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DIGITAL MULTIMETERS DMK-DMG SERIES

REMOTE CONTROL SOFTWARE MANUAL

SUMMARY

Introduction

The remote control software allows to connect one or more multimeter-DMG series multimeters (DMK32, DMK62, DMK40, DMK22, DMK52, DMG210, DMG300, DMG700, DMG800) to one PC, and provides the following functions:

- Graphically show the measures read from the multimeters, in the form of 'virtual' instruments (gauges, bar graphs, displays, counters and more).
- Periodically sample a set of measurements defined by the user and save them on disk in different formats (MS-Access, ASCII text, MS-Excel).
- Periodically sample the multimeter energy meters value and save them in a database. Automatically calculate the energy consumption between on sample and the following.
- Plot graphs of the sampled measures.
- Apply alarm thresholds to the sampled measures.
- Save on disk the alarm and event sequence happened in the multimeters network.
- Show a 'virtual' front panel of the multimeter, with the possibility to view all the readings and to click on the pushbuttons.
- Show, modify, save on disk, reload and print the multimeter setup settings.
- Display a graph of the voltage and current harmonic content, using the FFT readings supplied by the multimeter.
- Customize the software pages, inserting indicators linked to measurements, background pictures, fixed texts, command buttons and more.
- Change the language of the software menus and commands, selecting among Italian, English, French, German and Spanish.

Minimum PC hardware requirements

- Windows 95/98/2000/XP operative system.
- Graphic card with minimum resolution of 800x600, 1024x768 or more recommended.
- One free serial interface port (COM:)
- 64Mb of RAM
- Pentium-like processor or faster
- CD-ROM drive for installation

Installation

To proceed with the installation, it is necessary that the PC is already working with the operative system and to have the CD ROM for the software setup.
It is also recommended that the user has at least a minimum experience with PCs and Windows environment.

To install the software:

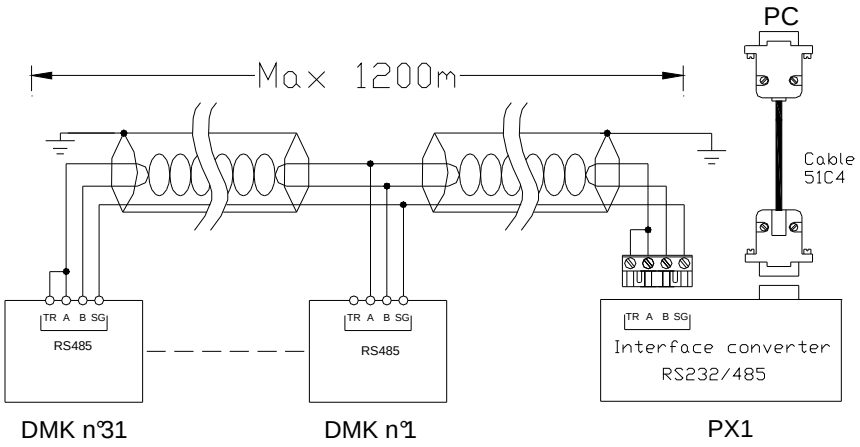
1. Close all active applications
2. Insert the CD in the drive and wait for its recognition.
3. Launch *Setup.exe*.
4. A dialog box will appear asking for the directory where to install the program. State the new name, if any, in the space.
5. Follow the step-by-step instructions
6. If at the end of setup process the installation program asks to reboot the Pc, execute this procedure.

Activation of the PC-multimeters connection

To operate the remote control program, it is essential the PC and multimeter can communicate by serial interface. To activate the serial link, without using a modem, follow these steps:

1. The first step is to make sure the PC has one free RS-232 serial communications interface port. Serial ports are normally indicated by the *COM* reference. They are usually numbered *COM1:* to *COM4:* although the majority of the brands on the market have only two available ports, *COM1:* and *COM2:*, identifiable by the 9-pin D-type male connector. Secondly, it is important to choose the PC port bearing in mind that one serial port is already used for the mouse in some cases.
1. Configure the software to use the selected serial port. This can be done when the multimeter.exe software is executed for the first time and also later, using *Configuration-Options-General* menu (see the Configuration chapter). The factory default for the serial port is COM1: , 9600 baud, no parity.
2. Prepare the Rs-485 network. Connect the Rs-232/Rs-485 converter to the PC. Connect all multimeters interface terminals in parallel with the twisted-pair cable and then to the interface converter, as shown in the following wiring diagram. Make sure the polarity is correct (A and B terminals).
3. We strongly recommend to use an interface converter supplied by Lovato. If the user wants to use an interface converter of another brand, we will not able to help with wiring, nor to assure that the communication will work properly. However, the interface converter must be insulated and have an automatic enable line control circuit.
4. From the front keyboard of each multimeter, enter the communication setup and set one different serial address for each multimeter-DMG, starting from address 01. Make sure that the PC speed and parity settings match the multimeters setting.
5. At this point it is possible to start the Remote control application. If the wiring and settings are correct, the link will be automatically established with the first multimeter.

Wiring diagram (direct connection)



Troubleshooting

If the connection does not work (trying to enter Online mode, the program emits some beeps and automatically proceeds in Offline mode), carefully check the following points:

1. The PC COM port used for the connection must match the one selected in *Configuration-Options-General-Serial port settings* menu. That port must NOT be configured as a serial mouse port on the PC.
2. The communication rate set on the PC and all Multimeters must be the same (e.g. 9600 bps for both).
3. If there are more than one multimeter connected, then each must have a serial address different than all the others (e.g. 01, 02, 03, etc.). To set the serial address, program the relative parameter in the communication setup menu.
4. The converter connection polarity to the RS-485 bus must be correct; all A terminals (marked on the leads), plugged on to one bus connector and the B terminals with the other.
5. The maximum distance between the two most distant units on the RS-485 bus must not exceed 1000 m.
6. The two most distant units must be connected to the terminal resistor (TR).
7. The interface converter on the PC side must be switched on and correctly configured; see the relative technical sheet attached to the device. In particular, it must be set for automatic enable line switching (Data mode).

Connection via modem

When the PC and the Multimeters are located at a considerable distance from one another, it is possible to establish remote control through a pair of modems. In this case the PC must be connected to the modem through the standard cable supplied with the modem. On the other end, the RS-232/RS-485 converter must be connected to the modem through the 51C9 cable supplied by Lovato. The connection between the RS-232/RS-485 converter and the multimeters must be done in the same way used with direct connection (see the wiring diagram in the previous page).
This type of connection may entail some difficulty for users who are not familiar with the use and programming of modems, as certain programming is necessary depending on the type of modem used, the type of telephone line, etc. For further information about the wiring and the programming of modems, see Appendix A.

Connection via Ethernet-to-serial gateways

It is possible to configure the software to establish the PC-multimeters connection through Ethernet-to-serial gateways. This devices are able to use the Ethernet LAN network to realize a link between serial devices, and can be used in two different ways:

1. Using a dedicated driver in the PC, one virtual COM port is created. This COM port s visible by any application running on the PC. It works logically exactly as a standard serial port, the only difference is that it is physically placed on the gateway, that is it can be placed far away from the PC. This allows to use an existing LAN to cover the major part of the distance between the PC and the place where the multimeter are installed. In this case the use of the Ethernet converter is *transparent*, that is both the configuration of the PC and the wiring of the multimeter interface to the serial port are to be done as usual (see the previous chapter *Activation of PC-Multimeters connection*). The only difference is that the PC serial port has to be substituted by the gateway converter serial port. This operation mode allows to use only one gateway.

2. The second possible connection mode works with a direct communication between PC and gateways without the need for a virtual COM driver, allowing to use several Ethernet-to-serial devices at the same time. This provides more flexibility in placing the converters in different points of the network and reaching multimeters that are far one from the other.
   In this case, for every multimeter the user must specify the IP address and IP port of the Ethernet converter where the multimeter is connected (see *Configure-Options* window in the following pages). It is also possible to connect several multimeters to the same port of the converter.
   The market offers many different brands and models of Ethernet/serial converters, and their characteristics and product codes are continuously evolving. For this reason this manual does not indicate a specific model, even if the major part of these devices is compatible with our application. To have help in selecting the right model, ask the producer of the gateway for technical support.
   To set-up the system and correctly configure the gateways, refer to their user manual and eventually ask for the help of an expert of LAN networks (IT system administrator).

   As a general indication, respect the following points:

   - The serial gateways have to be configured to work directly in TCP/IP, not through a virtual COM driver.
   - The IP addresses used for the converters must be free, that is they have not to be in conflict with other devices operating on the LAN. If necessary, ask for the IT system administrator help.
   - The serial port settings of the converters (baudrate, parity, data bits etc) must match what is set into the Multimeters.
   - All multimeters must have a different serial address.

   Concerning the physical connection between multimeter and converter:

   - If the Ethernet-to serial converter has a RS-232 interface port, then use the same wiring diagrams suggested for the COM port of the PC.
   - If otherwise the Ethernet gateway is equipped with an RS-485 interface compatible with the multimeters interface, then it will be possible to have direct wiring between multimeter and gateway.
   - For DMG300-700-800, the connection depends on the expansion module installed.

Basic principles

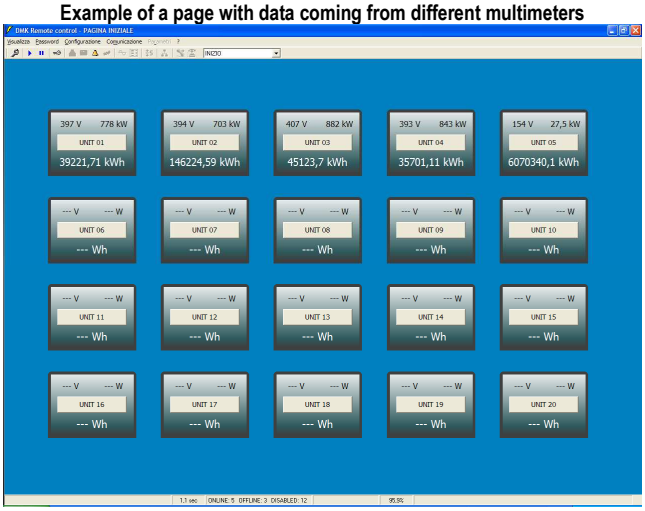
The working criteria of the program is to cyclically read the measures taken by connected multimeters and to display them in the form of indicators on the PC monitor. Information is grouped in *pages* that can be selected by the user during connection. When the software is installed, some already-made pages are supplied. The user, if needed, will be able to create new customized pages and/or to modify the existing ones.

Pages can be of two types:

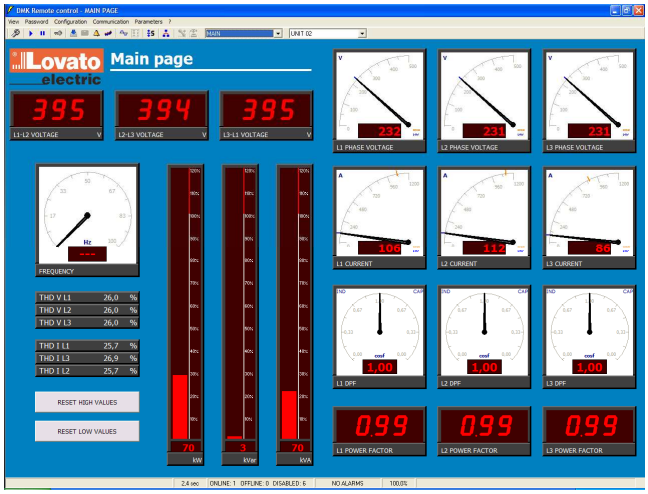
- Pages that groups data coming from different multimeters, for instance to show simultaneously voltage, current, power etc read from different points of a plant, each controlled by one multimeter. In this case each indicator displays readings coming from one particular multimeter.
- Pages with indicators not assigned to one particular multimeter, where the user selects from which multimeter he wants to read data to be shown. In this case it is possible to concentrate many measures all coming from the same multimeter (the one selected in that moment). With a simple click, the user can move its attention to another multimeter, and all indicators will be updated with data coming from the newly selected multimeter.

Most common pages are of the second type. When the software is displaying one of these pages, one drop-down list will be shown allowing the user to select the multimeter from which read measurements. In this case other functions will also be enabled, addressed to the selected multimeter, as for instance the access to setup parameters, harmonic contents graph, virtual front panel and so on.

Example of a page with data coming from different multimeters



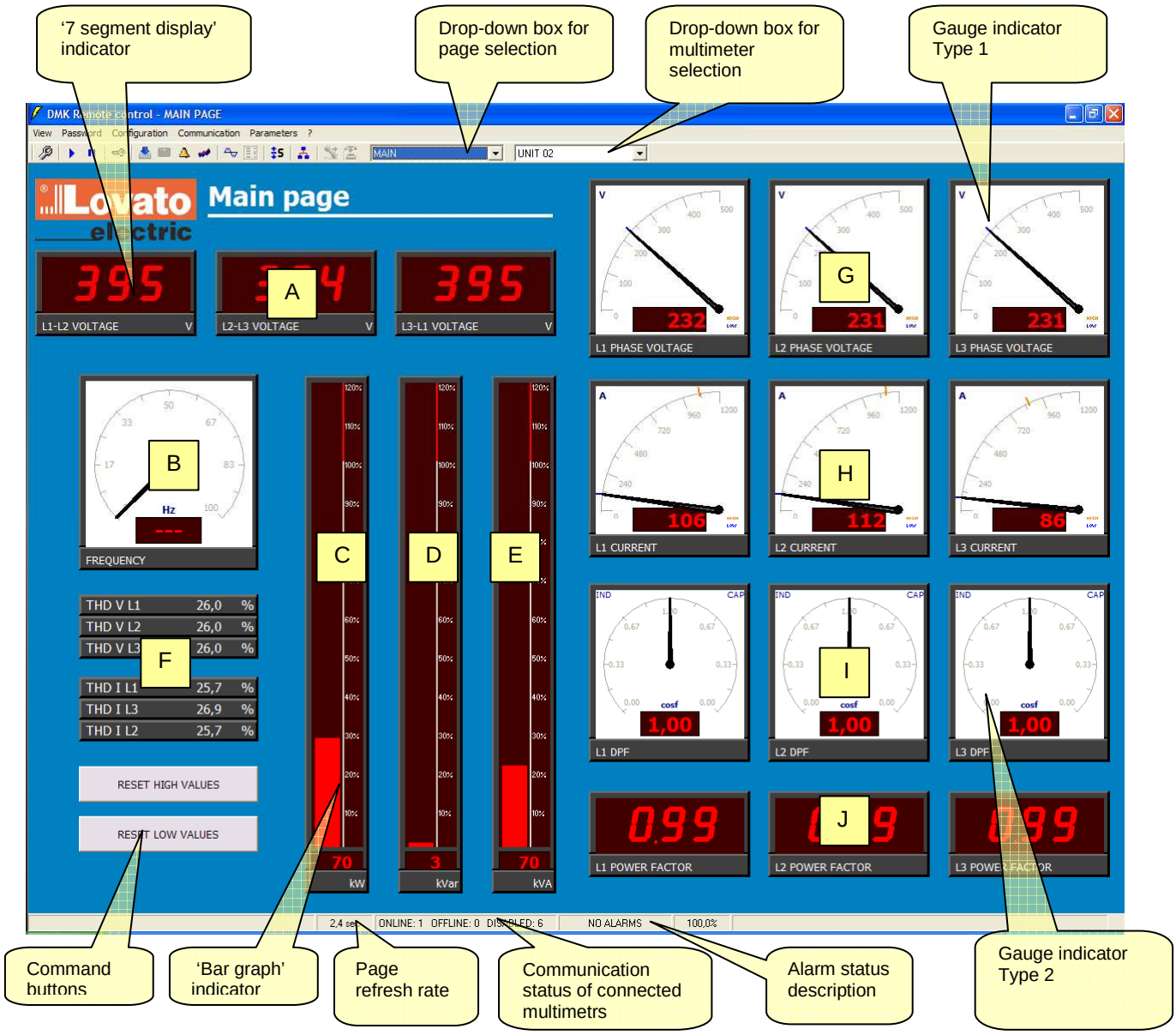
Example of a page filled with data coming from the same multimeter



Main window

The main window contains all menus and toolbars that allow the user to access to various functions of the software. Some of these functions that can modify the software and/or multimeter configuration are protected by a password, and are disabled when the program is started. In the following figure is displayed the main page aspect , with highlights on the most commonly used controls.

Fig 1.1 – Main window



The page shown in figure 1.1, called *MAIN,* is one of the already-made pages supplied with the program. It is a non-associated indicator page, so the displayed measures are referred to the multimeter selected in the drop-down selection box placed top-right.
In this page are displayed many of the most important readings given by multimeter, that is:

A) Phase-to-phase voltages
B) Frequency
C) Total active power
D) Total reactive power
E) Total apparent power
F) THD Voltage and Current
G) L1, L2, L3 phase voltage, with instantaneous maximum and minumum values (HIGH and LOW functions of the multimeter).
H) L1, L2, L3 phase current with HIGH-LOW.
I) L1, L2, L3 displacement power factor
J) L1, L2, L3 total power factor

If the selected multimeter model does not provide one measure, the correspondent indicator will show '---'.

System configuration

To access the configuration window it is necessary to enter the password. By default, the password is *LOVATO*. Click on *Password* menu, key-in LOVATO and then confirm with OK.
The configuration phase is a very important step to correctly define the program operation. In particular, in the case in which are connected more than one multimeter, the user will have to pay attention to the setting of each multimeter connected to the network.
Before proceeding with the explanation of the various functions of the software, we will examine the configuration window, looking at the meaning of all settings.

