Power System ~ Telecom-Industrial-Solar

always on

User's Guide

Smartpack2 Master Controller



Monitoring and Control Units

Powerpack, Flatpack2 & Minipack

DC Power Supply Systems

350020.013

SAFETY and ENVIRONMENTAL PRECAUTIONS

The **product warranty** becomes invalid if the following safety precautions are not followed during handling, installation, commissioning and general use/operation of *Eltek* DC power supply system.

General Precautions


Device Hazard

CAUTION: Even though the product incorporates protection circuitry and other safeguards, it can be **damaged, perform poorly or have a reduced lifetime** if it is exposed to **incorrect treatment** during transport, installation or service. Always handle the equipment using proper lifting techniques, do not roll, climb or drill hole in the cabinets or enclosures. G1


Electric Shock

WARNING: Opening the equipment may cause terminal injury — even if the mains AC supply is disconnected. Hazardous voltages may be present inside, as large capacitors may still be charged. G2

Environmental Precautions


Ventilated Hot Surface

CAUTION: To avoid damage the equipment, keep **objects clear of system ventilation inlets, outlets and system fans**, if any, ensuring the **airflow** through the units is **not obstructed**, and that the fans rotate freely. Use caution with rectifiers, as they can reach **extreme temperatures** under load and normal operation. E1


Current Surge Protection

WARNING: The installer/user is responsible for ensuring that the DC power system is not damaged by current surges, over-voltages, etc. caused by external transients, lightning, electrostatic discharge, etc. To avoid damage and obtain the expected system reliability, it is mandatory to always install SPDs in *Eltek's* power supply systems. Follow the instructions given in "*Guidelines for Lightning and Surge Protection*", doc. 2024623. E2


Humidity & Dust Protection

WARNING: The electronics in the power supply system are designed for indoor, clean environment. When installed in outdoor enclosures, it is important to keep the door closed during operation, and replace the filters on a regular basis. Indoor installations in dusty or humid areas require appropriate air filtering of the room, or filtering of the air entering the DC power system. Follow the instructions given in "*Generic Guidelines Environmental Protection.*", doc. 2038879. E3

Precautions during Installation


Qualified Personnel

CAUTION: **Read the user documentation carefully** before installing and using the equipment, as installation and operation is to be performed as described in it. Always tighten screws and bolts with the **torque values recommended** in the documentation. For safety reasons, the **commissioning and configuration of the equipment is only to be performed** by *Eltek*'s personnel or by authorized and qualified persons. I1


EMC, NEC/CEC Regard

CAUTION: This product is tested and verified according to international safety, environmental and EMC standards. Any **non-*Eltek* equipment** installed into this product after delivery might influence the performance and **could infringe the original approvals**. The **installer is responsible** for ensuring that the environmental properties of this product/ system do not deteriorate during installation, and that it is performed in accordance with applying regulations.
Installations in USA and Canada must comply with NEC/CEC requirements. I2


Device Hazard

CAUTION: Before you start the electrical installation, you must **always disconnect** all external AC supply fuses, as well as internal battery and load fuses/ breakers, if any. I3


Electric Shock

WARNING: For safety reasons (high leakage current / high touch current) you must always connect the AC earth wire (PE) to the terminals, before you connect the AC input cable(s).
The batteries, if any, represent a major energy hazard. To avoid short-circuit of battery poles, you must always remove metallic objects — uninsulated tools, rings, watches, etc. — from the vicinity of the batteries. I4


Electric Shock

WARNING: 60V and higher DC power systems are only to be installed in Restricted Access Locations (RAL). Access must be limited by use of tool, i.e. lock and key. I5

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1. Introduction

The advanced *Smartpack2 Master* controllers are developed for Eltek's *Flatpack2* DC power systems that implement the *Smartpack2*-based distributed control system.

About this Guide

This booklet provides users of *Smartpack2*-based DC power systems with the required information for operating the system using the *Smartpack2 Master*'s front panel. The booklet also describes the *Smartpack2 Master* controller's building blocks, external connections and technical specifications.

Read also the **generic and site specific documentation** for your DC power system.

For detailed functionality description, browse and search through the *Functionality Description* topic in *PowerSuite Online Help* or *CWUI Online Help*. Notice that you must **log in to access Online Help** (contact your Eltek representative)

System Diagram — *Flatpack2* Power System w/SP2

The generic *Smartpack2* (SP2) distributed control system — used in *Flatpack2* PS systems — monitors and controls the whole system, and consists of the *Smartpack2 Master* (SP2M) controller, the *Smartpack2 Basic* (SP2B) controller and the *I/O Monitor2* CAN node.

The *Smartpack2 Master* serves as the local user interface between you and the system. The system may also be configured via the Controller's Web-based User Interface (CWUI) on a standard web browser, and via the *PowerSuite* PC application. The *Smartpack2 Basic* monitors and controls the power system's internal wiring and supplies the CAN bus with power. The *I/O Monitor2* CAN node implements input and output signals.

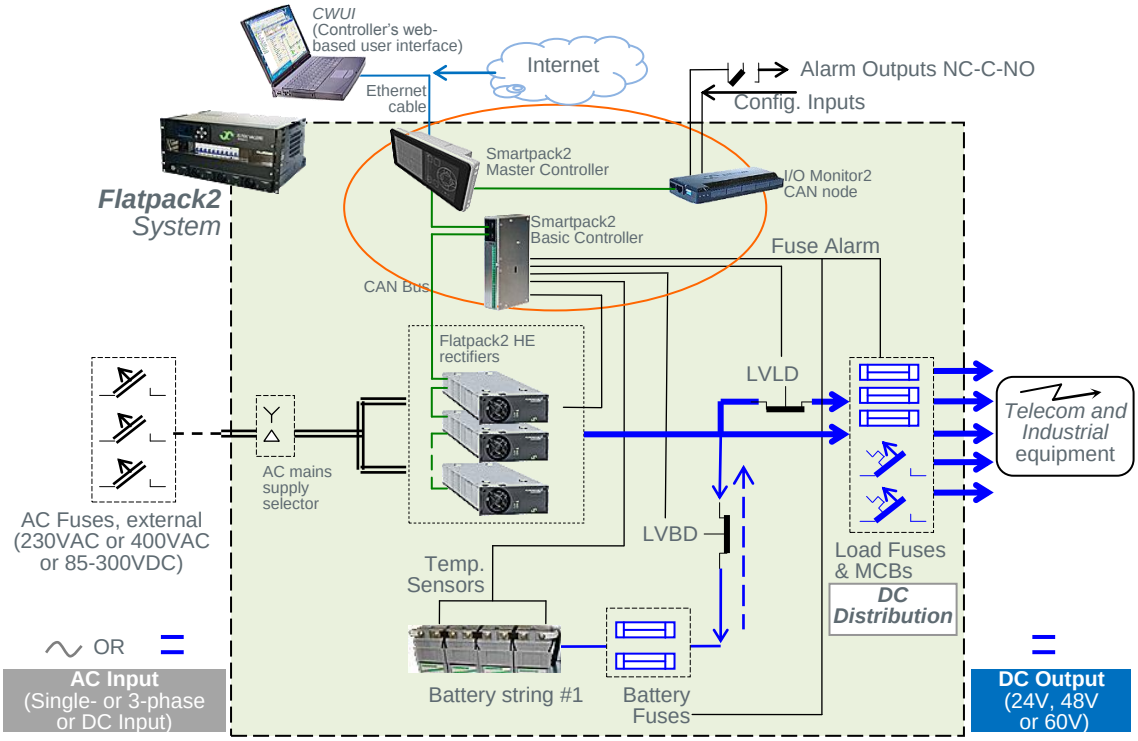


Figure 1 Typical Flatpack2 DC power system for telecom and industrial equipment, fed from external AC mains or DC supply. It consists of rectifiers in power shelves, master and basic controllers, DC distribution, etc.

2. The Smartpack2 Master Controller

The *Smartpack2 Master* controllers are powerful modules used as master controllers in the distributed control system of *Smartpack2*-based power supply systems. They serve as the local user interface between you and the power system.

The *Smartpack2 Master* controller is 2U high and 160mm wide, and it is mounted in the power system's front panel or door. The CAN bus is the only connection between the *Smartpack2 Master* and the *Smartpack2 Basic* controller, which provides great installation flexibility.



