THE DOCTOR

User manual

THE DOCTOR DM5

by FUCHS - INTERNATIONAL TECHNOLOGY GmbH

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THE DOCTOR DM5
User manual

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Introduction

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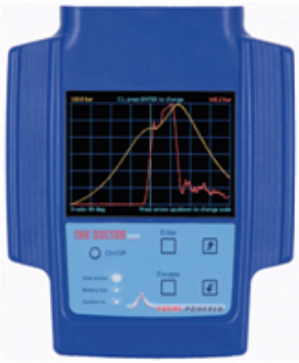
1 Introduction

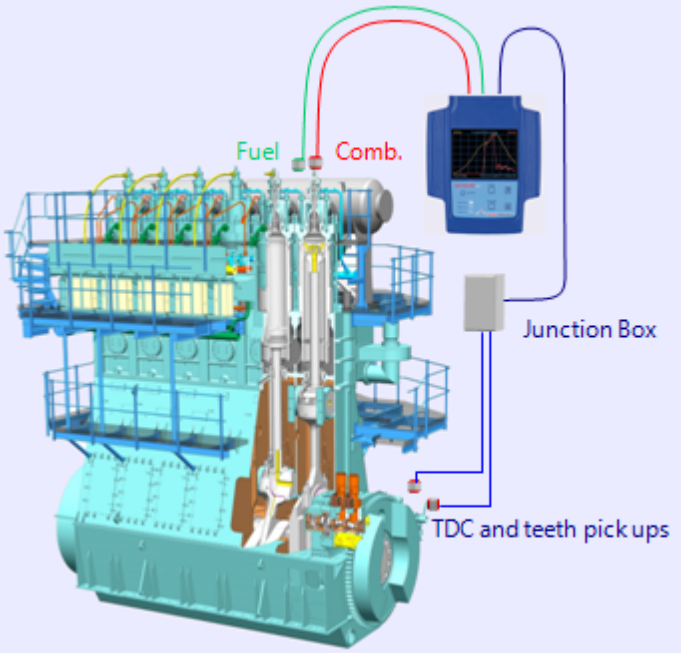
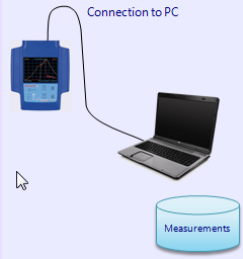


The Doctor DM-5 is a classic hand held data collection unit for easy engine condition monitoring. With this unit you can measure:

- Cylinder pressure
- Fuel pressure
- Crank shaft position

Recorded data can be displayed on device's own big color LCD screen and transferred later into PC for deeper analysis with this The Doctor PC software.

A typical usage of DM5 EPU is in the following picture.

Engine room Measurement procedure Phase 1	**Control room** Measurement procedure Phase 2
	

A fixed junction box can replaced with direct cables between the EPU and sensors.

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Starting EPU

II

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2 Starting EPU

After switching on the EPU the following MAIN MENU will be displayed.

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Preparation

III

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3 Preparation

Before you can start measuring an engine with the EPU, you need to

1. Configure the engines in the EPU; please see the chapter Engines
2. Connect sensors:
   - Connect TDC sensor(s) to TDC connector - for a 2-stroke engine TDC and TEETH, for a 4-stroke engine TDC only
   - Connect Combustion (compression) pressure sensor (Kistler sensor type 7613C) to Comp. connector
3. In case you also measure the fuel pressure:
   - Connect Fuel pressure sensor (Kistler pressure sensor type 6729A) to F.O. connector
     NOTE: For fuel pressure measurement TDC and Comb. pressure sensors must be connected also. Only the comb. pressure sensor will trigger the EPU to start measuring.

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User interface

IV

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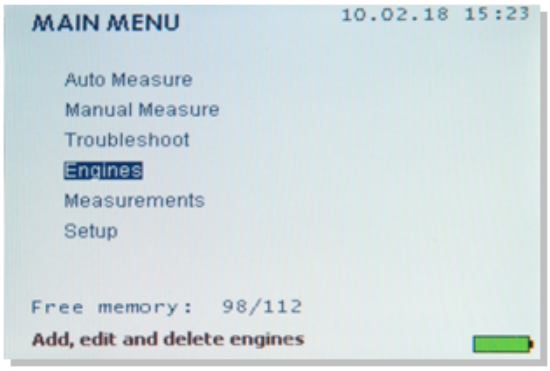
4 User interface

After switching on the EPU the following MAIN MENU will be displayed:



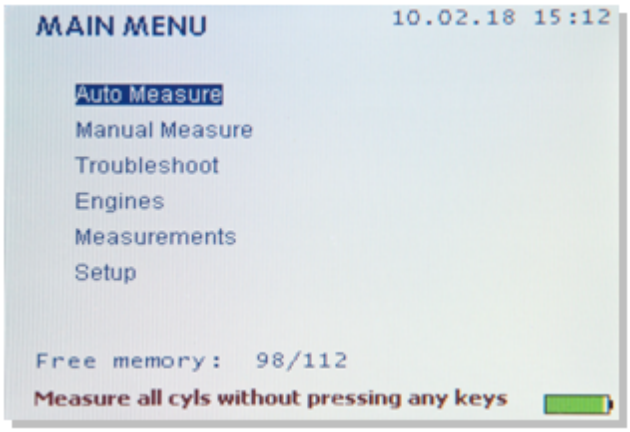
- Auto Measure
- Manual Measure
- Troubleshoot
- Engines
- Measurements
- Setup

On the bottom of the screen brief information relating to the selected menu option is shown.