Figure 2.1 – Configuration-Options-General

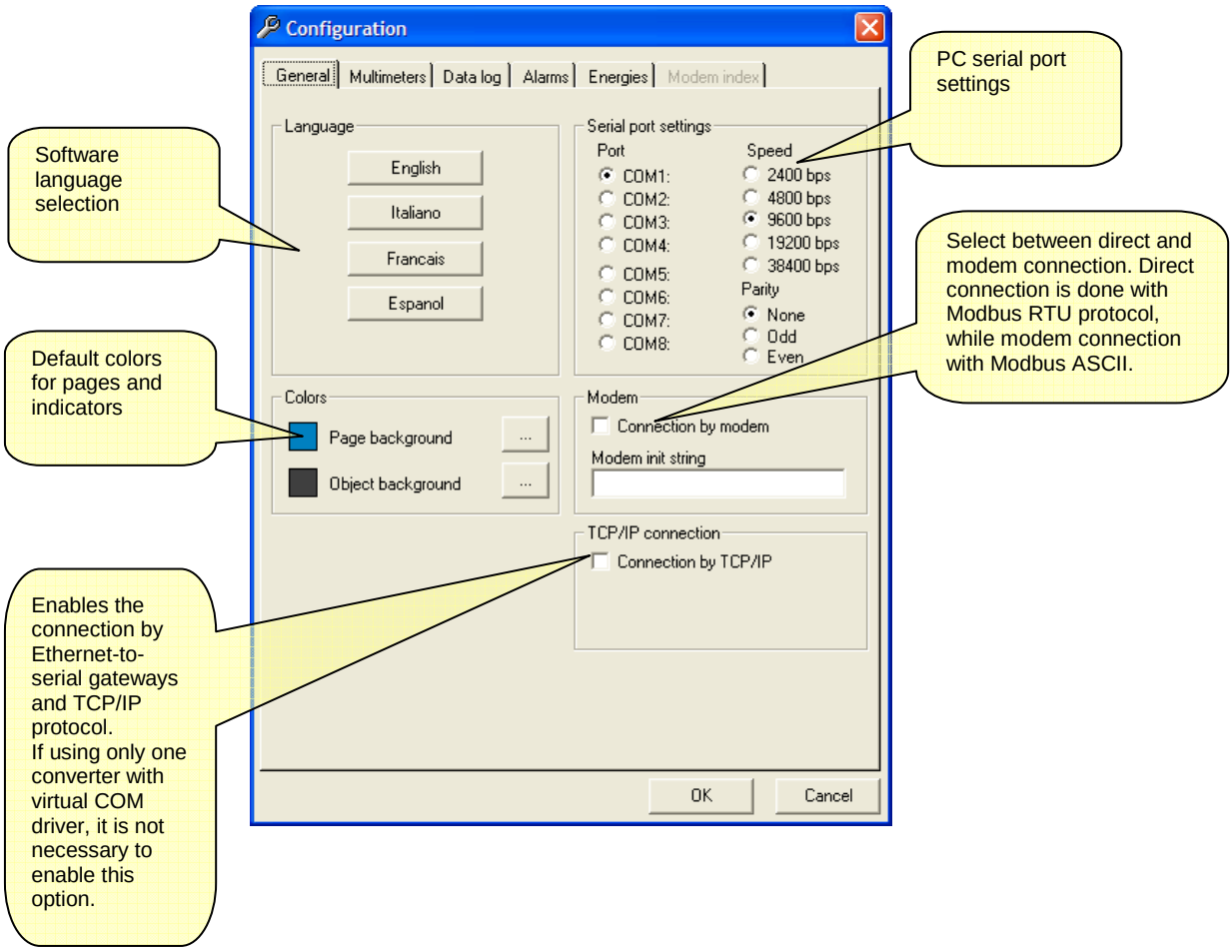


Figure 2.2 – Configuration-Options-Multimeters

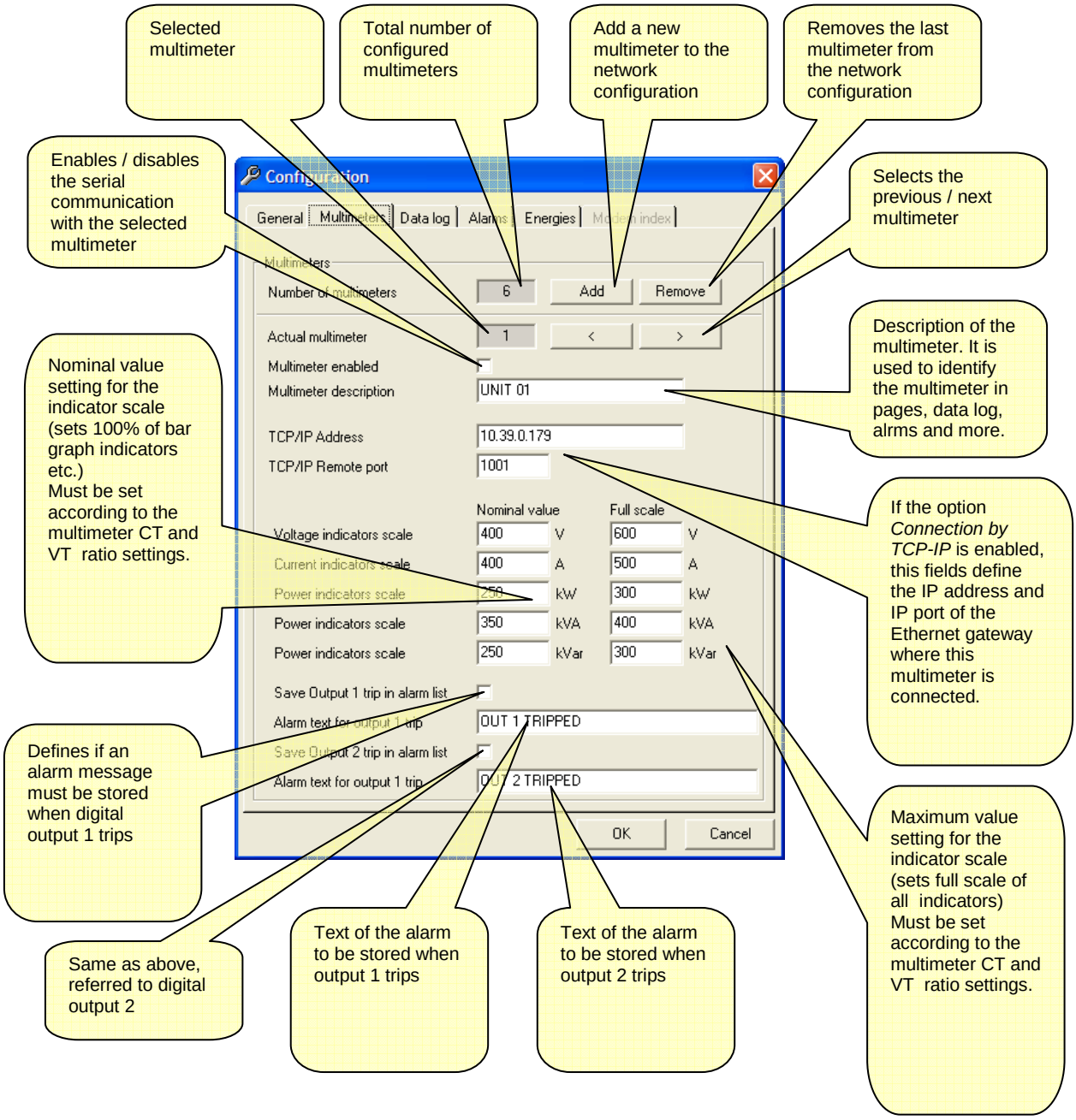


Figure 2.3 - Configuration-Options-Data log

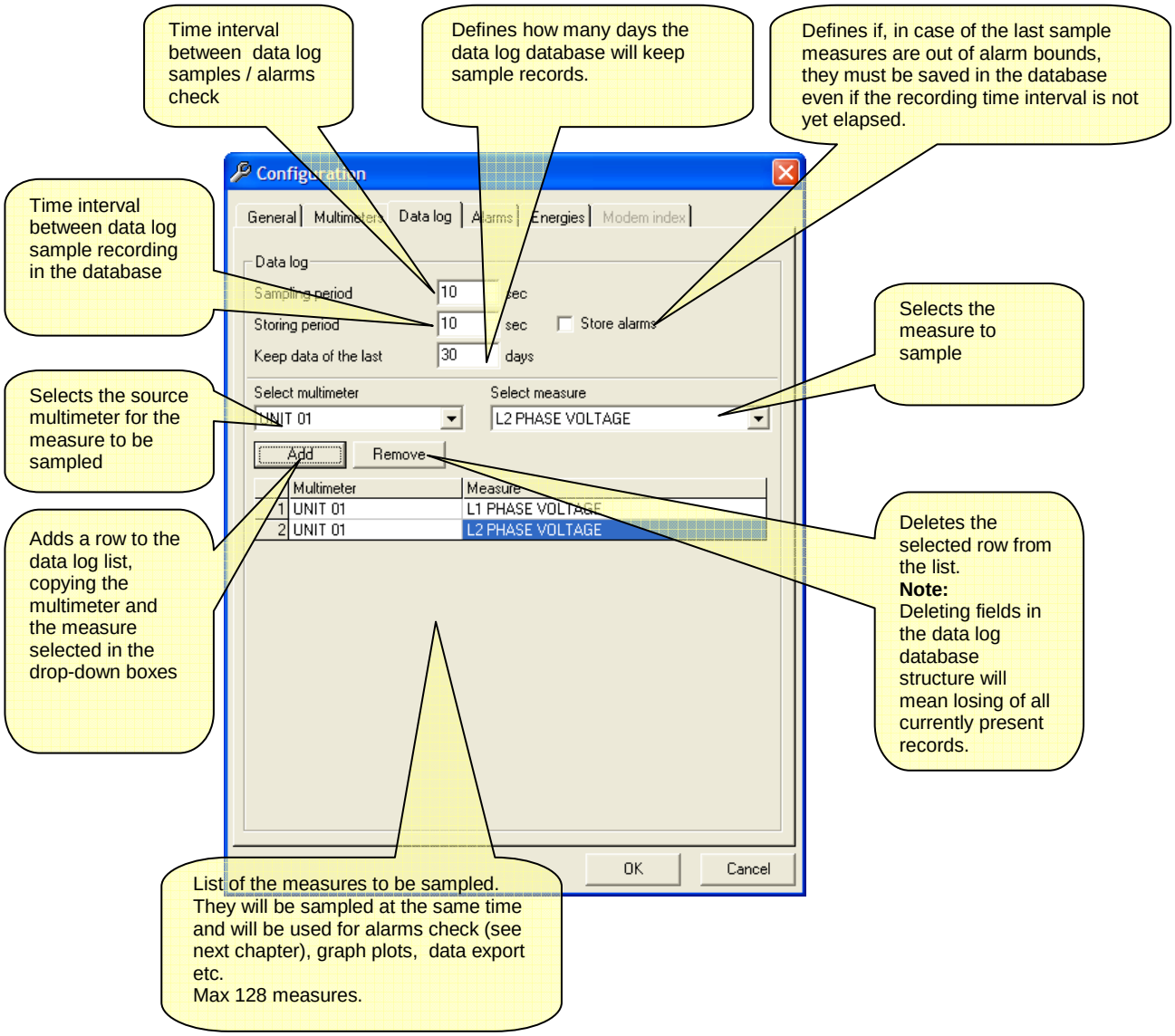


Figure 2.4 - Configuration-Options-Alarms

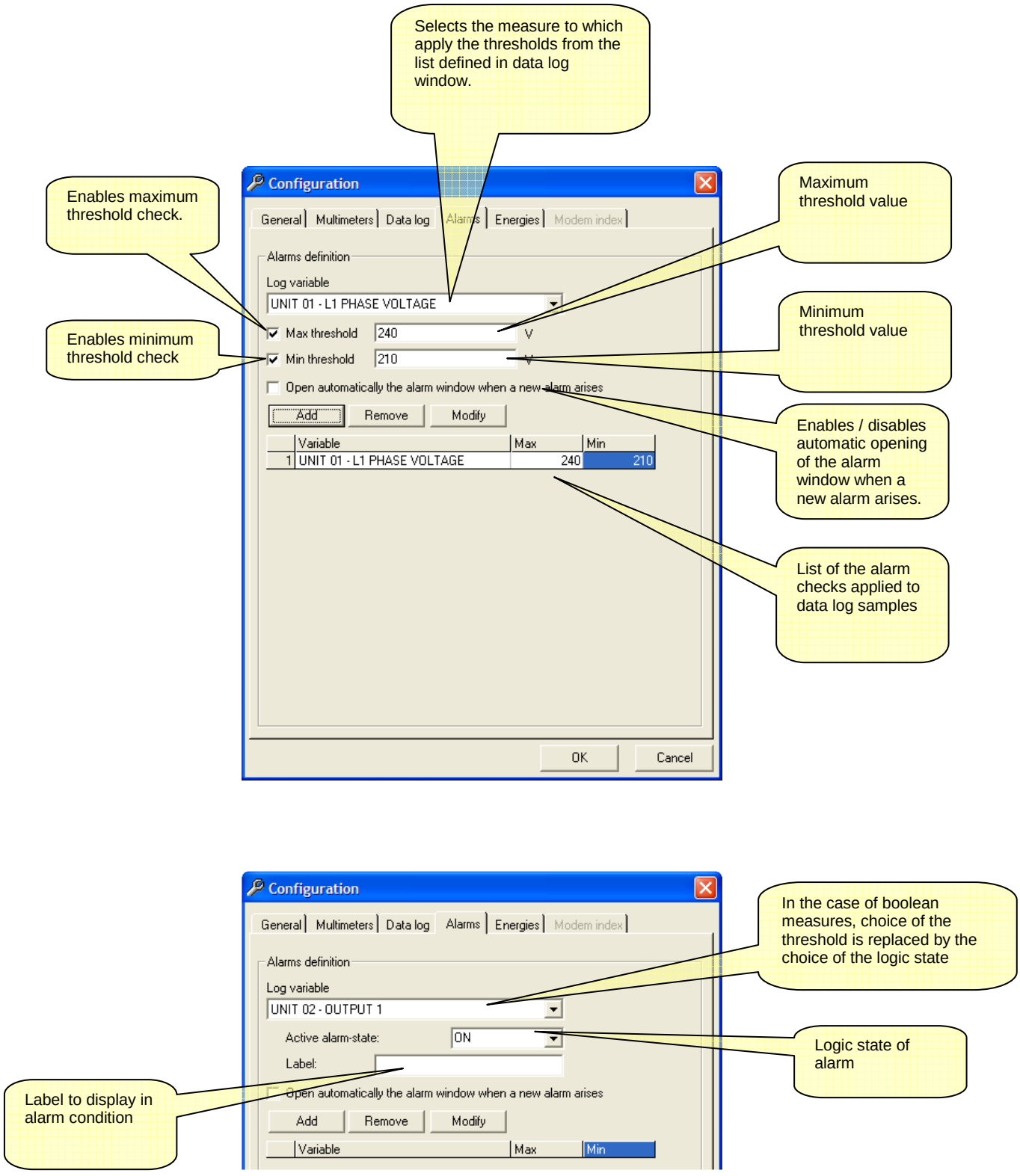


Figure 2.5 - Configuration-Options-Energies

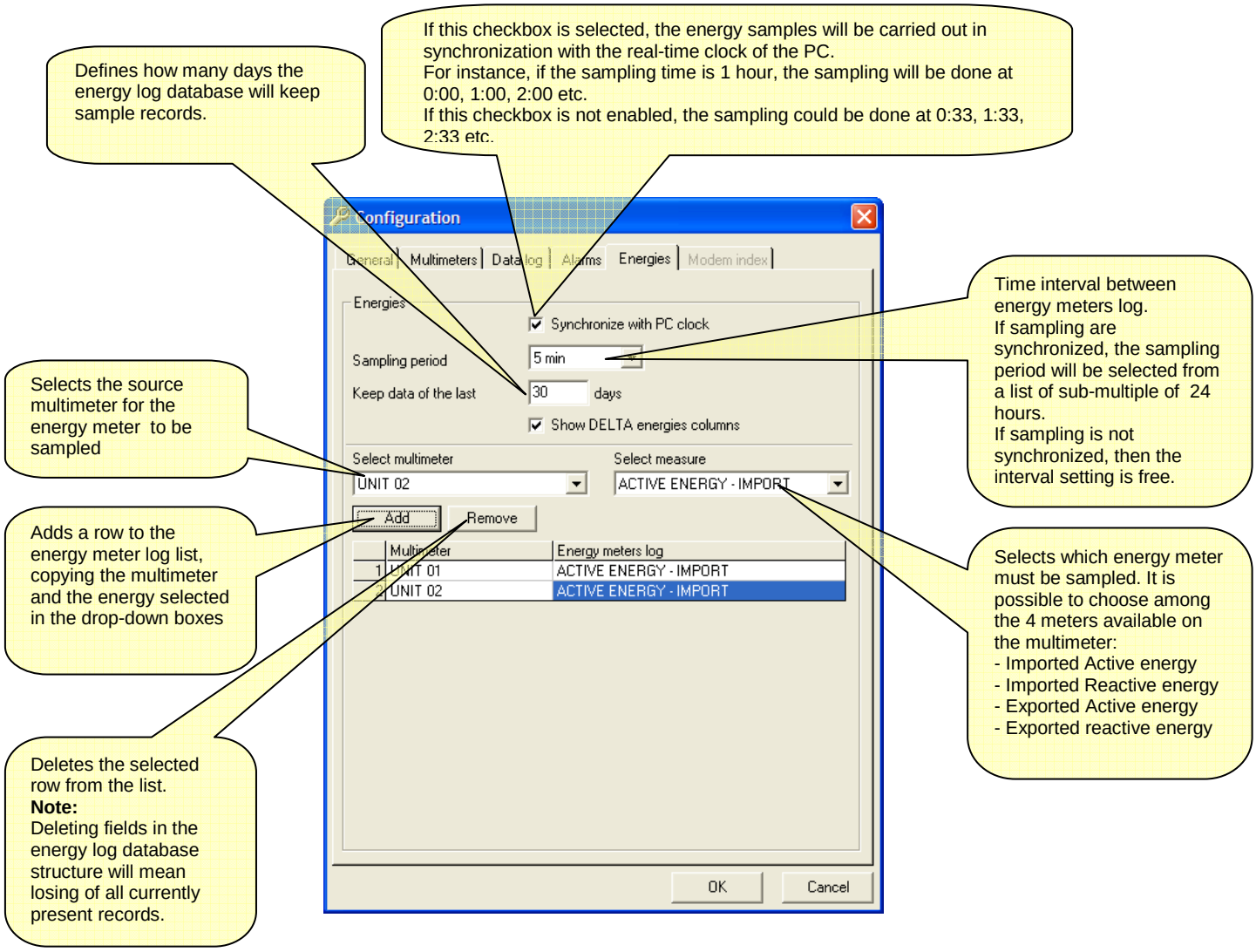
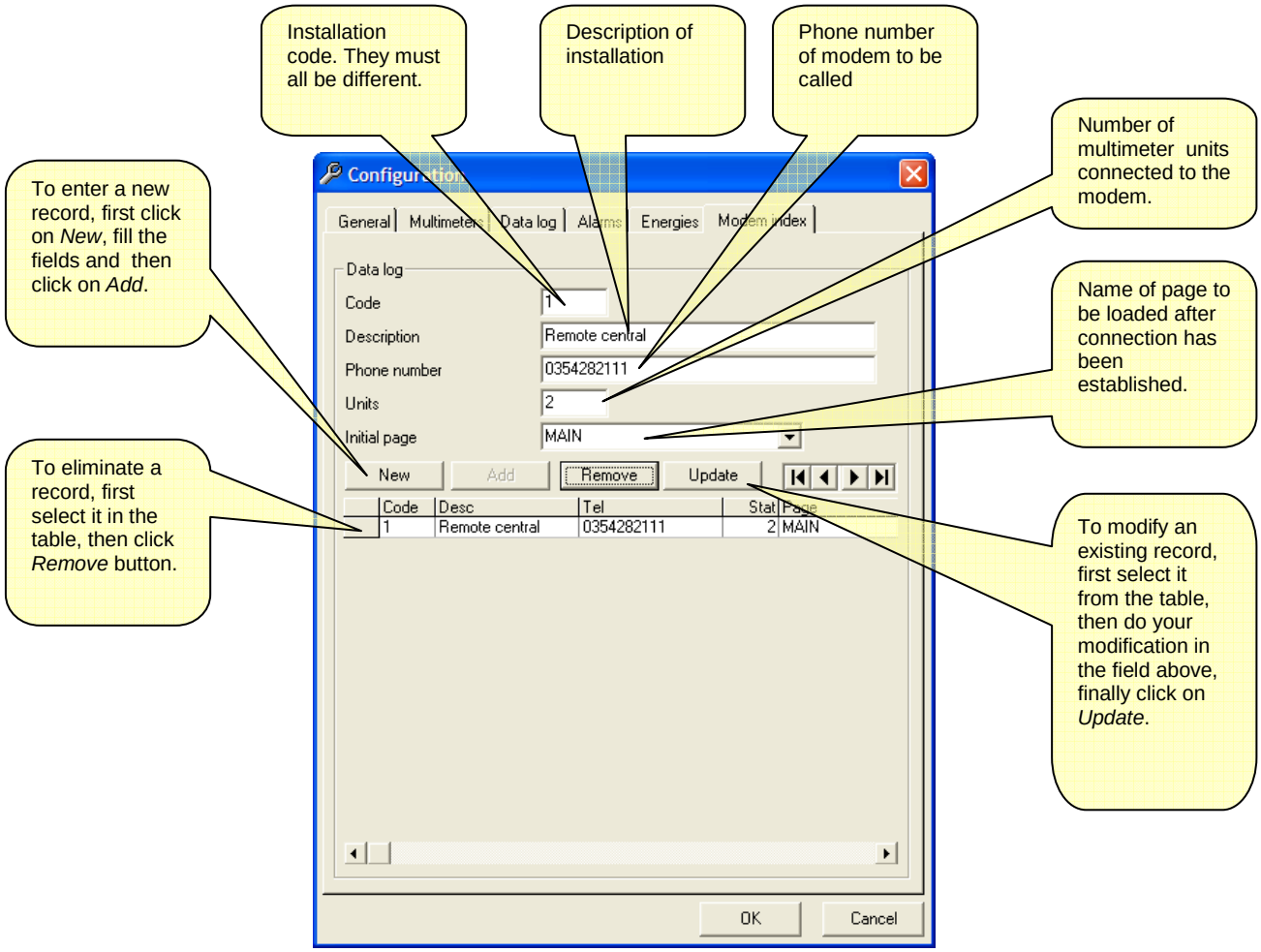


Figure 2.6 - Configuration-Options-Modem Index

If the software is configured for connecting via modem, it is possible to store a list of the various installations, that is a list of places where a multimeter network with modem is installed. For each installation, the user can define a code, a name and the corresponding phone number of the modem on the field. This way, when wanting to connect with a particular installation, it will be possible to dial it directly from this list. For each installation it is possible to define if one or more units are installed and associate an initial page to be loaded once connection has been established.



Important note:

Normally the user connects its multimeter network to the PC without modem. This allows to configure each multimeter, defining the name, the full-scale value for all the measurements etc (this are the configurations that are entered in the *Configuration-Options-Multimeters* window, see figure 2.2).

When using modem connection, all this setting can be used only if the remote connection is done always to the same multimeter network, that is, if there is only one record in the *Modem index* because the user dials always the same number. In this case, the couple of modems are used to reach a longer distance, but the communication is the same as for direct connection.

The concept changes if there are more than one multimeter networks in the field. In this case, each network may be different from the other, having different number of Multimeters, working with different voltage etc. The user can select one installation, connect to it and see the multimeter status, then disconnect and dial another phone number to connect to another multimeter network.

In such situation, functions like the *Data log*, *Energy meters log*, (and thus *Graph* and *Alarms*) cannot be used correctly, since data coming from different Multimeters may be stored in the same database.

For the above reasons, the software will work in two different ways:

- If the connection is direct (without modem) or via modem but with only one installation (only one phone number to dial) then the software will operate normally.
- If the connection is done via modem to different places (several multimeter networks each with a different phone number) then the *Data log* , *Energy meters log*, *Graph* and *Alarms* function will not operate. The full-scale value for the indicators will be calculated automatically using the multimeter settings as a reference, and the name of each multimeter will be assigned as default.

When the user clicks the New button to add the second installation phone number, a message box will be displayed, informing that the operation of the software is going to change.

View menu

