

User manual

Porsche Diagnostics Tool PDT999

Document version 1.8

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Porsche.... There is no substitute



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1. Introduction

The Porsche 928 is one of the finest sports cars Porsche ever made. It is timeless in design and one of a kind in the way luxury and performance are combined. However, this wonderful car is also a complex piece of machinery and from the moment of the first development drafts on, it was clear that electronics would play an important role in the management and controls of this car. Developed in the early 70's the car started life in 1978 as the 928. It then developed into the 928S model, the S2, S4, GT, and GTS. In 1986, Porsche started using advanced Bosch Automotive Electronics for several car functions and engine management, and in 1987 the first controllers that had internal diagnostics and fault memory were fitted.

Porsche developed a few diagnostic tools to cope with these new electronic features such as the 9268. This was a handheld device with a small display providing code messages. It used a simple binary signal to retrieve information from the controllers.



Later Bosch marketed the more advanced KTS300 (Porsche 9288) which became famous under the name of the Bosch "Hammer" because of its shape. This is a more versatile tool than the 9268 and was able to provide test signals, information, check sensor signals, and read fault codes from several models and controllers.

Porsche also developed a PST2 diagnostic PC and the Bosch KTS500 for use in their workshops. These were even more advanced and updated for modern Porsche models of today.



In 2005 Porsche 928 enthusiasts in the Netherlands under the name of "928-ecu-repair" started working on the protocols of this diagnostic system basically to understand and maybe develop an affordable and versatile diagnostic tool. Because the Porsches are starting to age and show flaws in the electric and electronic systems an affordable diagnostic tool was called for. This age related problems include the ECU break down and malfunctioning actuators and sensors. Troubleshooting without tools is not the easiest job. This tool was developed to solve this problem. It was developed purely from studying the system and monitoring the data. Therefore, no copyrights have been breached. It is intended for both personal use and workshops. The interface and software deals with Porsche 928 / 944 / 964 / 968 / 993 controllers dating from 1987 onwards, thus S4, GT, and GTS models for the 928, C2 and C4 for the 964, S2 for the 944, the 968 and finally the C2, C4 for the 993

IMPORTANT:

The PDT999 does also support the 993 turbo and 993 yr > 95 series. These cars are using the flat 16P OBDII connector. Inform "928-ecu-repair" about this cable.

Supported Porsches and models:

928 models S4,GT,GTS:

The 1987 and 1988 928-models had a 12pin socket to plug in the diagnostic device. This rectangular socket was intended for the 9268 interface that was also used in the 944 models in that time. A separate cable for this version will have to be ordered.

In 1989, Porsche redesigned the diagnostics wiring loom and fitted the 19pin diagnostics connector socket under a cover at the passenger side seat. (LHD)

The PDT999 connects to these interface connections, and communicates with the following 928 controllers (if fitted):

- LH, injection controller;
- EZK, ignition controller;
- RDK, tire pressure controller;
- ABS, anti locking brake system controller;
- PSD, Porsche slip differential controller (built inside the ABS box);
- ALARM, alarm and central locking controller;
- AIRBAG, then airbag controller,
- Knock count,
- Idle stabilization program,
- Enable dashboard diagnosis.

Diagnostic Capability by Model Year:

Year	Controller Installed with Diagnostics Functions? (Yes/No)							Diagnostic Port Connector	
	LH	EZK	RDK	PSD	Airbag	Alarm	Digital Instrument Cluster ²	19-way	12-way
1987	Yes ¹	Yes ¹	No	No	No	No	No	No	Yes
1988	Yes	Yes	No	No	No	No	No	No	Yes
1989	Yes	Yes	No	No	No	No	Yes	Yes	No
1990	Yes	Yes	Yes	Yes	US only	No	Yes	Yes	No
1991	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
1992	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
1993	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
1994	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
1995	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No

Note1. The late 1987 model was the first 928 with diagnostic capabilities. Diagnostics are only possible if the ecu says DIA on the label or with updated firmware, which brings the ecu up to 1988 standard with the DIA features.

Note2. The digital instrument cluster comes in different software versions K25-K29 with different capabilities.

944 models S2:

The PDT999 communicates with the following 944 S2 controllers (if fitted):

- MOTRONIC, injection controller,
- ALARM, alarm and central locking controller;
- AIRBAG, airbag controller,
- Idle stabilization program,
- Knock count.

964 models C2 and C4:

The round diagnose plug for the C2 and C4 models is fitted on the right site of the passenger's foot well.

The PDT999 communicates with the following 964 controllers (if fitted):

- MOTRONIC, injection controller,
- ALARM, alarm and central locking controller;
- AIRBAG, then airbag controller,
- CLIMATE, climate controller,
- PDAS, Porsche Dynamische Allrad Steuerung, porsche slip differential controller and anti system controller (only valid for C4 models),
- TIPTRONIC, tiptronic controller (if fitted),
- Idle stabilization program.

968:

The PDT999 communicates with the following 968 controllers (if fitted):

- MOTRONIC, injection controller,
- ALARM, alarm and central locking controller;
- AIRBAG, airbag controller,
- TIPTRONIC, tiptronic controller (if fitted),

993 models C2, C4:

The diagnose plug for the C2 and C4 models is fitted on the right site of the passengers foot well.

The PDT999 communicates with the following 993 controllers (if fitted):

- MOTRONIC, injection controller,
- ABS, anti locking brake system controller,
- ALARM, alarm and central locking controller;
- AIRBAG, airbag controller,
- TIPTRONIC, tiptronic controller (if fitted),
- CLIMATE, climate controller.

This document describes the all commands used in the PDT999. Commands like

- Reading ECU type,
- Reading and clearing fault-codes,
- Reading input signals like throttles, switches, etc
- Reading actual values like temperatures, voltages, etc.
- Reading sensor values like load, engine temperatures, etc,
- Performing drive links like actuate injectors, flaps, blowers etc,
- Performing drive links active when engine runs,
- Performing idle stab programs, knock counts, enable dash diagnosis.

Most of the commands are also described in the Workshop Manuals of each car. So please refer to these manuals for additional information about the commands and results. The PDT reacts in such a way that the commands and responses are almost the same as the hammer KTS301 with a software module from august-95. But some commands are not implemented due to safety reasons. Commands like locking airbags. Once you lock an airbag, according to the workshop manual, it is not easy to unlock the airbag. "928-ecu-repair" does not like such kind of commands so left them out of the menu structure.

2. How to use the PDT999?

This chapter describes in a nutshell how to use the tool.

2.1 Introduction:



Box:

The box has the following dimensions: 185mm x 85mm x 28mm.

Display:

The PDT contains a 4x 20 display with backlight. Backlight color is light green and the characters are black. The dimensions of the display are: 58 mm x 20 mm.

Buttons:

The PDT contains only four buttons.

- With the buttons **A** (down) and **B** (up) you can navigate through the menu structure.
- With button **C** you can select the commands and items in the menu, and switch back when your test is ready.
- With button **On/Off** the user is able to switch on/off the backlight of the PDT. When the user connects the PDT to the car, first the user has to press the On/Off button to switch on the backlight and to enter the main menu. When the user presses the On/Off button again, the backlight will be switched off to save power consumption, but the PDT is still consuming power from the battery!

Connector:

The connection with the car is provided by a 15-SUBD male connector.

Cable:

There are three cable's possible to connect to the PDT.

1. One with at the end the round 19P connector,
2. One with at the end the 12P connector special for 928, model S4, year 87. But the idle stab program for 928 will not work on the 12P variant.
3. Finally the 16P flat OBDII connector for 993 model year > 95.

Power supply:

The PDT uses the power available on the diagnose connector of the car.

