

Wattsoft3

Energy Management
Software



USER'S GUIDE

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The customer acknowledges that supervising is a complex undertaking requiring co-ordination between many different hardware and software elements, including elements not supplied by CGC, and requiring proper use and caution on the part of operator and others.

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WATTSOFT3

OPERATING MANUAL

INTRODUCTION

Wattsoft3 was expressly developed for the control and supervision of an electrical system.

The wide availability of information and control allows a real and complete management of energy.

Two are the main groups of available variables: the ones relating to the single instruments, the "SINGLE DATA", and the ones relating to the instrument which monitors the whole electrical network, the "TOTAL DATA"..

The data supplied by the software (if available in the read instrument) are the followings:

Cost total cost of the measured energy

kWh active energy (positive and negative)

kvarh reactive energy (positive and negative)

kWdmd average power (demanded active power)

kVA dmd average power (demanded apparent power)

kW active power

kvar reactive power

kVA apparent power

PF power factor

PFavg average power factor

Hz network frequency

A max maximum current of the 3 phases

V L-L average phase to phase voltage

V L1-N phase 1 to neutral line voltage

V L2-N phase 2 to neutral line voltage

V L3-N phase 3 to neutral line voltage
kW L1 phase 1 active power
kW L2 phase 2 active power
kW L3 phase 3 active power
Work h working hours
kvar L1 phase 1 reactive power
kvar L2 phase 2 reactive power
kvar L3 phase 3 reactive power
kVA L1 phase 1 apparent power
kVA L2 phase 2 apparent power
kVA L3 phase 3 apparent power
PF L1 phase 1 power factor
PF L2 phase 2 power factor
PF L3 phase 3 power factor
A L1 phase 1 current
A L2 phase 2 current
A L3 phase 3 current
THD V1 total harmonic distortion VL1-N
THD V2 total harmonic distortion VL2-N
THD V3 total harmonic distortion VL3-N
THD A1 total harmonic distortion AL1
THD A2 total harmonic distortion AL2
THD A3 total harmonic distortion AL3

All the data acquired from the network by WATTSOFT3 are stored in txt format so it is possible to use and manage them using another software able to import this kind of files (for example Microsoft EXCEL). All the files are stored in the folder C:\Wattsoft3\History.

Warning: this software is designed to run on the following versions of Microsoft Windows operating system: Windows 95, 98, 2000, NT, XP.

SYSTEM REQUIREMENTS

In order to operate properly and comfortably WATTSOFT3 requires to be installed in a PC which has, at least, the following characteristics:

Processor Pentium 266

Memory 32 Mb

Hard disk 1 Gb free space

SVGA monitor

WARNING. The serial communication port of a PC uses the RS232 standard while the instruments used to monitor the net use the RS422/485 standard. To correctly interface these two standards a RS232/RS485 line adapter (mod. SIU-PC.85, supplied by Carlo Gavazzi) should be used.

WATTSOFT3 allows the monitoring of a network composed by up to 255 instruments. If the instrument network is composed by a number of instruments bigger than 32, a line amplifier for the RS422 signal is needed. This line amplifier (mod. SIU-DIN.8585) has to be used every 32 instruments connected to the network (8 amplifier max.). See the appendix A for wiring diagrams examples.

INSTALLING PROCEDURE

The typical process for installing a new copy of WATTSOFT3 is the following.

Put the key on the parallel port of the PC (if you have a x.xml version the key is not required).

Access the "setup.exe" executable file from the CD and start it.

Follow the instructions on the screen and restart the PC.

MAIN MENU

After the program is launched, the main menu window appears.

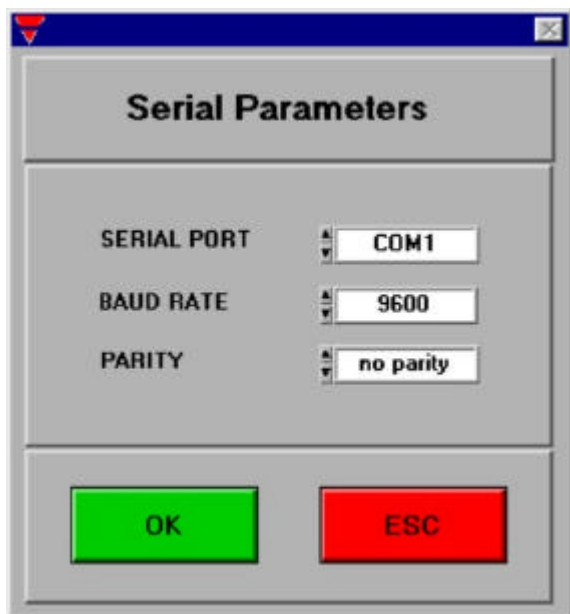


The following operations can be carried out by means of the menu buttons:

