light	5	Engine-compartment blower coolant level switch
8	High beam	6	Oil pressure switch
9	Oil pressure sensor	7	Washer fluid level
10	LED dim, terminal 58d	8	Central locking system locked
11	Bulb dim, terminal 58d	9	Spoiler extended check
12	Extend spoiler relay	10	Retract spoiler button
13	Speedometer A	11	Extend spoiler button
16	Cruise control	12	Door contact
17	Outside temperature	13	KVA DME
18	Coolant temperature	14	Terminal 58
19	Oil level	15	TN signal speed
20	Fuel level sensor		
21	K diagnosis		

16	HL speed	15	Roll-over protection
17	Tiptronic status	16	Cabrio convertible top
18	Tiptronic POS. LTG. 1	20	ABS-N-SILA FOR
19	Tiptronic POS. LTG. 2	21	Terminal 31
20	Top lever	23	Terminal 30^
21	Bottom lever	24	LED dim, terminal 31d
22	Front lever	25	Terminal 15
23	Battery charge	26	Idle period
24	Belt warning		
25	Rear lever		
26	Spoiler retracted check		

Assignment of plug III (black)

1	Key contact, terminal 86s
2	Check engine
6	Information system IN
8	Terminal 31
9	ParkAssistent input
10	Terminal 30
11	Information system OUT
12	Terminal 15
13	Brake pad wear +
14	Airbag

Checking the actual values

In the *Actual values* menu item, the current values of the following parameters can be read out and checked:

Test point 1

Tiptronic

Ignition on	
Brake pedal actuated	
Engine off	
PST2 display	100%
Engine idling	
PST2 display	P,R,N: 70%
Depends on gear engaged	
PST2 display:	
D:	
1st gear	10%
2nd gear	20%
3rd gear	30%
4th gear	40%
5th gear	50%
M:	
1st gear	15%
2nd gear	25%
3rd gear	35%
4th gear	45%
5th gear	55%

See also "Input signals" chapter, test point 1 and Technical Manual, Diagnosis/troubleshooting, Tiptronic.

Test point 2

Vehicle speed

Engine off

PST2 display

0 km/h

Drive vehicle at a constant speed

PST2 display

Tester display approximately equal to actual driving speed in km/h.

Troubleshooting:

Switch off ignition

Pull off plug II on the instrument cluster

Switch ignition on

Lift the vehicle

Rotate the rear left wheel by hand

Measure the voltage between plug II, pin 16 and ground
(AC range)

Voltmeter display

> 1 V

If the wheel speed signal is present at the instrument cluster, replace the instrument cluster. If the wheel speed signal is not present at the instrument cluster:

Switch off ignition

Pull plug off the ABS control module

Ohmmeter on instrument cluster plug II pin 16 and ground

Ohmmeter display:

 $\infty \Omega$

Ohmmeter on instrument cluster plug II pin 16 and plug on ABS control module pin 21

Ohmmeter display: $< 5 \Omega$

Test point 3

Speed

Ignition on

Engine off

PST2 display 0 rpm

Engine idling

PST2 display:

Tester display approximately equal to engine speed in rpm

Troubleshooting:

Switch off ignition

Pull off plug II on the instrument cluster

Engine idling

Measure the voltage between instrument cluster plug II, pin 15 and ground (AC range)

Voltmeter display: $> 1 \text{ V}$

Disconnect plug on DME control module (ME 5.2) or

Disconnect plug IV on DME control module (ME 7.2)

Switch ignition on

Measure the voltage between instrument cluster plug II, pin 15 and ground

Voltmeter display: 0 V

Ohmmeter on instrument cluster plug II pin 15 and plug on DME control module (ME 5.2) pin 80 or ME 7.2 plug IV pin 17

Ohmmeter display: $< 5 \Omega$

See also Drive Links chapter, "Tachometer"

Test point 4

Supply voltage

Ignition on

Engine off

All loads switched off

PST2 display > 11 V

Examine battery and generator

Test point 5

Brightness sensor

Engine off

Shine the pocket lamp on the sensor

PST2 display:

Tester display increases to a value of approx. 97% - 100%

Displays darken (dimming takes place slowly).

Brightening of the sensor

PST2 display:

Tester display drops to a value of 0 - 5%

Displays brighten (dimming takes place slowly).

If there is no change in the dimming, the instrument cluster is faulty.

Test point 6

Total mileage

Ignition on

Engine off

PST2 display:

Tester display equals the total mileage in km.

Check speed signal. See "Actual values"

Test point 2

Test point 7

Trip mileage

Ignition on

Engine off

Tester display equals the trip mileage in km.

See also Input signals chapter, Test point 18

Test point 8

Tank content sensor value

Engine off

Tank content greater than 19

PST2 display:

Tester display approximately equal to the sensor value in l.

Check the wire on the instrument cluster plug I pin 22 to the DME control module for open circuit/short to ground.

Test point 9

Tank content display

Engine off

PST2 display:

Tester display approximately equal to the display in l.

See also Drive links chapter "Fuel level display, warning light"

Test point 10

Coolant temperature

Engine off (with engine cold)

PST2 display:

Tester display corresponds to the ambient temperature.

Engine runs at idle speed at operating temperature

PST2 display:

Tester display corresponds to the coolant temperature of 80° C...100° C.

Troubleshooting:

Resistance values:

Switch off ignition

Disconnect plug connection X3/1

Ohmmeter on pin 29 and pin 30 on the sleeve side

Ohmmeter display at 20° C: approx. 1 K Ω

Switch ignition on

Measure voltage at plug connection X3/1 pin 29 and pin 30 on pin side

Voltmeter display: approx. 5 V

Switch off ignition

Reconnect plug connection X3/1

Remove connector of temperature sensor

Pull off plugs I and II on the instrument cluster

Switch ignition on

Measure the voltage between instrument cluster plug II, pin 5 and ground

Voltmeter display: 0 V

Measure the voltage between instrument cluster plug I, pin 24 and ground

Voltmeter display: 0 V

Switch off ignition

Ohmmeter on instrument cluster plug I pin 24 and plug on temperature sensor pin 2

Ohmmeter display: $< 5 \Omega$

Ohmmeter on instrument cluster plug II pin 5 and plug on temperature sensor pin 3

Ohmmeter display: $< 5 \Omega$

See also Input signals chapter, Test point 9, and Drive links chapter "Coolant warning light" and "Coolant temperature"

Test point 11

Average consumption

Engine off

Select average consumption with on-board computer selector lever

PST2 display:

Tester display approximately equal to actual average consumption

Switch off ignition

Pull off plug II on the instrument cluster

Disconnect plug on DME control module (ME 5.2) or

Disconnect plug IV on DME control module (ME 7.2)

Switch ignition on

Measure the voltage between instrument cluster plug II, pin 13 and ground

Voltmeter display: 0 V

Switch off ignition

Ohmmeter on instrument cluster plug II pin 13 and ground

Ohmmeter display: $\infty \Omega$

Ohmmeter on instrument cluster plug II pin 13 and plug on DME control module (ME 5.2) pin 83 or

Ohmmeter on instrument cluster plug II pin 13 and on DME control module plug IV, pin 33 (ME 7.2)

Ohmmeter display: $< 5 \Omega$

Test point 12

Average speed

Engine off

Select average speed with on-board computer selector lever.

PST2 display:

Tester display approximately equals the average speed

See also Actual values chapter, "Speed", Test point 2

Test point 13

Outside temperature sensor
value

Engine off

PST2 display:

Tester display approximately equals the ambient temperature

Troubleshooting:

Warm sensor with fingers and observe the increase in temperature on PST 2. If no change in temperature is determined or displayed:

Disconnect outside temperature sensor

Switch ignition on

Measure the voltage at the outside temperature plug, pin 1 and pin 2

Voltmeter display: approx. 4.5 - 5 V

Ohmmeter on pin 1 and pin 2 on the outside temperature sensor

Ohmmeter display at 20 °C: 2.5 - 3 K Ω

Switch off ignition

Pull off plug I on the instrument cluster

Switch ignition on

Measure the voltage between plug I on outside temperature sensor, pin 1 and ground

Voltmeter display: 0 V

Switch off ignition

Ohmmeter on outside temperature sensor plug, pin 2 and ground

Ohmmeter display: $< 5 \Omega$

Ohmmeter on instrument cluster plug I pin 17 and plug on outside temperature sensor pin 1

Ohmmeter display: $< 5 \Omega$

If no fault is established in the wires or on the outside temperature sensor, replace the instrument cluster.

Test point 14

Outside temperature display

Engine off

PST2 display:

Tester display approximately equals the ambient temperature

See test point 13

There is a time delay in the PST 2 for the temperature increase between sensor value and display.

Test point 15

Range on remaining fuel

Engine off

Select range on remaining fuel with on-board computer selector lever

PST2 display:

Tester display equals the remaining value displayed in km.

See also Actual values chapter, "Speed", Test point 2 and "Average consumption", Test point 11

Drive links

The following drive links are actuated in the menu item *Drive links*. Their functioning must be checked when doing this.

Lamp dimming

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: display dims

If the display does not dim, replace the instrument cluster

Gear display dimming

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: display dims

If the display does not dim, replace the instrument cluster

Display dimming (background)

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: display dims

If the display does not dim, replace the instrument cluster

External dimming

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: display dims

If the display does not dim, replace the instrument cluster

Spoiler

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: spoiler extended / retracted?

If not:

Check fuse D 8

Check "extend spoiler" and "retract spoiler" relays

Pull off relays

Connect ohmmeter to terminals 85 and 86

Ohmmeter display: approx. 75 Ω

Measure voltage between relay carrier pin 5 and ground

Voltmeter display: Battery voltage

Ohmmeter on relay carrier pin 4 and ground

Ohmmeter display: < 5 Ω

Pull plug off the spoiler

Ohmmeter on spoiler plug pin 1 and relay carrier
(extend spoiler) pin 3

Ohmmeter display: < 5 Ω



Tank level warning light	Ohmmeter on spoiler plug pin 1 and relay carrier (retract spoiler) pin 3	
	Ohmmeter display:	< 5 Ω
	Ohmmeter on spoiler plug pin 5 and ground	
	Ohmmeter display:	< 5 Ω
Brake pad warning light	Ignition on	
	Actuate drive link with F8 key (Off/On)	
	Test:	
	Visual inspection: indicator light flashes	
Brake fluid warning light	Ignition on	
	Actuate drive link with F8 key (Off/On)	
	Test:	
	Visual inspection: indicator light flashes	
Coolant warning light	Ignition on	
	Actuate drive link with F8 key (Off/On)	
	Test:	
	Visual inspection: indicator light flashes	

Spoiler warning light

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Visual inspection: indicator light flashes

Washer fluid warning light

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Visual inspection: indicator light flashes

Tachometer

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: the tachometer deflects from zero position to end position (stepper motor check).

Analog speedometer

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: The analog speedometer deflects from 0 to 250 km/h (stepper motor check)

Coolant temperature

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: The display rises from 40 °C to 120 °C

Tank display

Ignition on

Actuate drive link with F5 (On), F6 (Off) and F8 (Stop) keys

Test:

Visual inspection: the display moves from 1/4 to 4/4

Display segments

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Visual inspection: all display segments are switched on

Gear display

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Visual inspection: gear display illuminated

Key buzzer

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Noise inspection: warning signal emitted

Light buzzer

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Noise inspection: warning signal emitted

Variable buzzer (v)

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Noise inspection: warning signal emitted

Speed buzzer

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Noise inspection: warning signal emitted

Belt buzzer (USA)

Ignition on

Actuate drive link with F8 key (Off/On)

Test:

Noise inspection: warning signal emitted

Checking the input signals**Test point 1**

Tiptronic

Ignition on

PST2 display:

Depends on the selector lever position: P, R, N, D

Engine idling

Brake pedal actuated

Selector lever position P, R, N, D, M

PST2 display:

Depends on the selector lever position: P, R, N, D 1, D 2/ M 1, M 2

Drive vehicle

PST2 display:

Depends on the selector lever position: P, R, N, D 1 - 5/ M 1 - 5

See "Actual values" chapter, Test point 1 and Technical Manual, Diagnosis/troubleshooting, Tiptronic.

Test point 2

Signal, terminal 61

Ignition on

Engine off

PST2 display:

not present

Engine idling

PST2 display:

present



Engine idling

Measure voltage between both poles on the battery

Voltmeter display: > 13 V

Check generator in the case of deviations

Switch off ignition

Pull off plug II on the instrument cluster

Switch ignition on

Measure the voltage on the instrument cluster plug II, pin 23 and ground

Voltmeter display: 0 V

Engine idling

Measure the voltage on the instrument cluster plug II, pin 23 and ground

Voltmeter display: > 13 V

Switch off ignition

Disconnect plug on generator (terminal 61)

Switch ignition on

Measure the voltage on the instrument cluster plug II, pin 23 and ground

Voltmeter display: 0 V

Switch off ignition

Ohmmeter on instrument cluster plug II pin 23 and ground

Ohmmeter display: $\infty \Omega$

Ohmmeter on instrument cluster plug II pin 23 and plug on generator (terminal 61)

Ohmmeter display: < 5 Ω

Test point 3

Signal, terminal 15

Ignition on

Engine off

PST2 display: present

Communication with the control module is not possible without terminal 15.

Check fuse B 10

See also Actual values chapter, Test point 4

Test point 4

Terminal 86s signal

Ignition on

Engine off

PST2 display: present

If not:

Check fuse E1

Switch off ignition

Pull off plug III on the instrument cluster

Switch on terminal 86S

Measure the voltage between instrument cluster plug III, pin 1 and ground

Voltmeter display: Battery voltage

If battery voltage is present at plug III pin 1, replace the instrument cluster.

Test point 5

Terminal 58 signal
(lighting)

Ignition on

Terminal 58 switched off

PST2 display: Off

Terminal 58 switched on

PST2 display: On

If "Off" is displayed when terminal 58 is switched on:

Switch off ignition

Pull off plug II on the instrument cluster

Terminal 58 switched on

Measure the voltage between instrument cluster plug II pin 14 and ground

Voltmeter display: Battery voltage

Test point 6

Clock

Ignition on

Clock button not actuated

PST2 display: not actuated

Clock button pressed

PST2 display: actuated

Clock button turned to left

PST2 display: -actuated

Clock button turned to right

PST2 display: +actuated

If the tester displays no signal, the instrument cluster is faulty.