- The EPU menu is navigated by using the UP/DOWN and ENTER keys.
- ESCAPE key takes you back one step if nothing else is displayed on screen.

4.1 Auto measure

In auto measure mode, measuring can be performed by simply moving the pressure sensor from cylinder no. 1 to the next, guided by the information and instruction displayed on the LCD screen, or watching the LED (data stored).



Once pressure is detected, the measuring process will start automatically, no need to press any key.

The test results will be displayed on the screen after the measurement.

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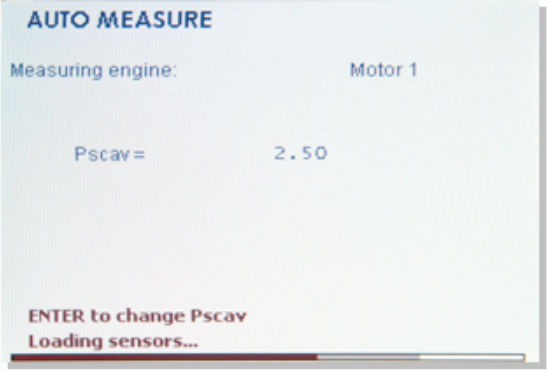
4.1.1 Procedure

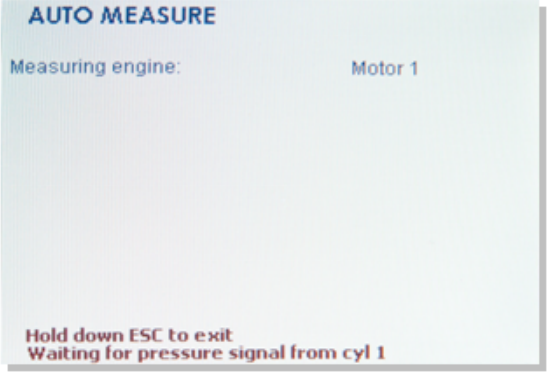
1. Select engine using UP/DOWN keys and ENTER



2. Initializing ..... sensors are loaded

3. "Pscav" screen appears.

   - Press ENTER to change the value (from eng setup).
   - Use UP/DOWN keys to change figures, EN confirm and move to next.
   - If you do not press ENTER, measuring will s using default value from setup.



4. "Waiting for pressure signal from cyl. 1" (press sensor must be connected to indicator cock w Thompson adapter) - open valve to pressurize

5. As soon as the message "Processing cyl 1 yo move to next cyl" appears (LED-data stored wi up green), you can close the indicator cock val move to the next cylinder (while the EPU is an the data).

6. You can also wait until the data is shown on the screen, to review same before you decide to move on, or to re-measure the current cylinder.

7. To re-measure the same cylinder hold down ENTER before you re-open the indicator cock valve. This will overwrite the previously measured data.
8. The cylinder number will change automatically when moving to the next (1,2,3 …). To measure the next cylinder(s) just repeat step 4 and 5.
9. When all cylinders are measured, press ESCAPE to exit to main menu.

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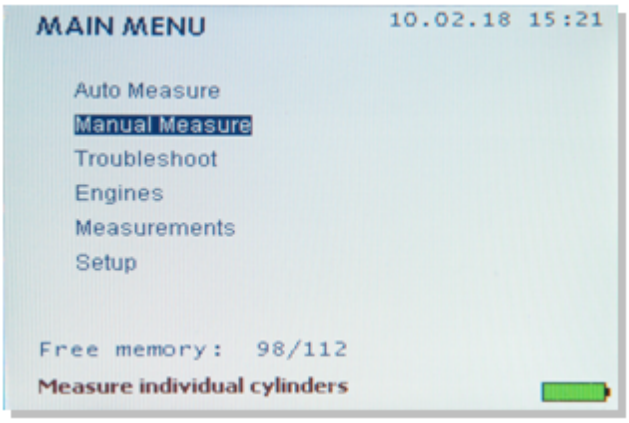
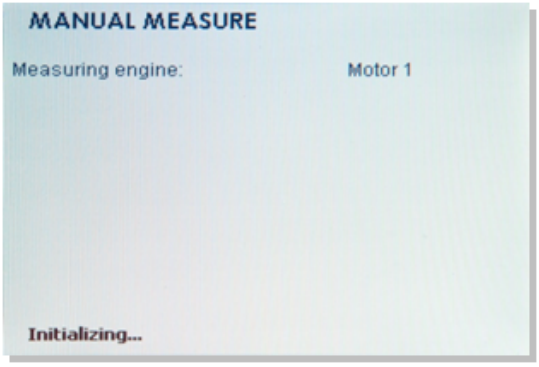
4.2 Manual measure

Manual measure mode, you decide when to start measurement with which cylinder).