Key Features

A wide range of features are implemented in the *Smartpack2 Master* controller, as mentioned below:

- ✓ Graphical TFT high contrast, high resolution color display for easy navigation
- ✓ LEDs for local visual alarming (Major, Minor, Power ON)
- ✓ Ethernet for remote or local monitoring and control via WEB Browser
- ✓ Ethernet port for straight-through and crossover cables
- ✓ SNMP protocol with TRAP, SET and GET on Ethernet. Email of TRAP alarms
- ✓ Comprehensive logging
- ✓ Automatic battery monitoring and test
- ✓ Battery lifetime indication
- ✓ Battery used and remaining capacity (Ah or %) monitoring
- ✓ User defined alarm grouping (Boolean logic for grouped alarms)
- ✓ Uploading and downloading of firmware and configuration files with SD card
- ✓ SD card slot for downloading/uploading of logs and setup
- ✓ Comprehensive generator/hybrid/DC solar system control and monitoring features

Read also chapter "Technical Specifications", page 12, for more details.

Location of Connector, Communication Ports

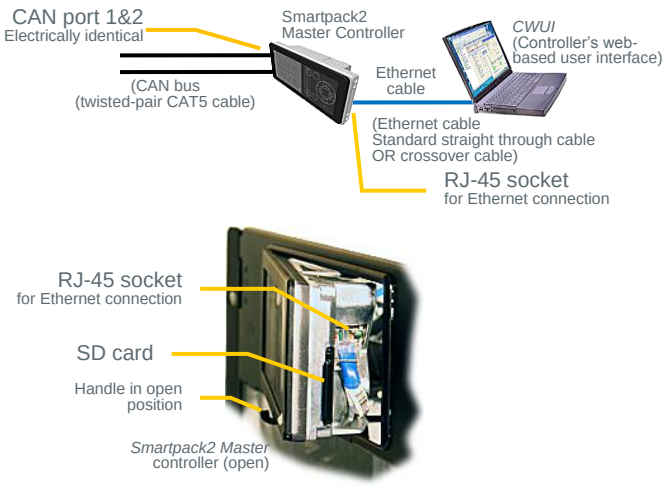


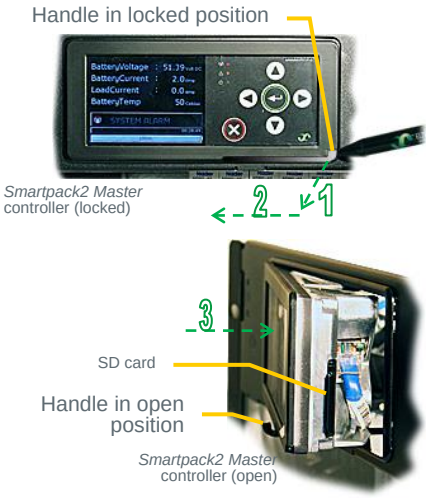
Figure 2 Location of CAN ports and Ethernet connector in the *Smartpack2 Master* controller

CAN port 1 and 2 are electrically identical, and are used to enable connection of the CAN bus incoming and outgoing CAT5 cables, or the RJ45 CAN bus termination plug.

Opening and Closing Smartpack2 Master Controller

Opening the controller's right side enables inserting an SD card and temporarily connecting an Ethernet cable.

1. To open it,
   pull the handle's knob slightly outwards (use your fingers or a pen) and
2. then **slide the handle to the left** (the controller's right side opens)
3. To close it,
   slide the handle to the right (the controller's right hand side closes, almost), then **push the controller's front inwards**, to close it completely



CAN Bus Termination

To ensure a correct bus communication and avoid data reflection, you must always **terminate the CAN bus with two 120Ω resistors**, one at each end of the line (60Ω bus impedance).

Smartpack2-based DC power systems are shipped from factory with the CAN bus already terminated with 120Ω resistors. The **CAN bus termination** is implemented with a special RJ45 plug with built-in 120Ω end-of-line resistor.

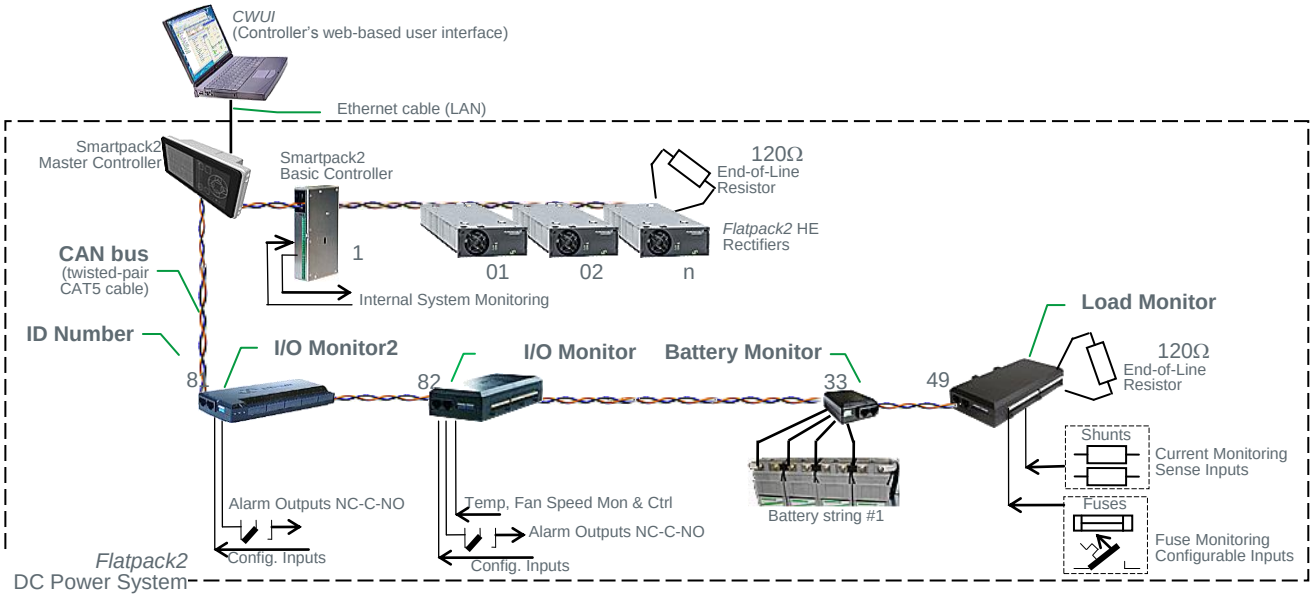


Figure 3 Example of CAN bus addressing and termination in a *Flatpack2* power system with *Smartpack2*-based control system and several monitors connected the CAN bus

When connecting **more CAN nodes to the bus**, you have to remove the CAN bus termination plug from one of the CAN bus ends, and plug it in one of the CAN ports on the last connected CAN node.

CAN Bus Cabling

In addition to the two dedicated wires for communication, the CAN bus multi-wire cable must integrate wires for the CAN power supply and other signals. In standard industrial environments, the CAN bus can use standard cabling without shielding or twisted pair wiring. If very low interference (EMI) is required, a CAT-5 twisted-pair cable is recommended.

Front Panel Operation

This chapter describes the *Smartpack2 Master* controller's keys and indicators, and how to operate the *Smartpack2*-based DC power system from the controller's front panel.



Figure 4 *Smartpack2 Master* controller's front keys and indicators

Graphical Display

The Graphical Color Display — 3.2" TFT 32k, QVGA 320x240 — is either in *Status Mode* (displays the system's status) or in *Menu Mode* (displays the menu structure).