Software version:

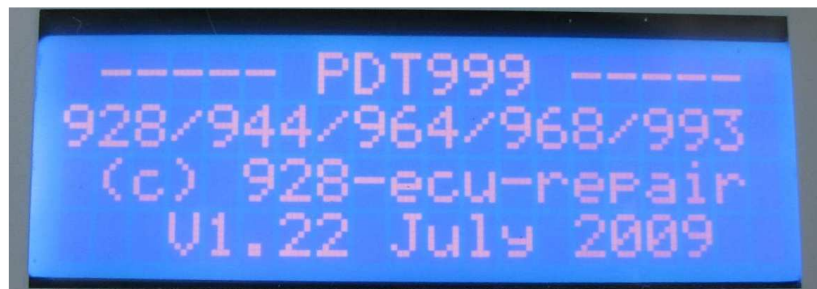
The current software version of the PDT is V1.30, November 2010

2.2 How to navigate through the menus:

This paragraph describes the part of the complete menu structure. part of the total menu structure because the other part of the menu structure (commands of each ECU) of will be explained in Chapter 3. This paragraph shows a motronic example: how to connect to the motronic, how to navigate through the motronic menus, how to read the fault-codes, how to clear them, how to select a certain test, how to use the buttons, etc.

Let's start:

Connect the PDT to the car and press the Onoff button



```
----- PDT999 -----
928/944/964/968/993
(c) 928-ecu-repair
V1.30 November 2010
```

STARTUP SCREEN:

When the user connects the PDT to the car, the startup screen will be visible. It contains the supported cars, hardware version number (1), software version number (23) and product release (November 2010). After 3 seconds, the next screen will be visible automatically.

```
MAIN MENU:          1/6
*928                ->
 944                ->
 964                ->
```

MAIN MENU:

Now the user will see the main menu. It contains 6 items and the cursor (the *) is at the first position of the menu (1 out of 6: 1/6 visible) item 928. With buttons A and B the user can navigate through the menu. The "->" means that when the user selects with button C this item, the next menu will be visible.

```
MAIN MENU:          4/6
*964                ->
 993                ->
 Settings           ->
```

MAIN MENU:

We are still in the main menu but the user has pressed some times on button A (bar down). The cursor is on the 964 (*). Press button C when the cursor is at 964 to select the 964.

Remark: When the cursor is on the last position ("Settings") and the user presses again button A the menu will be back at position 1 (**scroll through mechanism**).

964:	1/7
*MOTRONIC	->
ALARM	->
AIRBAG	->

964:	4/7
*CLIMATE	->
PDAS	->
TIPTRONIC	->

964:	6/7
PDAS	->
*TIPTRONIC	->
<- back	

**Connect to
MOTRONIC
Please wait**

964:

The user has selected the 964 and enters the next menu. The 964 main menu contains 7 items and the cursor is again on position 1. In next screens you will see the other items.

964:

On these two screens the user will see the other available ECU's of the 964 (if fitted). If fitted: not all 964's have a PDAS system on board, only C4 models. So probably when you select the PDAS with button C, the PDT tries to connect to the PDAS ECU. If PDAS is not fitted, the connection will fail and the PDT switches back to the 964-menu.

When the user wants to switch back to the MAIN MENU, select the "<-back" item and press button C. Each menu has a back functionality at the end of each menu.

Ok let's connect to the motronic. So navigate with buttons A and B to cursor 1, MOTRONIC and press button C to select.

CONNECT:

Now the PDT tries to connect to the motronic. It will try 3x times to connect. If the motronic is broken or not fitted, the connection fails and the PDT switches back to the 964-menu.

If it connects, the following screen will be visible:

Remark:

The user can break the connection procedure with pressing button C.

```
MOTRONIC      1/7*
*read version
 read fault codes
 clear fault codes
```

```
MOTRONIC      4/7*
*input signals  ->
 drive links    ->
 actual values  ->
```

```
ECU-nr: M00MOTRONIC
Info1:  9646181240
Info2:  0261200473
Info3:  1267356577
```

```
MOTRONIC      2/7*
 read version
*read fault codes
 clear fault codes
```

MOTRONIC:

So now the PDT is connected to the motronic. You can see that on the first line, right site. The "*" on this line is blinking. That means that the PDT is communicating with the motronic. **When you see a "*" is blinking, that means that the engine of the car is running.**

Again a list with commands is available. With scroll down the user can see the other items ("input signals" etc).

Remark:

The first three menu items "read version", "read fault codes" and "clear fault codes" are for all ECU's the same.

The cursor is at the first position but there is no "->" on the line at the right site. That means when the user selects this item, the user will NOT enter a menu anymore but enters an **information screen** with the requested information.

The user selects item "read version", press button C and the following information screen appears:

INFO:

Now the user will see some information retrieved from the motronic. The version of the motronic is M00, which is the motronic version of the 964. The 968 has another motronic version, M03 and the 993 has motronic version M04.

When the user presses button C again, the motronic main menu will be visible again.

Ok, press button C to switch back to the motronic menu and press buttons A and B to navigate to the next item: "read fault codes".

Press button C to select the item "read fault codes". Now the PDT reads the fault codes, that takes some time (5 seconds) and then the following information screen appears:

Faultcodes:
number of
faultcodes
- 2 -

Faultcodes: 1/2
- 13 -
Full load contact,
short to ground

Faultcodes: 2/2
- 31 -
Knock sensor 1

MOTRONIC 3/7*
read version
read fault codes
*clear fault codes

Faultcodes:
Faultcodes cleared

INFO:
After some time the following screen can appear (if there are fault codes). In this example two fault-codes are retrieved from the motronic.

Press button A to show the first fault code.

This is the first fault code. The code is number - 13 -. And the fault message is "full load contact, short to ground".

Press button A again to show the second fault code.

This is the second fault code.

Press button C to switch back to the motronic main menu.

Remark:
With button B, the user can switch back to the previous fault code.

MOTRONIC:
Now the user is back to the menu. Navigate to the next item, "clear fault codes" and press button C to select. The following information screen appears:

INFO:
The command to clear the fault codes is sent to the motronic. To check if the fault-codes are really cleared, the user has to switch back to the motronic menu and select "read fault codes" again.

Remark:
This information screen faultcodes cleared is only visible for 3 seconds. The PDT switches automatically back to the motronic menu.

```
MOTRONIC          4/7*  
read fault codes  
clear fault codes  
*input signals   ->
```

MOTRONIC:

Ok, the user is back to the motronic main menu. Navigate to the next menu item, "input signals". Press button C to select. The following menu appears:

```
Input signals: 1/3*  
*throttle  
airco  
<- back
```

MOTRONIC INPUT SIGNALS:

The user can select three items, the position of the throttles, the position of the airco switch or switch back to the motronic main menu.

Select button C to show the position of the throttles. The following information screen appears:

```
Throttle:  
  
t.idle: closed  
t.full: open
```

INFO:

The position of the throttle idle is closed, and the position of the throttle full is open.

Press button C to switch back to the input signals menu.

```
Input signals: 3/3*  
throttle  
airco  
*<- back
```

MOTRONIC INPUT SIGNALS:

Now we skip the airco test. It is almost the same as the throttle test.

Navigate to the menu item "back" and press button C to enter the motronic menu back.

```
MOTRONIC          5/7*  
clear fault codes  
input signals     ->  
*drive links      ->
```

MOTRONIC:

Back to the motronic main menu. Navigate to the next menu item, "drive links", press button C to select and the following menu appears:

```
Drive links 1/10*
*fuel tank vent
idle stabilizer
resonance plate
```

MOTRONIC DRIVE LINKS:

The user can select 5 items. Select the first item, "fuel tank vent".

The following information screen appears:

```
fuel tank vent.:
listen to actuator!
```

INFO:

Listen in your motor compartment!

Press button C to switch back to the motronic drive links menu.

```
Drive links 10/10*
fuel injector 5
fuel injector 6
*←-back
```

MOTRONIC DRIVE LINKS:

The other 8x drive links are the same.

Navigate to the back item, select with button C and switch back to the motronic main menu.

IMPORTANT:

In the next Chapter the menu structure will be shown in a little bit different way. During the described example, the user should now understand how to navigate through the menus, how to connect to a ECU, which buttons are important, how to switch back etc. Take the example above, the motronic drive links menu. In the next Chapter this menu will be described like this:

```
Drive links 1/10*
*fuel tank vent
idle stabilizer
resonance plate
fuel injector 1
fuel injector 2
fuel injector 3
fuel injector 4
fuel injector 5
fuel injector 6
←-back
```

Ok let's switch back to the motronic example.

```
MOTRONIC          6/7*  
drive links      ->  
*actual values  ->  
<-back
```

MOTRONIC:

The last menu item is actual values.
Navigate to the "actual values".

