ELTEK VALERE
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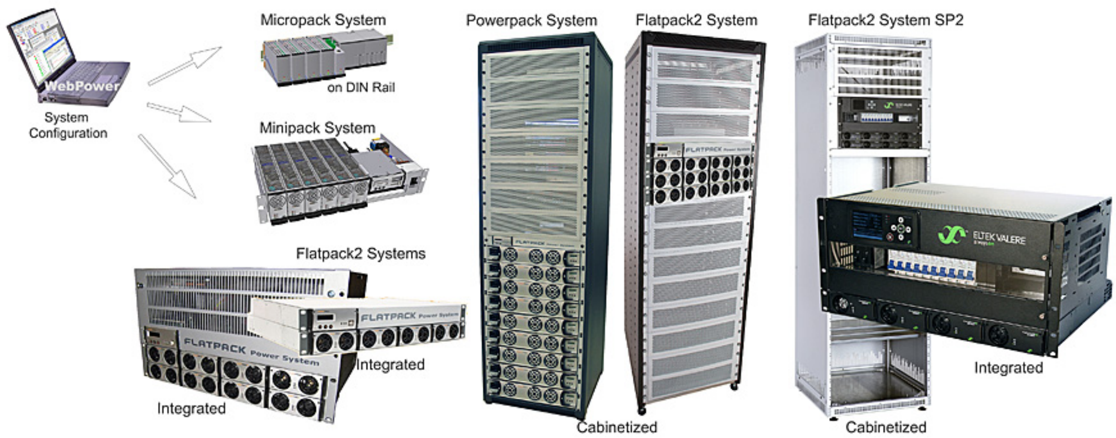
Description of

System Functionality



Smartpack2-, *Smartpack*- and *Compack*-based

DC Power Supply Systems

350020.073

Power Supply System ~ Telecom

always on

NS-EN ISO 14001 Certified
Certificate No:
11276-2007-AE-NOR-NA

NS-EN ISO 9001 Certified
Certificate No:
4072-2007-AQ-NOR-NA

Be "green" and do not print out this manual!

Read it on the screen, or the freshest version on www.eltekvalere.com

Did you know that it takes approx. 1 average sized tree to manufacture the paper required to print 40 manuals like this one?
(1 tree makes approx. 8300 sheets 80g A4 paper)

350020.073 **Issue 1.0, 2010 Jun**

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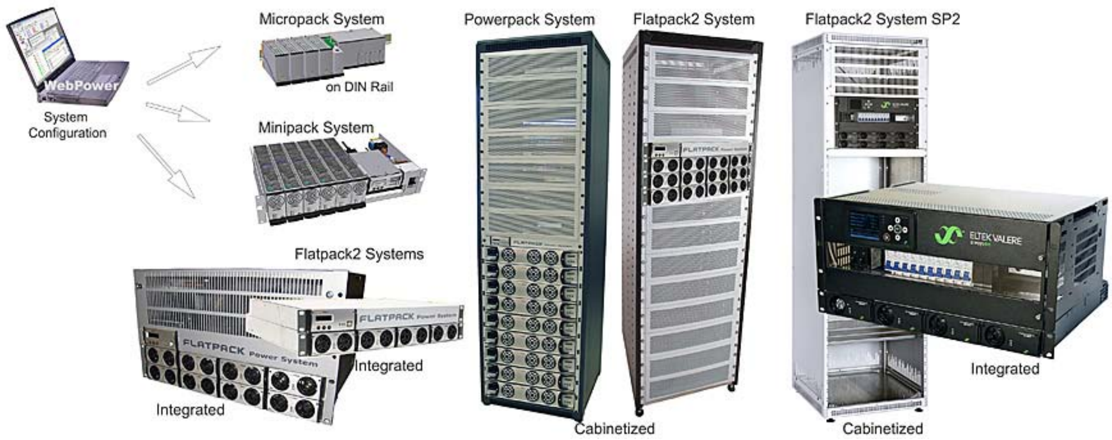
Functionality Description

Functionality Overview

Functionality Description Online Help System, 350020.073, 1v0a, 2010-06-21

This section offers a more detailed description of the functionality that *Eltek Valere* has implemented in *Smartpack2-*, *Smartpack-* and *Compack-based* DC power supply systems.



Select a topic, for detailed description of actual functions.

- "About Power System Configuring" on page 2
Overview of the types of user interfaces available to configure the power system, and how the parameters and system functionality are organized and grouped
- "Power System Functions" on page 7
Explains general topics related to the DC power supply system
- "Mains Functions" on page 37
Describes functions related to the DC power system's AC Mains input
- ""Generator Functions" on page 38
Describes functions related to the DC power system's AC Mains input, when supplied by a generator or *gen-set* (engine-generator set)
- "Rectifier Functions" on page 47
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- "Battery Functions" on page 54
Gives explanation to topics associated to the DC power system's battery bank

- "Load Functions" on page 79
  Explains the functionality related to the power system's DC load
- "Control System Functions" on page 81
  Clarifies the functionality of the control system -- the *Smartpack2*, the *Smartpack* and the *Compack* controllers, and other type of control units

About Power System Configuring

The *Eltek Valere* 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 *WebPower* firmware, a platform-independent graphical user interface (GUI) built-in the controllers
- **The *PowerSuite* program**
  A PC application run on computers using MS Windows operating systems

All the mentioned functions, characteristics and parameters are **fully configurable**, and are organized in following ***system-oriented*** *logical groups*:

- Power System
- Mains
- Generator
- Rectifiers
- Battery
- Load
- Control System

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

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.

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, 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>. We strongly recommend changing the passwords as soon as the power system is installed.

Read about "Access Levels" on page 81.

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.

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 82.

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>. We strongly recommend changing the passwords as soon as the power system is installed.

Read about "Access Levels" on page 81.

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 84.

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>. We strongly recommend changing the passwords as soon as the power system is installed.

Read about "Access Levels" on page 81.

The commands are organized in following groups:

- **System Commands**
  Read about "System Commands" on page 26
- **Battery Commands**
  Read about "Battery Commands" on page 57
- **Outputs Test**
  Read about "Output Test Commands" on page 88

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	Minot Alarm	-----	

Read about "Alarm Messages, (Log)" on page 33.

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 computer -- read about "Up/Download options" on page 6 – or use *WebPower* or *PowerSuite* to delete, print and save the log to a file in your computer.

Read about "Types of System Logs" on page 30.

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 *Smartpack2 Master* Controller's submenu:

Logs/Report > **Battery Test Log**

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

Read about "Battery Tests" on page 68.

Using *WebPower* 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 describe the power system, the site's name , serial number, installation and service dates, software name, etc.

Example of Inventory Report table in *Smartpack2 Master* 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.)	

Read about "DC Plant Information" on page 24.

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 *Smartpack2 Master* 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	

Commissioning options

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

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

Up/Download options

The options in this logical group let you upload firmware to connected controllers and control units, as well as download or save system related logs, etc.

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

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

Read about "Access Levels" on page 81.

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

- **Save Event Log**
  A command that saves to a computer the system related log of power system events, automatically registered by the system controller.
  Read about "Logs and Reports options" on page 4, or about "Types of System Logs" on page 30
- **Save Data Log**
  A command that saves to a computer the a control unit related 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).
  Read about "Types of System Logs" on page 30
- **Save Energy Log**
  A command that saves to a computer the a system related log that presents the power system's energy usage, (Wh).
  Read about "Types of System Logs" on page 30
- **Save /Load Config**
  A command that saves to a computer the System Configuration file <*.XML>, with all the specific parameters and settings.
  Also, you can upload a similar, specific System Configuration file

<*.XML> to the controller, e.g. for automatic configuration of specific functions

- **Software Upgrade**
  which offers you to upgrade the firmware in connected controllers and control units, by uploading files stored in the *Smartpack2 Master* controller's SD card.

  Available options in *Smartpack2 Master* 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	

Read also about other firmware upgrade methods in topic "Firmware Upgrade" on page 89.

Power System Functions

This section explains general topics related to the DC power supply system.

Networking the Controller - Access Methods

This topic describes how to access the power system main controller from a computer, so that you can configure and operate the DC power supply system.

You can access the controller using a standard computer, which is either connected to an existing LAN or directly connected to the controller.

(Example of *Compack* controller access via LAN and via a stand-alone computer)

After accessing the controller, you can read a short description about available methods to configure and monitor the DC power supply system, which you find in topic "Power System Configuration & Monitoring – Methods" on page 16.

Controller's Default IP Address

Each main controller is shipped with a **unique *Eltek Valere* MAC address** (Media Access Control) stored inside the controller and marked on the controller's label, e.g. [00-0A-19-C0-00-13].

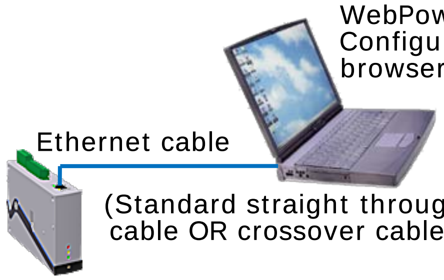
Also, the controllers are by default shipped with the **fixed, static IP address <192.168.10.20>**.

WARNING:
Some controllers may have the Dynamic Host Configuration Protocol (DHCP) enabled, instead of static IP address. Thus, they can automatically obtain necessary access data to operate in an existing Local Area Network (LAN), based on the Ethernet communication technique and the TCP/IP protocol suite.

NOTICE:
In short, two LAN devices (e.g. a controller and a computer) can communicate with each other, if they have different IP addresses and are in the same subnet.
A Subnet Mask is used to determine what subnet an IP address or device belongs to.
For example, all devices with IP address <169.254.52.XXX> and subnet mask <255.255.255.0> (where XXX can be 1 to 255) belong to the same subnet, and can “talk” to each other.

Controller Access -- Via Stand-alone PC

You can also access the power system controller directly from a stand-alone computer.



(Example of *Compack* controller access via stand-alone PC)

**NOTICE:
You need an Ethernet crossover cable, if the controller is a *Smartpack* with hardware version 1.x (SB70) or previous.

Contact your IT Department, if your computer has difficulties while installing or configuring the network card.

Requirements

- Computer equipped with a standard Ethernet Network Interface Card (NIC) with RJ-45 socket. Wireless NICs may not be used to access the controller.
- The NIC’s necessary network components have to be correctly installed, specially the Internet Protocol (TCP/IP). Also, the DHCP function must be enabled.
- Ethernet cable to connect the controller to the LAN (straight-through** or crossover cable, as the controller’s port implements HP Auto MDI/MDI-X detection and correction)

- "*Eltek Valere Network Utility*" program,
  that you can download with the controller's firmware from
  www.eltekvalere.com

**NOTICE:
You need an Ethernet crossover cable, if the controller is a *Smartpack* with hardware version 1.x (SB70) or previous.

Network components are software clients, services and protocols that the NIC uses to communicate with servers in the network.

In Short

To get access to the controller via a stand-alone computer, just connect the controller directly to the computer's NIC, using a standard Ethernet straight-through** or crossover cable.

NOTICE:
By default, the controllers are shipped with a unique MAC address, e.g. [00-0A-19-C0-00-13] and a fixed, static IP address <192.168.10.20>. Some controllers may have DHCP enabled (automatically obtain necessary access data to operate in an existing LAN).

For the computer to be able to access the controller, both devices need to have different IP addresses, but in the same subnet. If the computer's NIC IP address is e.g. <169.254.52.132>, so changing the controller's IP address from <192.168.10.20> to e.g. <169.254.52.133> will enable them to "talk" to each other.

NOTICE:
If the controller has DHCP enabled when you connect it to the computer's NIC, then the controller and the computer will assign themselves a random IP address, e.g. the controller may get <0.0.0.1> and the computer <169.254.52.132>.
In this case, change the controller's IP address from e.g. <0.0.0.1> to e.g. <169.254.52.133> to enable them to "talk" to each other.

Then, access the controller via your web browser, and change its LAN device name, to facilitate later identification.

The "Controller Access — Via Stand-alone PC" procedure involves following steps (as described in more detail in the topic "More Detailed" on page 10):

1. Start the "*Eltek Valere Network Utility*" program
2. Connect the computer to the controller and check its MAC address
3. Find the NIC's IP address and subnet mask used by the computer
4. Change the controller's IP address to the same subnet as the computer's
5. Access the controller's configuration pages in your web browser
6. Log in with the <admin> account,
7. Change the controller's Device Name

> **NOTICE:
> You need an Ethernet crossover cable, if the controller is a *Smartpack* with hardware version 1.x (SB70) or previous.

More Detailed

Carry out the following steps to access the controller via a stand-alone computer:

1. **Start the "*Eltek Valere Network Utility*" program**
   by opening the file "EVIPSetup.exe", which will not display any LAN devices, as the computer has now nothing connected to the NIC.

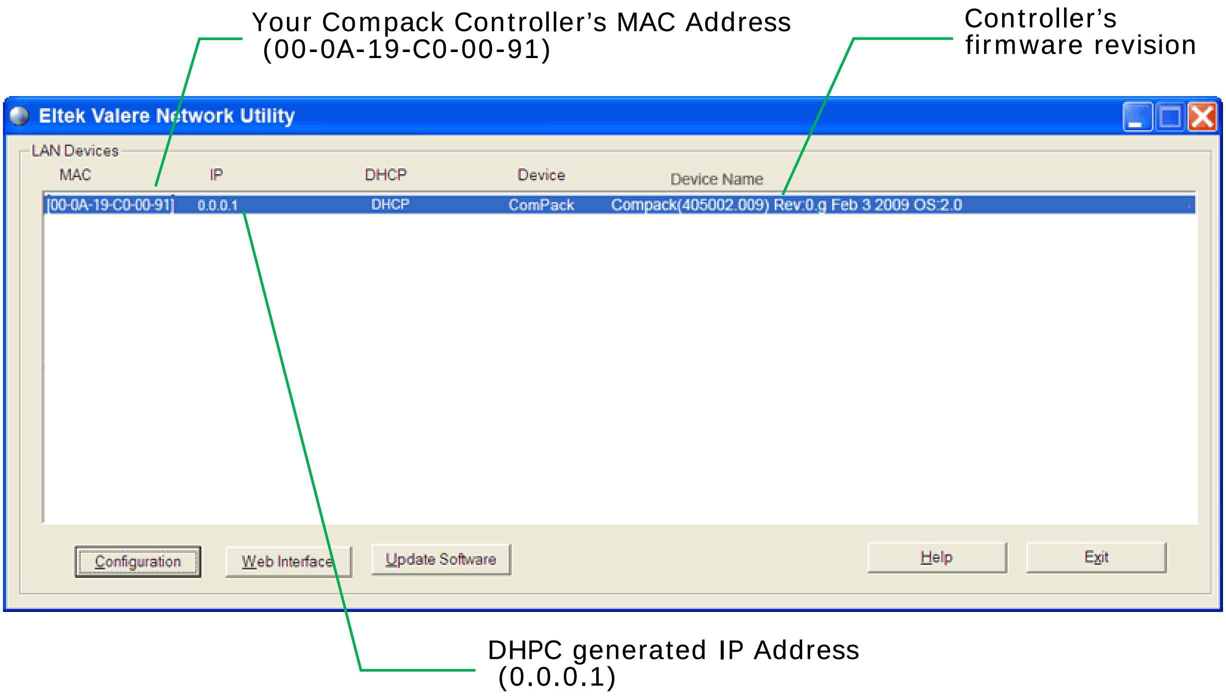
   Notice that if the computer has installed wireless Ethernet Network Interface Cards, they should not be active; otherwise the *Eltek Valere Network Utility* may display LAN devices accessed wireless.

2. **Connect the computer to the controller and check its MAC address**
   plugging one end of the Ethernet cable to the controller's RJ-45 socket, and the other end to the computer's NIC.

   The *Eltek Valere Network Utility* displays the controller as a connected LAN device (may take up to 1 minute to display) with the default static IP address <192.168.10.20>

   Notice that -- if the controller has the DHCP enabled instead of static IP address -- the controller automatically gets an IP address, e.g. <0.0.0.1>, as displayed in the *Eltek Valere Network Utility* below.

   Check that the displayed MAC address corresponds to the MAC address label on the controller.



(Example of Compack controller's data)

3. **Find the NIC's IP address and subnet mask used by the computer by,**
— Opening the computer's Network Connections window
— Selecting the actual network card (NIC) and
— Making a note of the IP address and Subnet mask displayed in the Details panel, on the left side of the window.
E.g. IP address: <169.254.52.132>, Subnet mask: <255.255.0.0>

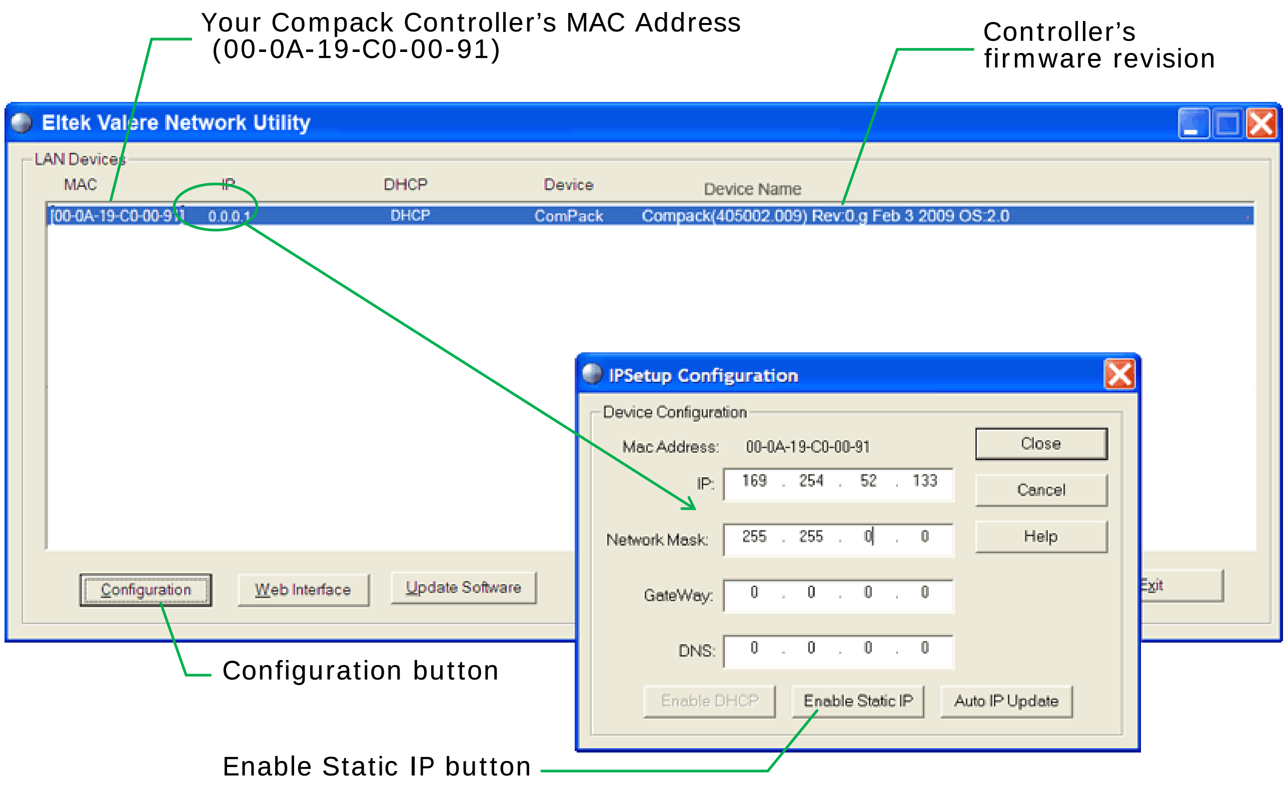
Read the topic How to Check or Change the Computer's IP Address (page 130) in the FAQs section

Notice that you can also get this information by opening a DOS window and running the command "IPCONFIG".