- Set-up of the serial port parameters
- Set-up of the system configuration
- Execution of the software
- Exit from the software

COMMUNICATION

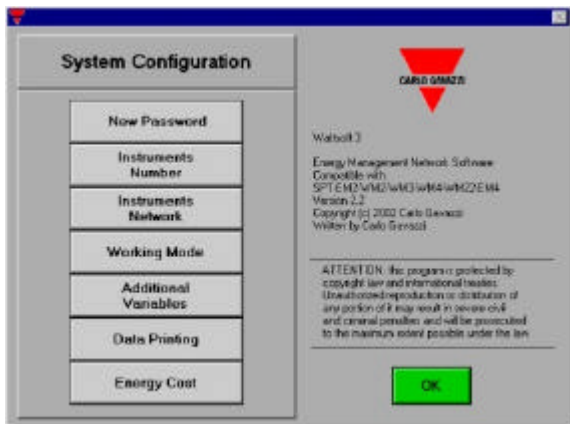
In the communication box the serial parameters of the instrument network must be set.



All the instrument must have the same baud rate and parity and the WattSoft3 serial parameters must be set accordingly.

SET-UP

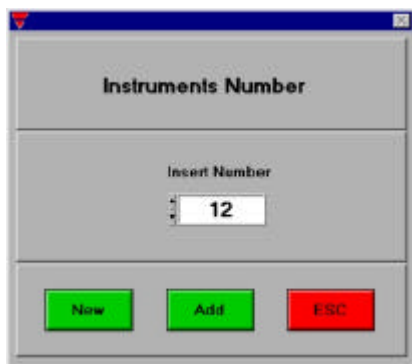
The Set-up menu allows the user to set all the parameters relating to the network configuration.



New password allows the user to choose the desired password. The password, if forgotten, can be bypassed by using a given access code.



Instrument Number allows the user to set the number of instruments present in the network. Selecting the instrument number and pressing NEW, the present network configuration is reset. If one or more instruments are to be introduced in the already configured network, the ADD button must be pressed until the required instrument number is reached. This window must be closed pressing ESC.

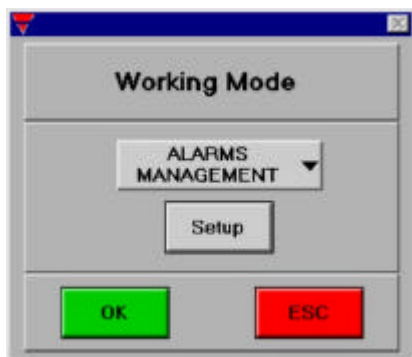


Instruments Network allows the user to define the characteristics (address, wiring system, etc.) of every instrument connected to the network.

Additional Variables enables the user to select further variables to be displayed in addition to the basic ones, for each kind of instrument.

Working mode defines the working mode of the software, which can be selected between:

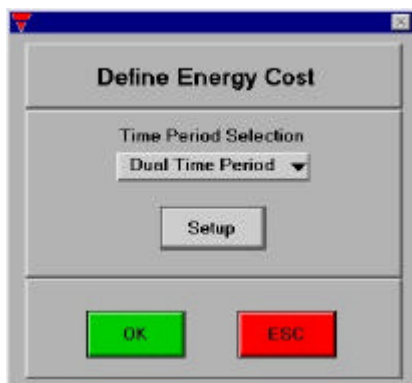
- Alarm Management
- Manual load activation



Data printing defines the configuration of the printing parameters.