Press button C and the following
menu appears:

```
Actual values:1/12*  
*vbat  
engine temperature  
air temperature
```

MOTRONIC ACTUAL VALUES:

Select the first menu item "vbat".
The following information screen
appears:

```
Battery voltage:  
Actual: 12.56    V
```

INFO:

Battery voltage on screen, press
button C to switch back to the
motronic actual values menu.

The complete motronic actual values menu is:

```
Actual values:1/12*  
*vbat  
engine temperature  
air temperature  
lambda  
transmission  
cat. / no cat.  
Maf  
Speed  
Load  
Spark  
Stabilizer  
<-back
```

```
MOTRONIC          7/7*  
input signals    ->  
drive links      ->  
*<- back
```

MOTRONIC:

Now the user is back in the motronic
main menu. Navigate to the last item
"back". Select this item and the
communication with the motronic
stops and the following menu
appears:

964:	1/7
*MOTRONIC	->
ALARM	->
AIRBAG	->

964:
Now the user is free to navigate to another ECU in the system.

2.3 Special command's, screens, etc:


In the previous paragraph we explained the basics of the PDT. This paragraph describes the special commands, strange screen information and some explanation:

2.3.1 Select a menu item with a *:

Main menu:

- Navigate to "964" and select,
- Navigate to "climate" and select (connection will start),
- When connected: Navigate to "input signals" and select "input signals",
- Navigate to "airco switch" and select "airco switch",

The following screen appears:

Input signals: 1/5 air circulation defroster switch *airco switch	
--	---

On fourth line of the display, you see an additional star behind "airco switch" (red circle). What does this star mean?

There are two versions of climate control ECU's for the 964. The first version is version H03 and the second version is H04. This information the user can retrieve from the climate control ECU by reading the "read version" in the climate main menu. See the motronic example in paragraph 2.2 how to do.

The airco switch is NOT available in climate version H03. So when the car has such a module inserted and the user wants to read the airco switch (which is not in) by selecting this menu item in PDT, the following screen appears:

Airco switch: Button not supported in this ECU version

Press button C to return to the climate input signals menu.

2.3.2 Select a menu item when engine runs:

The engine is running and the user connects to a certain ECU. Sometimes a command / menu item can only be executed when the engine is NOT running. When the user selects such a command while the engine is running, the following will be visible:

Example:

Engine is running,

Main menu:

- Navigate to "928" and select,
- Navigate to "LH" and select (connection will start),
- When connected to "LH",
- Navigate to "drive links" and select "drive links",

The following screen appears:

```
Drive links:    1/5#
*fuel tank vent
Idle stabilizer
Resonance flap
```

- Select "fuel tank vent"

The following screen appears:

```
Fuel tank vent:  #
Cannot perform test:
Switch off engine,
connect& check again
```

The user should do:

- 1) Switch off the running engine,
- 2) Perform a ignition only,
- 3) Navigate back to the LH-Drive links menu (main menu->928->LH->connect, etc)
- 4) Perform the test again.

2.3.3 Select a menu item when only ignition on:

The engine is NOT running, just ignition on, and the user connects to a certain ECU. Sometimes a command / menu item can only be executed when the engine IS running. When the user selects such a command while the engine not is running, the following will be visible:

Example:

Engine is NOT running, just ignition on:

Main menu:

- Navigate to "928" and select EZK (start connection),
- When connected, navigate and select to "actual values",

The following screen appears:

```
Actual values: 1/4*
*ects
rpm
load signal
```

- Select "ects":

The following screen appears:

```
ects: *
Cannot perform test:
Please start engine,
connect& check again
```

The user should do:

1. Switch on the engine,
2. Navigate back to the EZK-actual values menu (main menu->928->EZK->connect, etc)
3. Perform the test again.

2.3.4 Connection error:

Sometimes the communication with an ECU fails... Especially the alarm module version I00 and tiptronic ECU's have difficulties with the communication, but also other modules can fail. What happens? The following messages appear on the screen:

```
! Connection ERROR !
C = return to menu
```

The user should press button C to return to the main menu of the Porsche type.

3. Commands on the PDT999:

After the startup screen, the following screen appears:

MAIN MENU	1/6
*928	->
944	->
964	->
968	->
993	->
Settings	->

In this menu, no back item is available. This is the “main menu” where the user can select the Porsche type or check some “settings”. The star is on the first item of the list, so 1 out of 6 (1/6) on the first line of the screen. The “->” means when the user enters this menu item by pressing button C (select), a new menu structure appears on the screen.

Paragraph 3.x explains the main menu of each Porsche type (3.1, 928, 3.2, 944 etc).

Paragraph 3.x.x explains the supported ECU types of a Porsche type or other measurements like “knock count”.

3.1 Menu item “928”

When the user selected the Porsche type 928, the following menu items are possible to select:

928:	1/10
*Connect LH	->
Connect EZK	->
Connect PSD	->
Connect RDK	->
Connect ALARM	->
Connect AIRBAG	->
Knock count	
Idle adaptation	
Dashboard diagnosis	
<- back	

In the following paragraphs each menu item will be explained:

3.1.1 Menu item “connect LH”:

When the PDT is successfully connected to the LH the following LH menu appears:

LH:	1/7
*read version	
read fault codes	
clear fault codes	
input signals	->
drive links	->
actual values	->
<- back	

The first three menu items (“read version”, “read fault codes”, “clear fault codes”) are for all ECU types the same and already explained in the example in Chapter 2.

3.1.1.1 Input signals:

When the user selects the "input signals", the following screen appears:

```
Input signals:  1/5
*throttle
idle speed / drop
airco
coding
<- back
```

Throttle:

When the user selects the "throttle", the following screen appears:

```
Throttle:
Idle:      closed
Full:      open
```

When the user presses slowly the throttle, the following screen appears:

```
Throttle:
Idle:      open
Full:      open
```

And if the user presses the kick down switch, the following screen appears:

```
throttle:
t.idle:    open
t.full:    closed
```

Idle speed / drop:

When the user selects the "idle speed/drop", the following screen appears when gear is in "P" or "N":

```
Idle speed / drop:
actual:  open
```

When you have an automatic transmission in your 928, move the gear to "1" or "2" or "3":

```
Idle speed / drop:
actual:  closed
```

Airco:

When the user selects the "airco", the following screen appears:

```
Airco:
clutch:  off
on:      off
```

Press the AC button on your heating control unit. Both values should change to "on":

```
Airco:
clutch:  on
on:      on
```

Remark: We encounter that not always both values are on "on" when AC button is pressed. When the user has a LH unit which hybride is replaced by the firm: "JDS Porsche, Cambridge UK", it is possible that only one value, "clutch", switches to "on".

Coding:

When the user selects the "coding" and the engine is running, the following screen appears when you have a S4/GTS Automatic with CAT (>1988):

```
Coding:
code 2:  on
code 6:  off
```

3.1.1.2 drive links:

When the user selects the "drive links", the following screen appears:

```
Drive links      1/5
*fuel tank vent
idle stabilizer
resonance flap
fuel injectors
<- back
```

When the user selects one of the drive links (and engine is not running), the following screen appears:

```
Injection valve:
Listen to actuator!
```

When the user has the engine running, the following message appears:

```
Injection valve: #
Cannot perform test:
Switch off engine,
connect& check again
```

Please stop running the engine with ignition off, turn only ignition on, connect again to LH, and select drive links and again "injection valve".

3.1.1.3 actual values:

When the user selects the "actual values", the following screen appears:

```
Actual values 1/8
*rpm
oxysensor
mass air flow
engine temperature
v-bat
v-ref
ezk on
<- back
```

Remark: the actual value menu differs completely from the Bosch hammer KTS301. The KTS301 is **NOT** able to measure the "EZK-ON" signal, the "MAF" voltage, behavior of the "oxysensor", "rpm", "v-bat", "v-ref" and "engine temperature".

