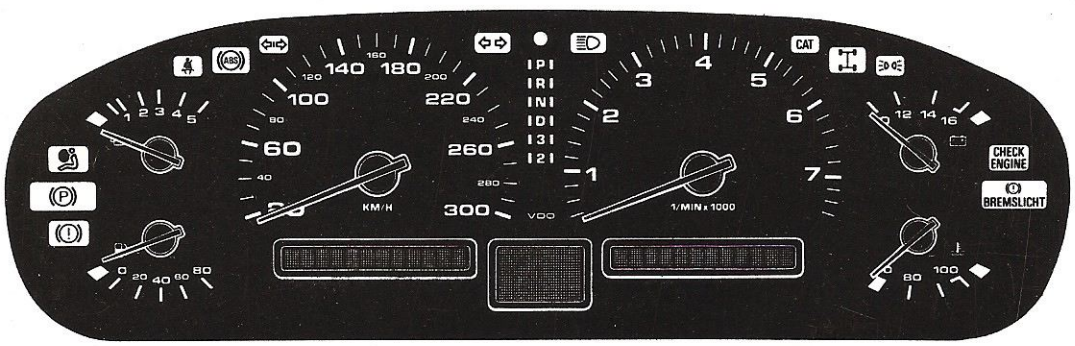
# SERVICE

Duckhart

# 928 S4

## DIAGNOSIS OF THE INSTRUMENT CLUSTER




# '89

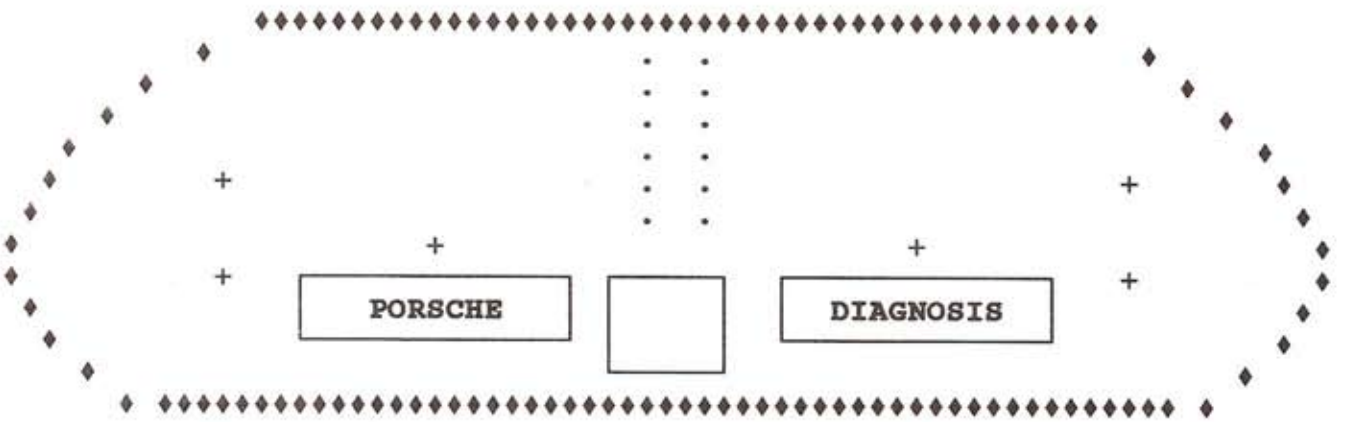
# INFORMATION

## TECHNIK



WKD 495 821

# ON BOARD DIAGNOSIS




# DIAGNOSIS

# OF THE INSTRUMENT CLUSTER



E = CLEAR MEMORY

PORSCHE Service,November 1988

## O N B O A R D DIAGNOSIS

The correct functioning of the INSTRUMENT CLUSTER itself, as well as diverse switches and sensors in the vehicle can be checked by means of the ON BOARD DIAGNOSIS.
During diagnosis of the instrument cluster, the instrument's three display boxes are used to indicate:

a.) the individual steps in the diagnosis,
b.) the software status,
c.) the duration and/or journey during which warnings were issued,
d.) the ACTUAL values of sensors and switches.