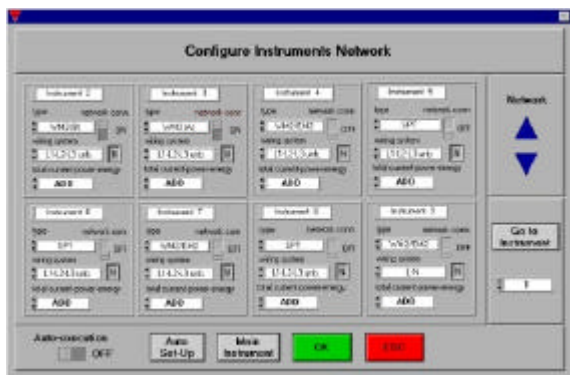
Energy costs enables the user to select all the parameters relevant to the energy cost calculation (energy cost, installed power cost, time periods, etc.) according to the chosen type of tariff management:

- Single time period management
- Dual time period management



INSTRUMENT NETWORK

The configuration of every instrument of the network must be set in the relevant control panel.



Instrument n: each control panel is referred to the instrument whose address is n.

Type defines the type of the nth instrument connected to the network (SPT, WM2/EM2, WM3, WM4 or WM22/EM4).

Network connection enables the connection of the instrument to the network.

Wiring System defines the type of the instrument wiring system (single-phase, balanced three-phase, unbalanced three-phase).

(N) Neutral indicates if the neutral is present or not.

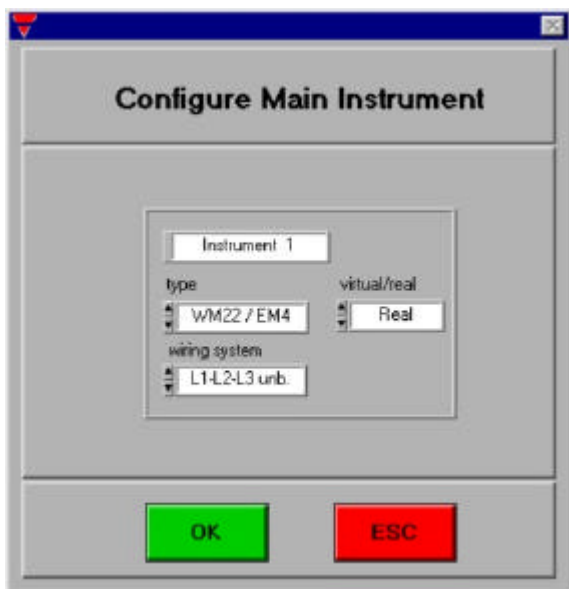
Total current-power-energy is available only if the main instrument is a virtual one. It defines how

the current, power and energy data of the nth instrument are managed by the virtual Main Instrument (ADD means added; SUB subtracted; NONE not taken into account).

Network: the two blue arrows in this area allow the user to scroll across the network.

Go to instrument allows the user to reach in a single step the instrument whose address is specified in the relevant control panel.

Main Instrument: by means of this key, it is possible to access the control panel of the main instrument.



This instrument can be either virtual or real.

- **Real:** the main instrument, whose address must be 1, is a real one and its data are read directly by WattSoft3.
- **Virtual:** the main instrument is a virtual one which collects the data from the real instruments of the network and manages them according to the "Total current-power-energy" selections.

Auto-execution: there are two different possibilities when launching WattSoft3.exe.

- **OFF:** the main menu appears and the user can choose if entering the set-up or executing the program.
- **ON:** the program will automatically enter the execution mode.

Autosetup: pressing this key, the software automatically reads the configuration of the instruments and fill in the relevant control panels with the downloaded information. Note that the "Total current-power-energy" box must be manually filled in.

- **OK:** exit saving the modifications.
- **ESC:** exit without saving the modifications.

By means of the **Main Instrument** key, it is possible to access the control panel of the Main Instrument. In addition to the parameters being common to the other instruments, it's possible to decide whether the Main Instrument is virtual or real; real means that the instrument is actually present in-field and the data are read directly, while virtual means that the data are taken from the reading of the other instruments present in the

network, depending on the selection being made in the total current-power-energy menu.

By means of the **Autosetup** key, it's possible to obtain directly from the reading of the instruments the following fields type: wiring system and network connection, while the operator must enter the other fields manually.

ALARM MANAGEMENT

In this box, it is possible to configure the alarms associated to the instrument selected on the list on the left of the window.