RPM:

When the user selects the "rpm" and the engine is running, the following screen appears:

```
rpm:
actual: 849 1/min
```

If the engine is not running, the user will see the following message:

```
rpm:
cannot perform test:
please start engine
connect& check again
```

Start engine running, probably connection will fail, reconnect to LH, and select "actual values" and finally again "rpm".

OXYSensor / Lambda:

When the user selects the "oxysensor" and the engine is running, the following screen appears:

```
lambda sensor:
actual: rich
```

Mass air flow:

When the user selects the "mass air flow", the following screen appears:

```
maf sensor:  
actual:  2.08  v
```

Engine temperature:

When the user selects the "engine temperature", the following screen appears:

```
engine temp.:  
actual:  62.8  deg  
         145.0  F
```

V-bat:

When the user selects the "v-bat", the following screen appears:

```
battery voltage:  
actual:  12.41 v
```

V-ref:

When the user selects the "v-ref", the following screen appears:

```
ref. voltage:  
actual:  4.12 v
```

EZK-on:

When the user selects the "ezk-on", the following screen appears:

```
ezk on. signal:  
actual:  12.09 v
```

3.1.2 Menu item “connect EZK”:

When the PDT is successfully connected to the EZK the following EZK menu appears:

```
EZK: 1/7
*read version
read fault codes
clear fault codes
sensors ->
actual values ->
<- back
```

3.1.2.1 Sensors:

When the user selects the “sensors”, the following screen appears:

```
Sensors: 1/5
*throttle full
trans. prot. sw.
transmission
cat. / no cat.
<- back
```

Remark: New additional commands versus the Bosch hammer KTS301. The “trans. Prot. Sw” (transmission protection switch) and “throttle full”.

Throttle full:

When the user selects the “throttle full”, the following screen appears:

```
throttle full:
actual: open
```

Remark: The user is able to check “throttle full” when the user connects to LH and select “input signals”.

Transmission protection switch:

When the user selects the “trans.prot.sw.”, the following screen appears:

```
Trans.prot. sw.:
actual: open
```

Transmission:

When the user selects the “transmission”, the following screen appears when the user has a car with automatic transmission:

```
transmission:
actual:  automa.
```

Cat. / no cat:

When the user selects the “cat. /no cat”, the following screen appears when the user has a car with cat:

```
Cat. / no cat.:
actual:  cat.
```

3.1.2.2 Actual values:

When the user selects the “actual values”, the following screen appears. The user is able to read those values only when the engine is running.

```
Actual values  1/4
*ects
rpm
load signal
<- back
```

ects:

When the user selects the “ects”, the following screen appears:

```
ects:
actual:  62.8 deg
         145.0 F
```

Rpm:

When the user selects the “rpm”, the following screen appears:

```
rpm:
actual:  1024 1/min
```

Load signal:

When the user selects the “load signal”, the following screen appears:

```
Load signal:
actual:  382.3 usec
```

3.1.3 Menu item “connect PSD”:

When the PDT is successfully connected to the PSD the following PSD menu appears:

```
PSD: 1/5
*read version
read fault codes
clear fault codes
drive links ->
<- back
```

3.1.3.1 Drive links:

```
Drive links 1/3
*bleed valve
Transverse lock
<- back
```

The two drive link test differs from the other tests so below a separate description how to perform the “bleed valve” and “transverse lock” tests:

Drive links bleed valve:

When the user selects the “bleed value”, the following screen appears:

```
Bleed valve:
Open bleed valve,
A = start
```

PSD:

The user should first open the bleed valve and then press button A to start.

The following screen appears:

```
Bleed valve:
bleed ready ?,
A = stop
```

PSD:

When the bleeding is ready (no fluid), press button A to stop.

The following screen appears:

```
Bleed valve:
Close bleed valve,
A = continue
```

PSD:

Close the bleed valve and press button A to continue.

The following screen appears:

```
Bleed valve:
Bleed valve closed?
A = reduce pressure
```

PSD:

The user has closed the bleed valve and press button A to reduce the pressure.

The following screen appears:

```
Pressure red.:
actual: started
```

PSD:

The PDT is busy with reducing the pressure, after 6 seconds the following screen appears:

Pressure red.:
actual: ready

PSD:
The bleed procedure is ready, after 5 seconds the PDT switches back to the drive link menu.

Drive links transverse lock:

When the user selects the "transverse lock", the following screen appears:

Transverse lock:
actual: X

PSD:
The user should hear clearly the pump. The value X on the screen counts from 1 to 20.

After 3 seconds the following screen appears:

Transverse lock:
Rotate rear wheel
Transv.lock active?
A = yes, B = no

PSD:
The user should rotate the rear wheel to check if the lock is active. Press button A if the lock is active, otherwise press button B.
User presses button A (yes):

Transverse lock:
A = reduce pressure

PSD:
Reduce the pressure, press button A.

Pressure red.:
actual: started

PSD:
The PDT is busy with reducing the pressure, after 6 seconds the following screen appears:

Pressure red.:
actual: ready

PSD:
The bleed procedure is ready, after 5 seconds the PDT switches back to the drive link menu.

3.1.4 Menu item “connect RDK”:

When the PDT is successfully connected to the RDK the following RDK menu appears:

```
RDK:                1/6
*read version
read fault codes
clear fault codes
trip info           *
input signals       ->
sensors             ->
<- back
```

3.1.4.1 Trip information:

Only the RDK module version R01 support the trip information (that is why an “*” start is added on that line). When the user selects the trip information, the following screen appears:

```
trip:
      please wait
```

RDK:

The PDT is collecting all trip information and after 6 seconds the first (out of 8) trip information will be visible. The first trip-information is the information of the last drive.

```
trip:
Trp:  RL:  RR:  FL:  FR:
-1    10   0    0    10
```

RDK:

With buttons A and B the user can scroll through the trip information list. The value 10 means 10 KM/h.

3.1.4.2 Input signals:

When the user selects the “input signals”, the following items are possible to select:

```
Input signals:    1/2
*pressure switch
<- back
```

The user selects the “pressure switches”. The following screen appears:

```
Pressure switch:
FL: open  FR: open
RL: open  RR: closed
```

RDK:

Lift one of the wheels and turn the wheel slowly... suddenly the user should see a transition from “open” to “closed”.

3.1.4.3 Sensors:

When the user selects the "sensors, the following items are possible to select:

```
Sensors: 1/3
*hf sending unit
Abs speed sensor
<- back
```

The user selects the "hf sending unit". The following screen appears:

```
Hf sending:
FL: 128   FR: 128
RL: 128   RR: 128
```

HF sending:
A reading of 125-150 for each sensor is a correct value.

The user selects the "abs speed sensor". The following screen appears:

```
Abs speed:
FL: 0     FR: 0
RL: 0     RR: 0
```

ABS speed:
Lift one of the wheels and turn the wheel fast... suddenly the user should see a transition from 0 to a value smaller than 6.

3.1.5 Menu item “connect ALARM”:

When the PDT is successfully connected to the ALARM the following ALARM menu appears:

```
ALARM:                1/7
*read version
 read fault codes
 clear fault codes
 input signals        ->
 drive links         ->
 coding              ->
 <- back
```

3.1.5.1 Input signals:

When the user selects the “input signals”, the following items are possible to select:

```
Input signals:       1/14
*lock position
 door unlock
 hatch unlock
 lock button
 activate alarm
 speed
 glove open
 hatch open
 hood open
 door open
 radio loop
 radio slide
 power t61
 <- back
```

Input signals:

Status of each input signal. For example the user selects: “lock button”. The lock button is the central locking button on the center console. When the user presses this button, the display on the PDT switches from “off” to “on”.

3.1.5.2 Drive links:

When the user selects the “drive links”, the following items are possible to select:

```
Drive links:         1/9
*function display
 locks
 horn
 turn signals
 interior lights
 button light
 external output
 anti drive          *
 <- back
```

Drive links:

Activate a drive link. For example the user presses “horn”. Now the user hears the horn loud and clear, press button C to switch off the horn and switch back to the menu.