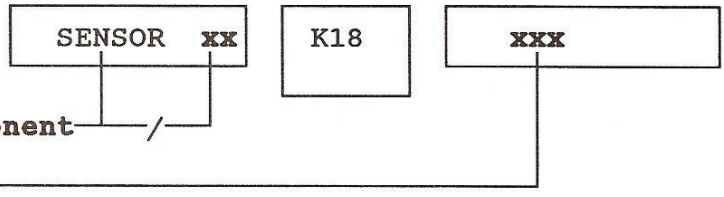
The current diagnosis step is indicated in the left and right display boxes and the central display box indicates the control unit code.

e.g. display:

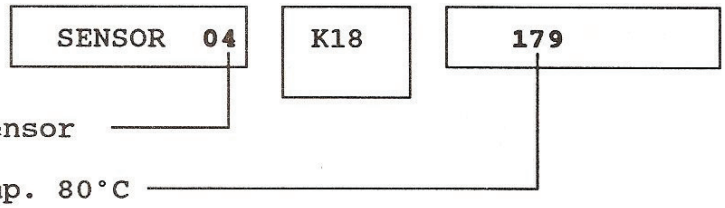

The control unit code contains a letter (K = instrument cluster) which is assigned an identification figure when diagnosis is activated, indicating the respective software status (e.g. K18) of the control unit.

The corresponding data values for each diagnosis step are indicated in the right-hand display box as either a code number or in plain text. Switches, sensors or actuators are also assigned a code number in the left-hand display box which identifies the respective component.

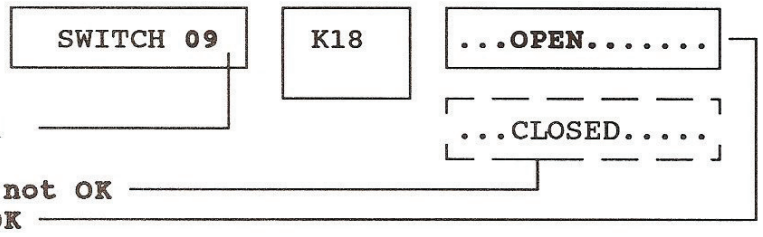
e.g. display:




Example :




or :



**OPERATING LEVER functions**

The operating lever - to the left of the steering column - can be used to start the diagnosis as well as to select and activate the individual steps.

The operating lever can operate in 4 planes.

- to the **FRONT** = **start DIAGNOSIS**
- to the **REAR** = execution desired - **YES**

- **UPWARDS** = execution desired - **NO**
- **DOWNWARDS** = execution desired - **YES (clear memory only)**

**RULE**
If a question appears on the display during diagnosis, such as

e.g.

| **ACTUATORS** | Kxx | **DRIVE?** |
|---|---|---|

this question must be answered with **YES** or **NO** by moving the operating lever in order to continue in the diagnosis program.

**NOTE:** **Operating lever UPWARDS = NO** - Do **not** execute display. **Jump to next diagnosis step**

**Operating lever to the REAR = YES** - Execute the display.

**Exception:** There is one exception to this rule:

Display :

| **MEMORY** | Kxx | **CLEAR?** |
|---|---|---|

If you wish to clear the error memory (YES), the operating lever must be pressed **DOWNWARDS - for approx. 1 s.**

If the answer is **NO** move the operating lever **UPWARDS.**

**The contact bridge 9293 is required to start diagnosis.**
The contact bridge 9293 must be plugged into the diagnosis-plug connector in the vehicle for this.

**NOTE:**

All other code letters shown in the central display box cannot be called at this time, or checked with the **PORSCHE System Tester 9268** (Off Board Diagnosis).