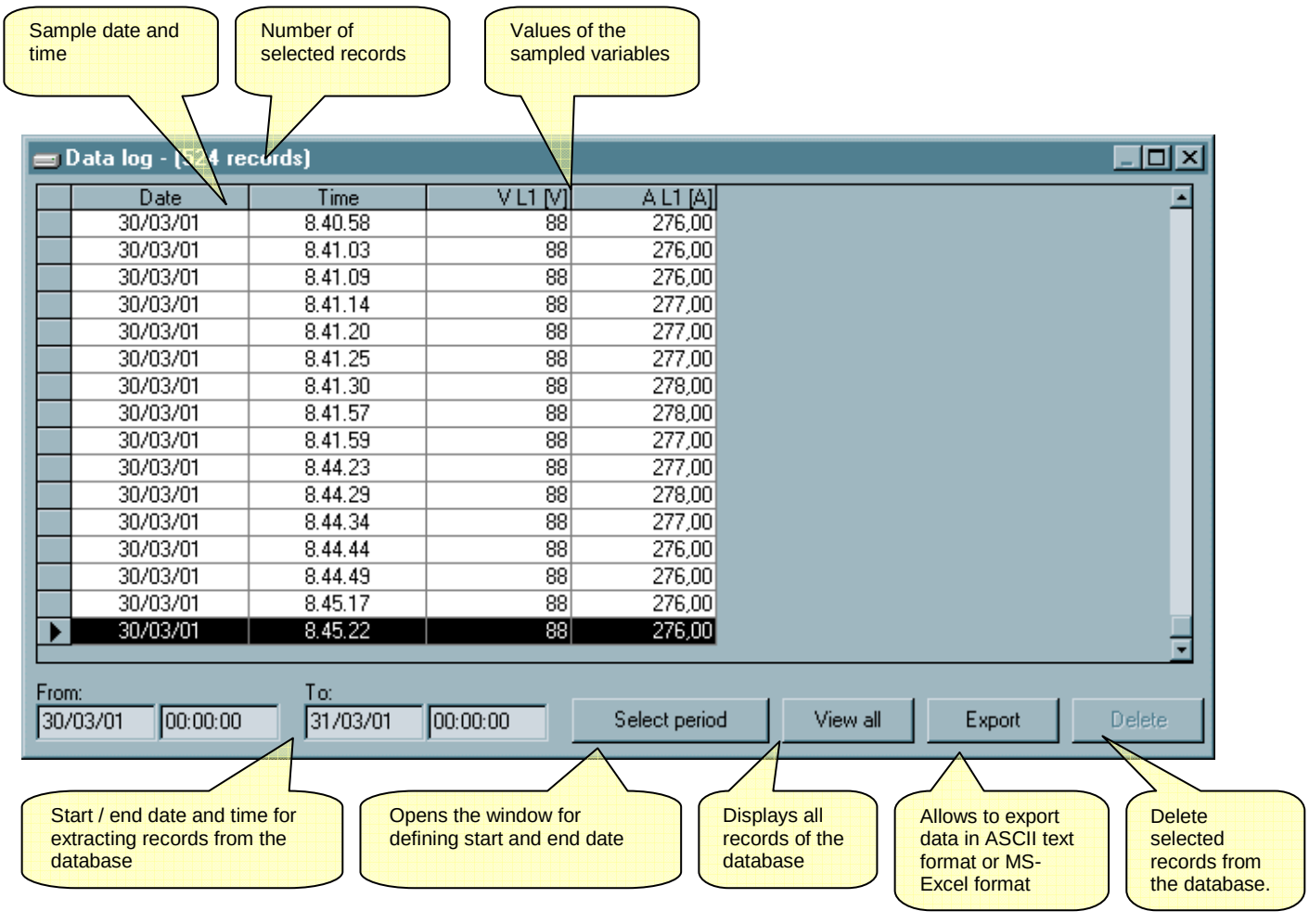
Data log

Variables defined in the *Data log* configuration (Figure 2.3) are sampled cyclically by the software, independently from which page is shown, with an acquisition rate defined by the user with the *Sampling period* setting. After each sample, data are compared with alarm thresholds defined by the user (if any). The same data are saved in the Data log database with a storing rate defined with *Storing period* setting.
For instance, it is possible to set a sampling period of 5 sec and a storing period of 30 sec. In this case, every 5 sec the software will read all variables defined in the data log configuration list, and will check those among them for which alarm thresholds have been defined. If there are no alarms, once every 30 sec the sample will be stored in a new record of the database. If the option *Store alarms* has been selected and one of the measures is out of bounds, its value will be saved in the database even if the storing period has not yet elapsed. Obviously, the user can decide to set a storing period equal to the sampling period. In this case, every sample will be saved in the database.
When the user defines the Storing period, he must pay attention to the disk space available on its PC. For instance, setting a storing period of 5 sec, a total of 17280 records/day will be added to the database, each one with date, time and value of each variable defined in the data log list.
This is the reason why it has been decided to separate the storing from the sampling period. This solution allows to check variables for alarms with a good frequency, but to store them only when they are out of bounds and however, with a slower ratio.
To limit the hard disk space occupation, it is possible to eliminate automatically from the database the samples older than a defined number of days. Setting *Maintain samples of the last…days* to 7, only records of the last week will be kept in the database.

If the multimeter model does not support the selected measure (for instance reading cos-phi from a DMK22) the correspondent field in the datalog database will remain empty.

Data recorded in the database can be displayed in a table with View-Data log menu, or clicking on the corresponding icon on the toolbar.

Figure 3.1 – View-Data log



Energy meters log

The energy meters defined in the *Energy meters log* configuration (Figure 2.5) are sampled cyclically by the software, independently from which page is shown, with an acquisition rate defined by the user with the *Sampling period* setting. If the *Synchronize with PC clock* checkbox is enabled, the samples are done at real-time regular intervals.

Example:

Sampling period: 5 min – Synchronized
Samples at: 0:00, 0:05, 0:10, 0:15 ……. 8:00, 8:05, 8:10 …….

Sampling period: 30 min – Synchronized
Samples at: 0:00, 0:30, 1:00, 1:30 ……. 8:00, 8:30, 9:00 …….

If the *Synchronize with PC clock* checkbox is NOT enabled, then the distance between one sample and the following can be set freely, and the reference time for sampling is the time the software is started.

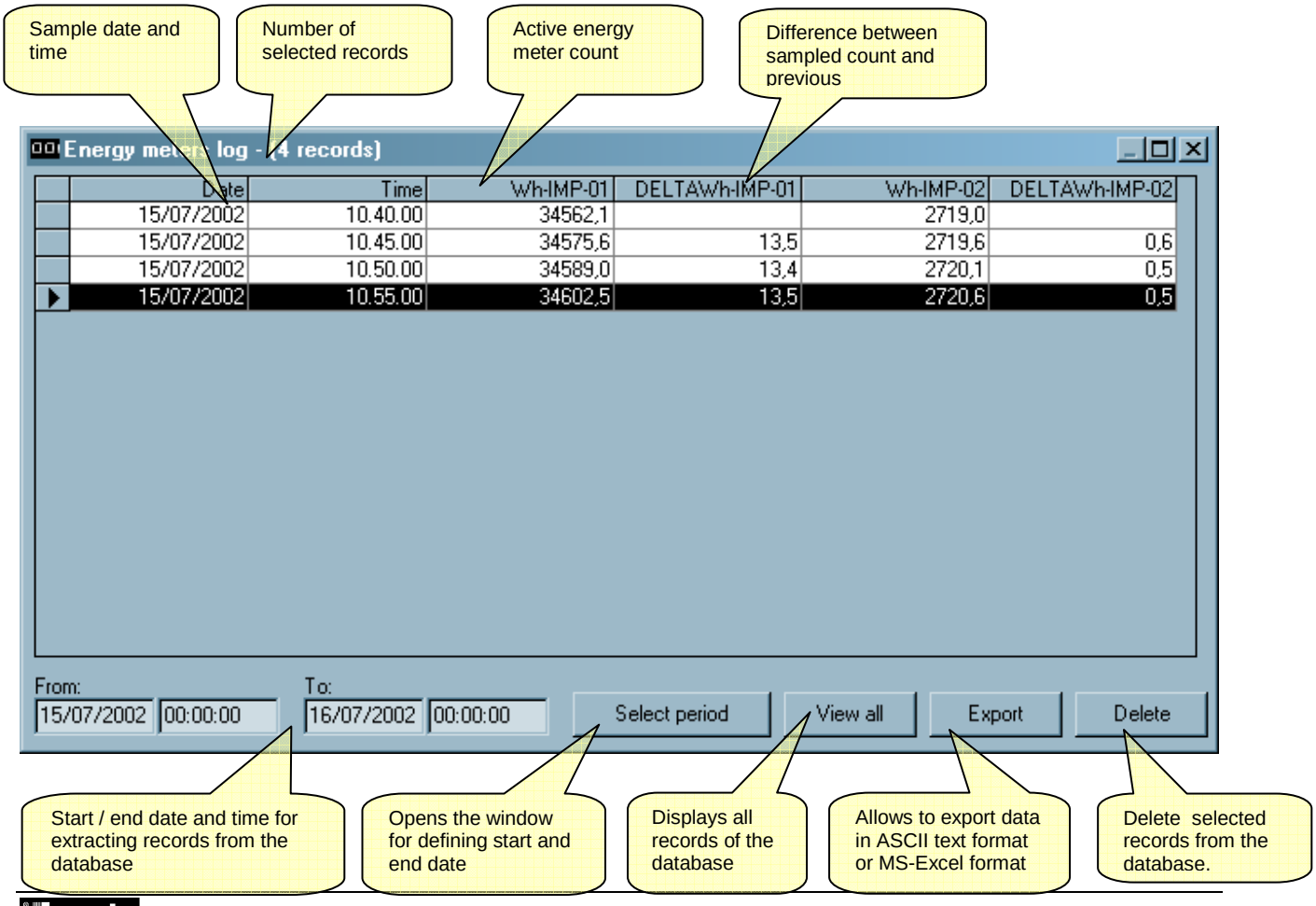
Example:

Sampling period: 5 min – NOT Synchronized
Samples at: 0:03, 0:08, 0:13, 0:18 …….