The *Smartpack2 Master* controller has the following LED indications:

LED Indicator	*Illumination Status*	*Description*
Power	OFF	The controller has NO supply
	ON green	Supply healthy
	Flashing Green	Distributed Power Fault
Warning	OFF	No Warning
	ON amber	Warning (Minor alarm, non-critical alarm)
	Flashing amber	Communications Fault
Alarm	OFF	No Alarm
	ON red	Alarm (Major Alarm, critical alarm)
	Flashing red	SW Fault / Boot Loader Mode

Table 1 Description of the *Smartpack2 Master* controller's LED illumination status

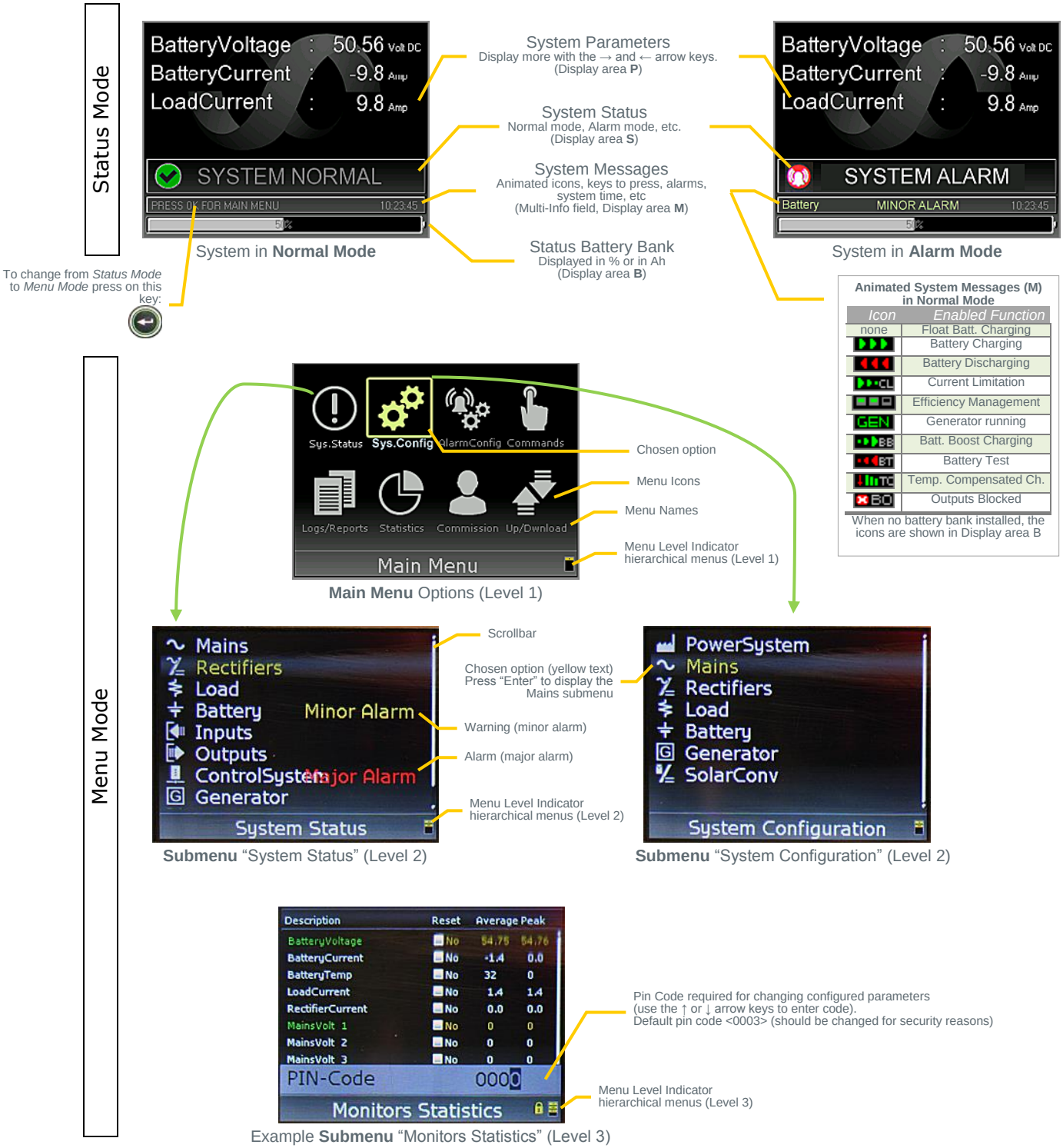
Front Keys

You can operate the power system navigating intuitively through the graphical menu structure via the following 6 front keys.

- Press on the key
  to change from *Status Mode* to *Menu Mode* and to select options, enter values
- Press the key
  to navigate to previous level and cancel options and values
- Press the or keys
  to navigate up- or downwards, point at options and increase and decrease values
- Press the or keys
  to navigate one page up- or downwards and point at options

Software Menus

The *Smartpack2*-based system's functionality is accessed via a network of software menus and submenus, enabling you to configure and control the whole power system from the controller's front panel. When browsing the menus, the Menu Level Indicator shows the menu level you are in. Editing parameters is password protected, (default pin code <0003> may be changed for security reasons). The display can be in *Status Mode* or in *Menu Mode*.



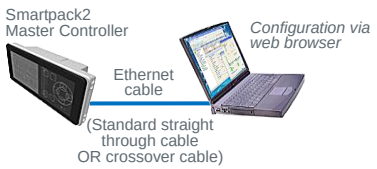
From a PC's web browser, or running the *PowerSuite* program, you can also access the complete system functionality, described in the programs' Help and in Online Help.

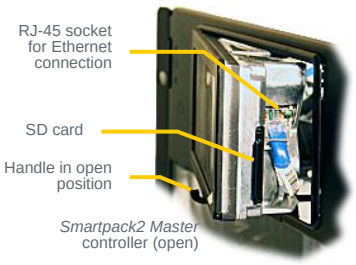
Controller Access — Via Stand-alone PC

You can access the *Smartpack2 Master* controller directly from a stand-alone computer, or via a Local Area Network (LAN) if available.

Each controller is shipped with a unique *Eltek* MAC address stored inside the controller and marked on the controller's label, and with the **fixed IP address <192.168.10.20>**.

Do following to access the controller:





1. **Start the "*Eltek Network Utility*"** (ENU) program
2. **Connect the computer to the controller;**
   check its MAC address is displayed
3. **Find the computer NIC's IP address**
   and subnet mask (network card)
   Tip:
   using DOS command IPCONFIG, in a Command Prompt window
   e.g. computer's IP address <169.254.52.132> Subnet mask <255.255.0.0>
4. **Change the controller's IP address**
   and Network Mask to be the same range as the computer's
   Tip:
   Using the ENU program,
   1. Select the controller,
   2. Click in the "Configuration" button
   3. Change
      from default <192.168.10.20> <0.0.0.0>
      to e.g. IP address <169.254.52.133> <255.255.0.0>,
      (Ping <169.254.52.133> first, to check that the address is unused)
   4. Click on the "Enable Static IP" button
5. **Access the controller**'s configuration pages
   in your web browser, e.g. clicking the "Web Interface" button in the ENU program
6. **Log in** with the <admin> account,
7. Change the controller's Device Name

After accessing the controller, you can configure and monitor the power system using a standard web browser or via the *PowerSuite* program. *PowerSuite's* newest version is always available on our FTP server. Contact your closest *Eltek* representative.

For detailed functionality description, browse and search through the *Functionality Description* topic in the *PowerSuite* programs' Help and in Online Help.

Technical Specifications

Control Features

Control System

- Output Voltage Measurement
- Load Current Calculation
- Energy Calculation
- Load/Battery Disconnect
- Real Time Clock with Battery Backup
- Stored Site Text/ID and Messages
- Position (long/lat) for auto placement
- Test of Relay Outputs
- Alarm grouping of events for relay outputs

Battery

- Battery Current Measurement
- Battery Temperature Measurement
- Battery Testing (acc. to discharge table or set time limit)
- Setup of Battery Data/Table
- Battery Capacity Indication
- Battery Boost Charging
  - Auto
  - Ah discharge or voltage threshold
  - Interval or Manual
- Temperature Compensated Charging
- Charge Current Limitation
- Battery Low Voltage Disconnect
  - Temperature dependent (optional)
  - Mains independent (optional)

Rectifier

- Available information about each rectifier, e.g. serial number, version, internal temperature
- Individual Rectifier Current Measurement
- Individual Rectifier Input Voltage
- Efficiency Management
- Emergency Voltage
- Startup delay
- Detailed internal alarms summary

Generator

- On/Off control for cyclic charging and fuel reduction
- Start-up delay of power system
- Fuel consumption logging and alarming based on tank level measurement
- Discharge cycle counter/Generator run hour logging
- DoD [%] logging w/time stamp

Alarms / Events available

Alarms can be set up with monitoring of minor and major levels. Hysteresis and time delay is user configurable. All average and peak levels on analogue values are auto logged in Event log

Power & Control System

- AC Mains Low (2-level)
- AC Phase Voltage x3 (2-level)
- "Digital" Inputs (programmable descriptions)
- Events trigger by inputs

Service mode (block relays), Generator running, Lower charge current limit, Battery test, Boost inhibit, Emergency low voltage , Clear manual reset alarms.