Test point 7

Brake pad

Ignition on

Engine off

PST2 display:

OK

If not:

Check brake pads on all four brake discs for wear

Switch off ignition

Pull off plug I on the instrument cluster

Pull off plug III on the instrument cluster

Ohmmeter on instrument cluster plug III pin 13 and ground

Ohmmeter display: $\infty \Omega$

Ohmmeter on instrument cluster plug I pin 23 and plug III pin 13

Ohmmeter display: $< 5 \Omega$ **Test point 8**

Brake fluid level

Ignition on

Engine off

PST2 display:

OK

If not:

Check brake fluid level in brake fluid reservoir

Switch off ignition

Pull off plug II on the instrument cluster

Pull off plug on brake fluid reservoir

Ohmmeter on instrument cluster plug II pin 4 and plug on brake fluid reservoir

Ohmmeter display: $< 5 \Omega$

Ohmmeter on brake fluid reservoir plug pin 2 and ground

Ohmmeter display: $< 5 \Omega$

Ohmmeter on instrument cluster plug II pin 4 and ground, level switch not actuated

Ohmmeter display: $\infty \Omega$

Ohmmeter on instrument cluster plug II pin 4 and ground, level switch actuated

Ohmmeter display: $< 5 \Omega$

Test point 9

Coolant level

Ignition on

Engine off

PST2 display: OK

If not:

Check coolant level in reservoir

Switch off ignition

Pull off plug II on the instrument cluster

Pull off plug on sensor for coolant level display

Ohmmeter on instrument cluster plug II pin 5 and ground

Ohmmeter display: $\infty \Omega$

Ohmmeter on instrument cluster plug II pin 5 and plug on reservoir pin 1

Ohmmeter display: $< 5 \Omega$

Ohmmeter on reservoir plug pin 2 and ground

Ohmmeter display: $< 5 \Omega$

See also Drive links chapter "Coolant warning light "and "Coolant temperature"

Test point 10

Oil pressure

Ignition on

Engine off

PST2 display not present

Engine idling

PST2 display: present

If oil pressure "not present" is displayed when the engine is running:

Check oil level

Switch off ignition

Pull off plug II on the instrument cluster

Ohmmeter on instrument cluster plug II pin 6 and ground

Ohmmeter display: $< 5 \Omega$

Disconnect plug on oil pressure switch

Ohmmeter on instrument cluster plug II pin 6 and plug on oil pressure switch, pin 1

Ohmmeter display: $< 5 \Omega$

Push plug onto oil pressure switch

Engine idling

Ohmmeter on instrument cluster plug II pin 6 and ground

Ohmmeter display: $\infty \Omega$

Check oil pump



Test point 11

Seat belt

Ignition on

Seat belt on driver's side not fastened

PST2 display: not fastened

Seat belt on driver's side fastened

PST2 display: fastened

Switch off ignition

Pull off plug II on the instrument cluster

Switch ignition on

Measure the voltage between instrument cluster plug II and pin 24 and ground

Voltmeter display: 0 V

Switch off ignition

Seat belt on driver's side not fastened

Ohmmeter on instrument cluster plug II pin 24 and ground

Ohmmeter display: $< 5 \Omega$

Seat belt on driver's side fastened

Ohmmeter on instrument cluster plug II pin 24 and ground

Ohmmeter display: $\infty \Omega$

Disconnect plug connection X16 for LHD vehicles and X17 for RHD vehicles

Ohmmeter on instrument cluster plug II pin 24 and plug connection X16 or X17 on sleeve side, pin B5

Ohmmeter display: $< 5 \Omega$ 

Test point 12

Spoiler button

Ignition on

Spoiler button (switch for rear spoiler) not actuated

PST2 display: not actuated

Spoiler button (switch for rear spoiler) "extend" actuated

PST2 display: extend actuated

Spoiler button (switch for rear spoiler) "retract" actuated

PST2 display: retract actuated

Switch off ignition

Pull off plug II on the instrument cluster

Pull plug off the spoiler button

Switch ignition on

Measure the voltage between instrument cluster plug II pin 11 and ground

Voltmeter display: 0 V

Measure the voltage between instrument cluster plug II pin 10 and ground

Voltmeter display: 0 V

Switch off ignition

Spoiler button "extend" actuated

Ohmmeter on instrument cluster plug II pin 11 and ground

Ohmmeter display: $< 5 \Omega$

Spoiler button "retract" actuated

Ohmmeter on instrument cluster plug II pin 10 and ground

Ohmmeter display: $< 5 \Omega$

See also Drive links chapter "Spoiler" and "Spoiler warning light"

Test point 13

Spoiler status

Ignition on

Spoiler retracted

PST2 display: retracted

Spoiler extended

PST2 display: extended

Spoiler in intermediate position

PST2 display: is unknown

See also Drive links chapter "Spoiler" and "Spoiler warning light"

Switch off ignition

Pull off plug II on the instrument cluster

Spoiler extended

Ohmmeter on instrument cluster plug II pin 9 and ground

Ohmmeter display: < 5 Ω

Spoiler retracted

Ohmmeter on instrument cluster plug II pin 26 and ground

Ohmmeter display: < 5 Ω

Pull plug off the spoiler drive

Ohmmeter on instrument cluster plug II pin 9 and plug on spoiler
drive pin 2Ohmmeter display: < 5 Ω Ohmmeter on instrument cluster plug II pin 26 and plug on spoiler
drive pin 4Ohmmeter display: < 5 Ω

Ohmmeter on spoiler drive plug pin 5 and ground

Ohmmeter display: < 5 Ω

If no faults are detected in the wire, replace the motor for the rear spoiler

Test point 14

Washer fluid level

Ignition on

Engine off

PST2 display: OK

Check washer fluid level

Switch off ignition

Washer fluid level full

Pull off plug on sensor for fluid level display

Ohmmeter directly on sensor for fluid level display, pin 1 and pin 2

Ohmmeter display: < 5 Ω

If not, replace sensor for fluid level display.

Ohmmeter on plug of sensor for fluid level display
pin 2 and ground

Ohmmeter display: < 5 Ω

Pull off plug II on the instrument cluster

Ohmmeter on instrument cluster plug II pin 26 and plug on sensor
for fluid level display, pin 1

Ohmmeter display: < 5 Ω

See also Drive Links chapter, "Washer fluid warning light"

Test point 15

Washer fluid level full

Ignition on

Vehicle not locked

PST2 display:

not present

Central locking button actuated

Vehicle locked

PST2 display:

present

Read out fault memory in alarm system control module and
eliminate faults present

If the central locking function is OK.

Switch off ignition

Pull off plug II on the instrument cluster

Lock vehicle

Ohmmeter on plug II of instrument cluster, pin 8 and ground

Ohmmeter display:

< 5 Ω

Unlock vehicle

Pull plug I off the alarm system control module

Ohmmeter on instrument cluster plug II pin 8 and plug I on alarm
system control module pin 30

Ohmmeter display:

< 5 Ω

Test point 16

On-board computer

Ignition on

Operating lever not actuated

PST2 display: not actuated

Move operating lever upwards

PST2 display: actuated upwards

Move operating lever downwards

PST2 display: actuated downwards

Push operating lever forwards

PST2 display: actuated forwards

Pull operating lever towards steering wheel

PST2 display: actuated backwards

Switch off ignition

Pull off plug on operating lever for on-board computer

Ohmmeter on operating lever plug pin 1 and ground

Ohmmeter display: $< 5 \Omega$

Pull off plug II on the instrument cluster

Ohmmeter on instrument cluster plug II pin 25 and plug on
operating lever for on-board computer pin 5Ohmmeter display: $< 5 \Omega$ Ohmmeter on instrument cluster plug II pin 22 and plug on
operating lever for on-board computer pin 4Ohmmeter display: $< 5 \Omega$

Ohmmeter on instrument cluster plug II pin 20 and plug on
operating lever for on-board computer pin 2

Ohmmeter display: < 5 Ω

Ohmmeter on instrument cluster plug II pin 21 and plug on
operating lever for on-board computer pin 3

Ohmmeter display: < 5 Ω

Test point 17

Dimming

Ignition on

Dimming button not actuated

PST2 display: not actuated

Dimming button actuated towards left

PST2 display: -actuated

Dimming button actuated towards right

PST2 display: +actuated

See also Actual values chapter, Test point 5 and Drive links chapter
"Lamp dimming", "Gear display dimming", "Display dimming",
"External dimming"

Test point 18

Trip mileage

Ignition on

Kilometre button not actuated

PST2 display:

not actuated

Kilometre button actuated

PST2 display:

actuated

Actual values

In the *Actual values* menu item, the current values of the following parameters can be read out:

Tiptronic

Vehicle speed

Speed

Supply voltage

Brightness sensor

Total mileage

Trip mileage

Tank content sensor value

Tank content display

Coolant temperature

Average consumption

Average speed

Outside temperature sensor value

Outside temperature display

Range on remaining fuel



Extract coding

In the menu item *Extract coding*, the following coding is displayed:

- | | |
|-----------------------|-----------------------|
| 1. Mileage: | miles (kilometres) |
| 2. Clock mode: | 12 h (24 h) |
| 3. On-board computer: | present (not present) |

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type 911 (996) and start the automatic control module search
3. Select *Instrument cluster* control module
4. Select menu item *Extract coding*
5. Extract individual coding



Modify coding

In the menu item *Modify coding*, the following coding can be changed:

- | | |
|----------------------|-----------------------|
| 1. Mileage: | miles (kilometres) |
| 2. Clock mode | 12 h (24 h) |
| 3. On-board computer | present (not present) |

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type 911 (1996) and start the automatic control module search.
3. Select *Instrument cluster* control module
4. Select menu item *Modify coding*
5. Select Coding from the function selection
6. Follow the instructions of the diagnostic tester
7. Confirm with the Coding (F8) key
8. Ignition off
9. Ignition on (coding is adopted)

Note:

Information on the workshop which carried out the coding is recorded.

Total mileage

In the menu item *Total mileage*, the total mileage can be transferred to a new instrument cluster after a faulty instrument cluster is replaced.

Work preparation:

1. Read out and record Vehicle Identification Number
2. Read off and note the total mileage in the old instrument cluster

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type *911 (1996)*
3. Select *Instrument cluster* control module
4. Select menu item *Total mileage*
5. Enter Vehicle Identification Number and confirm again
6. Enter total mileage and check
7. Press the F8 button (Coding)

Tank calibration

See Calibrating fuel level sensor system
Serv. No. 20 15 01

Speedometer A

The menu item *Speedometer A* is used to test the speed-dependent volume control and the speed warning signal.

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type *911 (1996)* and start the automatic control module search.
3. Select *Instrument cluster* control module
4. Select menu item *Speedometer A*
5. Simulate speed with Increase (F5) and Decrease (F6) buttons

Control module replacement

In the menu item *Control module replacement*, the control module of the instrument cluster is replaced. When doing this, the tank calibration is transferred from the old instrument cluster to the new one.

Procedure:

1. Connect PST2 and switch on the ignition

Select vehicle type *911 (1996)* and start the automatic control module search.

3. Select *Instrument cluster* control module
4. Select menu item *Control module replacement*
5. Read out values with PST2
6. Remove instrument cluster
7. Install new instrument cluster
9. Store values in the new instrument cluster with PST2.

91 01 Diagnosis/troubleshooting ParkAssistent (System P 01)

Diagnosis/Troubleshooting

ParkAssistent

System P 01

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Overview of possible menus

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System description

The ParkAssistant supports the driver when reversing. The system detects obstacles and indicates these to the driver in good time. If an obstacle is detected by the system, a signal tone with a tone break sounds at a distance of 1.5 m to the inside sensors and 0.6 m to outside sensors. The tone break of the signal tone shortens as the vehicle approaches the obstacle. At a distance of 0.3 m, a continuous tone is emitted.

System readiness

The ParkAssistant signals readiness with a short signal tone provided that:

- the ignition is switched on
- reverse gear is engaged

System error

System errors are indicated by the sounding of a continuous tone after reverse gear has been engaged. This continuous tone differs from the continuous tone emitted when an obstacle is detected.

System components

The ParkAssistant consists of :

- a control module which is located under the driver's seat together with a cover plate.
- four ultra-sound sensors which are installed in the rear spoiler.
- an audible signal transmitter which is integrated into the instrument cluster.



Warning

Danger of injury and damage to vehicle when the vehicle is rolling backwards!

- > Reverse gear must be engaged and the ignition must be switched on; otherwise the ParkAssistant System is deactivated.



Warning

Danger of injury and damage to vehicle when the system limits are reached! The system does not free the driver from his/her responsibility to be careful.

- > Short obstacles such as a person lying down cannot be detected.
- > The reflection capabilities of the system may be impaired by sound-absorbing obstacles such as powdery snow, and by sound-reflecting obstacles such as glass bottles.
- > Very thin obstacles and obstacles with small reflecting surfaces cannot be detected.

Sensor signals

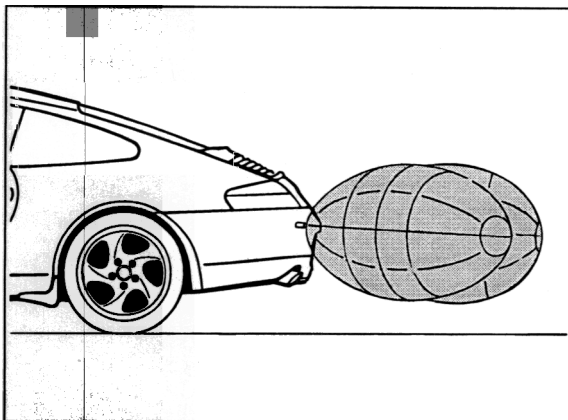
Every sensor emits an ultrasound beam with the following geometric specification.

Horizontal beam angle = 120°

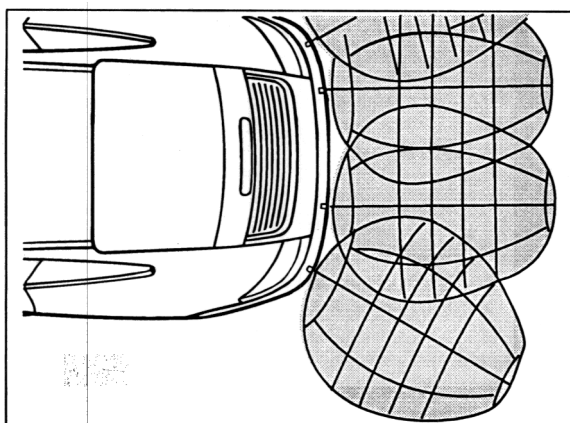
Vertical beam angle = 60°

The control module measures the distance between the sensor and any obstacle in cyclical intervals. Measurement is based on echo-sounding techniques.

The sensors are actuated briefly at regular intervals and transmit ultrasonic waves. Next, the sensors are switched to receive mode, and receive the reflecting soundwaves. The control module then calculates the distance between the sensor and the obstacle from the running time of the soundwaves.