4. **Change the controller's IP address to the same subnet as the computer's by,**
— Selecting the controller in the *Eltek Valere Network Utility* window
— Clicking on the Configuration button, to open the "IPSetup Configuration" window
— Changing the default static IP address <192.168.10.20> to e.g. <169.254.52.133>
OR from, e.g. <0.0.0.1> to e.g. <169.254.52.133>, if DHCP was enabled, as shown below.
Notice that the IP address you assign the controller must not be used by other devices.

— Changing the Network Mask from, e.g. <0.0.0.0> to e.g. <255.255.0.0>
— and clicking on the "Enable Static IP" button.

Now, the controller's and the computer's IP addresses are in the same subnet and both devices can "talk" to each other.
Computer's: <169.254.52.132> <255.255.0.0>
Controller's: <169.254.52.133> <255.255.0.0>



(Example of controller's data)

WARNING!
Never enter Network Mask (Subnet masks) <0.0.0.0> or <255.255.255.255> as they are not valid masks, and in the worst case may render the controller or LAN device inaccessible.

5. **Access the controller's configuration pages in your web browser**
by opening your web browser (e.g. Internet Explorer) and entering the controller's new static IP address in the browser's address line.
(E.g. <169.254.52.133>; entering "http://" before the address is not necessary)

6. **Log in with the <admin> account,**
by clicking on the "Enter" link — in the web browser, in the middle of the page — and entering <admin> as user name and <admin> as password (case sensitive).

Note that the web browser must have the Pop-ups function enabled, as the configuration web pages employ Java script navigation. Read topic How to Enable Pop-ups in the browser -- Internet Explorer (page 122) in the FAQs section

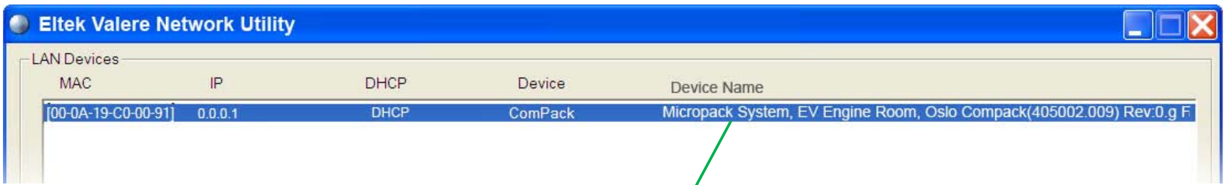
For security reasons, it is advisable to change the default passwords with your own passwords.
Read the topic How to Change WebPower's Default Log in Passwords (page 122) in the FAQs section

7. **Change the controller's Device Name by,**
(*In WebPower 5 GUI*)
— Clicking on "System Config" icon, in the toolbar
— Clicking on "Network Settings" in the command tree on the left, under Device Settings
— Then clicking in the Device Name field and entering the Device Name that describes your power system, e.g. "Micropack System, EV Engine Room, Oslo"

(*In WebPower 3 GUI*)
— Clicking on "Network Config" button, in the Power Explorer's toolbar
— Clicking on the "TCP/IP" tab
— Then clicking in the Device Name field and entering the Device Name that describes your power system, e.g. "Micropack System, EV Engine Room, Oslo"

Read topic How to Change the Controller's Device Name (page 128) in the FAQs section

Now the *Eltek Valere Network Utility* window will display the new device name.



Changed Compact Controller's Device Name
(Micropack System, EV Engine Room, Oslo)

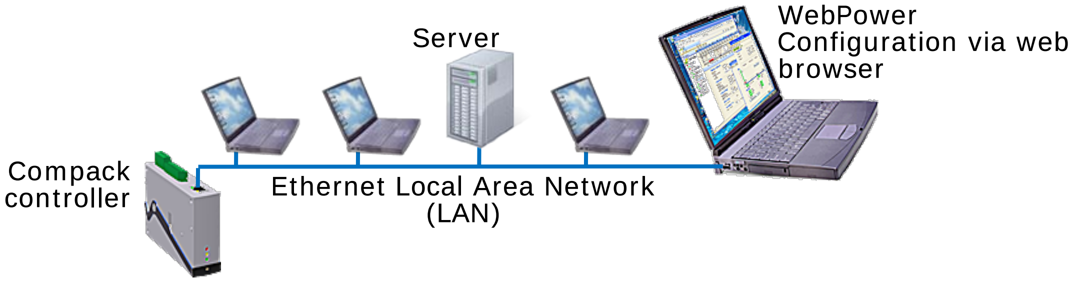
(Example of Compact controller's data)

NOTICE:
If later you connect your computer's NIC (while DHCP is enabled) to a LAN, the network server will automatically assign a new IP address to your NIC, so that your computer may access the LAN.

It may take up 1 or 2 minutes, but you can select the command "Repair this connection" — in the computer's Network Connections window — and Windows will right away automatically assign the new IP address.

Controller Access -- Via Ethernet LAN

If you have access to a Local Area Network (LAN) -- based on the Ethernet communication technique and the TCP/IP protocol suite -- you can simply connect the controller to the LAN, and get web browser access to the controller from your networked computer.



(Example of *Compack* controller access via LAN)

Contact your LAN administrator, if your computer has difficulties accessing the network.

Requirements

- Computer correctly configured and connected to the LAN
- Standard Ethernet cable (straight through cable),
  to connect the controller to the LAN
- "*Eltek Valere Network Utility*" program,
  that you can download with the controller's firmware from
  www.eltekvalere.com

In Short

To get access to the controller via your LAN networked computer just connect the controller to the LAN using a standard Ethernet straight-through** or crossover cable.

> NOTICE:
> By default, the controllers are shipped with a unique MAC address, e.g. [00-0A-19-C0-00-13] and a fixed, static IP address <192.168.10.20>. Some controllers may have DHCP enabled (automatically obtain necessary access data to operate in an existing LAN).

For the computer to be able to access the controller via the LAN network, both devices need to have different IP addresses, but in the same LAN subnet. If the networked computer's NIC IP address is e.g. <172.16.5.29>, so changing the controller's IP address from <192.168.10.20> to e.g. <172.16.5.30> will enable them to "talk" to each other via the LAN network.

> NOTICE:
> If the controller has DHCP enabled when you connect it to the LAN network, then the LAN network will automatically assign the controller with a spare IP address in the LAN subnet, e.g. the controller may get <172.16.6.130>, which will enable the networked computer to "talk" to controller.

Using the “*Eltek Valere Network Utility*” program, identify the controller, access it via your web browser and change the controller’s LAN device name, to facilitate later identification.

The “Controller Access -- Via Ethernet LAN” procedure involves following steps (as described in more detail in topic “More Detailed” on page 14):

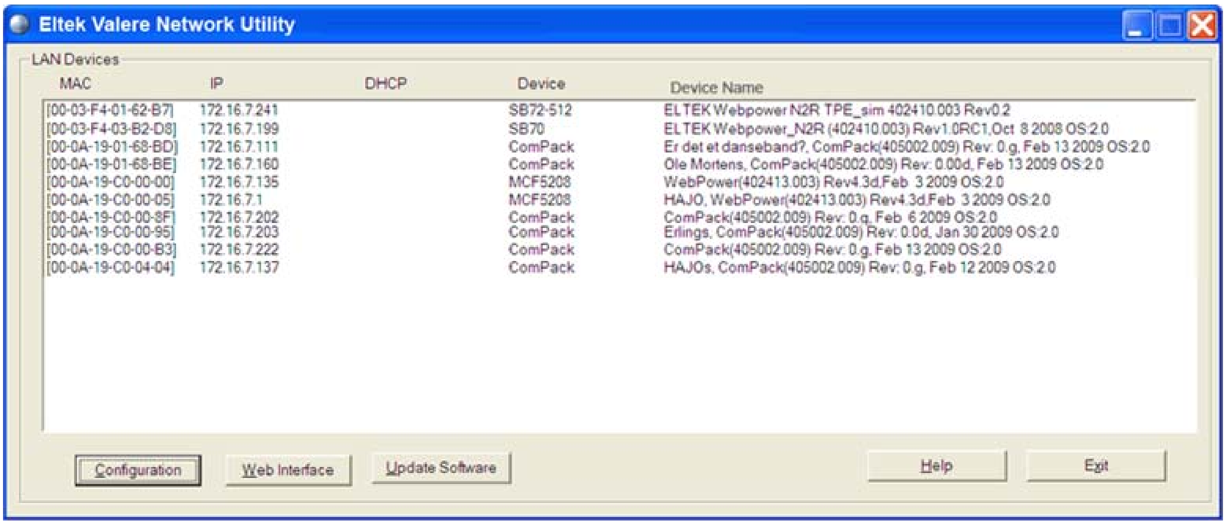
1. Start the “*Eltek Valere Network Utility*” program
2. Connect the controller to the LAN
3. Identify the controller in the “*Eltek Valere Network Utility*” program, and
   change the controller’s IP address to be in the LAN subnet
4. Access the controller’s configuration pages in your web browser
5. Log in with the <admin> account
6. Change the controller’s Device Name

Read also topic “Controller’s Default IP Address” on page 7.

More Detailed

Carry out the following steps to access the controller via the Ethernet LAN:

1. **Start the “*Eltek Valere Network Utility*” program**
   by opening the file “EVIPSetup.exe”, which will display already connected LAN devices. The controller will be displayed after connection to the LAN.



(Example of connected LAN devices)

Notice that if the computer has installed wireless Ethernet Network Interface Cards, they should not be active; otherwise the *Eltek Valere Network Utility* may display LAN devices accessed wireless.

2. **Connect the controller to the LAN**
plugging one end of a standard Ethernet cable (straight through Ethernet cable) to the controller's RJ-45 socket, and the other end to one of the LAN's available RJ-45 sockets.

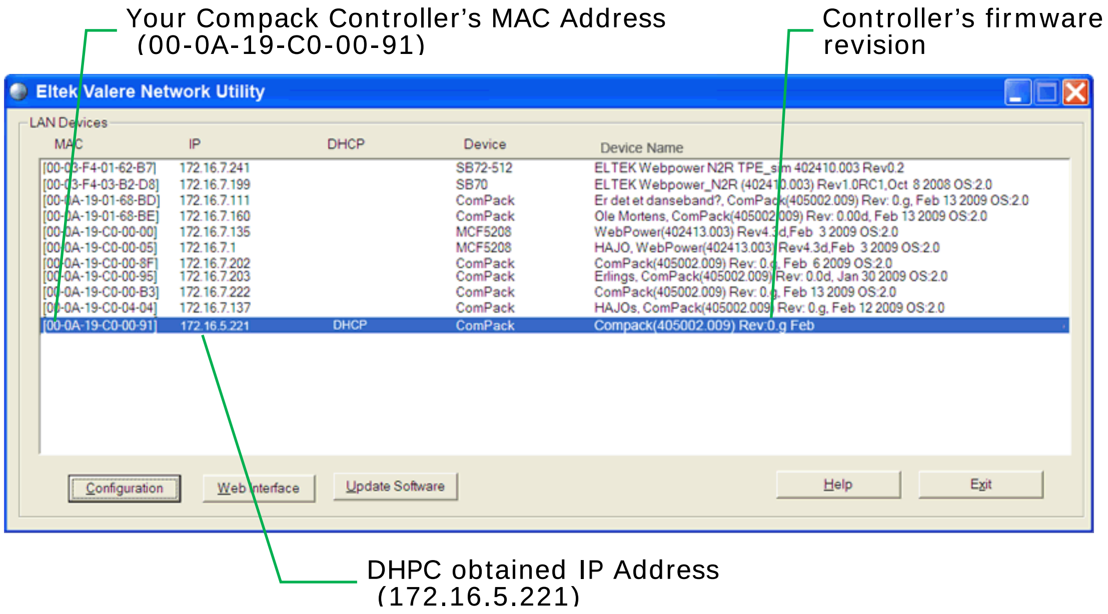
3. **In the "*Eltek Valere Network Utility*", identify the controller and change its IP address**
The utility program displays the controller as a connected LAN device with its unique MAC address and the default static IP address <192.168.10.20>
Note that it can take up to 1 minute before the connected controller is displayed in the utility program. Read also topic "Controller's Default IP Address" on page 7.

Then, change the controller's IP address to be in the LAN subnet by
— Selecting the controller in the *Eltek Valere Network Utility* window
— Clicking on the Configuration button, to open the "IPSetup Configuration" window
— Changing the default static IP address <192.168.10.20> to e.g. <172.16.5.30>, if the networked computer's NIC IP address is e.g. <172.16.5.29>
Notice that the IP address you assign the controller must not be used by other devices.

— Changing the Network Mask from, e.g. <0.0.0.0> to e.g. <255.255.0.0>
— and clicking on the "Enable Static IP" button.

Now, the controller's and the computer's IP addresses are in the same LAN subnet and both devices can "talk" to each other via the LAN network.
Computer's: <172.16.5.29> <255.255.0.0>
Controller's: <172.16.5.30> <255.255.0.0>

Notice that you do not have to change the controller's IP address -- if the controller has the DHCP enabled instead of static IP address. The controller then automatically gets an IP address from the LAN, e.g. <172.16.5.221>, as displayed in the *Eltek Valere Network Utility* below.



(Example of Compack controller's data)

4. Access the controller's configuration pages in your web browser
by marking the controller (blue marking line in the above example), and clicking on the Web Interface button.
or
by opening your web browser (e.g. Internet Explorer) and entering the controller's IP address in the browser's address line.
(E.g. <172.16.5.221>; entering "http://" before the address is not necessary)

5. Log in with the <admin> account,
by clicking on the "Enter" link -- in the web browser, in the middle of the page -- and entering <admin> as user name and <admin> as password (case sensitive).

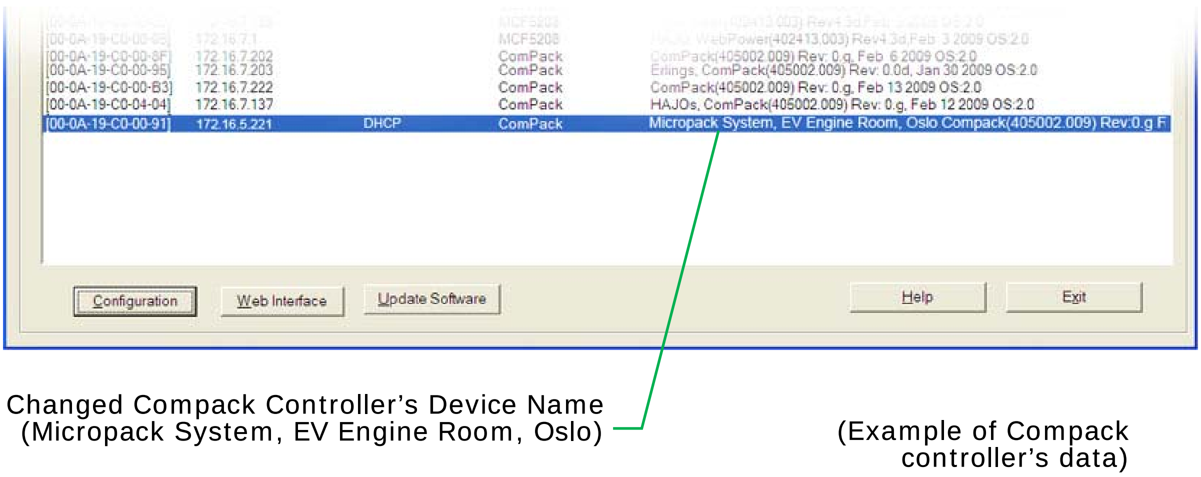
Note that the web browser must have the Pop-ups function enabled, as the configuration web pages employs Java script navigation. Read topic How to Enable Pop-ups in the browser -- Internet Explorer (page 122) in the FAQs section

For security reasons, it is advisable to change the default passwords with your own passwords.
Read the topic How to Change WebPower's Default Log in Passwords (page 122) in the FAQs section

6. Change the controller's Device Name by,
(*In WebPower 5 GUI*)
— Clicking on "System Config" icon, in the toolbar
— Clicking on "Network Settings" in the command tree on the left, under Device Settings
— Then clicking in the Device Name field and entering the Device Name that describes your power system, e.g. "Micropack System, EV Engine Room, Oslo"

(*In WebPower 3 GUI*)
— Clicking on "Network Config" button, in the Power Explorer's toolbar
— Clicking on the "TCP/IP" tab
— Then clicking in the Device Name field and entering the Device Name that describes your DC power system, e.g. "Micropack System, EV Engine Room, Oslo"
Read topic How to Change the Controller's Device Name (page 128) in the FAQs section

Now the *Eltek Valere Network Utility* window will display the new device name.



Power System Configuration & Monitoring – Methods

This topic describes the available methods to configure and monitor the DC power supply system from a computer.

