

Operation Guide



Flatpack MCU Monitoring & Control Unit

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POWERFUL TECHNOLOGY

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This product holds a CE mark and satisfies all requirements covering relevant standards and directives.

EMC

Generic Immunity Standard

- EN50082-1 Residential, Commercial and Light Industry
- EN50082-2 Industrial Environment

Generic Emission Standard

- EN50081-1 Residential, Commercial and Light Industry
- EN50081-2 Industrial

LVD

- LVD73/23/EEC Low Voltage Directive



Certificate no. 004
Sertifikat nr. 004



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Contents

1	KEY STAKEHOLDERS/ DOCUMENT HISTORY.....	5
2	INTRODUCTION	6
3	SCOPE.....	7
4	EQUIPMENT OVERVIEW	7
4.1	GENERAL.....	7
4.1.1	Communication protocols.....	7
4.1.2	Winpower communication software.....	7
4.2	EQUIPMENT FEATURES	8
4.2.1	Alarms.....	9
5	LOCAL OPERATION OF THE FLATPACK MCU.....	10
5.1	THE FRONT PANEL	10
5.1.1	The front Display	11
5.1.2	Status Mode	11
5.1.3	Menu Mode	11
5.2	CONTROL KEYS	11
5.2.1	Hierarchy of Menus	12
5.2.2	Menu Options.....	13
5.3	USER OPTIONS AND SERVICE OPTIONS.....	13
5.3.1	Available User Options.....	14
5.3.2	System ON/OFF.....	14
5.3.3	Resetting Alarms.....	14
5.3.4	Display Important System Voltages.....	15
5.3.5	Display Alarm Messages.....	15
5.3.6	Display of System's Software Number.....	16
5.3.7	Available Service Options.....	16
5.3.8	Adjustment of Important System Voltages.....	16
5.3.9	Output Voltage Calibration	17
5.3.10	Change of Service Options Password.....	17
5.3.11	Changing Boost-Charging Duration	18
5.3.12	Start or Stop Boost Charging.....	18
5.3.13	Auto boost configuration.....	19
5.3.14	Battery Test Setup	20
5.3.15	Battery Test Start/stop	21
5.3.16	Battery Charge current limitation.....	22
5.3.17	Battery Setup.....	23
5.3.18	Selection of Type of Output Voltage Control.....	24
5.3.19	Change date and time	25
5.3.20	Test Operation of Alarm Relays.....	26
5.3.21	Available Communication Options.....	27
5.3.22	Adjustment of Communication Protocol.....	27
5.3.23	Baud rate adjustment.....	27
5.3.24	Modem Sense Selection.....	28
6	OPERATING FROM A PERSONAL COMPUTER	29
6.1	INSTALLATION OF WINPOWER SOFTWARE.....	29
6.2	INSTALLATION OF THE PC AND THE MODEM.....	29
6.2.1	Local Installation.....	29
6.2.2	RS232C Cable pinouts – Local Connection.....	30
6.2.3	Remote Installation.....	31
6.2.4	RS-232 Cable pinouts – Remote Connection	32
6.2.5	Modem Configuration.....	33
6.3	LOGIN TO WINPOWER.....	34
6.4	USING SITE MANAGER	35
6.5	DESCRIPTION OF THE SCREEN INTERFACE	36
6.6	MAIN MENU	37

Contents

6.7	OTHER MAIN MENU OPTIONS	39
6.7.1	Log Values dialog	39
6.7.2	Symmetry Monitor.....	40
6.8	ALARM STATUS SCREEN	41
6.8.1	Alarms Requiring Manual Resetting.....	41
6.9	GENERAL CONFIGURATION	42
6.9.1	Set Levels - Setting alarm limits.....	42
6.9.2	Alarm Setup/Display.....	44
6.9.3	Configurable Inputs	46
6.9.4	Set Time	48
6.9.5	Site Info.....	49
6.9.6	Modem Callback.....	50
6.9.7	Relay Test.....	54
6.10	BATTERY CONFIGURATION.....	55
6.10.1	Battery Setup.....	55
6.10.2	Batt. Test Setup	57
6.10.3	Battery boost - Automatic boost charging	60
6.10.4	Battery Boost - Manual Boost.....	61
6.10.5	Current Limit Cfg.....	63
6.10.6	Output Control.....	64
6.10.7	Symmetry Measurement Configuration	65
6.11	SYSTEM CALIBRATION	66
6.11.1	Calibrating the temperature	66
6.11.2	Calibrating the rectifier current	67
6.11.3	Calibrating the output voltage.....	68
6.11.4	Calibrating the symmetry voltage.....	68
6.11.5	Calibrating the battery current.....	69
6.12	INSTALLATION SETTINGS	70
6.12.1	System Configuration.....	71
6.12.2	Exit Installation Settings.....	72
6.13	PASSWORDS.....	72
6.14	ALARM LOG	73
6.15	BATTERY TEST INFO.....	74
6.16	CLEAR EVENT LOG.....	74
6.17	RESYNCH SYSTEM	74
7	RANGE OF SETTINGS AND DEFAULT VALUES.....	75

1 Key Stakeholders/ Document History

Name	Title
Inge Forseth	Product Manager
Oddbjørn Storeli	Technical Responsible

Rev	Written by		Checked by		Approved by	
	Date	Sign	Date	Sign	Date	Sign
V6	19.01.04	M.G.C.	01/2004	O.S.	01/2004	I.F.
V7	05.01.04	B.F.C.	06/2004	O.S.	06/2004	I.F.

The original signatures are recorded on the company's logistic data system

Rev.V6	Addition of real time clock function (applies to version 10 and above of the MCU)
Rev.V7	Addition of new features added in WinPower 4.0 and 4.1. Improve modem and battery test sections. Update logos to new standards. Added Default Settings / Range of Settings table.

2 Introduction

Eltek Energy is a world leader in the development of new power supply systems, designed to meet the rapid growth within the field of telecommunication, as well as the increasingly stringent reliability requirements.

With the introduction of microelectronics in electronic equipment, energy distribution and telecommunication and data systems technology require a guaranteed, uninterruptible power supply and to meet this demand, Eltek Energy make in-depth investments in all types of scientific research, technical development, and experimental mathematical modelling of thermal characteristics of components and systems.

While securing ultimate reliability, we innovate new technology and topology that will reduce the size of converters and extend the operating range, thereby increasing efficiency and reducing costs.

Eltek Energy invests between five and ten per cent of its turnover in research and development. With more than fifty highly qualified engineers and research scientists, working with the most advanced development platforms available, we are able to offer tailor-made solutions - a key factor for penetrating new markets.

A modern power supply system must fulfil various international standards and regulations while, at the same time, meeting market requirements. Increased awareness of Electromagnetic Compatibility (EMC), especially in Europe, has resulted in Eltek's investment in an EMC test laboratory. This laboratory not only ensures that products comply with relevant standards, it is also utilised throughout product development.

The EMC test laboratory forms part of Eltek's extensive in-house test facility.

Electronic equipment for data and telecommunications require supply voltages generated from the mains, as well as from battery-assisted DC voltage. Intensive development work has produced power supply systems designed to meet both current and future power requirements, and the development of control and alarm modules make our power supply systems a market leader. Programmed functions monitor operating conditions, load and battery. Should problems be detected, the operator will be notified immediately, either via the telephone network, or via Ethernet. Shutdowns can thus be avoided for critical applications.

Eltek's software expertise is constantly expanding remote communication capabilities of systems, using standard network protocols. Eltek Energy AS accepts no responsibility for any damage or injury to the system, site or personnel caused by drawings, instructions or procedures not prepared by Eltek Energy.

3 Scope

Flatpack MCU supports pComm binary master-slave communication, and COMLI - a serial master-slave protocol used to interface Flatpack MCU with a modem or PLC.

The user interface is called Winpower and features extended functionality and an environment familiar to Windows users.

The Flatpack MCU comprises additional features such as:

- Connection to rectifier systems where Flatpack 1500 rectifiers are installed.
- The entire rectifier system is controlled by the microprocessor-based MCU with easy and secure monitoring, remote control and system interconnection.
- Controls, monitors and regulates each rectifier module
- Provides battery / system surveillance to protect and optimise battery lifetime.
- Operation of the rectifier system from the front keypad on the alarm module, or from a PC, using a series of menus and sub-menus.
- The monitoring of other equipment on site via digital inputs. Each digital input can be given a user defined alarm name (programmable) and may be set to activate any alarm relay(s). If the input is activated, the relay(s) will activate and the alarm name will appear in the front panel display, and on the PC screen (if Winpower is used).

In addition the alarm module incorporates several other features, as specified in the chapter "4 Equipment Overview"

Note: LVD3 (option)

Reference to LVD3 only applies when this option is fitted.

4 Equipment Overview

4.1 General

4.1.1 Communication protocols

The Flatpack MCU supports the following protocols:

- pComm binary master-slave communication protocol TE241241.000-B4
- COMLI - a serial master-slave protocol used to interface the Flatpack MCU with a modem or PLC. For details of the protocol, see TE36862-B4 "COMLI communication protocol implemented in PRS systems".

4.1.2 Winpower communication software

Winpower is the main user interface for the Flatpack MCU, when communicating from a PC. Winpower is a Windows based communication software that provides communication for local or remote monitoring and control of the power system. Different access levels with individual passwords provide safety against unauthorized access and can be used to allow read-only access, or read/write access to service, maintenance and operating personnel. The Winpower communication programme operates on, Windows NT, Windows 2000, Windows ME , Windows 98 and Windows XP.

4.2 Equipment Features

The Flatpack MCU alarm module may be connected to rectifier systems where the Flatpack 1500 modules are installed. With Flatpack MCU installed in the rectifier system, the MCU's front keypads and display can be used to monitor, interrogate and operate the system. Flatpack MCU provide connectivity for remote monitoring and control, either via Winpower communication software, WebPower web browser interface, or via an SNMP-agent to an NMS.

Flatpack MCU controls and monitors each rectifier module and provides battery / system surveillance to protect and optimise the battery lifetime.

The Flatpack MCU incorporates the following features:

- **RS232 serial interface** for remote control from a local PC — or via a modem (up to 9600 baud)
- **Dot matrix display** with background illumination (2 lines x 16 characters)
- **Menu-driven operation** enables user-friendly system operation via the front keypads and LCD
- **Keypad for local operation** comprising 3 keys on the front panel of the alarm module
- **Central Control** of the entire system
- **Current and Voltage Output Monitoring**
- **Up to five configurable digital inputs** for monitoring of external equipment (generator, air-conditioning, etc).
- **Voltage level adjustment**
- **Temperature-compensated charging**
- **Manual or automatic boost-charging**
- **Battery testing (automatic and manual)** Battery discharge tables are stored in memory
- **Battery monitoring**
- **Three (3) low-voltage load and/or battery disconnects controlled by timer or voltage**
- **Automatic High Temperature Battery Disconnect (with user defined threshold)**
- **Storage of alarm messages in non-volatile memory**
- **Potential-free (dry contact) output relays.**
- **Test operation of relays.** For testing of external alarm circuits (wiring and connections)
- **Modem Callback**
- **Adjustable alarm limits**
- **Battery backed up Real Time Clock (RTC) – *Version 10 and above MCU only***

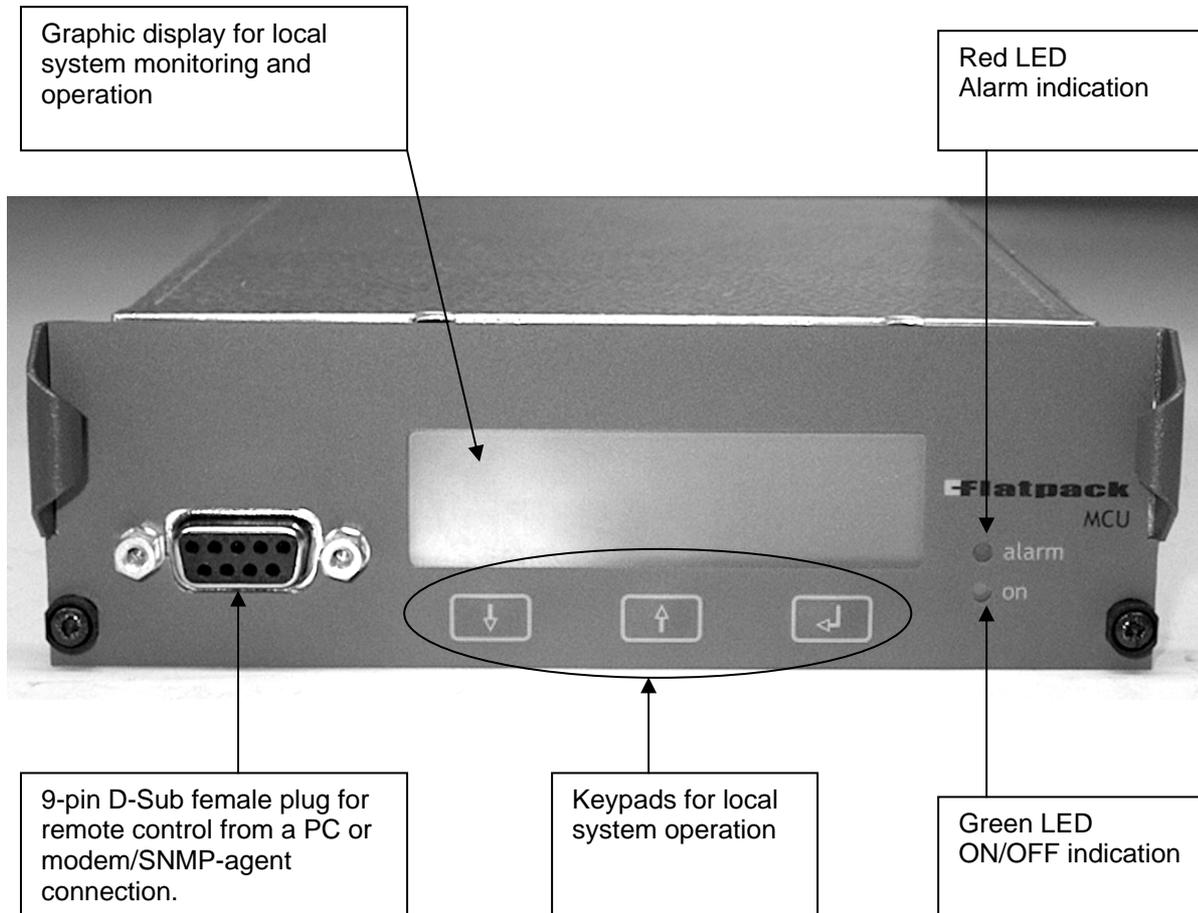
4.2.1 Alarms

The following are standard alarm trigger events and can be mapped to the available alarm relays.

- **High Battery Alarm 1** (50.0 to 58.0 VDC)
- **High Battery Alarm 2** (50.0 to 58.0 VDC)
- **Low Battery Alarm 1** (32.0 to 54.0 VDC)
- **Low Battery Alarm 2** (32.0 to 54.0 VDC)
- **LVD 1 (for load or battery disconnect).**
- **LVD 2 (for load or battery disconnect).**
- **LVD 3 (for load or battery disconnect).**
- **Battery Fuse Alarm** (battery breaker / fuse open)
- **Rectifier Alarm** (one rectifier failure)
- **Critical Rectifier Alarm** (more than one rectifier have failed)
- **Mains Failure alarm** (AC power to system is lost)
- **Battery Test Alarm** (Battery Test in progress / has occurred)
- **Battery Pre-Alarm** (Battery Test capacity result between 75% and 85% rated capacity)
- **Battery Fault Alarm** (Battery Test capacity result below 75% rated capacity)
- **Common Alarm** (summation alarm)
- **Load Fuse Alarm** (load breaker / fuse open)
- **Battery Symmetry Alarm** (Battery midpoint voltage excursion beyond user-defined limit)
- **High Temperature Alarm 1** (5°C to 80°C)
- **High Temperature Alarm 2** (5°C to 80°C)
- **Digital Input 1 through 5** (the alarm names for these inputs can be programmed)
- **On Battery Alarm** (>5A for 10s; <5A for 10s = clear alarm)
- **Rectifier Capacity Alarm** (user-defined threshold is exceeded. 1 to 100% of system capacity.)
- **Low Temperature Alarm** (-35°C to +20°C)
- **Probe Alarm** (detects open / shorted probes - reading is below -35°C or above +100° C)

5 Local Operation of the Flatpack MCU

5.1 The Front Panel



The Flatpack MCU control panel consists of a three-button keypad, a graphic display, a 9-pin D-Sub female plug, a green LED (indicating that the system is ON) and a red LED (indicating that the system is in the alarm mode).

The rectifier system is controlled from the Flatpack MCU by means of display menus and sub-menus.

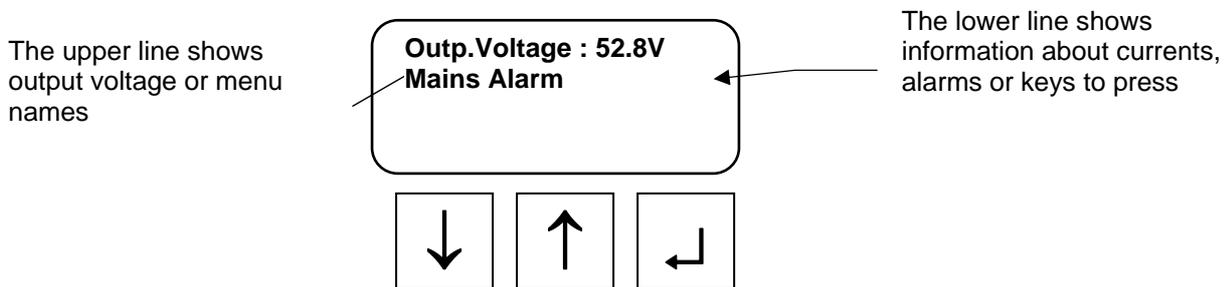
The keypad on the front panel of the alarm module enables easy operation and retrieval of information.

This chapter describes the menus accessed from the front panel of the Flatpack MCU.

Additional menus and service-related information are accessed by connecting a PC to the front panel of the Monitoring & Control Unit. Please Refer to chapter 6 Operating From a Personal Computer

5.1.1 The front Display

The Flatpack MCU Alarm Module incorporates a dot matrix display (16x2) with background illumination.



The system display can be in either *status mode* or *menu mode*

5.1.2 Status Mode

When the keypad is not in operation, the display is in *Status Mode*. The following information is then scrolled through the display:

The upper line continuously displays the battery voltage.

The lower line continuously scrolls the following information:

- Battery Current
- Load Current
- Active alarms
- Other messages

5.1.3 Menu Mode

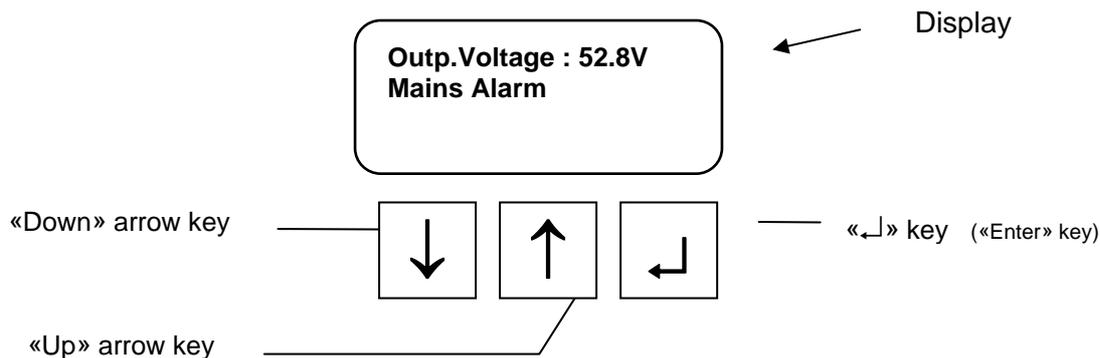
When the keypad is in operation, the system display switches to *Menu Mode* and the following information is scrolled through the display:

- The upper line shows the name of the active menu or sub-menu.
- The lower line indicates which key to press.

If the keypad is not used for 30 seconds, the display will switch from *Menu Mode* to *Status Mode*.

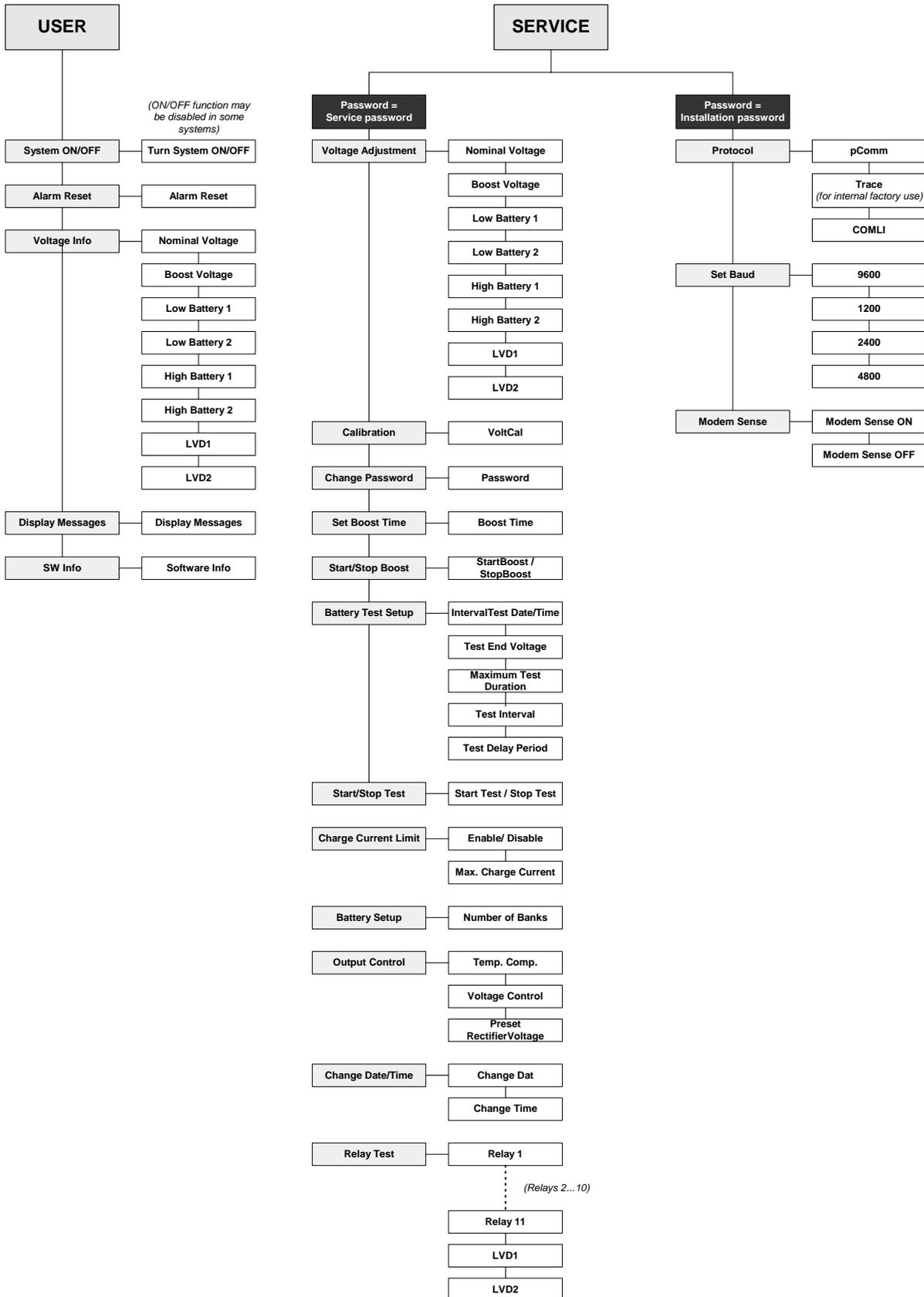
5.2 Control Keys

Operation from the *Alarm Module*'s keypad is based on first using the arrow keys to find and highlight the actual menu option on the display and then selecting the option or parameter by pressing the « \downarrow » key.



5.2.1 Hierarchy of Menus

Most menus in Flatpack MCU can be accessed when the Rectifier system is operated from the keypad of Flatpack MCU. The hierarchy structure described in this chapter gives an overview of these menu options.



5.2.2 Menu Options

This chapter gives a short description of the menu options that can be accessed from the front keypad. The description includes an overview of the keys to press to select the actual option.