4.2.1 Procedure

1. Motor 1



3. Initializing…. ..sensors are loaded

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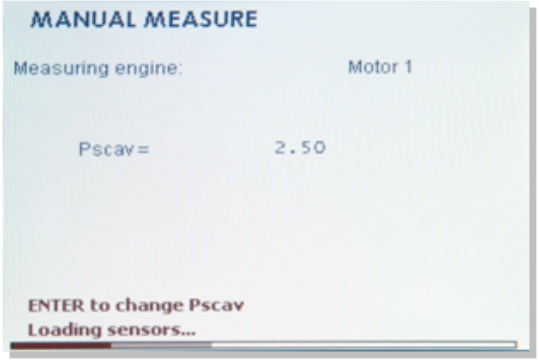
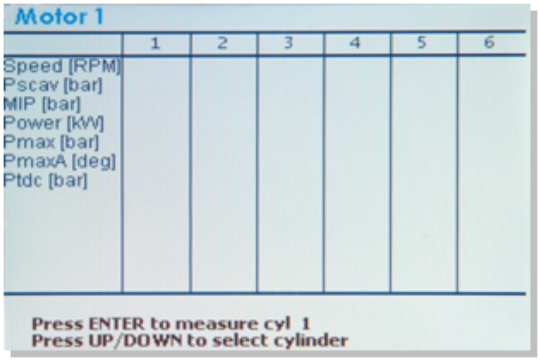


4. “Pscav” screen appears. Press ENTER to chan value (from engine setup) Use UP/DOWN keys change figures, ENTER to confirm and move to you do not press ENTER, process will continue default value from setup)



5. Press ENTER to start with cyl 1, or select cylir measure with UP/DOWN key (cyl.number char automatically) and ENTER to confirm and start measurement (pressure sensor must be conne indicator cock with Thompson adapter, valve op pressurize sensor).
6. As soon as the message “Processing cyl 1 you move to next cyl” appears (LED-data stored wi green), you can close the indicator cock valve a to the next cylinder (while the EPU is analyzing data).
7. You can also wait until the data is shown on th to review same before you decide to move on, c measure the current cylinder.
8. To re-measure the same cylinder re-select cyl. again before you re-open the indicator cock valv will overwrite the previously measured data.
9. When all cylinders you want are measured, pre ESCAPE to exit to main menu.

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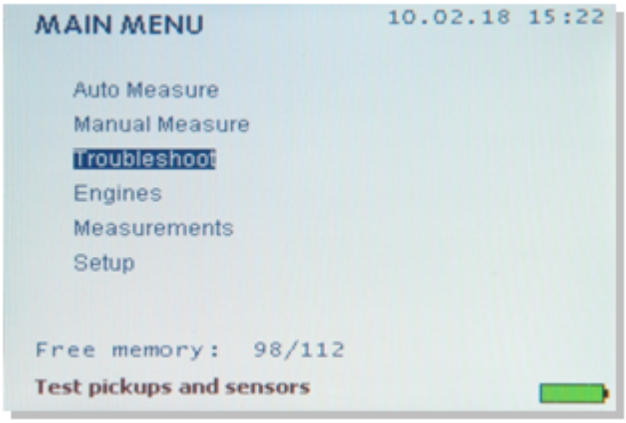
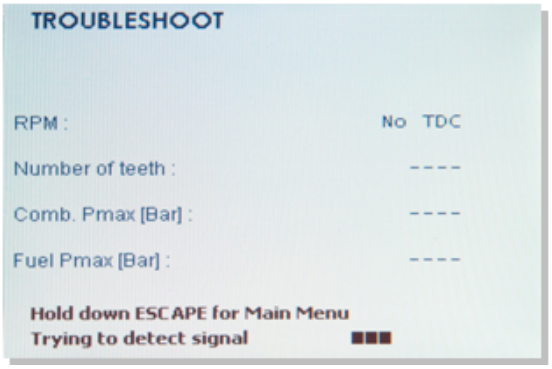
4.3 Troubleshoot