Load

- Load Disconnect
  -Voltage or Timer (from mains failure) based
  -Mains independent (optional)
- Load Fuse
- Load Current

Battery

- Battery Voltage (4-level, optional 8-level)
- Battery Temperature (2-level)
- Battery Used Capacity (2-level) [Ah or %]
- Battery Remaining Capacity (2-level) [Ah or %]
- Battery Fuse
- Symmetry Failure (2-level)
- -Only with BM Can Node
- Battery Quality after test (2-level)
- Battery Current (4-level)
- Battery Life Time (2-level) [from temperature log]

Rectifier

- Rectifier Failure (2-level)
- Rectifier Capacity (2-level)
- Rectifier Current (2-level)
- Rectifier Avg. Temperature (2-level)
- Rectifier Current Share (2-level)

Specifications – Master

Power Consumption	Max 4.5W
MTBF	> 1 300 000 hours Telcordia SR-332 Issue I, method III (a) ($T_{ambient}$: 25°C)
Display	32k colour TFT – QVGA (320x240)
Ethernet Port	o 10/100 BASE-T o HP Auto MDI/MDI-X
Removable media	SD Card
SNMP	v1, v2c, v3 (pending) GET, SET & TRAP
Web	Webpower; XHTML 1, java script, SSL
Networking	SMTP Client and NTP Client.
Event log	10 500 time stamped events
Dimensions (WxHxD)	156 x 72 x 38mm 6,4 x 3 x 1,6"

Ordering Information

Part no.	Description
242100.500	Smartpack2 Master Controller
242100.501	Smartpack2 Basic Controller
242100.502	I/O Monitor2 CAN node (type 2 G2)

Specifications are subject to change without notice

242100.50X.DS3– v4

Firmware Upgrade Controller

Upgrade of the *Smartpack2 Master* controller's firmware, while the system is live, is performed either via the controller's Ethernet port -- using the "*Eltek Network Utility*" program (ENU) — or via the controller's SD card.

Upgrading the firmware does not delete or change any of the configuration and calibration values stored in the controllers.

You can upgrade the *Smartpack2 Master* controller's firmware using one of the following two methods.

Firmware Upgrade from the SD Card

The *Smartpack2 Master* controller's firmware can be upgraded via the controller's SD card. Do following:

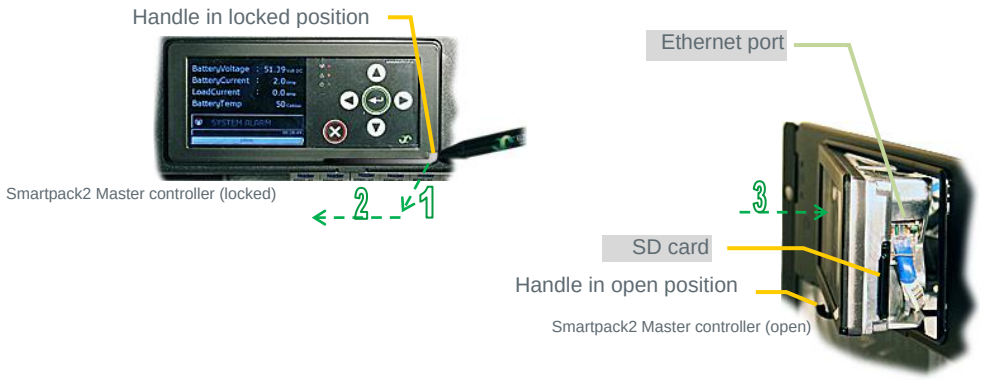


Figure 5 Opening the *Smartpack2 Master* controller

NOTICE:
All firmware upgrade and configuration files stored in the SC card must have specific file names.

- **Open the controller**
  using your fingers or a pen, see steps (1), (2) above or chapter "Opening and Closing Smartpack2 Master Controller", on page 7
- **Insert an SD card**
  containing the correct controller's firmware source file, e.g. f <SP2MAST.BIN> in the *Smartpack2 Master* controller.
  Read chapter "SD Card Storage - Overview Firmware Files (Binary Format)", on page 21
- Select "**Up/Download > Software Upgrade**"
  via the *Smartpack2 Master*'s front keypad; read chapter "8 - ", page 20

  The firmware file <SP2MAST.BIN> will be automatically downloaded to the *Smartpack2 Master* controller

Device Hazard

WARNING:
Uploading the firmware may take a long time, e.g. 35 minutes. Do not power down the system or controller during firmware upgrade, as it may corrupt the program memory and make the unit useless!

Firmware Upgrade from a Computer

The *Smartpack2 Master* controller can be upgraded using a personal computer to run the "*Eltek Network Utility*" program (ENU), to transfer the firmware file to the controller.

Do following:

- **Open the controller**
  using your fingers or a pen, see steps (1), (2) in the figure on page 13 or chapter "Opening and Closing Smartpack2 Master Controller", on page 7
- **Connect a PC to the *Smartpack2 Master* controller**
  plugging one end of a standard Ethernet cable to the PC and the other end to the controller's Ehternet port
- **Start the "*Eltek Network Utility*" program**, in the PC
- **Select the *Smartpack2 Master* controller**;
  using the ENU program, check correct MAC and IP address
  and the correct firmware file <SP2MAST_xx.xx.APP.s19>
- Click on the "**Update Software**" button
  in the ENU program

For detailed functionality description, browse and search through the *Functionality Description* topic in the *PowerSuite* programs' Help and in Online Help.

Overview LAN Devices and Firmware Files (PC - S19 Format)

The "*Eltek Network Utility*" program (ENU) will transfer the specific firmware file (s19-format) from a LAN connected computer to the device (or hardware platform).

LAN Device	File Name (examples)	File Type
Smartpack S	Smartpack-S_(part #)_(version #)_APP.s19	Firmware upgrade Controller & embedded Web Adapter
Smartpack2 Master	SmartPack2_Master_405006.009_1.3_APP.s19	Firmware upgrade Controller & embedded Web Adapter
Compack	ComPack_xx.xx_APP.s19	Firmware upgrade Controller & embedded Web Adapter
Smartpack (Part 242100.113)	Rev4.2_SB70Webpower_APP.s19	Firmware upgrade embedded Web Adapter
Smartpack (Part 242100.118, HW v2)	Webpower_MCF5208_43_APP.s19	Firmware upgrade embedded Web Adapter
Smartpack (Part 242100.118, HW v3)	Webpower_MCF5235_43_APP.s19	Firmware upgrade embedded Web Adapter
WebPower Adapter SB72	Rev4.2_SB72Webpower_APP.s19	Firmware upgrade Web Adapter (stand-alone with *Smartpack*)
WebPower Adapter SB72	Rev2.0_SB72Webpower_APP.s19	Firmware upgrade Web Adapter (stand-alone with *Aeon Gold*)
WebPower Adapter SB72-512	Webpower_SB72-512_20_APP.s19	Firmware upgrade Web Adapter (stand-alone with *Aeon Gold*)
WebPower Adapter SB72	Rev2.0_SB72Webpower_APP.s19	Firmware upgrade Web Adapter (stand-alone with *MCU*)
WebPower Adapter SB72-512	Webpower_SB72-512_20_APP.s19	Firmware upgrade Web Adapter (stand-alone with *MCU*)

The "xx.xx" refers to the firmware file's version number.

3. About Power System Configuration

The *Eltek* DC power supply system's functionality represents a vast **set of functions, characteristics or capabilities** implemented in the hardware and software of the controllers, control units and nodes connected to the system's CAN bus.