## 1.) ACTIVATING DIAGNOSIS

DISPLAY (example)

| | | | | |
|---|---|---|---|---|
| 1a.) Turn on ignition : | 3510 KM | +22.0 * °C | 185.5 KM I |
| 1b.) Connect contact bridge 9293 : | 3510 KM | +22.0 * °C | 185.5 KM I |
| 1c.) Move operating lever to the **FRONT** for approx. **3 s** | OUTSIDE | +22.0 * °C | TEMPERATURE |
| followed by : | **PORSCHE** | | **DIAGNOSIS** |

## 2.) CALLING THE CLUSTER CONTROL UNIT

| | | | |
|---|---|---|---|
| Press the operating lever repeatedly UPWARDS or DOWNWARDS until the identification code **K** appears. | PORSCHE | **K** | DIAGNOSIS |

If a **non-assigned code letter is called**, e.g. **'A'**
- operating lever to the REAR, the following display appears:

| | | |
|---|---|---|
| ---------- | **A** | ---------- |

| | | | |
|---|---|---|---|
| After a short waiting period the display changes : | PORSCHE | | DIAGNOSIS |

## K.) I N S T R U M E N T C L U S T E R D I A G N O S I S

At the beginning of model year '89, the **software status code K18** was fitted for the instrument cluster. The software was modified during this model year. The subsequent **new software status** has been assigned the **code K21.**

**NOTE:** In order to read out all diagnosis steps without maloperation and with the correct values, we recommend that the **instrument cluster diagnosis** be carried out with the engine running (at idle).

| PORSCHE | K | DIAGNOSIS |
|---|---|---|

**START THE ENGINE**

Operating lever to the REAR

Display : | CLUSTER | K18 (K21) | DIAGNOSIS |

## K1.) READING THE FAULT MEMORY

**NOTE:**
**The instrument cluster software status K18** contains a fault data memory, the content of which is of no significance to the Service. Once the last, existing fault has been read out, the display indicates any existing FAULT WARNING (diagnosis step K1.1), or jumps to the next diagnosis step K2.
**The instrument cluster software status K21** has no fault data memory. Any existing FAULT WARNINGS (diagnosis step K1.1) are indicated, otherwise the system jumps to the next diagnosis step K2.

Operating lever to the REAR: | MEMORY | Kxx | READ? |

If NO, operating lever UPWARDS - Jump to the next diagnosis step K1.2.

If 'YES' operating lever to the REAR: | NO | Kxx | FAULTS |

.....
To continue: operating lever to the REAR.

## K1.1) Fault warning display

If a warning is given in the display while driving, the duration and/or the journey is stored with this fault and issued on the display during diagnosis.

The following warnings are stored:

**OIL PRESSURE : in h/min**

**OIL LEVEL : in km**

**BRAKE FLUID LEVEL : in h/min**

**ENGINE TEMPERATURE : in h/min**

**COOLANT LEVEL : in km**

**TOOTHED BELT TENSION : in h/min**

Example:

| | | | | |
|---|---|---|---|---|
| Display | : | OIL PRESSURE | Kxx | ____01:12_H___ |

Operating lever to the REAR

| | | | | |
|---|---|---|---|---|
| Display | : | COOLANT LEV. | Kxx | ___127.3_KM___ |

etc.

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Fault warning display TERMINATED - To continue: operating lever to the REAR.

**Note:** The fault warning display is cleared if the battery cable is disconnected or if the plug connections of the instrument cluster have been separated.

12L OR 3gal FOR RES. CALIBRATION

## K1.2.) CLEARING THE FAULT MEMORY

| | | | |
|---|---|---|---|
| Display : | MEMORY | Kxx | CLEAR? |

If NO, operating lever UPWARDS - Jump to the next diagnosis step K2.

| | | | |
|---|---|---|---|
| If 'YES' operating lever DOWNWARDS for approx. 1 s : | MEMORY | Kxx | CLEARED |

.....

To continue: operating lever to the REAR.