3.1.5.3 Coding "landcoding":

It is possible to modify the land-coding of the Alarm module. When the user selects "coding" the following screen appears:

Coding: *land coding <- back	1/2
--	------------

The user selects "land coding", the following screen appears:

Land coding: actual: ROW

INFO LAND LODING:
The current land-coding of the ECU is visible: Rest Of the World. Press button A. The following screens appear:

Land coding: actual: ROW next: CH
--

INFO LAND LODING:
The next land-coding appears on screen. When you press again **button A**, next coding will be USA. And again, next will be CH (cycle complete). There are three options to select: Row, USA and CH.

Land coding: actual: CH next: CH

You can modify the landcoding with pressing **button B**. The landcoding after "next:" will be programmed into the ECU and after a second the following screen appears:

Status is updated; actual value is "CH".

3.1.6 Menu item “connect AIRBAG”:

When the PDT is successfully connected to the AIRBAG the following AIRBAG menu appears:

```
AIRBAG:          1/6
*read version
 read fault codes
clear fault codes
downtime
crash data
<- back
```

The AIRBAG menu does not have any submenu's like "input signals", "drive links" but some direct tests like downtime and crash data.

3.1.6.1 “downtime”:

When the user selects “downtime”, the following screen appears

```
Downtime:
Act: 0 h, 0 m
```

Downtime:

When the user selects “downtime”, the PDT checks for any registered downtime. Downtime is something the controller detects when an unexpected power failure occurs. The ECU registers period of time the power failure exists. The controller logs downtime to a maximum of 99 hours and 59 minutes.

3.1.6.2 “crash data”:

When the user selects “crash data”, the following screen appears

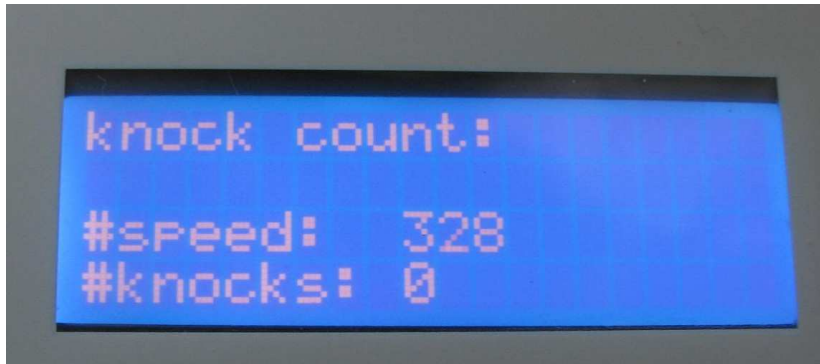
```
Crash data:
Act: 0 0 0
```

Crash data:

When the user selects “crash data”, the PDT checks for any registered crash data. This is useful to determine if the unit has been part of an accident. When the “act” value is all 0, the unit is not part of an accident.

3.1.7 Menu item “knock count”:

When the user selects the knock count, please run the engine otherwise the speed count (#speed:) will not increase. After 10.000 speed pulses, the values on the left side will be shift to the right side of the display and a new knock count session will be performed on the left side.



<p>knock count: #speed: 911 #knocks: 2</p>

Press button C to stop the knock count and to return to the 928 main menus.

3.1.8 Menu item "idle adaptation":

When the user selects the idle adaptation while ignition is still on, the following screen appears:

idle adaptation: 1
Cannot perform test:
switch off ignition

Idle adaptation:
Ignition is on, please switch off ignition, press button C to switch back to 928 menu and select again the idle adaptation. Now the following screen appears:

idle adaptation: 0
turn-on engine
within 3 seconds !

The user has to switch the ignition on and start the engine within 3 seconds. When the engine runs, the following screen appears:

idle adaptation: 1
engine runs !

Watch the value on the red circle. The value toggles a pattern (1411) on the check engine line. After approximately 20 seconds, the following screen appears:

idle adaptation: 1
engine runs !
- 1411 -

Code 1411 means "idle adaptation"
It is a code on the check engine line from the LH unit to the PDT. The PDT reads this check engine line and translate the pulses on this line to a code (in this case 1411). After approximately 60 seconds the following screen appears:

idle adaptation: 1
engine runs !
- READY -

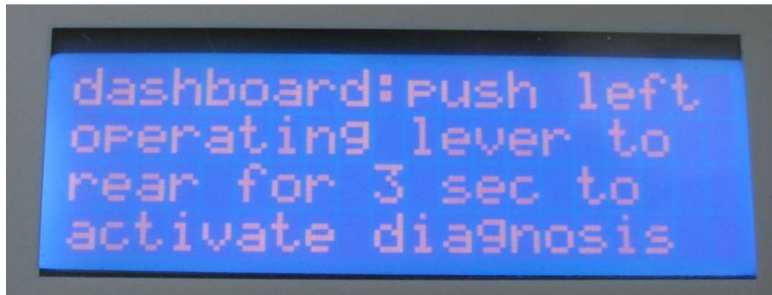
Press button C to return to the 928 main menu.

Remark:

Idle adaptation is not possible with 928 S4 with rectangular diagnose plug (< 1988). The reason is because the diagnose plug, 928-ecu-repair delivers, does not contain the permanent +12V voltage which is absolute necessary for the idle adaptation.

3.1.9 Menu item “dashboard diagnosis”:

When the user wants to enable the 928 dashboard diagnosis, the following screen appears.



dashboard:push left
operating lever to
rear for 3 sec to
activate diagnosis

Press on the left side of your steering -wheel the handle to the rear for three seconds, and the dashboard diagnosis will be enabled. When you press the lever to the front for three seconds, the user can select another dashboard language (French, German, Italian and English). Press button C to disable the dashboard diagnosis and to return to the 928 main menus.

3.2 Menu item “944”

When the user selected the Porsche type 944 S2, the following menu items are possible to select:

```
944:                1/5
*Connect MOTRONIC  ->
Connect ALARM      ->
Connect AIRBAG     ->
Knock count
<- back
```

3.2.1 Menu item “connect Motronic”:

When the PDT is successfully connected to the MOTRONIC the following MOTRONIC menu appears:

```
MOTRONIC            1/7
*read version
read fault codes
clear fault codes
system adaptation
input signals       ->
drive links         ->
actual values       ->
<- back
```

3.2.1.1 System adaptation:

When the user selects the “system adaptation”, the following screens appears.

```
System adapt.:      *
Engine at idle speed
Engine at oper.temp
a = start
```

The engine should run and the running at normal temperature. When the user presses the button A the system adaptation program starts and if all preconditions are ok, the following screen appears:

```
System adapt.:      *
System adaptation
being adapted, wait!
```

After approximately 30 seconds the system adaptation is ready and the following screen appears:

```
System adapt.:      *
System adaptation
is completed !!
```

Press button C to return to main menu of motronic.

If the preconditions are not OK, for instance, the engine is not running, the last sentence will be blanked, or “is not possible”, or “is interrupted”. In all situations, press button C to return.

3.2.1.2 Input signals:

When the user selects the "input signals", the following screen appears. The motronic 944 has only two kinds of input signals, "throttle" and "airco".

```
Input signals: 3/3*  
throttle  
airco  
*← back
```

Throttle:

When the user selects the "throttle", the following screen appears:

```
Throttle:  
  
Idle:      closed  
Full:     open
```

Airco:

When the user selects the "airco", the following screen appears:

```
Airco:  
  
clutch:   off  
on:       off
```

3.2.1.3 Drive links:

When the user selects the “drive links”, the following screen appears. The motronic 944 has four kinds of drive links, “fuel tank vent”, idle stabilizer”, “resonance plate” and “fuel injectors”.

```
Drive links 1/5*
*fuel tank vent
idle stabilizer
resonance plate
fuel injectors
<-back
```

When the user selects for example “idle stabilizer”, the following screen appears:

```
Idle stabilizer:
listen to actuator!
```

Drive links:
Listen in your motor compartment!

Press button C to switch back to the motronic drive links menu.