You can use following types of **user interfaces** to access the functions and parameters:

- **The controllers' front panel keypad**
  using software menus and submenu options
- **A standard web browser**
  to access the *CWUI* firmware (Controller Web-based User Interface), a platform-independent user interface built-in the controllers
- **The *PowerSuite* program**
  A PC application run on computers using MS Windows operating systems

Logical Groups or Menu Options

All the mentioned functions, characteristics and parameters are **fully configurable**, and are organized in following ***system-oriented logical groups*** (displayed only when the hardware is connected and activated):

- Power System
- Mains
- Generator
- Rectifiers
- Battery
- Load
- Control System
- Solar
- Wind
- Converter

Also, these functions, characteristics and parameters are presented in following ***task-oriented*** *logical groups*:

1. System Status
2. System Configuration
3. Alarm Configuration
4. Commands
5. Logs and Reports
6. Statistics
7. Commissioning
8. Up/Download

For detailed functionality description, browse and search through the *Functionality Description* topic in the *PowerSuite* program's Help or in Online Help.

1 - System Status options

Configuration **changes are not allowed** at System Status level. To make changes you have to access the System Configuration options, the Alarm Configuration options or similar.

This logical group presents the important system parameters, which indicate the status of the power system, such as number of battery banks, voltage, current, temperatures, fuse status, inputs and outputs status, and many similar parameters.

The presented parameters are organized in *system-oriented groups*: Power System, Mains, Generator, Rectifier, etc.

Refer to these topics (Mains, Rectifiers, etc.) for more information about the System Status parameters.

2 - System Configuration options

The options in this logical group let you change all the relevant system parameters, values and characteristics, such as temperature scales, system polarity (as represented on the display), language, system voltages, rectifiers and battery related values, and many similar parameters.

Configuration **changes are allowed** at this level, using a Pin-Code.

> NOTICE:
> The default Service Access Level password or Pin-Code is <0003>, which may be changed for security reasons.

The parameters are organized in *system-oriented groups*: Power System, Mains, Generator, Rectifier, etc.

Refer to these topics (Power System, Mains, Rectifiers, etc.) for more information about the System Configuration parameters.

3 - Alarm Configuration options

All the power system's **alarms are fully configurable**, and are implemented using Alarm Monitors (software modules). These software modules monitor input signals and logical states, and raise alarms when the signals reach certain limits or values.

Read more about "Alarm Monitors" on page 23.

The options in this logical group (the Alarm Configuration options) let you configure all the limits, values, etc. for the system's Alarm Monitors.

Configuration **changes are allowed** at this level, using a Pin-Code.

> NOTICE:
> The default Service Access Level password or Pin-Code is <0003>, which may be changed for security reasons.

The available Alarm Monitors are organized in *system-oriented groups*: Mains, Generator, Rectifier, Load, etc.

Refer to these topics (Mains, Rectifiers, etc.) for more information about the available Alarm Monitors parameters.

Read also the topic "Typical Parameters for Alarm Monitors" on page 26.

4 - Commands options

The options in this logical group let you issue or activate specific commands, such as resetting manual alarms, deleting the event log, starting battery tests, etc.

Issuing **commands is allowed** at this level, using a Pin-Code.

> NOTICE:
> The default Service Access Level password or Pin-Code is <0003>, which may be changed for security reasons.

The commands are organized in following groups:

- **System Commands**
- **Battery Commands**
- **Outputs Test**
  Read about "Output Test Commands" on page 31

5 - Logs and Reports options

The options in this logical group collect and present the system log, battery log, report of active alarms, etc.

The logs and reports are organized in following groups:

- Active Alarm Log
- Event Log
- Battery Test Log
- Inventory Report

Active Alarms Log

You can browse through the stored system alarm messages (or alarm log). The controller's alarm log may store up to 1000 chronological events. Each log entry contains event text, event action, time and date. When the log is full, the oldest value is overwritten. The log is stored in EEPROM.

Example of alarm log in *Smartpack2 Master* Controller's submenu:

Logs/Report > **Active Alarms**

#	Description	Value	Limit	Alarm Group	Output	Note
	BatteryTemp 1.1	42	30	----	---	
	SymmVolt 1.1	12,91	1,50	Alarm Group 15	----	
	RectifierError	1	1	Minor Alarm	-----	

Event Log

The Event Log is a record of system related events automatically registered by the system controller.

Example of Event Log in *Smartpack2 Master* Controller's submenu:

Logs/Report > **Event Log**

#	Date and Time	Description	Event	Note
	yyyy.mm.dd hh:mm:ss	RectifierError	MinorAl:On	
	yyyy.mm.dd hh:mm:ss	SymmVolt 1.4	MajorAl:On	
	yyyy.mm.dd hh:mm:ss	LVD close	Info:On	
	yyyy.mm.dd hh:mm:ss	Door alarm	MajorAl:Off	
	yyyy.mm.dd hh:mm:ss	OutdoorTemp 81.1	Info:Off	

You can also save the Even Log to a storage media -- read about "8 - Up/Download options (Data Storage Device)" on page 20 – or use CWUI (Controller Web-based User Interface) or *PowerSuite* to delete, print and save the log to a file in your computer.

Battery Test Log

The Battery Test Log is displayed in a results table; each row of data represents a battery test. Also, the battery quality, calculated by completed battery tests, and other test parameters are displayed.

Example of Battery Test Log table displayed in *Smartpack S* controller's submenu:

Logs/Report > **Battery Test Log**

#	StartTime	Durat.	Typ	Descr	Amp	Q%	EndV	Note
	09:58	34	Manual	----------	-68	70%	45.49	----------

Using the *CWUI* (Controller Web-based User Interface) or *PowerSuite* you can also display the test results for a battery test in a line graph.

Inventory Report

The Inventory Report presents information that describes the power system, the site's name , serial number, installation and service dates, software name, etc.

Example of Inventory Report table in *Smartpack S* controller's submenu:

Logs/Report > **Inventory Report**

#	Description	Note
	Company	
	Site	
	Model	
	Install Date	
	Serial N	
	Service Date	
	Responsible	
	Message 1	
	Message 2	
	(Installed HW and SW info, part #, serial #, version #, etc.)	

6 - Statistics options

This logical group collects and presents relevant system data and calculated statistics, such as average results, peak values, etc.

Example of the Statistics table available in *Smartpack S* controller's submenu:

Statistics

#	Description	Reset	Average	Peak	Note
	BatteryVoltage	☐ No	52,48	52,61	
	BatteryCurrent	☐ No	-35	0	
	Battery Temp	☐ No	41	0	
	Load Current	☐ No	35	50	
	Rectifier Current	☐ No	75	120	
	Mains Volt 1	☐ No	225	235	

7 - Commissioning options

This logical group presents a generic description of the steps required to carry out commissioning tasks of the power system.

Refer also to the system's user documentation, and to the Commissioning Procedure pull-out list in the system's quick start guide.

8 - Up/Download options (Data Storage Device)

The options in this logical group let you upload firmware from the controller's data storage device to connected controllers and control units, as well as download or save system related logs, etc. to the data storage device.

NOTICE:
The *Smartpack2 Master* controller uses an external SD card as data storage device, and the *Smartpack S* controller uses embedded Flash Memory.

In addition to firmware, this group's options offer you the possibility of uploading and saving system configuration files to the controller's data storage device.

Uploading and downloading **is allowed** at this level, using the Pin-Code for the **Service Access Level**.

NOTICE:
Using the *CWUI* (Controller Web-based User Interface) or *PowerSuite* you can also up/download to other storage media (e.g. computer hard discs)

The Up- and Download options are organized in following groups:

- **Save Event Log**
  (system related log)
  A command that saves to the controller's data storage device a log of power system events automatically registered by the system controller.
  Read about "Logs and Reports options" on page 18

- **Save Data Log**
  (control unit related log)
  A command that saves to the controller's data storage device a log of key system data (voltages, current and temperature values) registered by the system controllers, or by other connected control units (e.g. I/O Monitor, Mains Monitor)

- **Save Energy Log**
  (system related log)
  A command that saves to the controller's data storage device a log of the power system's energy usage, (Wh).

- **Save /Load Config**
  A command that saves to the controller's data storage device a binary formatted file <UNIT_nn.HEX> which contains the controller's or any connected CAN unit's System Configuration, with all the specific parameters and settings.
  Also, you can upload a similar, specific System Configuration file <UNIT_nn.HEX> to the controller or to any connected CAN unit, e.g. for

automatic configuration of specific functions

The “nn” in the file name specifies the unit’s CAN bus address.