5.3 User Options and Service Options

By dividing the available menu options into two levels — *User Options* and *Service Options* — it is easier to operate the system. Special not so frequently used options—such as calibration and adjustments — are included in the *Service Options* sub-menus.

While the *User Options* menus are available to all users, the *Service Options* sub-menus are password-protected and only authorised personnel have access to them.



The *Service Options* password is factory-programmed to «0000». We strongly recommend that this password is changed as soon as the system is installed

To access the *User Options* or *Service Options* menus, press the following keys:

To select *User Options*

Key	Comments
	Select <i>Menu Mode</i>
	Select <i>User Options</i>

To select *Service Options*

Key	Comments
	Select <i>Menu Mode</i>
	Scroll to <i>Service Options</i>
	Select <i>Service Options</i>
 	Press Password (one digit)
	Select Password

5.3.1 Available User Options

The following *User Options* menus are available to all users via the Flatpack MCU front keypad:

- Switch the system ON / OFF (May be disabled)
- Reset alarms
- Display important system voltages
- Display alarm messages
- Display the system's software and version numbers

5.3.2 System ON / OFF

In order to switch the system ON — or OFF— press the following keys on the keypad (In MPSU systems or in systems without batteries, the ON/OFF function may have been disabled):

Switch the System ON/OFF	
Key	Comments
	Select Menu Mode
	Select <i>User Options</i>
	Select System ON/OFF
 	Select ON or OFF
	Activate the option

5.3.3 Resetting Alarms

All alarms in the system are — as default— automatically reset, when the cause of the alarm is removed. Nevertheless, Flatpack MCU enables you to reset all active alarms. Alarms still active after resetting will be reported again refer to chapter 6.4.1. *Alarm Setup/Display*
To reset fault alarms from the module's keypad, press the following keys:

Resetting Alarms	
Key	Comments
	Select Menu Mode
	Select <i>User Options</i>
	Scroll down to <i>Alarm Reset</i>
	Reset Alarms

5.3.4 Display Important System Voltages

The *User Option* “*VoltageInfo* “ displays the following system voltages:

NomVolt

Nominal output voltage

BoostVolt

Battery boost-charging voltage

LowBatt 1

Voltage limit for *Low Battery Alarm 1*

LowBatt 2

Voltage limit for *Low Battery Alarm 2*

HighBatt1

Voltage limit for *High Battery Alarm 1*

HighBatt 2

Voltage limit for *High Battery Alarm 2*

LVD 1

Voltage limit for *Low Voltage Disconnect unit 1*

LVD 2

Voltage limit for *Low Voltage Disconnect unit 2*

To display some of the mentioned voltages, press the following keys:

Display of System Voltages	
Key	Comments
	Select Menu Mode
	Select <i>User Options</i>
	Scroll down to <i>AlarmReset</i>
	Scroll down to <i>VoltageInfo</i>
	Select <i>VoltageInfo</i>
 	Scroll to display voltages

5.3.5 Display Alarm Messages

The Flatpack MCU stores all system events chronologically in a message buffer.

This menu option is used to browse through the buffer’s alarm messages. The messages are presented on the lower line of the display, one message at a time. The last message will be displayed first.

To display stored alarm messages, press the following keys:

Display of Alarm Messages	
Key	Comments
	Select Menu Mode
	Select <i>User Options</i>
	Scroll down to <i>AlarmReset</i>
	Scroll down to <i>VoltageInfo</i>
	Scroll down to <i>DisplayMessages</i>
	Select <i>VoltageInfo</i>
 	Scroll through the alarm messages

5.3.6 Display of System's Software Number

This menu option displays the software number and version installed.

The information is presented on the lower line of the display.

To check the software number or version installed, press the following keys:

Show Installed Software No.	
Key	Comments
	Select Menu Mode
	Select <i>User Options</i>
	Scroll down to <i>AlarmReset</i>
	Scroll down to <i>VoltageInfo</i>
	Scroll down to <i>DisplayMessages</i>
	Scroll down to <i>SwInfo</i>
	Select <i>SwInfo</i>

5.3.7 Available Service Options

Infrequently used special options, such as calibration and adjustments are classified under the *Service Options* sub-menus (password-protected access).

The following options are available:

- Adjustment of key system voltages
- Voltage calibration
- Change of *Service Options* password
- Setting of boost function duration
- Start or stop boost function
- Auto boost configuration
- Battery test setup
- Battery test start/stop
- Battery charge current limitation
- Battery setup
- Selection of type of output control
- Set date and time
- Test operation of alarm relays

5.3.8 Adjustment of Important System Voltages

The menu option *VoltAdjustment*, in *Service Options*, enables adjustment of the following system voltages:

- NomVolt***
Nominal output voltage
- BoostVolt***
Battery boost-charging voltage
- LowBatt 1***
Voltage limit for *Low Battery Alarm 1*
- LowBatt 2***
Voltage limit for *Low Battery Alarm 2*
- HighBatt 1***
Voltage limit for *High Battery Alarm 1*
- HighBatt 2***
Voltage limit for *High Battery Alarm 2*
- LVD 1***
Voltage limit for *disconnect unit 1*
- LVD 2***
Voltage limit for *disconnect unit 2*

Adjustment of System Voltages		
Key	Comments	
	Select Menu Mode	
	Scroll to <i>ServiceOptions</i>	
	Select <i>Service Options</i>	
		Scroll to the relevant password (one digit)
	Select Password	
	Select <i>VoltAdjustment</i>	
	Scroll to type of voltage to adjust	
	Select type of voltage to adjust	
		Adjust the voltage up or down
	Accept the adjusted voltage	

5.3.9 Output Voltage Calibration

This menu option, in the *Service Options* menus, enables calibration of the output voltage.

To calibrate the output voltage, browse to the *Calibration Menu*, measure the bus voltage for the system (refer to the Installation Guide), and key in the calibration value.

To calibrate the voltage, press the following keys:

Output Voltage Calibration	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
 	Scroll to the relevant password (one digit)
	Select Password
	Scroll down to <i>Calibration</i>
	Select <i>Calibration</i>
 	Calibrate the voltage (up or down)
	Accept the adjusted voltage

5.3.10 Change of *Service Options* Password

The access password to *Service Options* menus may be changed by using this menu option.



The Service Options password is factory programmed to «0000». We strongly advise that this password is changed as soon as the system is installed.

The password must be a four digit format from «0000» to «9999» - otherwise access will be denied.

To change the access password to *Service Options* menus, press the following keys:

Change <i>Service Options</i> password	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
 	Scroll to the relevant password (one digit)
	Select Password
	Scroll down to <i>Calibration</i>
	Scroll down to <i>ChangePassword</i>
	Select <i>ChangePassword</i>
 	Scroll to a new password (up or down)
	Accept the new password

5.3.11 Changing Boost-Charging Duration

This menu option, in the *Service Options* menus, enables adjustment of the boost charging time of the batteries.

To program the batteries speed-charging duration — in minutes — press the following keys:

Changing Boost Charging Duration	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	Scroll to the relevant password (one digit)
	Select Password
	Scroll down to <i>Calibration</i>
	Scroll down to <i>ChangePassword</i>
	Scroll down to <i>SetBoostTime</i>
	Select <i>SetBoostTime</i>
	Change the No. of minutes (up or down)
	Accept the new boost duration time

5.3.12 Start or Stop Boost Charging

This menu option, in the *Service Options* menus, enables manual start or stop boost charging of batteries.

Check that boost time and voltage are configured with the correct values.

To start or stop the boost charging of batteries, press the following keys:

Start / Stop boost charging	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	Scroll to the relevant password (one digit)
	Select Password
	Scroll down to <i>Calibration</i>
	Scroll down to <i>ChangePassword</i>
	Scroll down to <i>SetBoostTime</i>
	Select <i>Start / StopBoost</i>
	Starts or stops charging
	Scrolls back to <i>Start/StopBoost</i>

5.3.13 Auto boost configuration

From auto boost configuration menu the operator can set the following auto boost parameters

Enable/Disable autoboot: Autoboot will only start if this option is enabled

Auto boost threshold: The auto boost will only start if the discharge of the batteries (Ah) during mains failure or battery test has been larger than this value. The auto boost threshold can be set from 0Ah to 1000 Ah. If the threshold is set to 0, no boost will start.

In the LCD display, the message "AUTO BOOST" will tell the user that auto boost is in progress.

Auto boost configuration	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	 Scroll down and select <i>Auto Boost Conf.</i>
	Select Enable/Disable
	 Scroll and select Enable/Disable
	Scroll down to AutoBoostThreshold
	 Scroll and select the Auto boost threshold

5.3.14 Battery Test Setup

A battery test can be run to verify the quality of the batteries. In this menu option the criteria for battery test can be configured.

The following options are possible using the *Battery Test Setup*

Interval test Date/Time: Start time for interval battery test (YYMMDD HHMM)

Test end voltage: When the system voltage reaches this level the test will be terminated (V/cell)

Max test duration: Maximum duration for the battery test (min)

Test interval: The period between interval tests

Test delay: Minimum time between a test/mains fail and the next interval test

In the LCD display, the message “Battery test” will tell the user that a battery test is in progress.

Battery test setup	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	 Scroll down and select <i>Batt test setup</i>
	Select <i>IntervalTest Date/Time</i>
	 Scroll and set the Interval Test Date
	Scroll down to <i>Interval Test Time</i>
	 Scroll and set the Interval Test Time
	 Scroll down and select <i>End Volt</i>
	 Scroll and set the End Volt
	 Scroll down and select <i>MaxTestDuration</i>
	 Scroll and set the Max Test Duration
	 Scroll down and select <i>Test interval</i>
	 Scroll and set the Test interval
	 Scroll down and select <i>Test delay</i>
	 Scroll and set the Test delay

5.3.15 Battery Test Start/stop

Having defined the test parameters in the *Battery Test Setup* menu the following procedure is used to initiate a test.

The test may be manually stopped at any time

Battery test start/stop	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	 Scroll down and select <i>Start/Stop Test</i>
	Scroll to chose start test or stop test
	Select to start or stop test

5.3.16 Battery Charge current limitation

In this menu the following parameters can be set:

Enable/Disable charge current limitation: The battery charge current will be limited if this function is enabled.

Maximum charge current: The output voltage is controlled in order to keep the current below this limit. Temperature or regulated voltage mode must have been chosen for this function to work.

Battery Charge Current Limitation	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	 Scroll down and select <i>Charge Curr Lim</i>
	Select <i>Enable/Disable</i>
	 Scroll and select to Enable/Disable battery charge current limitation
	Scroll down to <i>MaxChargeCurr</i>
	 Scroll and select the Maximum charge current

5.3.17 Battery Setup

This menu option allows the user to define the number of battery modules (battery banks) in the system.

Battery setup	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	 Scroll down and select <i>Battery setup</i>
	Select <i>NumOfBanks</i>
	 Scroll and set the number of battery banks in the system

5.3.18 Selection of Type of Output Voltage Control

This menu option, in the *Service Options* menus, enables selection of the type of control on the output voltage.

The output voltage can be controlled in three different ways:

Preset Rect. Volt

The output voltage is not controlled by the Flatpack MCU, but by the rectifier module — factory preset (refer to the rectifier manual).

Temp.Comp.

The output voltage is temperature- compensated (as a function of temperature and type of batteries).

Voltage Control

The output voltage is controlled by the alarm module.

To choose the type of output voltage control, press the following keys:

Select Type of Output Voltage Control	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	Scroll down to <i>Calibration</i>
	Scroll down to <i>ChangePassword</i>
	Scroll down to <i>SetBoostTime</i>
	Select <i>Start/StopBoost</i>
	Scroll down to <i>Output Control</i>
	Select <i>Output Control</i>
	 Scroll to the required type of control
	Select control type

5.3.19 Change date and time

This menu option, in the *Service Options* menus, allows the date and time in Flatpack MCU to be changed.

The Date and time are used for different purposes:

Alarm /Message Log

Indicates when an alarm or event occurred in the system.

Automatic Battery Test

A battery test can be set to automatically start at any given date and time. Further tests can be scheduled in intervals after the first test.

Modem Callback

The system can be set to initiate calls via a modem for remote communication at any given date and time. Further calls can be scheduled in intervals after the first test.

Note: Version 10 and above MCU controllers incorporate a battery-backed real time clock (RTC). Previous MCU hardware versions without an RTC will not maintain the time setting after power is lost to the controller, and will need to be reset after a loss of DC power and/or after removal from the system.

Change date and Time	
Key	Comments
	Select <i>Menu Mode</i>
	 Scroll down to and select <i>ServiceOption</i>
	 Scroll to and select <i>Password</i>
	 Scroll to and select correct password
	 Scroll to and select <i>Change Date/Time</i>
	Select <i>Date</i>
	 Scroll to and select correct year
	 Scroll to and select correct month
	 Scroll to and select correct day
	 Scroll to and select <i>Time</i>
	 Scroll to and select hour
	 Scroll to and select minutes

5.3.20 Test Operation of Alarm Relays

This facility is provided to test external equipment connected to the system's alarm relay outputs, it is used to operate the alarm relays and, if necessary the *Low Voltage Disconnect* contactors (LVD1, LVD2, LVD3).

Note that testing the LVD contactor(s) will disconnect either the batteries or the non-priority load(s), depending on the type LVD tested. The rectifiers must be installed and switched ON, in order to operate the LVD contactors.

On exiting the *RelayTest* menu option, the Flatpack MCU will automatically reset the relays to their normal position.

To test-operate the relays, press the following keys:

Test Operation of Alarm Relays	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password
	Scroll down to <i>Calibration</i>
	Scroll down to <i>ChangePassword</i>
	Scroll down to <i>SetBoostTime</i>
	Select <i>Start/StopBoost</i>
	Scroll down to <i>Output Control</i>
	Scroll down to <i>RelayTest</i>
	Select <i>RelayTest</i>
	 Scroll to the relay to be tested
	Activate or de-activate (toggle) the relay

5.3.21 Available Communication Options

The following options are available (Installation password – protected)

5.3.22 Adjustment of Communication Protocol

Options:

Pcomm: for Winpower Silver, WebPower and modem communication

Comli: Comli protocol

Trace: VT-100 protocol for internal hardware testing

Adjustment of Comm protocol	
Key	Comments

Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	Scroll to the relevant password (one digit)
	Select Password (installation password)
	Scroll to Comm. protocol
	Select Comm protocol

5.3.23 Baud rate adjustment

Options:

- 1200
- 2400
- 4800
- 9600

Adjustment of Baud Rate	
Key	Comments

Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	Scroll to the relevant password (one digit)
	Select Password (installation password)
	Select protocol
	Scroll to select baud rate
	Select baud rate

5.3.24 Modem Sense Selection

Options:

-Modem Sense ON

-Modem Sense OFF

If the Modem Sense is set to OFF, the DTR line will be ignored.

This can be chosen when the Flatpack MCU is connected directly to a PC (Winpower Silver/Comli equipment)

To be able to use a modem with the Flatpack MCU the modem sense **must** be **ON**

In order to use certain other devices with the Flatpack MCU, modem sense must be OFF (example, Eltek's WebPower adapter).

If not using a modem with Flatpack MCU, it is recommended that modem sense be set to OFF.

Adjustment of the Modem Sense	
Key	Comments
	Select Menu Mode
	Scroll to <i>ServiceOptions</i>
	Select <i>Service Options</i>
	 Scroll to the relevant password (one digit)
	Select Password (installation password)
	Select protocol
	Select baud rate
	 Adjust the modem sense
	Accept modem sense

6 Operating From a Personal Computer

The rectifier system can either be operated from the Flatpack MCU— by means of the keypad on its front panel— or from a standard personal computer.

Operation from the front keypads enables control of important system functions and parameters, the use of a personal computer allows access to additional menus and service-related information

Note that Administrator login / access is required to install applications on some operating systems (Windows NT and Windows 2000).

6.1 Installation of Winpower software

Note that administrative login / permissions may be required when installing software on Windows NT, 2000 and XP.

The WinPower communication program must be installed on your personal computer. WinPower is available on standard CD-ROM media (floppy disk by request). Insert the CD-ROM in the CD-ROM drive (or installation Disk #1 in the floppy drive) and start “setup.exe”. Note that on PCs with autorun enabled, the setup program will launch upon installation of the CD-ROM in the drive. The installation program will guide you through a complete WinPower installation.

6.2 Installation of the PC and the Modem

The rectifier system can be operated from a personal computer by either using an RS232C serial cable to connect the two— in a local installation setup —, or by using modems and standard telephone lines— in a remote installation setup.

6.2.1 Local Installation

The local installation setup is used when the Rectifier system is located in the vicinity of a PC and they are less than 15m apart. The only link is an RS232C serial cable.



Figure 6-a Local Installation Setup – Rectifier connected to a PC

The Rectifier system can be installed in a technical room, while the PC may be located in the control room.

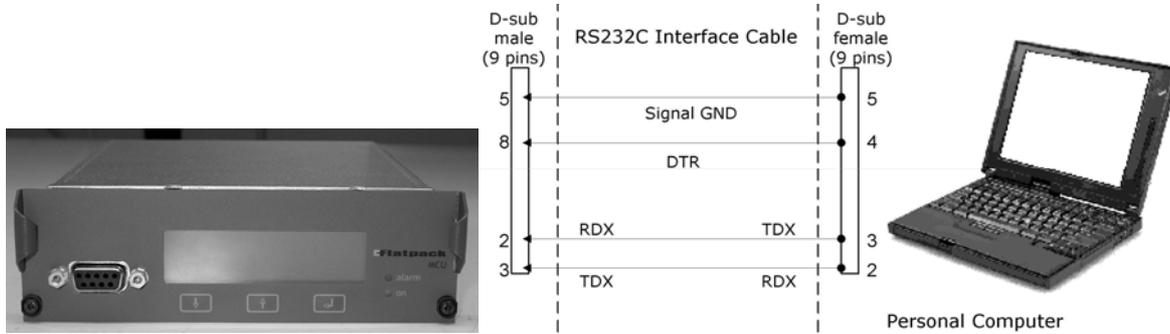
The Rectifier system can then be monitored and controlled from the PC.

6.2.2 RS232C Cable pinouts – Local Connection

6.2.2.1 Two 9-pin D-sub contacts

A standard serial cable (without DTR connection) can be used for PC communication, in which case the Flatpack MCU must be suitably configured (ref. chapter 5.3.24).

The serial cable in this figure can be used on PC's with 9-pin D-sub male plugs. The serial cable is connected to the 9-pin D-sub female plug on the Flatpack MCU and to one of the PC's serial ports (COMx).



RS232C serial cable with 9-pin D – sub plug on the PC side

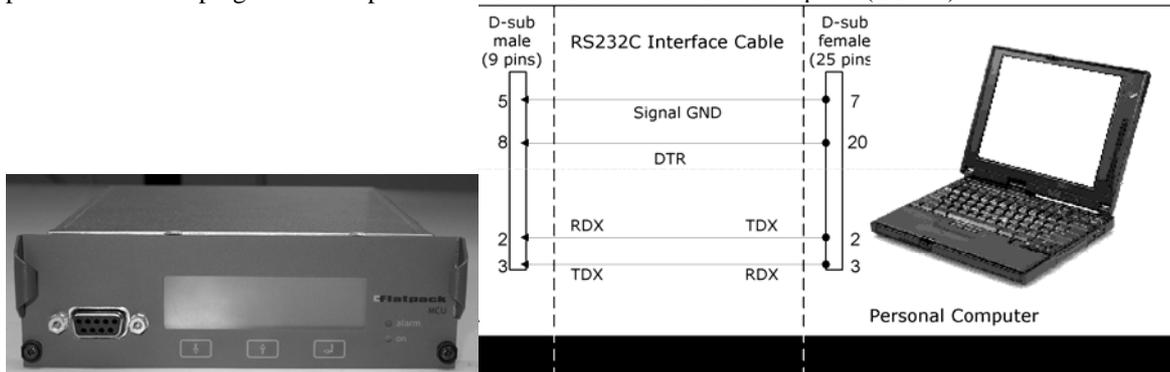


Note: the “TDX” signal (pin 3) from the Flatpack MCU should be connected to the “RDX” signal (pin 2) on the PC or modem

6.2.2.2 9 and 25-pin D-sub plugs

A standard serial cable (without DTR connection) can be used for PC communication, in which case the Flatpack MCU must be suitably configured (ref. chapter 5.3.24).

The serial cable in figure 5-c can be used on PCs with 25-pin D-sub male plugs. The serial cable is connected to the 9-pin D-sub female plug on the Flatpack MCU and to one of the PC's serial ports (COMx).



RS 232C serial cable with 25 pins D – sub plug on the PC side



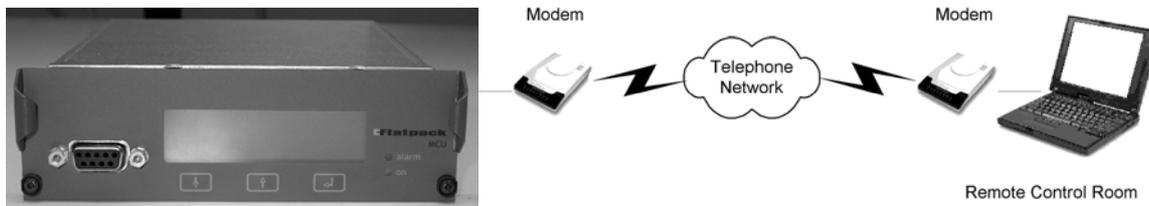
RS232C serial cables can be supplied by Eltek Energy.

6.2.3 Remote Installation

The remote installation setup is used when the Rectifier system and the PC are located at a distance from each other, in different buildings or areas.

The communication link is achieved via two modems and the public switched telephone network (PSTN).

The connection between the Rectifier system modem, and the PC modem is accomplished by means of RS232C serial cables.



Typical remote installation setup –A rectifier system connected to a PC, via modems and telephone lines



Two compatible HAYES intelligent modems — with MNP5 fault correction and data compression facilities - are necessary for communication via the standard telephone network



When using a modem:

Access to an AC mains wall outlet supply may be necessary to connect the modem to the PC. The modem connected to the Flatpack MCU is normally fed from the DC-bus.

Only true analog modems are supported (switchboard and other digital / PBX connections are not supported).



Equipment communicating via an RS232C link must be configured with the same communication parameters:

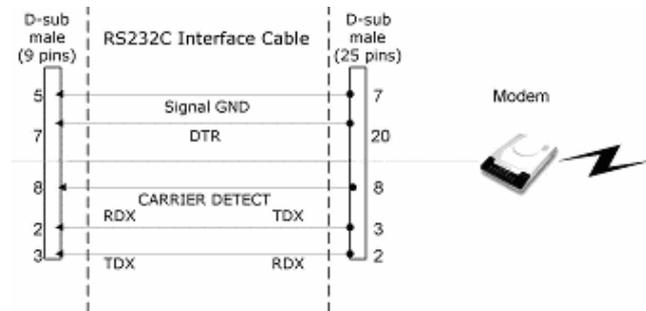
Baud rate can be “1200”, “2400”, “4800” or “9600” baud, as well as an “8” bits word length, parity “none” and “1” stop bit.

6.2.4 RS-232 Cable pinouts – Remote Connection

6.2.4.1 Cable from Flatpack MCU to Modem

The serial cable connecting the MCU to the modem may be either a 9 pin connection or 25 pin connection at the modem depending on the modem type.

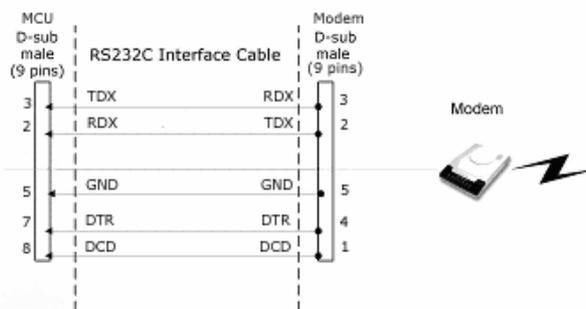
The serial cable in the drawing below is connected to the 9-pin D-sub male plug on Flatpack MCU and to the 25-pin D-sub male plug on the modem's port.



RS232C serial cable with 25- pin D – sub plug on the modem side.

- ✓ **Note: the “TDX” signal (pin 3) from the alarm module is connected to the “RDX” signal (pin 2) on the PC or modem**
- ✓ **The RS232C serial cable can be supplied by Eltek Energy (6x0.22 mm², length 200 cm, part. no. 30615 for 25 pin modem) «Earth» is connected to the cabinet's chassis**

Where the modem has 9 pin connection the following drawing applies.