Sampling period: 30 min – NOT Synchronized
Samples at: 0:17, 0:47, 1:17, 1:47 …….

For each energy meter that will be saved in the database, an additional column will be added, holding the differences (delta) between the energy meter count from one sample and the previous. This calculated value shows the amount of energy that has been consumed/generated in that interval of time, and will be available to be plotted on the *Graph* window.
To limit the hard disk space occupation, it is possible to eliminate automatically from the database the samples older than a defined number of days. For example, Setting *Maintain samples of the last…days* to 30, only records of the last month will be kept in the database.

Figure 3.2 – View-Energy meter log



Alarms

As described in the previous Alarm configuration page (Figure 2.4), the user has the possibility to apply thresholds (minimum, maximum or both) to the measures sampled with the data log. In the case in which one or more of the values is out of bounds, the alarm condition is always saved in the alarm database with date and time. When the alarm conditions ends, another record will be saved, allowing to define the duration of the abnormal situation.

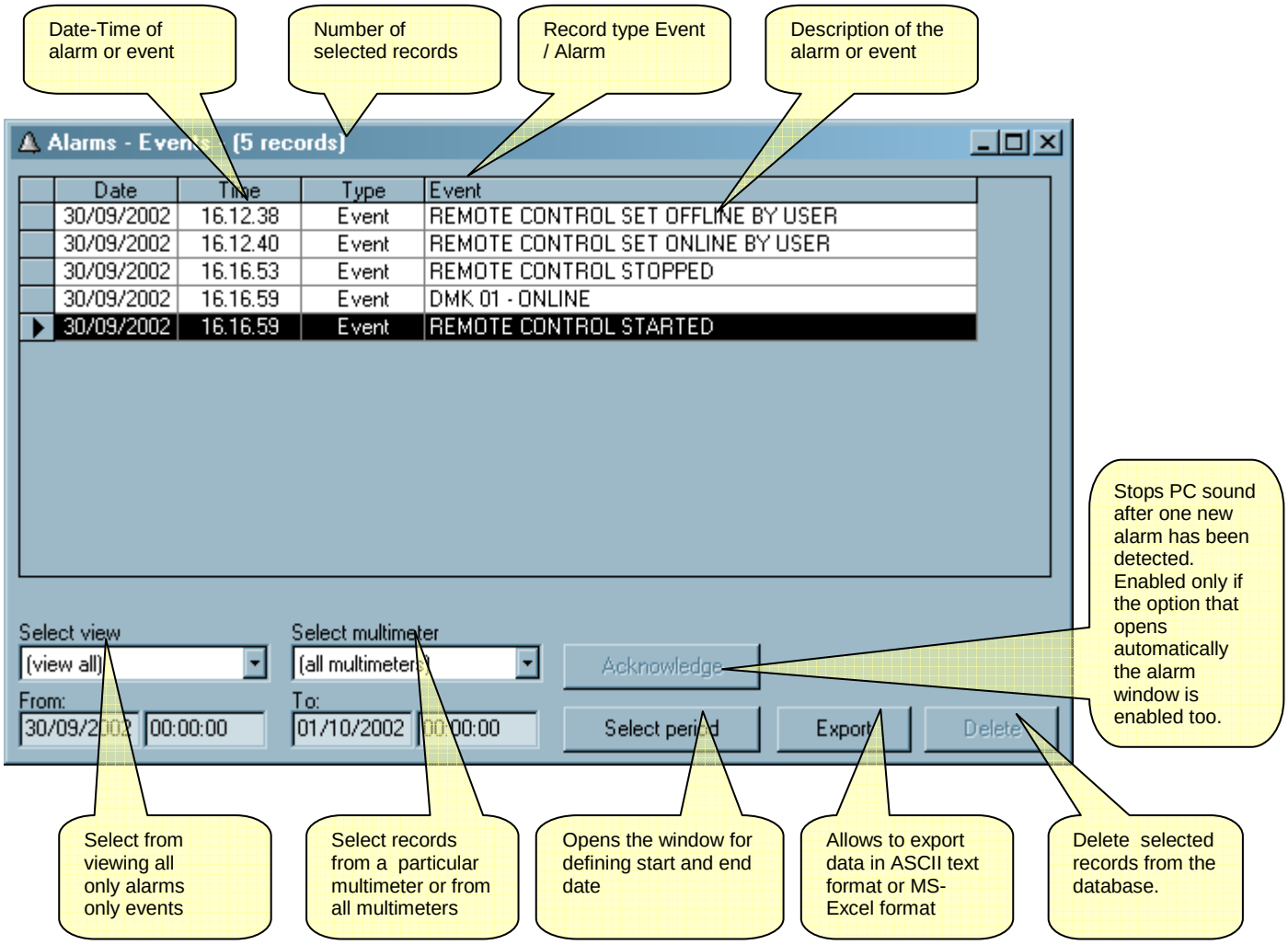
In the *Multimeter configuration* window (Figure 2.3) it is possible to specify if the multimeter digital outputs tip has to be saved as an alarm record into the alarms database. In this case it is possible to freely define the text that will be stored each time the output will be activated.

In the same database are stored also some *Events*, that is something that happened that can help to better understand the alarms sequence. One example of Event can be the activation of the remote control, that is the instant in which the software has been started and thus the measures sampling has been initiated. It is obvious that if the software or the Pc have been left inactive, then some alarm situation may not be found in the alarm recording. The same can happen if one multimeter has been left switched off for a certain period of time.

Events are stored in time sequence with alarms, but with the database window the user will be able to select the information with the following criteria:

- Period in which alarms and events have happened (date-time of start and end)
- View only alarms, only events, both
- View alarms/events from one particular multimeter or from all configured multimeters

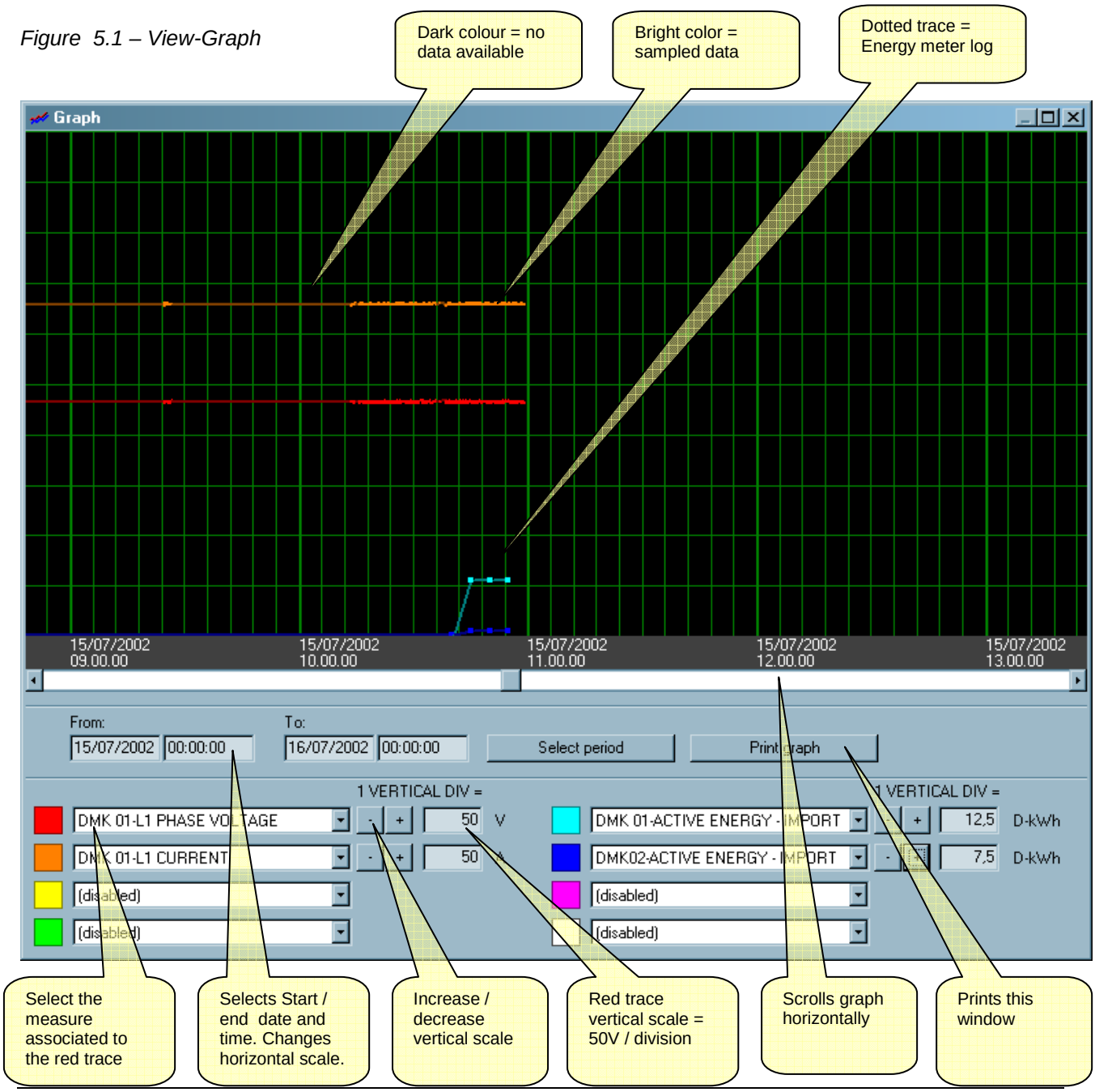
Figure 4.1 – View-alarms



Graphs

The content of the *Data log* and of the *Energy meter log* databases can be shown in the form of a graph (strip-chart). In this way it is possible to have immediately a global idea of the trend of the most important measures, or to compare on the same graph two measures taken from two different part of the plant.
To open the graph window click on *View-Graph* menu or use the correspondent icon on the toolbar.
The operation criteria of this graph is very similar to on oscilloscope. The X-axis (horizontal) represents the time. The horizontal scale is common to all shown traces and is indicated with sample date-time labels .
It is possible to plot up to 8 traces simultaneously, selecting them among the measures defined in *Data log* / *Energy meter log*. The selection is done by the eight drop-down boxes, one for each trace color.
For each measure it is possible to modify the vertical scale using the + and – pushbuttons. The value of one measure in a certain moment can be calculated looking at the vertical scale division value (one square).
If , for instance, the vertical scale is 50V/division and the plot is about at 8 division, then the absolute value of the measure is about 400V. When looking at a graph of this type, it is more important to look at the trend of the measure rather than its absolute value.
The graph is 240 divisions wide per 10 division in height. When opened, the window is set to show data of the current date, that is from 00:00:00 of current day up to 00:00:00 of the next day (tomorrow). Using the Select period pushbutton it is possible to select a different period and also to change the horizontal scale resolution.
If in the database there is no data for a certain period of time (for instance because the software has been inactive) one straight line is drawn using a dark colour, connecting the two edges of the 'hole'.

Figure 5.1 – View-Graph

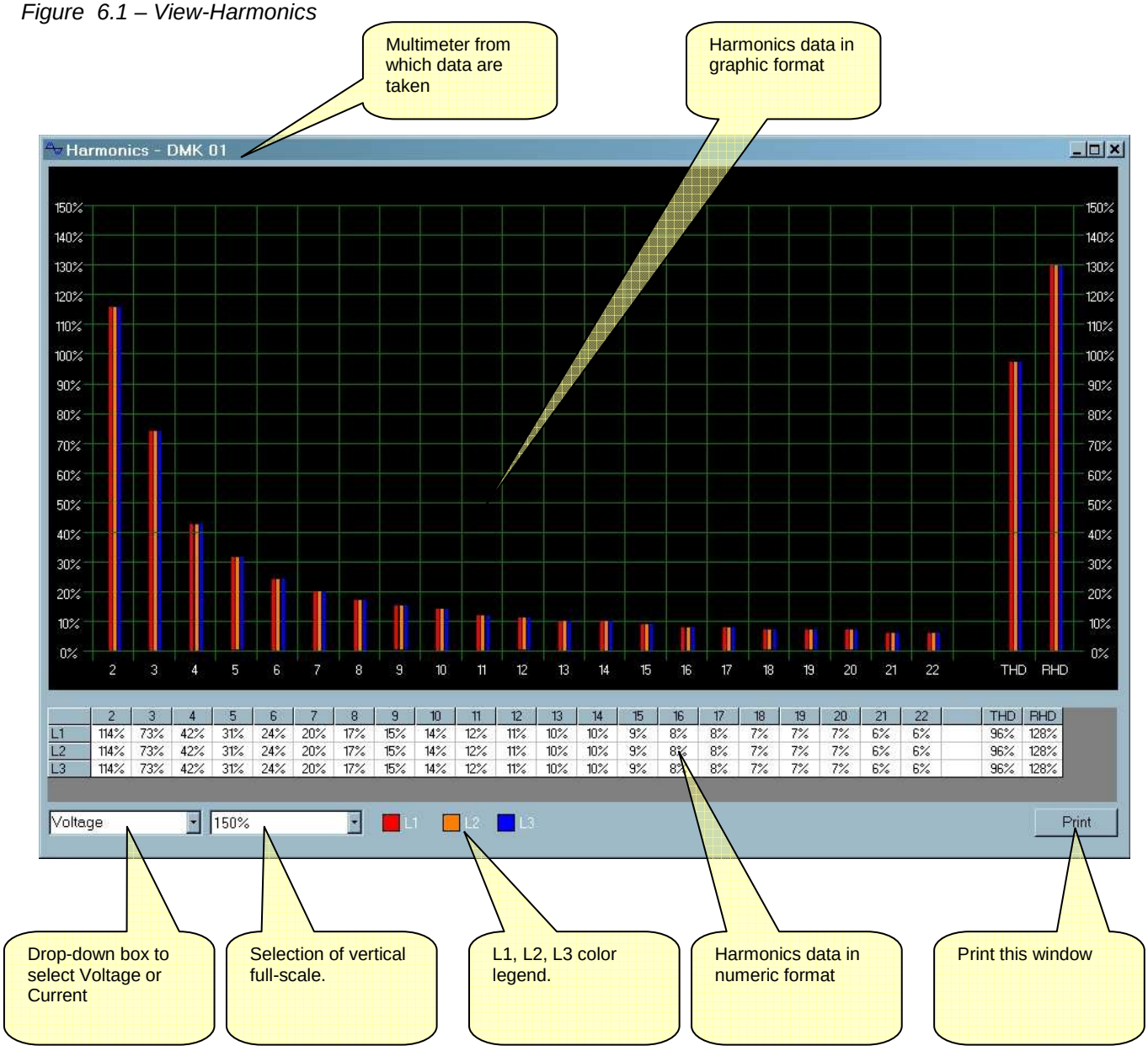


Harmonics

DMK32-62-40 and DMG300-800 multimeters have the possibility to measure the harmonic content of the voltage and current waveforms, for each phase, by means of an FFT algorithm (Fast Fourier Transform). Using *View-Harmonics* menu, it is possible to display harmonic data on a bar-graph where on the horizontal axis are represented the order of the harmonic, from the 2nd to the 22nd, plus two bars that represents the THD (Total Harmonic Distortion) and RHD (Residual Harmonic Distortion).
The vertical axis represents the intensity of each harmonic, expressed as a percentage of the fundamental harmonic.
By means of a drop-down box it is possible to select between Voltage and current harmonic analysis. The single phases L1, L2 and L3 are displayed in three different bar colors.
Data shown is referred to the currently selected multimeter (see drop-down box in figure 1.1). If the software is showing a page with data coming from different multimeters, then it will not be possible to show the harmonic analysis window.

Note:
On DMK multimeters the FFT calculation can be disabled in order to have a better acquisition speed. In this case the graph will not show any data.