- **Software Upgrade**
  which offers you to upgrade the firmware in connected controllers and control units, by uploading files stored in the controller’s data storage device.
  Read chapter “SD Card Storage - Overview Firmware Files (Binary Format)”, page 21

  Example of some of the available options in controller’s submenu:

  Up/Download > Software Upgrade

#	Description	SW Info		Note
	Compack 11	405006.009	0A.M	
	Smartpack1	402073.009	3.05E	
	I/O Unit 1	402088.009	3.01	

SD Card Storage - Overview Firmware Files (Binary Format)

You can store binary files in the *Smartpack2 Master* controller’s SD card (data storage device) and use them for firmware upgrading of controllers and control units, as well as for exporting and importing configuration files.

> NOTICE:
> All firmware upgrade and configuration files stored in the SC card must have specific file names.

The SD card uses the 8.3 file name format. Before storing the files on the SD card, you must rename them, so that they conform to the specific file names described below.

For example, if you receive the file “SmartPack2_Basic_405007.009_V1.1.mhx” to upgrade your *Smartpack2 Basic* controller firmware to version 1.1, you must first rename the file to exactly “SP2BAS.MHX”, then copy the file to the SD card and finally insert the SD card in the *Smartpack2 Master* controller to start the firmware upgrade process.

#	CAN Node	File Name	File Type	CAN Node Type
	Smartpack2 Master	SP2MAST.BIN	Firmware upgrade	Controller
	Smartpack2 Basic	SP2BAS.MHX	Firmware upgrade	Controller
	Smartpack2 Basic Industrial	SP2BASIN.S19	Firmware upgrade	Controller
	Smartpack	SP.MHX	Firmware upgrade	Controller
	Smartnode	SMARTNOD.MHX	Firmware upgrade	Control Unit
	Battery Monitor	BATTMON.HEX	Firmware upgrade	Control Unit
	Load Monitor	LOADMON.HEX	Firmware upgrade	Control Unit
	AC Mains Monitor	MAINSMON.HEX	Firmware upgrade	Control Unit
	I/O Monitor	IO_UNIT.HEX	Firmware upgrade	Control Units: I/O Monitor, Monitor2 & Monitor3
	Flexi-Monitor	FLEXIMON.S19	Firmware upgrade	Control Unit
	Any node	UNIT_aa.HEX	Configuration File (Save/Load)	All types

The “aa” refers to the CAN bus address or ID number.
E.g. “UNIT_82.HEX” could be the configuration file for I/O Monitor with CAN bus address 82.

When upgrading the firmware of controllers and control units — if several units of the same type are connected to the CAN bus — the *Smartpack2 Master* controller will request you to specify the CAN bus ID number of the unit to upgrade.

Flash Memory Storage

You can store files in the *Smartpack S* controller's embedded Flash Memory (data storage device) and use them for firmware upgrading of controllers and control units, as well as for storage of logs, language codes, and for exporting & importing configuration files.

When upgrading the firmware of controllers and control units — if several units of the same type are connected to the CAN bus — the *Smartpack S* controller will request you to specify the CAN bus ID number of the unit to upgrade.

FTP Client

The files stored in the controller's Flash memory are also accessible from a computer, via the FTP client embedded in the controller's web-based user interface.

NOTICE:
You must use the "Admin" log in account, to be able to use the embedded FTP client.

An external FTP client, such as e.g. "FileZilla" (freeware) — running on a computer connected to the controller's Ethernet port — can also be used to access the files on the controller's embedded Flash memory

WARNING:
It is not recommended to use the FTP client embedded in Windows Explorer.

WARNING:
Before uploading files to the Flash memory (4MB), check that there is enough storage space. Also, consider deleting files that are no longer necessary.

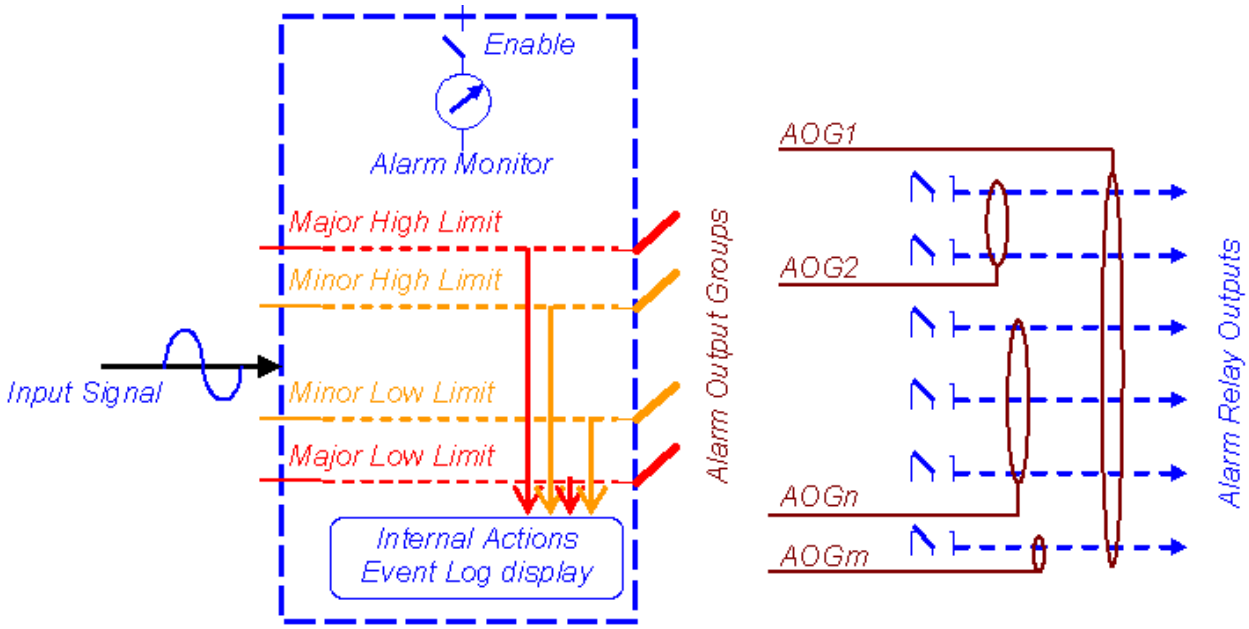
Alarm Monitors

Alarm monitors are software modules used by the system controller to **measure system internal and external input signals or logical states**.

When an alarm monitor is enabled, it **compares the measured parameter with the preprogramed values or limits**, and raises an alarm in the event of the measured parameter reaching one of the limits.

When this event occurs, the alarm monitor stores the event in the Event Log, initiates an internal action and activates an output group.

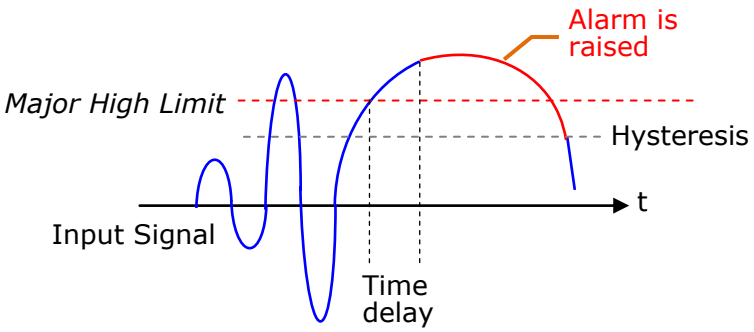
Internal preprogrammed actions may be battery current limiting, boost inhibiting or similar. The generated alarm **activates a preprogrammed group of relay outputs** (an alarm output group, AOG).



The alarm monitors' most commonly used configuration parameters are: (Refer to the "Alarm Monitor dialog boxes" topic in *PowerSuite Online Help*)

- **Type of input**
  The measured Input Signal can be
  analogue (e.g. a voltage),
  logical (e.g. an open or closed contact) and
  numeric (e.g. number of rectifiers, % remaining capacity, etc.)
- **Alarm Monitor activation**
  You have to *Enable* the alarm monitor so that it functions
- **Type of alarm reset**
  You can select whether the alarm generated by monitor can be *reset manually*, or automatically (when the event that caused the alarm is no longer true)
- **Hysteresis and Time delay**
  When the input signal has reached a certain limit or criteria for a *certain period of time*, the alarm monitor raises an alarm. This period of time is called *Time*

delay.
You can also enter a *hysteresis* value to prevent the alarm monitor from unwanted rapid "switching", when the input signal is around the limit or criteria.
.