450_98



451_98

Diagnosis

The following components are subject to cyclical monitoring when the ignition is on and the shift lever is in reverse gear:

Control module supply voltage

Sensor supply voltage

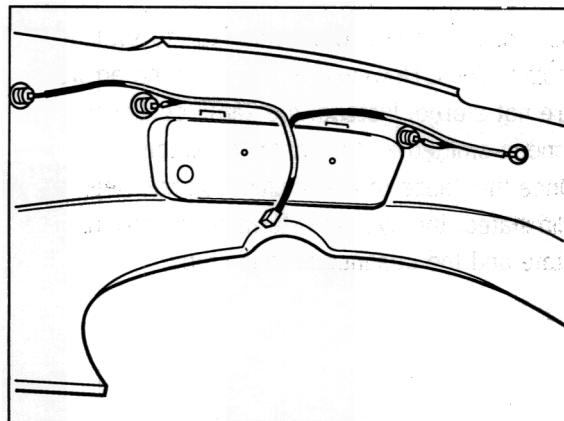
Function of all sensors

Function of control module
(transmission and reception pulses,
EEPROM)

Note

External environmental conditions such as ice, snow or dirt can also adversely affect the function of the sensors and lead to a fault being stored.

The four sensors are connected to the control module via a wiring harness incorporated in the rear spoiler. To replace the sensors or to perform tests, the rear spoiler must be removed.



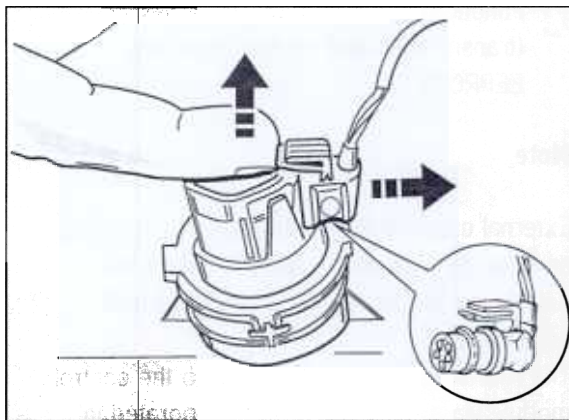
475_98

Pull off plug on the sensor

If a sensor has to be replaced, the electrical plug connection must first be disconnected.

Procedure

1. Lift the lower tab carefully with your finger.
2. Pull out the plug.



474_98

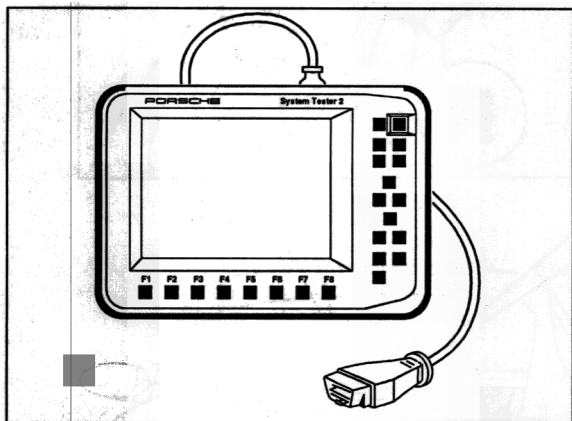
Note

Dirty or frost-covered sensors lead to system malfunctions. However, in this case the errors are not stored. Instead, the same continuous tone is emitted as for obstacle detection. Once the cause of the malfunction has been eliminated, the system returns to its normal state and the continuous tone stops.

Tools

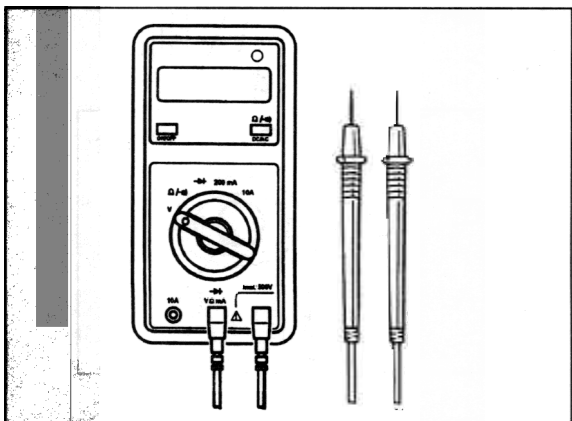
The following equipment is required for troubleshooting:

1. Porsche System Tester 2



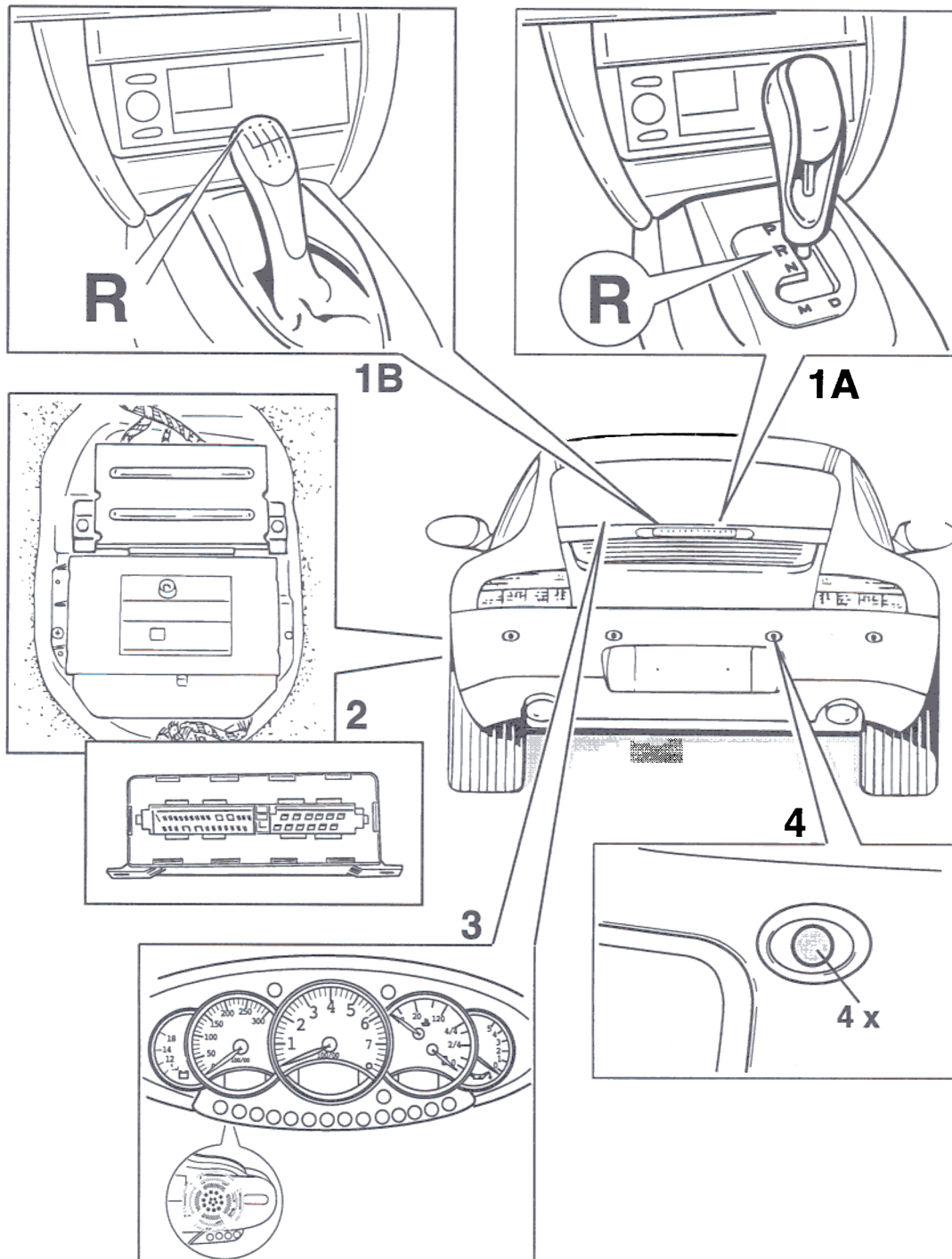
547_96

2. Commercially available digital multimeter



2178_28

Component arrangement



477_98

Function of individual components

[1A,1B]- Shift lever

The ParkAssistent is activated by moving the shift lever into reverse (shift lever position R) with the ignition switched on. The shift lever must be in reverse gear during diagnosis on this system, as otherwise the control module of the PST 2 cannot be read out.

[2]- Control module

The control module is installed under the driver's seat and is protected by means of a cover plate.

[3]- Loudspeaker in instrument cluster

The loudspeaker is integrated in the instrument cluster and is actuated by the ParkAssistent control module. The loudspeaker emits the following signals:

Signal type	Tone type
System readiness	0.5 sec. continuous tone, 1200 Hz.
Fault signal	Continuous tone whenever just switched on, 600 Hz.
Obstacle detection	Signal tone with tone break. Tone break is distance-dependent. Continuous tone from distance of 30 cm, 1200 Hz.

A ParkAssistent sensor together with holder consists of the following components:

[1]- Rosette

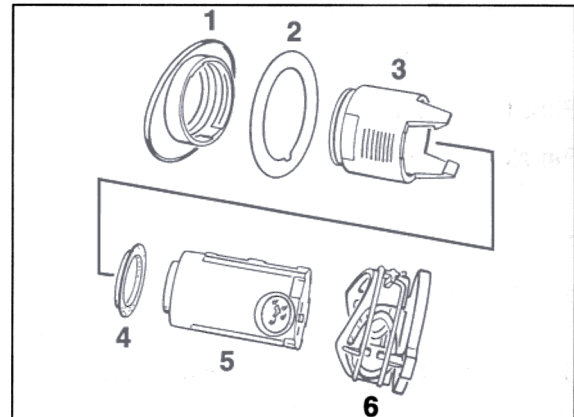
[2]- Washer

[3]- Sensor housing

[4]- Isolating ring

[5]- Sensor

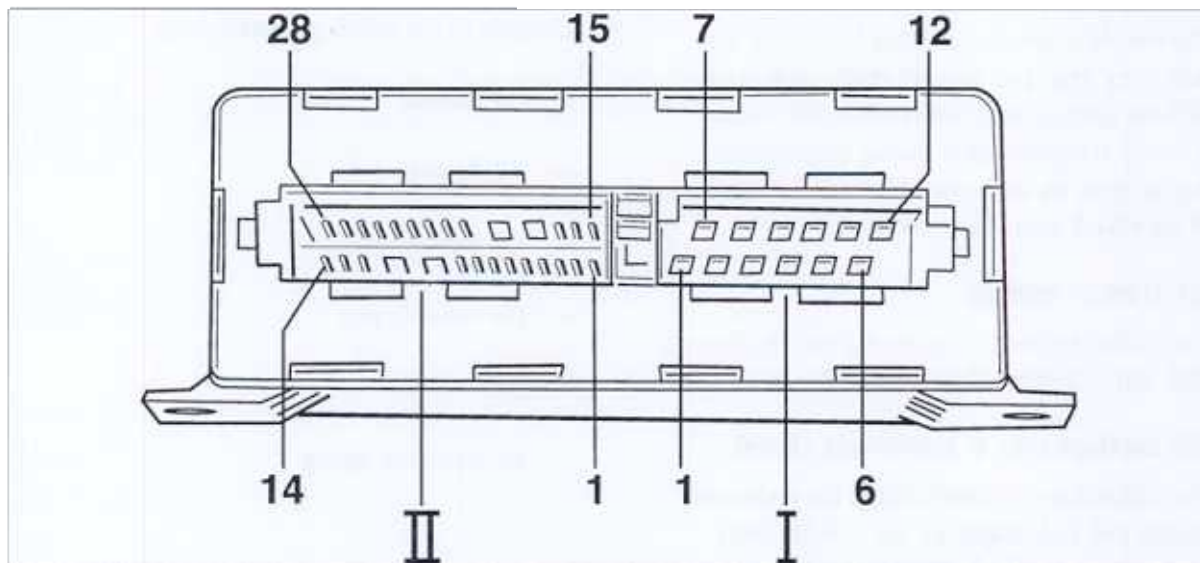
[6]- Retaining spring



410_97

[4]- Sensors for ParkAssistent

Four ultrasonic sensors are installed in the rear spoiler.

Connector assignment

488_98

Plug I (12-pole)

Pin No.	Designation
1	Signal from outer left sensor
2	Signal from inner left sensor
3	Signal from inner right sensor
4	Signal from outer right sensor
5	Sensor B+
6	Not used
7	Sensor ground

Pin No.	Designation
1	Signal from outer left sensor
2	Signal from inner left sensor
3	Signal from inner right sensor
4	Signal from outer right sensor
5	Sensor B+
6	Not used
7	Sensor ground

Plug II (28-pole)

Pin No.	Designation
1	Loudspeaker in instrument cluster
2	Not used
3	Diagnosis K-line
4 to 9	Not used
10	Terminal 31
11 to 17	Not used
18	Reverse gear signal
19 to 28	Not used

Pin No.	Designation
1	Loudspeaker in instrument cluster
2	Not used
3	Diagnosis K-line
4 to 9	Not used
10	Terminal 31
11 to 17	Not used
18	Reverse gear signal
19 to 28	Not used

Fault overview

Test point	Fault code	Fault effect	Page
1	1	System malfunction	91 - D 45
2	2	System malfunction	91 - D 45
3	3	System malfunction	91 - D 46
4	4	System malfunction	91 - D 46
5	5	System malfunction	91 - D 47
6	6	System malfunction	91 - D 48
7	7	System malfunction	91 - D 48
8	8	Fault memory	91 - D 49
9	9	Fault memory	91 - D 49
10	0	Fault memory	91 - D 50

Fault, Fault code**Possible causes, elimination, notes**

Test point 1

Outer right sensor faulty

Fault code 1

This fault is stored in the memory in the following cases:

1. Open circuit in supply lead to outer right sensor.
2. Short circuit to B+ in supply lead to outer right sensor.
3. Short circuit to ground in supply lead to outer right sensor.

Remedy:

Erase fault memory, move shift lever out of reverse gear and switch off ignition. Next, switch ignition back on, move shift lever into reverse and read out fault memory.

If the fault reappears, check the plug on the sensor for open circuit.

If no open circuit can be detected, check sensor plug, pin 1 to pin 4 and pin 1 to pin 2, for continuity using an ohmmeter. There should be no continuity.

If no short circuit can be detected, replace sensor.

Test point 2

Inner right sensor faulty

Fault code 2

This fault is stored in the memory in the following cases:

1. Open circuit in supply lead to inner right sensor.
2. Short circuit to B+ in supply lead to inner right sensor.
3. Short circuit to ground in supply lead to inner right sensor.

Remedy:

Erase fault memory, move shift lever out of reverse gear and switch off ignition. Next, switch ignition back on, move shift lever into reverse and read out fault memory.

If the fault reappears, check the plug on the sensor for open circuit.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

If no open circuit can be detected, check sensor plug, pin 1 to pin 4 and pin 1 to pin 2, for continuity using an ohmmeter. There should be no continuity.

If no short circuit can be detected, replace sensor.

Test point 3

Inner left sensor faulty

Fault code 3

This fault is stored in the memory in the following cases:

1. Open circuit in supply lead to inner left sensor.
2. Short circuit to B+ in supply lead to inner left sensor.
3. Short circuit to ground in supply lead to inner left sensor.

Remedy:

Erase fault memory, move shift lever out of reverse gear and switch off ignition. Next, switch ignition back on, move shift lever into reverse and read out fault memory.