6.2.4.2 Cable from modem to PC

A standard RS232C serial cable is used when connecting a PC to a modem. The cable should have a 25-pin D-sub male plug on the modem side, and a 9 or 25 pins D-sub female plug on the side of the PC.

- ✓ **A standard type RS232C serial cable can be supplied by Eltek Energy**

- Earth faults on the communication equipment must be rectified prior to connection**

6.2.5 Modem Configuration

Both modems must be configured with specific communication parameters before they can be used. It is recommended that the local modem used for communication with the Flatpack MCU(s) be dedicated to this purpose and not shared for any other purpose.



Configuration of the remote modem (connected to the rectifier system's monitoring/control unit) is different to configuration of the local modem (connected to the PC).

6.2.5.1 Setting up the *PRS* (remote) modem

In order to configure the remote modem— to be connected to the Flatpack MCU Monitoring & Control Unit— connect the modem to a PC, with the appropriate terminal emulation programme, and use the keyboard to enter the following communication parameters:

AT&F	Enter	Load Factory settings
AT&D	Enter	DTR option 0 (assumed ON and thus ignored)
AT&Q5	Enter	The modem will try to negotiate an error-connected link
AT\N3	Enter	Selects auto-reliable mode
ATS0=1	Enter	Answers after 1st ring
ATQ0	Enter	Enables result codes
ATV0	Enter	Numerical result codes
ATE0	Enter	Disables command echo
AT&W	Enter	Stores the current configuration

6.2.5.2 Setting up the *PC* (local) modem

In order to configure the local modem— to be connected to the PC— connect the modem to a PC, with the appropriate terminal emulation programme, and use the keyboard to enter the following communication parameters:

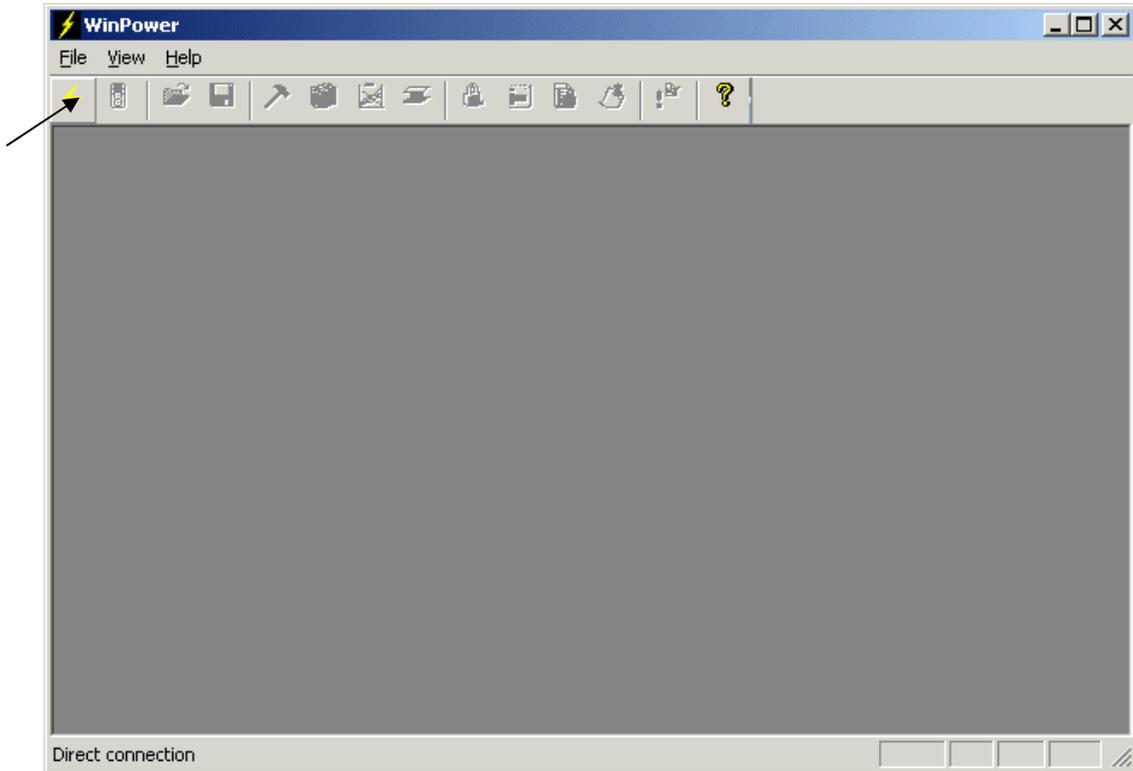
AT&F	Enter	Factory settings
AT&S	Enter	DSR will remain ON at all times
AT\N3	Enter	Selects auto-reliable mode
AT&W	Enter	Stores the current configuration

Note that it may be necessary to force the local and remote modems to connect at the same data rate, i.e. 9600. Consult the user manual provided with the modem to determine the correct AT command(s). These commands may also be entered from within WinPower (see Section 6.9.6, Modem Callback) for the remote modem.

6.3 Login to Winpower

To login, first establish the communication link between your PC and the Flatpack MCU alarm module.

Start Winpower and click on the “lightning bolt” connection icon to open the Site Manager.

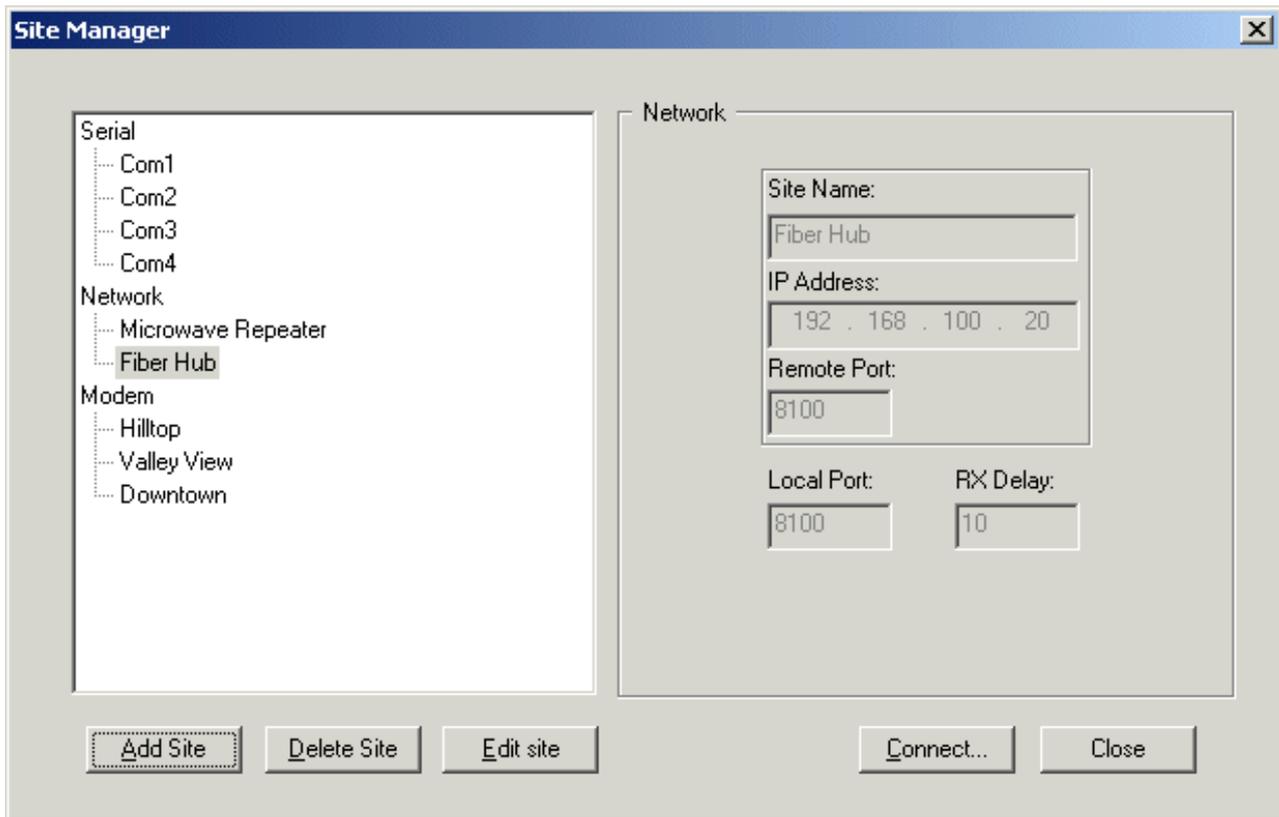


Connection Icon -->



The Site Manager will then open, allowing selection of connection type and a method to choose between local system and/or remote sites.

6.4 Using Site Manager



The above screen image shows the Site Manager window after the addition of Network and Modem sites. A new Flatpack MCU will not contain site entries under the *Network* or *Modem* categories, until the user adds these entries.

Serial is a serial cable connection, which connects the specified PC serial port and the Flatpack MCU in a local installation setup. Site entries are not applicable to direct serial connections. Reference Section 6.2.2

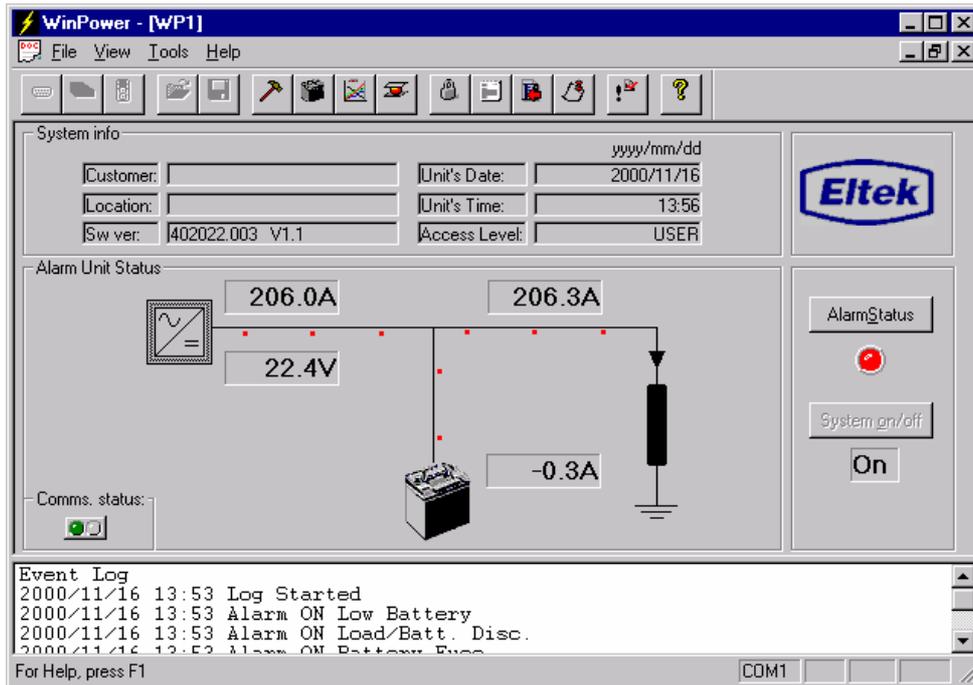
Network is a TCP/IP connection between the PC and Flatpack MCU via an optional serial to Ethernet adapter. Site entries under this category will connect using the network interface in the PC, to the remote sites equipped with an optional serial to Ethernet adapter.

Note that it is not necessary or possible to connect to Eltek's WebPower adapter via WinPower (the serial to Ethernet Network adapter is a separate solution than WebPower).

Modem refers to a connection to a Flatpack MCU, at a given remote site, to the PC. Reference Section 6.2.3. Site entries under this category will connect using a modem connected to and installed on the PC, to the remote sites equipped with a modem connected to the Flatpack MCU.

Select the appropriate serial port, if connecting directly. In this case it is not necessary to create a "site" entry. If connecting via either remote method (Network or Modem), a site must be created before connecting. To create a site, click the Add Site button and complete the required information fields in the Site Manager window. Select the desired site name from the menu, and then double-click the highlighted name, or click the **Connect** button. The initial screen interface will then be displayed.

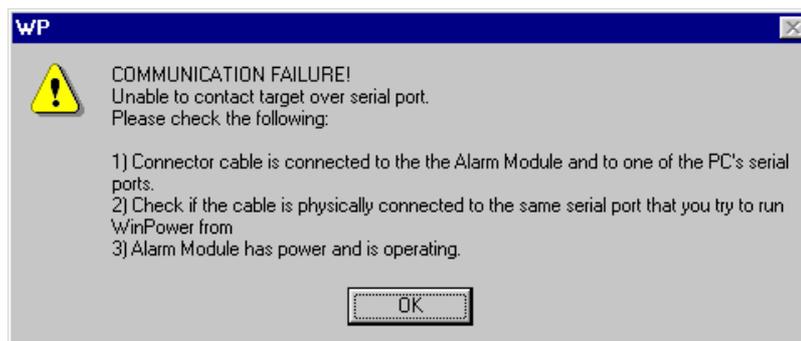
6.5 Description of the Screen Interface



After establishing the communication link between your PC and the rectifier system, the Flatpack MCU microprocessor will take control of the PC screen. Operation of the rectifier system from a PC is based on pre-programmed menus accessed from the main menu. The main menu and each function key are described in detail in the chapter 6.6 Main Menu

The screen interface includes the following information:

- **System Info:**
 - Customer:** customer's name
 - Location:** customer's location
 - Sw ver:** software part no. and version no.
 - Unit's Date:** current date yyyy/mm/dd
 - Unit's Time:** digital clock
 - Access Level:** USER or SERVICE
- **Alarm Unit Status** shows the system status, in ampere and volts, for the rectifier, batteries and load.
- **Comms. status** displays green alternating lights when the system is functioning without fault. The lights will stop flashing when the system malfunctions and the following message will be displayed:



- **AlarmStatus** shows a red light when an alarm is active. A green light will show when all alarms are inactive.
- **System On/Off** displays the ON/OFF-status of the system. Access to **System On/Off** is only possible when in **SERVICE** mode and may be disabled in some software versions.
- **Event Log** - System events are displayed in chronological order. The date, time and a description of each event is shown. Note that the Event Log is for informational purposes only; while the Alarm Log is provided for alarm recording.
- **COM1**, at the bottom of the screen, indicates the selected communication port.

6.6 Main Menu

The *Main Menu* has two access levels:

- *User*
- *Service*

Access Level: USER sub-menus are available to all users, while **Access Level: SERVICE** sub-menus are password-protected and accessed only by authorized personnel. The menu options are protected by the user access password, required on initial system access.

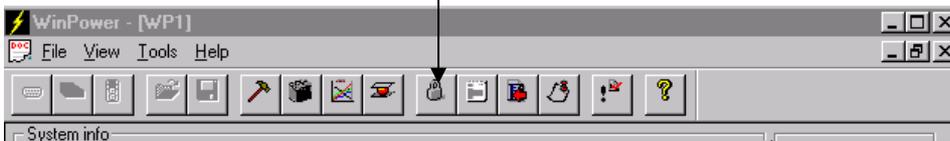
Access rights to USER level of operation are limited to read-only system data. This level is available to all users, provided they have the USER password.

Access rights to SERVICE level enables editing of information in the General Configuration, Battery Configuration and Calibration Settings menus. This level is only available to authorized personnel.

Access rights to INSTALLATION level enables editing of information in the Installation Settings menu. This level is only available to authorized personnel.

To gain access to **SERVICE** level:

- Select "Password"



- Enter your password (factory-programmed to «service»)
- Press Enter ↵ or **Login**



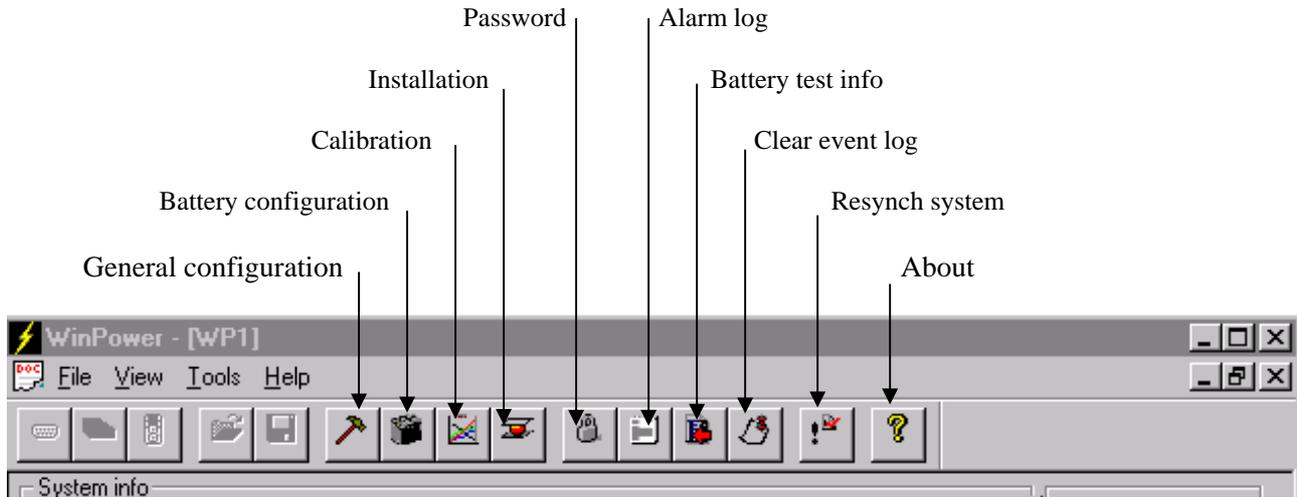
For security reasons, we strongly advise you to change factory-programmed passwords as soon as the system is installed

6 Operating From a Personal Computer

Personnel with **USER** access are only able to monitor the system.

Authorized personnel with **SERVICE** access are able to monitor and control the system.

Authorized personnel with **INSTALLATION** access are able to monitor and control the system, as well as setting system specific parameters in the **INSTALLATION** menu.



- **General Configuration**

<i>Set Levels</i>	Sets alarm and security limits
<i>Alarm Setup/Display</i>	Configuration of the alarm relays
<i>Configurable Inputs</i>	Configure digital inputs
<i>Set Time</i>	Sets date and time
<i>Site Info</i>	Specific site-related information
<i>Modem Callback</i>	Configuration of modem callback
<i>Relay Test</i>	Tests the alarm relays

- **Battery Configuration**

<i>Batt. Test Setup</i>	Manual battery test and test setup
<i>Auto Boost</i>	Automatic boost charging
<i>Manual Boost</i>	Manual boost charging
<i>Battery Type</i>	Type of battery
<i>Current limit Cfg</i>	Charge current limitation
<i>Output Control</i>	Select type of output voltage control
<i>Batt. Setup User Def.</i>	Battery definition and configuration
<i>Symmetry measurement Cfg</i>	Configure the symmetry measurements

- **Calibration Settings**

<i>Temperature</i>	Calibration of temperature measurement
<i>Rectifier current</i>	Calibrating rectifier current measurement
<i>Output voltage</i>	Output voltage calibration
<i>Battery current</i>	Calibrating battery current measurement
<i>Symmetry Voltage</i>	Calibration of the voltage for symmetry measurement

- **Installation Settings**

<i>System Config.</i>	Configuration of system-specific settings
-----------------------	---

- **Password**

SERVICE password

- **Alarm Log**

Log of alarms and events with date and time

- **Battery Test Info.**

Results from the two latest battery tests and the date for the next scheduled test

- **Clear Event Log**

Clears the log of events on the screen interface

- **Resynch system**

Updates specific data from MCU to WinPower

- **About**

Shows information about WinPower

6.7 Other Main Menu options

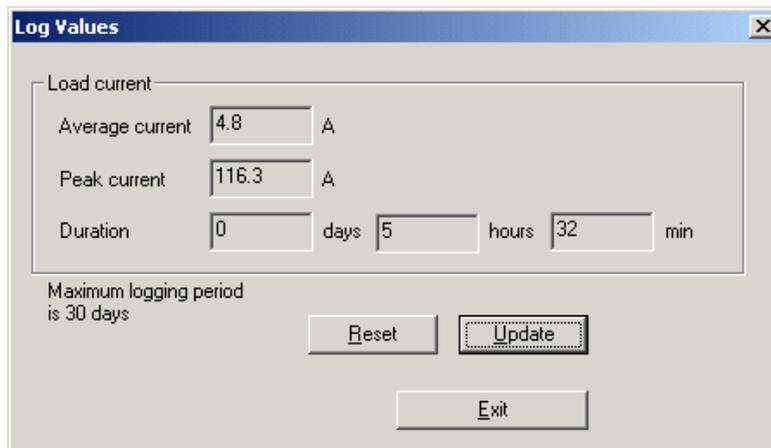
6.7.1 Log Values dialog

To open the *Log Values* dialog, select *Log Values* on the *View* menu.



The following information will be displayed

- Average current; the average load current over a period of time defined by the *Duration*.
- Peak Current; the peak load current over the same period of time
- Duration; the logging period.
- Reset; Pressing the reset button will reset the logging values
- Update; Pressing the update button will send a request to the MCU to update the data



Average current

The average load current is updated every minute. Maximum logging period is 30 days. When this limit is reached, the average current calculations will continue. Number of measurements will be fixed at 30 days, shifting out the oldest values as new ones are added.

Peak current

Every minute, the peak value and the load current are compared. If the load current is higher than the peak current the peak current is updated to the latest value of the load current.

Duration

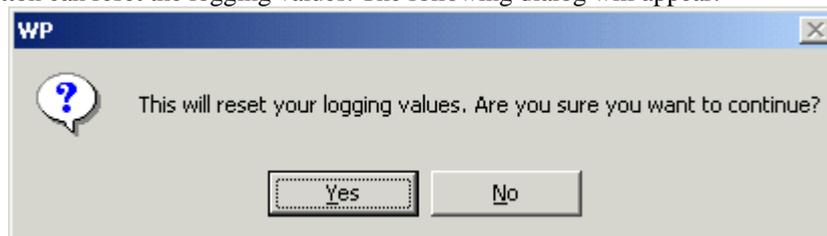
The duration is updated every minute. Duration is presented as days, hours and minutes. Maximum logging period is 30 days. When this limit is reached, the average and peak current calculations will continue, but number of measurements in the calculation will be kept to the last 30 days, shifting out the oldest measuring values as new ones are added.

Update values

When the *Log Value* dialog is opened, a *Log Value request* will be sent to the MCU to get the latest values. There is no automatically update of the values when the window has been opened. To update the values again, the user has to press *Update*.

Reset

Pressing the reset button can reset the logging values. The following dialog will appear:

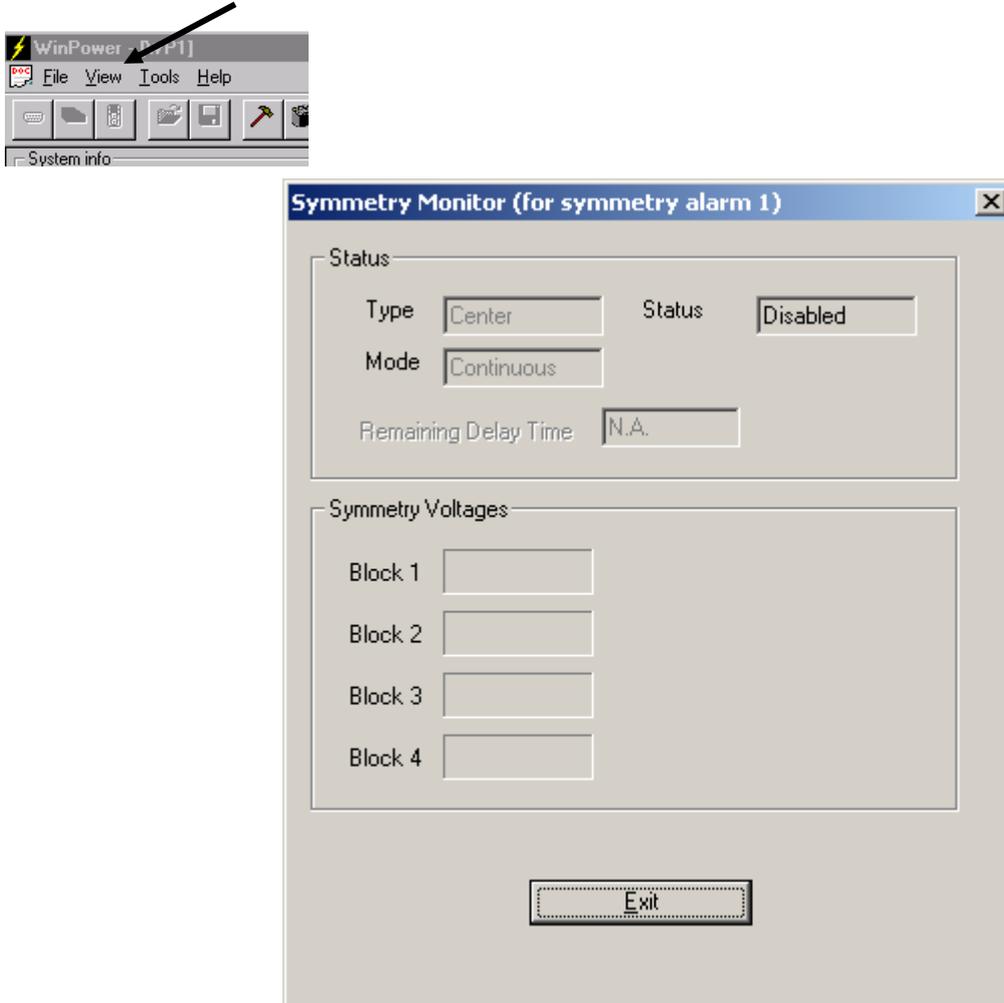


6 Operating From a Personal Computer

If the user selects “Yes” the values will be reset. The duration will be set to 0, while the average and peak current will be set to the value of the load current at the time of the reset. After a *Reset* has been sent to the MCU, the values will be updated automatically.