For example: A *MajorHigh* Limit is set to 57.00VDC, with a Hysteresis of 0.10VDC and a Time delay of 5 seconds.
An input signal of 57.08VDC lasting 3 seconds will not cause the alarm monitor to raise an alarm.
The alarm will only be generated when the input signal is over 57.00VDC for a longer period of time than 5 seconds (the *Time delay*).
The alarm will only be switched off when the input signal is lower than 56.90VDC (the *hysteresis*).

- **Monitored Limits and Events**
  Analogue and numeric alarm monitors compare the measured input with from *one to four user-defined values or limits*; two above normal value (*Major High* and *Minor High*) and two below normal value (*Minor Low* and *Major Low*).
  The type and number of internal actions (*events*) are usually defined from factory.
  Logical alarm monitors only compare the measured input signal with a logical state (normally open or closed). The user can define the alarm group that the monitor will activate when the input signal is not in the normal state.

- **Alarm output groups**
  For each value or limit, you can *select which alarm output group* (AOG) the alarm monitor will activate, in the event the measured input reaches the specific limit

- **Measured Average Value**
  The alarm monitor stores all input signal measurements and performs average calculations every minute. Then, the monitor continuously displays the *input signal average value*, and the period of time the input signal has been measured. You can restart the monitor's average calculations.

- **Measured Peak Value**
  The alarm monitor stores all input signal measurements. Then, the monitor continuously displays the *input signal peak value*, since the measurements started. You can restart the monitor's peak value measurements.

In addition, you can configure the alarm monitors with a description of the alarm monitor and other configuration parameters.

Read also the "Alarm Monitor dialog boxes" topic in *PowerSuite Online Help*.

Types of Alarm Monitors

The power system's controller uses following types of alarm monitors, determined by the monitor's type of input signal:

- ***Logical Alarm Monitors*** (L1)
  (monitor logical states such as Open/Closed or Yes/No)
- ***Numeric Alarm Monitors*** (N1, N2%)
  (monitor numeric values such as the number of rectifiers, errors, the % battery capacity, etc)
- ***Analogue Alarm Monitors*** (A2, A4)
  (monitor analogue values such as voltage, current, etc)
- ***Special Alarm Monitors*** (LVD)
  (monitor the battery voltage and controls the LVD contactors)

Analogue and numerical alarm monitors compare the measured input with one to four user-defined values or limits; two above normal value (*Major High* and *Minor High*) and two below normal value (*Minor Low* and *Major Low*).

Logical alarm monitors only compare the measured input signal with a logical state (normally open or close). The user can define the type of event the monitor activates when the input signal is not in the normal state.

Using *PowerSuite* or the controller's web-based interface (CWUI), you can change the default alarm monitor's name (Description). This is useful for alarm monitors of the type "ProgInput X.Y", but you should be careful changing the name of other system alarm monitors.

Read also the "Alarm Monitor dialog boxes" topic in *PowerSuite Online Help*.

Typical Parameters for Alarm Monitors

The power system's controller uses following types of alarm monitors, determined by the monitor's type of input signal:

- *Logical Alarm Monitors* (L1)
- *Numeric Alarm Monitors* (N1, N2%)
- *Analogue Alarm Monitors* (A2, A4)
- *Special Alarm Monitors* (LVD)

The examples below show typical configuration parameters for these alarm monitors.

Parameters with "(x)" references in the Note column are described in more detail at the end of this chapter.

Parameters for Logical Alarm Monitors (L1)

Example to monitor logical states such as Open/Closed or Yes/No.

#	Description	Value	Unit/Label	Note
	Monitor – Enable/Disable?	☐	Enable	Activates or deactivates the alarm monitor
	Manual Reset	Disabled		Or "All Levels" or "MajorHigh Only" (a)
	Hysteresis	000		(not applicable)
	TimeDelay	7	Seconds	Selects among delay time options (b)
	MinorHigh AlarmGroup	Major Alarm		Selects the alarm group to activate

Parameters for Numerical Alarm Monitors (N1)

Example to monitor numeric values such as the number of rectifiers, errors, etc.

#	Description	Value	Unit/Label	Note
	Monitor – Enable/Disable?	☐	Enable	Activates or deactivates the alarm monitor
	Manual Reset	Disabled		Or "All Levels" or "MajorHigh Only" (a)
	Hysteresis	0000	Units	(not applicable)
	TimeDelay	2	Seconds	Selects among delay time options (b)
	MajorHigh AlarmLevel	001	Units	Upper limit
	MajorHigh AlarmGroup	Major Alarm		Selects the alarm group to activate
	MinorHigh AlarmLevel	001	Units	Lower limit
	MinorHigh AlarmGroup	Minor Alarm		Selects the alarm group to activate

Parameters for Numerical Alarm Monitors (N2%)

Another example to monitor numeric values such as the percent of battery capacity, etc.

#	Description	Value	Unit/Label	Note
	Monitor – Enable/Disable?	☐	Enable	Activates or deactivates the alarm monitor
	Manual Reset	Disabled		Or "All Levels" or "MajorHigh Only" (a)
	Hysteresis	2	%	(b)
	TimeDelay	10	Seconds	Selects among delay time options (b)
	MajorHigh AlarmLevel	95	%	Upper limit
	MajorHigh AlarmGroup	Major Alarm		Selects the alarm group to activate
	MinorHigh AlarmLevel	80	%	Lower limit
	MinorHigh AlarmGroup	Minor Alarm		Selects the alarm group to activate

Parameters for Analogue Alarm Monitors (A2)

Example to monitor analogue values such as voltage, current, etc with 2 limits.

#	Description	Value	Unit/Label	Note
	Monitor – Enable/Disable?	☐	Enable	Activates or deactivates the alarm monitor
	Manual Reset	Disabled		Or “All Levels” or “MajorHigh Only” (a)
	Hysteresis	100	Amp	(b)
	TimeDelay	5	Seconds	Selects among delay time options (b)
	MajorHigh AlarmLevel	5000	Amp	Upper limit
	MajorHigh AlarmGroup	Major Alarm		Selects the alarm group to activate
	MinorHigh AlarmLevel	4000	Amp	Lower limit
	MinorHigh AlarmGroup	Minor Alarm		Selects the alarm group to activate

Parameters for Analogue Alarm Monitors (A4)

Example to monitor analogue values such as voltage, current, etc with 4 limits.

#	Description	Value	Unit/Label	Note
	Monitor – Enable/Disable?	☐	Enable	Activates or deactivates the alarm monitor
	Manual Reset	Disabled		Or “All Levels” or “MajorHigh Only” (a)
	Hysteresis	10	Volt AC	(b)
	TimeDelay	7	Seconds	Selects among delay time options (b)
	MajorHigh AlarmLevel	280	Volt AC	Major High upper limit
	MajorHigh AlarmGroup	Mains Alarm		Selects the alarm group to activate
	MinorHigh AlarmLevel	260	Volt AC	Minor High upper limit
	MinorHigh AlarmGroup	Mains Alarm		Selects the alarm group to activate
	MinorLow AlarmLevel	100	Volt AC	Minor Low lower limit
	MinorLow AlarmGroup	Mains Alarm		Selects the alarm group to activate
	MajorLow AlarmLevel	80	Volt AC	Major Low lower limit
	MajorLow AlarmGroup	Mains Alarm		Selects the alarm group to activate

Parameters for Special Alarm Monitors (LVD)

Example to monitor the battery voltage and control the LVD contactors.

#	Description	Value	Unit/Label	Note
	Monitor – Enable/Disable?	☐	Enable	Activates or deactivates the alarm monitor
	MainsIndependent Enable/Disable?	☐	Enable	(c)
	Temp. Dependant Enable/Disable?	☐	Enable	(d)
	Disconnect Voltage [V]	43,00		(e)
	Reconnect Voltage [V]	48,00		(f)
	Delay After Disconnect [seconds]	000		Selects among delay time options (g)
	AlarmGroup	LVBD		
				Selects the alarm group to activate
				Minor Low lower limit
				Selects the alarm group to activate
				Major Low lower limit
				Selects the alarm group to activate

The LVD alarm monitors “observe” that the battery voltage (input signal) is within limits, otherwise they activate the LVD contactors (alarm group).