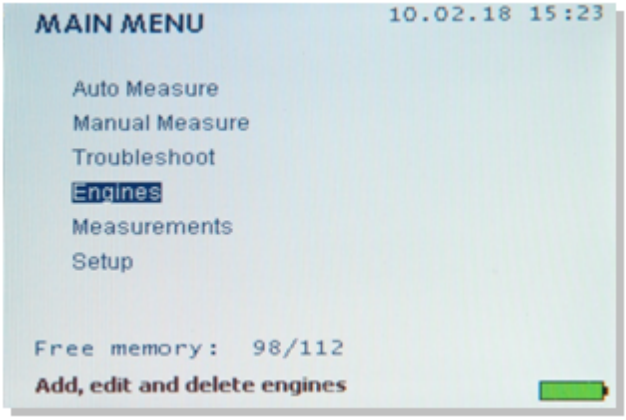


Displays all signals detected: RPM, pickups (TDC / TEETH) and both pressure sensor (Combustion and Fuel). Please note that the pressure sensors must be pressurized to detect any signal.



- RPM –TDC pickup
- Number of teeth: -TEETH pickup
- Comb.Pmax (Bar) – Combustion pressure sensor
- Fuel Pmax (Bar) – Fuel pressure sensor.

4.4 Engines



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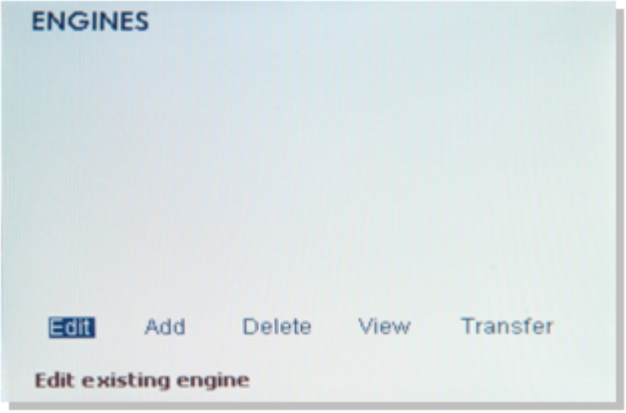
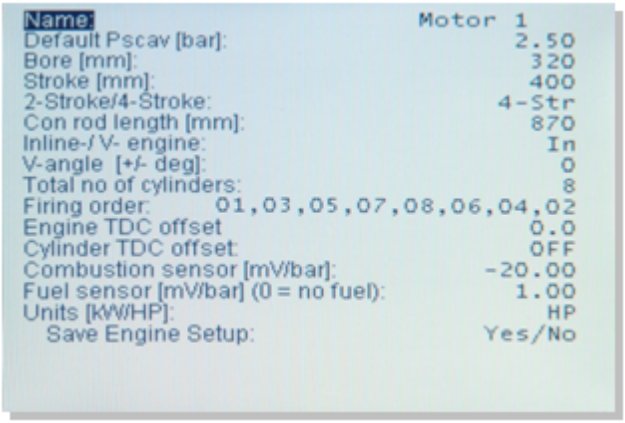
4.4.1 Edit

In this menu you configure your engine setup.



- **Edit**
  Alter stored engine parameters.
- **Add**
  Add and configure a new engine.
  NOTE: There can be maximum eight engines configured in the EPU.
- **Delete**
  Delete a selected engine
- **View**
  View a selected engine setup.
- **Transfer**
  Transfer (download) selected engine settings from PC .For more information see PC software manual "Transfer Engine Settings to EPU".

For functions Edit, Add, Delete and Transfer the “password” (default is 0000) is required.



Edit and Add menu items open the following screen for entering engine parameters .

Use Add to create a new setup and Edit to alter parameters.

You need to enter the engine and the pressure sensor parameters in the correct fields, using UP/DOWN and ENTER/ ESCAPE keys (Remark: ENTER / ESCAPE keys move the active field to right and left, UP/DOWN keys change the value in the active field).

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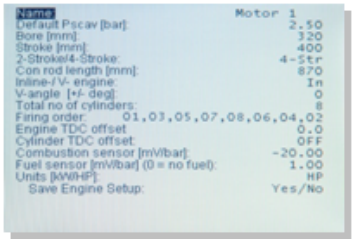
4.4.1.1 Change parameters



You need to enter the engine and the pressure sensor parameters in the correct fields, using UP/DOWN and ENTER/ ESCAPE keys (Remark: ENTER /ESCAPE keys move the active field to right and left, UP/DOWN keys change the value in the active field).