If the fault reappears, check the plug on the sensor for open circuit.

If no open circuit can be detected, check sensor plug, pin 1 to pin 4 and pin 1 to pin 2, for continuity using an ohmmeter. There should be no continuity.

If no short circuit can be detected, replace sensor.

Test point 4

Outer left sensor faulty

Fault code 4

This fault is stored in the memory in the following cases:

1. Open circuit in supply lead to outer left sensor.
2. Short circuit to B+ in supply lead to outer left sensor.
3. Short circuit to ground in supply lead to outer left sensor.

Learning functions

Immobilizer

The immobilizer code can be entered under menu item *Learning functions/immobilizer* after the alarm control module is replaced.



Caution!

The immobilizer code cannot be deleted or changed again. An incorrect input will render the control module useless.

- > Input and check immobilizer code carefully.

Transponder key

A new remote control can be adapted for the vehicle under menu item *Learning functions/transponder key*. After the alarm system control module is replaced and the immobilizer code is entered, the old transponders can be adapted to the new control module (refer to *Teaching hand-held transmitter* on Page 90 - D 54 and *Reading out and transferring remote control* on Page 90 - D 57).

Remote control

Up to four remote controls can be adapted to the control module under menu item *Learning functions/remote control*. After the alarm system control module is replaced and the immobilizer code is entered, the old remote controls can be adapted to the new control module (refer to *Reading out and transferring remote control* on Page 90 - D 57 and *Teaching hand-held transmitter* on Page 90 - D 54).

Reading out remote controls

Under the menu item *Reading out remote controls*, the data of the remote controls can be read out after the alarm system control module is replaced. If it is not possible to read out and transfer the remote controls (e.g. no communication with the control module), the old remote controls can be adapted to the new control module (teaching hand-held transmitter).

Transferring remote controls

Under the menu item *Transferring remote controls*, the data read out from the remote controls can be transferred to the new control module.

Fault, Fault code

Possible causes, elimination, notes

Remedy:

Erase fault memory, move shift lever out of reverse gear and switch off ignition. Next, switch ignition back on, move shift lever into reverse and read out fault memory.

If the fault reappears, check the plug on the sensor for open circuit.

If no open circuit can be detected, check sensor plug, pin 1 to pin 4 and pin 1 to pin 2, for continuity using an ohmmeter. There should be no continuity.

If no short circuit can be detected, replace sensor.

Test point 5

Control module supply
voltage >16.5 V
or <9 V

Fault code 5

This fault is stored in the memory in the following cases:

1. Low vehicle voltage.
2. If there is a fault in the generator.

Remedy:

Examine battery and generator voltages.

Select **Control module supply voltage** and **Sensor supply voltage** in the *Actual values* menu item, and check the values with the vehicle in reverse gear and the engine running.

Displayed control module supply voltage approx. 12 V

Displayed sensor supply voltage approx. 8 V

Erase fault memory, move shift lever out of reverse gear and switch off ignition. Next, switch ignition back on, move shift lever into reverse and read out fault memory.

Teaching hand-held transmitter

General

Up to four hand-held transmitters can be adapted to the control module. The hand-held transmitter can be used to activate the central locking and the convertible top (for 996 Cabrio, country-specific version). Another function is the immobilizer by means of the integrated transponder coil.

Work preparation

The following information is required to teach the hand-held transmitter:

Key learning code from IPAS

24 digit Code No. (see barcode label on key grip)

If the key is stolen or the hand-held transmitter is faulty, all keys still in the customer's possession will be required.

Note:

During maintenance work, please bear in mind that the transmission frequency of the hand-held transmitter is different according to the country of use. The corresponding reception frequency is printed on the alarm system control module. This reception frequency is either:

433 MHz with M-number M534

or

315 MHz with M-number M535

Procedure

1. Connect the vehicle keys and the new hand-held transmitter and insert in the ignition.
2. Connect PST 2 and switch on ignition.

3. Select *Alarm system* in the menu and press the double arrow key [>>].
4. Select *Learning function* in the menu and press the double arrow key [>>].
5. Select menu item *Transponder key* and press the double arrow key [>>].
6. The following message appears on the screen: "Input key learning code". With the arrow keys [<] or [>], input the key learning code and press the double arrow key [>>].
7. The following message appears on the screen: "Please confirm input". Check the input and press the [F7] key to confirm the input.
8. Distinguish between loss and fault and additional hand-held transmitter for the transponder.

a) Teaching an additional hand-held transmitter

With the arrow key [>] select a free position (1, 2, 3 or 4) and press the [F8] key.

Now the transponder code is saved in the selected position. Note the **position** of the new transponder code.

- b) Teaching in the case of a lost or faulty hand-held transmitter:



Caution!

Risk of theft due to the lost hand-held transmitter !

- > It is essential to identify and delete the transponder code of the lost hand-held transmitter as described in step 8 b).
- > It is essential to identify and delete the radio code of the lost hand-held transmitter as described in step 12 b).

In this case, it is first necessary to identify and delete the stored transponder code of the lost hand-held transmitter. The remaining vehicle keys are required for this purpose. One after the other, insert the keys into the ignition lock, switch the ignition on and establish communication with the control module. **Current transponder** shows the transponder code of the vehicle key that is presently inserted in the ignition lock. Compare this transponder code with the transponder codes at positions 1 to 4. This comparison allows the position of the lost hand-held transmitter (transponder code) to be identified, as one transponder code is ultimately left over at positions 1 to 4. Insert the vehicle key equipped with the new hand-held transmitter into the ignition lock and switch on the ignition. Establish communication between the PST2 and the control module. Select the identified position using the arrow keys [↖] and [↗], then delete the transponder code with key [F3]. Then press the [F8] key.

9. Press the double arrow key [<<], select menu item *Remote control* and press the double arrow key [>>].

10. "Input key learning code" appears on the screen. With the arrow keys [↖] or [↗], input the key learning code and press the double arrow key [>>].

11. The following message appears on the screen: "Please confirm input". Check the input and press the [F7] key to confirm the input.

12. Distinguish between loss and fault and additional hand-held transmitter for the radio code.

- a) Teaching an additional hand-held transmitter

Select the same position (1 to 4) as for the transponder key and press the [F8] key.

- b) Teaching in the case of a lost or faulty hand-held transmitter:

In this case, it is first necessary to identify and delete the stored "radio code" of the lost hand-held transmitter. The remaining hand-held transmitters are required for this purpose. Press the locking button on the hand-held transmitter and then insert the vehicle key into the ignition lock, switch on the ignition and re-establish communication with the control module. **Current radio key** shows the "radio code" of the vehicle key that is presently inserted in the ignition lock.

Compare this radio code with the radio codes at positions 1 to 4. This comparison allows the position of the lost hand-held transmitter (radio code) to be identified, as one "radio code" is ultimately left over at positions 1 to 4.

Insert the vehicle key equipped with the new hand-held transmitter into the ignition lock and switch on the ignition. Establish communication with the control module. Select the identified position using the arrow keys [↖] and [↗], then delete the radio code with key [F3]. Then press the [F8] key.

13. Carefully input the 24 digit code number with the arrow keys [↖] or [↗] and press the double arrow key [→→].
14. The following message appears on the screen: "Please confirm input". Check the input and press the [F7] key.
15. Now the hand-held transmitter is taught. Go back to the menu item *Learning function*, remove the key and switch on the ignition again. Once the key has been removed again, the hand-held transmitter is ready for use. Check hand-held transmitter for operation.

Reading out and transferring remote control

General

When replacing the alarm system control module, it is possible to read out remote controls from the old control module and transfer them to the new control module. In this way, the hand-held transmitters (remote controls and transponders) can be retained. In other words, it is not necessary to change the hand-held transmitter when replacing the alarm system control module.

Requirement:

- Communication can be set up between the PST2 and alarm system control module.

The remote controls and transponder coils are correct and functional.

Note:

When the remote control is read out and transferred, only the **remote control data** are read out and transferred.

The transponder coil of the individual keys must be adapted to the control module. Four positions are available for this purpose in menu item *Transponder key*. This function is described from step 19 onward.

Work preparation:

The following information is required from the IPAS for reading out and transferring remote controls:

Key learning code

Immobilizer code

Procedure:

1. Connect PST2 to the data link connector, and switch on the ignition.
2. Switch on the PST2, select vehicle type 911 (1996) and start the automatic control module search with the double arrow key [>>].
3. After a brief search, the PST2 reports: "Fault memory reading completed".
4. Select *Alarm system* in the menu and press the double arrow key [>>].
5. Select *Learning functions* from the selection list and press the double arrow key [>>].
6. Select menu item *Read out remote control* and press the double arrow key [>>].
7. The following message appears on the screen:
"Input key learning code".
Input the key learning code with the arrow keys [v] or [^] and press the double arrow key [>>].
8. The following message appears on the screen:
"Please confirm input".
Check the input key learning code and press the key [F7].
9. The following message appears on the screen:
"Remote controls were read out". Press the double arrow key [<<] twice to change to the control module overview. Switch the ignition off, remove the old control module, install the new control module and switch the ignition on again.



Comparison table of input signals

The following table shows a comparison point to the data read out from PST 2 on the vehicle, and should simplify diagnosis and troubleshooting.

Boundary conditions

- Both doors closed

Ignition switched on

Central locking system variant code in variant 4

Doors not locked

Switch position	Text
open	radio contact open
open	input 1 open
closed	terminal 15 signal available
closed	alarm horn connected
closed	driver's side not secured
closed	passenger's side not secured
closed	driver's side not locked
closed	passenger's side not locked
open	doors on driver's side closed
open	doors on passenger's side closed
open	door lock barrel not actuated
open	central locking system not actuated

Switch position	Text
closed	terminal 86 S signal available
closed	immobilizer active
open	signal from airbag not available
open	front luggage compartment closed (front lid)
open	rear luggage compartment closed (rear lid)
open	convertible top/sliding roof closed
open	oddments tray open
open	convertible top compartment lid open
open	button 1 on the radio transmitter not actuated
open	button 2 on the radio transmitter not actuated

Note

The information in the comparison table applies for vehicles with the safe function. The safe function is not provided for all countries (e.g. USA). In this case *Driver's side secured* and *Passenger's side secured* will be displayed in the PST 2. In vehicles with the safe function, this display would indicate an error in the door lock module or its wiring.

Actual values

In the *Actual values* menu item, the current values of the following parameters can be read out:

Tiptronic

Vehicle speed

Speed

Supply voltage

Brightness sensor

Total mileage

Trip mileage

Tank content sensor value

Tank content display

Coolant temperature

Average consumption

Average speed

Outside temperature sensor value

Outside temperature display

Range on remaining fuel

Extract coding

In the menu item *Extract coding*, the following coding is displayed:

- | | |
|-----------------------|-----------------------|
| 1. Mileage: | miles (kilometres) |
| 2. Clock mode: | 12 h (24 h) |
| 3. On-board computer: | present (not present) |
| 4. Stop light switch | PSM ABS |

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type 911 (996) and start the automatic control module search
3. Select *Instrument cluster* control module
4. Select menu item *Extract coding*
5. Extract individual coding

Modify coding

In the menu item *Modify coding*, the following coding can be changed:

- | | |
|----------------------|-----------------------|
| 1. Mileage: | miles (kilometres) |
| 2. Clock mode | 12 h (24 h) |
| 3. On-board computer | present (not present) |
| 4. Stop light switch | PSM / ABS |

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type 911 (1996) and start the automatic control module search.
3. Select *Instrument cluster* control module
4. Select menu item *Modify coding*
5. Select Coding from the function selection
6. Follow the instructions of the diagnostic tester
7. Confirm with the Coding (F8) key
8. Ignition off
9. Ignition on (coding is adopted)

Note:

Incorrect coding of the stop light switch leads to malfunctions in the instrument cluster. The warning lights for ABS or brake fluid level are triggered continuously.

Total mileage

In the menu item *Total mileage*, the total mileage can be transferred to a new instrument cluster after a faulty instrument cluster is replaced.

Work preparation:

1. Read out and record Vehicle Identification Number
2. Read off and note the total mileage in the old instrument cluster

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type 911 (1996)
3. Select *Instrument cluster* control module
4. Select menu item *Total mileage*
5. Enter Vehicle Identification Number and confirm again
6. Enter total mileage and check
7. Press the F8 button (Coding)

Country coding

The following country versions can be coded under menu item *Country coding*:

1. RoW
2. Canada
3. Saudi Arabia
4. Japan

Incorrect coding leads to malfunctions such as missing acoustic signals.



91 01

Diagnosis/troubleshooting

PCM

System N 01

Contents overview

Information

Member overview the possible

Component element

action individual its

definition

Tool:

connect assignment display and operator unit

connect pin assignment navigation

identification

entry (overview of possible results)

point

factory

Actual value

live links

ion

load code

General information

The PCM is protected against theft by a device code. Furthermore, the integrated navigation system is also protected by a code against unauthorized users.

Both codes must be input when the system is commissioned at the factory or after replacement of the display and operator control unit **and** the navigation unit. In both cases, the code for the PCM must be input first.

Only the NAVI code has to be input again after the navigation system has been exchanged.

Only the PCM code has to be input again after an interruption in the continuous power supply (e.g. when the battery is changed) if both codes were input correctly before the interruption.

Code input

1. Switch on the PCM.
2. The prompt to input the PCM code appears.
3. The max. 4-digit device code number is input and confirmed using the right-hand knob. Rotate knob to position the selection pointer to the option **PCM** and press. Select the digits by turning and confirm by pressing the knob. After entering the PCM code, select the option **Confirm**.
4. After input of the PCM code, the NAVI code can be input analogously in order to activate the navigation system. If the NAVI code is not input, the remaining system functions (telephone, on-board computer, audio system, main display and A/C display) are nevertheless available.

5. Correction of incorrect inputs:

If an incorrect digit is input, position the selection pointer to **Correction** and press the knob:

< 1 sec.: Last digit input is deleted.

> 1 sec.: Entire content of the input field is deleted.

Then continue with correct input.

If the wrong code was input

The system is locked up for around 10 minutes if an incorrect code was entered three times. Another three incorrect inputs lock up the system for an additional 10 minutes. After another three incorrect inputs (i.e. after a total of nine unsuccessful attempts), the lock-up time increases to 60 minutes (this also applies to all further groups of three incorrect inputs). However, the emergency-call function of the PCM system always remains available.

Activating the PCM

Vehicles leaving the factory are delivered with deactivated PCM in order to protect the battery. The PCM must be activated before delivery to the customer.

1. Connect Porsche System Tester 2.
2. Select vehicle type 911 Carrera (996) and start control module search.
3. Select PCM.
4. Select Modify coding.
5. Select PCM active.
6. Code PCM active with the F8 key.