(a) **Manual Reset**
The DC power system can be configured with *automatic* or *manual* alarm reset. When *Manual Alarm Reset* is enabled -- and the alarm condition no longer exists -- the operator **must reset the alarm manually**, via the power systems user interface (web GUI or controller's front keys).
When the Manual Alarm Reset is disabled, then the *Automatic Alarm Reset* is enabled (default). In this case, when an alarm condition no longer exists, the **main controller will automatically reset the alarm**, by deactivating the alarm lamps and relays to indicate that normal operation is established.

(b) **Hysteresis and Time Delay**
Read also topic "Alarm Monitors" on page 23

(c) **Mains Independent**
Check this option if you want that the LVD alarm monitor will reconnect the LVD contactor when the rectifier system output voltage reaches the Reconnect Voltage limit, regardless whether Mains is ON or OFF. For example, this is possible using an additional primary supply.
Uncheck this option (Mains dependent) if you want that the LVD alarm monitor will NOT reconnect the LVD contactor until Mains is ON again.

(d) **Temperature Dependent**
Used with LVD contactors that disconnect the battery bank (LVBD). Check this option if you want that the LVD alarm monitor will reconnect the LVBD contactor when the battery temperature is lower than the temperature limit configured in the "BatteryTemp" alarm monitor.

(e) **Disconnect Voltage**
Enter a numeric value for the battery voltage drop-down limit. When -- after a Mains failure -- the battery voltage gradually drops down to this limit; then the alarm monitor raises the alarm and trips the LVD contactor.

(f) **Reconnect Voltage**
Enter a numeric value for the battery voltage reconnection limit. When the Mains supply is ON again, the rectifier system output voltage increases to this limit; then the alarm monitor will reconnect the LVD contactor.

(g) **Delay Time after Disconnect**
Enter the Time delay or number of seconds the LVD contactor has to be tripped or disconnected, before the alarm monitor is allowed to reconnect the LVD contactor

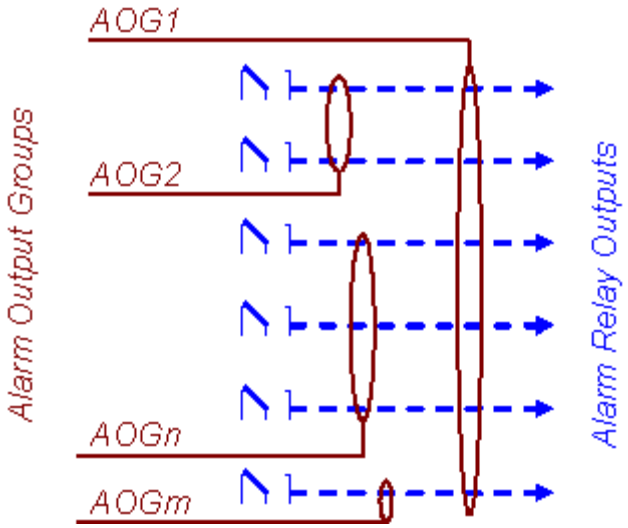
Alarm Output Groups

An Alarm Output Group (AOG) is a **user defined software assignment** that consists of grouping together all the **outputs** that **always are activated at the same time**.

The outputs -- alarm relay outputs and or latching contactors (LVLD and LVBD) – are distributed among the power system's controllers and control units.

In order to activate the alarm relay outputs and latching contactors (LVLD and LVBD) in the DC power supply system, **you have to assign them to output groups** (AOG).

Output relay assignment and output relay mapping are similar terms, synonyms.



Read also the "Alarms Overview Outputs tab" topic in *PowerSuite Online Help*.

The power supply system uses at least **20 different alarm output groups** (AOG); 18 for assignment of alarm output relays, and 2 or more for assignment of LVD latching contactors.

Usually, the **first seven** alarm output groups have alarm relay outputs already assigned to them from factory (**Factory Default Settings**).

Typically, alarm output groups 8 through 18 are listed as "*Alarm Group 8*", "*Alarm Group 9*"… to "*Alarm Group 18*", but they have no alarm relay outputs assigned.

Alarm output groups "LVBD OG" and "LVLD1 OG" have usually LVD battery and load latching contactors assigned from factory.

NOTICE:
Usually, most controllers and I/O Monitors are physically equipped with relay outputs.

The outputs of *Smartnode* control units are telephone numbers, instead of relay outputs.

The assignment procedure is the same, but you group the phone numbers and assign them to Alarm Output Group.

Read also topic "Control Unit Modem Callback Setup tab" in *PowerSuite Online Help*.

The example below shows typical Alarm Output Group assignment in a *Smartpack S*-based system.

Alarm Configuration > Outputs

#	Description Alarm Groups	Output	1	2	3	4	5	6	LVBD	LVLD1	Note
1	Major Alarm, AOG		☑	☐	☐	☐	☐	☐			
2	Minor Alarm, AOG		☑	☐	☐	☐	☐	☐			
3	Mains Alarm, AOG		☑	☑	☐	☐	☐	☐			
4	Fuse Alarm, AOG		☑	☐	☑	☐	☐	☐			
5	High Battery Alarm, AOG		☑	☐	☐	☑	☐	☐			
6	Low Battery Alarm, AOG		☑	☐	☐	☐	☑	☐			
7	Rectifier Alarm, AOG		☑	☐	☐	☐	☐	☑			
8	Gen-Set AOG		☑	☑	☐	☐	☐	☐			
9	Alarm Group 9		☐	☐	☐	☐	☐	☐			
10	Alarm Group 10		☐	☐	☐	☐	☐	☐			
	---		☐	☐	☐	☐	☐	☐			
	---		☐	☐	☐	☐	☐	☐			
17	Alarm Group 17		☐	☐	☐	☐	☐	☐			
18	OutpBlocked, AOG		☐	☐	☐	☐	☐	☐			
19	LVBD, AOG		☐	☐	☐	☐	☐	☐	☑		
20	LVLD, AOG 1		☐	☐	☐	☐	☐	☐		☑	
	-----		☐	☐	☐	☐	☐	☐			
	-----		☐	☐	☐	☐	☐	☐			

In the example above,

- Alarm relay output 1 is used for external common alarm signalling
- Alarm Output Group 18, “OutpBlocked, AOG”
  If an external warning is necessary, you can assign output relays to the “OutpBlocked, AOG” group, e.g. to activate a lamp or alarm bell when the alarm output relays are blocked.
  Read more in topic “Alarm Outputs Isolation (Output Blocked)” on page 31

- Alarm Groups 9 through 17 are unused, and can be assigned when required

Output Test Commands

This logical subgroup lets you issue or activate **specific commands to test the activation of the alarm output relay contacts**. For example, following commands might be available in *Smartpack S* controller's submenu:

Commands > Output Test

#	Description	Action	Unit/Label	Note
	Output Relay # 1		No	Tests alarm relay number 1
	Output Relay # 2		No	
	Output Relay # 3		No	
	Output Relay # 4			
	Output Relay # 5			
	Output Relay # 6			

The Output Test functionality enables to test and verify the circuits connecting external equipment to the power system's alarm relay outputs.

The Output Test command will toggle the alarm relay contacts -- regardless of the position they are at the moment -- for a certain period of time (entered in the "Output Test Timeout (sec)" in PowerSuite).

Issuing **commands is allowed** using a Pin-Code.

> NOTICE:
> The default Service Access Level password or Pin-Code is <0003>, which may be changed for security reasons.

Alarm Outputs Isolation (Output Blocked)

When the user activates the "OutpBlocked" command, system alarms will NOT trigger any alarm output group (similar to relay isolation), except for the "OutpBlocked, AOG" group, which is always Alarm Output Group 18.

If an external warning is necessary, you can assign output relays to the "OutpBlocked, AOG" group, e.g. to activate a lamp or alarm bell when the alarm output relays are blocked.

The "OutpBlocked" command will reset all alarm output groups to normal status, and possible new alarms will NOT trigger any alarm output groups (output relays activation is blocked), except for AOG 18. Also, this command will always activate Alarm Output Group 18 to facilitate external warning of this function being active.



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