Figure 6.1 – View-Harmonics

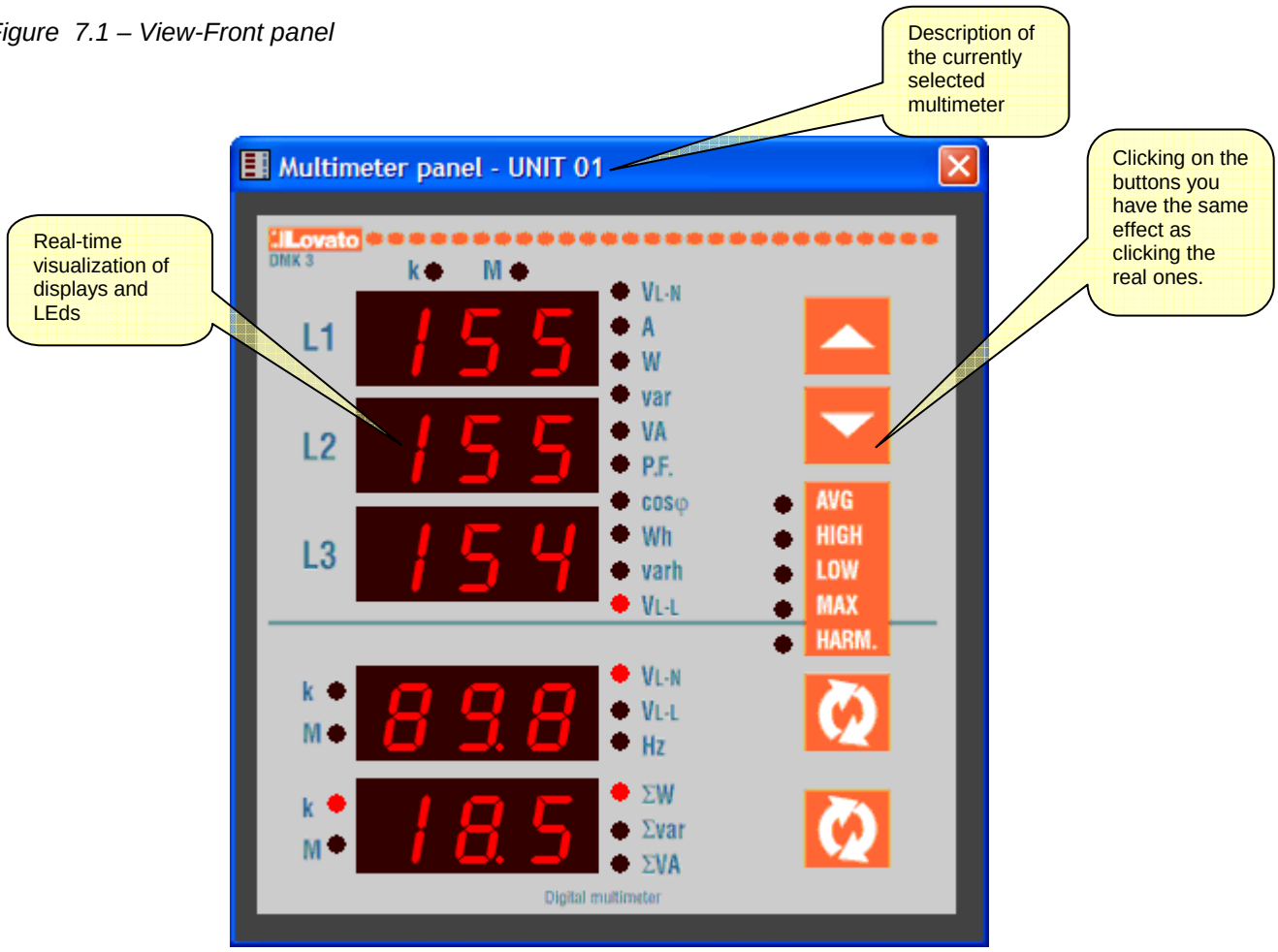


Front panel

With the remote control software it is possible to display on the PC monitor a 'virtual' front panel of DMK multimeters. The window can be opened with *View-Front panel* menu. It will show the panel of the currently selected multimeter, with real-time visualization of displays and leds status. Clicking with the mouse on the pushbuttons, the user will have the same effect as clicking the real multimeter buttons, selecting measurements and functions. It will not be possible to access the functions (like entering setup , meters reset etc) that require the simultaneous pression of more than one button or the continuous pression of the same button for a certain period of time.
There are several types of front panels, that represents multimeters of various multimeter series. The front panel window shows the front panel that corresponds to the currently selected multimeter. For this reason, it will not be possible to view the front panel window when the software is showing a page with measures coming from different multimeters.

Note:
The quality of the graphic representation of the front panel may vary according to some PC settings, such as screen resolution, Font size etc.
Virtual front panel is not supported for DMG series.

Figure 7.1 – View-Front panel



Password

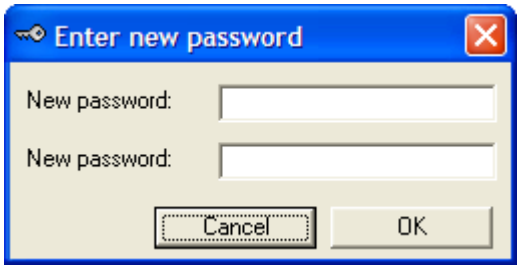
When the software is started some of the functions are disabled. By means of the *Password* menu it is possible to key in the password that will allow access to all functions, including:

- Modifying remote control software settings
- Entering a new password
- Delete records from *Alarms* and *Data log* databases
- Use of the page editor
- Modify the multimeter settings from the remote control

Figure 8.1 – Password

After the first installation the password is LOVATO. Later, the user will be able to customize its password, using the New Password button and then entering the new desired password two times.

Figure 8.2 – New password



Communication menu

Online

The *Communication-Online* menu allows to re-establish the serial link after it has been stopped by the user with the Offline command. When clicking Online, the software executes a complete scan of all configured multimeter, to verify their status.

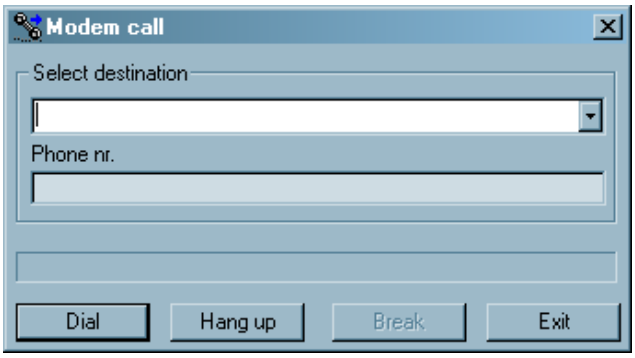
Offline

With communication-Offline the user has the possibility to temporarily suspend the serial communication link between the PC and the multimeter network. When the software is in Offline mode, all indicators are shown in a disabled status and Alarm checking and Data log are suspended.
This command is to be used when, for instance, it is necessary to modify the network wiring or when multimeter are to be switched off. The System Offline status is displayed on the main page Toolbar (at the bottom of the main window).
The system passes automatically in Offline mode when the user opens the *Configuration* window or the *Page editor*.

Modem Call

To connect to one or several multimeter via a couple of modems, it is necessary to select the Modem connection checkbox in the *Configuration-Options-General* window. Selecting modem communication will automatically change the communication protocol used by the software, from the standard Modbus RTU to Modbus ASCII, which can be used with modems. From the user point of view, the difference between those two protocols is only a little slower speed in case of the ASCII protocol, due to its length that is double than the RTU and the modem modulation that requires also a certain amount of time.
When the program is configured for modem communication (see *Configuration-Options-General* window) it automatically shows the modem call dialog after it has been started, because it is not possible to communicate with the multimeter before dialing the phone number of the remote modem. The same window can be opened manually using *Communication-Modem call* menu or the dedicated pushbutton on the toolbar.

Figure 8.3 - Communication-Modem call



Once the window illustrated has been opened, from the pull-down box choose the name of the installation with which you want to be connected. The names entered in the *Modem index* during configuration will be displayed. Once the choice has been made, the corresponding phone number appears in the box below. Click the *Dial* button to start the connection procedure.
At this point the program will instruct the modem to make the call. While waiting, the sliding blue bar of the maximum time allowed for making the connection will be seen (1 minute). The modem called will take the line and exchange the usual handshaking messages with the answering modem. At the end of this procedure, if everything has been carried out correctly, the PC status bar will show a message informing the user that connection has taken place and the program will switch automatically to the *Online* mode. If any errors occur, carefully check the connections and if necessary follow the *Troubleshooting guide* given in appendix A of this manual. Normally connection is not critical since very common and absolutely standard procedures are used. With the *Break* button it is possible to block the calling procedure, while *Hang up* ends a communication already in progress.

Hang up

This command interrupts a modem connection, closing the telephone line. It is the equivalent of hanging up the handset in an ordinary phone call. It is carried out automatically every time you exit the program.

Parameters menu

The multimeters setup settings can be viewed and modified using the *Parameters* menu. This way of accessing to the multimeter setting is far more immediate and easy than using the direct access from the multimeter front keyboard, because on the PC window displays:

- The parameter code
- Parameter description
- Set value
- Bar graph or drop-down box with possible options

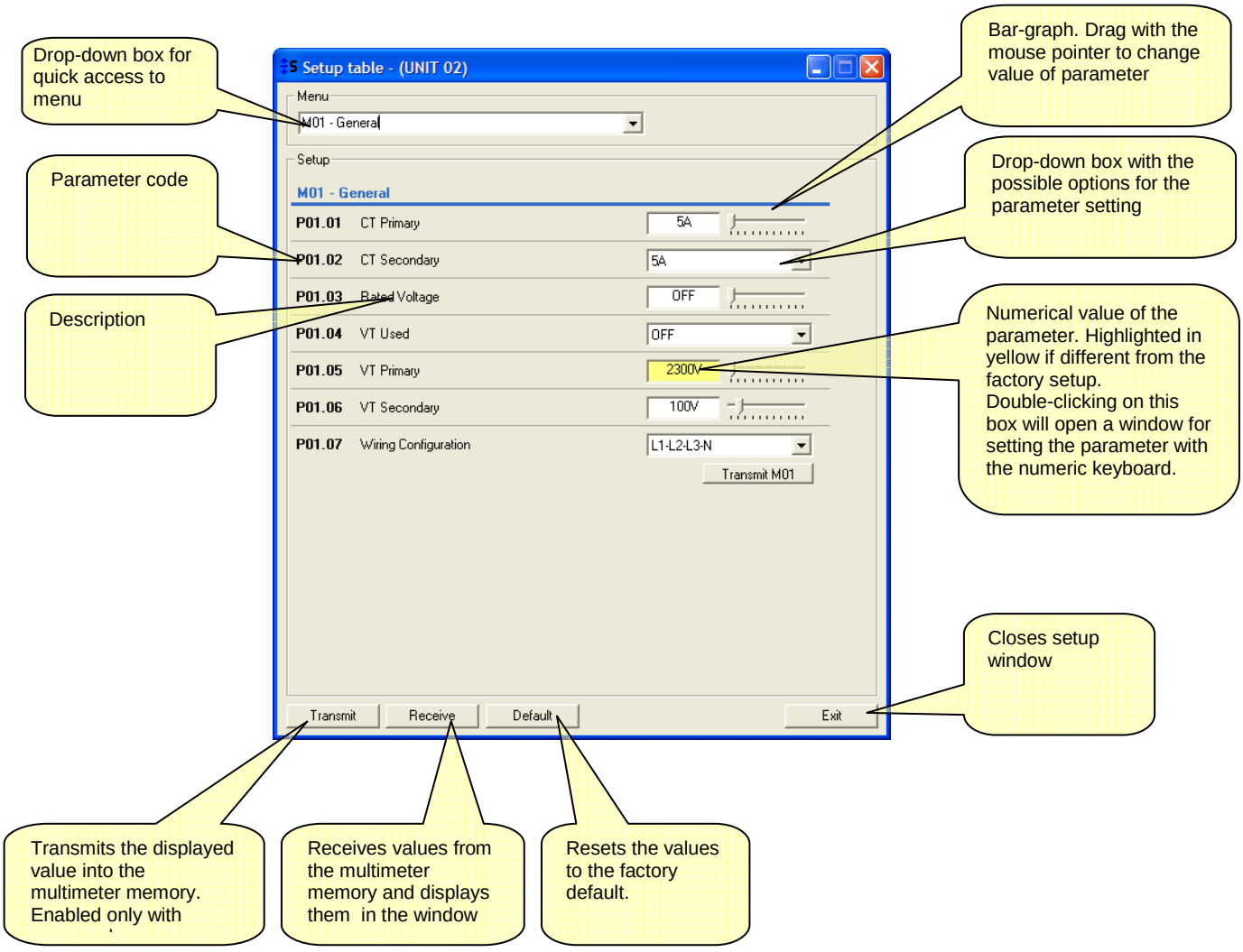
Parameters are grouped into four menus that follow the structure described on the multimeter manual and addendum. The available menus are:

- Base setup (basic settings like CT ratio, VT ratio etc.)
- Advanced setup (settings of the digital outputs)
- Capacitor overload setup (settings for the capacitor protection function)
- Serial communication setup (parameters regarding serial interface)

Some multimeter models do not support one or more of this menus. In this case, the correspondent button on the toolbar and drop-down menu will not be enabled.

Base setup

Figure 9.1 – Parameters-Setup



Save-Load-Print

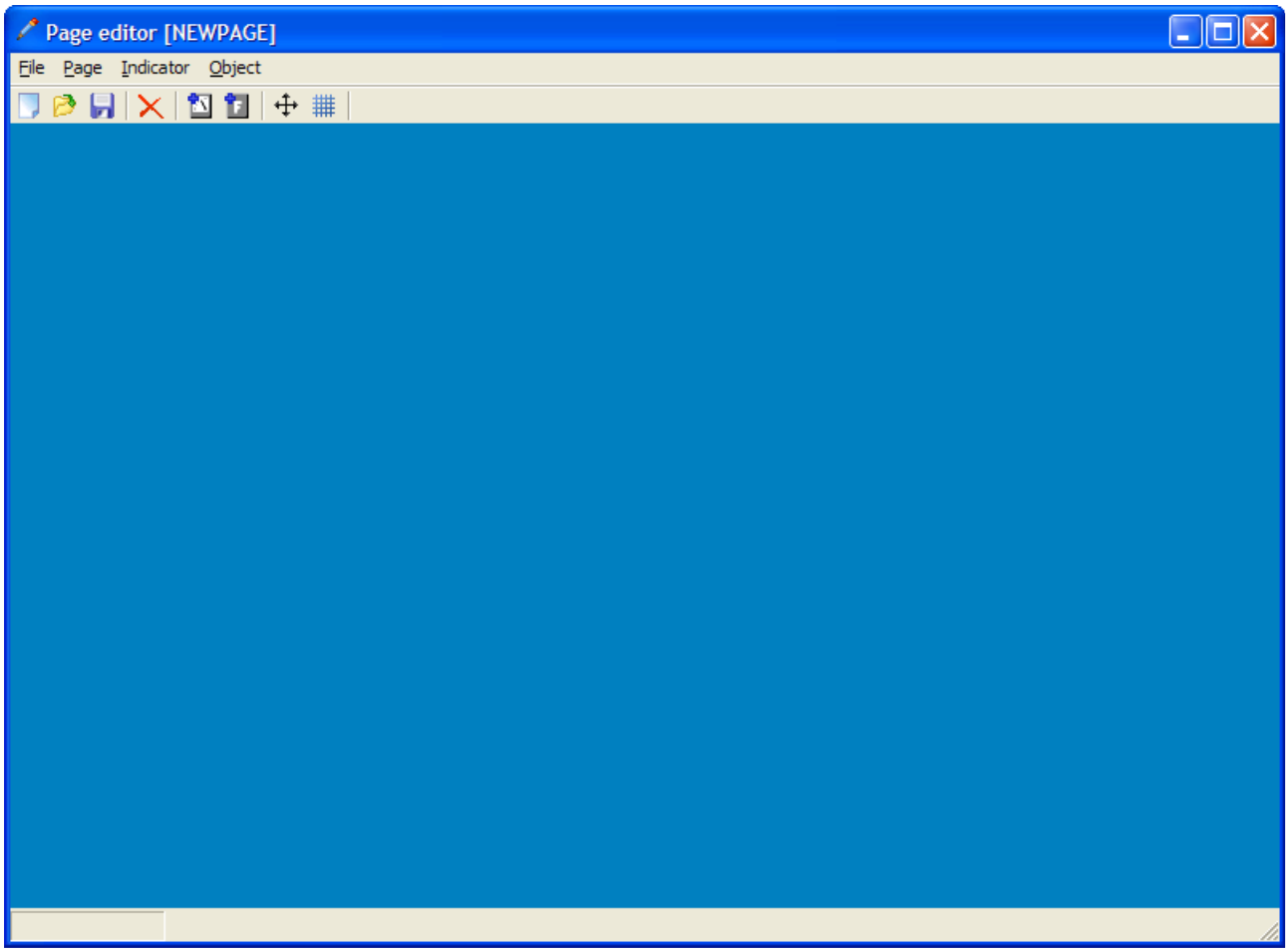
Parameters values (of all four menus) can be saved on disk in a ASCII text file, allowing the user to load them in another multimeter in a very fast and comfortable way.
This function is useful when it is necessary to program various multimeters with the same settings or when the user wants to keep track of the setting of one particular plant.
To save on disk, select *Parameters-Save* and enter the desired file name. The extension for this type of file is .PAR. To execute the reverse operation, that is transfer a file to the multimeter memory, use *Parameters-Load* menu.
It is also possible to have a printout of the settings, useful to archive with the plant documentation, using Parameters-Print menu.

Page editor

The Page editor is the part of the remote control software that allows the user to create some custom pages, inserting indicators and fixed objects.
This argument, that should be a part of the configuration Chapter, has been left as the last part of the manual because it is intended for experienced users.

To open the page editor, enter the password and click on *Configuration-Page editor*.
Please note that during page editing, as during configuration change, the software enters Offline mode, that is the serial communication with the multimeters is stopped.