Menu

Overview of the possible menus

Identification

Fault memory

Erase the fault memory

Actual values

Input signals

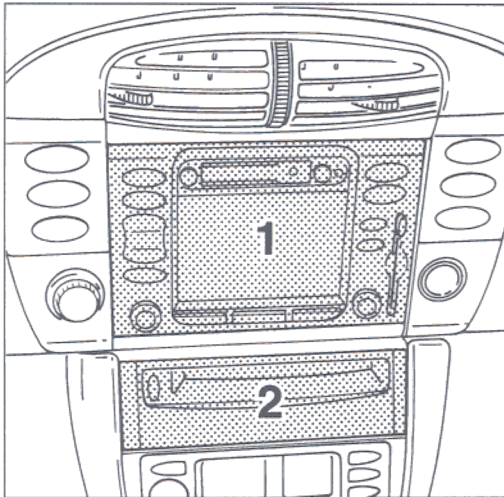
Interface status

Drive links

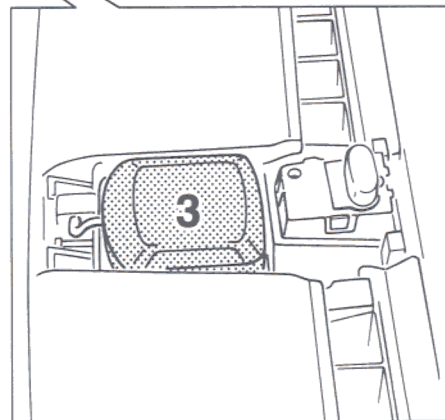
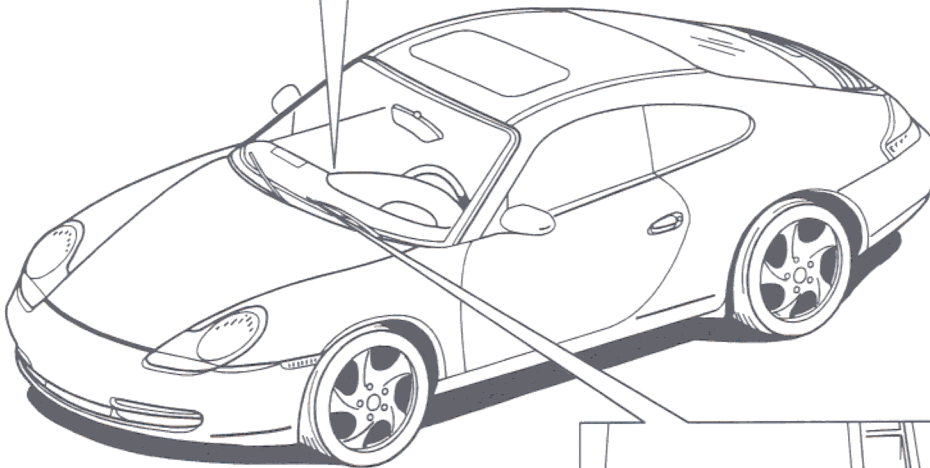
Position

Modify coding

Component arrangement



1/2



Function of individual components

1. Display and operator control unit

The display and operator control unit is the main part of the PCM system.

It is operated with a so-called dial. A function shown on the display can be selected by turning this dial and activated by pressing it.

2. Navigation unit

The navigation unit is located below the operator control unit. It contains a CD-ROM with special map data, which allow the navigation system to orient itself in the road network.

3. GPS antenna

Signals of the "Global Positioning System (GPS)" are received to determine the position of the vehicle.

The GPS antenna is located in the centre of the dashboard and in front of the sun sensor. The GPS antenna is covered by a cover.

System description

Basic functions of the PCM

Audio (tuner with cassette drive)

GSM telephone with SIM card reader

Navigation

On-board computer

A/C display

In addition to the station-search function, the system also has an autostore function in FM operation. This function assigns the station buttons and automatically adds the station names described above so that they are permanently visible.

The main pages for all audio sources include the item **Set.** If this item is selected, the system offers adjustment possibilities for treble, bass, balance, fader, speed-dependent volume control (GAL) and loudness.

Navigation

The highly accurate satellite-based navigation system permits rapid and sure guidance to an input destination in areas for which a digitized road map on CD-ROM is available. Route guidance is realised by means of driving instructions with voice output in various selectable national languages, supported by arrow or map displays on the screen.

If the Digital Sound Processor (DSP) option has been installed, further functions for optimum sound adjustment are available.

In this case, it is possible to select conventional treble/bass adjustment or a 7-band equalizer. Furthermore, high-fidelity audio patterns can be selected. Finally, the user can also define individual audio patterns according to his or her own taste.

Audio

Buttons for selecting the various audio sources (AM/FM tuner, cassette, CD) are located on the left side of the front panel.

The RDS names of the stations of the current memory level stored at the station buttons are shown on the function display offered during FM radio operation. The desired station can thus be selected quickly.

Telephone

The GSM telephone offered for the European region fulfills all demands with regard to practical operation, voice transmission and reception sensitivity.

Individual functions:

GSM telephone with 2 W transmission power

Digital handsfree use (echo compensation) via the audio loudspeakers and an external handsfree microphone

Audio mute function during a conversation in handsfree mode

Integrated SIM card reader

Emergency call possible even without SIM card

Separate passive handset can be connected

SMS (Short Message Service) reception with the possibility of directly selecting telephone numbers present in the message section

Manual dialling

Telephone directory:
External telephone number memory on SIM card (with/without name)

Memory for frequently used numbers:
for seven numbers of the telephone directory (the data of up to five different SIM cards are stored)

The five numbers most recently called can be stored on the SIM card

Redial function (at the push of a button)

Volume adjustment during a conversation via volume control

Visual and audible call signal

Telephone numbers of incoming calls are displayed (if available in the network); the associated name is also displayed if an entry exists in the directory.

Telephone number of the outgoing call is displayed

Duration of the conversation is displayed

Network operator and field strength are displayed

Existing network operators are displayed; manual or automatic selection is possible

PIN query can be switched on/off (if supported by service provider), PIN can be input/changed

Copying and rental of phone cards.

On-board computer

Some functions of the on-board computer display are linked with the data of the navigation unit: The time is set automatically according to the data determined by the GPS receiver; thus, the only work required involves setting the time zone once.

The route to the destination is known if the route guidance function is activated in the navigation unit. The length of this route is displayed as the distance to the destination. The range display allows an estimate about whether the fuel supply is adequate for the remaining distance.

The estimated time of arrival is calculated on an individual basis according to the driving style and the planned route: The navigation unit informs the on-board computer about the different road categories along the route and the length of these road sections.

The on-board computer calculates a different individual average driving speed for each road category. This information is used to calculate the planned time of arrival – if no traffic-related delays occur – on an individual basis.

The on-board computer also supplies standard information, for instance the average consumption, average speed, distance travelled, and elapsed driving time. The outside temperature is adopted from the instrument cluster. It is possible to set a limit that triggers a visual and audible speed warning.

It is also possible to switch to different units of measure and languages and adjust the display contrast.

The A/C function is limited to the display of data transferred from the air-conditioning regulator.

Fan setpoint

Passenger compartment temperature
setpoint

Air distribution

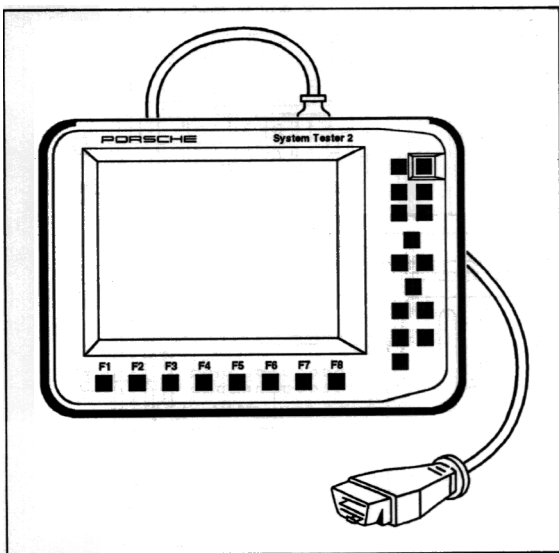
Status display (automatic system,
defroster, A/C compressor, air circulation)

The display is activated automatically whenever a manual adjustment is made on the air conditioning regulator or the A/C function is specifically selected.

Tools

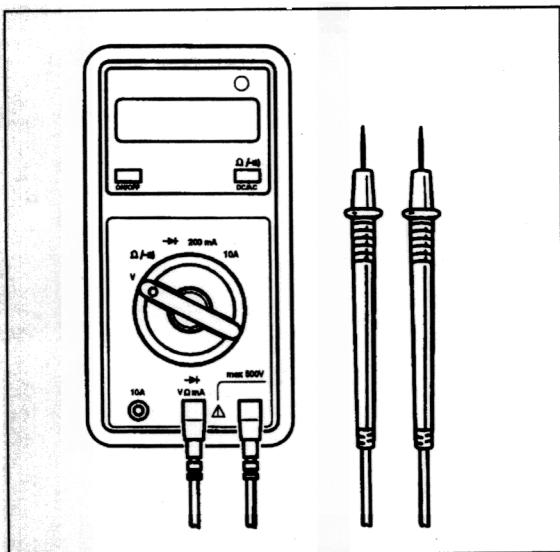
The following equipment is required for troubleshooting:

1. Porsche System Tester 2



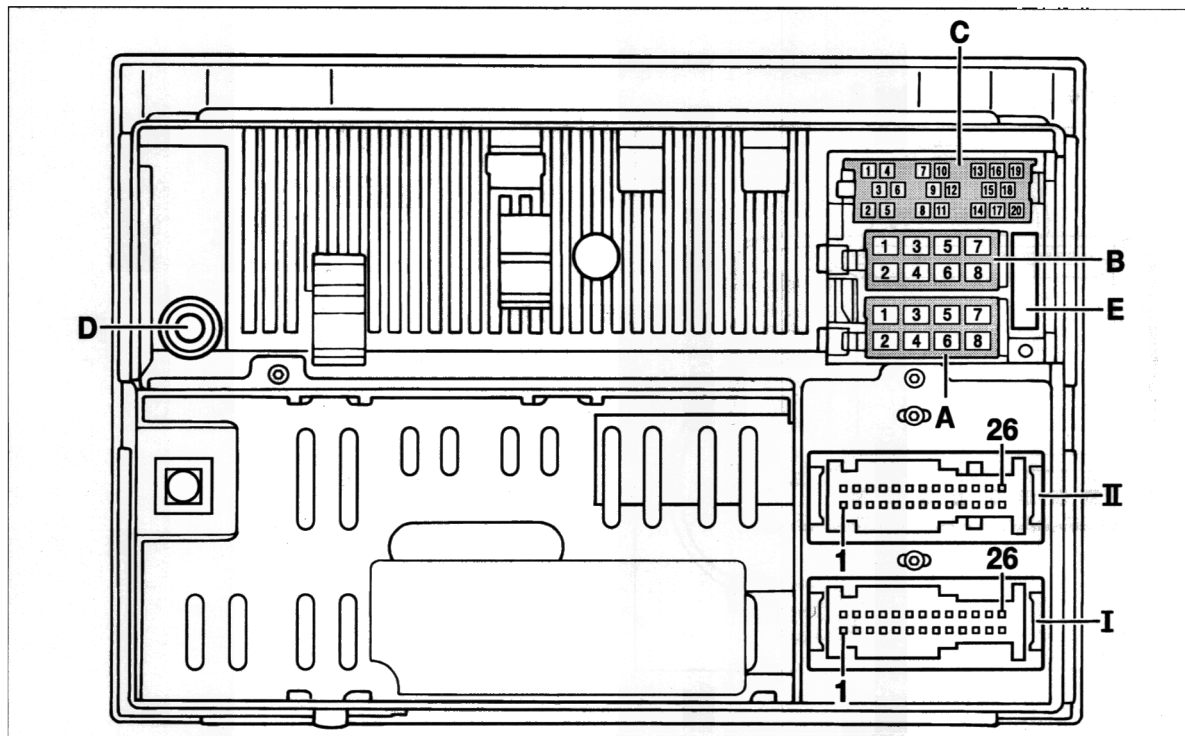
547-96

2. Commercially available digital multimeter



2178-28

Connector pin assignment, display and operator control unit



565_97

Plug A

- 1 – Speed signal
- 2 – Free
- 3 – Free
- 4 – Terminal 30
- 5 – Terminal 30 for windscreen antenna
- 6 – Free
- 7 – Free
- 8 – Terminal 31

Plug B

- | | |
|--------------------------------|-------------------|
| 1 – Loudspeaker, rear right + | 15 – Free |
| 2 – Loudspeaker, rear right – | 16 – Free |
| 3 – Loudspeaker, front right + | 17 – Free |
| 4 – Loudspeaker, front right – | 18 – CD AF ground |
| 5 – Loudspeaker, front left + | 19 – CD AF, left |
| 6 – Loudspeaker, front left – | 20 – CD AF, right |
| 7 – Loudspeaker, rear left + | |
| 8 – Loudspeaker, rear left – | |

Note

Plug B is assigned only if no amplifier is installed.

Plug C

- 1 – Line out, rear left
- 2 – Line out, rear right
- 3 – AF ground
- 4 – Line out, front left
- 5 – Line out, front right
- 6 – Terminal 30 for amplifier
- 7 – Control lead for CD changer
- 8 – Terminal 30 for CD changer
- 9 – Free
- 10 – Data lead
- 11 – Clock lead
- 12 – Reset lead
- 13 – Free
- 14 – Free

Note

Plug C consists of 3 parts.

Pins 1 to 6 : yellow housing.
 Pins 7 to 12 : green housing.
 Pins 13 to 20 : blue housing.

Pins 1 to 6 are the loudspeaker outputs to the amplifier. They are assigned only if an amplifier is installed.

Pins 7 to 12 are the control leads for the CD changer.

Pins 18 to 20 are the loudspeaker outputs of the CD changer.

Pins 7 to 20 are assigned only if a CD changer is installed.