A **User** field, which can be used to enter the name of the user or a brief description, is available for every instrument.

The variables relevant to the selected instrument are listed on the right side of the box. For every available variable (**measure**), it is possible to select the alarm set-point (**Set**), the hysteresis (**H.**), the **type** of alarm (up, down, up latch, down latch).

The alarm on the selected variable is enabled only if the **ON/OFF** selector is on.

With EM2 and SPT, it is possible to duplicate the software alarm, driving the digital output of the mentioned instruments. The **SW/HW** selector must be set on HW to enable this function.

The **HW alarm test** button allows the user to test remotely the EM2/SPT digital output. The digital

output must be ON when the LED above the test button is green.

The set-point and the hysteresis are linked to the alarm type: if the alarm is Up, the alarm occurs when the measured value is higher than the set-point value; if the alarm is down, the alarm occurs when the measured value is lower than the set-point value.

Example:

Down alarm: if the set-point is equal to 210V and the hysteresis is equal to 5V, the alarm occurs when the voltage becomes lower than 210V and it terminates when the voltage becomes higher than 215V.

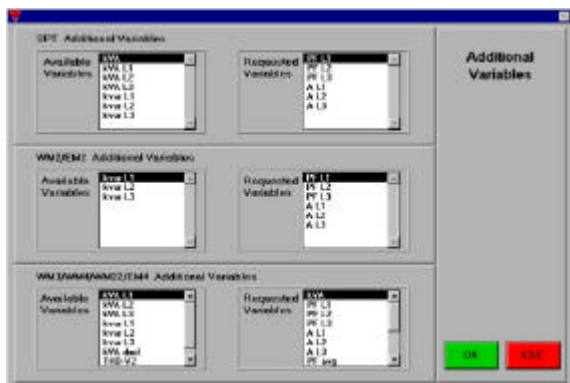
OK: exit saving the modifications.

ESC: exit without saving the modifications.

ADDITIONAL VARIABLES

Double-click on the variable in the **Available variable** box to add it to the list of the displayed ones.

Double-click on the variable in the **Requested variable** box to remove it from the list of the displayed ones.

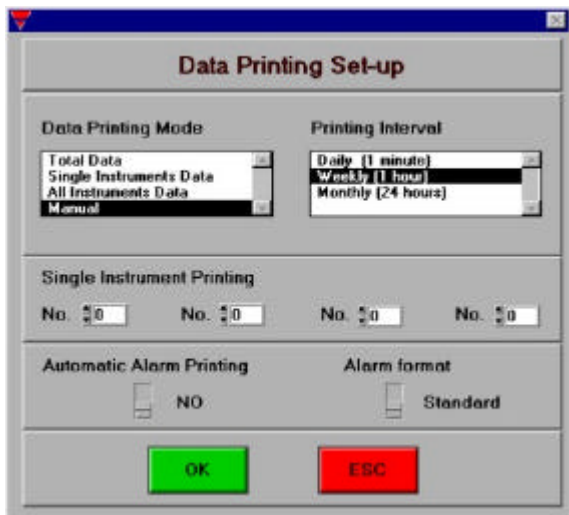


OK: exit saving the modifications.

ESC: exit without saving the modifications.

DATA PRINTING

This window allows the definition of the printing parameters.



Data Printing Mode defines the set of instruments whose data are printed at the selected time interval.

Total data: only the data of the main instrument are printed

Single instrument data: only the data of up to 4 selected instruments are printed

All instruments data: the data of the whole network are printed

Manual: the user can print the desired data by means of the print button.

Printing Interval defines the interval between two subsequent prints.

Single Instrument Printing defines up to 4 instruments whose data are printed in the Single Instrument Data printing mode.

Automatic Alarm Printing: if **YES** is selected, the list of the occurred alarms is automatically printed at 0.00 am.

Alarm format: if **Standard** is selected, the list of the occurred alarm are printed reporting the following information: instrument number, date/hour of the alarm, variable value.

If **Extended** is selected, the set-point value, the engineering unit, the type of alarm are printed in addition to the standard information.