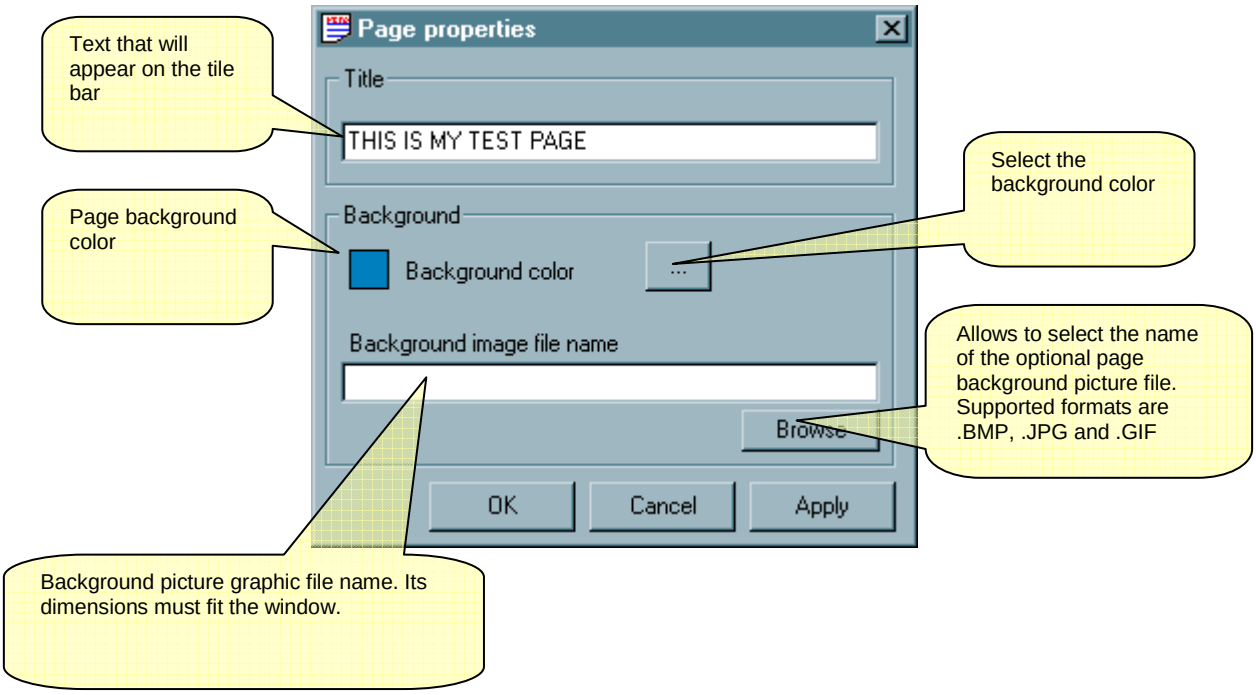
When started, the page editor shows an empty page. With *File* menu it is possible to execute the common operations of loading, saving and generating a blank new page. The pages used by the remote control software are placed in a directory (named ...\PAGES\ENG when the software is set for English language). The pages are loaded and saved only from this directory. For this reason, the Open and Save windows do not appear as the common Windows file open/save dialogs.



In the following paragraphs we will explain the functionality of the page editor by means of a very simple example that will create a test page.

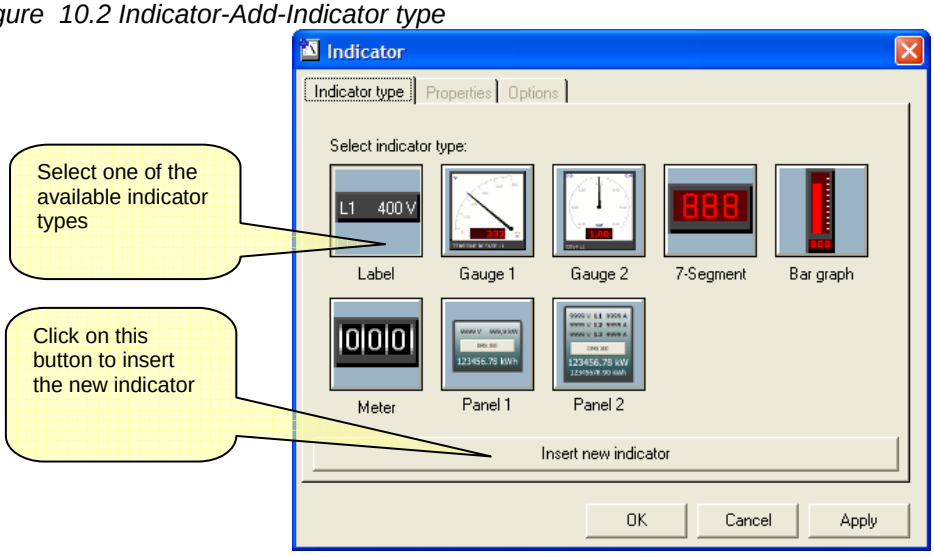
Step 1
The first operation that the user can carry out is to define some general properties of its new page, such as the title, the background color, and an optional background picture.
For this purpose, use the Page-Properties menu and open the following window:

Figure 10.1 – Page-Properties



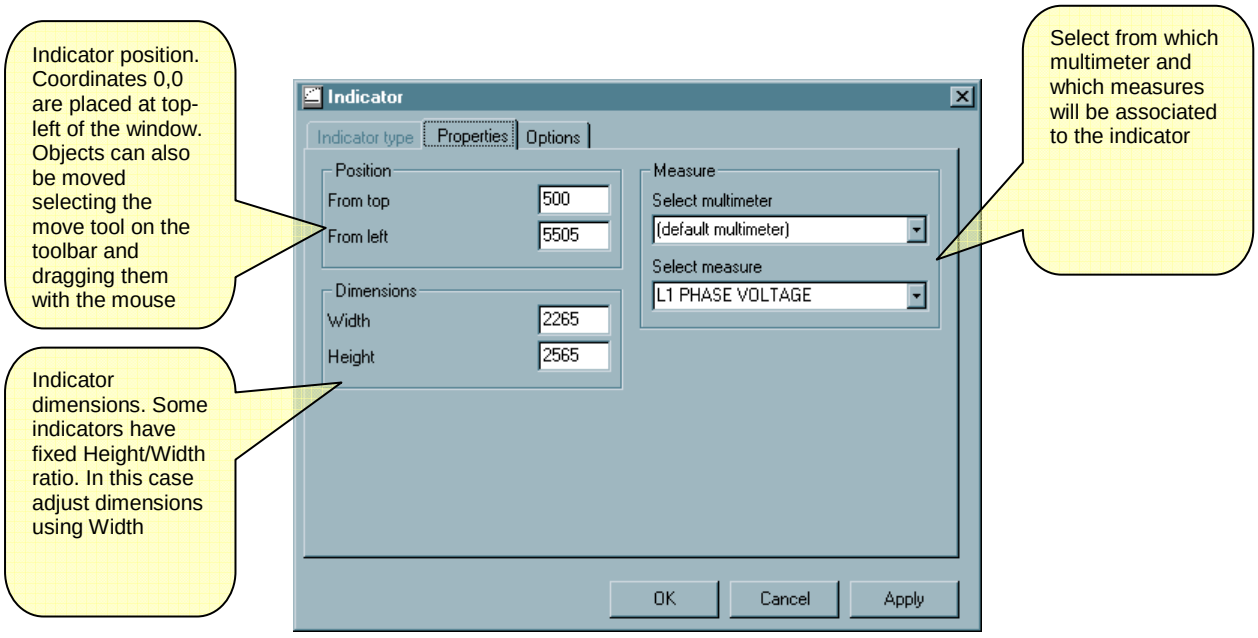
Step 2
At this point, the user may want to add to its page one needle indicator that will show the equivalent phase voltage. Select Indicator-Add menu or right-click on an empty point in the page and select Add indicator from the pop-up menu. The following window will be shown:

Figure 10.2 Indicator-Add-Indicator type



Select the button with the *Gauge 1* indicator and then click on the button *Add new indicator* At this point on the page a new indicator will be shown, with standard position and dimensions. At the same time, the window moves to the basic properties for all indicators:

Figure 10.3 – Indicator -Properties



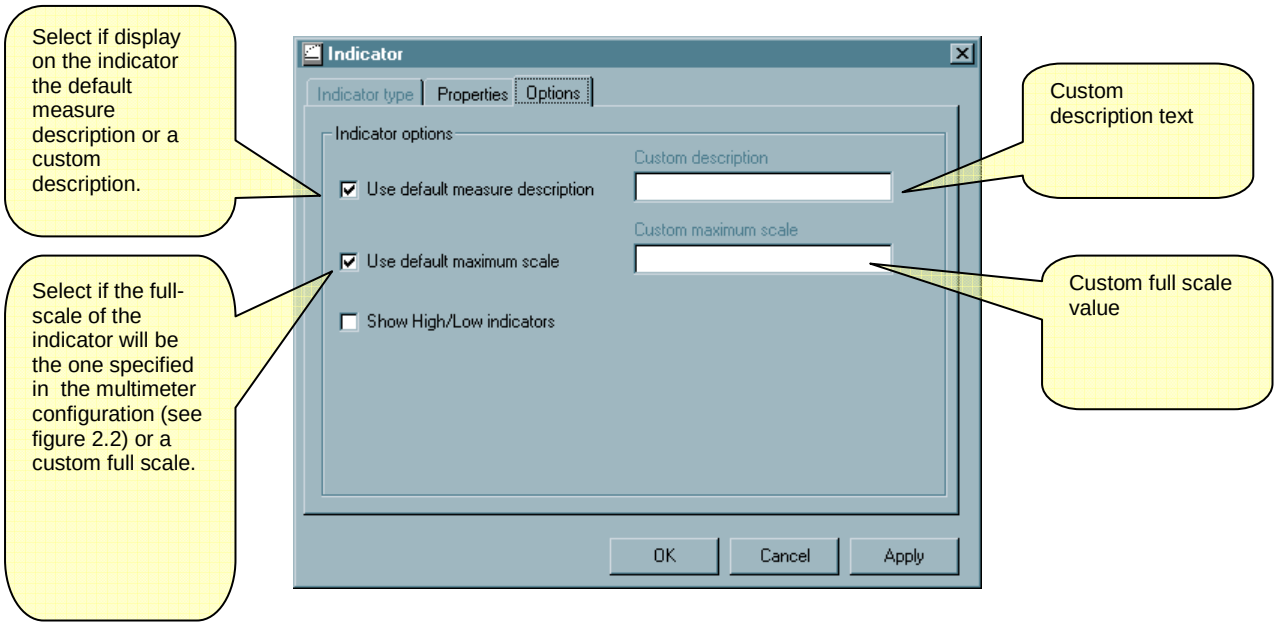
The properties shown in Figure 10.3 are common to all kind of indicators.
When specifying the multimeter from which read the measure, please take into account that:

- If in the *Select multimeter* drop-down box you choose one of the configured multimeters, the measure displayed by the indicator will always be read from that specific multimeter. This solution must be used when we want to put in the same page measures coming from different multimeters.
- If the *Select multimeter* drop-down box is left to *Default multimeter* , the indicator will show the measure read from the multimeter currently selected in the main page (see figure 1.1). Building one page with all indicators set in this way will enable the user to use the same page with all of the multimeters, one at a time.

After having specified position and dimensions of the new indicator, leave the *Multimeter selection* box to *Default multimeter* and then select from the possible measures the one that we want for ourexample, that is *Equivalent phase voltage*.

At this point we can move to the Options page of the Indicator window and fill-in some options for the Gauge 1 indicator type. This Options are different from one indicator to the other. In our case, for example, we can disable the Use default description checkbox and specify a custom description to be placed on our indicator.

Figure 10.4 – Indicator-Options (for Gauge1 type indicator)



Clicking on OK the options are applied and the window is closed.

Following the same procedure, it is possible to add other indicators to our page.

To modify the properties of an already-placed indicator, select it clicking with the mouse (the indicator is highlighted with a frame) and then use *Indicator-Modify* menu or right-click and select *Modify* from the pop-up menu.
In the same way, after having selected one indicator, it is possible to delete it with *Delete*.

Step 3
At this point we have created a very simple page that is ready to be loaded by the software. Let's save the page with File-Save as , specifying , for instance, TESTPAGE. This command will create a text file, called TESTPAGE.PGD and placed in the …\PAGES\ENG\ directory with the other pages. For whose interested, the file content can be examined and eventually modified with a standard text-editor.

Step 4
Now, close the page editor with File-Exit page editor. The program loads the MAIN page (figure 1.1) or the START page (in this case select one of the multimeter to move to MAIN page). Now, in the page selection drop-down box we will find our TESTPAGE. Selecting it, the page will be shown and the indicator will display the equivalent phase voltage read from the currently selected multimeter.

At this point we have concluded the very minimum sequence to create a custom page. We will now explain the other capabilities of the software that will enable to create more complex pages.

Indicator types

Label indicator

The label indicator shows one measure in numeric format.

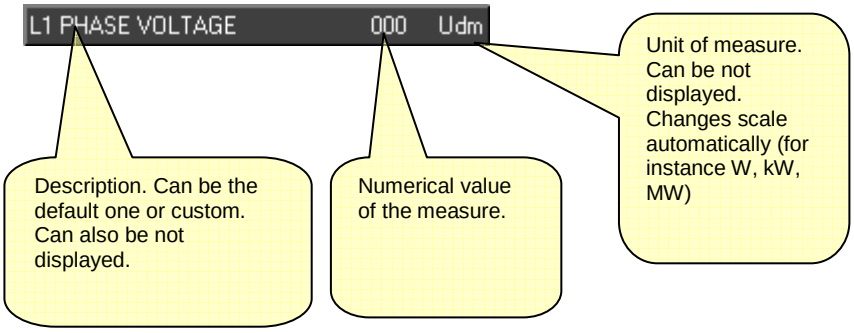
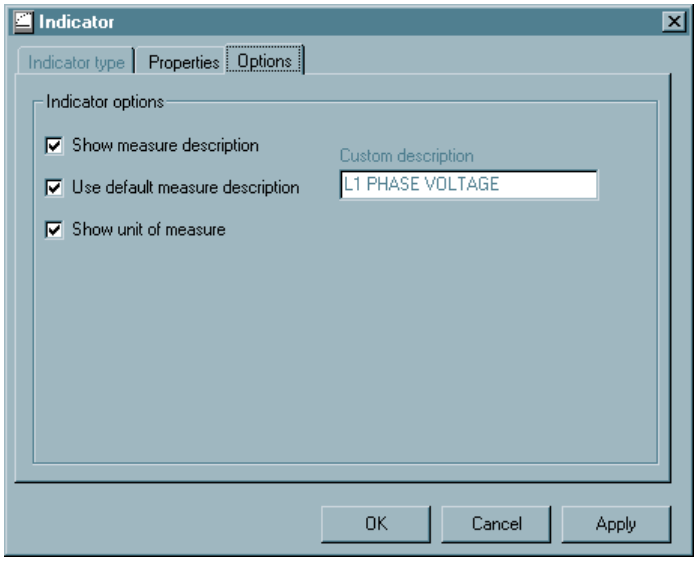


Figure 10.5 – Indicator-Options (for label indicator)



Gauge1 indicator

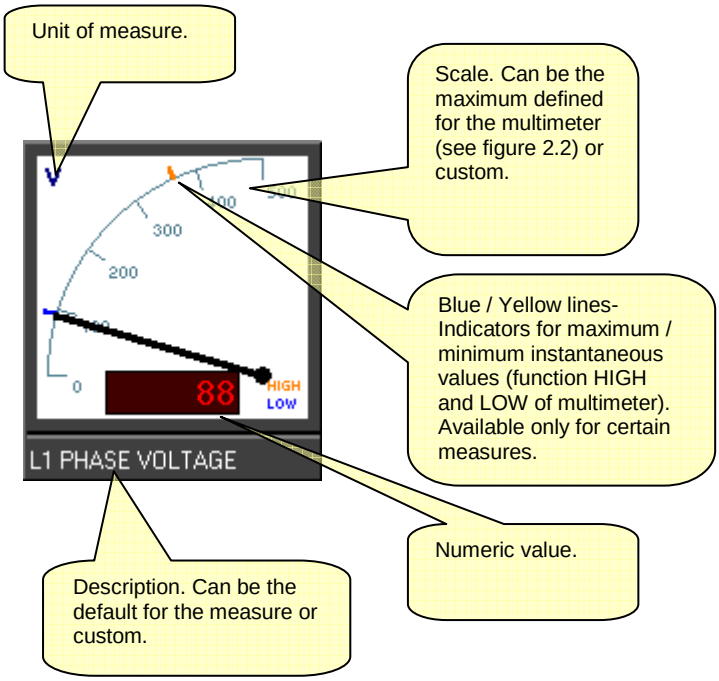
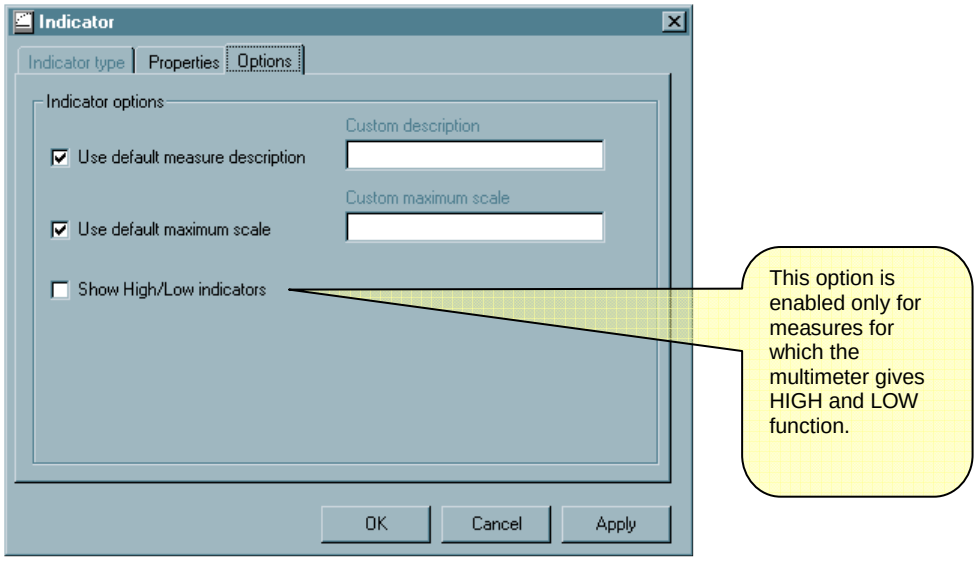