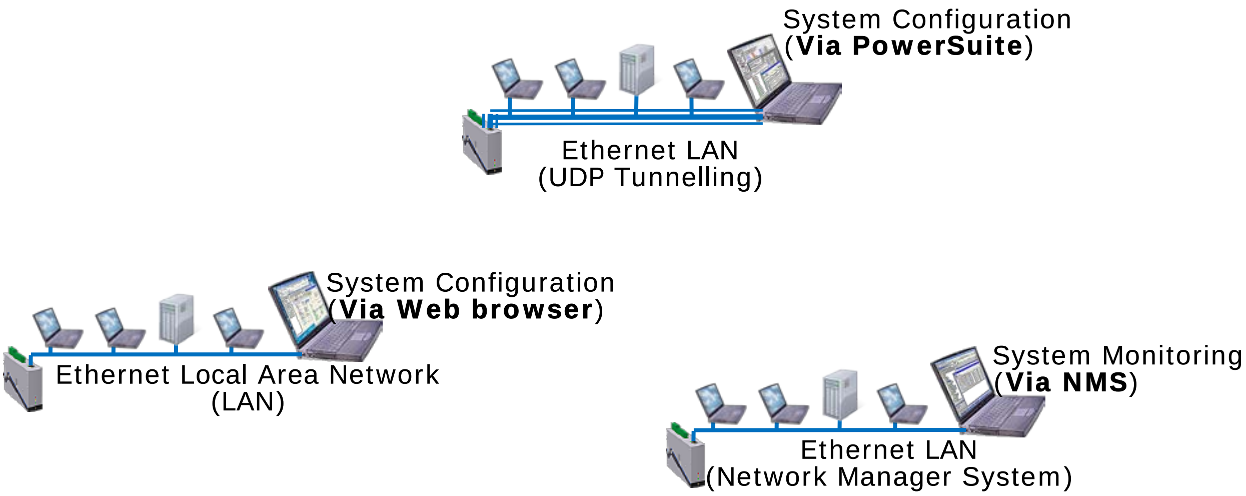
Before configuring and monitoring the power system, the computer must be able to access the controller, which is described in topic "Networking the Controller - Access Methods" on page 7.

You can configure and monitor the DC power supply system from a computer — connected to a LAN or directly connected to the controller — using the following methods:

- **Via a standard web browser.**
  The configuration Web pages are stored in the controller, so you do not need to install any programs in the computer. They enable useful monitoring and configuration features.

  For more information about how to access the configuration web pages, read topic How to Change WebPower's Default Log in Passwords (page 122) in the FAQs section
- **Via PowerSuite application.**
  The powerful *PowerSuite* application must be installed in the computer, and enables advanced monitoring and configuration features.

  For more information read topics Installing PowerSuite and Installing PowerSuite (Ethernet) in the *PowerSuite Help* file.
- **Via Network Management System (NMS)**
  The NMS hardware and software must be installed in the network. For more information, read topic "Monitoring -- via Network Management System" on page 17

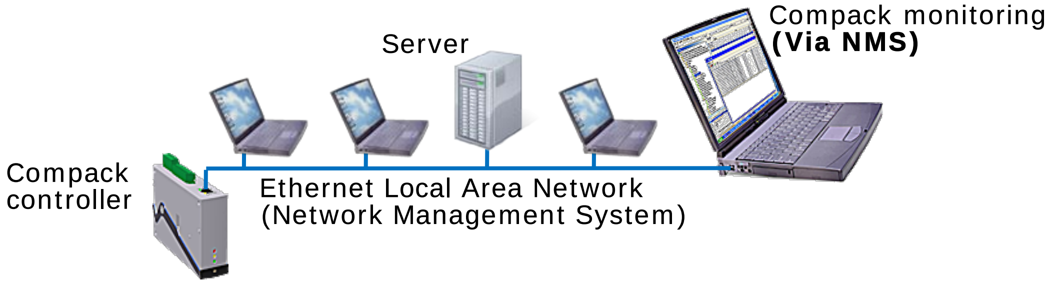


(Example of power system configuration and monitoring via Web browser, PowerSuite and NMS)

Monitoring -- via Network Management System

You can remote monitor the DC power supply system from a computer connected to an Ethernet LAN which has installed a Network Management System (NMS).

The NMS hardware and software must be previously installed in the LAN network.



(Example of power system remote monitoring via NMS)

Requirements

- Computer correctly configured, connected to the LAN and with access to the NMS
- Standard Ethernet cable (straight through cable), to connect the controller to the LAN
- Eltek Valere's specific SNMP MIB files (Management Information Base)

Contact your IT Department, if your computer has difficulties while installing the MIB files or accessing the SNMP agent (Simple Network Management Protocol).

In Short

The power system's controllers implement an SNMP agent which interfaces with the Network Management System (NMS), enabling remote monitoring via the standard SNMP messaging commands SET, GET and TRAP.

The SNMP agent is compatible with all major NMS on Ethernet, such as "HP Open View", "Sun NetManager", etc.

The SNMP agent responds to SNMP's GET and SET commands, and forwards TRAPs to designated recipients when critical conditions occur to the DC power system, as configured in the controller.

The GET commands provide the NMS with remote monitoring status — e.g. Battery status, etc. — of the power system.

The SET commands enable the NMS to remote control the power system, e.g. changing the output voltage.

The TRAP commands are unsolicited alarm messages that the power system sends to the NMS, when critical situations occur.

You can regard SNMP agents (network devices) that send TRAPs as "clients", and network devices that receive TRAPs and poll devices (issue GETs and SETs) as "servers".

The "Monitoring — via Network Management System" procedure involves following steps:

Controller's SNMP configuration:

1. TRAP receiver IP addresses
   (Network Managers that receive alarm messages)

2. TRAP Community Strings
3. TRAP Repeat Rates
4. Read and Write Community Strings

Refer to topic “More Detailed - Controller SNMP Configuration” on page 19.

NMS configuration:

1. Compile the Eltek Valere’s device specific MIB files into the NMS database
   (Read chapter “About Eltek Valere’s SNMP MIB Files”, page 22)

2. Add the controller object to the Management Map
   (See an example of the *Compack* controller object added to the Management Map, in chapter “Example -- NMS Configuration”, page 23.)

3. “Ping” the controller to ensure connectivity
4. Define and configure the TRAP event handling, as required

Refer to the NMS manuals for accurate instructions.

More Detailed - Controller SNMP Configuration

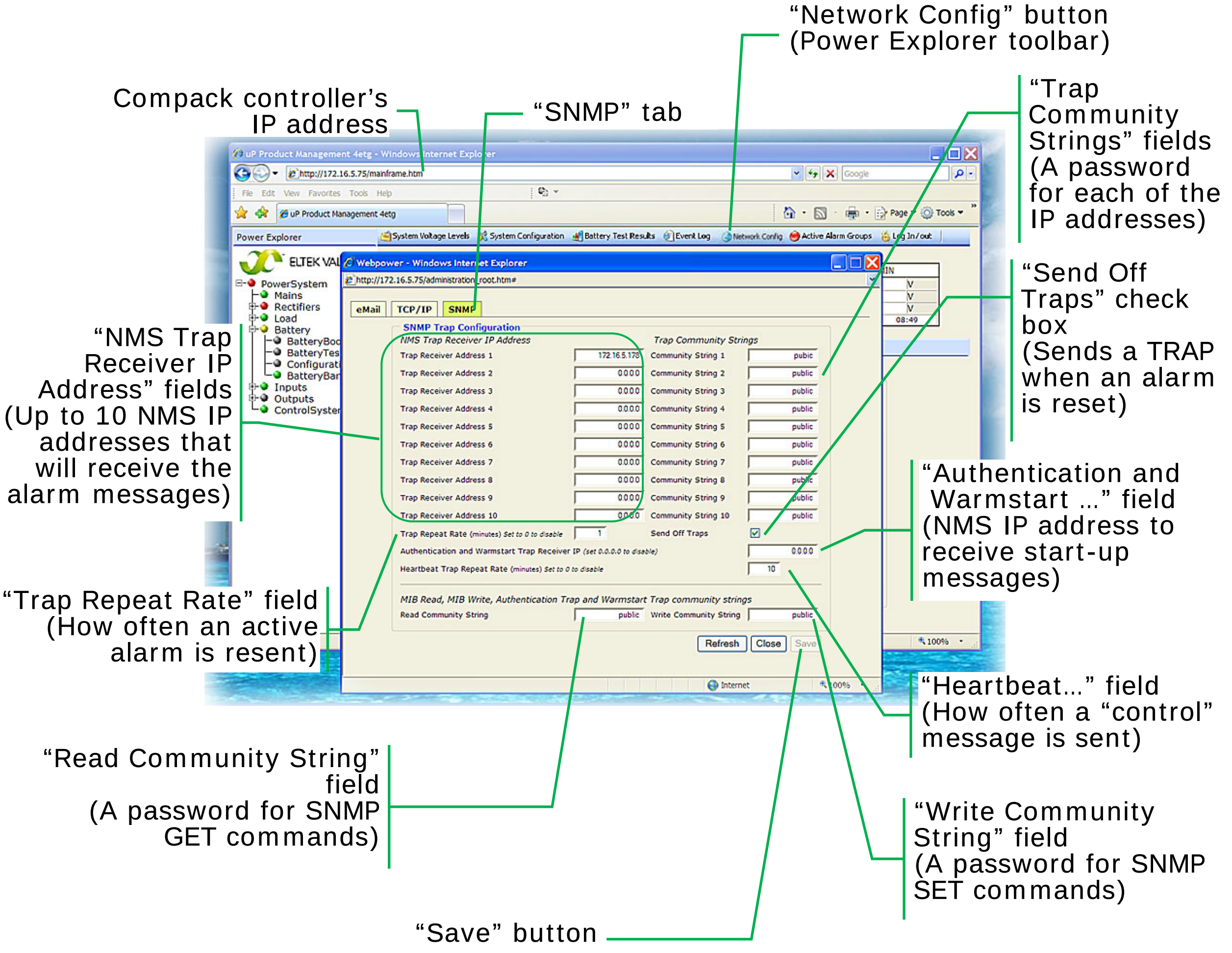
Carry out the following steps to configure the controller’s SNMP agent:

1. **Access the controller’s configuration pages in your web browser**
   by opening your web browser (e.g. Internet Explorer) and entering the controller’s IP address in the browser’s address line.
   (E.g. <172.16.5.75>; entering “http://” before the address is not necessary)
2. **Log in with the <admin> account,**
   by clicking on the “Enter” link — in the web browser, in the middle of the page — and entering <admin> as user name and <admin> as password. (case sensitive)
   Refer also to the log in procedure in topic How to Change WebPower’s Default Log in Passwords (page 122) in the FAQs section.

   Note that the web browser must have the Pop-ups function enabled, as the configuration web pages employ Java script navigation. Read topic How to Enable Pop-ups in the browser -- Internet Explorer (page 122) in the FAQs section.

3. **Configure the controller's SNMP agent by,**
(*In WebPower 5 GUI*)
— Clicking on "System Config" icon, in the toolbar
— Clicking on "Network Settings", then on "SNMP" in the command tree on the left
— Entering the SNMP agent's data in appropriate fields

(*In WebPower 3 GUI, as shown below*)
— Clicking on the "Network Config" button, on the Power Explorer toolbar
— Clicking on the "SNMP" tab, in the dialog box
— Entering the SNMP agent's data in appropriate fields,
as described below
— Then clicking on the "Save" button, to activate the SNMP data



(Example of Compack controller's configuration pages)

"NMS Trap Receiver IP Address" fields:
Enter the NMS IP addresses of up to 10 TRAP hosts.
When critical situations occur in the power system, the controller's SNMP agent can unsolicited send alarm messages to up to 10 different NMS IP addresses (TRAP hosts or managers).

“Trap Community Strings” fields:
Enter a password for each of the 10 TRAP receivers or hosts. Default password is “public” (case sensitive). The password entered here for each TRAP receiver, is also to be entered in the NMS TRAP Receiver List.
Notice:
Community Strings or passwords can be max 19 characters long. Valid characters are A-Z, a-z, 0-9 and special characters ~@#%^&_-+=:,. Do not use any other characters.

“Trap Repeat Rate” field:
Enter how often (number of minutes 0-10) the TRAP message will be resent to the receiver, while the event or alarm remains in active condition. Enter “0” not to resend.

“Send Off Traps” check box:
Check the box to enable sending a TRAP message when an event or alarm is reset to normal condition. Uncheck the box to disable this function.

“Authentication and Warmstart Trap Receiver IP” field:
Enter NMS IP address (TRAP host or manager) that will receive start-up TRAP messages.

“Heartbeat Trap Repeat Rate” field:
Enter how often (number of minutes 0-10) the “heartbeat”, control TRAP message, will be resent to the receiver. Enter “0” to disable sending “heartbeat” messages.

“Read Community String” field:
Enter a password for the SNMP agent’s Read access level. Default password is “public” (case sensitive). Network devices issuing the SNMP GET command must be configured with this password.
Notice:
Community Strings or passwords can be max 19 characters long. Valid characters are A-Z, a-z, 0-9 and special characters ~@#%^&_-+=:,. Do not use any other characters.

“Write Community String” field:
Enter a password for the SNMP agent’s Write access level. Default password is “public” (case sensitive). Network devices issuing the SNMP SET command must be configured with this password.

About Community Strings

You can regard SNMP agents (network devices) that send TRAPs as “clients”, and network devices that receive TRAPs and poll devices (issue GETs and SETs) as “servers”.

The Community String is like a password that the “server” device issues to the “client” device during a remote query (e.g. a GET or SET command). Both the “server” and “client” devices have to use the same password.

Most network devices implement different levels of SNMP access (e.g. Read, Write, etc.) each with its password or community string.

About Eltek Valere’s SNMP MIB Files

The *Eltek Valere’s* device specific MIB files (Management Information Base) contain device description data, which is used by other SNMP requester devices in the Network Management System (NMS).

> NOTICE:
> You can visit www.eltekvalere.com to download *Eltek Valere’s* device specific MIB files, or contact Eltek Valere’s Service Dep.

The MIB files are in the plain-text, DOS End-of-Line format, and conform to the ASN1 coding syntax.

Eltek Valere’s SNMP compliant devices are described in one or several MIB files, which are required for configuration of the Network Management System (NMS).

There are 3 types of *Eltek Valere* SNMP MIB files:

- The “**First-Time Installation Type**” MIB files.
  Describe a complete MIB tree structure (root and a branch) for *Eltek Valere* SNMP devices.
  Use this type of MIB file if your NMS MIB tree does NOT already contain an *Eltek Valere* SNMP MIB tree structure.
- The “**Root Type**” MIB files.
  Describe the *Eltek Valere* MIB tree base or root (no branches for SNMP devices).
  Use this type of MIB file if you want to use several *Eltek Valere* Branch MIB files simultaneously as branches in the NMS MIB tree.
- The “**Branch Type**” MIB files.
  Describe the *Eltek Valere* MIB tree branches for SNMP devices (no root).
  Use this type of MIB file if you already have the *Eltek Valere* MIB tree root compiled in the NMS MIB tree.
  You can compile several *Eltek Valere* Branch MIB files in the NMS MIB tree, thus describing different *Eltek Valere’s* SNMP compliant devices (equipment).

Following table is an overview of some of the *Eltek Valere* SNMP MIB files, their MIB file type and the equipment they describe:

MIB File Type	MIB File Name	Described Eltek Valere Equipment
Root	Eltek_Root.MIB	Top file for all Eltek Valere Branch SNMP MIB files in the NMS
Branch	EltekDistributedPowerPlantV2_branch9.MIB	Smartpack controller with embedded WebPower with firmware version 4.0
Branch	EltekDistributedPowerPlantV3_branch9.MIB	Smartpack controller with embedded WebPower with firmware version 4.1 and 4.2
Branch	EltekDistributedPowerPlantV4_branch9.MIB	Smartpack controller with embedded WebPower with firmware version 4.3, and *Compack* controller with firmware version 1.0
First Installation	EltekDistributedPowerPlantV3.MIB	Complete Root and Branch file for Smartpack controller with embedded WebPower with firmware version 4.1 and 4.2
First Installation	EltekDistributedPowerPlantV4.MIB	Complete Root and Branch file for Smartpack controller with embedded WebPower with firmware version 4.3, and *Compack* controller with firmware version 1.0

Example -- NMS Configuration

After completing the controller's SNMP configuration — see chapter "More Detailed - Controller SNMP Configuration", page 19 — you have to configure your NMS, to complete the "Monitoring — via Network Management System" procedure.

Refer to your NMS manuals for accurate instructions about how to configure the NMS (e.g. "HP Open View", "Sun NetManager", etc.)

Follow these general steps to configure the Network Management System:

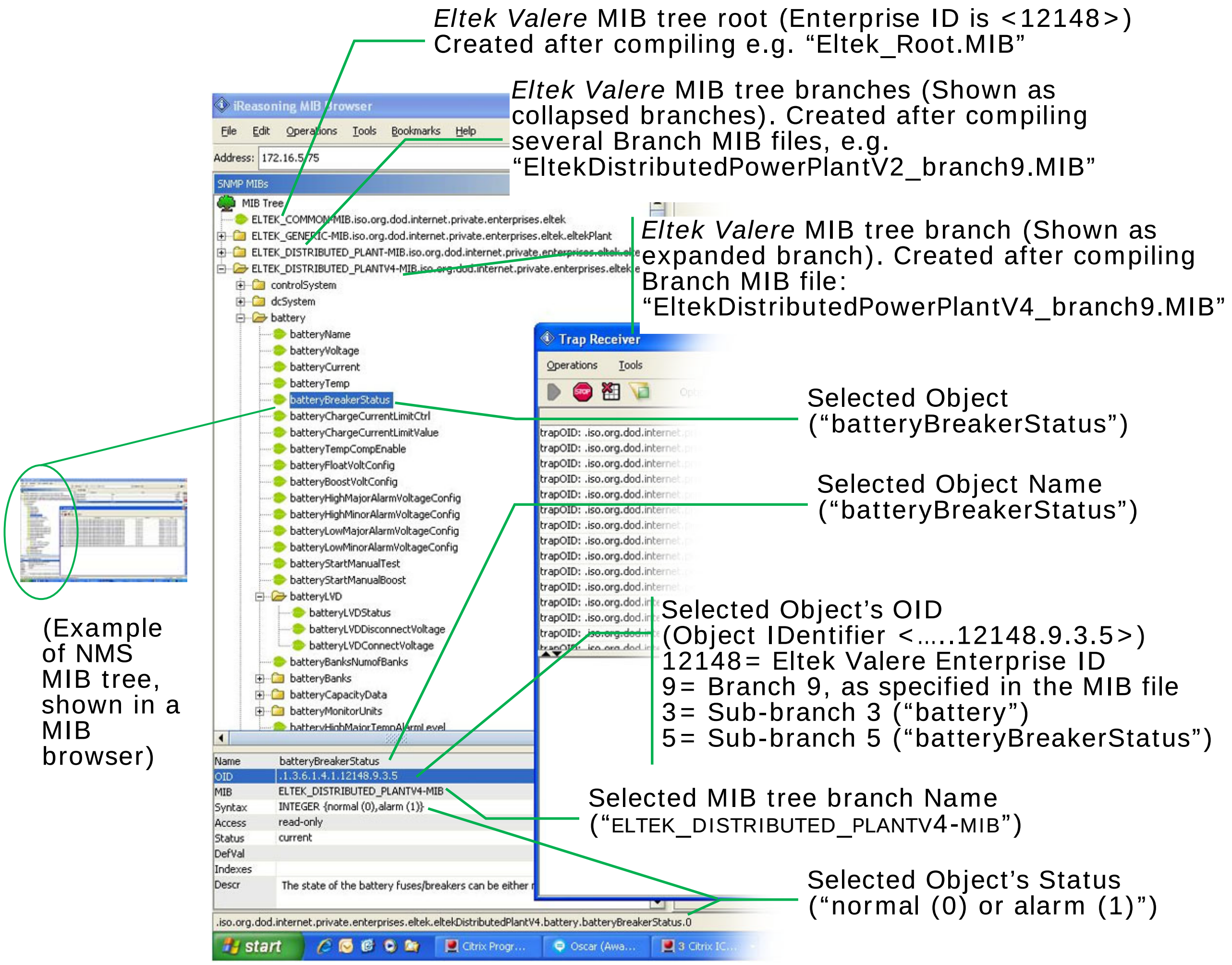
1. Compile the *Eltek Valere*'s device specific MIB files into the NMS database.
   Any suitable SNMP based NMS with MIB compiler may be used.
   (Read also chapter "About Eltek Valere's SNMP MIB Files", page 22)

2. Add the controller object to the Management Map
   (The figure below is an example of the *Compack* controller object added to the Management Map.)