6.7.2 Symmetry Monitor

To open the *Symmetry Monitor*, select Symmetry Monitor on the *View* menu.



The Symmetry Monitor is an auto-updating window that shows you the current symmetry voltages, Type, Status, Mode and Remaining delay time. (Symmetry is disabled in the picture above)

6.8 Alarm Status Screen

Clicking the Alarm Status button (above the colored indicator on the main screen) will open a window that displays a summary of alarms and their current states. Colored indicators are used to denote alarm states: GREEN for Normal (non-alarm state) and RED for Fault (alarm state). See image below.



Available options are:

OK – Close the Alarm Status window

Reset Alarms – Cycles and resynchronizes the alarm relay states. Active alarm relays are forced to non-alarm condition. If the alarm still exists, these relays will again enter alarm condition after a short delay.

6.8.1 Alarms Requiring Manual Resetting

These alarms require manual reset in order to preserve the alarm notification, if the alarm state subsequently clears. For example, a Battery Symmetry alarm is triggered when the battery midpoint voltage exceeds a predetermined setpoint. It is possible that the battery has experienced a momentary internal fault, which has caused this alarm to be reported. In order to notify the site management personnel that this momentary event has occurred, the alarm is latched and requires manual intervention to reset. Note that all alarm events, whether automatically or manually reset, are reported to the Flatpack MCU alarm history log.

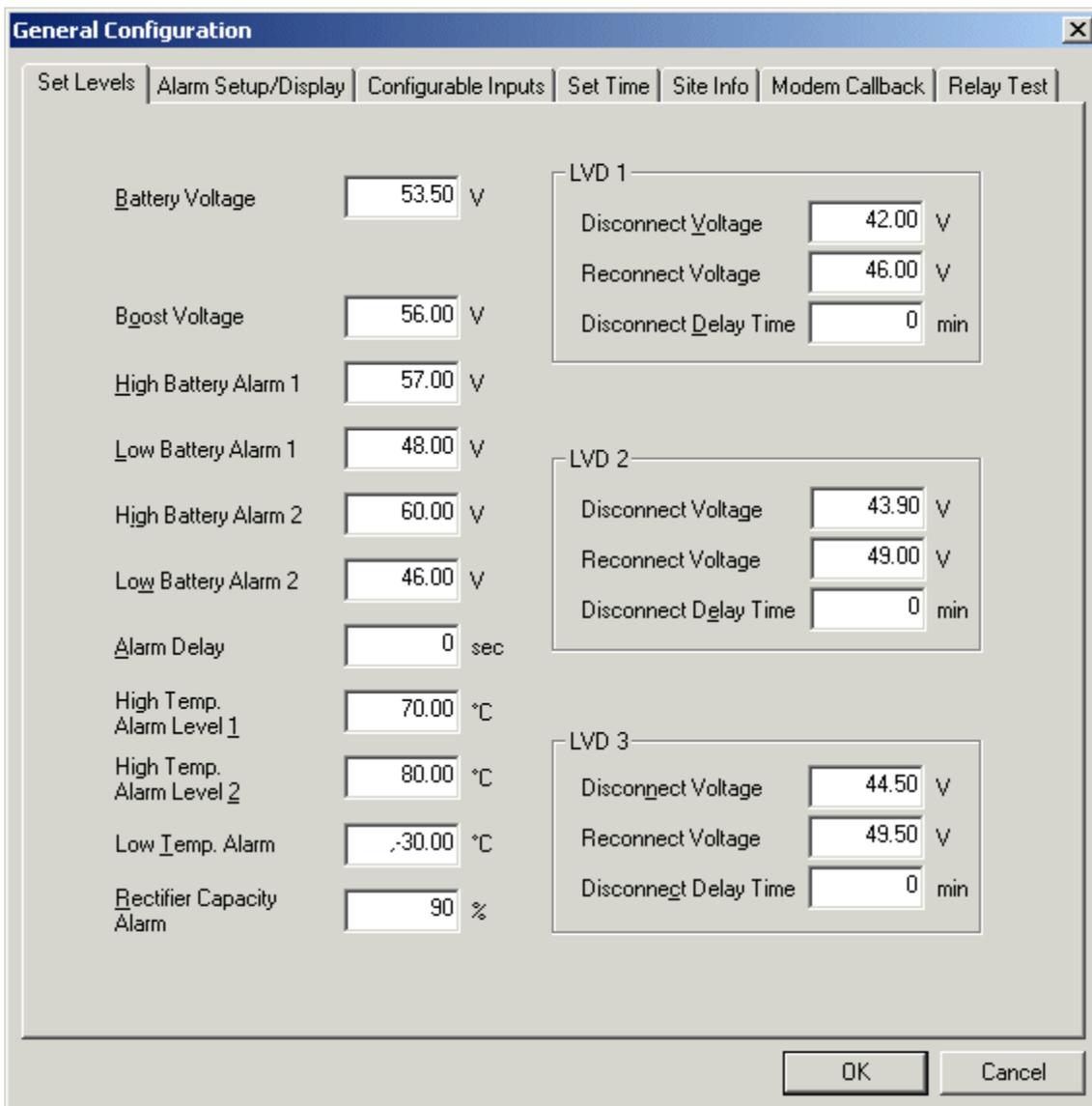
- Battery Pre-Alarm
- Battery Fault
- Symmetry 1

6.9 General Configuration



6.9.1 Set Levels - Setting alarm limits

This menu option is used to set alarm limits and other system parameters.



The following parameters can be set/changed:

- **High Battery Alarm (volts)**
- **Low Battery Alarm (volts)**

- **LVD1 / LVD 2 / LVD3 Disconnect Voltage, (Volts)**

Voltage limit for disconnection of load **or** battery. The disconnect unit (contactor) will open at this voltage, and may be interdependent on if the mains voltage is present (see Installation Settings)). This output must be hardwired in the system for battery (LVBD) or load (LVLD) disconnect.

- **LVD1 / LVD 2 / LVD3 Disconnect Delay Time (minutes)**

Default = 0 minutes

Application: Disconnection of loads (LVLD) at a predetermined time after the mains voltage is cut off. If the mains supply voltage is interrupted, an internal timer (minute counter) starts to count down from the pre-set time value. When the timer reaches zero, the load (**or** the battery, depending on how the system is configured) will be disconnected. If the mains returns before the timer reaches zero, the LVLD will **not** disconnect and the timer will count upwards to the pre-set time. If the mains is lost again while counting upwards and the battery voltage is still above low voltage disconnect (LVD), the timer will change direction and count downward. If the battery voltage falls below the LVD level before the counter = 0, then LVLD will be activated to prevent battery damage due to overdischarge. The *Disconnect Delay Timer* is deactivated when set to 0.

Note: If the “Mains Dependant” checkbox is cleared (see Installation Settings), the Disconnect Delay is disabled.

- **Battery Voltage (Volts)**

The alarm module will regulate the battery voltage to the specified value, if *Output Control* is selected (see chapter *Output Control*) If the resistance of the battery cable is set to zero, the battery and the output voltages will be equal.

- **Boost Voltage (Volts)**

Voltage level for boost charging. For more information on how to start boost-charging, see chapters *Auto Boost* and *Manual Boost*.

- **Alarm Delay (seconds)**

The operator can define a delay for the mains alarm and low battery voltage alarm. The duration of the alarm delay can be set between 0 and 60 sec. Default setting is 0.

- **High Temp. (°C)**

Generates an alarm condition in case of high battery temperature. Two levels are provided, which may be configured for relay alarms and also to automatically disconnect the battery contactor, if desired. The alarm levels can be changed between 5 °C and 80 °C. Level 1 must be lower than Level 2. When the temperature exceeds Alarm Level 1, the alarm message "High Temp. Alarm 1" will be displayed. This alarm will automatically be reset when the temperature falls below the pre-set level. If the battery temperature exceeds Alarm Level 2, the alarm message "High Temp. Alarm 2" will be displayed. In order to cause a LVD (battery disconnect) on either temperature alarm, the appropriate LVD must appear in the alarm output configuration in the Alarm Setup/Display menu.

- **Low Temp Alarm (°C)**

Generates an alarm condition in case of low battery temperature. Alarm point is settable between –35°C and +20°C.

- **Rectifier Capacity Alarm (percent of capacity)**

This feature allows setting an alarm condition that is based on a percentage of the available rectifier output current. This can be used as a rectifier redundancy alarm or for any other situation where it is necessary to be notified when the system current exceeds a percentage of the charge current capability.

Notes:

If LVD3 is enabled config input 5 is dedicated to the LVD3 feedback (Ref. System Configuration.)

Hysteresis on *High Temperature 1* and *Low Temperature* alarms is 1°C; hysteresis on *High Temperature 2* is 2°C.

The temperature alarm-functions are available, and the setpoints are changeable, only when temperature-compensated charging is activated.

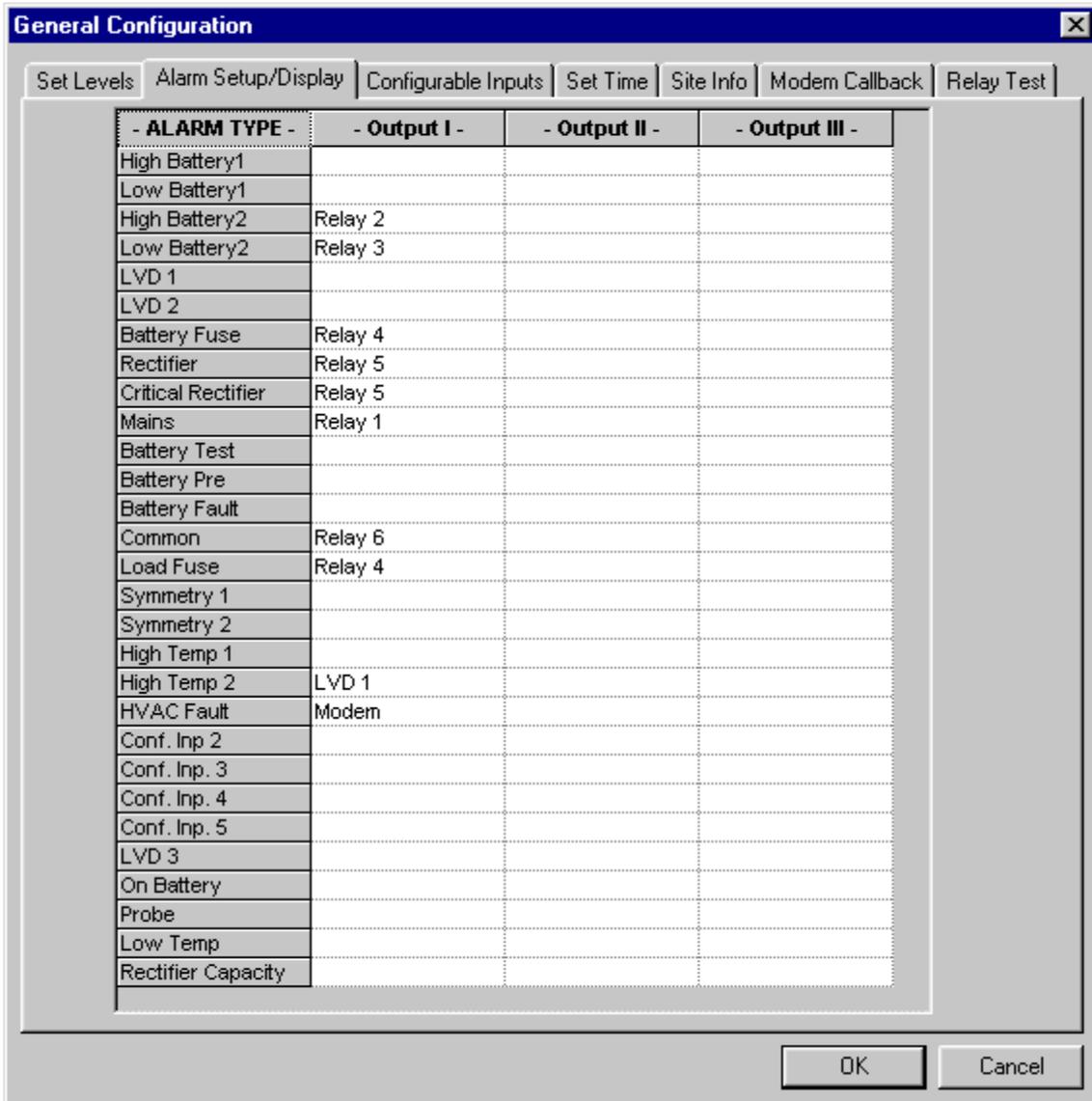
6.9.2 Alarm Setup/Display

This menu option illustrates, by means of a table, how the alarm relays are configured. Each system alarm or event may activate one, two or three relay outputs, an LVD, or affect the modem callback. Several alarms may also activate the same relay output, LVD, or be assigned to modem callback.

The current alarm relay configuration of your system will be displayed. All alarms in the system are, as default, automatically reset when the cause of the alarm is removed. The alarm module enables resetting of all active alarms, any alarms still active after resetting will again be reported.

To reset fault alarms from the PC:

- Select *Alarm Status* on the screen interface
- Reset the alarms from the *Alarm Status* displayed

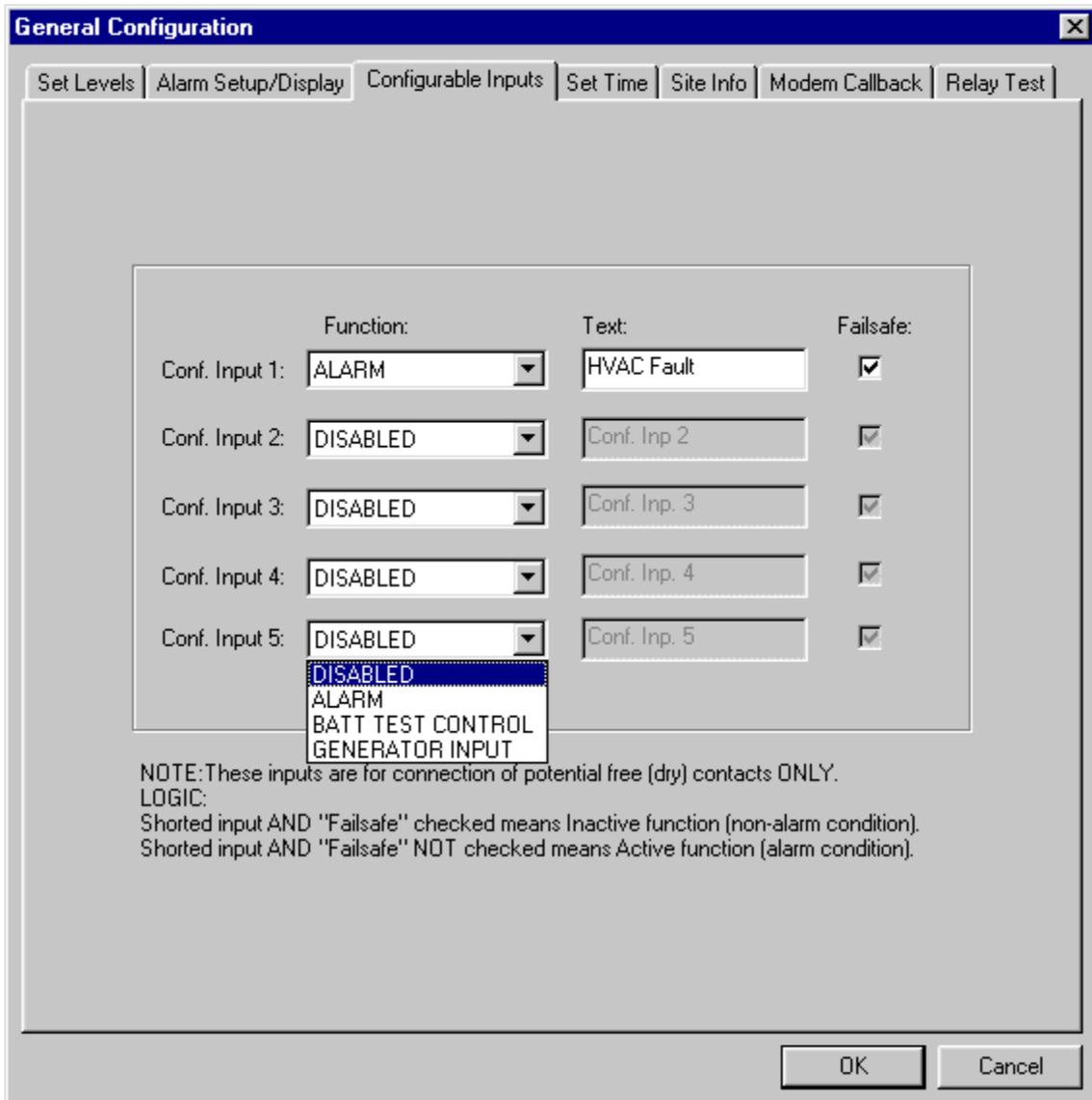


Notes:

In the above screen capture, Configurable Input 1 has been renamed “HVAC Fault” and is assigned to a modem. Also, High Temperature 2 is mapped to LVD1 and will disconnect this LVD contactor when the temperature limit is reached.

TYPE OF ALARM	RESETTING
High Battery1 / High Battery 2 This alarm is reported if the output voltage exceeds the applicable <i>High Voltage Limit</i>	Automatic reset (1 V hysteresis)
Low Battery1 / Low Battery 2 This alarm is reported if the output exceeds the applicable <i>Low Voltage Limit</i>	Automatic reset (1 V hysteresis)
LVD1 / LVD2 / LVD3 This alarm is reported if the load or batteries are disconnected by the MCU. LVD conditions are checked every second.	Automatic reset when contactor is reconnected
Battery Fuse This alarm is reported if any battery fuse or breaker has opened or tripped	Automatic reset
Rectifier This alarm is reported if one rectifier malfunctions. Alarm may be masked under Mains Fail condition, depending on Installation Settings.	Automatic reset
Critical Rectifier This alarm is reported if more than one rectifier malfunctions. Alarm may be masked under Mains Fail condition, depending on Installation Settings.	Automatic reset
Mains This alarm is reported if the mains supply fails	Automatic reset
Battery Test Battery test in progress	Manual reset
Battery Pre This alarm is reported if the result of a battery capacity test is less than 80 % (< 80 %) and higher than 75 % (> 75 %)	Manual reset
Battery Fault This alarm is reported if the result of a battery capacity test is less than 75 % (< 75 %)	Manual reset
Common This alarm is reported if one or more alarms are active and is indicated by the <i>Alarm</i> LED on the front panel of Flatpack MCU and by <i>Alarm ON (OFF)</i> on the status lines (except when battery test is in progress)	Automatic reset when no active alarms remain
Load Fuse This alarm is reported if any load fuse or breaker has opened or tripped	Automatic reset
Symmetry 1 This alarm is reported if there is a symmetry fault in any battery string monitored by the Flatpack MCU's internal symmetry monitoring circuits	Automatic reset
Symmetry 2 This alarm is reported if there is a fault reported by an external symmetry monitoring PCB.	Automatic reset
High Temp. 1 Only active if temperature compensated charging is active. Gives an alarm if the battery temperature is above temperature alarm level 1	Automatic reset
High Temp. 2 Only active if temperature compensated charging is active. Gives an alarm if the battery temperature is above temperature alarm level 2.	Automatic reset
On Battery Gives an alarm if the battery current is above 5 amperes for >10 seconds.	Automatic reset
Probe Gives an alarm if the temperature probe reading exceeds the range of -35°C to +100°C, indicating an open or shorted probe, respectively.	Automatic reset
Low Temp Only active if temperature compensated charging is active. Gives an alarm if the battery temperature is below the temperature alarm level.	Automatic reset
Rectifier Capacity Gives an alarm if the rectifier current is above the alarm threshold.	Automatic reset
Conf. Inp. 1 - Conf. Inp. 5 Refers to one of five configurable digital inputs, usable for monitoring external equipment. The name can be changed to reflect the usage of the input, for example "HVAC Fault" or "Open Door".	Automatic reset

6.9.3 Configurable Inputs



The Flatpack MCU incorporates 5 digital inputs, providing a means to monitor other on site equipment through the Flatpack MCU and WinPower interface.

In the above setup, two alarm inputs are configured for monitoring a generator set, and a burglar alarm. The texts are freely chosen and must be within 13 characters. These texts will appear both in the front panel display of the Flatpack MCU, as well as on the local/remote computer (if the system is monitored via SNMP, the default texts "Conf. Input 1 -> Conf. Input 5" will be transferred to the NMS).

Note: If LVD3 is enabled (see chapter System Configuration.), Config. Input 5 is used for LVD3 feedback. In this case, it will not be possible to enable config. Input 5. The text "This input is used for LVD3 feedback" will appear.

Furthermore, the digital inputs can be configured as trigger inputs for other conditions. A drop-down menu selects between DISABLED, ALARM, BATT TEST CONTROL, and GENERATOR INPUT, as shown above.

Input configured as DISABLED: disables the configurable input.

Input is configured as ALARM: The Flatpack MCU will enter alarm condition on either an open or short circuit condition, depending on the state of the “failsafe” checkbox. When the checkbox is selected (“ticked”), an open circuit on a particular input (to AGND) will cause an alarm condition, and a shorted input (closed contacts) clears the alarm. Each input’s alarm logic can be configured independently of the other inputs, providing a flexible external alarming solution.

Input configured as BATT TEST CONTROL: If the input goes to alarm condition, a “start battery test” event will be sent to the battery test module. This will start a battery test if the system is in idle state (No battery test). The text “Test ext. active.” (meaning that battery test start has been triggered by an external input) will be added to the alarm log in addition to the texts added from the battery module. If the system already is in battery test mode the text “Test alr.started” will be added to the alarm log.

If the input goes out of alarm condition, a “stop battery test” event will be sent to the battery module. Any ongoing battery test will then be aborted (even if the ongoing battery test is an interval test or manual test started from Winpower). The text “Test ext.deactiv” (meaning that battery test stop has been triggered by an external input) will be added to the alarm log in addition to the texts added from the battery module. If a test is in progress, (all kind) it will be stopped when the output voltage has reached the end voltage or if the max test time has expired, independent on the state of the input. If the system is in idle state (No battery test) when the input goes low, the text “Test alr.stopped” will be added to the alarm log.

Input configured as GENERATOR INPUT: Generator feed functionality is suitable in systems equipped with a generator as backup mains source. Configuring any of the 5 configurable inputs to “Generator Input” enables “slow current walk in” at generator start up. The chosen input will read a signal from the generator to determine whether the generator is running/not running.

If the input enters alarm condition, it is assumed that the generator has started. If charge current limitation is enabled, the value for Generator Feed Current Limitation will be used to limit the battery current. If the system has critical mains fail (Mains alarm and rectifier current below 10A), this transition will prepare the system for “slow current walk in”.