ENERGY COST

In this box the data relevant to the calculation of the energy costs must be inserted. WattSoft3 calculates both the fixed costs due to the installed power and the variable costs proportional to the active and reactive energy consumption.

| Define Cost Parameters | |
|-------------------------------|--|
| Energy Calculation OFF | Installed power: 0 kW |
| Monthly Reset OFF | Monthly tariff: 0.00 €/kW |
| WMZ/EMZ: dmd select. Fixed | Amount: 0 €/h |
| KW dmd: 15 min | Over power demand (kW dmd) limit: 0 kW |
| Currency: | Over power demand (kW dmd) tariff: 0.00 €/kW |
| OK | Active energy tariff: 0.00 €/kWh |
| ESC | Reactive Energy limit 1: 0 kVArh |
| | Reactive Energy tariff 1: 0.00 €/kVArh |
| | Reactive Energy limit 2: 0 kVArh |
| | Reactive Energy tariff 2: 0.00 €/kVArh |
| | Tax on used energy: 0 % |
| | Tax on installed power: 0 % |

To calculate the fixed costs, the following parameters are requested:

A) Installed power

Rated power of the electricity supplier contract

B) Monthly tariff

Monthly cost per kW

AxB) Amount

Monthly fixed cost, automatically calculated by WattSoft3

C) Over power demand limit

Upper kWdmd limit admitted by the supplier. If during the current month kWdmd has exceeded the installed power (A) but was

always lower than this limit (C), the fixed cost of the month becomes equal to $A \times C$

D) Over power demand tariff

Tariff per kW applied if, during the current month, the actual kWdmd has exceeded the over power demand limit (C)

The variable costs are calculated using the following parameters:

E) Active energy tariff

Active energy cost per kWh

F) Reactive energy limit 1

First limit of the reactive energy expressed as percentage of the installed power (A). Under this limit no additional costs are due for the reactive energy consumption

G) Reactive energy tariff 1

Cost of the reactive energy per kvarh. This tariff is applied only if the reactive energy exceeds the kvar limit 1 (F) and is lower than kvar limit 2 (H)

H) Reactive energy limit 2

Second limit of the reactive energy expressed as percentage of the installed power (A) over which the kvar tariff 2 (I) is applied

I) Reactive energy tariff 2

Cost of the reactive energy per kvarh. This tariff is applied only if the reactive energy exceeds the kvar limit 2 (H)

Wattsoft3 adds to the total amount the taxes to be applied both to the variable and the fixed costs

E,G,I) Tax on used energy

Percentage value of the VAT on the variable costs

AxB,D) Tax on installed power

Percentage value of the VAT on the fixed costs

Energy Calculation enables the energy calculation during the execution of the software.

Monthly Reset enables the automatic reset of all the cost counters.

WM2/EM2 dmd selection enables the user to choose between fixed and floating dmd calculation of the active power in WM2 and EM2. The other instrument calculate themselves the kWdmd value which is read directly by WattSoft3.

KW dmd enables the user to set the period for the calculation of the kWdmd.

Currency allows the user to set the currency used on the cost calculation.

Tariff1/2: this selector, which is present only if the Dual Time Period management is selected, allows the user to define the cost parameters relevant to both tariff 1 and 2.

OK: exit saving the modifications.

ESC: exit without saving the modifications.

DUAL TIME PERIOD

This window enables the user to set the beginning/end time of the two time periods by means of the scrolling bar on the left of the box.



In the dual time period energy management, it is possible to set two time intervals (Time 1 and Time 2) and to associate the relevant tariff (Tariff 1 and Tariff 2): the configuration can be carried out by means of the boxes on the right part of the window.

Reset is used to reset the configuration.

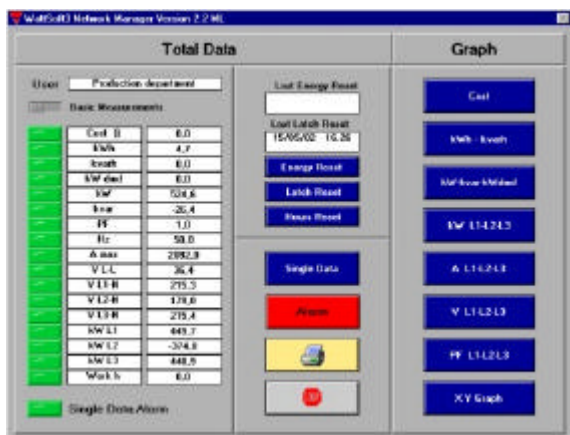
Define costs allows you to enter the “Define cost parameters” box.