3. "Ping" the controller to ensure connectivity

4. Define and configure the TRAP event handling, as required

Eltek Valere's unique Enterprise ID is <12148>



(Example of NMS MIB tree, shown in a MIB browser)

DC Plant Information

The DC Plant configuration pages of WebPower and PowerSuite enables you to enter information that describe the power system, the site's name , serial number, installation and service dates, software name, etc.

In addition, you can enter **Map Coordinates** to register the exact global position where the DC power system is installed. The global position is specified using a geographic coordinate system with 3 coordinates: latitude, longitude and elevation.

The global position data is stored in the controller, and used by the *MultiSite Monitoring PC Application* software to dynamically display the position of power system installations in maps.

System Configuration ~ General

System Voltages Levels

You can display the power system voltages.

In *Compack*-based systems, via:

- The *WebPower* configuration web pages
- The *PowerSuite* application

In *Smartpack*-based systems, via:

- The *WebPower* configuration web pages
- The *PowerSuite* application
- The *Smartpack* controller's front keys

From the Smartpack Controller's Front

You can display important system voltages by selecting ***"UserOption > VoltageInfo"***, via the *Smartpack* controller's front keys.

Following voltages may be displayed selecting the *VoltageInfo* sub options (level 3):

Option	Description
NomVolt	Nominal output voltage
BoostVolt	Battery boost-charging voltage
LowBatt1	Voltage limit for Low Battery Alarm 1
LowBatt2	Voltage limit for Low Battery Alarm 2
HighBatt1	Voltage limit for High Battery Alarm 1
HighBatt2	Voltage limit for High Battery Alarm 2
LVD 1	Voltage limit for Low Voltage Disconnect unit 1

From PowerSuite

By clicking on the "**System Voltage Levels**" button, on the *PowerSuite* toolbar, you can also display and change important system voltages, such as:

- Nominal or Reference voltage (float)
- Boost voltage
- Battery Test End Voltage
- Rectifier standby voltage
- Battery disconnect voltage
- Battery reconnect voltage

- Rectifier OVS trip voltage

Refer also to *PowerSuite's* System Voltage Levels dialog box topic.

From Configuration Web Pages

By clicking on the "**System Voltage Levels**" button, on the *home page* toolbar, you can also display and change important system voltages, such as:

- Nominal or Reference voltage (float)
- Boost voltage
- Battery Test End Voltage
- Rectifier standby voltage
- Rectifier OVS trip voltage
- Battery disconnect voltage
- Battery reconnect voltage

For more information, refer to *WebPower Online Help*.

System Commands

This logical subgroup lets you issue or activate **specific commands related to the whole system**. For example, following commands might be aavailable in *Smartpack2 Master* Controller's submenu:

Commands > **System Commands**

#	Description	Action	Unit/Label	Note
	Reset Manual Alarms	☐	No	Read about "Alarm Reset" on page 33
	Reset Number of Modules	☐	No	Read about "Resetting the Number of Rectifiers" on page 48
	Delete Event Log	☐	No	Read about "Types of System Logs" on page 30
	Set Default Configuration	☐	No	

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

NOTICE:
The default Service Access Level password or Pin-Code is <0003>. We strongly recommend changing the passwords as soon as the power system is installed.

System Calibration

The Eltek Valere DC power systems are factory calibrated.

Normally, the power system will not require additional calibration, except when the system's controller or control units are re-installed in other power systems.

Definition

The power system calibration is the process of establishing the **relationship between a measuring device** (system inputs) and the **units of measure** (displayed measurements).

The accuracy of the displayed measurements depends on how god calibration data is entered in the control units (calibration quality).

What to Calibrate

Following types of inputs can be calibrated in *Eltek Valere* DC power systems:

- **Current Sense Inputs**
  -- Load Current calibration
  -- Battery Current calibration
- **Voltage Monitoring Inputs**
  -- Battery Voltage calibration
  -- Symmetry Voltage calibration
- **Temperature Sense Inputs**
  -- Battery Temperature calibration

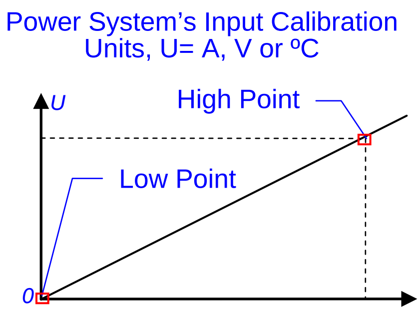
Read following topics for information about available inputs and outputs in:

- "The *Smartpack* Controller - Overview" on page 109
- "The *Compack* Controller - Overview" on page *110*
- "The *Battery Monitor* Control Unit - Overview" on page 112
- "The *Load Monitor* Control Unit - Overview" on page 113
- "The *I/O Monitor* Control Unit - Overview" on page 113

How to Calibrate

The *Eltek Valere* DC power systems are factory calibrated at a 0 calibration point (**Low Calibration Point**) and at 50-60% of the system's maximum output power (**High Calibration Point**).

The two calibration points' units of measurement can be Ampere, Volt or degree Celsius.



Temperature calibration is performed under normal temperature conditions, e.g. 20C to 30C.

In general, the calibration process consists of carrying out following steps:

High Calibration Point

1. Setting the power system at the **High Calibration Point stage**

2. **Measuring** the actual current, voltage or temperature with an accurate and reliable ammeter, voltmeter or thermometer
3. **Entering the measured value** in the system's control units (e.g. via the *PowerSuite* application)

Low Calibration Point

Only to be performed if calibration of the Low Calibration Point is necessary.

1. Setting the power system at the **Low Calibration Point stage**
2. **Measuring** the actual current, voltage or temperature with an accurate and reliable ammeter, voltmeter or thermometer
3. **Entering the measured value** in the system's control units (e.g. via the *PowerSuite* application)

> NOTICE: When calibrating current shunts, you must also enter the current shunt rating, in addition to the low and high calibration measurements.
> Refer to the Alarm Monitor Scale tab (current shunt) topic in *PowerSuite*.

Battery Current Calibration

If you need to calibrate the power system's Battery Current, follow this procedure, while **the power system is operating normally**.

Low Calibration Point

Performed when the battery is disconnected -- e.g. via the LVBD contactor.

Carry out the following:

1. Disconnect the batteries from the load, using the LVBD contactor
2. Measure with a clip-on ammeter and confirm that the discharge current is 0A
3. Enter the value, 0A, as a "**Low Calibration Point**" in *PowerSuite*, in the "BatteryCurrentX" dialog box, under the Calibration tab

High Calibration Point

Performed during battery discharging -- while the rectifiers are turned off, or have reduced output voltage -- and the battery current is at least 30% of the current shunt rating.

During battery charging, the battery current is defined as positive (+); during discharge, it is defined as negative (-).

Carry out the following:

1. Turn the rectifiers OFF, and ensure that the batteries are delivering an stable current to the load
2. Measure the discharge current with a clip-on ammeter
3. Enter the measured current, as a value (e.g "-95") in the "**High Calibration Point**" in *PowerSuite*, in the "BatteryCurrentX" dialog box, under the Calibration tab

NOTICE: When calibrating current shunts, you must also enter the current shunt rating, in addition to the low and high calibration measurements.

Refer to the Alarm Monitor Scale tab (current shunt) topic in *PowerSuite*.

Battery Voltage Calibration

If you need to calibrate the power system's Battery Voltage, follow this procedure, while **the power system is operating normally**.

NOTICE: You do not need to calibrate the Battery Voltage's "Low Calibration Point".

High Calibration Point

Performed during battery discharging -- while the rectifiers are turned off, or have reduced output voltage -- and the battery current is at least 30% of the current shunt rating.

Carry out the following:

1. Turn the rectifiers OFF, and ensure that the batteries are delivering an stable current to the load
2. Measure the battery output voltage at the load terminals with a voltmeter
3. Enter the **measured voltage**, as a value in the "**High Calibration Point**" in *PowerSuite*, in the "BatteryVoltage" dialog box, under the Calibration tab

Battery Symmetry Voltage Calibration

If you need to calibrate the power system's Battery Symmetry Voltage, follow this procedure, while **the power system is operating normally**.

NOTICE: You do not need to calibrate the Battery Symmetry Voltage's "Low Calibration Point".

Read also "Battery Banks, Strings and Blocks" on page 54 and "Battery Symmetry Measurements" on page 57.

High Calibration Point

Performed during battery discharging -- while the rectifiers are turned off, or have reduced output voltage -- and the battery current is at least 30% of the current shunt rating.

Carry out the following:

1. Turn the rectifiers OFF, and ensure that the batteries are delivering an stable current to the load

2. Measure with a voltmeter, the battery symmetry voltage as follows:
   -- At the terminals of each battery block (block measurement method), if you are using *Smartpack* controller's inputs.
   -- Between the 0V battery terminal and each battery block negative terminal, e.g. 0-12V, 0-24V, 0-36V and 0-48V,
   if you are using a Battery Monitor control unit
3. Enter the **measured voltage**, as a value in the "**High Calibration Point**" in *PowerSuite*, in the "SymmDeltaX" dialog box, under the Calibration tab

Battery Temperature Calibration

If you need to calibrate the power system's Battery Temperature, follow this procedure, while **the power system is operating normally**.

NOTICE: You do not need to calibrate the Battery Temperature's "Low Calibration Point".

High Calibration Point

The calibration must be performed with an installed battery temperature sensor, and under normal temperature conditions, e.g. 20C to 30C.

Carry out the following:

1. Measure the temperature -- as close to the temperature sensor as possible -- with a thermometer, while the batteries are under normal temperature conditions
2. Enter the **measured temperature**, as a value in the "**High Calibration Point**" in *PowerSuite*, in the "BatteryTempX" dialog box, under the Calibration tab

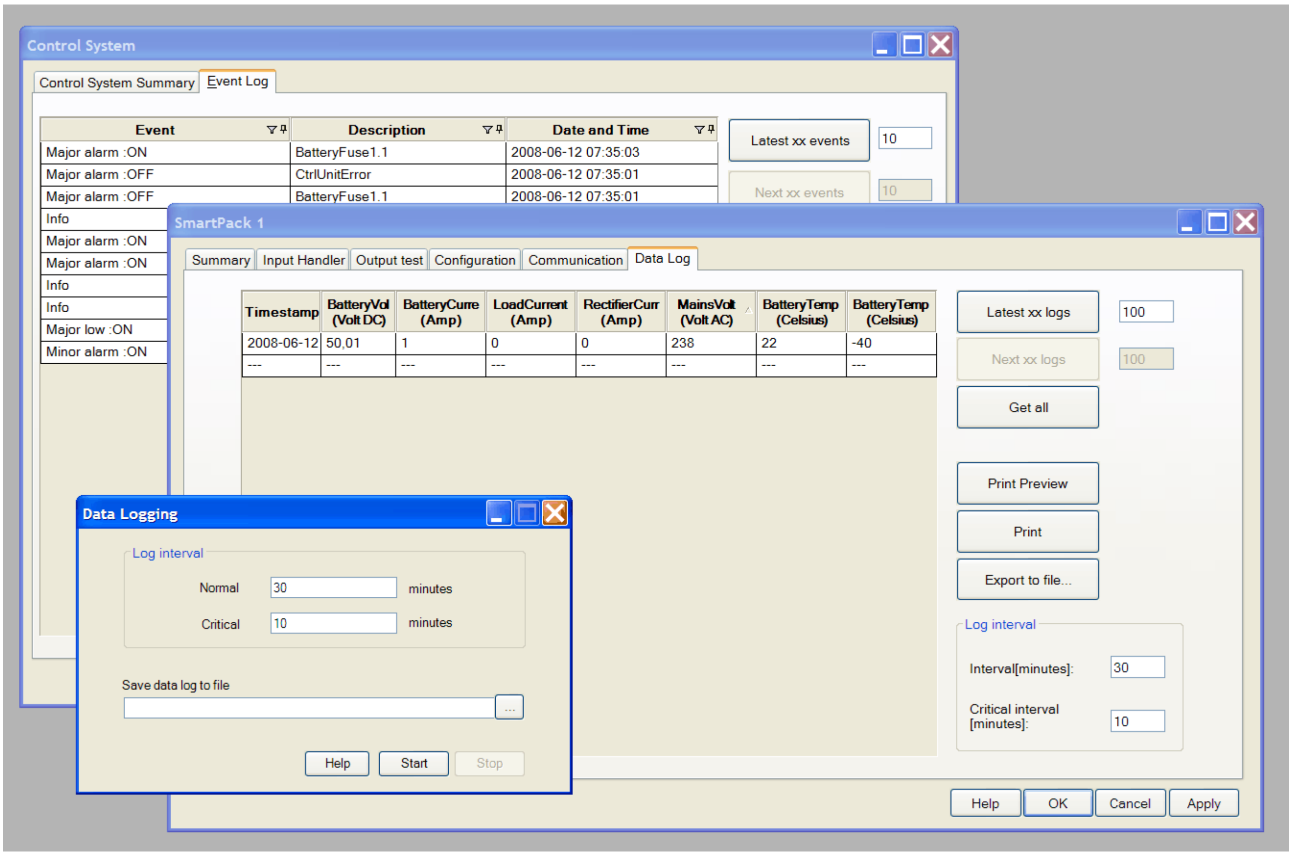
Types of System Logs

The control system in *Eltek Valere*'s power systems keeps several types of useful logs or data records that you can present in the controller's display or using other GUI.

Also, you can export the logs and data records to a computer, or print them out on paper.

The control system implements following 5 types of logs: (see figure)

- Event Log
- Data Log
- Data Logging
- Energy Log
- Load Monitor Info



This figure shows examples of *PowerSuite* dialog boxes for Event Log, Data Log and Data Logging.

Event Log

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

You can access the log either using the controller's front keypad or other GUI.

Read more in topic Control System Event Log tab in *PowerSuite* Online Help

Data Log

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) at the intervals specified by e.g. in *PowerSuite*.

You can access the log either using the controller's front keypad or other GUI.

Read more in topic Control Unit Data Log tab in *PowerSuite* Online Help

Data Logging

Data Logging is a log of key system data (voltages, current and temperature values) that *PowerSuite* registers or saves in a file in your computer.

PowerSuite acquires the key system data by interrogating the system controller at the specified intervals.

You can access the log via the *PowerSuite* application.

Read more in topic Data Logging dialog box in *PowerSuite* Online Help

Energy Log

The Energy Log functionality represents an efficient way of logging the **power system's energy usage**, (Wh).

The system controller measures almost continuously the energy delivered from the system batteries, through the system load fuses and from the rectifiers, and the energy supplied to the system by a connected AC generator or a solar charger.

For example, following data may be presented in the controller's display selecting the Energy log sub options:

Option			Description
	Battery	Hour ↑↓ Day ↑↓ Week ↑↓ Used ↑↓	Batteries' average energy per hour, day, week and total
	Load	Hour ↑↓ Day ↑↓ Week ↑↓ Used ↑↓	Load's average energy per hour, etc (as above)
Energy log→	Rectifier	Hour ↑↓ Day ↑↓ Week ↑↓ Used ↑↓	Rectifiers' average energy per hour, etc (as above)
	Generator	Hour ↑↓ Day ↑↓ Week ↑↓ Used ↑↓	AC Generator's average energy per hour, etc (as above)
	SolarCharger	Hour ↑↓ Day ↑↓ Week ↑↓ Used ↑↓	Sola Chargers' average energy per hour, etc (as above)

For each of them, the controller stores the **average energy** provided during the last hour, the **energy used** the last day and the last week and the **total energy** provided (used) since system start.

The system controller stores the latest 52 calculations, which can be displayed by the Energy Log.

	Batteries Energy Log			
Comment	Calculation #	Hour Wh	Day kWh	Week kWh
Latest calculation	1	50	2	25
Last but one calculation	2	60	4	30
	3	40	1	10
	51	20	3	12
Oldest calculation	52	55	2	15
Used kWh (total) >>>				650

The table above shows an example of Energy Log for the system batteries.

While the total energy provided (used) since system start is continuously updated, the controller calculates the values for the average energy delivered or supplied every hour, every day and every week.

For example, the "Day kWh" value for the latest calculation represents the average energy consumption for the latest 24 hours (calculations).

Load Monitor Info

The Load Monitor Info functionality represents an efficient way of logging the **energy delivered** (Wh) **through each load fuse**, when monitored with a Load Monitor CAN Bus node (unit).

After selecting the node (unit) number and the input number used to monitor the output fuse (or MCB), the Load Monitor Info command displays the **latest output voltage, output current and power** delivered through the fuse. It also displays the **total energy** (Wh) delivered through the fuse.

For example, following data may be presented in the controller's display selecting the Load Monitor Info sub options:

Option			Description
	Unit 01.x ↑↓ Input 01.1 ↑↓	V – A – W – Total kWh	Displays for each of the selected inputs:
	Unit 02.x ↑↓ Input 02.1 ↑↓	V – A – W – Total kWh	the latest output voltage, output current,
LoadMonitor Info→			output power and total energy
	Unit nn.x ↑↓ Input nn.1 ↑↓	V – A – W – Total kWh	delivered trough the load fuse

Alarm Messages, (Log)

You can browse through the stored system alarm messages,

In *Compack*-based systems, via:

- The *WebPower* configuration web pages
- The *PowerSuite* application

In *Smartpack*-based systems, via:

- The *WebPower* configuration web pages
- The *PowerSuite* application
- The *Smartpack* controller's front keys

From the Smartpack Controller's Front

You can browse through the stored system alarm messages (alarm log) by selecting ***"UserOption > DisplayMessages"***, via the *Smartpack* controller's front keys.

The *Smartpack* controller's alarm log stores several hundred chronological events (depending on controller's firmware). 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.

From PowerSuite

Refer to "Types of System Logs" on page 30.

From Configuration Web Pages

By clicking on the "**Event Log**" button, on the *home page* toolbar, you can also display a log of power system events automatically registered by the system controller

Alarm 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.