D-Antenna lead**E-Fuse**

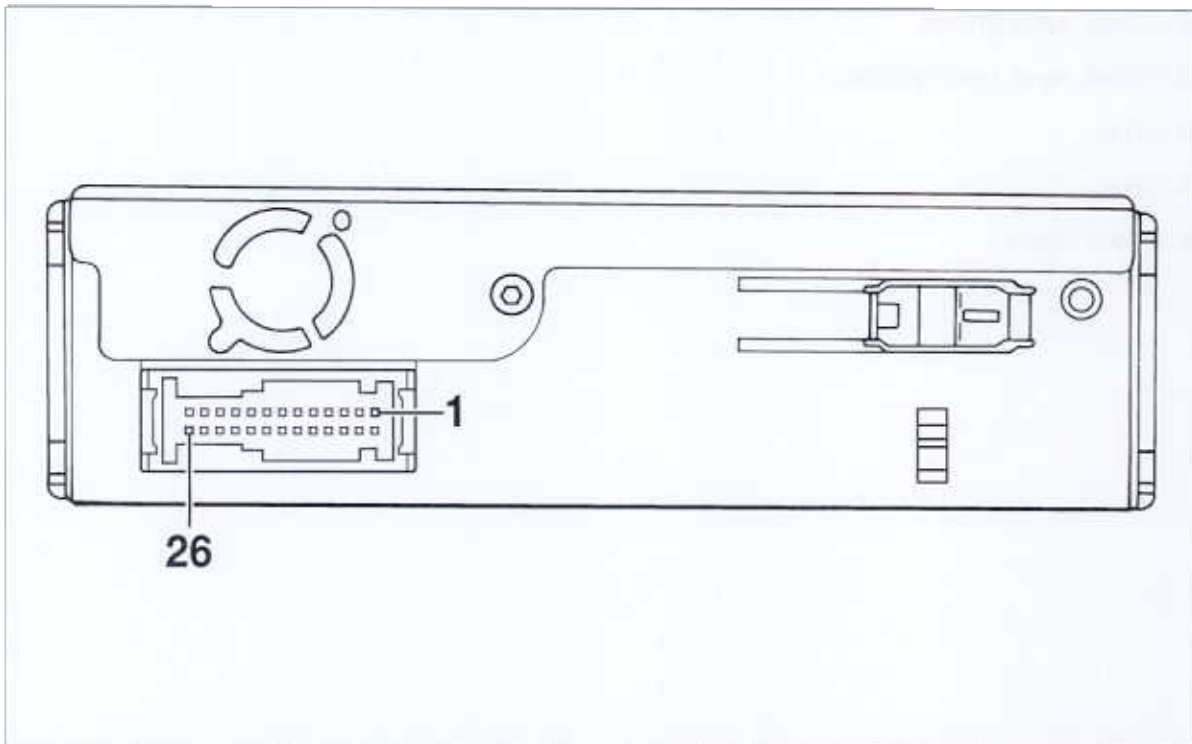
Plug I

- 1 – Video signal, red
- 2 – Video signal, green
- 3 – Free
- 4 – Free
- 5 – Free
- 6 – Terminal 31
- 7 – Free
- 8 – Free
- 9 – Free
- 10 – Terminal 30 for navigation
- 11 – Terminal 58 d
- 12 – Free
- 13 – Terminal 30
- 14 – Video signal, blue
- 15 – Video signal synchronisation
- 16 – Video signal ground
- 17 – Free
- 18 – Free
- 19 – Terminal 31
- 20 – To combination plug III pin 6
- 21 – From combination plug III pin 11
- 22 – Free
- 23 – Fuel consumption signal
- 24 – Speed signal
- 25 – Free
- 26 – Terminal 30

Plug II

- 1 – Diagnosis lead
- 2 – Terminal 15
- 3 – Terminal 86 s
- 4 – Data lead to navigation unit
- 5 – Free
- 6 – DSP (amplifier) ground
- 7 – Handsfree microphone ground
- 8 – Handset microphone
- 9 – Handset speaker
- 10 – Terminal 30, handset
- 11 – Free
- 12 – Voice output ground
- 13 – Voice output
- 14 – DSP (amplifier)
- 15 – Data lead from the heater / A/C unit
- 16 – Free
- 17 – Data lead from the navigation unit
- 18 – Free
- 19 – Free
- 20 – Handsfree microphone
- 21 – Handset ground
- 22 – Handset on-hook contact
- 23 – Free
- 24 – Free
- 25 – Free
- 26 – Free

Connector pin assignment, navigation unit



566_97

- | | |
|--|--------------------------|
| 1 – Terminal 31 | 10 – Video signal, blue |
| 2 – Terminal 30 | 11 – Free |
| 3 – Speed signal | 12 – Free |
| 4 – Reverse-gear signal | 13 – Voice output ground |
| 5 – Data lead from the display and operator control unit | 14 – Terminal 30 |
| 6 – Free | 15 – Free |
| 7 – Data lead to the display and operator control unit | 16 – Free |
| 8 – Video signal, red | 17 – Free |
| 9 – Video signal, green | 18 – Free |
| | 19 – Terminal 58 d |

20 – Free

21 – Free

22 – Video signal ground

23 – Video signal synchronisation

24 – Free

25 – Free

26 – Voice output

Identification

The part numbers for the display and operator control unit and for the navigation unit can be read out with menu item **Identification**.

Fault memory

Overview of possible faults

Data lead, air conditioner-PCM

Data lead, navigation unit-PCM

Data lead, PCM-navigation unit

Data lead, DSP-PCM

Speedometer A, navigation unit

Signal, reverse gear-navigation unit

Antenna, navigation unit

Data lead, PCM-instrument cluster

Data lead, instrument cluster-PCM

Vehicle data record

Program memory

Signal, terminal 15 PCM

Signal, terminal 86 s PCM

Navigation, CD fault

Control module faulty/navigation unit

Navigation fault, gyro

Control module faulty/navigation unit

Connection to audio module

Telephone, internal fault

Connection to telephone

Write error, Flash

Video interface

Fault, memory interface

Fault, photo sensor

Control module faulty

Note

Faults can be stored during initialisation of the PCM if all plugs are not connected.

If a fault appears under Environmental Condition in combination with an unrealistic date, e.g. 7 Feb. 36, the fault was stored at a time at which there was not yet any satellite reception.

The faults are stored only during the phase after terminal 86 s has been disconnected.

ult overview

Test point	Fault code	Fault effect	Page
	20	Climatic fan speed	
		No route guidance	
		No route guidance	
		No function	
		ate position terminated	24
		Reversing received	24
		teletext reception	
		date temperature display	26
			26
		function	
		route guidance	
		te guidance	
		audio station	
		telex function	
		telex function	

Test point	Fault code	Fault effect	Page
20	39	No screen display	91 - D 30
21	40		91 - D 30
22	41		91 - D 30

Fault, fault code	Possible causes, elimination, notes
Test point 1	
Data lead, air conditioner	
-PCM	
Open circuit/short to ground	Open circuit/short to ground
Short to B+	1. Pull off plug II on the display and operator control unit.
Signal disturbance	2. Pull off plug C on the heater / A/C control unit.
Fault code 20	3. Check lead from plug II pin 15 to plug C 12 for continuity and short to ground.
	Note
	The lead is routed via the 10-pole plug connection on the heater/ A/C unit.
	Short to B+
	1. Pull off plug II on the display and operator control unit.
	2. Pull off plug C on the heater / A/C control unit.
	3. Check lead from plug II pin 15 to plug C 12 for short to B+.
	Signal disturbance
	Check wiring harness for short with other leads.

Fault, fault code	Possible causes, elimination, notes
Test point 2 Data lead, navigation unit-PCM Open circuit/short to ground Short to B+ Signal disturbance Fault code 21	Open circuit/short to ground <ol style="list-style-type: none">1. Pull off plug II on the display and operator control unit.2. Pull off plug on the navigation unit.3. Check lead from navigation unit plug pin 7 to plug II pin 17 for continuity and short to ground. Short to B+ <p>Pull off plug II on the display and operator control unit.</p> <ol style="list-style-type: none">2. Pull off plug on the navigation unit.3. Check lead from navigation unit plug pin 7 to plug II pin 17 for short to B+. Signal disturbance <p>Check lead from navigation unit plug pin 7 to plug II pin 17 for short with other leads.</p>

Fault, fault code**Possible causes, elimination, notes****Test point 3**

Data lead,
PCM-navigation unit
Short to ground
Short to B+

Fault code 22**Short to ground**

1. Pull off plug II on the display and operator control unit.
2. Pull off plug on the navigation unit.
3. Check lead from navigation unit plug pin 5 to plug II pin 4 for short to ground.

Short to B+

1. Pull off plug II on the display and operator control unit.
2. Pull off plug on the navigation unit.
3. Check lead from navigation unit plug pin 5 to plug II pin 4 for short to B+.

Test point 4

Data lead, DSP-PCM
Open circuit/short to ground
Short to B+
Signal disturbance

Fault code 23**Open circuit/short to ground**

1. Pull off plug II on the display and operator control unit.
2. Pull off plug I (18-pole) on the amplifier.
3. Check lead from plug II pin 14 to plug I pin 17 for continuity and short to ground.

Short to B+

1. Pull off plug II on the display and operator control unit.
2. Pull off plug I (18-pole) on the amplifier.
3. Check lead from plug II pin 14 to plug I pin 17 for short to B+.

Fault, fault code	Possible causes, elimination, notes
<p>Signal disturbance</p> <p>Check lead from plug II pin 14 to plug I pin 17 for short with other leads.</p> <p>Test point 5 Speedometer A, navigation unit Open circuit/short to ground/short to B+ Fault code 24</p>	<p>Signal disturbance</p> <p>Open circuit/short to ground/short to B+</p> <ol style="list-style-type: none"> 1. Pull off plug on the navigation unit. 2. Pull off plug I on the instrument cluster. 3. Check lead from navigation unit plug pin 3 to plug I pin 13 for continuity and short to ground or short to B+. <p>Note</p> <p>The lead is routed via jumper plug 1 on relay carrier 1</p>
<p>Test point 6 Signal, reverse gear-navigation unit Signal implausible Fault code 25</p>	<p>Signal implausible</p> <ol style="list-style-type: none"> 1. Check reversing light switch or, on Tiptronic vehicles, position switch. 2. Check lead from navigation unit plug pin 4 to the reversing light switch or position switch for short circuit to B+. <p>Note</p> <p>The lead is routed via plug connection X 2/4 and via the jumper plug 20/1 on relay carrier 2.</p>

Fault, fault code**Possible causes, elimination, notes**

Test point 7

Antenna, navigation unit

Open circuit

Fault code 26**Open circuit**

1. Check whether plug connection of the antenna lead is securely locked.
2. Check whether plug connection of the antenna lead on the navigation unit is securely locked.
3. Check continuity of the antenna lead.

Test point 8

Data lead,

PCM-instrument cluster

Short to ground

Short to B+

Fault code 27**Short to ground**

1. Pull off plug I on the display and operator control unit.
2. Pull off plug III on the instrument cluster.
3. Check lead from plug I pin 20 to plug III pin 6 for short to ground.

Short to B+

1. Pull off plug I on the display and operator control unit.
2. Pull off plug III on the instrument cluster.
3. Check lead from plug I pin 20 to plug III pin 6 for short B+.

Fault, fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Test point 9

Data lead, instrument cluster-PCM

Open circuit/short to B+

Short to ground

Signal disturbance

Fault code 28

Open circuit/short to B+

1. Pull off plug I on the display and operator control unit.
2. Pull off plug III on the instrument cluster
3. Check lead from plug I pin 21 to plug III pin 1 for continuity and short to B+.

Short to ground

1. Pull off plug I on the display and operator control unit.
2. Pull off plug III on the instrument cluster.
3. Check lead from plug I pin 21 to plug III pin 11 for short to ground.

Signal disturbance

Check lead from plug I pin 21 to plug III pin 11 for short with other leads.

Test point 10

Vehicle data record

Programming error

Fault code 29

1. Select menu item `Modify coding`.
2. Select `Vehicle model`
3. Modify coding from LHD vehicle (RHD vehicle) to RHD vehicle (LHD vehicle).
4. Modify coding from RHD vehicle (LHD vehicle) to LHD vehicle (RHD vehicle).

If the fault appears again, replace the display and operator control unit.

Fault, fault code**Possible causes, elimination, notes****Test point 11**

Program memory
Programming error

Fault code 30

1. Remove CD from navigation unit.

2. Switch off PCM.

3. Switch on PCM and insert CD.

4. Clear fault memory.

5. Read out fault memory

If the fault appears again, insert a different CD (older version).

6. Switch off PCM.

7. Switch on PCM.

8. Clear fault memory.

9. Read out fault memory

If the fault appears again, replace the display and operator control unit.

Test point 12

Signal, terminal 15 PCM
Open circuit

Fault code 31

Note

This fault is stored only if the vehicle is driven faster than 50 km/h for more than 10 seconds.

1. Check fuse E 8.

2. Pull off plug II on the display and operator control unit.

3. Connect voltmeter to plug II pin 2 (positive) and ground.
Switch on ignition. Display: Battery voltage.

Fault, fault code	Possible causes, elimination, notes
Test point 13 Signal, terminal 86 s PCM Open circuit Fault code 32	Note This fault is stored only if the ignition is switched on for at least 1 minute. 1. Check fuse E 1 2. Pull off plug II on the display and operator control unit. 3. Connect voltmeter to plug II pin 3 (positive) and ground. Switch on ignition. Display: Battery voltage. Note The lead is routed via jumper plug 13/1 on relay carrier 1
Test point 14 Navigation, CD fault CM faulty/navigation unit Value range Fault code 33	Replace navigation unit.
Test point 15 Navigation fault, gyro CM faulty/navigation unit Value range Fault code 34	Replace navigation unit.



Fault, fault code**Possible causes, elimination, notes**

Test point 16

Connection to
audio module

Value range

Fault code 35

Replace display and operator control unit.

Test point 17

Telephone, internal
fault

Value range

Fault code 36

Replace display and operator control unit.

Test point 18

Connection to
telephone

Value range

Fault code 37

Replace display and operator control unit.

Test point 19

Write error, Flash

Value range

Fault code 38

Replace display and operator control unit.

Fault, fault code	Possible causes, elimination, notes
Test point 20 Video interface Value range Fault code 39	Replace display and operator control unit.
Test point 21 Fault, memory interface Value range Fault code 40	Replace display and operator control unit.
Test point 22 Fault, photo sensor Control module faulty Value range Fault code 41	Replace display and operator control unit.

Erasing fault memory

Note

The fault memory can be erased only if it was first read out at least once.

The entire fault memory is always erased.

Actual values

Values currently under test can be read out via this menu item.

The following values (setpoints in brackets) can be called up:

Speed

Current fuel consumption

Phototransistor PCM (0-255)

0 : Maximum brightness

255 : Minimum brightness

Date

Time

Dial, left [volume control] (up/down-counter)

Dial, right [selection knob]
(up/down-counter)

- * The counter is set to zero after the start of diagnosis. The counter is incremented by one when the dial is turned clockwise and decremented by one when the dial is turned counter-clockwise.

Input signals

Input signals of the PCM can be read in with this menu item. This allows the function of the input signals to be assessed very quickly.

The following input signals can be read in:

Signal, terminal 86 s

Signal, terminal 15

Signal, terminal 58 d

Signal, DSP on

Signal, terminal 15 Navi

Signal, terminal 15 Tel

Signal, TV on

Signal, hook-on/off*

CC button

CD button

FM button

AM button

Station button 1

Station button 2

Station button 3

Station button 4

Station button 5

Station button 6

Search left button

Search right button

Pressure contact, left dial

Main button

Audio button

Tel button**

Navi button**

BC button

AC button

Pressure contact, right dial

Map button

Dark button

Repeat button

Handset/Info button

Eject button

1-2 direction change

* Telephone handset contact

**Only Navi button on USA vehicles

Interface status

Connections to other systems can be checked with this menu item.