3.2.1.4 Actual values:

When the user selects the “actual values”, the following screen appears. The motronic 944 has eleven kind of actual values.

```
Actual values:1/12*
*vbat
engine temperature
air temperature
engine speed
spark angle
maf
lambda
engine Load
stabilizer
cat. / no cat.
transmission
<-back
```

Vbat:

When the user selects for example “Vbat”, the following screen appears:

```
Battery voltage:
Actual: 12.56 V
```

INFO:
Battery voltage on screen, press button C to switch back to the motronic actual values menu.

Engine temperature:

When the user selects the “engine temperature”, the following screen appears:

```
engine temp.:  
actual:   62.8 deg  
          145.0 F
```

Air temperature:

When the user selects the “air temperature”, the following screen appears:

```
air temp.:  
actual:   25.0 deg  
          57.7 F
```

Engine speed:

When the user selects the “engine speed” and the engine is running, the following screen appears:

```
Engine speed:  
actual:   895 1/min
```

All the other “actual values” are in the same way as the just mentioned “actual values”. Just select and read the information from the display. Press button C to return to “actual values” menu.

3.2.2 Menu item “connect ALARM”:

All details see paragraph 3.1.5.

3.2.3 Menu item “connect AIRBAG”:

All details see paragraph 3.1.6

3.2.4 Menu item “knock count”:

All details see paragraph 3.1.7

3.3 Menu item “964”

When the user selected the Porsche type 964, the following menu items are possible to select:

```
964:                1/7
*Connect MOTRONIC ->
Connect ALARM      ->
Connect AIRBAG     ->
Connect CLIMATE    ->
Connect PDAS       ->
Connect TIPTRONIC->
<- back
```

3.3.1 Menu item “connect Motronic”:

When the PDT is successfully connected to the MOTRONIC the following MOTRONIC menu appears:

```
MOTRONIC            1/7
*read version
read fault codes
clear fault codes
system adaptation
input signals      ->
drive links        ->
actual values      ->
```

3.3.1.1 System adaptation:

When the user selects the “system adaptation”, the following screens appears.

```
System adapt.:      *
Engine at idle speed
Engine at oper.temp
a = start
```

The engine should run and the running at normal temperature. When the user presses the button A the system adaptation program starts and if all preconditions are ok, the following screen appears:

```
System adapt.:      *
System adaptation
being adapted, wait!
```

After approximately 30 seconds the system adaptation is ready and the following screen appears:

```
System adapt.:      *
System adaptation
is completed !!
```

Press button C to return to main menu of motronic.

If the preconditions are not OK, for instance, the engine is not running, the last sentence will be blanked, or “is not possible”, or “is interrupted”. In all situations, press button C to return.

3.3.1.2 Input signals:

When the user selects the "input signals", the following screen appears. The motronic 964 has two kinds of input signals, "throttle" and "airco".

```
Input signals: 3/3*  
throttle  
airco  
*←- back
```

Throttle:

When the user selects the "throttle", the following screen appears:

```
Throttle:  
  
Idle:      closed  
Full:     open
```

Airco:

When the user selects the "airco", the following screen appears:

```
Airco:  
  
clutch:   off  
on:       off
```

3.3.1.3 Drive links:

When the user selects the "drive links", the following screen appears. The motronic 964 has nine kinds of drive links, "fuel tank vent", "idle stabilizer", "resonance plate" and "fuel injector 1-6".

```
Drive links 1/10*  
*fuel tank vent  
idle stabilizer  
resonance plate  
fuel injector 1  
fuel injector 2  
fuel injector 3  
fuel injector 4  
fuel injector 5  
fuel injector 6  
←-back
```

When the user selects for example "fuel injector 4", the following screen appears:

```
Fuel injector 4:  
  
listen to actuator!
```

Drive links:

Listen in your motor compartment!

Press button C to switch back to the motronic drive links menu.

3.3.1.4 Actual values:

When the user selects the "actual values", the following screen appears. The motronic 964 has eleven kind of actual values and has the same actual values as the 944 motronic.

```
Actual values:5/12*  
vbat  
engine temperature  
air temperature  
engine speed  
*spark angle  
maf  
lambda  
engine Load  
stabilizer  
cat. / no cat.  
transmission  
<-back
```

Spark:

Example, when the user selects the "spark", the following screen appears:

```
Spark:  
actual: 6 crk
```

All the other "actual values" are in the same way as the just mentioned "actual values". Just select and read the information from the display. Press button C to return to "actual values" menu.

3.3.2 Menu item “connect ALARM”:

All details see paragraph 3.1.5.

3.3.3 Menu item “connect AIRBAG”:

All details see paragraph 3.1.6

3.3.4 Menu item “connect CLIMATE”:

When the PDT is successfully connected to the CLIMATE the following CLIMATE menu appears:

```
CLIMATE          1/7*
*read version
 read fault codes
 clear fault codes
 input signals   ->
 sensors         ->
 drive links     ->
 actual values   ->
 <- back
```

3.3.4.1 Input signals:

When the user selects the “input signals”, the following screen appears. The climate 964 has four kinds of input signals, “air circulation”, “defroster switch” and two input signals depending on the version of the ECU: “airco switch” and “airco max”.

```
Input signals: 1/5*
*air circulation
 defroster switch
 airco switch      *
 airco max         *
 <- back
```

Air circulation:

Example when the user selects the “air circulation”, the following screen appears:

```
Air circulation:
Actual:   open
```

3.3.4.2 Sensors:

When the user selects the “sensors”, the following screen appears.

```
Sensors:          1/6*
*footwell
 defroster
 blower
 temperature
 reverse flap     *
 <- back
```

Footwell:

Example when the user selects the “footwell”, the following screen appears:

```
Footwell:
Actual: 120
██████████
```

3.3.4.3 Drive links:

When the user selects the “drive links”, the following screen appears. The climate unit has a lot of drive links to control all kind of blowers, different steps of blowers, or flaps.

```
Drive links: 1/19*
*left mix.flap warm
left mix.flap cold
right mix.flap warm
right mix.flap cold
defrost. flap open
defrost. flap close
footwell flap open
footwell flap close
freshair flap open
freshair flap close
rear blower step1
rear blower step2
blower heater left
blower heater right
oilcooler blow.st1
oilcooler blow.st2
condensor blow.st1*
.condensor blow.st2*
<- back
```

3.3.4.4 Actual values:

When the user selects the “actual values”, the following screen appears.

```
Actual values: 1/9*
*v-bat
inside temp.
rear temp.
mixing temp. left
mixing temp. right
oil temp.
evaporator temp. *
outside temp. *
<- back
```

3.3.5 Menu item “connect PDAS”:

When the PDT is successfully connected to the PDAS the following PDAS menu appears:

```
PDAS 1/6
*read version
read fault codes
clear fault codes
input signals ->
drive links ->
<- back
```

The PDAS ECU is only located in the 964 C4 Porsche.

3.3.5.1 Input signals:

When the user selects the “input signals”, the following screen appears. PDAS has only one input signal, “full lock switch”.

```
Input signals: 1/2*
*full lock switch
<- back
```

The full lock switch has three positions, “on”, “off” and “open”.

3.3.5.2 Drive links:

When the user selects the “drive links”, the following screen appears. For each of the drive links, read carefully the instructions on the screen.

```
Drive links: 1/4*
*blood
transverse lock
longitude lock
<- back
```

Bleed:

When the user selects the “bleed” procedure, the following screen appears:

```
Bleed valve:
open bleed valve
a = start
```

The user opens the bleed valve and start on button A. The following screen appears:

```
Bleed valve:
bleed ready ?
a = stop
```

Bleed is ready, stop bleed by pressing button A. The following screen appears:

Bleed valve:
close bleed valve
a = continue

Press button A, the following screen appears:

Bleed valve:
bleed valve closed?
a = reduce pressure

Press button A, the following screen appears:

Pressure red.:
Actual: ready

After 5 seconds the PDT will switch back to the "drive links" menu of the PDAS.

Transverse lock:

When the user selects the "transverse lock" procedure, the following screen appears:

Transverse lock:
1
a = buildup pressure
b = reduce pressure

The user can build up pressure by pressing multiple times button a. The value 1 increases to 2 when one time pressing button a, etc. With reducing the pressure, press button b.