Power System's Operation Mode

The DC power system may be in *normal condition* or in *critical condition*.

Usually, a system is in *critical condition* after a Mains outage or when the battery voltage is too low. When the system is not in critical condition, it functions in a *normal condition*.

When in normal condition, the DC power system may function in three operational modes:

- *Float Mode*
- *Test Mode*
- *Boost Mode*

The active operational mode is always displayed on *PowerSuite's* status bar.

Test and *Boost* operation modes are NOT permitted, when the power system is in a *critical condition*. Also, in general, the LVD latching contactors may ONLY be disconnected while in *critical condition*, and reconnected when NOT in *critical condition.*

Read also "LVBD - Battery Protection" on page 78.

The power system's outputs -- voltage or voltage free (relay contacts) -- can be either in a *Normal State* or in *Alarm State*.

Configuration of Critical Condition

Using *PowerSuite*, you can configure which of the four following circumstances (monitors in alarm) the DC power system has to encounter for the system to be in *critical condition*.

A. *MainsLow* alarm is ON (one or several phases fail)

B. *Battery Current Minor Low* alarm is ON

C. When alarm
"A" OR "B" above is ON

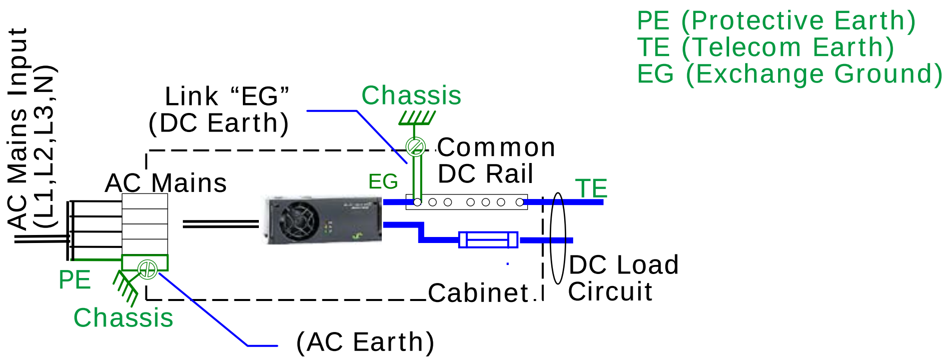
D. When alarms
"A" AND "B" above are ON

Refer also to *PowerSuite*'s System Configuration dialog box topic.

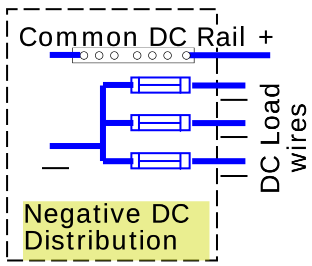
About AC, DC Earthing Systems

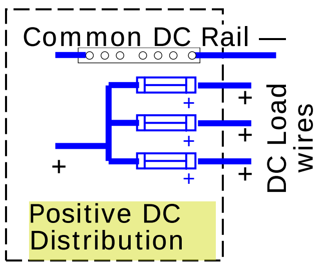
To prevent the risk of electric shock, all cabinet's chassis are to be electrically connected to AC Earth (PE). Also, it is a common practice for telecom equipment to have its common DC output rail (+ or –) connected to a separate "Telecom Earth" (TE) or DC Earth.

Earth connections are in particular important where frequent lightning might induce high voltage levels in AC supply and in battery and load cables.



At factory, AC Earth (PE) and DC Earth (TE) are connected to chassis. Remove "Link EG" ("floating earth") for compliance with other local earthing systems.





Common Positive (+) DC Output Rail is usual in 48 and 60V DC supply systems: *Negative DC Distribution*.

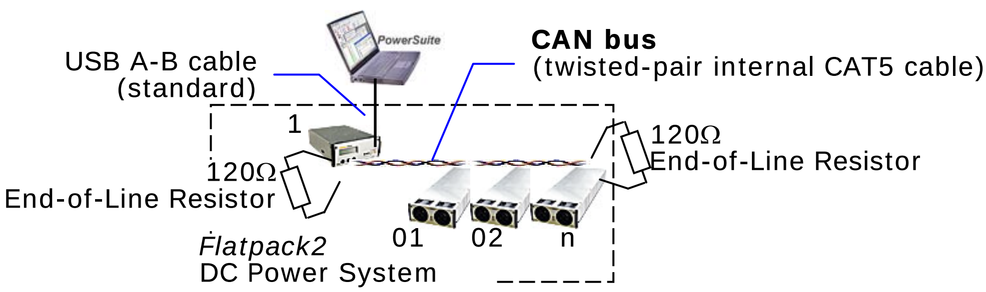
Common Negative (–) DC Output Rail is usual in 24V systems: *Positive DC Distribution*.

CAN bus Termination

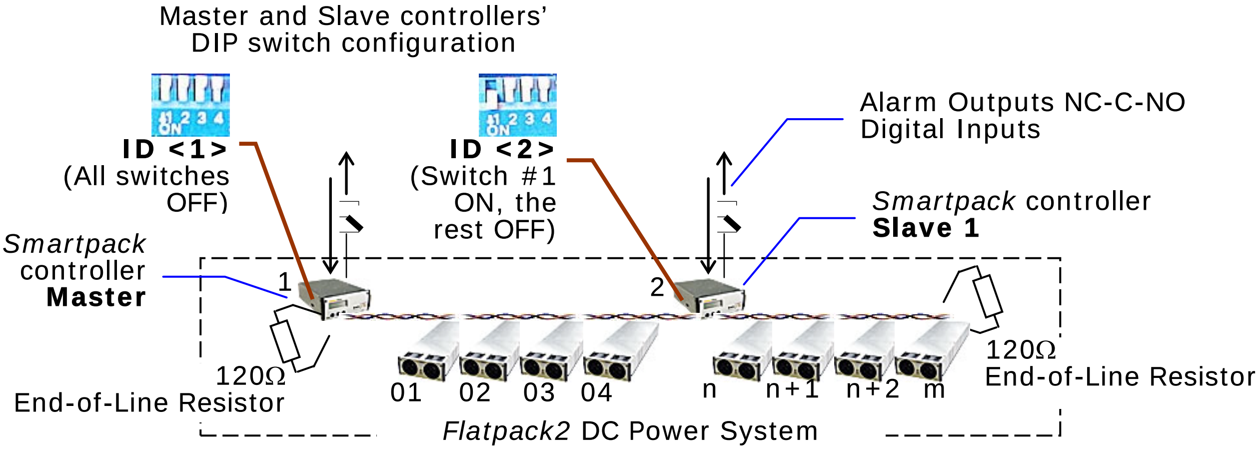
To ensure a correct bus communication and avoid data reflection, you must always terminate the CAN bus with two 120Ω resistors at both ends of the line (*60Ω bus impedance*). The CAN bus is connected using CAT5 twisted-pair cables.

Read also topic "CAN bus Addressing" on page 99.

The figure below shows a generic *Flatpack2* DC power system, with the CAN bus terminated with a 120*Ω* resistor on both line ends (60*Ω* bus impedance).

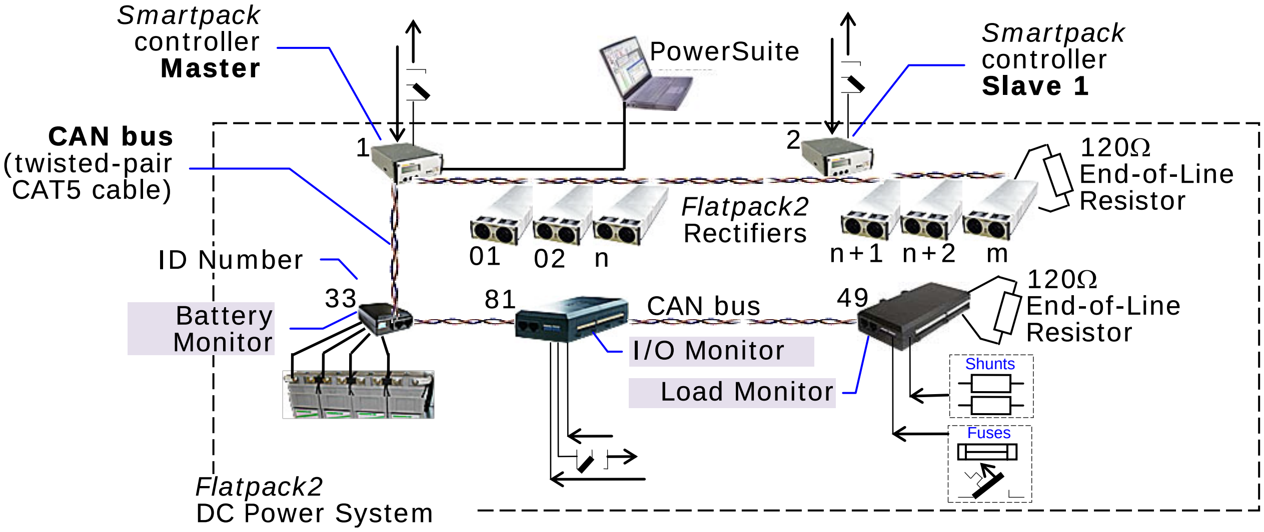


The figure below shows a *Flatpack2* DC power system expanded with a slave controller to implement additional digital inputs, relay outputs or similar functionality. The CAN bus is terminated with a 120*Ω* resistor on both line ends (60*Ω* bus impedance).



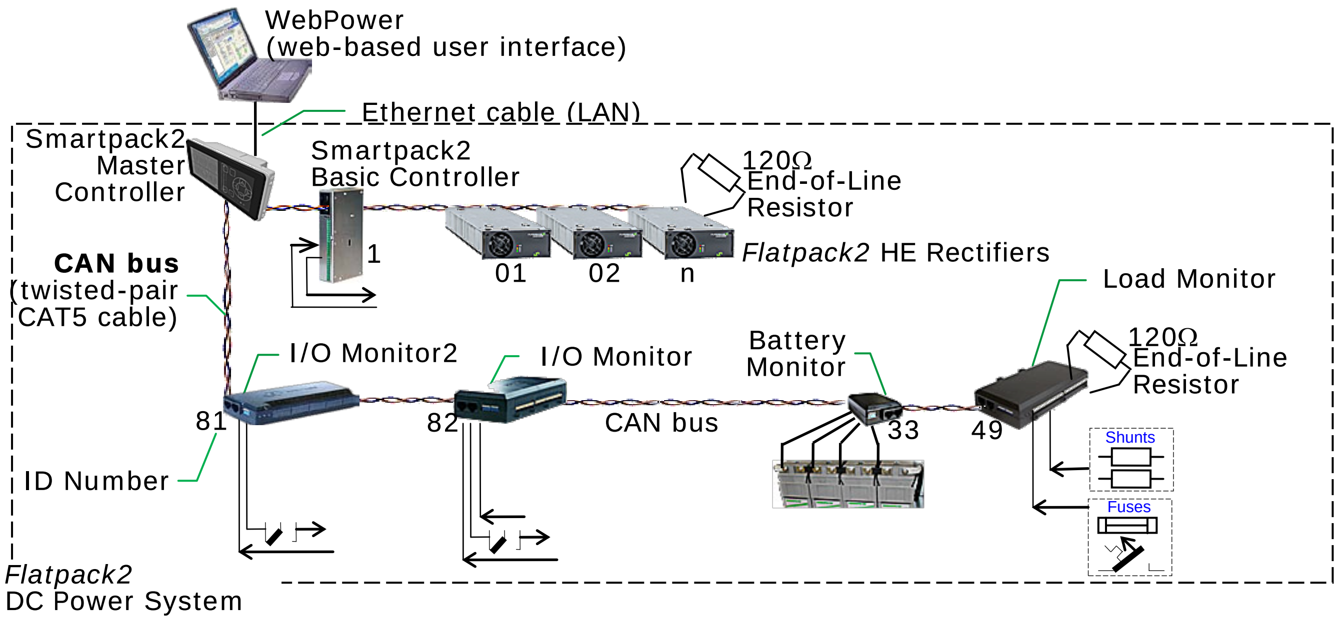
The figure below shows a *Flatpack2* DC power system expanded with a slave controller and 3 CAN bus Nodes to implement additional relay outputs and digital inputs (for current and fuse monitoring, temperature and fan speed control & monitoring or similar functionality). The CAN bus is terminated with a 120*Ω* resistor on both line ends (60*Ω* bus impedance).

The 3 CAN Bus nodes connected are: a Battery Monitor (ID#33), an I/O Monitor (ID#81) and a Load Monitor (ID#49).



The figure below shows a *Flatpack2* DC power system with *Smartpack2*-based control system and 4 CAN nodes, to implement additional digital inputs, relay outputs or similar functionality. The CAN bus is terminated with a 120*Ω* resistor on both line ends (60*Ω* bus impedance).

The 4 CAN Bus nodes connected are: an I/O Monitor2 (ID#81), an I/O Monitor (ID#82), a Battery Monitor (ID#33) and a Load Monitor (ID#49).



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.

Mains Functions

This section describes functions related to the DC power system's AC Mains input.

Mains Phase Assignment versus Rectifier ID

In systems with 3 phase AC feed, the controller can be configured to report a warning if one phase fails, and to report an alarm if two phases fail, for example.

The 230V phases of the power systems' Mains AC Feed are routed to the rectifiers' inputs in a special pattern that loads the 3 phases evenly. The routing of the phases is implemented via internal wiring and the use of **4AC Power Shelves** or **2AC Power Shelves** or similar shelves. Refer to your system's quick start guide and specific documentation for more information.

To be able to display correct information about the phases, the controller must "know" which phase is connected to which rectifier (ID number).

Usually, DC power systems are shipped from factory with the rectifier modules already installed in **the correct position in the power shelves**, with respect to their ID number (or CAN bus address).

This relationship is very important, as the controller always uses rectifier ID 01, 02 and 03 to monitor mains phase L1, L2 and L3 respectively. If these rectifiers malfunction, rectifier ID 04, 05 and 06 will automatically take over. If these fail, the controller uses rectifier ID 07, 08 and 09.

For example: accidentally inserting a rectifier with ID 02 in a power shelf position internally connected to mains phase L1, will cause the controller to monitor L1 "thinking" it monitors L2.

Generator Functions

This section describes functions related to the DC power system's AC Mains input, when supplied by an AC generator or *gen-set* (engine-generator set).

AC Generator as AC Mains

The control system's Generator functionality is a set of software functions that enables efficient monitoring and controlling of generator-fed, hybrid DC power systems.
See a diagram in topic "Configuration Criteria" on page 38.

The control system's Generator functionality implements following main features:

Generator Start & Stop Control

- Automatic generator start/stop, based on the discharge level of the system's battery bank
- Daily and monthly periodical start & stop, based on configurable data

Generator Management

- Generator monitoring via digital input feedback
- Reduced battery charging current limitation
- Optimized implementation with adjustable parameters for: Mains delay, Stop delay, Boost charging, etc
- Smother rectifiers start-up with Walk-in Time feature
- Optional delay for rectifiers start-up
- Logging of generated and consumed energy

You can use the controller's keypad or other GUI to configure the Generator functionality.

About Hybrid Systems

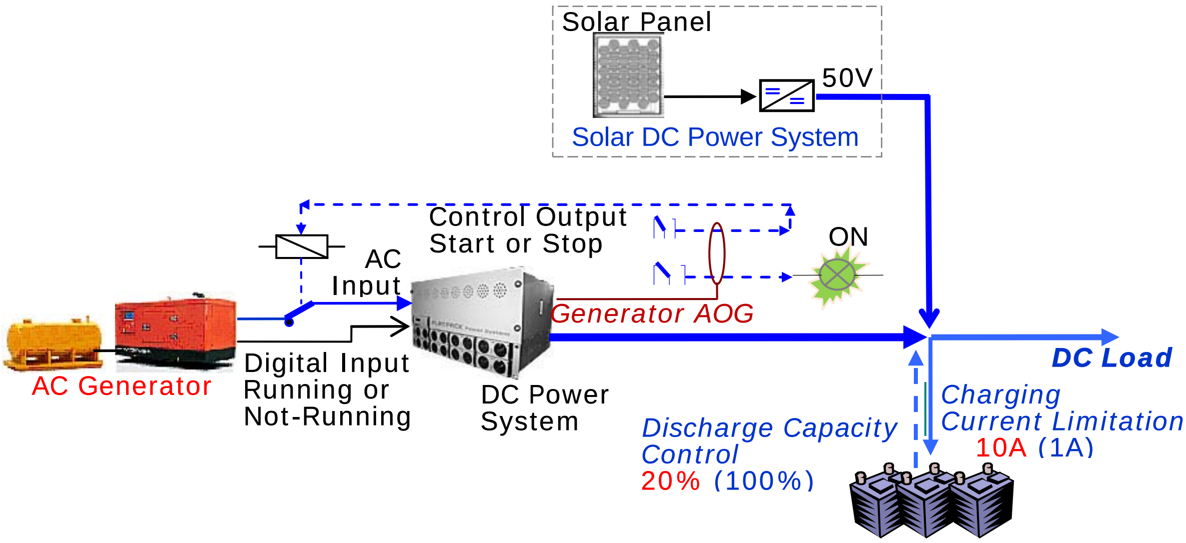
In hybrid DC power systems, the AC feed is usually supplied by an engine-generator set (gen-set).

Such systems could be implemented with *Eltek Valere's* hybrid DC power system, which consists of e.g. *Flatpack2* HE Solar Converters, *Flatpack2* HE Rectifiers, *Smartpack2*-based control system, etc. The input power for such hybrid system could be solar panels, AC Mains and one or two AC generators.

Another hybrid system could be implemented with two paralleled conventional systems: an AC generator-fed system and a Solar panels-fed system. See a diagram in topic "Configuration Criteria" on page 38.

Configuration Criteria

Following criteria is required in the configuration of the example of the hybrid system below:



Example diagram for a hybrid AC generator-fed system and a Solar panels-fed system

Daytime

The DC load is supplied from the Solar System during the daytime.

The controller automatically starts the generator, if the batteries discharge level has reached the limit (e.g. **20% DOD**), which could happens during cloudy days.

The generator-based power system will then help out supplying the DC load. The controller will stop the generator, when the batteries are fully recharged (**100% SOC**).

Night-time

At night, the DC load is supplied from the generator-based power system.

The controller will daily and periodically start the generator at **20:00** hours and stop it at **06:00** hours.

Monthly

Twice a month, the 1st and the 15th, the controller will periodically start the generator at **09:00** hours, and will run for **16 hours**.

The generator-based power system will then help out supplying the DC load. These monthly generator starts will improve the battery heath (SOH).

Generic Criteria

To protect the batteries from too high charge current, the "generator-feed **battery charging current**" must be limited to **10A** max., which is lower than standard "mains-feed battery charging current".

To avoid that the generator keeps on running, after the batteries are recharged (almost 100% SOC), the controller must stop the generator, when the charging current is as low as **1A (Generator Stop Current Limit)**.