Figure 10.6 – Indicator-Options (for Gauge1 indicator)



Gauge2 indicator

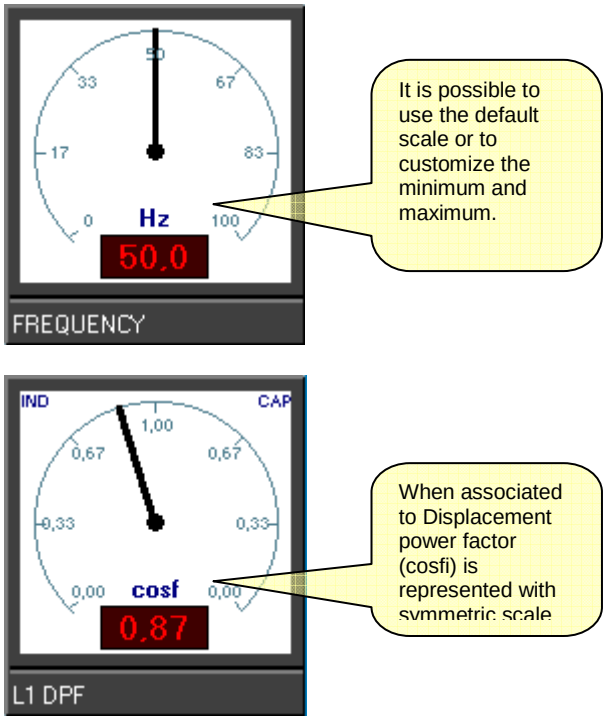
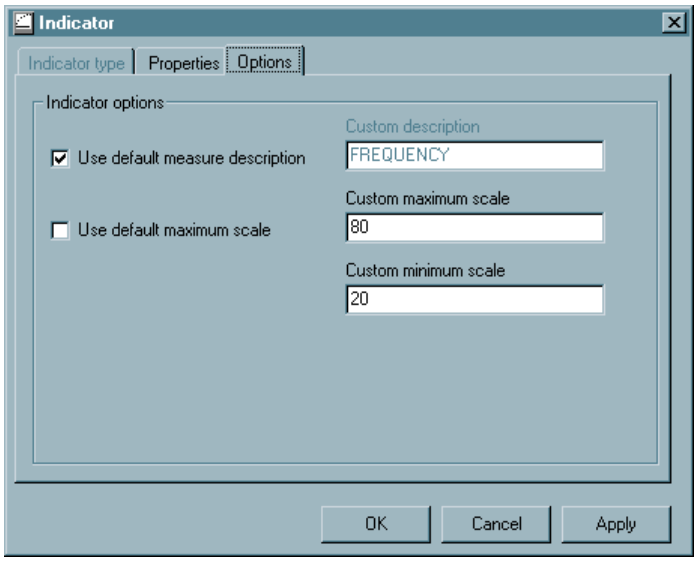


Figure 10.7 – Indicator-Options (for Gauge2 indicator)



Seven-segment indicator
Operation similar to the label indicator, with 7-segment Led display visualization.

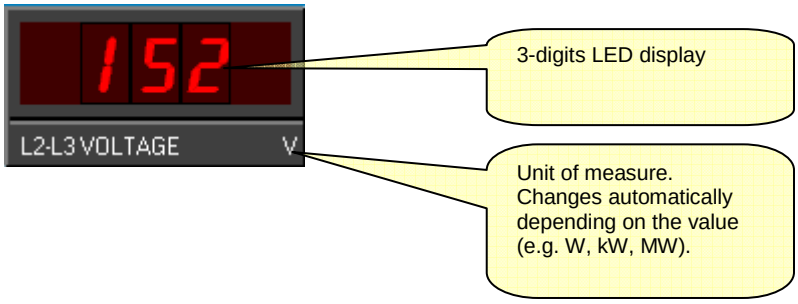
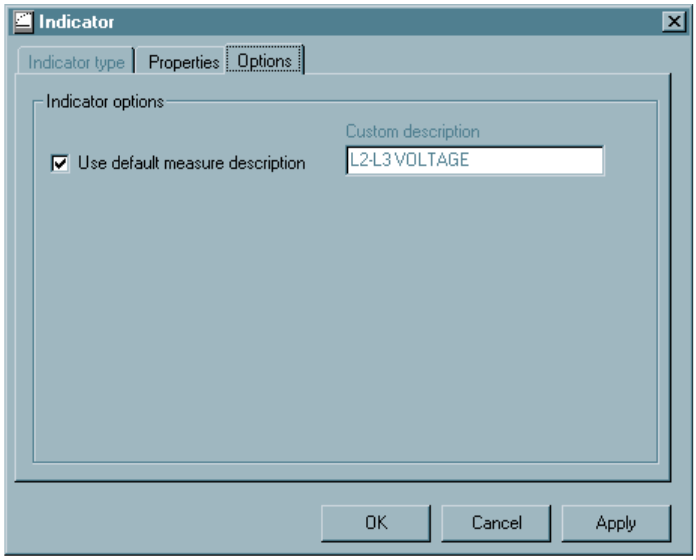


Figure 10.8 – Indicator-Options (for Seven-segment indicator)



Bar-graph indicator

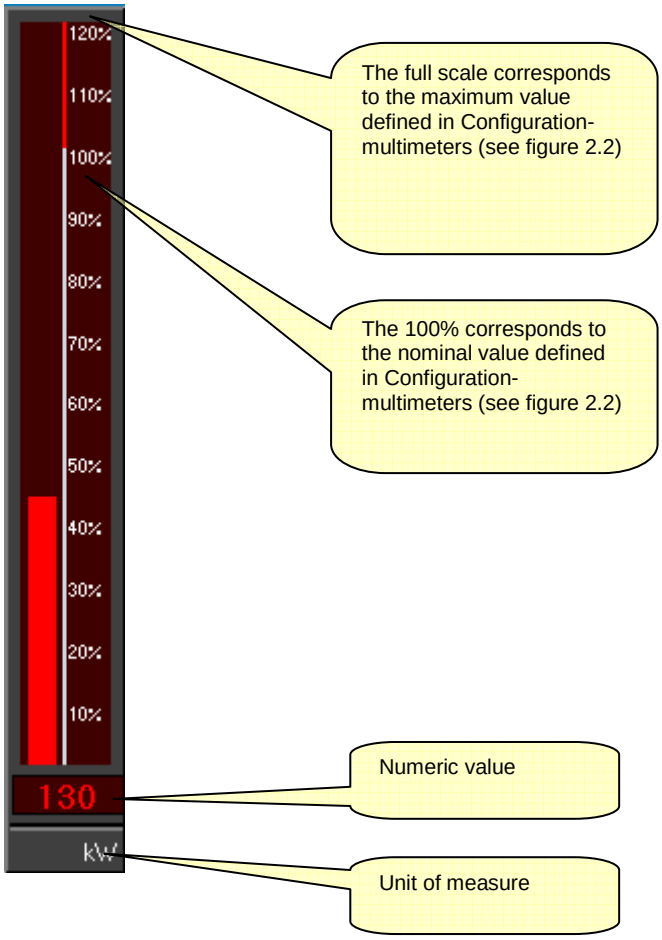
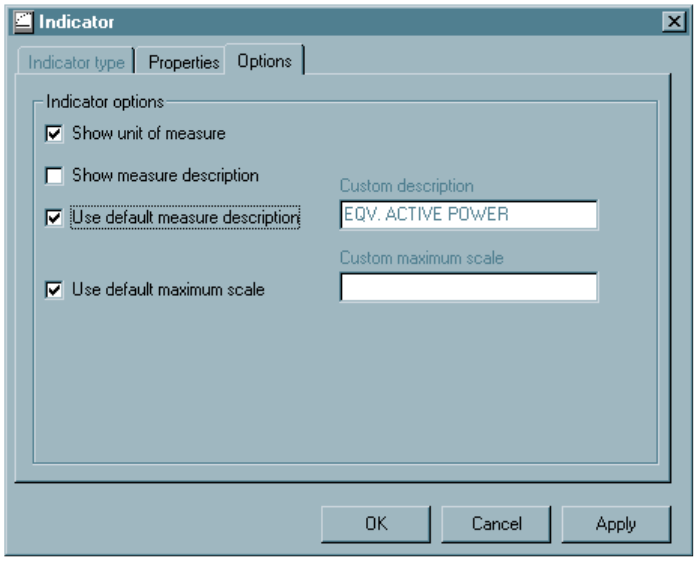


Figure 10.9 – Indicator-Options (for Bar-graphs indicators)



Energy-meter indicator

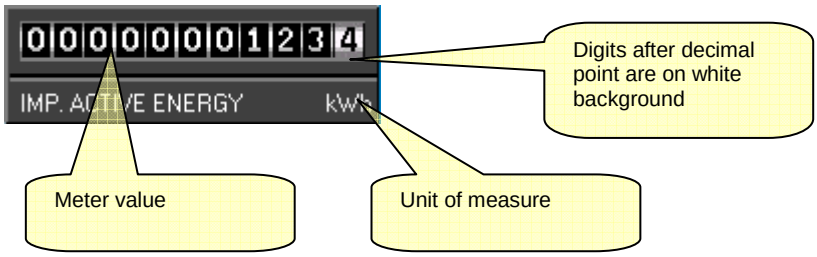
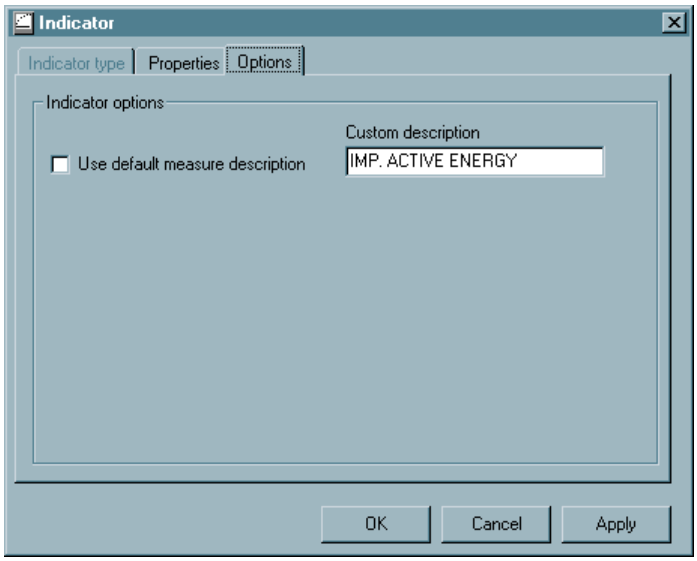


Figure 10.10 – Indicator-Options (for Energy-meter indicator)



Panel 1 and 2 indicator

Panel 1 and Panel 2 indicators allow to group the main measures of one multimeter in a single, compact indicator, in order to create a page that shows the measurements of several multimeters at the same time (start page).

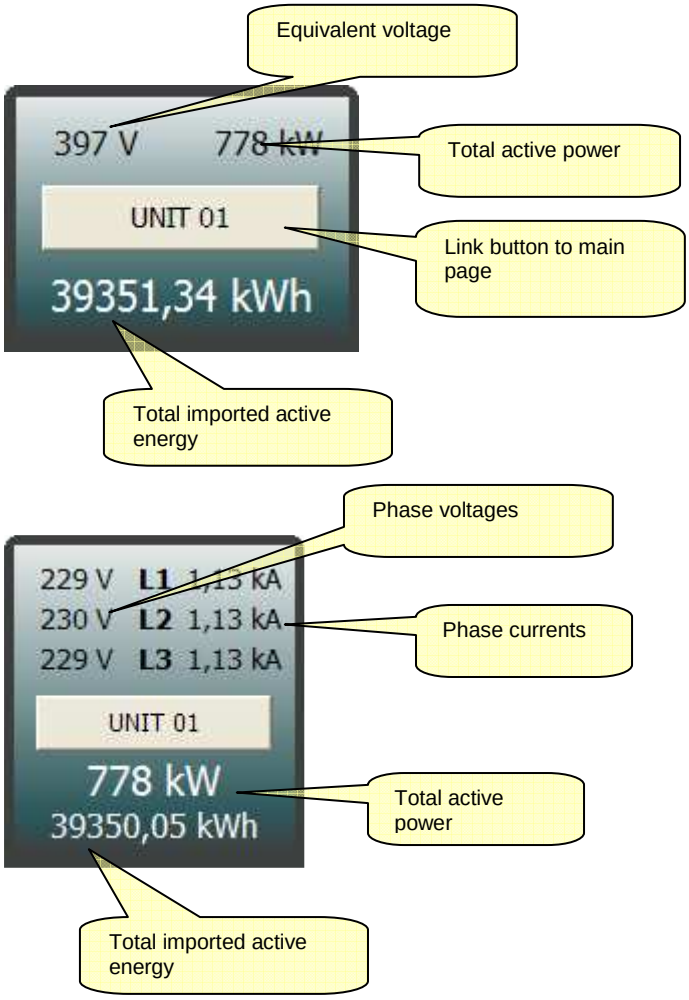
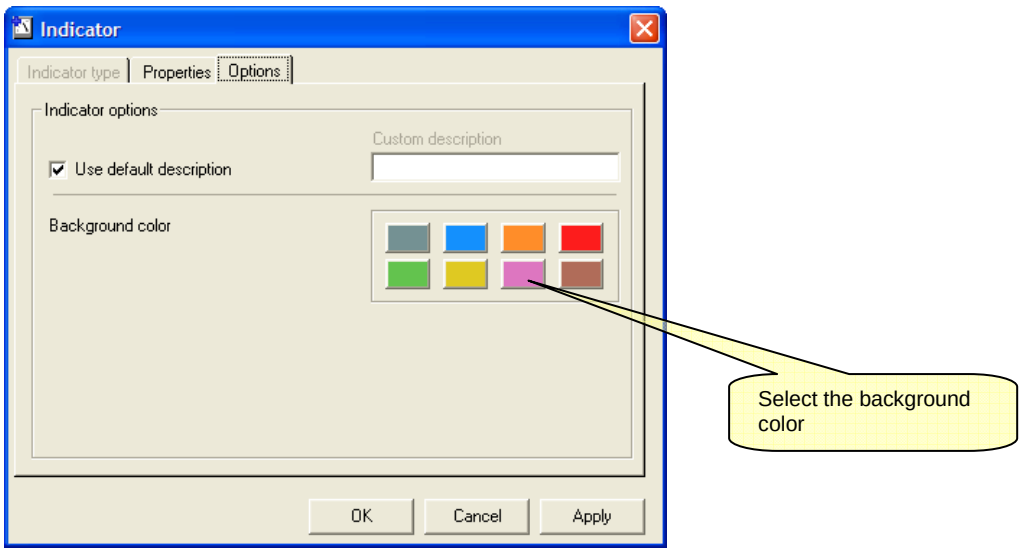


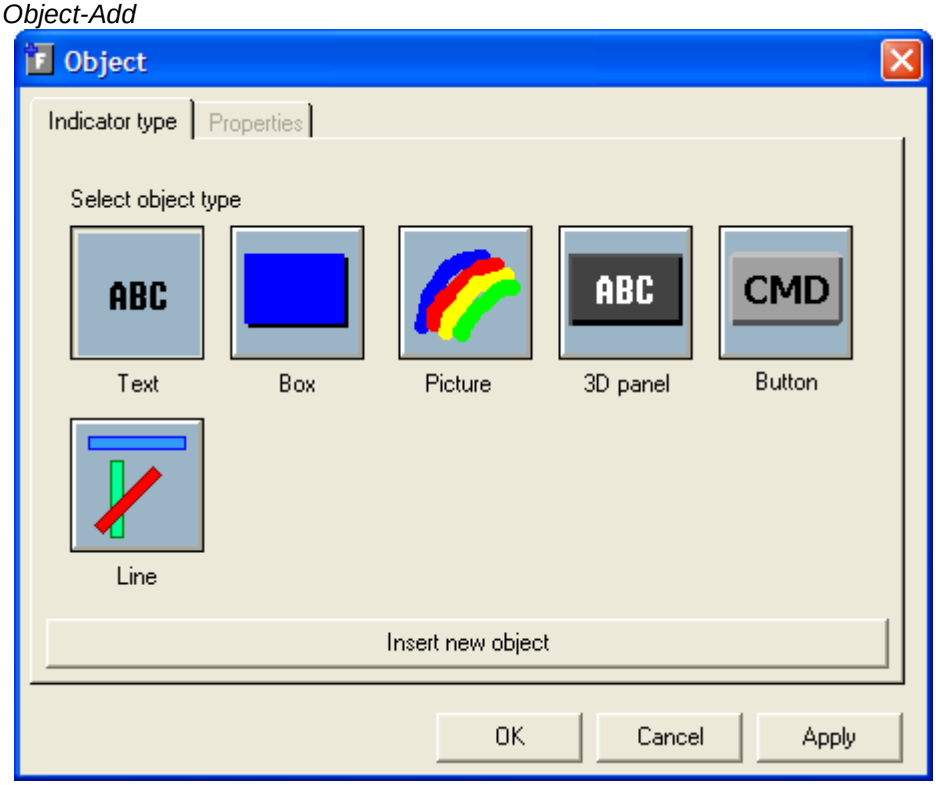
Figure 10.11 – Indicator-Options (for Panel1 – Panel2)



Objects types

On a page it is possible to add other objects, some of them fixed (such as fixed texts, lines, pictures etc.) and others with an active function (for instance command buttons). Inserting and editing of these objects is done in the same way as for the indicators. Using Object-Add it is possible to open the window that allows to select the object type and to specify its options.