If the input goes low, it is assumed that the generator has stopped. If “Charge Current Limitation” is enabled, the general value for “Charge Current Limitation” will be used to limit the battery current. This transition will also stop “slow current walk in”.

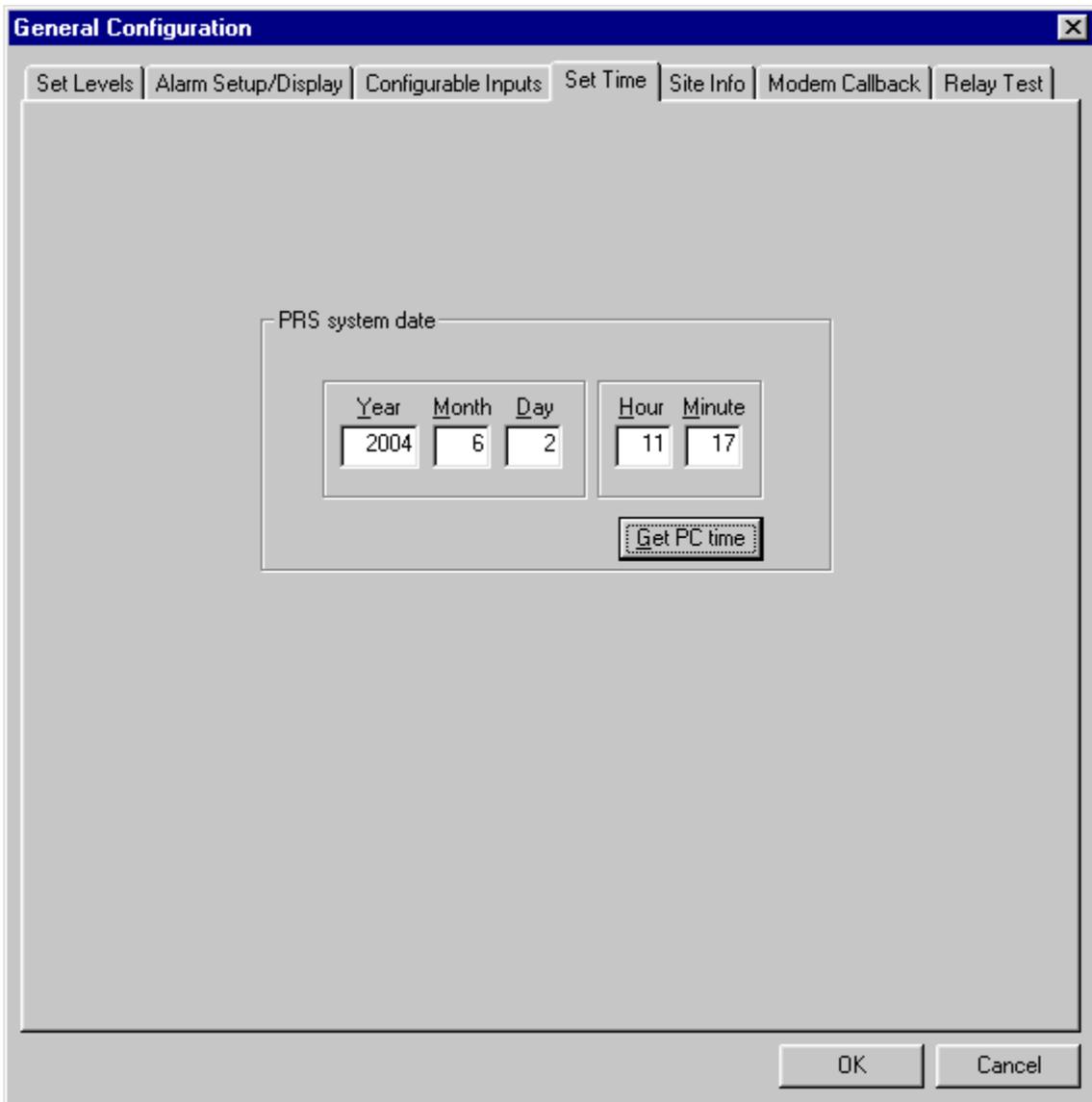
The purpose of this function is to give the generator a soft start by slowly stepping up the output voltage. The voltage will be raised in about 0,1V steps. The number of steps and time between steps before the desired voltage is reached will be calculated from the “Slow Current Walk In Rise Time” value in the Charge current configuration.

The level set in “Maximum charge current” for generator feed overrides the stepping of output voltage. In case of a critical mains fail, the system will wait for the generator to start. When the generator starts, the chosen digital input will go high. The system will then prepare for slow current walk in by lowering the pwm output to 1 V below the battery voltage. When the mains reappears (generator running properly) the pwm will, after about 1 second, be regulated slowly up towards the Set Voltage. If charge current limitation is enabled, the battery current will control the stepping of the pwm. If charge current is disabled, the pwm will be stepped up with a fixed value each time the timer expires. There are several criteria that will make the system leave the *Slow Current Walk In* state:

- Pwm is equal to or above a defined pwm level corresponding to the desired output voltage.
- Output voltage is equal to or above the desired Set Level.
- Desired Rise Time expires.
- Critical Mains fail
- Generator stops

6.9.4 Set Time

In order to keep a chronological record of events and other time-dependent functions, the internal clock requires to be set with the correct date and time.



The parameters are entered in the correct format, date: «YYYY-MM-DD», and time: «HH:MM».

Note that the Flatpack MCU prior to Version 10 does not incorporate a real time clock with battery backup – if a pre-version 10 MCU is powered down, the correct date and time must be re-entered after restoration of power. The date and time must be set in order for a valid timestamp to appear in the Event and Alarm logs.

Note that “PRS” is an abbreviation for “Power Rack System”.

6.9.5 Site Info

This menu option enables you to adapt the Flatpack MCU to a site specific installation, by registering site-related information such as the name of the customer/owner, location, serial numbers, number of rectifiers installed, battery type, serviced by, software version, battery installation and service dates, and messages.

The screenshot shows a 'General Configuration' dialog box with the 'Site Info' tab selected. The dialog contains the following fields and values:

Customer	Customer Name Here	Rectifiers Installed	8
Location	Site Name Here	Battery type	Battery Info Here
Serial no.	Equipment ID Here	Serviced by	Eltek
CU serial no.	MCU ID Here	Software version	402040.003 4.0
Max Current Pr Rect	20	Hardware version	2
Battery inst. date	Year: 2004, Month: 1, Day: 1		
Last service date	Year: 2004, Month: 1, Day: 1		
Message 1	Informational Text Here		
Message 2	More Information Here		

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

The software version and Hardware version information is read-only and reflects the state of the Flatpack MCU.

The **Rectifiers Installed** and **Max Current Per Rectifier** entries are used by the Capacity Alarm feature and must be accurately defined. The **Max Current Per Rectifier** entry should be set to “30” for the Flatpack 1500 rectifier, and “14” for the Flatpack 700 rectifiers.

Notes:

Other *Max. Current Per Rectifier* values may be used, for example, a lower figure may be appropriate where constant high ambient operating temperature results in rectifier output power derating.

Any rectifiers installed as cold or hot standby units do not contribute to the total available current and are not to be included in the total *Rectifiers Installed*.

Be sure to update the *Rectifiers Installed* field if the system configuration is changed due to an increase or decrease in the number of installed and operational rectifiers.

6.9.6 Modem Callback

This menu option initiates the modem callback function. The MCU has “standard callback”, “alarm callback” and “interval/automatic callback” functionality. The Flatpack MCU will initiate a call when:

- An alarm programmed to activate the modem callback is triggered
- The Rectifier system has been called up from a remote location
- An automatic call is scheduled, if enabled

Note: When editing the settings in this screen, the previous configuration will be overwritten.

General Configuration

Set Levels | Alarm Setup/Display | Configurable Inputs | Set Time | Site Info | **Modem Callback** | Relay Test

Modem Callback Modem Init string
 AT&F&D0&Q5&K0&C1S0=1

Baud rate
 9600
 4800
 2400
 1200

Phone number #1 atdt5551234
 Phone number #2 atdt5558675309
 Phone number #3 atdt5551234

Site ID message
 MODEM MESSAGE FROM POWER RACK SYSTEM

Starting time for first automatic call Hour: 0 Minute: 0 Connect time: 15 sec. Report interval: 0 hours

OK Cancel

- **Modem callback**
Tick here to enable the modem callback. The “Modem Callback” choice is a master enable/disable for any callback functionality.
- **Baud rate**
Choose the appropriate baud rate between the Flatpack MCU and the modem, preferably as high as possible.

Modem Init. string shows the initiating string for the specific modem in use (max. 40 characters). *The Flatpack MCU automatically places the commands E0, V0 and Q0 in the initialisation string.* It is essential that the modem is set to ignore DTR, and DCD must correspond to the state of the carrier. The initiating string for the Westermo Industrial Modem is the default setup, as shown above.

- **Phone number #1 - #3** shows the phone numbers the Flatpack MCU will call, in order of preference (max. 20 characters). It is recommended to fill all the phone number slots. If you just have two different phone numbers, the third option should be filled with the most preferable phone number. Number 2 and 3 will only be used if the system has problems with the first number. *The modem dialing command (ATDT) must precede the phone number, e.g. ATDT12345678.*
- **Site ID message** identifies the specific site (max. 40 characters), e.g. «MODEM MESSAGE FROM SYSTEM». This string will always be attached to any calls from this alarm module.
- **Starting time for first automatic call** from the Flatpack MCU is indicated by entering the time of the first automatic call «HH:MM». The message «AUTOMATIC CALL» is displayed in intervals, as specified above.
- **Connect time (sec.)** is the time before hanging up, after the message has been sent. This is because one message/alarm is often followed by another message/alarm.
- **Report interval (hours)**
If you want the Flatpack MCU to generate automatic calls:
 - Enter the intervals, in hours, between automatic calls from the Flatpack MCU. If «0» is entered, the function will be disabled. The function is intended for surveillance of the communication link.
A display showing the connection between the PC and the modem will appear on the right-hand side of the **Modem Callback** interface.

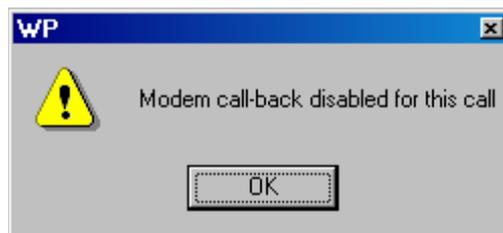
6.9.6.1 Alarm programming

The alarm is programmed via the alarm setup menu. Configure the outputs and choose «MODEM» for the alarms that activate the modem callback. The Flatpack MCU will initiate a call, if any of the alarms that are set to activate the modem are triggered.

6.9.6.2 Calling up the DC Rectifier system

When you call up the system and the modem callback is enabled, the Flatpack MCU will reply that it will call back. The Flatpack MCU will call the first phone number in the list of three numbers and will attempt to establish a connection three times before trying the next number, and so on.

To configure the alarm module when modem callback is disabled at the MCU, press ALT-P in Winpower's Site Manager, **before** pressing the modem Connect button. A password dialog will pop up. Type 0 for password and the following information will appear:



During **this** session, Winpower will communicate with the system like a direct connection. You will then be able to configure your system (enable modem callback, etc.).

If the direct connection fails, the system may have been in the initialization mode and not ready for direct connection. The system will leave this state soon, so if the user waits for about one minute, the system should be ready for an incoming call.

Automatic call

The Flatpack MCU will call at the specified time and interval as stated in the modem setup menu. The message «AUTOMATIC CALL» will be displayed.

General

If connected directly to a PC, and the modem callback is enabled, the following message will be received in WinPower «THE SYSTEM WILL CALL YOU BACK». Ignore this and enter CR a couple of times, and you will then be asked for the password.

6.9.6.3 Modem Installation and Configuration

Configuring the local modem

The local modem (on the PC side) can be almost any type of internal or external modem that is correctly installed within the Windows operating system. **It is recommended that only true analog / hardware modems be used.**

Note: Certain internal 56k “softmodems” (such as Rockwell/Conexant and Lucent Winmodems) do not work properly with WinPower (these low-cost embedded laptop modems use the PC processor to effect functions that are handled by separate DSP circuits in a “true” modem). Use of these modems is not recommended. Use of these modems to receive automatic and periodic alarm reports from the MCU is possible, however callback will not function when attempting to operate WinPower remotely through the modem dialup link.

To install the modem, open 'My Computer', select the 'Control Panel' and double click the 'Modem' icon. Follow the steps to install your modem. After installation has completed, select 'Properties' and set the baud rate to 9600.

In the 'Advanced' menu of the 'Properties' -setup, the user can add extra initialization commands. If the modem has problems initializing calls (because of internal lines etc.), ATX3 or ATX0 can be added in this field to change the modem response code handling. Other ATX variations may be necessary to permit the correct response codes, depending on specific modem types and line/connection conditions.

The modem cable is a normal “straight through” cable, with all pins connected.

Configuring the remote modem

Eltek Energy offers for sale with our DC power systems appropriate modems for use with the MCU controller. Depending on system configuration and locality, two basic options are available (as of this writing); the Westermo TD-32B DIN rail mounted modem, and the Western Telematic FTM-336 19” rack mounted modem. Both of these modems are DC-powered and operate from the power system bus.

It is important that the modem on the alarm module side is configured to let the DCD line follow the state of the carrier, usually by the AT command “AT&C1”.

The Westermo AT command string is the default and is as shown in section 6.9.6:

```
AT&F&D0&Q5&K0&C1S0=1
```

In order to use the Western Telematic modem, use the following AT command string:

```
AT&F&D&Q5&K$MB9600$SB9600S37=9S0=1
```

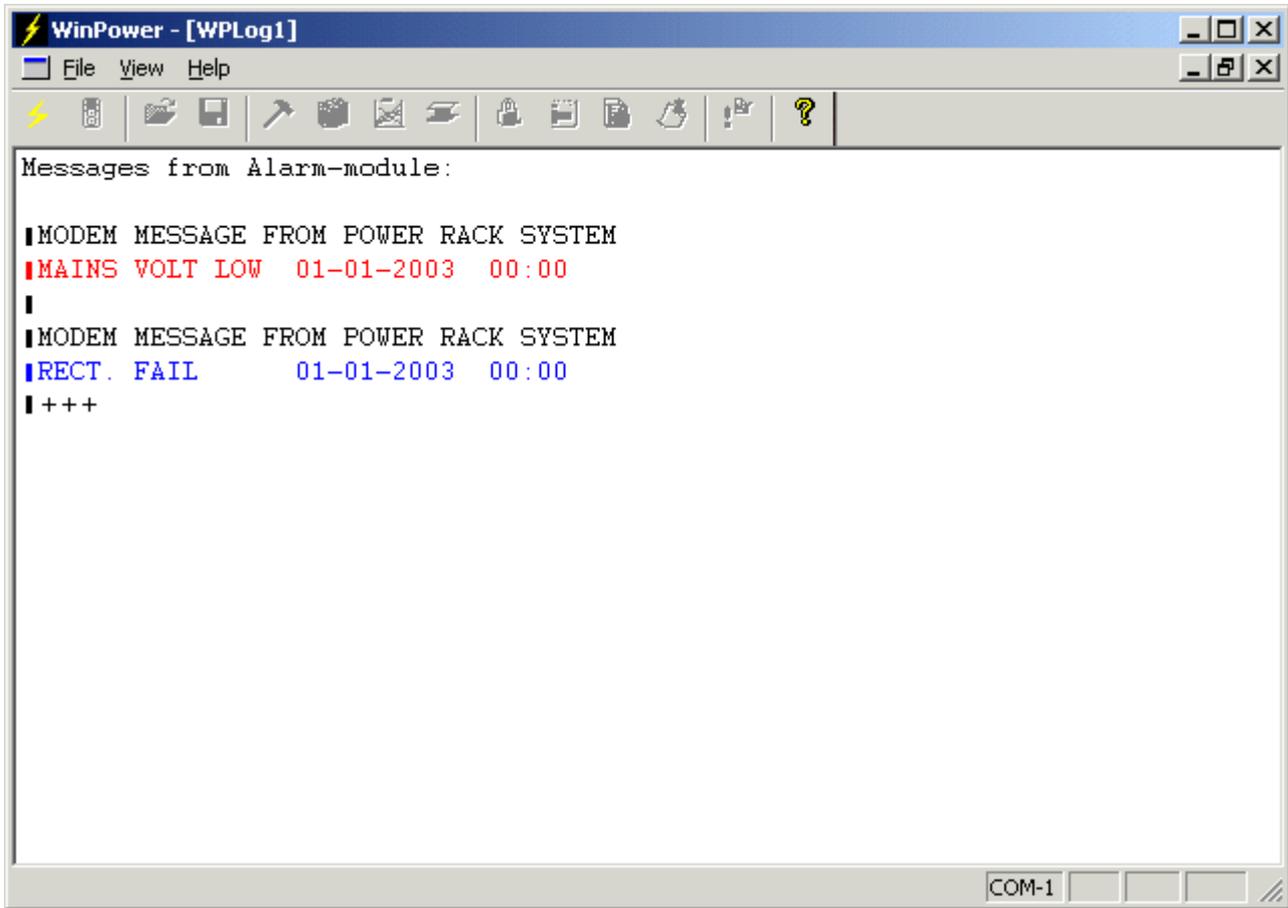
Note that the strings “9600” should coincide with the baud rate set in WinPower and configured at the MCU.

6.9.6.4 Using Modem Callback

In order to use the modem callback alarm reporting functionality, the local PC and connected modem must remain ON at all times. Also, WinPower must be running and all connections must be closed.

In this state, WinPower will continuously monitor all installed modems for a “RING” indication, and will issue an “ANSWER” command when a remote site / MCU initiates a call.

After receiving a call from a remote MCU, WinPower will display the following screen:



All currently active alarms will be reported along with the associated timestamps, indicating when the alarms occurred. (in the example above, the time had not been set in the MCU).

6.9.6.5 Customising the displayed event colors

Editing the alarmcolor.def file, located in the application folder, allows customising the colors displayed in this screen. Normally this is **C:\Program Files\Eltel\WinPower Silver\VerX.X** (where X.X represents the version of WinPower installed, example “Ver4.1”).

A total of twenty-six (26) events are defined within this file and can be assigned colors from a standard 8-color palette (red, black, yellow, green, blue, magenta, cyan and white). Note that assigning white to an event will render such text invisible.

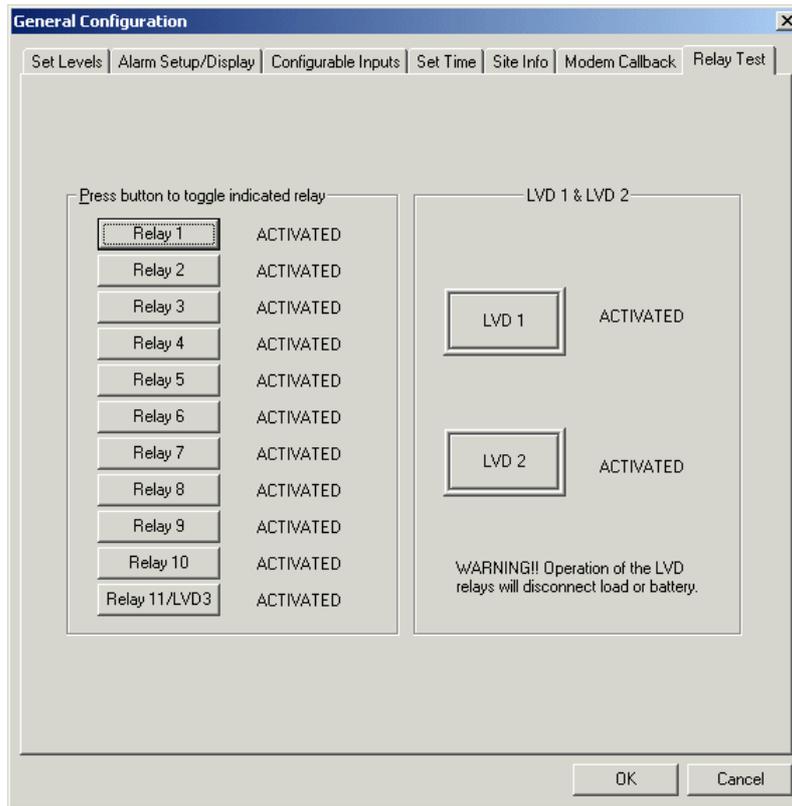
By default, alarm conditions are displayed in RED. In the screen shown above, the RECT. FAIL color assignment in the alarmcolor.def file has been changed as below:

Default: **RECT. FAIL;red**

Changed to: **RECT. FAIL;blue**

Any text editor (such as Windows Notepad) can be used to make changes to the alarmcolor.def file.

6.9.7 Relay Test



This facility is used to test-operate the alarm relays, the low voltage disconnect contactors (LVD1, LVD2 and LVD3 if enabled, Ref. chapter System Configuration.), in order to test any external monitoring equipment connected to the system's alarm relay outputs.

Note! Operating "LVD1" "LVD2" or "LVD3" will disconnect either batteries or load. Only perform tests of "LVD1", "LVD2" or "LVD3", when it is acceptable to lose the battery backup during a test of a Low Voltage Battery Disconnect unit and/or experience shutdown of the load(s) during a test of a Low Voltage Load Disconnect unit.

To test-operate alarm relay number 1, select **Relay 1**. The contacts on Relay 1 will toggle and the external wiring can be tested and verified. Do the same test for all alarm relays that are used / require testing.

The alarm relays have fail-safe functionality. The relay coils are all energised ("ACTIVATED") when there are no alarms.

"DEACTIVATED" ⇒ ALARM. If LVD3 is disabled, test Relay 11 by selecting Relay11/LVD3.

LVD 1, LVD 2 and LVD 3 are programmable outputs that are used to control either a Low Voltage Battery Disconnect unit (LVBD) or a Low Voltage Load Disconnect unit (LVLD) hereby called by a common name "LVD". **Testing these functions will disconnect batteries and/or loads.**

To test-operate LVD control output 1, select **LVD 1**. "DEACTIVATED" means that batteries or load are disconnected. To test-operate LVD control output 2, select **LVD 2**. "DEACTIVATED" means that batteries or load are disconnected. Whether batteries or load are disconnected, depends on the system configuration.

To test-operate LVD control output 3, select Relay 11/LVD3.

When the tests have been terminated and the *Relay Test* menu is exited, the Flatpack MCU will automatically reset the relays and LVD outputs to their normal state.

6.10 Battery Configuration



The following options are available under **Battery Configuration**:

<i>Battery Setup</i>	Battery Type definition and configuration
<i>Batt. Test Setup</i>	Manual battery test and test setup
<i>Auto Boost</i>	Automatic boost charging
<i>Manual Boost</i>	Manual boost charging
<i>Current Limit Cfg.</i>	Charge current limitation (for normal and generator feed conditions)
<i>Output Control</i>	Select output voltage control mode
<i>Symmetry Measurement Cfg.</i>	Battery symmetry monitoring setup

6.10.1 Battery Setup

	Time (min)	Current (A)
1	1	,173.0
2	5	,144.0
3	10	,119.0
4	15	,100.0
5	20	86.0
6	30	69.8
7	45	54.0
8	60	45.0
9	90	30.4
10	120	24.3
11	180	17.9
12	240	14.2
13	300	11.5
14	480	7.5
15	600	7.2
16	5000	0.5
17	5000	0.1

6.10.1.1 Battery Name

The Flatpack MCU is delivered with three default (pre-defined) battery definition tables and one user-defined table. The Flatpack MCU can be configured to use one of these. The “Get next battery” button will cycle through the available choices. When using a user-specified battery definition table, instead of one of the three pre-defined tables, the following parameters must be defined:

- Battery Name
- Battery test End Voltage (Volts/cell). Minimum end voltage is 1.82 V/cell.
- Enter values, 1 - 10 000, in the **Battery table (Minutes / Amps)**. This is the battery discharge curve data (for a given end voltage, enter the discharge current that correlates to various discharge times).
- *Voltage at 20°C* and *Slope* Temperature Compensation settings (see next section).

6.10.1.2 Temperature Compensation

Due to a battery's electrochemical characteristics, a fixed charge voltage can provide optimum charging only at a fixed battery temperature. Under actual operating conditions, the battery temperature will vary due to charge and discharge cycles, ambient temperature fluctuations, etc. During low battery temperature conditions, the batteries will never reach 100 % capacity with a fixed charge voltage. Likewise, during high temperature conditions the batteries will be charged to excess, reducing their lifetime and increasing the risk of a catastrophic thermal runaway event. In order to compensate for these thermal effects, the Flatpack MCU can adjust the charge voltage proportional to the battery temperature.