To prevent starting the generator during short mains outages, the generator will start **5 min** after a mains outage is detected (**Mains Delay**).

To be able to charge the battery bank a bit longer, after reaching the assigned recharge level (100% SOC), the generator will run **extra 10 min**, after all the criteria to stop the generator are reached (**Stop Delay**).

To reduce the required recharging time, **battery boost charging** (increase of charging voltage) must be enabled.

Configuration of Generator Functionality

You can use the controller's keypad or other GUI to configure the controller's Generator parameters with the specified criteria – see topic "Configuration Criteria" on page 38.

Follow the configuration steps below.

In short:

Step 1- Enable the Generator function

Step 2- Define Alarm Output Group and Assign Relays

Step 3- Configure a Digital Input

Step 4- Link Generator Functions to Input and Output

Step 5- Configure Automatic Generator Start/Stop Criteria

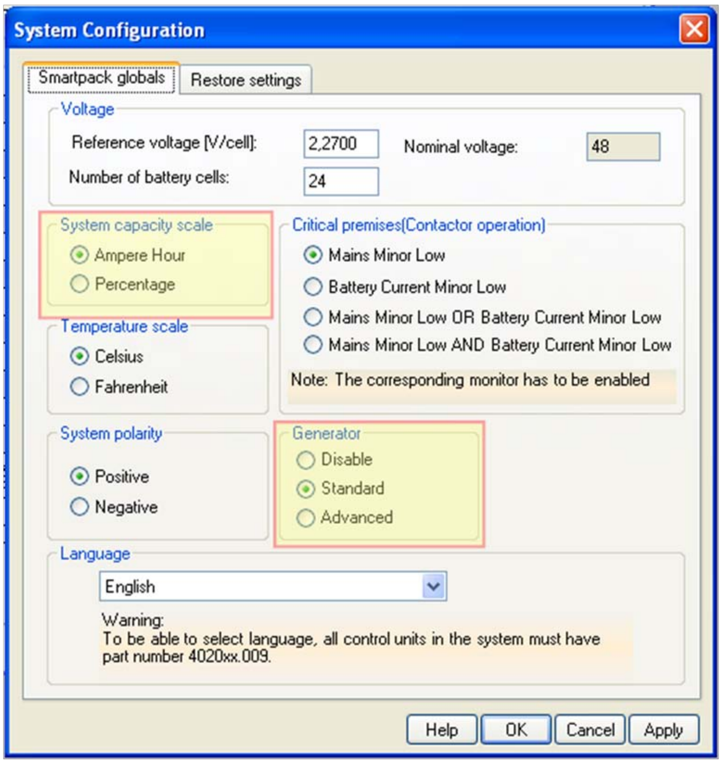
Step 6- Configure Periodic Generator Start/Stop Criteria

More Detailed:

Step 1 - Enable the Generator Function

Use the controller's keypad or other GUI, and carry out the following to enable the Generator Function:

- Select the **Standard** Generator radio button
(the Advance option is not in use)
- Select the **Percentage** system capacity scale
(to show the battery bank capacity in %, instead of in Ah)



Example dialog box from PowerSuite GUI,
the System Configuration dialog box, on the toolbar

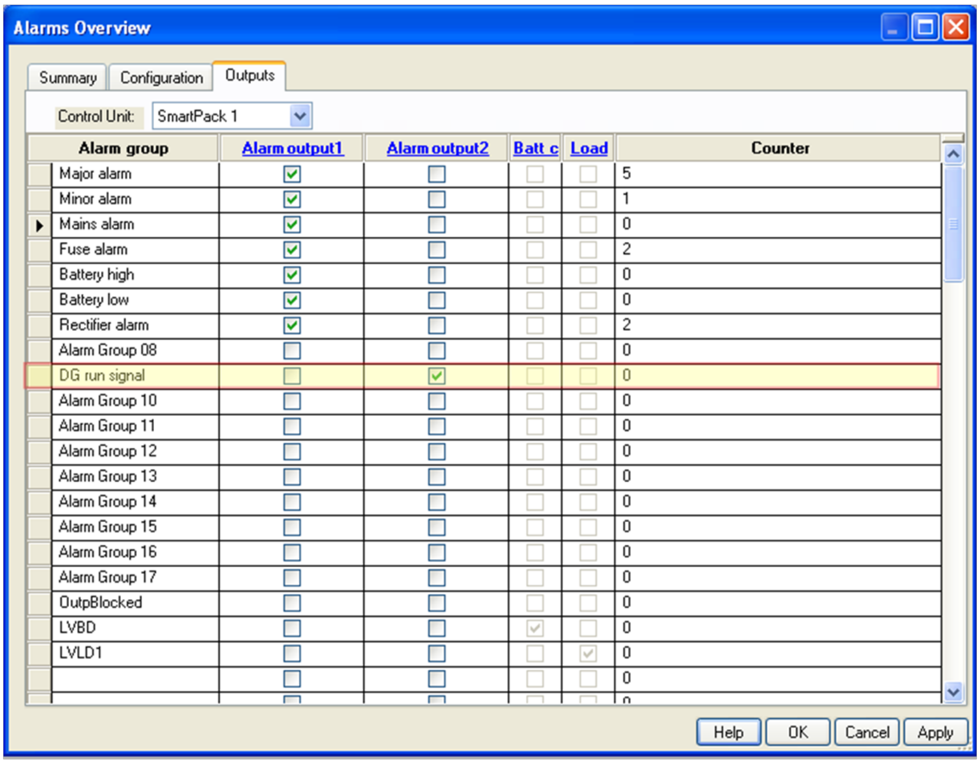
Step 2 - Define Alarm Output Group and Assign Relays

Use the controller's keypad or other GUI, and carry out the following to define an Alarm Output Group and to assign alarm relays to the group.

The controller will use the alarm output relay to start and stop the generator.

- **Rename** the spare Alarm Output Group "Alarm Group 09" to e.g. "**DG run signal**"
- **Assign the relay** "Alarm Output 2" to the group "DG run signal"

For detailed information, refer to topic "Alarm Output Groups" on page 86, and to the tutorial "How to Configure Alarm Output Groups" on page 114



Example dialog box from PowerSuite GUI,
the Outputs tab in the Alarms Overview dialog box, on the toolbar

Step 3- Configure a Digital Input

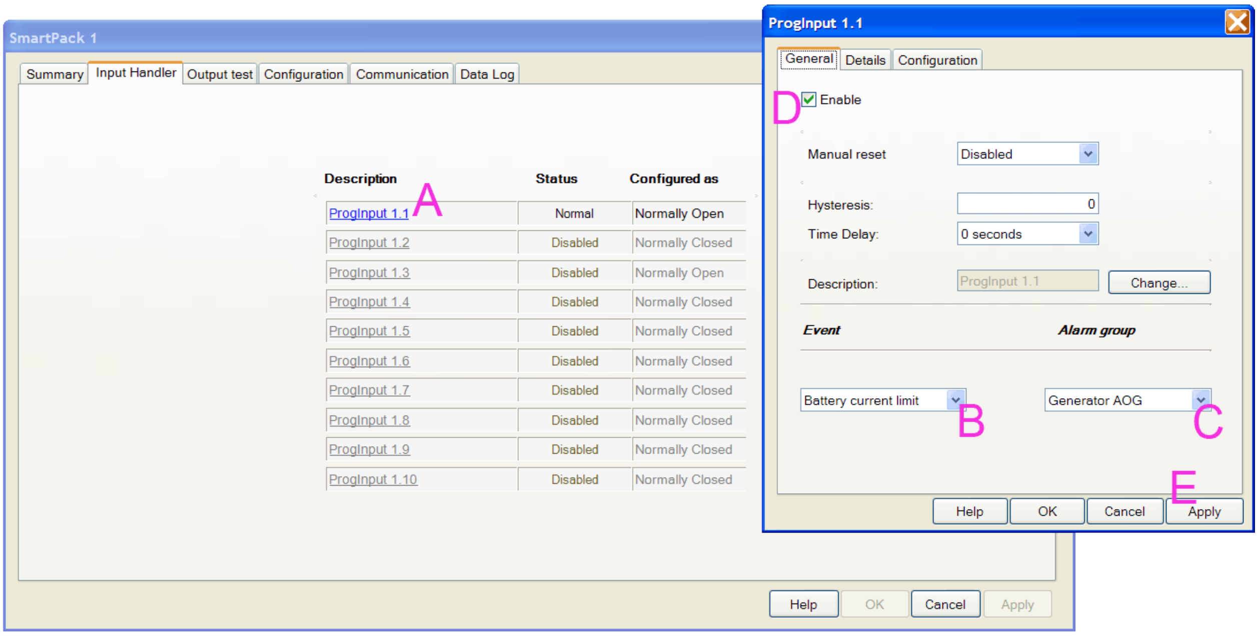
Use the controller's keypad or other GUI, and carry out the following to configure a digital input to get feedback from the generator, and to activate the reduced battery charging current limitation.

The controller will get "Running" / "Non-Running" feedback from the generator via the digital input.

- Double click on "**ProgInput 1.1**" (A)
- Select the "**Battery Current Limit**" event (B)
- Select the "**Generator AOG**" group (C)
  (If you want to use to give a warning that the generator is running)

- Check the "**Enable**" box, to activate the digital input (D), and click on the **Apply** button (E)

For more detailed information, refer to the tutorial "How to Configure Alarm Monitors & Programmable Inputs" on page 115.



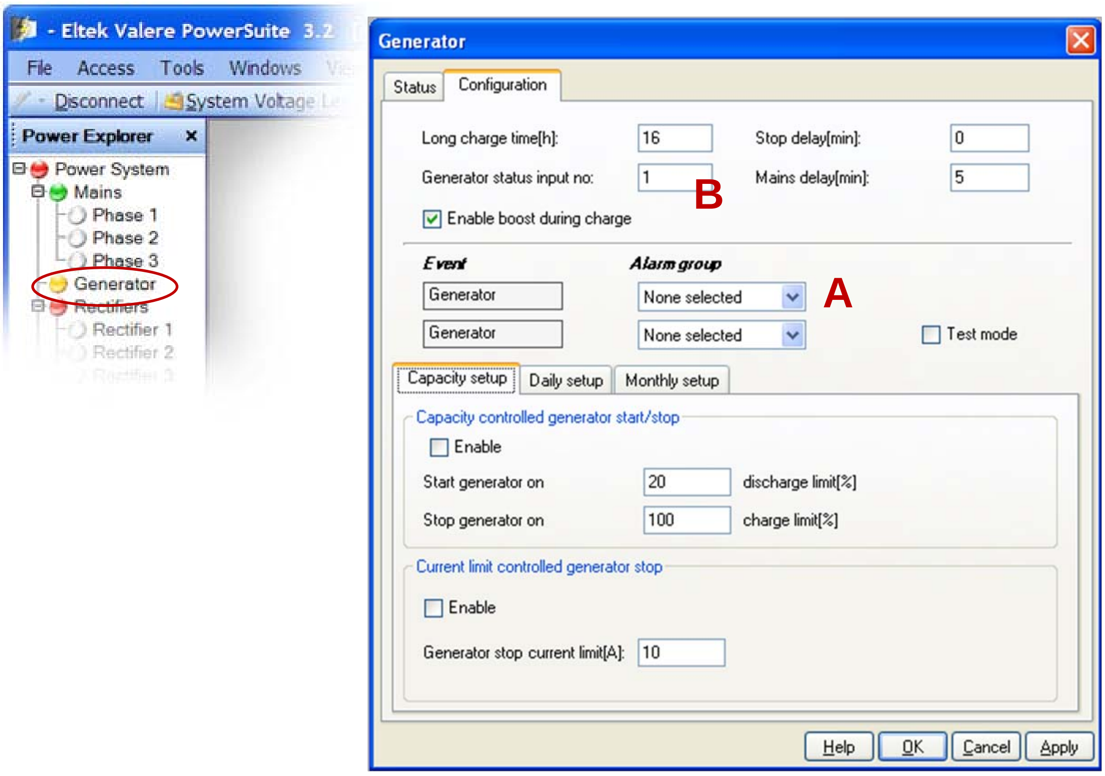
Example dialog box from PowerSuite GUI,
the Input Handler tab in the Smartpack Control Unit dialog box, in the Power Explorer pane

Step 4- Link Generator Functions to Input and Output

Use the controller's keypad or other GUI, and carry out the following to "connect" the configured digital input and alarm output group to the Generator function.

The controller will get "Running" / "Non-Running" feedback from the generator via the digital input.

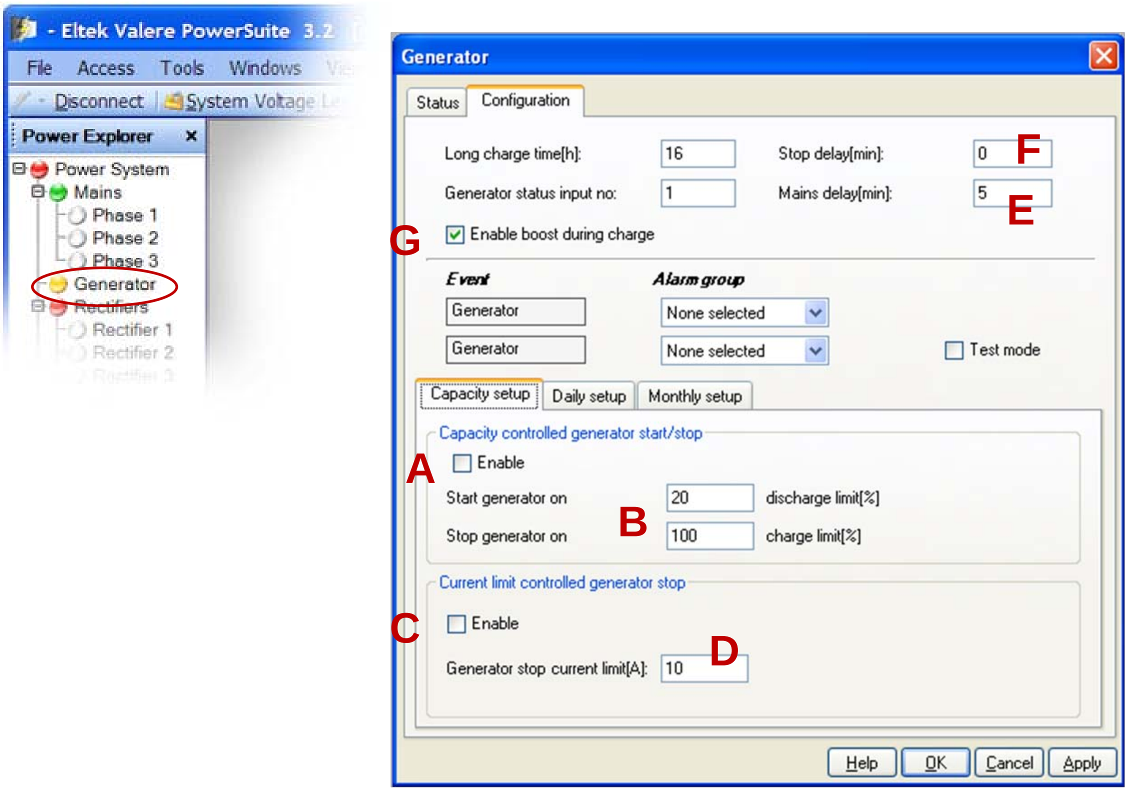
- **Open the Generator** dialog box
  by double clicking on Generator icon, on *PowerSuite's* power explorer pane
- Select the previously defined alarm output group "**DG run signal**" to the first **Generator event** (A),
  thus "connecting" the alarm output group to the Generator function.
  Notice that you could use a another alarm output group to start another generator (in double-generator fed systems)
- Type <**1**> in the "**Generator Status Input number**" field,
  thus "connecting" the digital input to the Generator function.



Example dialog box from PowerSuite GUI
the Configuration tab in the Generator dialog box, in the Power Explorer pane

Step 5- Configure Automatic Generator Start & Stop Criteria

Use the controller's keypad or other GUI, and carry out the following to configure the automatic Generator start & stop criteria.



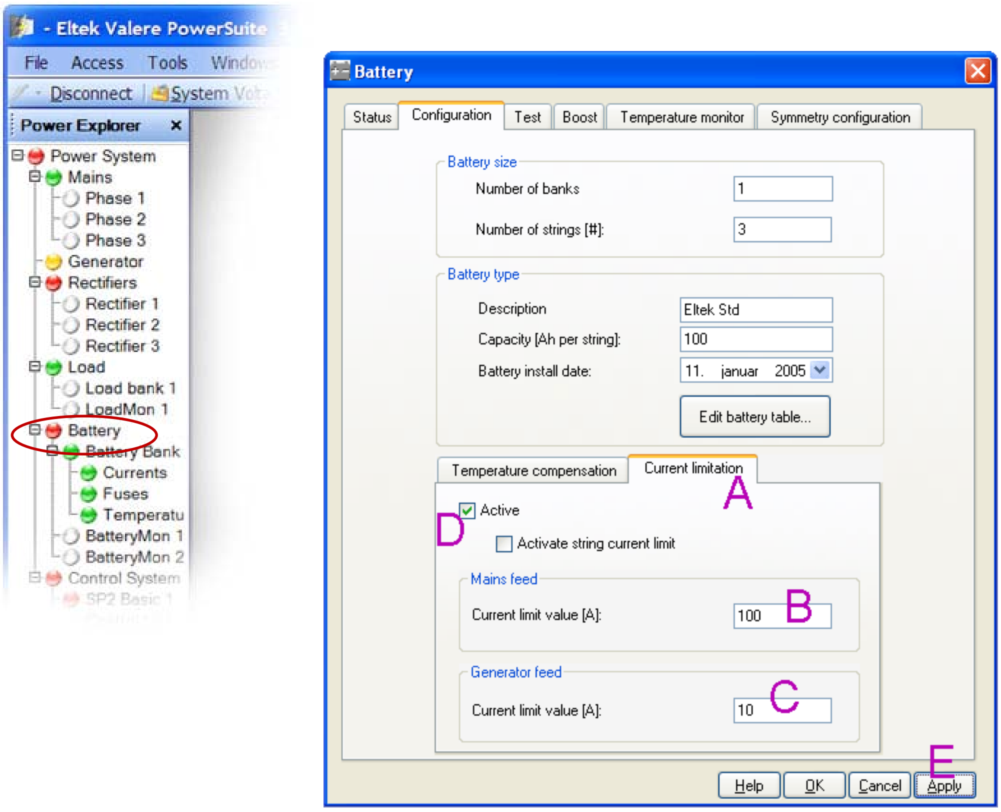
Example dialog box from PowerSuite GUI
the Configuration tab in the Generator dialog box, in the Power Explorer pane

- Check the "**Enable**" box (A) to activate the "**Capacity controlled** generator start/stop" criteria
- Type in the start and stop generator fields (B) the battery **discharge level** (**20%** DOD) to start the generator, and the **charged level** (**100%** SOC) to stop the generator
- Check the "**Enable**" box (C) to activate the "**Current limit controlled generator stop**" criteria
- Type <**1**> amp, instead of "10", in the "**Generator stop current limit [A]**" field (D);
  stops the generator when the charging current is low
- Type <**5**> in the "**Mains Delay [min]**" field (E); the delay will prevent starting the generator during short mains outages
- Type <**10**> minutes, instead of "0", in the "**Stop Delay [min]**" field (F); to charge the batteries a bit longer
- Check the "**Enable boost during charging**" box (G) to allow e.g. automatic battery boost charging (reduces recharging time).
  Refer to topic "Battery Boost Charging" on page 73, for configuration of boost charging method, parameters, etc.