## K2.) DRIVING INSTRUMENT-CLUSTER ACTUATORS

| | | | |
|---|---|---|---|
| Display : | ACTUATORS | Kxx | DRIVE? |

If NO, operating lever UPWARDS, jump to the next diagnosis step K3.

| | | | |
|---|---|---|---|
| Operating lever to the REAR: TANK DISPLAY. The tank display must indicate 40 L = 1/2 TANK | ACTUATOR 01 | Kxx | DRIVEN |
| Operating lever to the REAR: TANK DISPLAY: The tank display must indicate 80 L FULL TANK | ACTUATOR 02 | Kxx | DRIVEN |
| Operating lever to the REAR: The checkered DISPLAY changes inversely. | ACTUATOR 03 | | DRIVEN |
| Operating lever to the REAR: Only for vehicles with M 215 (Saudi Arabia): speed warning buzzer sounds. | ACTUATOR 04 | | DRIVEN |

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Drive actuators TERMINATED - To continue: operating lever to the REAR

**Attention: code number without () = software status K18 + K21**
**code number in () = software status K21 only**

**K3.) SENSORS** | **SENSORS** | **K18 (K21)** | **CHECK?**

If NO - operating lever UPWARDS, jump to the next diagnosis step K3.1

Operating lever to the REAR: | **SENSOR 01** | **K18 (K21)** | **xxx**

Each movement of the operating lever to the REAR - jump to the next sensor.

| SENSOR | CODE | COMPONENT | NOMINAL VALUES |
|---|---|---|---|
| **01** | | **PHOTOTRANSISTOR** | |
| | 00 - 255 | | |

If the phototransistor is covered with your hand and/or the sidelight terminal 58d is switched on, the displayed value (code) must be smaller. The displayed value must be higher if the phototransistor is illuminated externally.

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**02** **INSTRUMENT LIGHTING**, Terminal 58d — Voltage on Terminal 58d

00 = switched off

34 - 255 = switched on

EXAMPLE 143 / 10 = 12.0

Code No. = Voltage
16

When the instrument-potentiometer is adjusted, the indicated value (code) must be reduced or increased accordingly.

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**03** **OUTSIDE TEMPERATURE** (°C) (Sensor value(Ω))

| | | |
|---|---|---|
| 25 | 60° | 750 |
| 34 | 50° | 1 K |
| 48 | 40° | 1.6 K |
| 66 | 30° | 2.5 K |
| 90 | 20° | 3.8 K |
| 120 | 10° | 6 K |
| 136 | 5° | 7.6 K |
| 150 | 0° | 9.8 K |
| 169 | - 5° | 12.6 K |
| 185 | - 10° | 16.5 K |
| 213 | - 20° | 29 K |
| 234 | - 30° | 53 K |
| 248 | - 40° | 100 K |

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ERROR 01 DEAD BATTERY

K3.) SENSORS

| SENSOR xx | K18 (K21) | xxx |
|---|---|---|

| SENSOR | CODE | COMPONENTS | NOMINAL VALUES |
|---|---|---|---|
| 04 | | ENGINE TEMPERATURE (°C) | (Sensor value(Ω)) |
| | ( 97) | (120°) | (22.5) |
| | (100) | (118°) | (23.8) |
| | 106 | 115° | 25.5 |
| | 108 | 113.5° | 26.5 |
| | 114 | 110.5° | 29 |
| | 134 | 100° | 38.5 |
| | 156 | 90° | 51.5 |
| | 179 | 80° | 70 |
| | 201 | 70° | 97 |
| | 222 | 60° | 137 |
| | 242 | 50° | 198.5 |
| | 255 | 40° | 293 |
| 05 | | TANK LEVEL | (Sensor value(Ω)) |
| | 96( 81) | 63 L | 19.1 (15.5) |
| | 174(161) | 42 L | 42.3 (37.8) |
| | 227(218) | 21 L | 65.7 (61.2) |
| | 240(232) | 15 L(calibration value) | 72.7 (68.4) |
| | 245(238) | 12.5L | 75.6 (71.7) |
| 06 | | VOLTAGE, Terminal 15 | |
| | 96 | | 6 V |
| | 112 | | 7 V |
| | 128 | | . |
| | 144 | | . |
| | 166 | | Code No. = Voltage |
| | 176 | | 16 . |
| | 189 | | . |
| | 208 | | . |
| | 224 | | . |
| | 240 | | 15 V |
| | 255 | | 16 V |