The charge voltage equation can be represented by a straight line, based on the voltage at 20 °C and the desired variation of the charge voltage per degree celsius. The following two settings are associated with the stored Battery Types (including the User Defined battery) and loaded along with the other parameters for each battery type.

Voltage at 20°C

Enter the charge voltage as recommended by the battery manufacturer, normalized for 20°C.

Slope

Enter the slope of the equation as the change in millivolts per cell per degree Centigrade.

Maximum and Minimum battery voltage limits can also be set, to restrain the charge voltage compensation range. These limits can be set to protect connected equipment against excessive voltage excursions and are global settings (not dependent upon battery type selection).

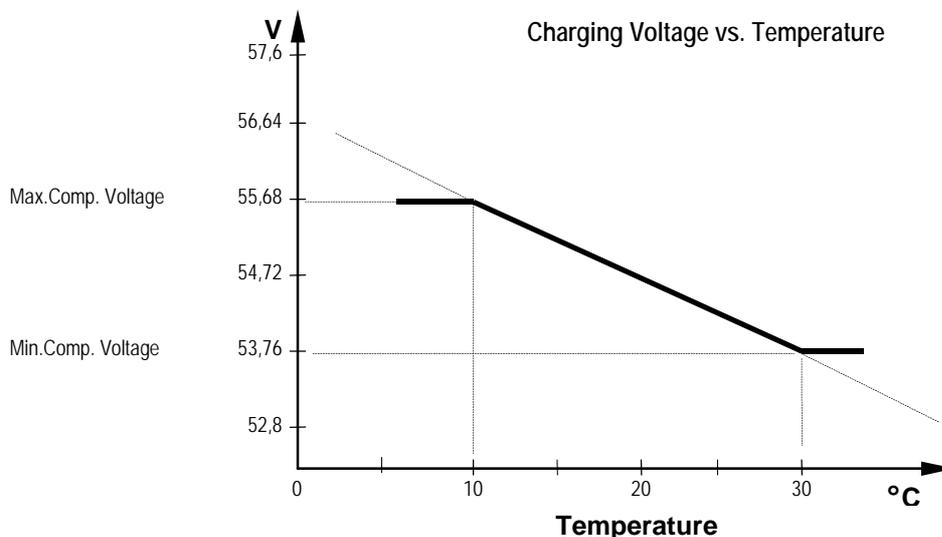
Max. Comp. Voltage

Enter the desired upper limit of charge voltage

Min. Comp. Voltage

Enter the desired lower limit of charge voltage

See the following graph for a representation of the charge voltage versus temperature relationship.



6.10.1.3 Battery Setup

Number of battery modules

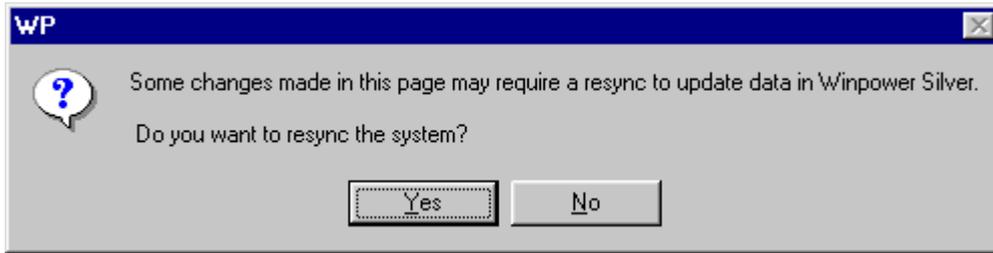
The Flatpack MCU must be configured with the exact number of battery banks connected in parallel in the power supply system. This information is essential for calculating the battery capacity.

Battery cable resistance (milliohms)

The battery cable resistance must be known when performing calculations during battery tests and battery charging. A battery test is terminated when the battery voltage has dropped to the end voltage (defined in the battery table). If the voltage drop in the battery cables is considerable, the measured battery voltage will be reduced thus, causing the battery test to terminate early. The calculated capacity will then be slightly lower than actual. The cable resistance also influences battery charging. In this case, the charging voltage will be too low and the batteries will never reach 100 % capacity. In order to compensate for this effect, the Flatpack MCU may be configured with the total battery cable resistance (both wires + and -), thus enabling a correct calculation of the battery voltage.

6.10.1.4 Resync system

If the settings in the Battery Setup menu have been changed (particularly the USER DEFINED battery name and parameters) the following screen may appear when exiting the menu:

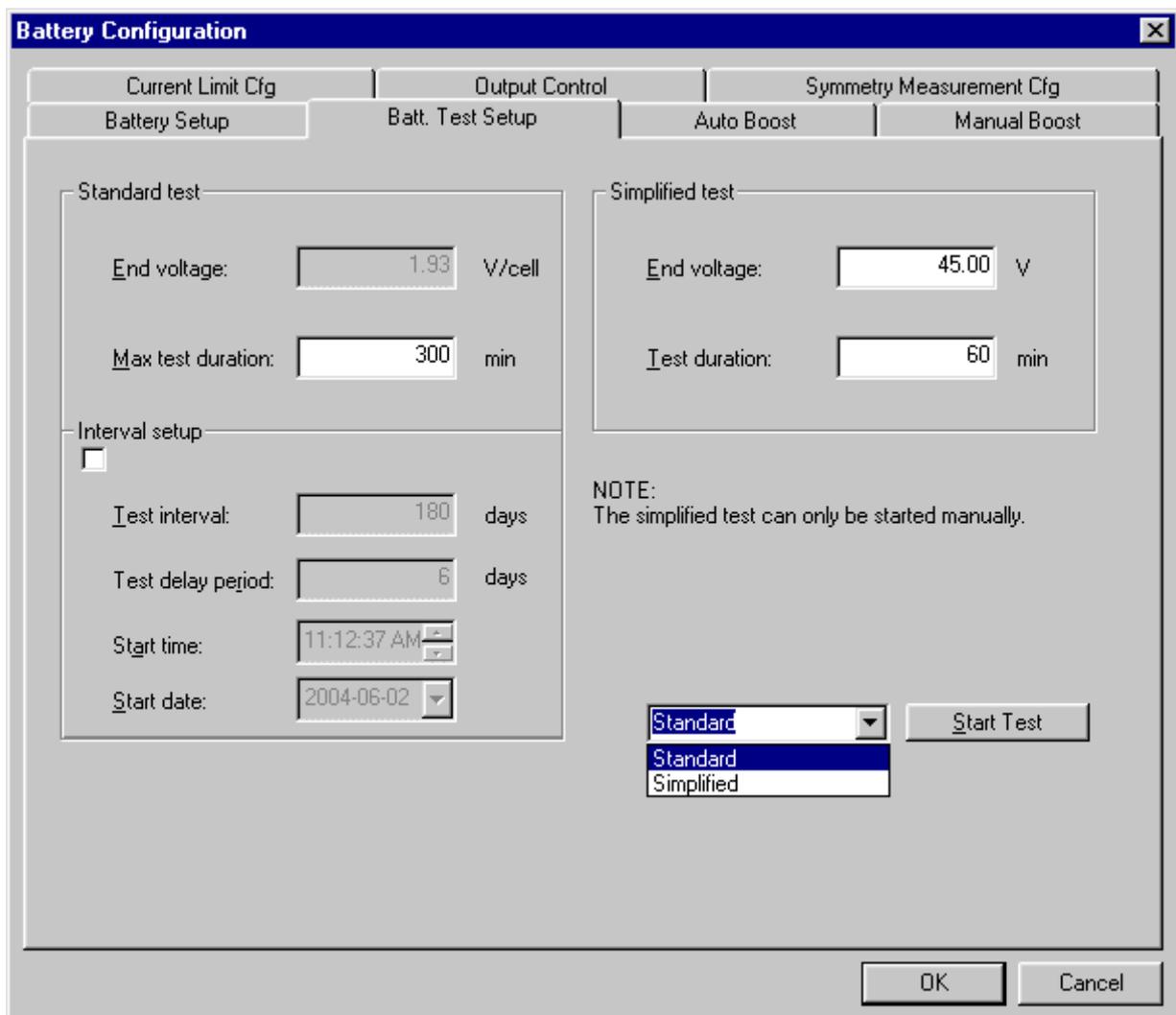


It is recommended to select “Yes” to be sure that all the settings in Winpower Silver are updated.

6.10.2 Batt. Test Setup

The Flatpack MCU incorporates advanced functionality for monitoring and maintaining the system batteries. The batteries may be boost-charged, capacity-tested, and the charging voltage can be actively temperature compensated.

The Flatpack MCU provides two basic types of battery testing; Standard and Simplified. Standard battery test uses a battery table for a given end voltage to calculate the battery quality. The Standard test may be started manually, at intervals defined by the user, or automatically upon mains failure (optional setting). The Simplified test does not use the battery table and may only be started manually. A drop-down menu box selects which type of test is to be used.



6.10.2.1 Functional description – Standard Battery Test

Prerequisites for the test are:

- 1) The currents to the load and batteries are measured / identified
- 2) The correct discharge table for the batteries is selected
- 3) The *Max. test duration* is set higher than the expected time needed for the batteries to reach the battery *End Voltage*.

The first requirement is inherently met by the MCU (the discharge current is accumulated every 20 seconds). The other requirements must be met by correct setup of the battery discharge table and test parameters by the end user. The Flatpack MCU must be configured (in a battery table) to ensure that the Standard battery test works as intended. The Flatpack MCU is pre-programmed with three default battery tables, and one user-defined battery table is available (in Battery Setup). The battery capacity is calculated as the ratio between the actual test time and the expected test time with an average current, as specified in the discharging table. When the test is completed, the average discharge current per battery bank is calculated and the battery data table is used to interpolate the "ideal" discharge time for the given current. Battery "efficiency" is calculated as Test duration/Ideal discharge time for the average current

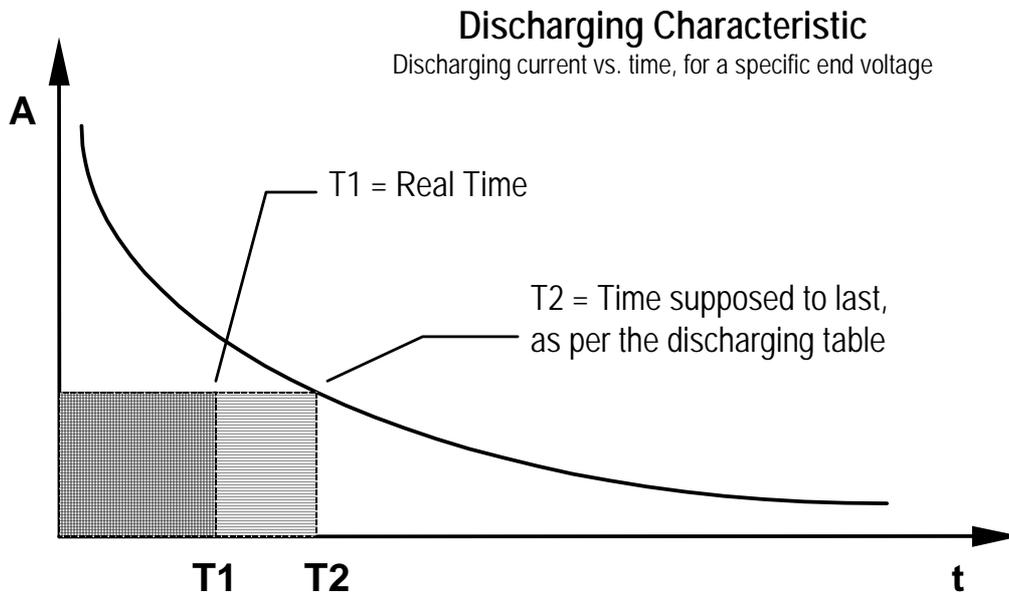
Test termination criteria are:

- End-voltage – this is the only termination criteria that will calculate a Test result and/or give an alarm.
- Test time – Test result will be overwritten by next test
- Aborted by user - If the test is aborted or interrupted, there will be no alarm, due to an incomplete test. The test result will then be overwritten by next test.

In order to acquire a valid battery quality result, the test must terminate due to reaching the specified End Voltage, and not be terminated due to an elapsed Duration value.

The battery test sequence is as follows:

- 1) The Flatpack MCU reduces the DC voltage from the rectifiers to approx. 45 V (The entire load current is thus supplied by the batteries).
- 2) The *Test start time* commences.
- 3) The Flatpack MCU measures the average current supplied to the load (at a 20 second sampling rate).
- 4) The test is stopped when the battery voltage has dropped to the battery *End Voltage*, **or** the timer has counted down to *Max. test duration* time. The test should be aborted and repeated **if** *Max. test duration* occurs.



The Battery Test Alarm Limits, with *Capacity in Percent* = $[T1/T2] * 100$, are defined as:

- | | |
|----------------------------|---------------------------|
| Capacity > 80 % | ⇒ Battery condition is OK |
| Capacity < 80 % and > 75 % | ⇒ Pre-alarm |
| Capacity < 75 % | ⇒ Battery Test Alarm |

6.10.2.2 Standard Test – Termination Criteria

End Voltage (Volts per cell) : The battery test is stopped if the battery voltage drops to the specified **End Voltage** value. This value should not be changed in the Standard Test.

Max. test duration (min.) : The battery test is stopped when the test timer reaches **Max. Test Duration**. Note: This indicates that the battery test may be incorrect Battery condition will display **Aborted**.

6.10.2.3 Standard test – Start Methods

- Manual - the user starts the Standard test manually
- Interval - automatically starts at a given date and time set by the user. Test interval can be set to 1-1000 days and Test delay period can be set to 1-1000 days.
- Automatic - starts upon AC mains fail and system is running on battery. Will not start if manual test is already running.
-

6.10.2.4 Interval test parameters

Test interval (days) : The period of time between two automatic battery tests

Test delay period (days) : The number of days an automatic battery test is delayed from the last time that the mains was disconnected. This is to avoid a battery test on previously discharged batteries.

Start time, Start Date : Date and time when the initial interval battery test shall start.

6.10.2.5 Functional description - Simplified Battery Test

Simplified battery test does not use a battery table to determine the battery quality and can only be started manually. The Simplified Test differs from the Standard Test in that Battery quality = N/A when performing the Simplified Test, and the termination criteria behaviour is as follows:

6.10.2.6 Simplified Test – Termination Criteria

End Voltage (Volts) : The battery test is stopped if the battery voltage drops to the specified **End Voltage** value (note that End voltage is set as total battery voltage, rather than a volts-per-cell figure as in the Standard Test). Reports Battery Alarm and test result will be overwritten by next test.

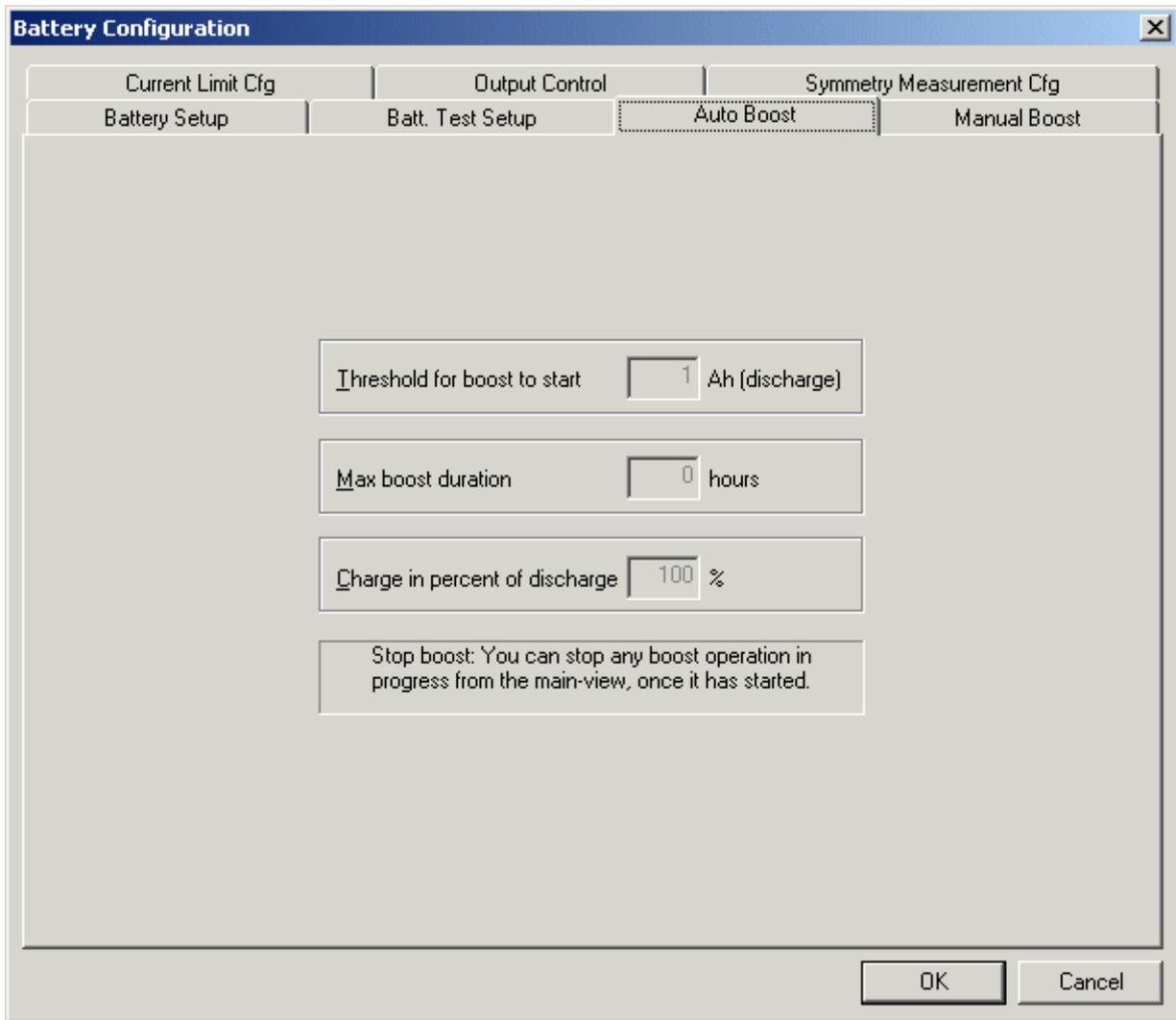
Test duration (min.): The battery test is stopped when the test timer reaches **Test Duration**. No Battery Alarm is generated (Battery OK).

If the user aborts the test, any test result will be overwritten by next test.

6.10.2.7 Manual Test control

Start Test: Activates the battery test. This control is common for both Standard and Simplified tests. The drop-down menu box selects which type of test is to be used.

6.10.3 Battery boost - Automatic boost charging



The automatic boost (equalize) charge function is developed to ensure a brief recharging time for the batteries after discharge. Automatic boost must be enabled in the installation menu (see page 70) and the following parameters must be set:

Threshold for boost to start (Ampere hour (discharge))

The autoboot will only start if the discharge of the batteries, in Ah, during mains failure or battery test was greater than the threshold value. The autoboot threshold can be set from 0 to 1000 Ah. The autoboot is deactivated if the threshold is 0 (default).

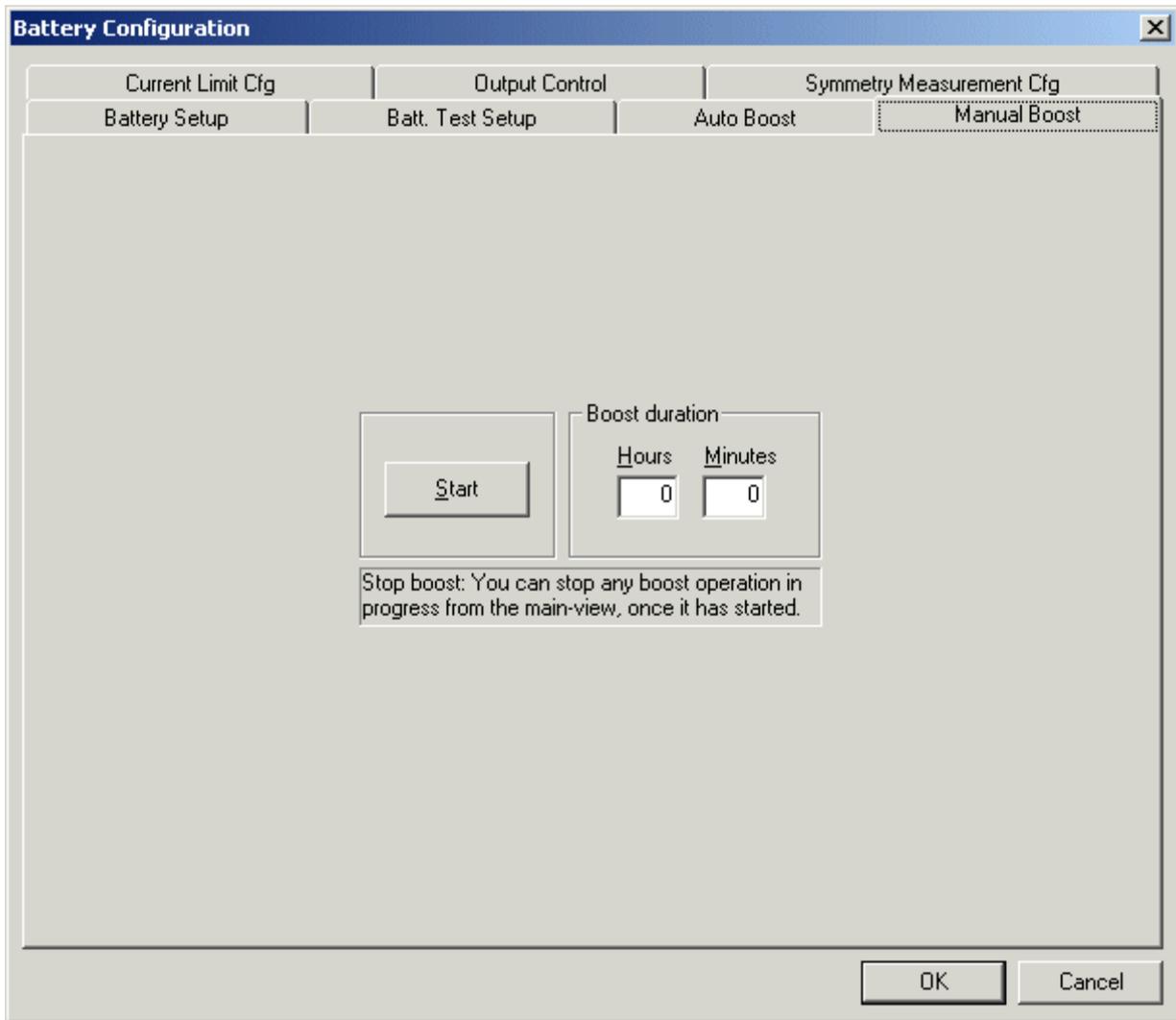
Max. boost duration (hours)

The maximum boost duration can be set from 0 to 20 hours. Duration set to 0 indicates that no maximum duration limit is set. If the value is greater than 0, the boost will stop when the timer expires. This is independent of recharge level.

Charge in percent of discharge (%)

Batteries can be charged from 100 % to 150 % of discharged Ah.

6.10.4 Battery Boost - Manual Boost



Use the battery boost function, if you need to charge the system batteries faster than normal. The output voltage will then increase until the boost voltage setting is reached, see chapter *Set Levels*.