In addition to the 1A "Generator stop current limit", carry out the following to configure the 10A max "generator-feed battery charging current".

- In the Battery dialog box, click in the Configuration tab, then in the Current Limitation sub tab (A)

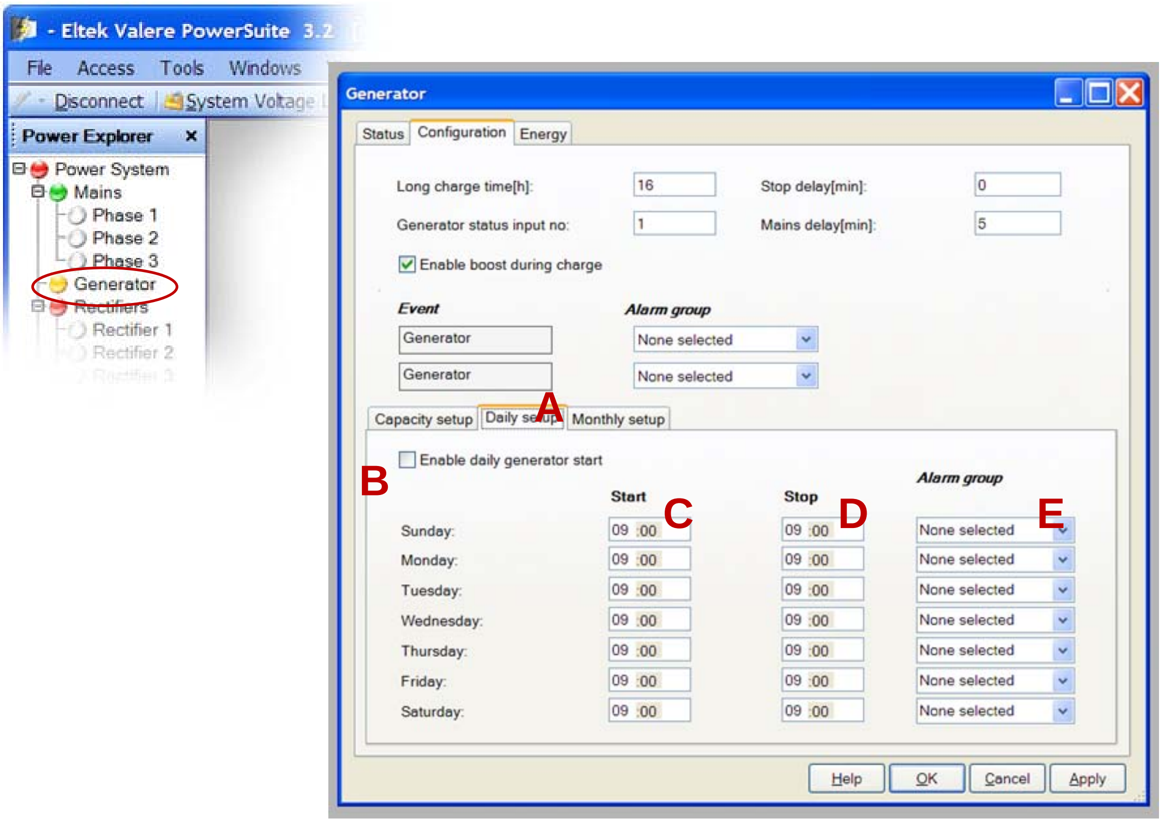
- Type e.g. <100> amp in the Mains Feed “Current limit value [A]” field (B), and
  <**10**> amp in the Generator Feed “**Current limit value [A]**” field (C), to protect the batteries from too high charge current
- Check the “**Active**” box (D) to enable the “**generator-feed battery charging current**” criteria,
  and click on the **Apply** button (E)



Example dialog box from PowerSuite GUI
the Current Limitation sub tab, in Configuration tab in the Battery dialog box, in the Power Explorer pane

Step 6- Configure Periodic Generator Start & Stop Criteria

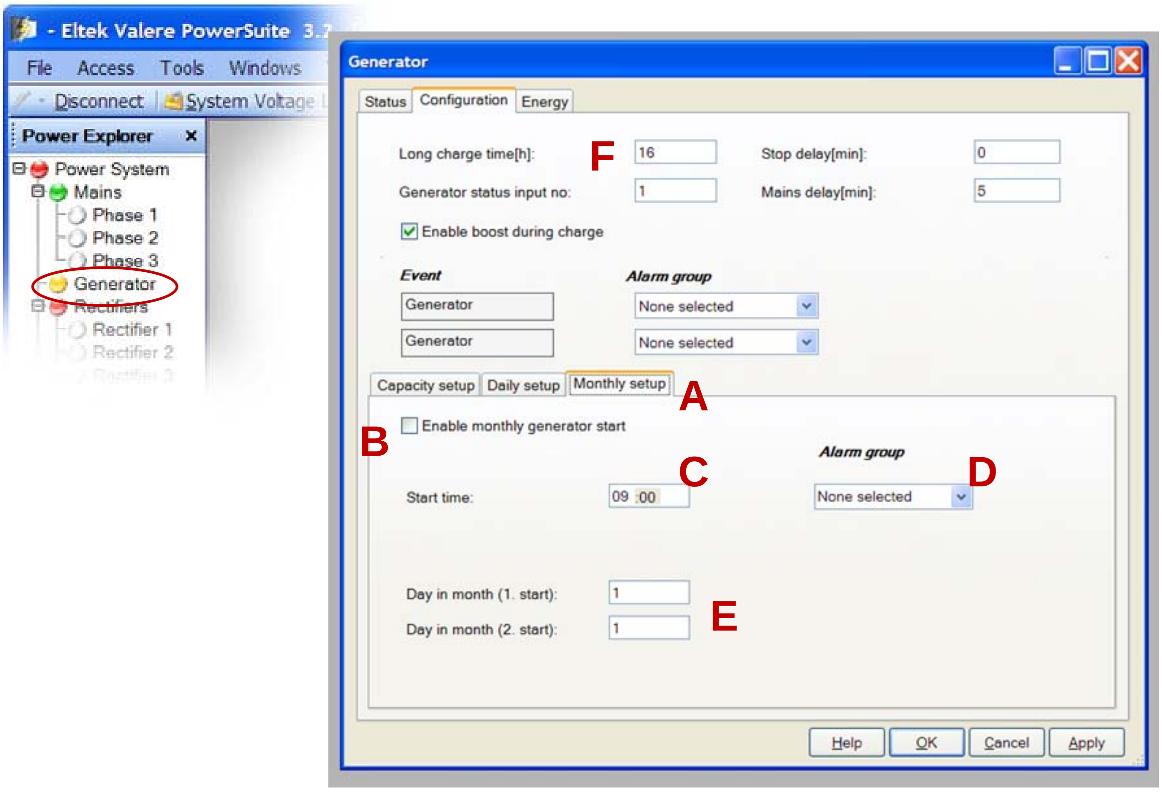
Use the controller’s keypad or other GUI, and carry out the following to configure the periodic Generator start & stop criteria.



Example dialog box from PowerSuite GUI
the Configuration tab in the Generator dialog box, in the Power Explorer pane

- Click in the "**Daily Setup**" sub tab (A),
  and check the "**Enable daily generator start**" box (B) to activate the periodic generator start/stop criteria
- Type <**20:00**> hours in **all the Start** fields (C), and <**06:00**> hours in **all the Stop** fields (D)
  to start the generator every day during the night at 20:00 hours and stop it at 06:00 hours
- Select a suitable alarm output group (E), if a warning or similar is required when the generator runs periodically

In addition to the periodic daily criteria, carry out the following to configure the periodic monthly Generator start & stop criteria.



Example dialog box from PowerSuite GUI
the Configuration tab in the Generator dialog box, in the Power Explorer pane

- Click in the "**Monthly Setup**" sub tab (A),
  and check the "**Enable monthly generator start**" box (B) to activate the periodic generator start/stop criteria
- Type <**09:00**> hours in the **Start** field (C)
  for the monthly start of the generator at 09:00 hours
- Select a suitable alarm output group (D), if a warning or similar is required when the generator runs periodically
- Type <**1**> in the "**Day in month (1st start)**" field and <**15**> in the "**Day in month (2nd start)**" field (E)
  for the monthly start of the generator the 1st and the 15th of every month
- Type <**16**> hours in the **"Long charge time [h]"**field (F)
  so that the generator, starting at 09:00 hours, may run for 16 hours, the 1st and the 15th of every month

Rectifier Functions

This section clarifies functionality related to the DC power system's rectifiers.

Plug-and-Play Rectifiers

WARNING:
It is important to insert the Flatpack2 rectifiers in the correct position in the power shelves.
This fact is not so important in systems using Micropack rectifiers.

When a rectifier is **hot plugged in a power shelf for the first time**, the main controller assigns the next available ID number to the rectifier, starting with "01". This ID number (or CAN bus address) and the rectifier's serial number are stored in both modules.

When a **previously installed (hot plugged)** rectifier is inserted in a power shelf, the main controller "recognises" the module, and assigns the same ID to the rectifier.

In other words, the controller and the rectifier "remember" the assigned ID and serial numbers, even after removing and reinserting the rectifier in the shelf.

To achieve a more controlled ID assignment, you should always insert & hot-plug **new rectifiers** in the power shelves, **one module at a time, starting with shelf position 1**, 2, 3 and so on. The sequence is indifferent after positions 9.

The power shelf position numbers vary with the type of AC mains and the type of power shelves installed in your system. Refer to your system's quick start guide and specific documentation for more information.

Do not relocate already pre-installed rectifiers.

Resetting the Number of Rectifiers

When a rectifier reset is activated, the number of rectifiers is recalculated, and only the number of communicating modules at the moment will be counted.

For instance: in a DC power system equipped with 10 rectifiers, rectifier with ID number "04" malfunctions. If you insert rectifier ID#10 in the position of the failing ID#04, and then activate a rectifier reset, the controller recalculates the number of communicating rectifiers to only 9. At the same time the controller reassigns rectifier with ID#10 to ID#04, thus filling the gap.

Rectifier Information

You can display information about the rectifiers,

In *Compack*-based systems, via:

- The *WebPower* configuration web pages
- The *PowerSuite* application

In *Smartpack*-based systems, via:

- The *WebPower* configuration web pages
- The *PowerSuite* application
- The *Smartpack* controller's front keys

From the Smartpack Controller's Front

You can display information about the *Flatpack2* rectifiers communicating in the system, by selecting ***"UserOption > Rectifier Info"***, via the *Smartpack* controller's front keys.

Following information may be displayed selecting the *Rectifier Info* sub options (level 3):

Option	*Description*
NoOfRects.	Number of rectifiers installed in the system.
RectCurrent	Rectifier current
RectSerialNumber	Rectifier ID and serial number
Rect.PrimaryVolt	Rectifier input voltage
Rectifier Status	Rectifier status
Rectifier Temp	Rectifier temperature

While the controller is accessing information from a specific rectifier, the green LED on the rectifier's front panel flashes.

The *Smartpack* controller sends out status messages every 200ms to all the *Flatpack2* rectifiers connected to the CAN bus, such as:

- The *Smartpack* controller's status
- Current Limit Reference
- Measured Output Voltage
- Reference Output Voltage
- Over-voltage Protection Reference

From PowerSuite

By double-clicking on any of the Rectifier icons, on the *PowerSuite* Power Explorer pane, you can also display important parameters about all the rectifiers in the system, such as:

- Rectifier's ID number
- Rectifier's Status
- Rectifier's Serial Number
- Rectifier's Output Current
- Rectifier's internal ambient temperature
- Rectifier's AC input voltage

Read also the "Rectifier Details tab" topic in *PowerSuite Help*.

From Configuration Web Pages

By clicking on the "**Rectifiers**" link, on the Power Explorer pane, in the *configuration web pages*, you can also display a summary of all rectifiers in the power system, as well as detailed information about each rectifier.

For more information, refer to *WebPower Online Help*.

Rectifier Status - Alarm Levels

When the rectifiers are in normal state, the green LED on the module's front is lit, or flashing if the controller reads data from the rectifier.

Following system events causes the rectifier to switch over to alarm state:

Alarm Type	*Caused by System Event*
Major Alarm (Red LED is ON)	• Rectifier is in Shut-down Mode due to low mains, or high internal temperature, or high output voltage • Internal rectifier failure (malfunction) • Fan failure (single or double fan malfunction) ** • Low output voltage • CAN bus failure
Minor Warning (Yellow LED is ON)	• Rectifier is in Derating Mode (reduced output power) due to high internal temperature, or low input voltage, or fan failure ** • The remote Battery Current Limit is activated • AC input voltage is out of range • Rectifier in stand-alone mode (or loss of communication with the controller
Minor Warning (Yellow LED is flashing)	• Rectifier is in Over-voltage Protection Mode (AC input)

** Not applicable with Micropack rectifiers.

Read also the “Rectifier Details tab” topic in *PowerSuite Help*.

Efficiency Management

This feature optimizes the power system’s efficiency loss, when the load current is less than approx. 50% of the installed rectifier capacity.

The control system’s Efficiency Management is an advanced and very valuable software function that enables reducing the energy cost by **automatically switching OFF unnecessary rectifiers**, so that the remaining running rectifiers can operate in the most efficient zone of the output efficiency characteristic (typically between 50 to 80% max output on *Flatpack2* rectifiers).

Enabling

You can use the controller’s keypad or other GUI to configure the Efficiency Management function.

When you enable Efficiency Management, the control system will check if the **total load current is less than approx. 50% of the system’s total capacity**, in which case it will switch OFF redundant rectifiers. Thus, the AC current requirement is reduced and the remaining running rectifiers operate more efficiently.

If the load increases, the control system will automatically switch ON more rectifiers to supply the new load requirements.

Shuffle Time

The Efficiency Management’s **Shuffle Rectifier feature** will further help reduce rectifier fatigue, by **sequentially rotating which rectifiers are switched ON**. The interval of rotation can be adjusted with the Shuffle Time parameter (hours).

OFF Time

During the rotation cycle, one rectifier turns ON and **-- after an interval period -- the longest running rectifier will be turned OFF**. The interval period can be adjusted with the OFF Time parameter.

Redundancy

When Efficiency Management is enabled, you can select to operate in "**Redundant Mode**" or in "**Non-Redundant Mode**".

Operating in Redundant Mode, the control system will **have one more rectifier turned ON** than what it calculates it is ideal.

HE Priority

If the power system has *Flatpack2* HE rectifiers installed (High Efficiency rectifiers with 96% efficiency), then you can enable the Efficiency Management with the HE Priority activated.

When the HE Priority is activated -- and if the total load current is less than approx. 50% of the system's total capacity -- the Efficiency Management feature **will only switch ON the HE rectifiers to supply the load** efficiently.

When the HE Priority is activated, it is not required to select parameters for Shuffle Time, OFF Time and Redundancy.

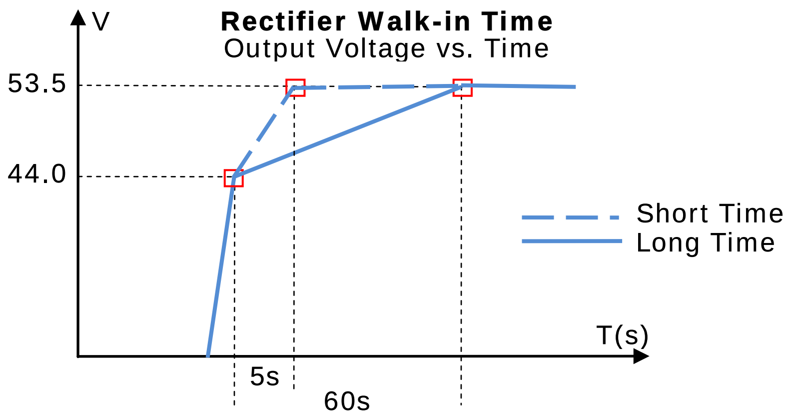
Rectifier Walk-in Time

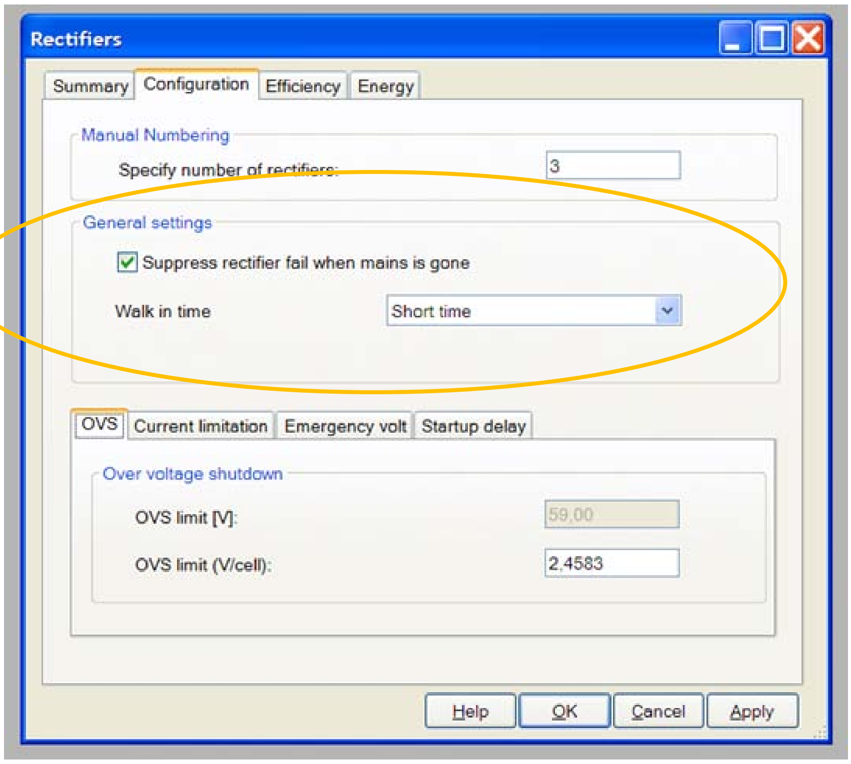
The rectifier's Walk-in Time is a software function that helps **extend the time** it takes the rectifiers to increase **from the switch-on voltage** (approx 44VDC in a 48V system) **to the specified system float voltage** (default 53.5VDC).