Figure 11.1 – Object-Add



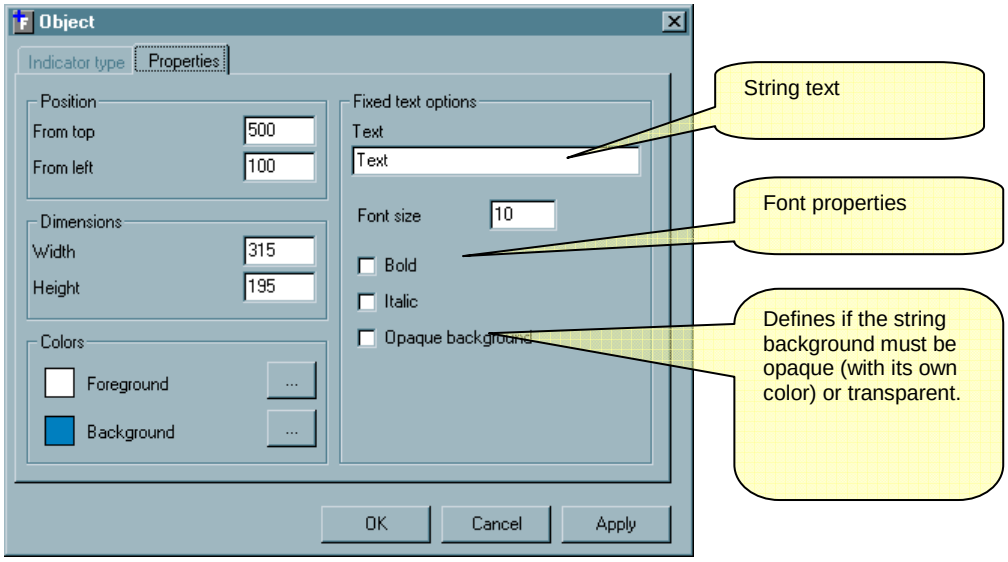
The available objects type are

- Fixed text — Fixed string with customizable colors and dimensions
- Rectangle — Painted rectangle with customizable dimensions.
- Picture — Box showing a graphic file
- 3D panel — Fixed string on a 3D panel
- Line — Line with variable color and free inclination
- Command button — Button that can carry out particular functions

Just like the indicators, objects have different properties depending on the object type. In the following pages we will explain the function of this properties.

Text Object
Inserts a fixed string on the page background.

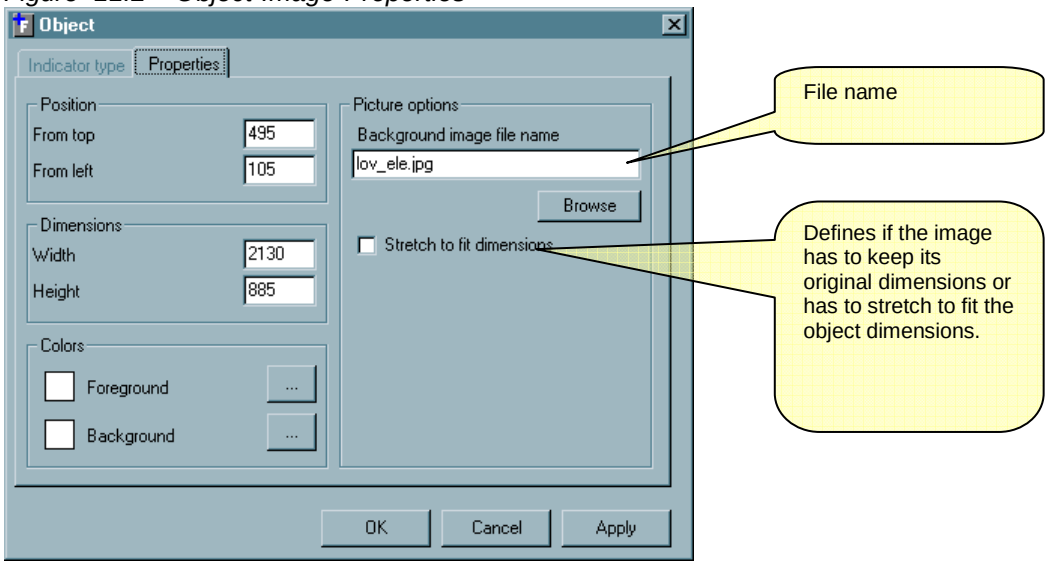
Figure 11.2 – Object-Text-Properties



Rectangle Object
Allows to place a filled rectangle on the page background. Modifying its dimensions it is possible to draw orthogonal lines.

Image object
Inserts a box displaying a graphic file in BMP, JPG or GIF format.

Figure 11.2 – Object-Image-Properties



3D panel object
Similar to the text object, but placed over a 3D-effect panel

Line object
Works in a similar way as the rectangle object. Changing the dimensions it is possible to change line inclination. It is also possible to choose line thickness.

Command button object
The command button is an active object. Clicking it with the mouse can execute a series of commands selectable by the user. In the Property window, besides the common settings such as position, dimensions, text etc., the user must define also the *Action* for the command button and an optional *Operand* for that action.
The possible *Actions* are the following:

- COMMAND

Sends a command to the multimeter. In this case the operand defines the type of command to send. The possible commands are:

- Reset energy meter
- Reset HIGH function values
- Reset LOW function values
- Reset MAX function values
- Reset digital output 1
- Reset digital output 2
- Reset multimeter (DMK series only)
- Reset partial hour counter (DMG series only)
- Reset external counters (only for DMG300-700-800)
- Reset Energy tariffs (only for DMG300-700-800)
- Reset alarm latch (only for DMG300-700-800)
- Reset limit latch (only for DMG300-700-800)
- Set REM1..8 variable (only for DMG300-700-800)
- Reset REM1..8 variable (only for DMG300-700-800)

- END

Quit the remote control software

- NEWPAGE

Loads a new page. In this case the operand must be selected among one of the existing pages.

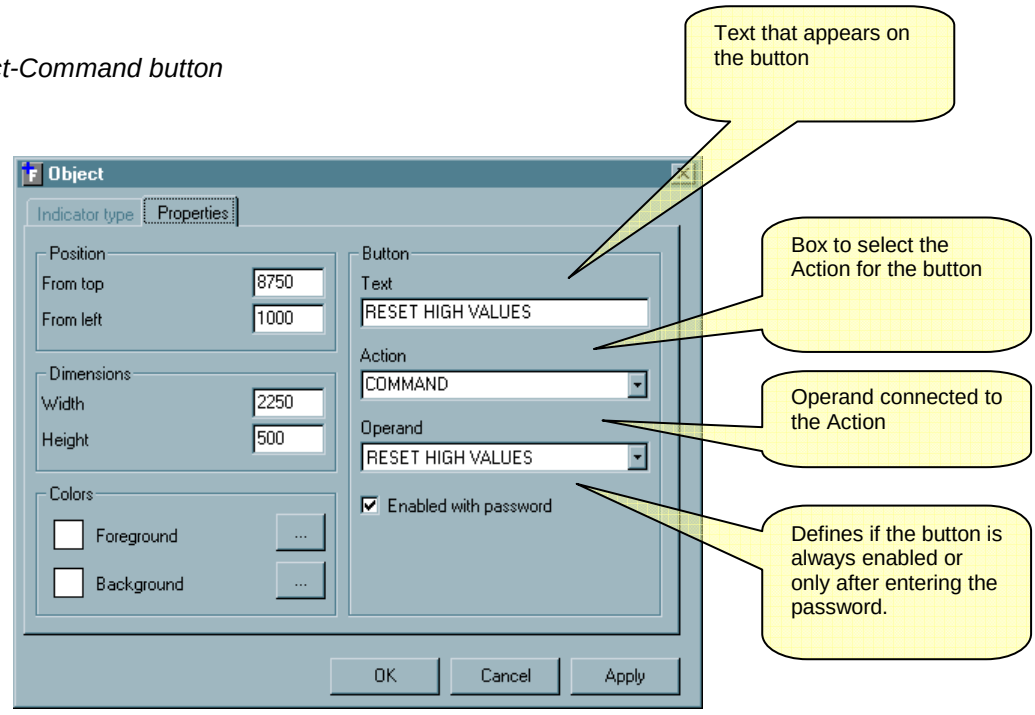
- NEWNODE

Selects a new multimeter. In this case the operand must be selected among one of the configured multimeters.

- PANEL

Shows the front panel of the multimeter specified in the operand.

Figure 11.3 – Object-Command button



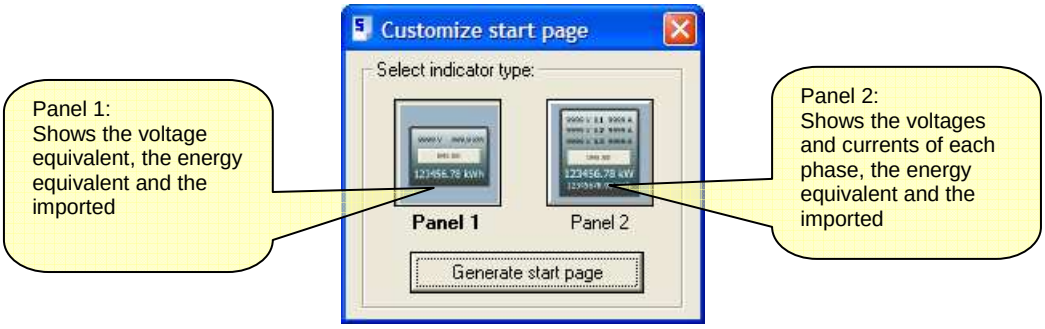
Start page generation

When the software is started, it loads a page with the following criteria:

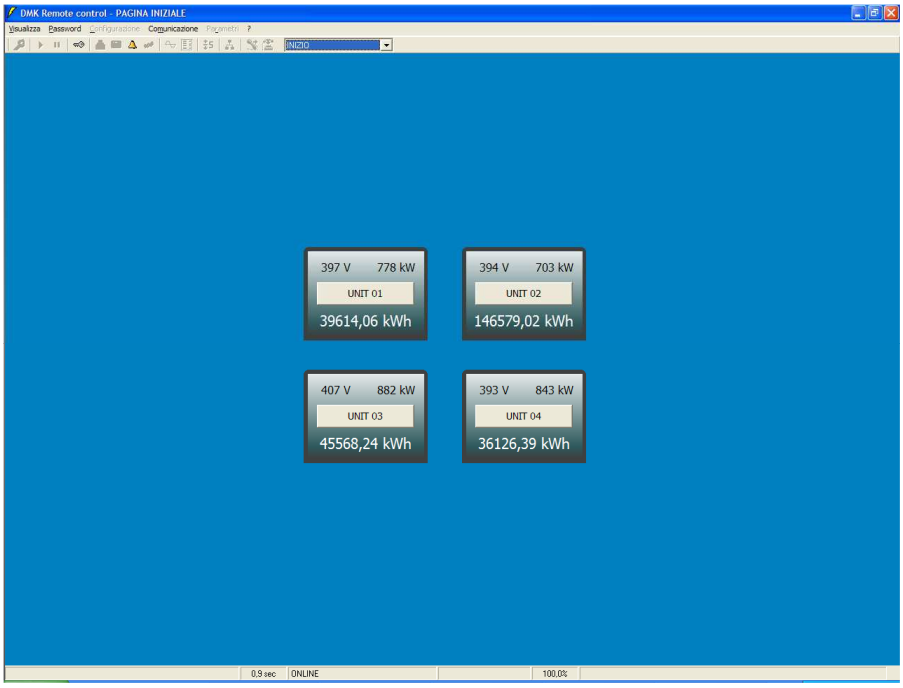
- If there is only one multimeter in the configuration, the page named 'MAIN' is loaded.
- If there are more than one multimeter, then the program loads the page named 'START'

These page names are valid when the software is configured in English. The user, if he wants, can customize these pages with the page editor , but it is necessary that the files MAIN.PGD and START.PGD are not deleted.

There is the possibility to automatically generate the 'START' page, displaying one panel foe each multimeter.
This operation can be carried out after having finished the configuration phase, opening the page editor and selecting *Page-Generate start page*.
In this way, the software automatically generates the page file START.PGD, inserting for each multimeter in the network a panel, user can choose the type of panel through the following interface:



After having generate the page, the user has the possibility to customize it using the common commands of the editor. The following picture shows an example of start page automatically generated for a four-multimeter network.



At this point he user can add, for instance, a picture with a scheme of its plant and then place the panels in the correct positions.

When the software is installed for the first time, it is supplied a START page with only one multimeter. This page can be overwritten by the one customized by the user, that will be automatically loaded every time the software is started.

APPENDIX A – Connection modes

Connection via standard modem
To make a remote connection via a switched telephone line the use of a pair of modems is necessary. Lovato guarantees correct operation of the connection using modems of the following type:

- 3-Com U.S. Robotics 56K model 5630

Though correct operation is possible also with modems of other types, in this manual all the configuration commands (variables depending on the manufacturer) and the connection diagrams will refer to the above-mentioned modem model.

Though very simple in conception, connection via modem requires that the installer have a minimum of experience concerning the problems connected with serial communication, modem programming, types of telephone lines, etc. In an attempt to simplify the configuration procedure as far as possible, we have subdivided the operations to be carried out in the following steps:

1. ***Modem configuration at the multimeter end***
   From the multimeter end the modem must be configured before it can be used. Configuration serves to implement the following functions:
- Disable the echo
- Set a communication speed fixed at 9600 baud (this must be the default speed for multimeter also)
- Permanently store the two previous settings as default at switch on

   To make these configurations, the modem to be connected to the RS232/RS485 converter will have to be momentarily connected to the PC with its standard cable. Then start the PM.EXE program (supplied together with this software) and press the *Program modem* button. Wait for the confirmation message and then disconnect the modem from the PC and connect it to the multimeter. The PM.EXE program transmits the following configuration string to the modem:

   AT E0 &N6 &U6 &W0 <CR> (commands valid for modem model 5630)

   If the user is familiar with terminal emulation programs (such as Windows Hyperterminal) this programming can be done manually without the aid of the PM.EXE program. In this case, it will be necessary to set the serial interface at 9600 Baud, 8 bit, No parity, 1 stop bit and type in the above string from the keyboard. On pressing return the modem will answer with OK confirming that programming has taken place.

2. ***multimeter configuration***
   Also the multimeter needs a configuration to be able to converse with the modem.
- Check that the internal software revision of the multimeter is higher or equal to 8.0. The software revision is shown on the displays at power-on.
- From the front panel of each multimeter, enter the serial communication setup menu (see the multimeter Addendum Manual)
- Check the serial address (parameter P.41). If several Multimeters are connected to a RS-485 bus, set each of them with a progressive serial address starting from 001.
- On each unit, select the Modbus ASCII protocol (parameter P.44 set to ASC).
- If you want the multimeter to answer when modem rings (modem without auto-answer) then set parameter P.45 to 001, only for the multimeter with serial address 01.
- Otherwise, if you want the modem to answer automatically itself, then enable the modem auto-answer, setting its parameter S0 to 001 (with command ATS0=1 &W0) and leave the first multimeter with P45 to 000.

3. ***System connection***
- Connect the multimeter-side modem to the RS232/RS485 interface converter using 51C9 cable.
- Connect the RS232/RS485 interface converter to the multimeter network using a shielded twisted pair cable (see wiring diagram in the following page).
- Connect the second modem to the PC with the standard cable provided with the modem. The PC-side modem does not require any particular programming (it must be left at factory defaults).

- Connect both modems to the respective telephone lines. For the first tests you are advised to use two internal lines in the same office to keep the call under control.

4. Configuration of the multimeter.exe program

- Start the multimeter.exe program from the PC with the modem already connected and powered.
- Choose the *Configuration-Options* menu
- Set the *Connection via modem* box from the *General* table.
- If the *Modem Index* table is empty, enter a record with the name of the installation and the phone number corresponding with the telephone line of the modem connected to the multimeter.
- Click on *OK* to close and save the *Options* window.

5. Online Connection

- Choose *Call with modem* from the *Communication* menu
- From the pull-down box choose the name of the installation to be called. The corresponding telephone number (previously loaded in the *Modem index*) will be shown in the box below.
- Click on *Dial*
- At this point, the modem at the PC end calls the multimeter modem. After a few rings the multimeter modem and the program switch automatically to the online mode.
- To end the connection, choose *Modem-Hang up* from the *Communication* menu

In the event of problems…

If during the attempted call the modem connected to the multimeter does not 'ring', this means that the call fails to reach its destination. In this case, carry out the following checks:

- Try dialing the telephone number of the line to which the multimeter is connected using a normal telephone. The modem called should give off sounds that ought to be heard in the handset. If this does not happen, there are problems on the telephone line or on the switchboard.
- Check that PC modem is powered and connected with the cable to the correct serial port (the one set in *Communication-Serial port*)

If the modem called rings repeatedly but the connection fails to be established

- Check the multimeter programming (in particular about auto-answer, see previous point 2)
- Check modem programming (in particular about auto-answer, see previous point 2)
- Check the integrity and the polarity of multimeter-Converter RS-485 twisted-pair cable
- Check the integrity of modem-converter cable 51C9
- Check if when the phone rings, the yellow LED on the interface converter blinks briefly. This means that the modem is sending the RING message to the converter and this is sending the message to the Multimeters.

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