The following conditions can interrupt boost charging:

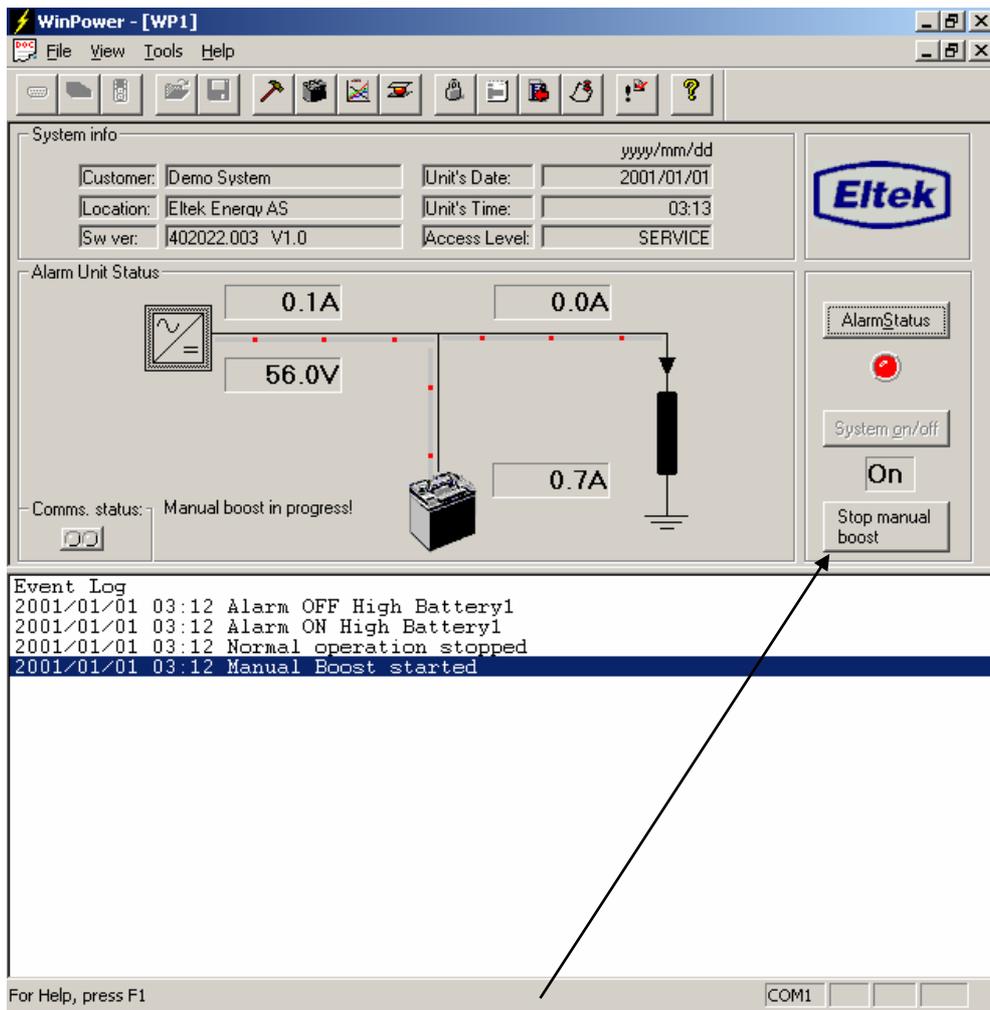
- the maximum boost time set in *Boost duration* is reached
- boost charging is interrupted manually

Click the *Start*-button to commence manual boost charging of system batteries.



This message will appear. Click *OK* to confirm

6 Operating From a Personal Computer



The boost charge can be stopped by clicking a dedicated STOP button underneath the system ON indicator in the main screen.

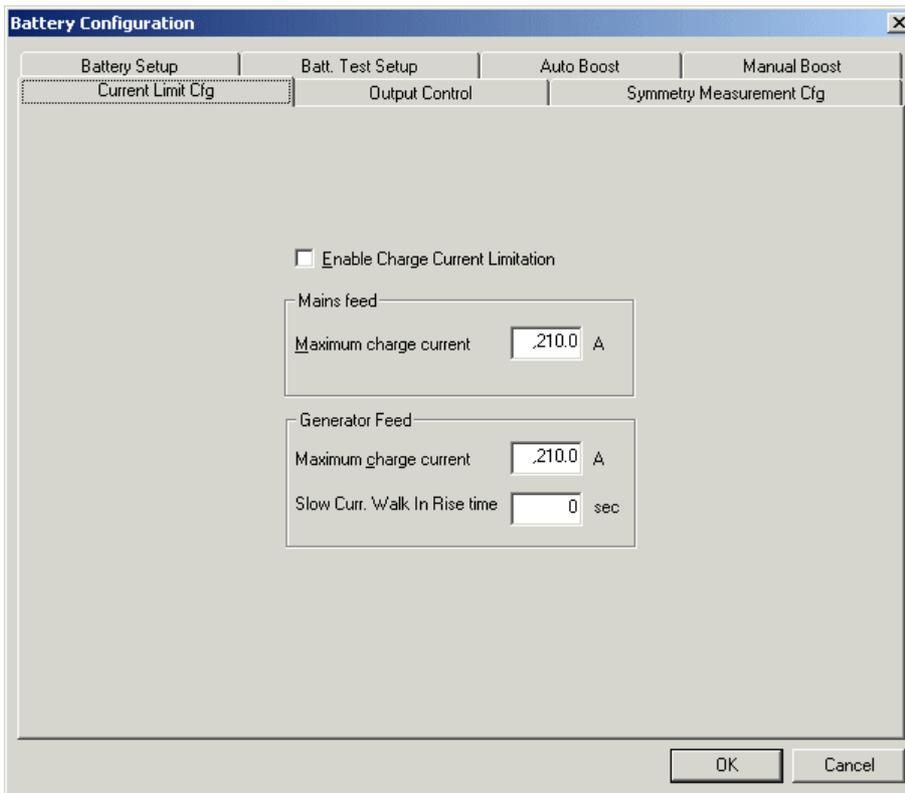


Other menu options cannot be used while battery boost is in progress

Note: The Boost Duration parameter is only passed to the MCU from WinPower when a Manual Boost is started from this menu. If the new setting must be saved to the MCU memory, it is necessary to either:

- Start and Stop the Manual Boost from WinPower
- Change the setting at the MCU using the keypad and LCD display (see section 5.3.12).

6.10.5 Current Limit Cfg



This function sets the maximum charging current of the batteries, to prevent an excess of available recharge current from overcharging the batteries or tripping the protective battery breaker. This is a concern after a discharge event, during the recharge cycle, before the loads are reconnected and full rectifier system current could be delivered to the battery plant.

When charge current limitation is enabled the Flatpack MCU will maintain a current limited state by regulating the charge voltage. If several battery strings are connected to the same system, the total charge current for all strings must be used. Note that the Charge Current specifically applies to the battery current as monitored by the MCU, and will not reduce the load current delivered by the rectifiers with fully charged batteries.

When the system is to be fed from a generator (see section 6.9.3) the charge current limitation allows for a separate maximum charge current value to be set when one of the configurable inputs is configured to “Generator Input” and the generator is running. “Slow Curr. Walk In Rise time” is used during generator start up.

Options:

Select *Deactivate* or *Activate* under **Charge Current Limitation**. The enable checkbox is common for both “Mains Feed” and “Generator Feed” Charge Current Limitation.

Mains feed

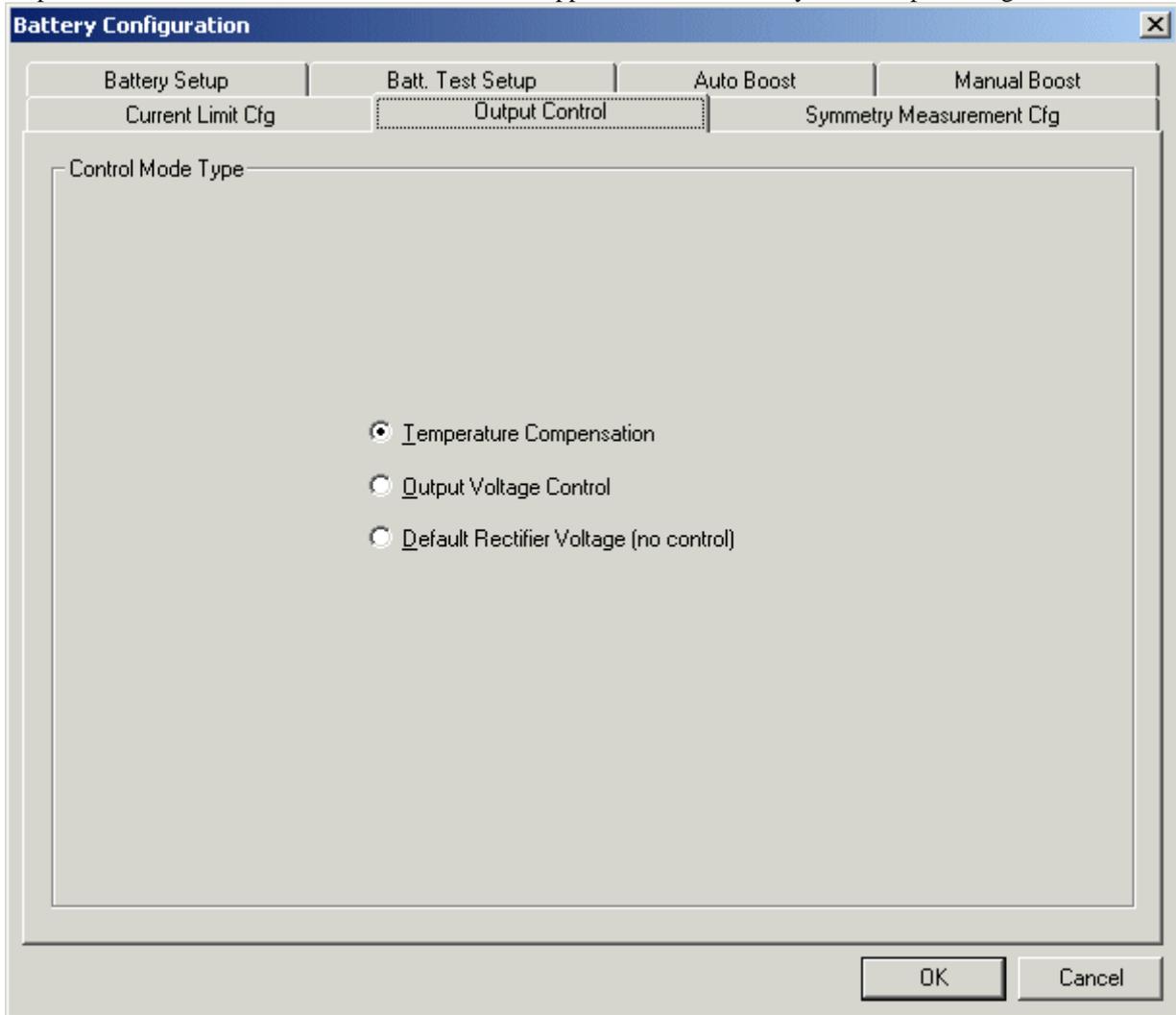
- Maximum charge current; The maximum charge current in systems without generator. Valid from 0 to 210A. Default value is 0A.

Generator Feed

- Maximum charge current; The maximum charge current in systems with generator. Valid from 0 to 210A. Default value is 0A.
- Slow Curr. Walk In Rise Time; The time from which the generator has started to when nominal voltage should be reached. Valid from 0 to 60 seconds. Default value is 10 seconds.

6.10.6 Output Control

This option enables selection of the control mode to be applied on the rectifier system's output voltage.

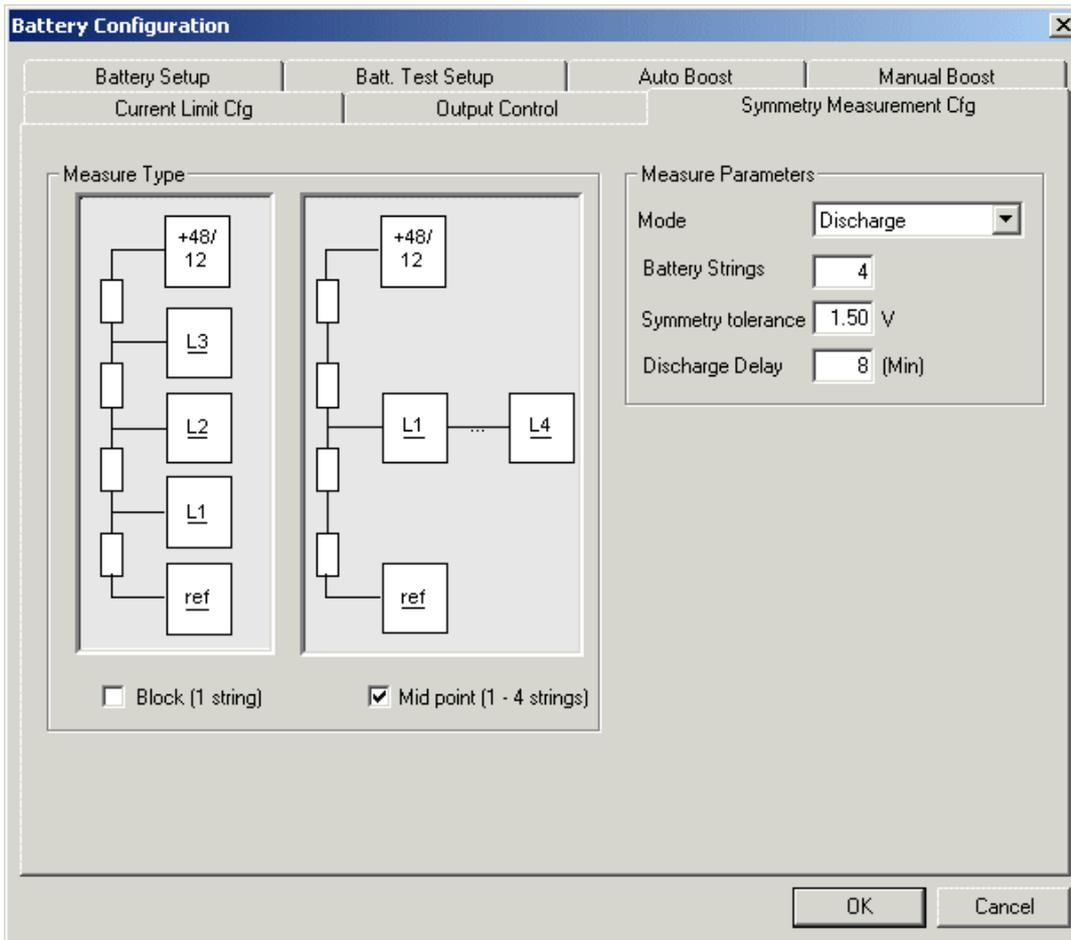


The following *Control Mode Types* are available:

- **Temperature Compensation**
The output voltage is determined by the temperature and type of batteries used. A temperature sensor must be installed. See chapter *Temperature compensated charging*
- **Output Voltage Control**
The output voltage is set to the voltage level defined in Flatpack MCU (adjustable level).
- **Default Rectifier Voltage (no control)**
The output voltage is set to the same value as the rectifier's output voltage (factory settings). See the rectifier Operation Guide.

Note that in the event of an AC mains alarm, the MCU will read the rectifier current to determine if the AC failure has affected all the rectifiers. If the total rectifier current is below 10 amperes, the rectifier voltage will revert to the front-panel control setting (Default Rectifier Voltage mode) until either the load current exceeds 10 amperes or the AC failure alarm has cleared.

6.10.7 Symmetry Measurement Configuration



Symmetry measurement provides a method of automatically detecting unbalanced battery blocks. There are two methods in which this measurement can be made; Block and Mid-point monitoring. Four (4) inputs are available for battery measurements. In either method, the individual measurements are made and the Flatpack MCU software performs calculations based on the measured total battery voltage to determine if an unbalanced condition exists, based on a user-defined Symmetry Tolerance value. Any individual measurement that differs from the calculated value by an amount in excess of the tolerance will generate a Symmetry Alarm condition.

Block Measurement. Each 12 Volt block is monitored in a single 48 Volt battery string. This provides the most detailed measurements, however only a single string can be monitored by the Flatpack MCU circuitry.

Mid-point Measurement. Each battery string is measured at its mid-point. This method allows additional battery strings (up to four) to be monitored, compared to Block Measurements.

Symmetry measurements may be taken continuously, or only during an actual discharge event. Because it is normal for a battery to vary somewhat from nominal voltage values when unloaded (during recharge), it is recommended that symmetry monitoring be performed under discharge conditions for the most accurate results. Furthermore, it is normal for some unbalance to exist between battery elements during the beginning of a discharge cycle, and for this reason a configurable discharge delay time is provided. This also prevents symmetry alarms during brief AC power outages, when recharge and discharge conditions may exist within a short timeframe.

The following parameters are selectable:

Measurement Type – Block or Mid-point

Mode – Continuous or Discharge

Battery Strings – the number of monitored battery strings. In Block Measurement, this field is fixed at “1”.

Symmetry Tolerance – The symmetry alarm threshold, in volts

Discharge Delay – The delay time between when a discharge event begins and alarms are reported

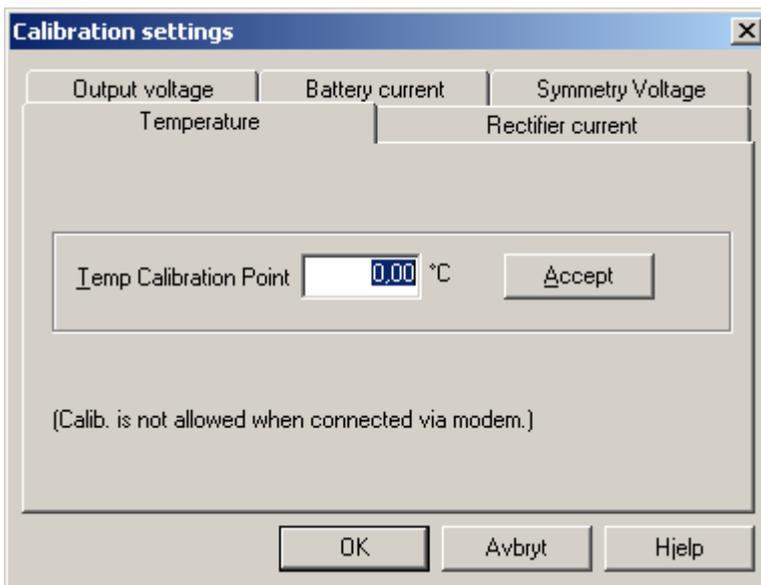
6.11 System Calibration



Calibration of the system is performed in the factory. The factory calibration is done at two different calibration points, 0A and at 50-60% of the systems maximum capacity. The system will normally not require any further calibration, except when the Flatpack MCU has been moved from one system to another system with much less/higher total capacity. The following parameters can be calibrated, if necessary:

- **Battery Temperature**
- **Rectifier current**
- **Output voltage**
- **Battery current**
- **Symmetry Voltage**

6.11.1 Calibrating the temperature



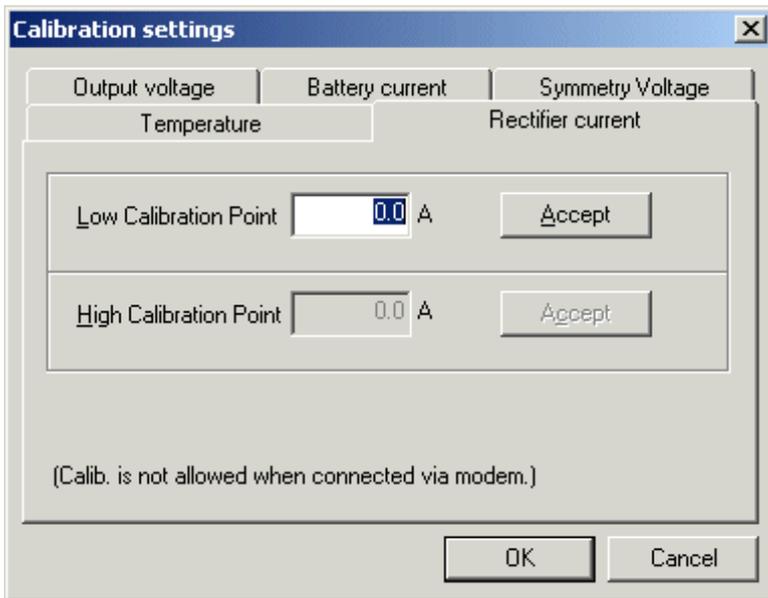
When the calibration value is entered, the Flatpack MCU will use this value together with the factory calibrated value at 0°C to calculate the temperature characteristic of the sensor.

Calibration:

It is recommended that this calibration is performed at temperatures above 15 °C.

- Measure the temperature as close to the temperature probe as possible.
- Enter the measured value (a figure between 15 °C and 60 °C) in "**Temp Calibration Point**".
- Select **Accept** to initiate calibration.

6.11.2 Calibrating the rectifier current



The rectifier current is always defined as positive (+). It is difficult to calibrate the rectifier current while charging the batteries, since the current is not constant. During calibration, the batteries should be at their maximum capacity or (if possible) disconnected. The calibration value should be more than 30 % of the system's maximum capacity.

Ensure you have a stable load current of approx. 40-60 % of the rated shunt current

Measure the load current with a current probe, or directly by measuring the voltage over the rectifier shunt and then calculating the current:

$$I_{\text{shunt}} = V_{\text{shunt}} / R_{\text{shunt}}$$

$$R_{\text{shunt}} = 60\text{mV} / I_{\text{rated}} *$$

* Note that the shunt voltage drop is dependant on specific shunt type. 60mV shunts are typically used, although 50mV shunts may be used in some cases. If in doubt, inspect the shunt body for the actual rating markings.

Enter the calculated or *measured* current for the **Low CalibrationPoint** in *Amps*

Select **Accept**

Ensure that you have a stable load current of approx. 30-60 % of the rated shunt current

Measure the voltage over the rectifier shunt and calculate the current

Enter the calculated or *measured* current for the **High CalibrationPoint** in *Amps*

Select **Accept**

Click **OK** to exit the calibration menu, if done.

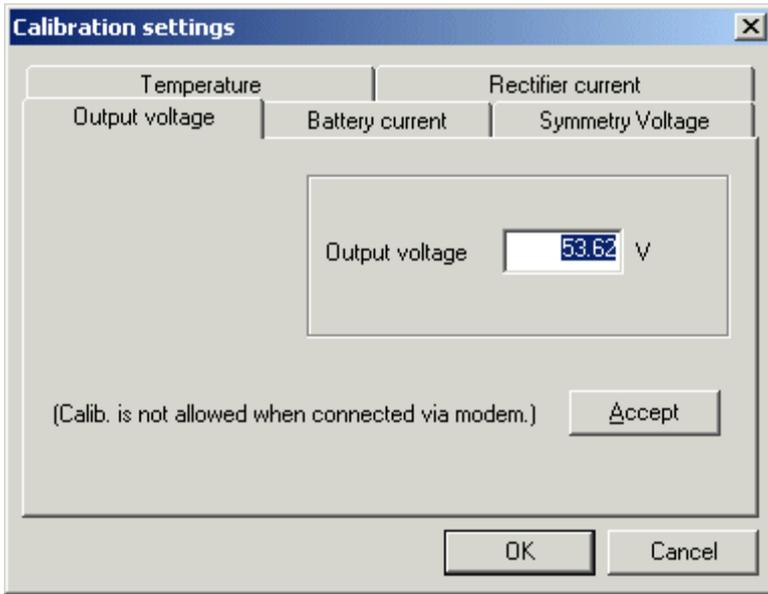
6.11.2.1 Internal System Current and Shunt Calibration Considerations

Perceived calibration errors may exist when no system load is connected, where the Flatpack MCU display indicates some battery discharge current due to the internal power system load current. Awareness of the reasons for this condition should alleviate concerns regarding the perceived discrepancy, and the intent of these paragraphs is to avoid confusion over the issue.

In LVD contactor-equipped DC power systems where the contactor coils are fed from the battery side of the system distribution bus, it is necessary to consider the effects of the resultant internal power system current drain on the battery. This current consists primarily of the LVD contactor coil power requirements. This current must be considered as part of the battery discharge current when calibrating the current shunts. Typical contactor coil currents are on the order of 500mA per contactor (Example: in a three LVD system, a "phantom" current of approximately 1.5 amperes exists).

Note that attempts to calibrate the battery current shunt to read zero with the internal load current present will result in an offset error in the Total and/or Rectifier current readings due to the mathematical summation of Rectifier and Battery current readings by the Flatpack MCU to arrive at a Total load value.