The following connecting leads can be checked:

- Data lead, air conditioner-PCM

- Data lead, navigation system-PCM

- Data lead, PCM-navigation system

- Data lead, DSP-PCM

- Data lead, PCM-instrument cluster

- Data lead, instrument cluster-PCM

- Speedometer A, navigation unit

- Signal, reverse gear-navigation unit

Drive links

Drive links of the PCM can be activated with this menu item. This allows the function of the drive links to be assessed very quickly.

The following drive links can be controlled:

Display colour black

Display colour red

Display colour green

Display colour blue

Display colour white

Note

The activated drive link is automatically switched off after approximately 20 seconds.

Position

The current location (latitude, longitude) can be read out with this menu item.

Modify coding

The PCM can be coded on a country-specific basis with this menu item.

The following items can be set on an individual basis:

Vehicle model (LHD vehicle, RHD vehicle)

Language (driving instructions in German, English (GB/USA), French, Italian, Spanish)

Temperature (°C, °F)

Fuel consumption (l/100 km, mls/gal, mpg, km/l)

Distance (kilometres, miles)

Clock (12 hours, 24 hours)

Time zone (CET, GMT, Atlantic, Eastern, Central, Mountain, Pacific, Tokyo)

PCM active (active, not active)

Note

The state (active or inactive) is not indicated. Whether or not the PCM is active can be determined only by switching on the PCM.

94 92 **Diagnosis/troubleshooting HBA**

Diagnosis/Troubleshooting

HBA

System HBA 01

Contents overview

Menu (overview of the possible menus)	94 - D 3
Introduction	94 - D 4
General information on the fault memory	94 - D 5
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Function of individual components	94 - D 8
System description	94 - D 9
Connector assignment	94 - D 10
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Checking the actual values	94 - D 21

Menu

Overview of possible menus

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Fault memory	94 - D 25
Erase fault memory	94 - D 25
Actual values	94 - D 25
Drive links	94 - D 25
Coding	94 - D 26
Calibration	94 - D 26

Introduction

The manual contains the diagnosis for the following system:

HBA (headlight beam adjustment).

General instructions / safety instructions

The following points must be observed during vehicle diagnosis:

After the battery is connected, volatile memories must be reprogrammed. In the case of radio coding and tuning, the customer must be informed of decoding and the deleted tuner memory.

The coding, calibration and headlight adjustment must be observed after an HBA control module or an angle sensor for HBA has been replaced or the running gear has been modified.

After troubleshooting or repairs, erase the fault memory with the Porsche System Tester 2 and carry out a test drive.

- After the test drive, read out the fault memory with Porsche System Tester 2 again.



Caution!

Danger of damage due to improper handling of the battery and the control module connectors.

- > Never disconnect battery with engine running.
- > Never start engine without securely connected battery.
- > Never pull off or push on plug connections of the control modules or other electronic components when the ignition is switched on.

General information on the fault memory

Fault code setting conditions

Fault codes can be set in several circumstances,

e.g.

- Power failure
- Plug connections disconnected

In these circumstances, no fault is present in the system and the fault memory must be erased.

Fault memory Info key F8

In order to be able to assess the fault exactly, the fault memory Info key F8 must be pressed. This information should be saved using the Save key F4 and printed out. If a fault code is stored with "not present" status and no other problems are present, then the fault memory must be erased.

1. Open circuit/short to ground/short to B+:

Short to ground / open circuit:

There is (present) or was (not present) a short circuit to ground or an open circuit in the circuit to the control module terminal.

Short to B+:

There is (present) or was (not present) a short circuit to voltage.

2. Version / vehicle parameters

Incorrect vehicle coding or coding not carried out.

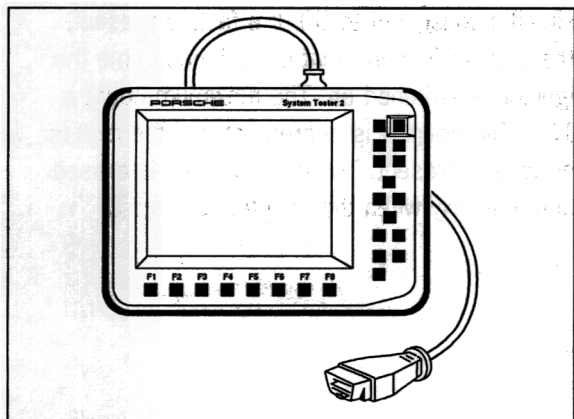
3. Counter

When a fault first occurs, a fault entry is made in the fault memory and the counter is simultaneously set to 50. If a fault is present, the counter is incremented by 1 each time the ignition is switched on. The maximum count is 100. The counter is decremented if the fault is no longer present. The fault memory is erased automatically when the counter reaches 0.

Tools

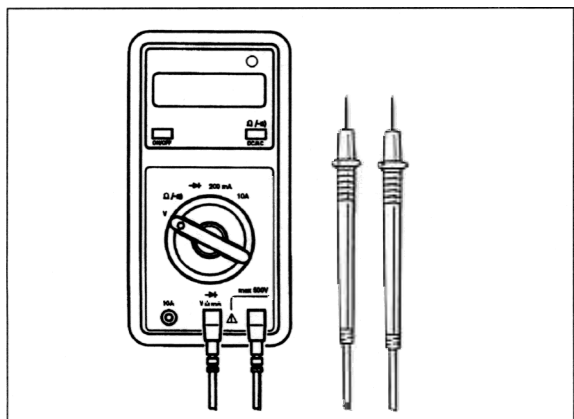
The following testers are required for vehicle diagnosis:

Porsche System Tester 2 (PST 2)



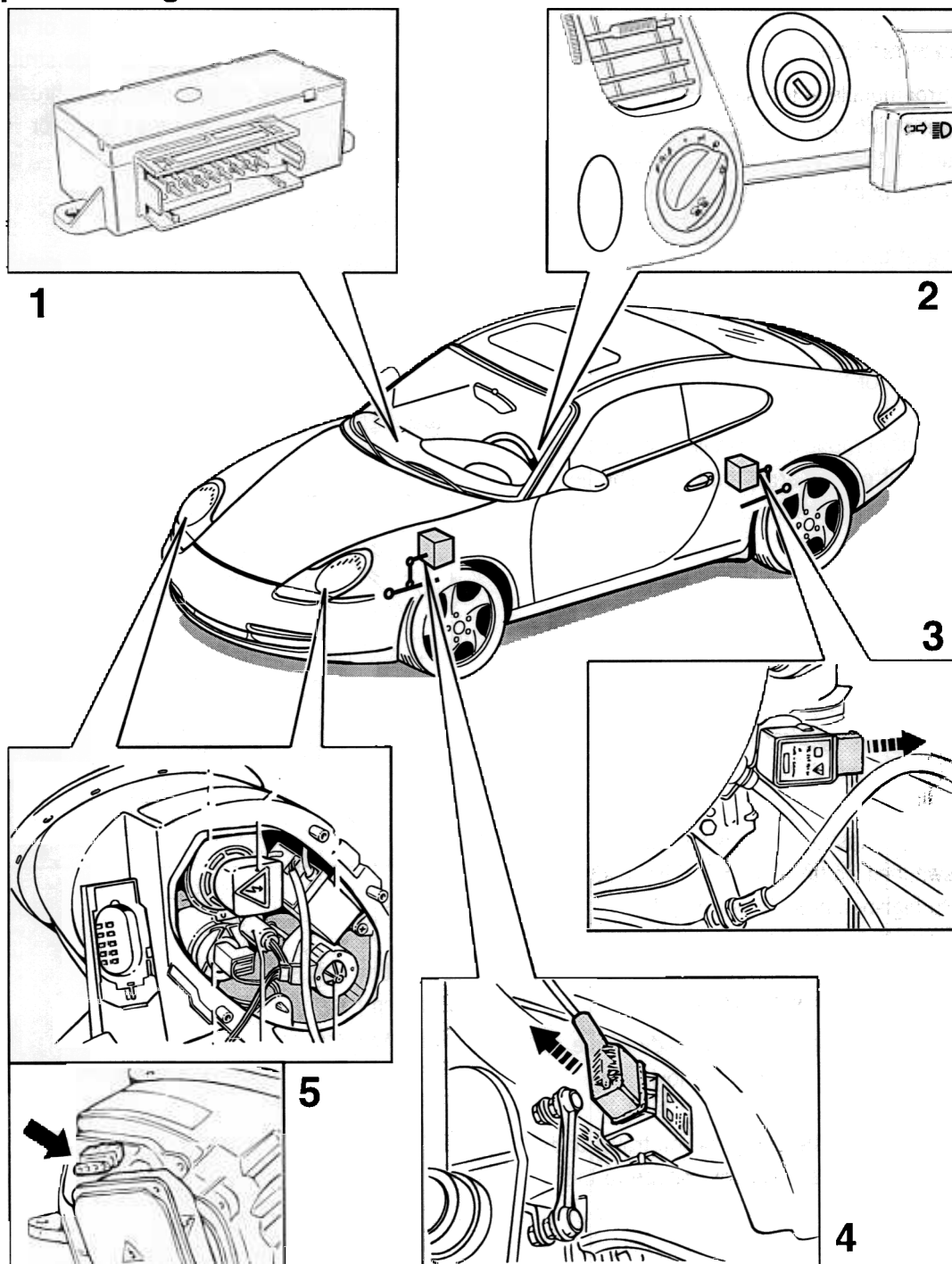
547_96

Commercially available digital multimeter



2178_28

Component arrangement



407_99

Function of individual components

1. Control module

The control module is installed on the passenger's side below the passenger's airbag unit. If the control module is replaced, the following points must be observed:

1. Coding of the vehicle type
2. Calibration of the control module
3. Adjustment of the headlights

If a new control module is installed, fault codes "6 Control unit coding error" and "7 Calibration not performed yet" are stored.

Remedy:

Start the automatic control module search and code the vehicle type. Then perform a calibration and then erase the fault memory. Adjust the headlights after calibration.

2. Main light switch

The HBA system is activated when the parking light is switched on (terminal 58). The headlights are set to high-beam position when the high-beam switch is operated.

3. Angle sensor for HBA, rear

The sensor is fastened on the left side of the rear axle and is connected to the lower axle strut by a linkage.

A sensor measures the compression travel and forwards this value as a sensor voltage to the control module.

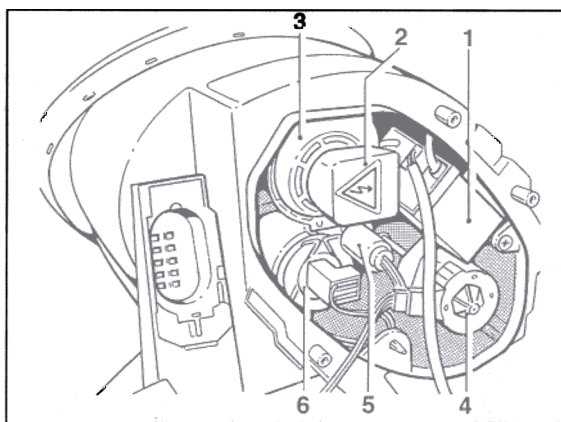
4. Angle sensor for HBA, front

The sensor is fastened on the left side of the front axle and is connected to the axle strut by a linkage. A sensor measures the compression travel and forwards this value as a sensor voltage to the control module.

5. Headlights

Each headlight includes a stepper (servomotor for HBA) which is activated by the control module. Figure 407_99 (arrow) shows the connections for the respective servomotor.

Headlight without lens



9_69_99

1. Ignition unit
2. Lamp plug
3. Lamp fastener
4. Servomotor for HBA (stepper motor)
5. Parking light
6. High beam

System description

The HBA system is installed in vehicles with Litronic headlights.

The HBA system consists of the following components:

- Angle sensor for HBA, rear, with linkage

- Angle sensor for HBA, front, with linkage

- One stepper motor in each headlight (servomotor for HBA)

- Control module

Braking or acceleration, as well as loading, changes the inclination of the vehicle and therefore the headlight range. The HBA system already reacts to the above driving conditions when the dipped beam is switched on, preventing oncoming traffic from being dazzled. Furthermore, the system ensures an ideal headlight range for the driver in all driving situations.

The sensors at the front and rear axles measure the vehicle inclination and forwards this value as sensor signals to the control module, which carries out the further processing of the signals. If it should be necessary to change the headlight range, the stepper motors in the headlights are adjusted to the appropriate position. The HBA system also functions with the high-beam setting.

Diagnosis

When the ignition is switched on, the *servomotors for HBA* are set to the minimal position and subsequently returned to the initial position. There is a fault in one or both motor circuits if the servomotors are not set to minimum position when the ignition is switched on. The angle sensors (axle position sensors) are faulty if the servomotors are not set to high-beam position when high beam is activated.

Note:

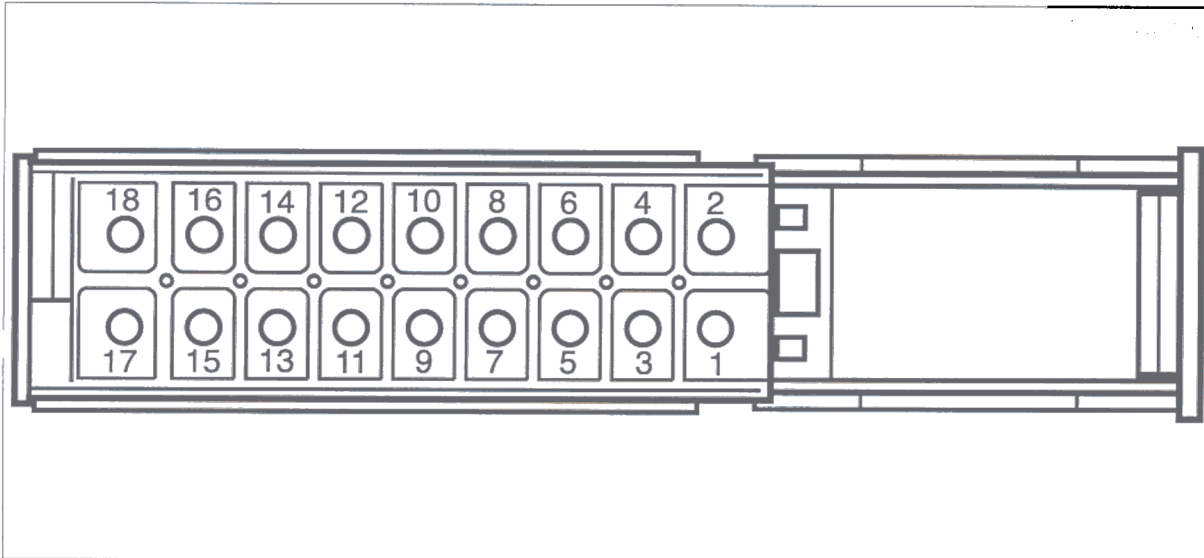
When high beam is activated, the servomotors are set to high-beam position only if the parking light is switched on (terminal 58).