Name	10 characters can be used
Default Pscav [bar]	this value will appear in menu "Auto / Manual Measure" – it can be changed there again
Bore [mm]	cylinder bore
Stroke [mm]	piston stroke
2-stroke/4-stroke	choose applicable engine type
Con rod length [mm]	connecting rod length (between centers)
Inline/V-engine	select IN for inline engine or V for V-engine
V-angle [deg]	angle between banks - set only for V-engines
Total no of cylinders	for V engines only one bank
Firing order 01, 02,...	ENTER - selects, ESCAPE - deletes , UP/DOWN - changes number
Engine TDC offset	this value is dependant on the correct setup of the TDC pickup with regard of the position of the TDC of cylinder no.1.You can leave this value at 00 and correct it after the analysis of the first test (this parameter has no influence on data transferred to the PC, but on the data presented on the EPU screen (MIP, Power, Ang. of Pmax , Ang max PrRise).
Cylinder TDC offset	correction for engines with uneven shaft.
Combustion sensor [mV/bar]	take this value from Calibration Certificate (sensor type 7613C, use value at 0-250bar / 200ºC). Important: always use negative value for sensitivity, e.g. -19,94.
Fuel sensor [mV/ bar]	take this value from Calibration Certificate (sensor type 6729A). Important: always use negative value for sensitivity, e.g. -2,53.
Units	choose kW or HP for the power parameter to be displayed in the table on the EPU screen.
Save Engine Setup	by pressing ENTER, you will save all of the parameters in the EPU memory. Use UP/DOWN to select Yes/No.

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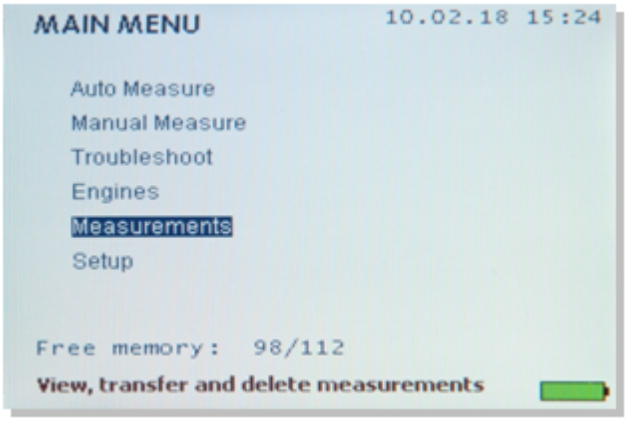
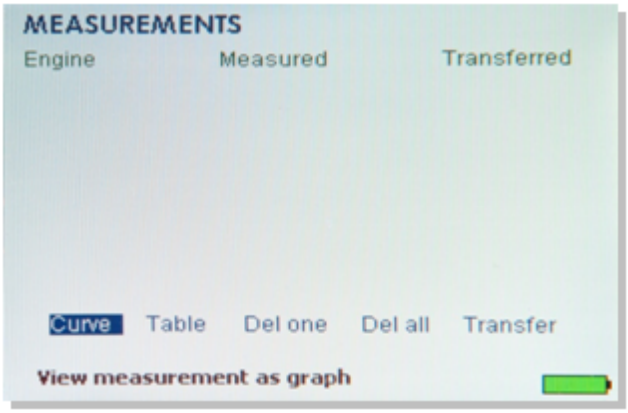
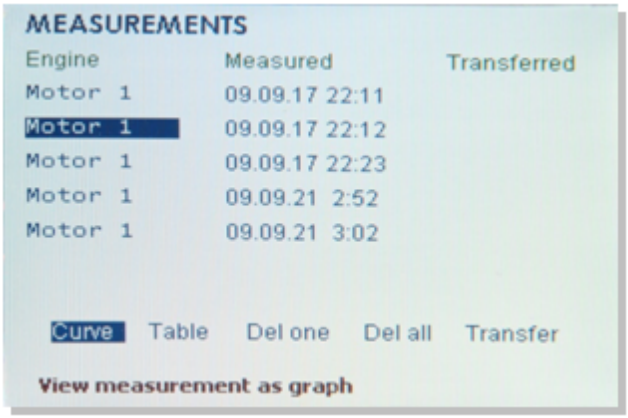
4.5 Measurements







In this menu you can view, delete and transfer measurements.