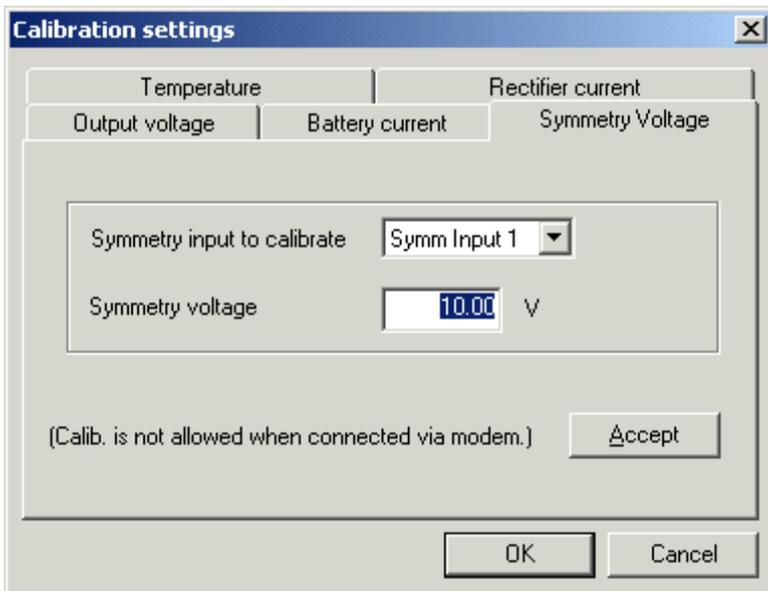
6.11.3 Calibrating the output voltage



Calibration of the output voltage needs only one calibration point (at working voltage). The output voltage should be measured at the load terminals.

- Enter the **Output Voltage** in **Volts**, a figure between 10.00 and 75.00.
- Select **Accept**

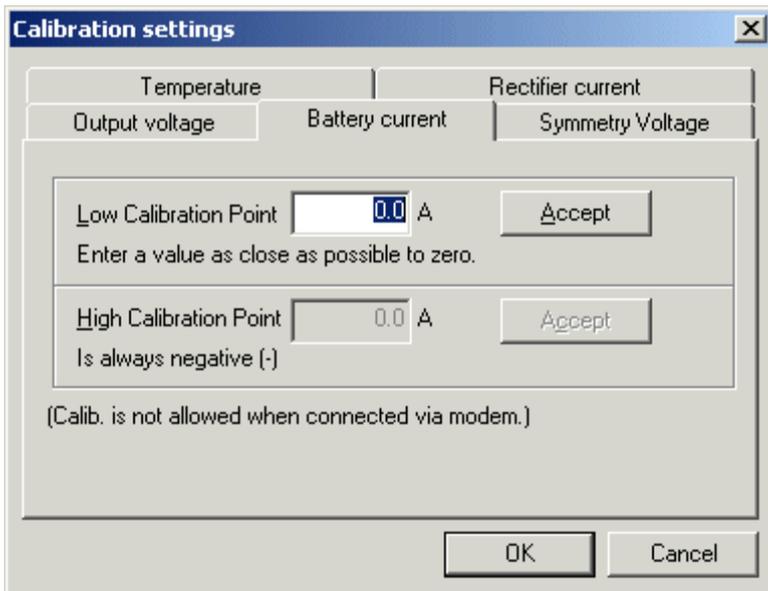
6.11.4 Calibrating the symmetry voltage



Calibration of the symmetry voltage needs only one calibration point (at working voltage). The symmetry voltage should be measured at the battery terminals.

Enter the **Symmetry Voltage** in **Volts**, a figure between 10.00 and 75.00.
Select **Accept**

6.11.5 Calibrating the battery current



During charging, the battery current is defined as positive (+), during discharge, it is defined as negative (-). In order to obtain an acceptable degree of accuracy of the current measurement, the current must be calibrated at one low level point and one high level point. Since the load supply must be maintained, the low calibration current should be positive, i.e. the current should be measured during float charging while the rectifiers supply both the load and the battery. The high calibration point should be measured during discharging, while the rectifiers are turned off (or lowered in voltage). To obtain acceptable accuracy, the high calibration point current should be at least 30 % of the shunt current capacity.

To calibrate the battery current:

While the system is in float charge mode, measure the shunt voltage and calculate the current

$$I_{\text{shunt}} = V_{\text{shunt}} / R_{\text{shunt}}$$

$$R_{\text{shunt}} = 60\text{mV} / I_{\text{rated}} *$$

* Note that the shunt voltage drop is dependant on specific shunt type. 60mV shunts are typically used, although 50mV shunts may be used in some cases. If in doubt, inspect the shunt body for the actual rating markings.

It is also acceptable to directly measure the current with a calibrated clamp-on DC ammeter or other device, rather than calculating the current using the shunt resistance and measured voltage drop.

Enter the calculated or *measured* current for the **Low CalibrationPoint** in **Amps**

Select **Accept**

Ensure that you have a stable load current of approx. 30-60 % of the rated shunt current and turn the rectifiers off

Measure the voltage over the battery shunt and calculate the current

Enter the calculated or *measured* current for the **High CalibrationPoint** in **Amps**

Select **Accept**

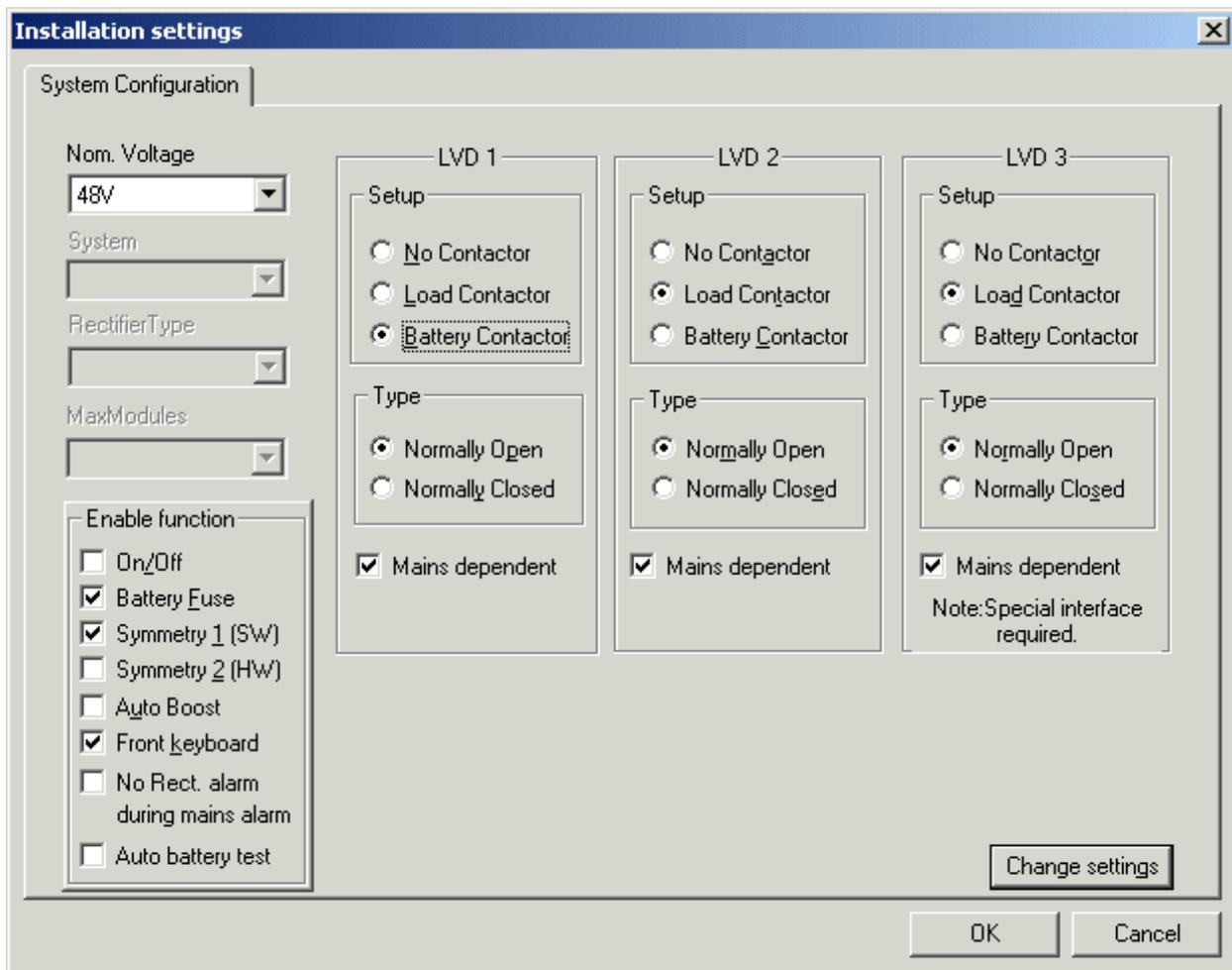
Click **OK** to exit the calibration menu, if done.

6.12 Installation settings



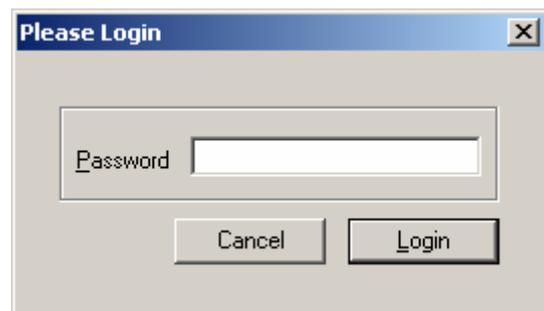
The installation settings menu is only accessed when the system is set up at the factory, or when major system hardware changes have been done in the field (added or changed hardware). Parameters such as system voltage and hardware configuration are set in this menu. Access rights to edit these settings are only available to authorized personnel. Unauthorized personnel are limited to read-only access. The installation menu is accessed from the initial screen interface.

- Select **Installation settings** from the Main Screen
The Installation settings menu will then be displayed.



To gain access to the installation level:

- Select **Change settings**
- Enter the password (the **INSTALLATION SETTINGS** password is generally only available to factory / system installation personnel - contact Eltek Energy for this password)
- Press Enter ↵ or **Login**



6.12.1 System Configuration

The system is configured according to the following options:

Nom. Voltage - This parameter specifies the nominal voltage for 12V, 24V, 26V, 48V or 60V systems. **It is essential to check the system voltage before making changes.** Entering the wrong system voltage can cause damage to the load equipment, or cause the rectifiers to go into over-voltage shutdown.

System, Rectifier Type and **MaxModules** settings are not used in Flatpack systems and are grayed out (disabled).

Enable function

- **On/Off**
Enables or disables the rectifier *On / Off* function on the system. When disabled, the rectifiers cannot be switched off from either the front panel of the monitoring unit, or from a local/remote computer.
- **Battery Fuse**
Enables or disables the battery fuse alarm input.
- **Symmetry Alarm 1**
Enables symmetry monitoring of battery strings using the internal Flatpack MCU hardware.
- **Symmetry Alarm 2**
Enables symmetry monitoring of battery string(s) by externally connected hardware.
- **Auto Boost**
Autoboost can be activated or deactivated. If activated, the autoboost will be a menu choice in the battery menu under Service access level. Autoboost is initiated after mains failure or battery test.
- **Front Keyboard**
Allows disabling the MCU keypad, to prevent unauthorized use. This feature is enabled (MCU keypad functionality is enabled) by default.
- **No Rect. Alarm During Mains Alarm**
When enabled, Rectifier Failure and Critical Rectifier Fail alarms are masked during a Mains Fail condition.
- **Auto Battery Test**
When enabled, a Battery Test will be initiated upon a mains failure.

LVD 1 / LVD 2 / LVD3

Set up features for Low Voltage Disconnect units (contactors). Contains features that define setup (battery or load) and type of contactor(s) installed.

LVD 1 = LVD control output 1

LVD 2 = LVD control output 2

LVD 3 = LVD control output 3 (Relay 11 output signal from Flatpack MCU microcontroller).

- **Load Contactor/Battery Contactor**
Defines the set up of the disconnect unit installed and determines the alarm message (battery disconnect or load disconnect) that will appear if the disconnect is activated.
- **No Contactor**
No contactor installed on this control output
- **Normally Open / Normally Closed**
A Normally Open contactor is energized and closed during normal operation, while it is not energized and open in alarm condition. A Normally Closed contactor is not energized and closed during normal operation, while it is energized and open in alarm condition.

The Eltek factory settings are: Load Contactor =Normally Closed (must be energized to disconnect); Battery Contactor =Normally Open (must be de-energized to disconnect).

6 Operating From a Personal Computer

- **Mains Dependent**

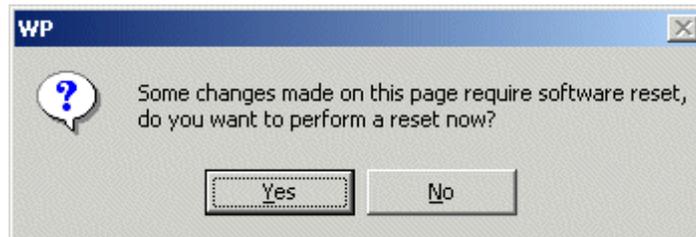
When enabled, a Mains Failure alarm must be present AND measured Rectifier Current must be below 10 amperes, in order to operate the low voltage disconnect. This is the recommended setting, as this prevents a disconnect event due to a loss of DC voltage sensing to the MCU.

When disabled, the LVD will be dependent only on the voltage setting; and the disconnect timer value is not applicable.

Note: changing the LVD setup in a live system could cause load or battery disconnection.

6.12.2 Exit Installation Settings

If the settings in the Installation settings menu have been changed, the following screen will appear when exiting the menu:



In order to permanently retain any new settings in Flatpack MCU memory (after the unit is powered down or removed from the system), this software reset must be executed.

Notes:

A Software Reset causes the contactors to change state, which could cause load supply interruption.

A Software Reset may cause the rectifier output voltage to be reduced for 5-10 seconds, while the MCU reboots. The batteries will supply the load during this time.

If a LVD service switch is present, it should be in the **SERVICE** position to avoid disconnection before executing software reset. Software reset causes the rectifiers to reduce the output voltage for 5-10 seconds. The batteries will have to supply the load during this time.

Turn the service switch back to **NORMAL** when the output voltage has stabilised.

✓ **Never perform a software reset on a commissioned system, unless the consequences have been fully analysed**

6.13 Passwords

Access to the various menu options is protected by passwords as follows:

The **USER** level is not secured by password, as no changes are possible under this access level.

The **SERVICE** password is alphanumeric (max. 9 characters) and is accessed from the key on the Main Screen indicated by a padlock. This password is set to a default (<<service>>) at the factory and should be changed as soon as the system is installed.

The **INSTALLATION SETTINGS** password is generally only available to factory / system installation personnel.

To change the passwords:

Log in under the appropriate access level (using the “lock” toolbar icon)

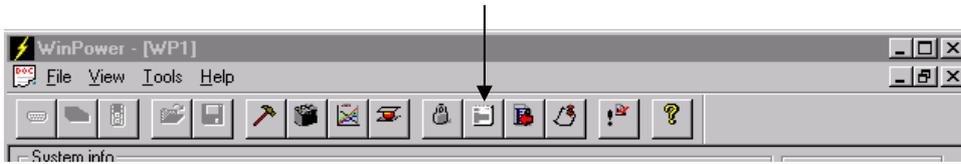
Select **Tools**

Select **Options**

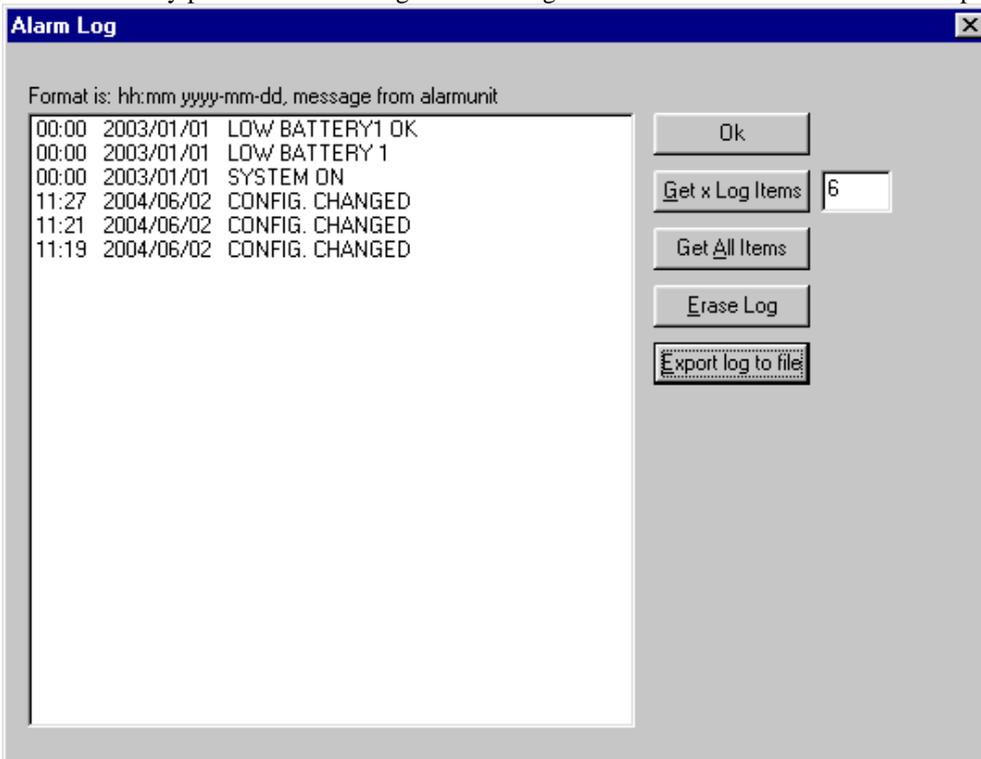
Change the password, as appropriate

Select **OK**

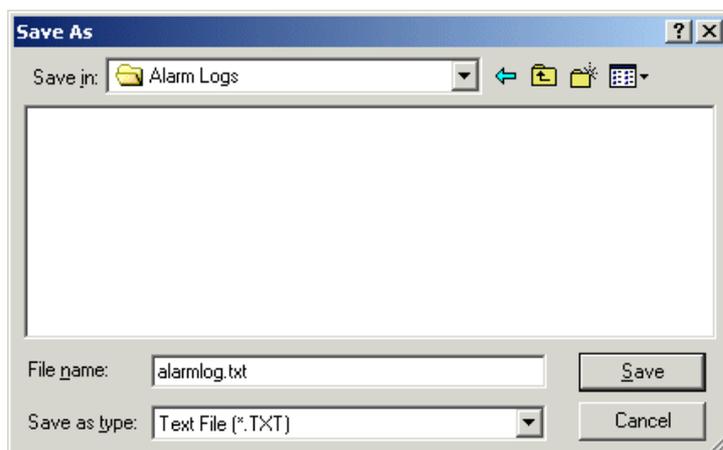
6.14 Alarm Log



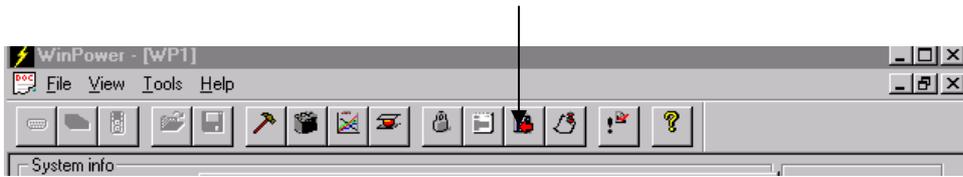
The alarm log registers every event in the alarm unit with time, date and event description. The Alarm Log also stores a record when any parameters or configuration changes are made via WinPower. See example:



- **Get x Log Items**
Select this option and specify the exact number of log items to be listed
- **Get All Items**
Select this option and all alarm module events will be listed in the log
- **Erase Log**
Select this option and all alarm module events will be erased from the log
- **Export log to file**
Select this option and the alarm log can be exported to a chosen file. The following window will appear:

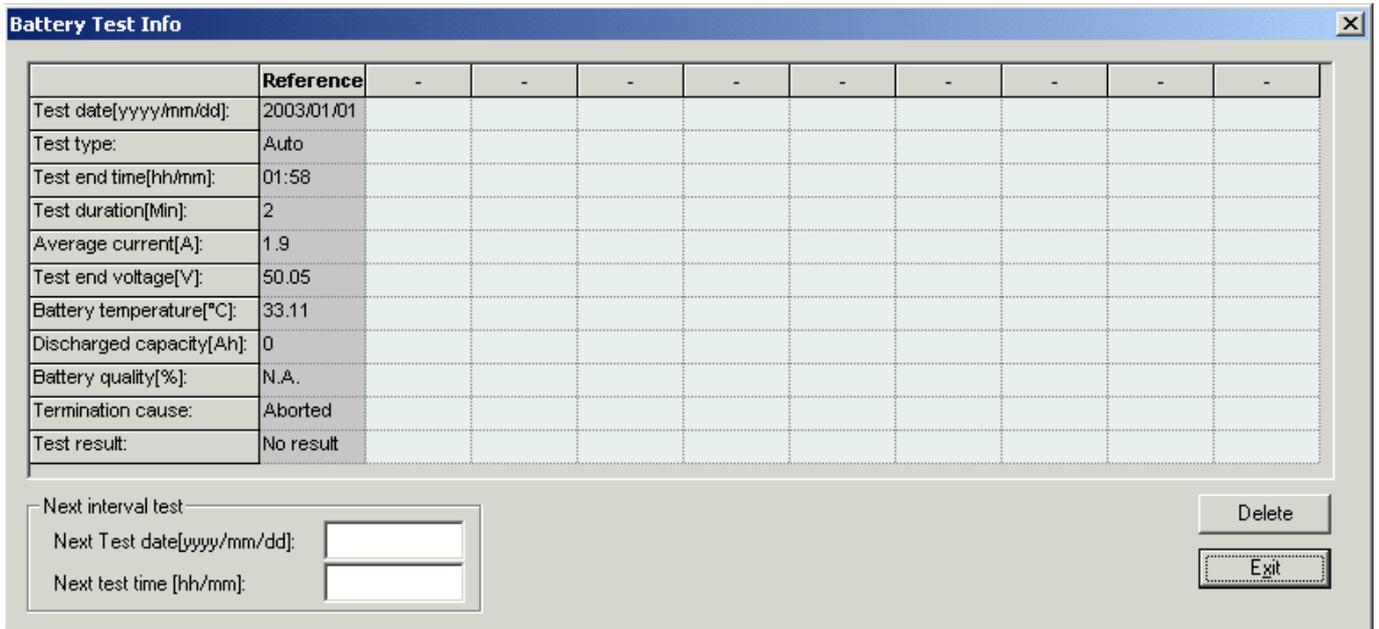


6.15 Battery Test Info



This option shows the results of the last ten battery tests, and when the next test is scheduled. The first test result is kept as a reference and will not be overwritten (when changing the battery installation date the user will be asked if the battery test results shall be deleted). When the eleventh test occurs, it will overwrite the result of the second test (graphically the results take a “shift left”). This screen is automatically displayed when a battery test is terminated for any reason (automatically or manually).

It is possible to copy and paste the results to a spreadsheet application for trend analysis /graphical presentation.



6.16 Clear Event Log



Selecting this option will clear the event log in the main screen interface.

6.17 Resynch System



Selecting this option will reset the communication. It might be necessary to perform such a resynchronisation, if the installation settings in the Flatpack MCU have been changed.

7 Range of Settings and Default Values

The Flatpack MCU alarm and setpoint limit values, and standard / factory default settings, are shown below.

Function	Default Value	Minimum Value	Maximum Value	User Setting	Notes
Battery Voltage	53.5V	43.0V	60.0V		
Boost Voltage	56.0V	52.0V	60.0V		
High Alarm 1	57.0V	50.0V	58.0V		
High Alarm 2	57.0V	50.0V	58.0V		
Low Alarm 1	50.0V	32.0V	54.0V		
Low Alarm 2	50.0V	32.0V	54.0V		
LVD1 Disconnect Point	43.0V	40.0V	50.0V		
LVD1 Reconnect Point	47.0V	40.0V	50.0V		
LVD1 Disconnect Delay	0 min	0 min	1800 min		
LVD2 Disconnect Point	43.0V	40.0V	50.0V		
LVD2 Reconnect Point	47.0V	40.0V	50.0V		
LVD2 Disconnect Delay	0 min	0 min	1800 min		
LVD3 Disconnect Point	43.0V	40.0V	50.0V		
LVD3 Reconnect Point	47.0V	40.0V	50.0V		
LVD3 Disconnect Delay	0 min	0 min	1800 min		
Alarm Delay	0 sec	0 sec	60 sec		
Low Temp	0°C	-35°C	20°C		
High Temp 1	30°C	5°C	80°C		
High Temp 2	40°C	5°C	80°C		
Capacity Alarm	0%	0%	100%		



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