When the user presses b, the following screen appears:

Pressure red.:
Actual: ready

After 5 seconds the PDT will switch back to the "drive links" menu of the PDAS.

Longitude lock:

When the user selects the "longitude lock" procedure, the following screen appears:

```
Longitude lock:
Actual: 1
```

The actual value 1 changes to 2, 3, etc up to 20. After 3 seconds the following screen appears:

```
Longitude lock:
1
a = buildup pressure
b = reduce pressure
```

The user can build up pressure by pressing multiple times button a. The value 1 increases to 2 when one time pressing button a, etc. With reducing the pressure, press button b.

When the user presses b, the following screen appears:

```
Pressure red.:
Actual: ready
```

After 5 seconds the PDT will switch back to the "drive links" menu of the PDAS.

3.3.6 Menu item “connect TIPTRONIC”:

When the PDT is successfully connected to the Tiptronic the following Tiptronic menu appears:

```
TIPTRONIC          1/7
*read version
read fault codes
clear fault codes
input signals      ->
drive links        ->
actual values      ->
coding             ->
<- back
```

3.3.6.1 Input signals:

When the user selects the “input signals”, the following screen appears.

```
Input signals: 1/8*
*kickdown
downshift
upshift
manual program
selector lever     *
multi func. sw.   *
stop light        *
<- back
```

Example when the user selects “kickdown”, the following screen appears:

```
kickdown:
Actual: open
```

Example when the user selects “selector lever” (depends on the version of the ECU), the following screen appears:

```
Selector lever:
Actual: P
```

Switch the lever to another value (Z, N, 1, 2, 3, D) and you will see that the PDT follows that value.

3.3.6.2 Drive links:

When the user selects the "drive links", the following screen appears.

```
Drive links: 1/9*
*solenoid 1
solenoid 2
torgue converter
gear indicator
oilcooler blower *
reverse relay *
shift lock *
ign. timing change
<- back
```

When the user selects for example "solenoid 1", the following screen appears:

```
Solenoid 1:
listen to actuator!
```

Drive links:

Press button C to switch back to the tiptronic drive links menu.

3.3.6.3 Actual values:

When the user selects the "actual values", the following screen appears.

```
Actual values:1/16*
*rpm
speed 1 *
speed 2 *
injection time *
v (fr) *
v (fl) *
v transmission *
throttle
temperature
transverse accel.*
select. lever sw.*
gear
v-bat
version coding
modulation press.*
<- back
```

V-bat:

When the user selects the "v-bat", the following screen appears:

```
battery voltage:
actual: 12.41 v
```

3.3.6.4 Coding:

When the user selects the "coding", the following screen appears.

```
Coding:          1/2*
*land coding    *
<- back
```

Land coding

There is only one "coding" available: "land coding". When the user select "land coding", the following screen appears:

```
Land coding:
actual: row
```

INFO LAND LODING:

The current land-coding of the ECU is visible: Rest Of the World. Press button A. The following screens appear:

```
Land coding:
actual: row
next:   usa
```

INFO LAND LODING:

The next land-coding appears on screen. When you press again **button A**, next coding will be TAI. And again, next will be ROW (cycle complete). There are three options to select: Row, USA and TAI.

```
Land coding:
actual: tai
next:   tai
```

You can modify the landcoding with pressing **button B**. The landcoding after "next:" will be programmed into the ECU and after a second the following screen appears:

Status is updated; actual value is "TAI".

3.4 Menu item “968”

When the user selected the Porsche type 968, the following menu items are possible to select:

```
968: 1/5
*Connect MOTRONIC ->
Connect ALARM ->
Connect AIRBAG ->
Connect TIPTRONIC->
<- back
```

3.4.1 Menu item “connect Motronic”:

When the PDT is successfully connected to the MOTRONIC the following MOTRONIC menu appears:

```
MOTRONIC 1/8
*read version
read fault codes
clear fault codes
input signals ->
drive links ->
drive links act. ->
actual values ->
<- back
```

3.4.1.1 Input signals:

When the user selects the “input signals”, the following screen appears.

```
Input signals: 5/5*
throttle
ac switch
reference mark
cool fluid
*-<- back
```

Throttle:

When the user selects the “throttle”, the following screen appears:

```
Throttle:
Idle: closed
Full: open
```

Cool fluid:

When the user selects the “cool fluid”, the following screen appears:

```
cool fluid:
actual: closed
```

3.4.1.2 Drive links:

When the user selects the "drive links", the following screen appears.

```
Drive links    1/9*
*fuel tank vent
idle stabilizer
fuel injector 1
fuel injector 2
fuel injector 3
fuel injector 4
ac relay
variocam
<-back
```

When the user selects for example "idle stabilizer", the following screen appears:

```
Idle stabilizer:
listen to actuator!
```

Drive links:

Listen in your motor compartment!

Press button C to switch back to the motronic drive links menu.

3.4.1.3 Drive links active:

When the user selects the "drive links active", the following screen appears. Don't forget that "drive links active" are active when engine is running.

```
Drive links    1/6*
*ign.circ 1 off
ign.circ 2 off
ign.circ 3 off
ign.circ 4 off
vario cam off
<-back
```

3.4.1.4 Actual values:

When the user selects the "actual values", the following screen appears.

```
Actual values:1/14*
*v-bat
motor temperature
oil temperature
version coding
rpm
ignition timing
ho2s
load signal
iacv
airflow sensor
speed
throttle plate
injection time
<- back
```

V-bat:

When the user selects the “v-bat”, the following screen appears:

battery voltage: actual: 12.41 v

3.4.2 Menu item “connect ALARM”:

All details see paragraph 3.1.5.

3.4.3 Menu item “connect AIRBAG”:

All details see paragraph 3.1.6

3.4.4 Menu item “connect TIPTRONIC”:

All details see paragraph 3.3.6.

3.5 Menu item “993”

When the user selected the Porsche type 993, the following menu items are possible to select:

```
993:                1/7
*Connect MOTRONIC ->
Connect ALARM      ->
Connect AIRBAG     ->
Connect CLIMATE    ->
Connect TIPTRONIC->
Connect ABS        ->
<- back
```

3.5.1 Menu item “connect Motronic”:

When the PDT is successfully connected to the MOTRONIC the following MOTRONIC menu appears:

```
MOTRONIC            1/8
*read version
read fault codes
clear fault codes
input signals       ->
drive links         ->
drive links act.   ->
actual values      ->
<- back
```

3.5.1.1 Input signals:

When the user selects the “input signals”, the following screen appears.

```
Input signals: 5/7*
throttle
ac switch
signal heating
reference mark
*tr
ignition timing
<- back
```

Signal heating:

When the user selects the “signal heating”, the following screen appears:

```
Signal heating:
actual:   ok
```

3.5.1.2 Drive links:

When the user selects the “drive links”, the following screen appears.

```
Drive links 1/11*
*fuel tank vent
idle stabilizer
resonance plate
fuel injector 1
fuel injector 2
fuel injector 3
fuel injector 4
fuel injector 5
fuel injector 6
varioram
<-back
```

When the user selects for example “idle stabilizer”, the following screen appears:

```
Idle stabilizer:
listen to actuator!
```

Drive links:
Listen in your motor compartment!

Press button C to switch back to the
motronic drive links menu.

3.5.1.3 Drive links active:

When the user selects the “drive links active”, the following screen appears. Don't forget that “drive links active” are active when engine is running.

```
Drive links 1/8*
*ign.circ 1 off
ign.circ 2 off
ign.circ 3 off
ign.circ 4 off
ign.circ 5 off
ign.circ 6 off
air pump off (usa)
<-back
```

3.5.1.4 Actual values:

When the user selects the “actual values”, the following screen appears.

```
Actual values:1/14*  
*v-bat  
ects  
iats  
version coding  
rpm  
ignition timing  
ho2s  
load signal  
iacv  
airflow sensor  
speed  
throttle plate  
injection time  
<- back
```

V-bat:

When the user selects the “v-bat”, the following screen appears:

```
battery voltage:  
actual: 12.41 v
```

3.5.2 Menu item “connect ALARM”:

All details see paragraph 3.1.5.