| 07 | | OIL PRESSURE INDICATION (bar) | | | (Sensor value(Ω)) |
|---|---|---|---|---|---|
| | | on the instrument | * | on the display | |
| | 141 | 0.0 | * | 0.0 | 10 |
| | 153 | 1.0 | * | 0.6 | 29.6 |
| | 161 | 1.5 | * | 1.0 | 48 |
| | 167 | 2.0 | * | 1.6 | 65.3 |
| | 171 | 2.5 | * | 2.0 | 82 |
| | 175 | 3.0 | * | 2.4 (2.6) | 99 |
| | 178 | 3.5 | * | 2.8 (3.0) | 116 |
| | 180 | 4.0 | * | 3.2 (3.7) | 133.6 |
| | 182 | 4.5 | * | 3.7 (4.2) | 151 |
| | 186 | 5.0 | * | 4.5 (5.0) | 184 |

The reasons for different indications on instrument and display are due to the tolerances of the analog instrument.

K3.) SENSORS | SENSOR xx | K18 (K21) | xxx

| SENSOR | CODE | COMPONENTS | NOMINAL VALUES |
|---|---|---|---|
| 08 | | OIL PRESSURE SENSOR (bar) | (Sensor value(Ω)) |

| | INDICATION : on the instrument | * | on the display | |
|---|---|---|---|---|
| | 29 | 0.0 | * 0.0 | 10 |
| | 70 | 1.0 | * 0.6 | 29.6 |
| | 97 | 1.5 | * 1.0 | 48 |
| | 116 | 2.0 | * 1.6 | 65.3 |
| | 131 | 2.5 | * 2.0 | 82 |
| | 143 | 3.0 | * 2.4 (2.6) | 99 |
| | 153 | 3.5 | * 2.8 (3.0) | 116 |
| | 162 | 4.0 | * 3.2 (3.7) | 133.6 |
| | 169 | 4.5 | * 3.7 (4.2) | 151 |
| | 180 | 5.0 | * 4.5 (5.0) | 184 |

The reasons for different indications on instrument and display are due to the tolerances of the analog instrument.

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**09 ALTERNATOR, Terminal 61**

| | | |
|---|---|---|
| 96 | | 6 V |
| 112 | | 7 V |
| 128 | | . |
| 144 | | . |
| 160 | Code No. | = Voltage |
| 176 | 16 | . |
| 192 | | . |
| 208 | | . |
| 224 | | . |
| 240 | | 15 V |
| 255 | | 16 V |

.....

TO CONTINUE - operating lever to the REAR.

## K3.1) INPUT VARIABLES

Specific dynamic input variables of the instrument cluster may be shown with the correct unit. The display follows automatically after diagnosis step K3 'SENSORS CHECK?'.

Operating lever to the REAR: | OIL PRESSURE | K18 (K21) | x.x BAR |

Operating lever to the REAR: | ENG. SPEED | K18 (K21) | xxxx RPM |

At the present time, only the OIL PRESSURE and ENGINE SPEED can be called up. Differing indications between the analog and digital display are OK as long as the analog display deviations are not greater than +0.7 bar or ± 1.5 % of the full-scale value at 400 - 2500 rpm.

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Sensor diagnosis TERMINATED - To continue: operating lever to the REAR

**K4.) SWITCHES** | **SWITCH** | K18 (K21) | **CHECK?**

If NO - operating lever UPWARDS, jump to the next diagnosis step K5.