Note:

If there are faults in the motor circuit, the fault memory will be updated only after the ignition has been switched off and then on again. After remedying the fault cause, switch the ignition off and then on again and subsequently erase the fault memory.

If the fault cause has been remedied, faults in the sensor circuit will be automatically deleted when the ignition is switched off and then on again.

Connector assignment



94980001

Pin	Designation	Pin	Designation
	Stepper motor, left	8	Stepper motor, right
2	Stepper motor, left	9	Diagnosis
3	Stepper motor, left	10	Terminal 58 (parking light)
4	Stepper motor, left	11	Wheel speed signal
5	Stepper motor, right	12	Angle sensor for HBA (signal wire), front
6	Stepper motor, right	13	Angle sensor for HBA (signal wire), rear
	Stepper motor, right	14	+5V supply for angle sensors

Pin	Designation
15	Terminal 56A (high beam)
16	Terminal 15 (ignition)
17	Ground for angle sensors
18	Terminal 31 (ground for control module)

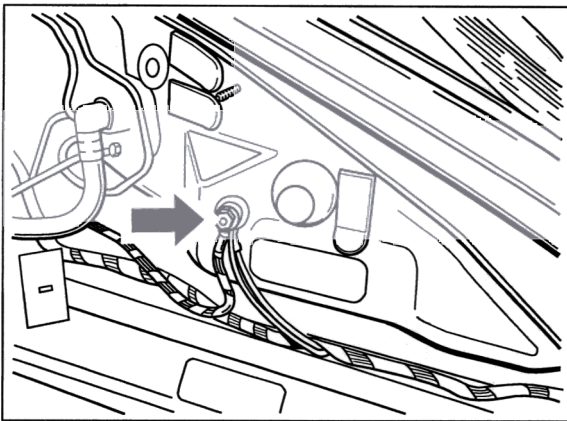
Ground points

Ground point 1

The ground point is located on the right in the front of the luggage compartment (KS front right)

Ground point 2

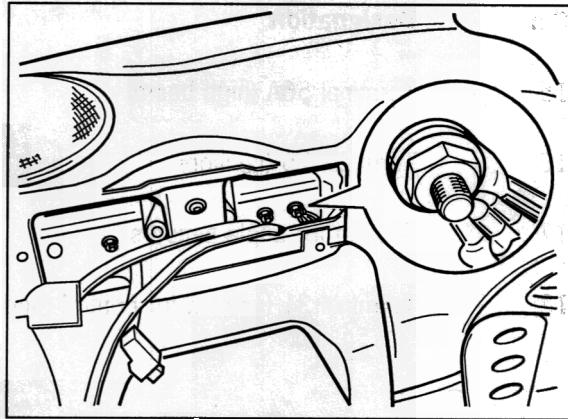
Ground point 2 is located on the left at the front of the luggage compartment (KS front left). Figure 225_99 shows the position of ground point 2.



225_99

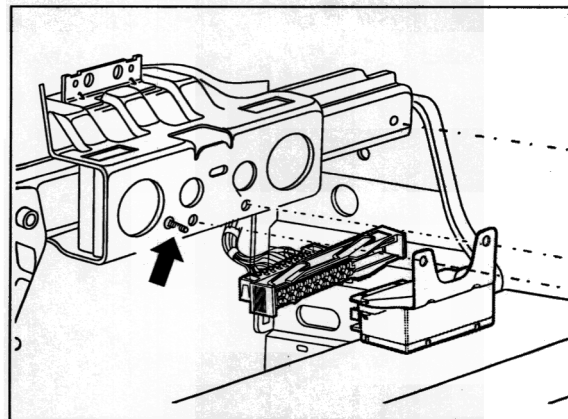
HBA ground point (ground point 4)

This ground point is located behind the instrument cluster in the passenger compartment and is shown in Figure 70180003.



70180003

A new ground point was defined for the HBA during production (introduced in September 1998). Figure 70180001 shows the position of the ground point (on the passenger's airbag unit) after the modification (arrow).



70180001

Fault overview

Fault code	Fault effect	Page
	No automatic adjustment possible	94 - D 14
2	No automatic adjustment possible	94 - D 15
3	No automatic adjustment possible Headlights in safety position	94 - D 16
4	No automatic adjustment possible Headlights in safety position	94 - D 17
5	No automatic adjustment possible Headlights in safety position	94 - D 18
6	No automatic adjustment possible	94 - D 20
7	No automatic adjustment possible	94 - D 20

Fault, Fault code	Possible causes, elimination, notes
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Fault code 1

Motor circuit, left

This fault is stored in the following cases:

1. Short circuit to ground or open circuit in the circuit between control module and *servomotor for HBA, left*, terminals 1, 2, 3, 4
2. *Servomotor for HBA, left*, is faulty
3. The control module is faulty

Elimination:

Switch off ignition

Pull plug off the *control module*Pull plug off the *servomotor for HBA*Check for open circuit in the supply leads to the *servomotor for HBA*, terminals 1, 2, 3, 4

Ohmmeter display

< 5 Ohm

Check for short to B+ in the supply leads to the *servomotor for HBA*

Ohmmeter connected to terminals 1, 2, 3, and 4; measure resistance to ground

Ohmmeter display

 ∞ Ohm

Check for short circuits between the supply leads.

If no fault is detected in the wires, replace the *servomotor for HBA*.

Also check the plug on the wiring harness side and replace if necessary.



Fault, Fault code

Possible causes, elimination, notes

Fault code 2

Motor circuit, right

This fault is stored in the following cases:

1. Short circuit to ground or open circuit in the circuit between control module and *servomotor for HBA, right*, terminals 5, 6, 7, 8
2. *Servomotor for HBA, right*, is faulty
3. The control module is faulty

Elimination:

- Switch off ignition

Pull plug off the *control module*Pull plug off the *servomotor for HBA*Check for open circuit in the supply leads to the *servomotor for HBA, right*, terminals 5, 6, 7, 8

Ohmmeter display

< 5 Ohm

Check for short to B+ in the supply leads to the *servomotor for HBA*

Ohmmeter connected to terminals 5, 6, 7, and 8; measure resistance to ground

Ohmmeter display

 ∞ Ohm

Check for short circuits between the leads.

If no fault is detected in the wires, replace the *servomotor for HBA*.

Fault, Fault code	Possible causes, elimination, notes
-------------------	-------------------------------------

Fault code 3

Axle position sensor, front
(angle sensor for HBA)

This fault is stored in the following cases:

1. Short circuit to voltage/ground or open circuit in the supply leads between the control module and *angle sensor for HBA, front*
2. The sensor linkage is disengaged or faulty
3. *Angle sensor for HBA, front*, is faulty
4. The control module is faulty

Elimination:

Visually inspect the sensor linkage and check the plastic holder of the sensor.

Switch off ignition

Pull plug off the *angle sensor for HBA, front*

Switch ignition on

Measure voltage between terminal 5 of the sensor plug and ground
Voltmeter display approx. 5 V

Measure voltage between terminal 5 and terminal 1 of the sensor plug

Voltmeter display approx. 5 V

In the PST2 menu item *Actual values*, select *Sensor voltage, spring travel 1 (front)*

Connect a jumper to terminals 4 and 5 of the sensor plug

PST2 display approx. 5 V

If no fault is detected in the wires, replace the angle sensor for HBA.

Fault, Fault code**Possible causes, elimination, notes****Fault code 4**

Axle position sensor, rear
(angle sensor for HBA)

This fault is stored in the following cases:

1. Short circuit to voltage/ground or open circuit in the supply leads between the *control module* and *angle sensor for HBA, rear*
2. The sensor linkage is disengaged or faulty
3. *Angle sensor for HBA* is faulty
4. The control module is faulty

Elimination:

- Visually inspect the sensor linkage and check the plastic holder of the sensor.

Switch off ignition

Pull plug off the *angle sensor for HBA, rear*

Switch ignition on

Measure voltage between terminal 5 of the sensor plug and ground
Voltmeter display approx. 5 V

Measure voltage between terminal 5 and terminal 1 of the sensor plug

Voltmeter display approx. 5 V

In the PST2 menu item *Actual values*, select *Sensor voltage, spring travel 2 (rear)*

Connect a jumper to terminals 4 and 5 of the sensor plug

PST2 display approx. 5 V

If no fault is detected in the wires, replace the angle sensor for HBA.

Fault, Fault code

Possible causes, elimination, notes

Fault code 5

5 V supply for axle
position sensors
(angle sensors for HBA)

This fault is stored in the following cases:

1. Short circuit to voltage/ground in the supply leads between the *control module* and *angle sensors for HBA*
2. *Angle sensor for HBA* is faulty
3. The control module is faulty

Note:

The 5V supply voltage for the sensors is ensured via terminal 14 on the HBA control module. A fault in this supply lead affects both angle sensors.

Elimination:

- Switch off ignition

Pull plug off the *angle sensor for HBA, front*

Switch ignition on

Read the fault memory and observe whether fault code 5 reappears.

If fault code 5 does not reappear, the supply lead to the *angle sensor for HBA, front*, is faulty. Proceed as follows in this case:

Measure voltage between terminal 5 of the sensor plug and ground
Voltmeter display approx. 5 V

Measure voltage between terminal 5 and terminal 1 of the sensor
plug

Voltmeter display approx. 5 V

Fault, Fault code

Possible causes, elimination, notes

In the PST2 menu item *Actual values*, select *Sensor voltage, spring travel 1*

Connect a jumper to terminals 4 and 5 of the sensor plug

PST2 display approx. 5 V

If no fault is detected in the wires or control module, replace the *angle sensor for HBA, front*.

If fault code 5 reappears after the plug has been removed from the *angle sensor for HBA, front*, there is a fault in the supply lead to the *angle sensor for HBA, rear*. Proceed as follows in this case:

Pull plug off the *angle sensor for HBA, rear*

Measure voltage between terminal 5 of the sensor plug and ground
Voltmeter display approx. 5 V

Measure voltage between terminal 5 and terminal 1 of the sensor plug

Voltmeter display approx. 5 V

In the PST2 menu item *Actual values*, select *Sensor voltage, spring travel 2*

Connect a jumper to terminals 4 and 5 of the sensor plug

PST2 display approx. 5 V

If no fault is detected in the wires or control module, replace the *angle sensor for HBA, rear*.

Fault, Fault code	Possible causes, elimination, notes
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Fault code 6

Control module coding error

This fault is stored in the following case:

1. Control module has not been coded yet

Elimination:

Code the control module

Fault code 7

Calibration not carried out yet

This fault is stored in the following case:

1. A newly installed control module has not be calibrated yet

Elimination:

- Select menu item *Calibration*.

Follow instructions on the screen and carry out the calibration

Note:

Calibration is not possible if the sensor voltage lies outside the plausible range (sensor voltage less than 2 V or greater than 3 V).

Check the sensor voltages in menu item *Actual values*, with the vehicle parked on a level surface (vehicle not raised)

Check sensor holder and linkage

Checking the actual values

The specified voltage values are reference values

Test point 1

Sensor voltage, spring travel

1 (front)

Engine off

Vehicle on level surface

PST2 display

$2\text{ V} < U_s < 3\text{ V}$

U_s = sensor voltage

The system is faulty if voltage values such as 0.4 V in the lower range or 4.5 V in the upper range are displayed. See the description for fault code **3**

Test point 2

Sensor voltage, spring travel

2 (rear)

Engine off

Vehicle on level surface

PST2 display

$2\text{ V} < U_s < 3\text{ V}$

U_s = sensor voltage

The system is faulty if voltage values such as 0.4 V in the lower range or 4.5 V in the upper range are displayed. See the description for fault code **4**

Test point 3

Terminal 15

Engine off

All loads switched off

PST2 display greater than 10 V

Note:

Communication with the control module is not possible without terminal 15

Test point 4

Terminal 58

Engine off

Parking light off

PST2 display 0

Engine off

Parking light on

PST2 display

If 0 is displayed with the parking light on:

1. Check fuse A5
2. Pull plug off the control module

Switch parking light on

Measure voltage between terminal 10 and ground

Voltmeter display greater than 10 V

If the signal (terminal 58) is present at the control module, replace the control module. Check the wire if the signal (terminal 58) is not present at the control module.

Note:

The headlights are not raised when high beam is activated if there is an open circuit at terminal 58 or if the control module is faulty.

Test point 5

ABS speed

Engine off

Vehicle raised

Ignition on

Slowly rotate the rear left wheel by hand

PST2 display greater than 1 km/h

If 0 km/h is displayed when the wheel is rotated:

1. Check fuse B9
2. Switch ignition off and pull off plug on the control module

Switch ignition on

Rotate the rear left wheel by hand and measure the voltage
(AC range) between terminal 11 and ground

Voltmeter display greater than 1 V

If the wheel speed signal is present at the control module, replace the control module. If the wheel speed signal is not present at the control module, check the wire for open circuit or short to ground and check the ABS or PSM control module.

Test point 6

High beam

Engine off

Parking light off

High beam off

PST2 display 0

Engine off

Parking light on

High beam on

PST2 display

If 0 is displayed with the high beam on:

1. Check fuse A 1
2. Switch ignition off and pull off plug on the control module

Switch ignition on

Switch the high beam on and measure the voltage between plug terminal 15 (high beam on signal) and ground

Voltmeter display greater than 10 V

If the high beam signal is present at the control module, replace the control module. If the high beam signal is not present at the control module, check for an open circuit in the wire.

Identification

The diagnosis software number and control module part number can be read out under the *Identification* menu item.

Fault memory

Faults stored in the control module can be read out under the *Fault memory* menu item.

Erase fault memory

Faults stored in the control module can be erased under the *Erase fault memory* menu item. Here, all stored faults are erased.

Actual values

In the *Actual values* menu item, the current values of the following parameters can be read out:

Sensor voltage, spring travel 1 (front)

Sensor voltage, spring travel 2 (rear)

Terminal 15

Terminal 58

ABS speed

High beam

Drive links

In the *Drive links* menu item, the servomotors for HBA can be moved to three different positions

Servomotor in max. position

Servomotor in centre position

Servomotor in min. position

Note:

The servomotors cannot be activated if there are any open circuits in the servomotor circuit.

Coding

A new control module can be coded in menu item *Coding*.

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type *911 (996)* and start the automatic control module search.
3. Select control module *HBA*.
4. Select menu item *Coding*.
5. Select vehicle type *911 (996)* and start coding with the F8 key.

Calibration

The control module can be calibrated under menu item *Calibration*. Calibration is necessary in the following cases:

When replacing the *servomotors for HBA*

When replacing the entire headlights

When replacing the control module

When replacing angle sensors for HBA

When modifying the running gear

Note:

Adjust the headlights after calibration.

Procedure:

1. Connect PST2 and switch on the ignition
2. Select vehicle type 911 (1996) and start the automatic control module search.
3. Select control module *HBA*.
4. Select menu item *Calibration* and follow the instructions displayed by the PST2

Note:

The servomotors will be activated in the three possible positions – max. position, centre position and min. position – during calibration. Observe this process with the dipped beam switched on. Read out the fault memory after calibration.