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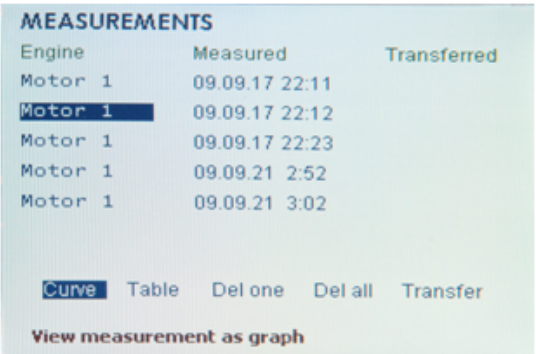
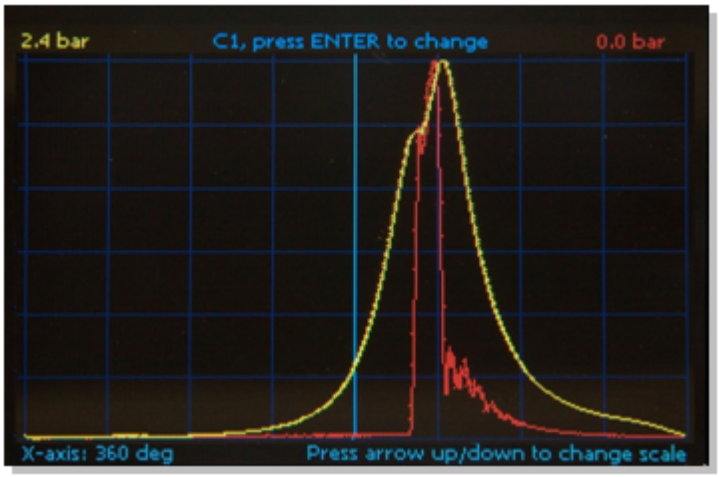
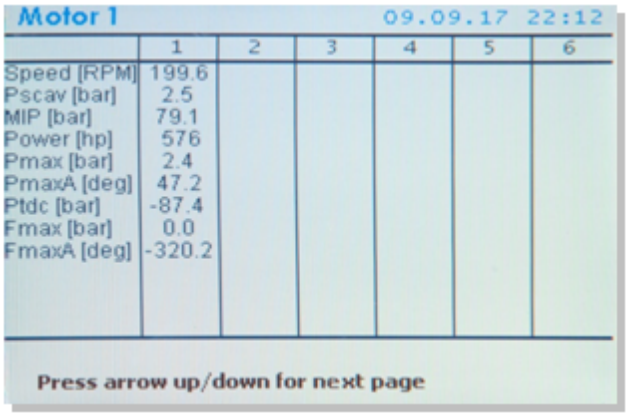


- **Curve**
  To show the measurement as a graphic.
- **Table**
  To show the results of the measurement in table format,(RPM, Pscav, MIP, Power, Pmax etc…)
- **Del one**
  To delete individual measurements. (password required for this function)
- **Del all**
  To delete all measurements in the EPU. (password required for this function)
- **Transfer**
  To transfer measurements to the PC, select Transfer and highlight the engine measurement you want to transfer (no ENTER required). Now the EPU is prepared, use the PC for transfer command.

4.5.1 Curve



4.5.2 Table



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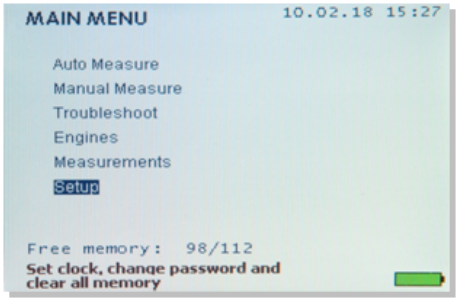
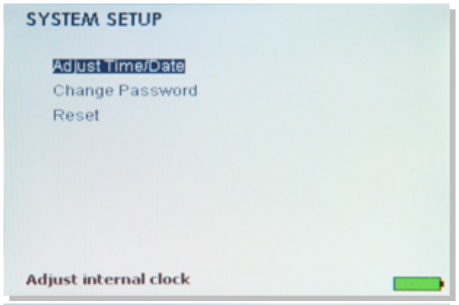
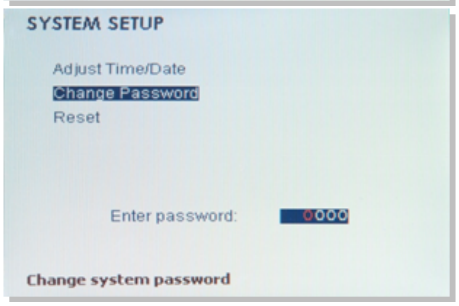
4.6 Setup



In this menu you can Adjust Time and Date, Change the system password and do a Factory Reset.



- **Adjust Time/Date**
  Date format is year.month.day



- **Change password**
  To change the system password (default factory password is 0000). In case this password is changed and lost, contact Fuchs Technology.
- **Reset**
  This function will reset the EPU to factory configuration (password required). CAUTION: this function will clear the EPU of all its settings (including measurements and engine configurations).

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Battery charging

V

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5 Battery charging

Use The Doctor battery charger max. 9VDC only (min 1,2A are required).

When connecting the battery charger, the EPU will turn on automatically.

To reduce charging time switch unit OFF completely (“system on” light must not show)

EPU units with serial number S-200 and higher are fitted with Li-Ion batteries, charging time for a fully discharged battery is about 5 hours.

The battery operating time is over 5 hours

Keep the battery in good condition by fully charging it after each use – regardless whether it is fully discharged or not. For the lifetime of a battery it is better to keep it charged.

When not used, store the EPU in a cool place (heat reduces the battery lifetime).

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Reset EPU

VI

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6 Reset EPU

Software Reset

If the screen is frozen (system blocked), press ENTER & ESCAPE together, to switch off EPU. You can loose current cylinder data if you press ENTER & ESCAPE while the EPU is processing.

Hardware reset

The hardware reset button is located at the lower RH-side of the housing.