3.5.3 Menu item “connect AIRBAG”:

All details see paragraph 3.1.6

3.5.4 Menu item “connect CLIMATE”:

All details see paragraph 3.3.4.

3.5.5 Menu item “connect TIPTRONIC”:

All details see paragraph 3.3.6.

3.5.6 Menu item “connect ABS”:

When the PDT is successfully connected to the ABS the following ABS menu appears:

```
ABS: 1/6
*read version
read fault codes
clear fault codes
drive links ->
actual values ->
bleed
<- back
```

3.5.6.1 Drive links:

When the user selects the “drive links”, the following screen appears.

```
Drive links 1/11*
*abs warning lamp
abd warning lamp *
abd info lamp *
pump relay
MV front left
MV front right
MV rear *
MV rear left *
MV rear right *
MV rear abd *
<-back
```

ABS warning lamp:

Example when the user selects the ABS warning lamp, watch the dashboard. The ABS warning lamp toggles each second from “on” to “off” to “on” to “off” etc.

MV front left:

When the user selects MV front left, the following screen appears:

```
Mv front left:
Press brake-
pedal during test
a = start
```

Press button A to start, the following screen appears:

```
Mv front left:
Possible to rotate
front left wheel?
a = yes, b = no
```

The user rotates left front wheel and it is possible to rotate, press button A (yes). The following screen appears:

```
Mv front left:
Possible to block
front left wheel?
a = yes, b = no
```

The user rotates left front wheel and it is not possible to rotate (block), press button A (yes). The following screen appears:

```
Mv front left:  
Possible to rotate  
front left wheel?  
a = yes, b = no
```

The user rotates left front wheel and it is possible to rotate, press button A (yes). The following screen appears:

```
Mv front left:  
  
Ready  
c = return to menu
```

MV rear abd:

Another example, "MV rear abd". When the user select "MV rear abd", the following screen appears:

```
Mv rear abd:  
Do NOT press brake-  
pedal during test  
a = start
```

Press button A to start, the following screen appears:

```
Mv rear abd:  
Possible to rotate  
rear wheels?  
a = yes, b = no
```

The user rotates both rear wheels and it is possible to rotate, press button A (yes). The following screen appears:

```
Mv rear abd:  
Possible to block 1  
rear wheels?  
a = yes, b = no
```

The user rotates both rear wheels and it is not possible to rotate (block), press button A (yes). The following screen appears:

```
Mv rear abd:  
Possible to block 2  
rear wheels?  
a = yes, b = no
```

The user rotates again both rear wheels and it is not possible to rotate (block), press button A (yes). The following screen appears:

```
Mv rear abd:  
  
Ready  
c = return to menu
```

3.5.6.2 Actual values:

When the user selects the “actual values”, the following screen appears.

```
Actual values: 1/6*
*stop light switch
valve relay
return pump
speed front / rear
terminal 61
throttle *
```

Speed:

Example when the user selects speed, the following screen appears:

```
speed:
FL: 0    FR: 0
RL: 0    RR: 0
```

3.5.6.3 Bleed:

When the user selects the “bleed”, the following screen appears.

```
Bleed ABD*
Please wait
```

After 5 seconds the next screen appears:

```
Bleed ABD*
actual: -
a = start, b = stop
```

When the user presses button A, the following screen appears:

```
Bleed ABD*
actual: started
a = start, b = stop
```

When the user presses button B, the following screen appears:

```
Bleed ABD*
actual: stopped
a = start, b = stop
```

Press button C to return to ABS menu.

3.6 Menu item “settings”

When the user selected the settings page, the following menu items are possible to select:

```
Settings:          1/4
*version
supported ECU's  ->
connect Diag ECU ->
<- back
```

3.6.1 Version:

When the user presses “version”, the latest software release will be visible.

```
----- PDT999 -----
928/944/964/968/993
(c) 928-ecu-repair
V1.30 November 2010
```

3.6.2 Supported ECU's:

When the user presses “supported ECU”, the list of all possible cars for PDT will be visible. Select one and you will see which ECU's the PDT is able to connect and communicate with.

```
Settings:          1/6
928                ->
944                ->
964                ->
968                ->
993                ->
<- back
```

Supported ECU: 928

```
928:              1/7
LH:               L00,L01,L02
EZK:              E00,E01,E02
PSD:              S00
RDK:              R00,R01,R02
ALARM:            I00,I01,I02
AIRBAG:           B00,B01,B02
<- back
```

Supported ECU: 944

```
944: 1/4
MOTR: M01
ALARM: I00, I01, I02
AIRBAG: B00, B01, B02
<- back
```

Supported ECU: 964

```
964: 1/7
MOTR: M00
TIPT: G00, G01
CLIM: H00, H03, H04
PDAS: S00
ALARM: I00, I01, I02
AIRBAG: B00, B01, B02
<- back
```

Supported ECU: 968

```
968: 1/5
MOTR: M03
TIPT: G00, G01, G03
ALARM: I00, I01, I02
AIRBAG: B00, B01, B02
<- back
```

Supported ECU: 993

```
993: 1/7
MOTR: M04, M06, M05
      M07
TIPT: G01, G03, G10
CLIM: H05, H06, H08
ABS: A00, A01
ALARM: I00, I01, I02
AIRBAG: B01, B02, B03
<- back
```

3.6.3 Menu item “connect Diag ECU”:

When the PDT is successfully connected to the Diagnose ECU the following Diagnose ECU menu appears:

```
Diagnose ECU:    1/7
*read version
Read fault codes
clear fault codes
sensors          ->
drive links      ->
actual values    ->
<- back
```

The diagnose ECU is a new project within “928-ecu-repair”, maybe it will be a new product for the market. We are still busy to improve the DE (Diagnose Ecu). The DE is an ECU inside the LH unit (Porsche 928). With some additional wires attached to the DE, the DE is able to measure much more signals than the normal LH unit can do. Further, the DE is also able to measure these signals during drive. The DE is, like the other ECU’s connected to the diagnose bus and possible to read by the PDT.

3.6.3.1 Sensors:

When the user select the sensors menu, the following items are possible to select.

1. “PWM” means Pulse Width Modulation. The “idle” stab signal is typical such a PWM-signal.
2. “LOW” means low signal, the time that a signal has a low level. “injection” is typical such a LOW signal. How many msec is the injection LOW active?
3. “HIGH” means high signal, the time that a signal has a high level. “load” signal is typical such a HIGH signal. How many usec is the load signal HIGH active?
4. “RPM” means rotation per minute. This signal counts more or less the number of transitions from LOW to HIGH. Speed pulse is typical such a signal.

```
Sensors:        1/5
*PWM (idle)
LOW (inj)
HIGH (load)
RPM (speed)
<- back
```

PWM:

Example, when the user selects the PWM signal, the following screen appears:

```
PWM (idle):
actual:    54 %
```

3.6.3.2 Drive links:

The DE has also two signals which the user is able to drive. The current DE version does not have any wires from DE to LH unit, so you can select / switch these drive links, but nothing will happen. What is possible with these signals? Think about controlling the fuel pump. In the LH there is no way to control the fuel pump. It would be nice if the user is able to enable pump by switching "on" out 0 (which controls for example the fuel pump). These options are under investigation in "928-ecu-repair".

```
Drive links:      1/3
*Out 0 On/Off
  Out 1 On/Off
<- back
```

3.6.3.3 Actual values:

The DE has some wires from LH-connector. Think about "MAF", "oxygen sensor", "temperature", "idle stab" and engine running ("speed").

```
Actual values:   1/6
*Read ch.0 (maf)
  Read ch.1 (oxy)
  Read ch.2 (temp)
  Read ch.3 (idle-s)
  Read ch.4 (speed)
<- back
```

MAF:

An example is to read the MAF signal on the LH connector. There is a wire connected from PIN7 of the LH connector towards the DE. The DE measures the voltages of that line.

```
Read ch0 (maf):  #
Actual:  2.10 v
```