OK: exit saving the modifications.

ESC: exit without saving the modifications.

TOTAL DATA

This box displays the Main Instrument data.



The basic variables or the additional ones are displayed according to the position of the **basic meas./add. measurements** selector. The **Users** field displays the label given to the instrument on the alarm set-up box.

The presence of an alarm is indicated by means of a flashing red LED, placed close to the relevant variable box. Once an alarm, set as latch alarm, is called off the LED remains red and can be reset only by the **Reset Latch** key (password protected). When a non-latch type alarm is called out, the relevant LED becomes green again.

Energy Reset (password protected) enables the user to reset all the energy values of the main instrument (only for real main instrument).

Hours Reset (password protected) resets the hour counter.

The **Single Alarm Data** LED informs that an alarm condition is present in one of the other instruments.

Single Data allows the access to the data of all the instruments (except for the main one).

Alarm shows the list of the occurred alarms.

Print allows the printing of the displayed data on the default printer.

Stop (password protected) terminates the acquisition.

The keys on the right side of the window allows the displaying of the **graph** pages relevant to the different electrical variables.

XY graph enables the user to choose three variables of different types to be displayed in the graphical mode.

SINGLE DATA

The data relevant to all the instruments connected to the network, grouped up to 6 by 6 according to their type (SPT, WM2/EM2, WM3/WM4/WM22/EM4) in different pages, are displayed in the **Single Data** box.

| Instrument | Pump 1 | Meter B | Pump 2 | | | |
|------------|--------|---------|--------|--|--|--|
| Inst. # | 8.0 | 8.0 | 8.0 | | | |
| SW | 37.2 | 38200.0 | 1362.4 | | | |
| SW | 6.0 | 7579.6 | 820.5 | | | |
| SW del | 470.3 | 0.0 | 515.8 | | | |
| SW | 487.4 | 494.8 | 1383.9 | | | |
| SW | -26.7 | -21.8 | 98.5 | | | |
| PI | 1.0 | 1.0 | 1.0 | | | |
| Hi | 6.0 | 50.0 | 50.0 | | | |
| A max | 2195.8 | 2100.0 | 2164.0 | | | |
| V L1 | 0.0 | 0.0 | 270.7 | | | |
| V L2 | 273.0 | 215.8 | 215.8 | | | |
| V L3 | 220.2 | 215.8 | 217.2 | | | |
| V L4 | 220.2 | 215.8 | 217.4 | | | |
| SW L1 | 470.4 | 494.8 | 495.8 | | | |
| SW L2 | 487.4 | 494.8 | 496.8 | | | |
| SW L3 | 480.2 | 495.8 | 497.2 | | | |
| SW L4 | 0.1 | 0.1 | 0.1 | | | |

Last Energy Reset: [] [] [] [] [] []
Last Alarm Reset: [] [] [] [] [] []
Reset: [E] [A] [N] [E] [A] [N] [E] [A] [N] [E] [A] [N] [E] [A] [N] [E] [A] [N]

1123 [Home] [Total]

To display the different pages, the blue buttons located on the bottom left corner must be pressed. The number of the current instrument page is displayed in the upper left corner.

The basic variables or the additional ones are displayed according to the position of the **basic meas./add. measurements** selector. The **Users** field displays the label given to the instrument on the alarm set-up box.

The presence of an alarm is indicated by means of a flashing red LED, placed close to the relevant variable box. Once an alarm, set as latch alarm, is called off the LED remains red and can be reset only by the **Reset Latch** key (password

protected). When a non-latch type alarm is called out, the relevant LED becomes green again.

En (password protected) resets the energy values of the relevant instrument.

Al (password protected) resets the called off latch alarms of the relevant instrument.

h (password protected) resets the hour counter of the relevant instrument.

Alarm shows the list of the occurred alarms.

Print allows the printing of the displayed data on the default printer.

Total Data allows the return to the main instrument data page.

GRAPH

In this window the graph shows the trend of the variables relevant to the selected instrument.



In the upper part of this window, the graph type and the instrument whose data are displayed must be selected.