In case the EPU freezes, hold this button depressed for about 10 seconds (use ballpoint pen or similar to depress).

It recycles the battery power supply to the circuit board and will allow the EPU to start up again.

The setups and measurements will not be deleted from the memory by pushing the reset button.

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Update EPU software

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7 Update EPU software

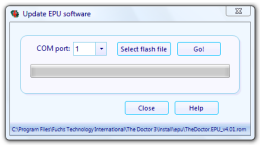
DM 4/5 models with serial number S-200 and higher can be updated by downloading a new software into EPU.

Prepare EPU:

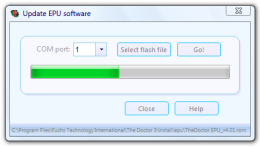
1. Connect PC and EPU with the serial cable and switch off the instrument.
2. Hold down ESCAPE, press ON/OFF, release ESCAPE. If this is done OK, the system on LED will start to blink and the screen is black.
3. NOTE: With this step you will clear the old software from the EPU.
   Press following sequence: ESCAPE, UP, DOWN, ENTER, DOWN, UP, ENTER. You will hear a long beep; this means the EPU is cleared. (If you don't hear the long beep, try again from point 1)
4. Shut down the instrument by holding down ESCAPE and press ENTER
5. Hold down ESCAPE, press ON/OFF, release ESCAPE. The system on LED will start to flash and the screen is black. (EPU is ready for updating)

Download a new software into EPU:

Select `Data sources - EPU DM-4/5 - Update EPU software...` menu command from The Doctor PC software.



Press "Select flash file..." button and locate the desired file with a .rom suffix.
NOTE: The latest release named TheDoctor.rom is in the install/EPU sub directory of your The Doctor base installation path.
Specify CPM port and click GO!



Now wait for about a minute while the EPU is getting updated.
When the updating is done the EPU will switch on.

Remark: In case of a problem you can start this procedure at any stage again at point 1.

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Cables

VIII

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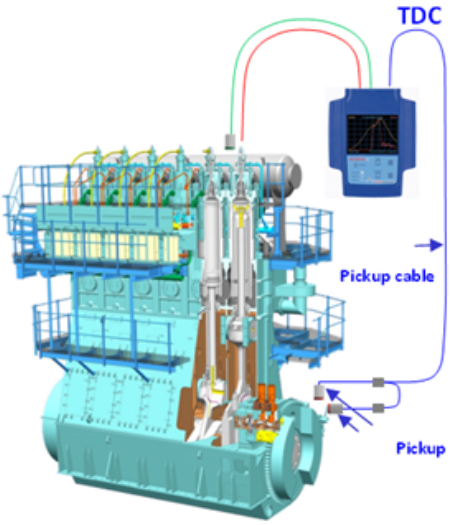
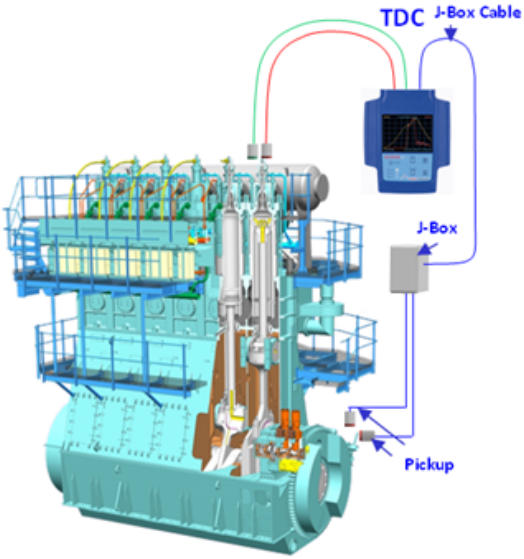
8 Cables

8.1 Connecting sensors





Please read more information from THE DOCTOR Hardware installation manual.

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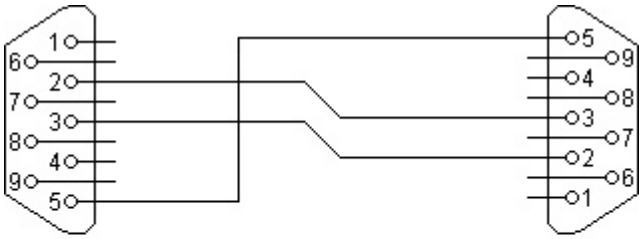
8.2 Data cable

The EPU is connected to the PC with a standard null modem (RS232) cable:

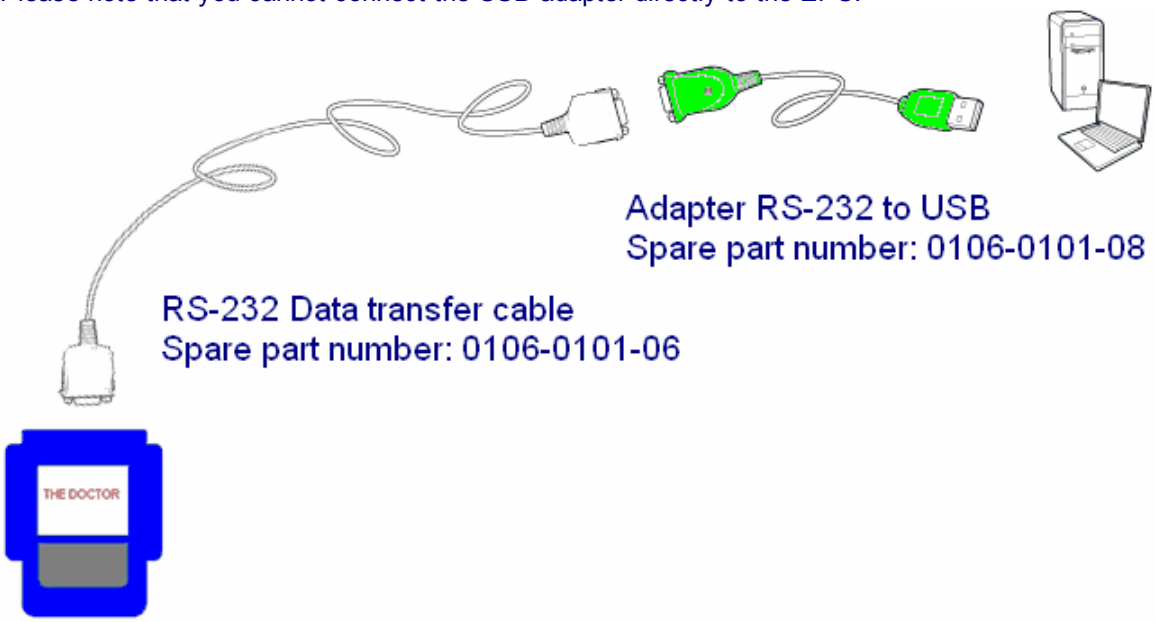


EPU	Function	PC
2	Rx ← Tx	3
3	Tx → Rx	2
5	Signal ground	5

Please note, The Doctor DM5 is soon available with USB connector instead of this RS232.

8.2.1 USB port adapter

The USB port adapter is connected between The Doctor data transfer cable and and the USB port in your computer.
Please note that you cannot connect the USB adapter directly to the EPU.



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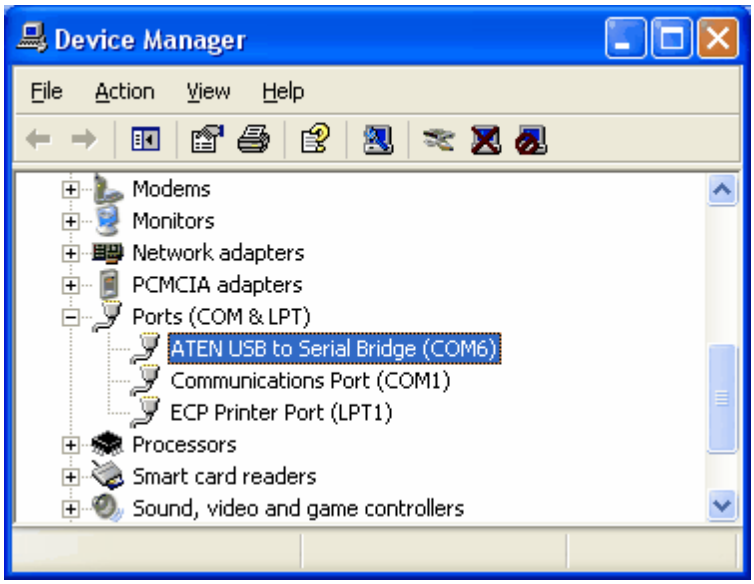
8.2.1.1 Installation

For Windows XP:

1. Plug the USB adapter into your computer.
2. The *New Hardware Wizard* appears; click **Next** to continue.
3. In the dialog box that comes up, leave the default choice (*Search for the best drivers for your device*); click **Next** to continue.
4. In the dialog box that comes up, first put the USB adapter's distribution disk into your CDROM; choose UC232A directory; Browse to the folder on the disk that corresponds to your version of Windows; Click **Next** to continue.
   NOTE: Instead of using a CD you can find the needed installation files from `installation/USBadapter` sub directory of your The Doctor base directory (PC SW ver. 2.1.0.7 and above).
5. In the Ready to install... dialog box that comes up, click **Next** to continue. Files are now copied into right location on the hard disk.
6. After the driver files have been copied, a dialog box appears to tell you that the installation has finished. Click **Finish**. Windows now finishes up the installation.

Checking the installation

1. Open the Device Manager (For example by clicking My Computer -> Control panel -> System -> Hardware -> Device Manager tab)
2. Check that you have a new serial port in your computer (ATEN USB to Serial Bridge)



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