Operating lever to the REAR: | SWITCH 01 | K18 (K21) | _____

Each movement of the operating lever to the REAR - Jump to the next switch.

| SWITCH | COMPONENTS | SWITCH | DISPLAY |
|---|---|---|---|
| **01** | **PARK BRAKE** | Not operated<br>Operated (-) | OPEN<br>CLOSED |
| 02 | No function | | OPEN |
| **03** | **ABS** | System OK<br>Not OK (-) | OPEN<br>CLOSED |
| 04 | No function | | OPEN |
| **05** | **RDK** | Not installed<br>Installed (-) | OPEN<br>CLOSED |
| **06** | **CAT. MONITOR** | System OK<br>Not OK (-) | OPEN<br>CLOSED |
| 07 | No function | | OPEN |
| **08** | **WASHER WATER LEV.** | Level OK<br>Not OK (-) | OPEN<br>CLOSED |
| **09** | **COOLANT LEVEL** | Level OK<br>Not OK (-) | OPEN<br>CLOSED |
| **10** | **COOLANT PRESSURE** | OK ≤ 0.1 bar<br>≥ 0.1 bar (-) | OPEN<br>CLOSED |

K4.) SWITCHES

| SWITCH xx | K18 (K21) | |
|---|---|---|

| SWITCH | COMPONENTS | SWITCH | DISPLAY |
|---|---|---|---|
| 11 | OIL LEVEL | OK > 6 l<br>Not OK <6 l | OPEN<br>CLOSED |
| 12 | TOOTHED BELT TENS. | Tension OK<br>Not OK (+) | OPEN<br>CLOSED |
| 13 | BRAKE PADS | Pad OK<br>Not OK (-) | OPEN<br>CLOSED |
| 14 | BRAKE FLUID | Level OK<br>Not OK (-) | OPEN<br>CLOSED |
| 15 | BRAKE-LIGHT SWITCH | Not operated<br>Operated (+) | OPEN<br>CLOSED |
| 16 | BRAKE LIGHT | OK<br>Not OK (-) | OPEN<br>CLOSED |
| 17 | CENTRAL LOCKING | Not operated<br>Operated (-) | OPEN<br>CLOSED |
| ~~18~~ | No function | | OPEN |
| ~~19~~ | No function | | OPEN |
| 20 | Speedo<br>~~TACHOMETER~~ SIGNAL<br>Output | Rear wheels turn | OPEN<br>CLOSED |
| ~~21~~ | No function | | OPEN |
| 22 | OIL-PRESSURE SWITCH | OK > 2.5 bar<br>Not OK (-)<br>< 0.25 bar | OPEN<br>CLOSED |
| 23 | SAFETY BELT | Not closed<br>Closed | OPEN<br>CLOSED |
| 24 | TAIL LAMP | OK<br>Not OK (-) | OPEN<br>CLOSED |
| 25 | Speedo<br>~~TACHO~~ RESET<br>green "0" Button on console | Not operated<br>Operated (-) | OPEN<br>CLOSED |

Switch diagnosis TERMINATED - To continue: operating lever to the REAR

## K5.) SPECIFIC FUNCTIONS

The operating time of the vehicle can be interrogated with this program without a ~~tachometer~~ SPEEDO signal (driving without tachometer connected).

If 'NO', operating lever UPWARDS.

| SF | K18 (K21) | EXECUTE? |
|---|---|---|

If 'YES', operating lever to the REAR for approx. 6 s.

| SF | K18 (K21) | xxx/xx/xxx |
|---|---|---|

Example:

| SF | K18 (K21) | 200/08/165 |
|---|---|---|

CODE 200 MEANS DISCONNECTED

SF code
Value 1
Value 2

Calculation from the display:

Failure time in minutes = (value 1 x 256) + value 2

$$\text{Failure period in hours} = \frac{(\text{value 1} \times 256) + \text{value 2}}{60}$$

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Specific functions TERMINATED
Instrument cluster diagnosis TERMINATED - Operating lever to the REAR

Display :

| PORSCHE | K | DIAGNOSIS |
|---|---|---|

To continue diagnosis - operating lever to the REAR - repeat instrument cluster diagnosis.

Interrupt diagnosis - switch off ignition, remove contact bridge.

If you forget to move the contact bridge, the following display appears when the ignition is switched on again:

| DIAGNOSIS | | PLUG |
|---|---|---|

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TERMINATED