Starting from the left side:

- Indication of the **Engineering Unit** of the displayed variable.
- **Alarm** LED informs that an alarm condition is present in the current instrument.
- **Instrument n** selector: selection of the instrument whose data are to be displayed.
- **Daily/Weekly/Monthly** selector: selection of the graph type (**daily**=1 value/min resolution; **weekly**=1 value/hour resolution, the value is the average of the previous 60 acquired values; **monthly**=1 value/day resolution, the

- value is the average of the previous 1440 acquired values).
- **User**: indication of the user name chosen on the alarm setup box.
 - **Wiring sys**: indication of the wiring connection of the selected instrument.
 - **Neutral**: indication of the presence of the neutral (**red**=neutral; **white**=no neutral)
 - **Date/time**: indication of the current date/time.

The lower part of the graph window has different functions according to the selected graph type:

- **Daily**
 - **Move/Stop** selector: if **Move** is selected, the last hour is displayed and the graph is updated every minute. If **Stop** is selected, the displayed graph is not updated.
 - The box containing the date/time allows the shift of the displayed graph which can be carried out by means of the blue arrows. The date/time indicates the last datum of the graph.
- **Weekly**
 - **All/Step** selector: if **All** is selected the graph shows all the relevant data, since the beginning of the measurements. If **Step** is selected, the graph is limited to the week showed in the central box. This time period is modifiable by means of the two blue arrows.
- **Monthly**
 - **All/Step** selector: if **All** is selected the graph shows all the relevant data, since the beginning of the measurements. If **Step** is selected, the graph is limited to the month showed in the central box. This

time period is modifiable by means of the two blue arrows.

Print allows the printing of the displayed graph.

Total Data allows the return to the main instrument data page.

The right side of the window contains the legend of the graph and the configuration of the cursor:

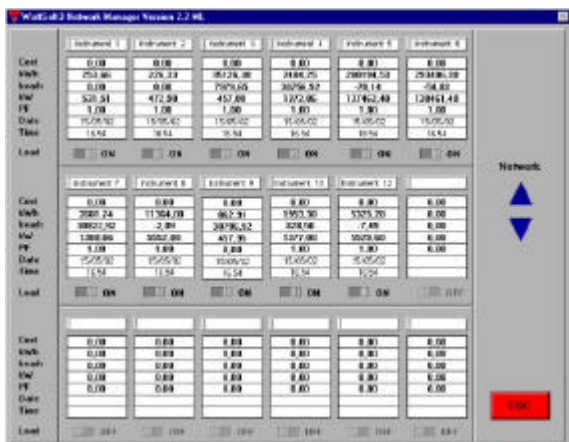
- **Cursor plot:** selection of the variable to be analysed by means of the cursor.
- **Cursor value:** indication of the value pointed by the cursor.
- **Cursor time:** indication of the time pointed by the cursor.
- **Graph tools**
 - **(X):** pressing this button, the whole stored data are displayed. When a new value is acquired, the last hour (or day/month) is displayed again. To maintain the whole-stored-data view, the (X) button must be held pressed by means of the selector on its left.
 - **(Y):** pressing this button, the autoranging function is enabled (Y axis). To maintain the autoranging view, the (Y) button must be held pressed by means of the selector on its left.
 - **(X.XX):** the format, precision and linear/logarithmic mapping mode related to the X axis are selectable.
 - **(Y.YY):** the format, precision and linear/logarithmic mapping mode related to the Y axis are selectable.

- **(magnifying lens)**: six zoom functions are available by pressing this button.
- **(+)** enabling of the cursor
- **(hand)**: enabling of the panning function. The cursor changes to a hand shape and it is possible to pan using the mouse by dragging the image with the primary mouse button held down.

If XY graph is chosen, it is possible to set the three variable to be graphically displayed by means of the 3 selector placed in the position of the legend, in the right side of the window.

MANUAL LOAD ACTIVATION

In the Manual Load Activation mode, it is possible to remotely activate/de-activate the load controlled by means of the digital output of the relevant instrument.



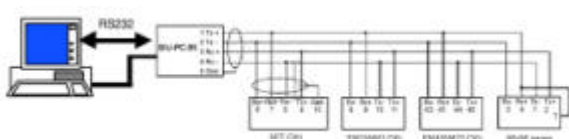
The available information are limited to the cost, the energies, the instantaneous active power, the power factor and the data/time of the activation of the load.

Switching **ON** the **Load** selector, the contactor connected to the digital output (static or relay) is switched on too, activating the load.

Switching **OFF** the **Load** selector, the load is deactivated, the energy meters reset and, if the printing is enabled, a report including the displayed information is automatically printed by the default printer.

APPENDIX A Connection

The connection between WATTSOFT3 and the instruments of the network must be the 4-wire RS422. An example of a network made by different kinds of instruments follows.



Some element of the network (SIU-PC.85, EM2-DIN, WM2-DIN and SPT-DIN) have to be properly set in order to work with the RS422 serial interface by means of the dip-switches they are equipped with.

In the following pages the complete setting of the mentioned instruments is described.

A.1 SIU-PC.85

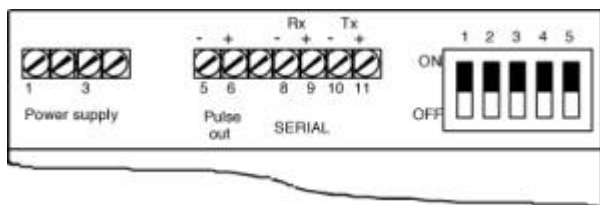
The SIU-PC.85 is a line adapter capable to convert the RS422 signal, coming from the instruments network, to the RS232 signal used by the serial communication port of the PC. The selection dip-switches are inside the SIU-PC85; to select the required function, unscrew the 4 screws at the four angles of the adapter back panel.



| DIP-SWITCH | FUNCTION | DIP-SWITCH POSITION |
|------------|-------------------------------|---------------------|
| 1 | "Tx+" Line bias | ON |
| 2 | "Tx-" Line bias | ON |
| 3 | 2/4 Wires (ON=2 wires) | OFF |
| 4 | 2/4 Wires (ON=2 wires) | OFF |
| 5 | "Rx+" Line bias | OFF |
| 6 | "Rx-" Line bias | OFF |
| 7 | Termination of reception line | ON |
| 8 | "Rx+" Line bias | OFF |

A.2 WM2-DIN/EM2-DIN

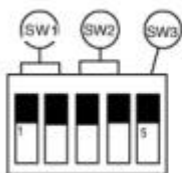
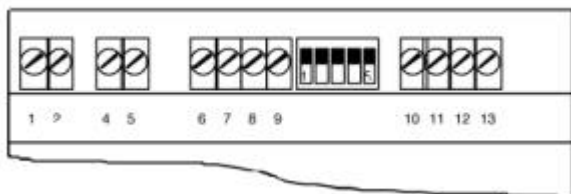
The selection dip-switches, in both WM2-DIN and EM2-DIN, are placed on the right of the terminals of the serial communication port.



| DIP-SWITCH N° | FUNCTION | DIP SWITCH POSITION |
|---------------|------------------------------------|---------------------|
| 1 | 2/4 Wires (ON=2 Wires) | OFF |
| 2 | 2/4 Wires (ON=2 Wires) | OFF |
| 3 | Biasing - | OFF |
| 4 | Biasing + | OFF |
| 5 | Terminalization (ON= Terminalized) | OFF |

A.3 SPT-DIN

The selection dip-switches, in SPT-DIN, are placed on the right of the terminals of the serial communication port.



| DIP-SWITCH N° | FUNCTION | DIP-SWITCH POSITION |
|---------------|------------------------|---------------------|
| 1 | 2/4 Wires (ON=2 Wires) | OFF |
| 2 | 2/4 Wires (ON=2 Wires) | OFF |
| 3 | Biasing - | OFF |

To avoid any possible communication problem between the PC and the instruments, it is necessary to use a 4-wire shielded cable, respecting the maximum distance of 1200 m from the output of the RS232/RS422 and the last instrument of the network. The RS422, in the last instrument of the network, has to be terminalised: see the instruction manual of the relevant instrument to terminalise correctly.

WATTSOFT3 is able to manage a network of up to 255 instruments. Note that, due to the features of the RS422, every 32 instruments a line adapter SIU-DIN.8585 is required.