Using the controller's keypad or other GUI, you can select how long time it will take to reach the default output voltage, by selecting "**Short Walk-in Time**" (5s) which is default or "**Long Walk-in Time**" (60s).

The rectifier's Walk-in Time feature helps reduce the current pull when running on low current supply AC sources (solar panels, AC generators, etc).

This feature helps also reduce battery damage, caused by very large in-rush currents at AC connection and reconnections to Mains. This is especially critical if the batteries have reached the battery disconnect point or worse, have been deep-discharged.



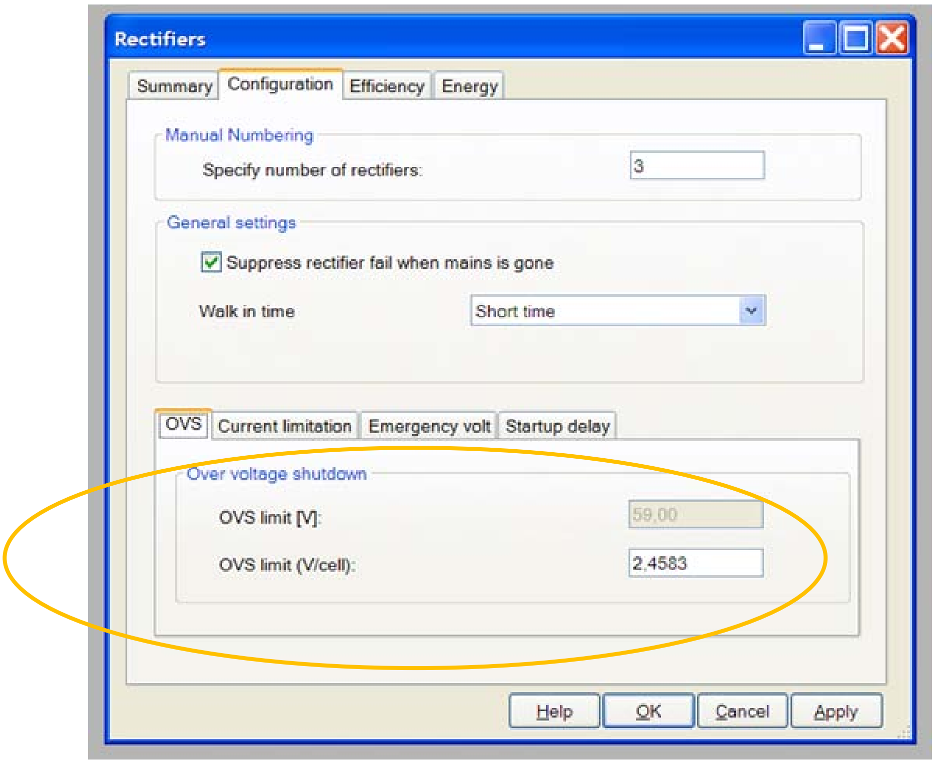


Rectifier OVS Trip Voltage

The system controller uses the Rectifier OVS Trip Voltage or limit (Over Voltage Shutdown) **to protect the load** against e.g. malfunctioning rectifier hardware.

The controller "commands" the rectifiers, via the CAN bus, to **switch OFF, if its output voltage reached the OVS limit**, which is always higher than the default output voltage (53.5VDC).

Using the controller's keypad or other GUI, you can set the OVS Trip Voltage to a suitable value above the default output voltage.



Example of Rectifier OVS Trip Voltage configuration in *PowerSuite*

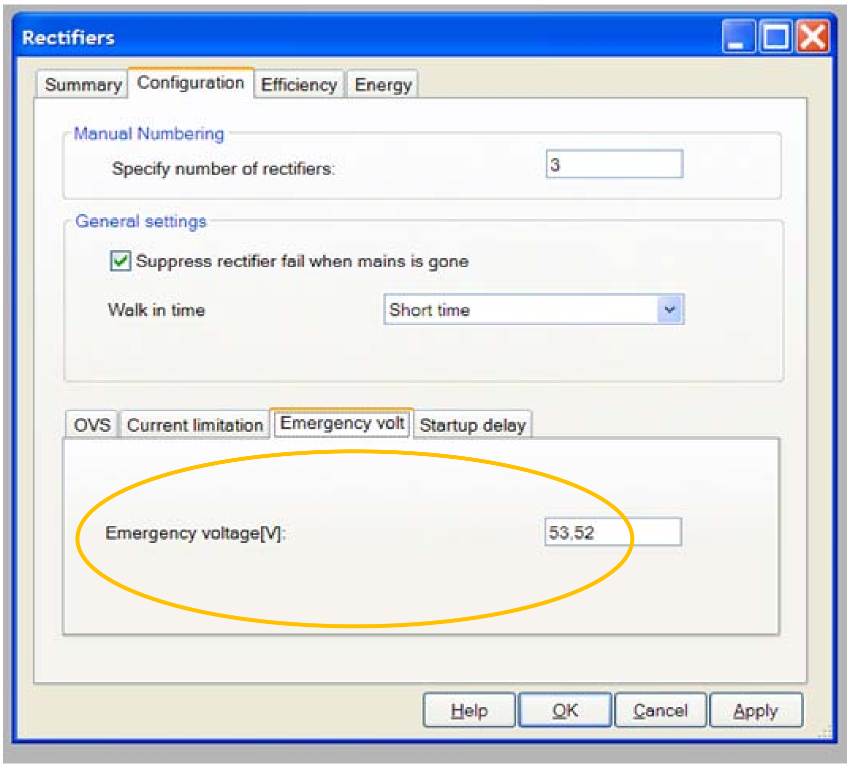
Rectifier Emergency Voltage

The system controller uses the Rectifier Emergency Voltage for security or site specific reasons.

The controller "commands" the rectifiers, via the CAN bus, to **reduce their output voltage to a lower value** than the default (53.5VDC).

Using the controller's keypad or other GUI, you can set the Emergency Voltage to a suitable value lower than the default output voltage.

Then the action can be enabled externally, e.g. using a programmable input to inform the controller to activate this function.



Example of Rectifier Emergency Voltage configuration in *PowerSuite*

Firmware Upgrade - Rectifiers

The *FWLoader* program helps you upgrade the firmware installed in your power system's control units, such as controller, rectifiers and other CAN Bus nodes.

NOTICE:
Contact the *Eltek Valere* Service Dep. if you need to upgrade the rectifier's firmware or any CAN Bus control units other than controllers.

FWLoader Online Help helps you using the *FWLoader* graphical user interface (GUI).

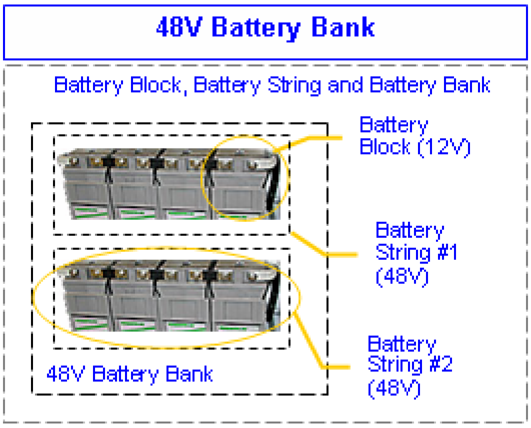
Read more "About the *FWLoader* Program" on page 94.

Battery Functions

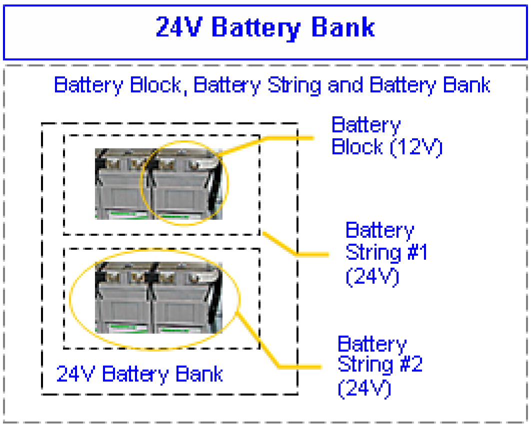
This section explains topics associated to the DC power system's battery banks.

Battery Banks, Strings and Blocks

Normally, battery banks are implemented by connecting in parallel several battery strings; each string is formed by battery blocks connected in series.



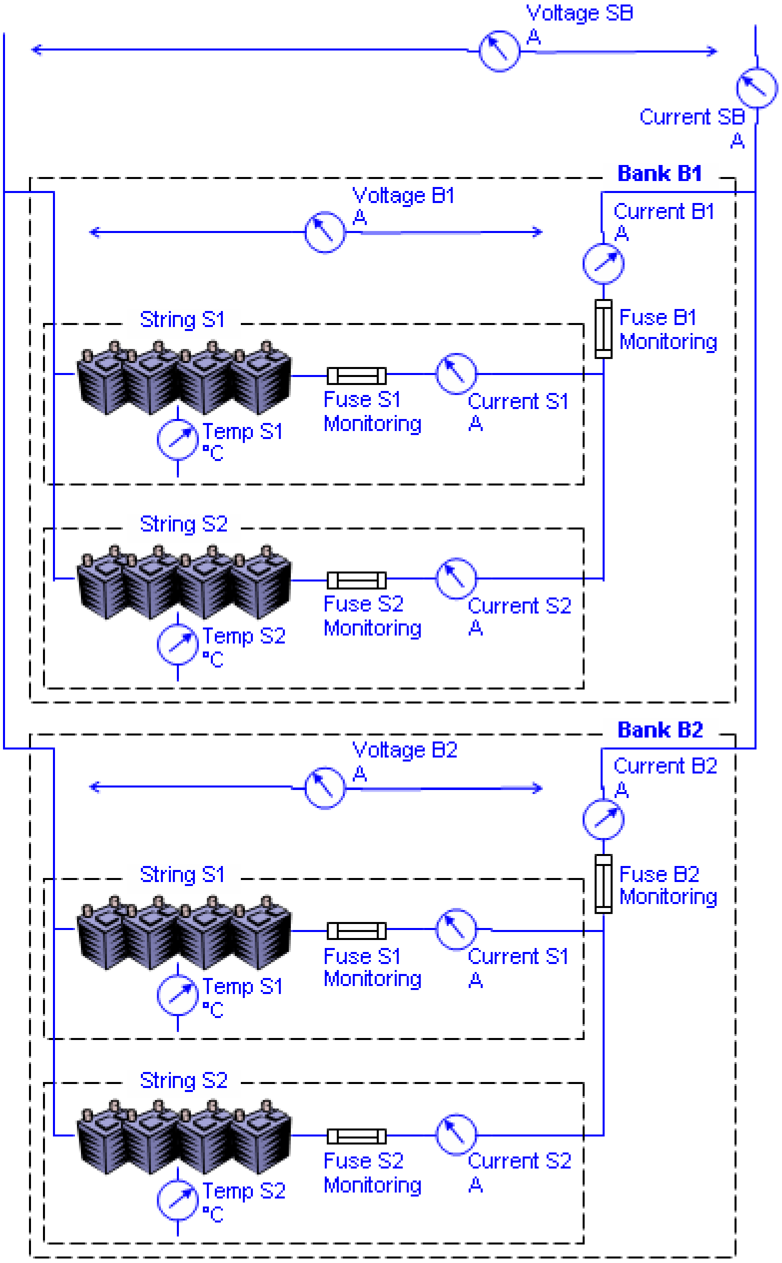
Example of a 48V battery bank implemented with two 48V battery strings; each string consists of four 12V battery blocks



Example of a 24V battery bank implemented with two 24V battery strings; each string consists of two 12V battery blocks

Overview Battery Measurements

DC power systems may be implemented with one or several battery banks, each consisting of one or several battery strings.



Overview of the power system's battery measurements.

Depending on how many controllers and shunts you have implemented in the power system, you can carry out the following battery measurements:

For all the power System's Battery banks
- o Voltage SB
- o Current SB

For each battery Bank
- o Voltage Bx
- o Current Bx
- o Fuse monitoring Bx

For each battery String

- Current Sx
- Fuse monitoring Sx
- Temperature Sx

Read also about "Battery Banks, Strings and Blocks" on page 54, and the controller's "Available Inputs and Outputs" on page 110.

Battery Commands

This logical subgroup lets you issue or activate **specific commands related to the power system's battery bank**. For example, following commands might be aavailable in *Smartpack2 Master* Controller's submenu:

Commands > **Battery Commands**

#	Description	Action	Unit/Label	Note
	Start Battery Test	□	No	Read about "Battery Test Start Methods" on page 70
	Stop Battery Test	□	No	
	Start Battery Boost	□	No	Read about "Battery Boost Charging" on page 73
	Stop Battery Boost	□	No	

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

NOTICE:
The default Service Access Level password or Pin-Code is <0003>. We strongly recommend changing the passwords as soon as the power system is installed.

Battery Symmetry Measurements

Symmetry measurement is a battery monitoring method for automatically detecting unbalanced battery blocks, due to battery cell failure. Symmetry monitoring of a battery string may be performed after three different methods:

- **Block measurement method**
  Measuring each battery block
- **Mid-point measurement method**
  Measuring from the mid-point of the battery string to one end
- **Double mid-point measurement method**
  Measuring from the mid-point of the string to both ends

Read also about the controller's "Available Inputs and Outputs" on page 110 and about "The *Battery Monitor* Control Unit - Overview" on page 112.

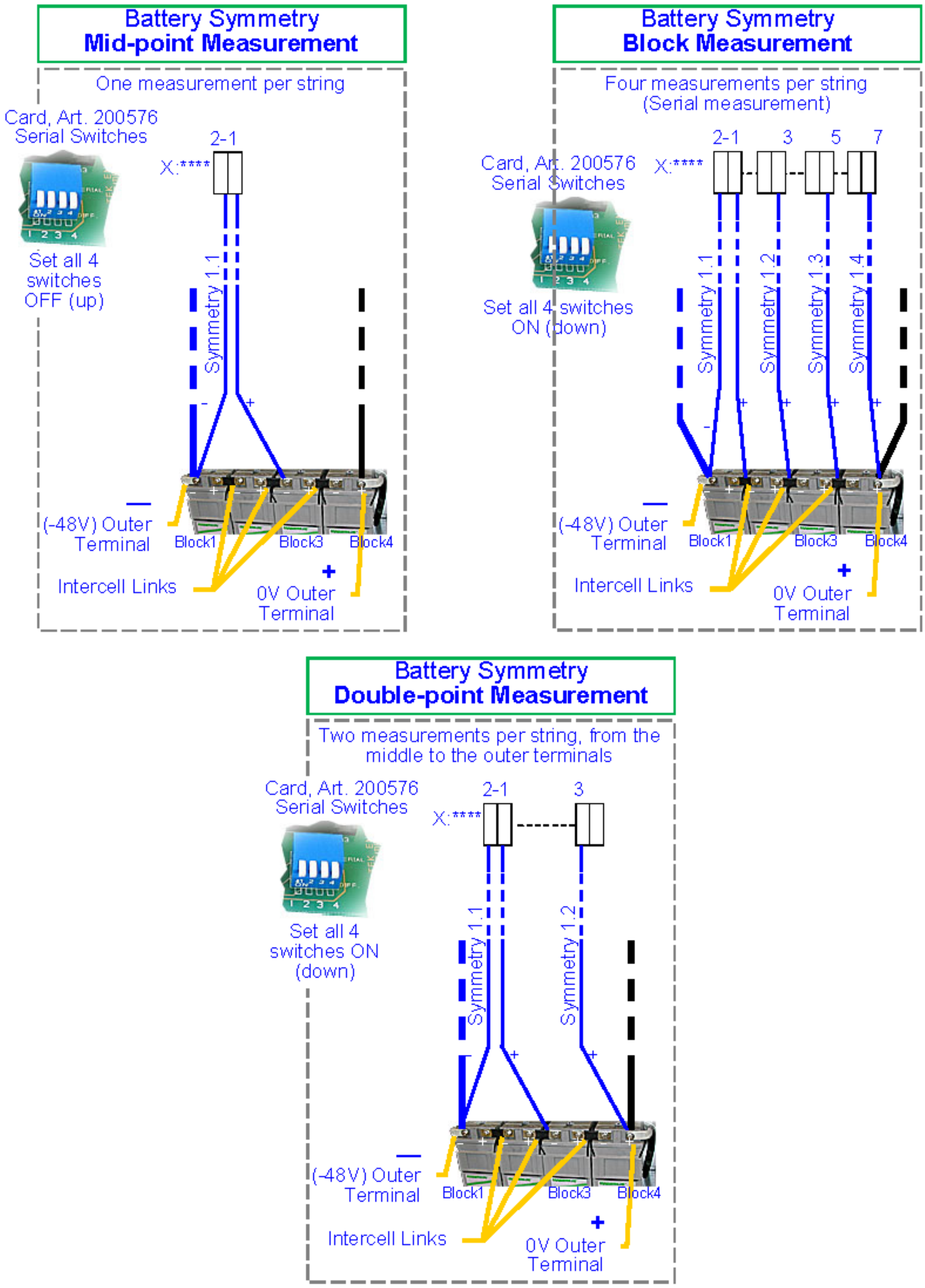
Symmetry in 48V Systems

The power system has many inputs — on the controller and on Battery Monitors connected to the CAN bus — which are dedicated for battery symmetry measurements.

Controller's Battery Symmetry Connections, 48V

DC power systems are normally delivered with the symmetry measurement method and the number of measurement points already preprogrammed in the controller. Any deviation from factory settings requires Symmetry reconfiguration via the *PowerSuite* PC program.

Refer to the *PowerSuite Help*, for symmetry reconfiguration, or when configuring *Battery Monitor Control Units.*



Example of terminal connection points for the controller's Symmetry ***Block, Mid-point and Double Mid-Point Measurement Methods*** *in 48V DC power systems*

The *mid-point measurement method* requires 2 symmetry wires per battery string; the double *mid-point measurement method* requires 4 symmetry wires per battery string, while the *block measurement method* requires 8 symmetry wires per battery string.

Notice:
If you open the serial switches in card, Art. 200576 -- setting all to OFF (up) -- you have to connect the + and – wires of every symmetry input.

Each *Smartpack* controller is equipped with 8 battery symmetry inputs (on CON4 and CON3), enabling symmetry measurement of:

- 2 battery strings (block meas. method)
- 4 battery strings (double mid-point meas. method)
- 8 battery strings (mid-point meas. method)

You can implement any of these methods using one or two *Battery Connection Kits* and the appropriate number of *Battery Symmetry Kits*, which contain a single wire with suitable cable lugs, etc.

Refer to the system's quick start guide for connection details, and for using fewer wires, setting the switches to ON.

Read also about "The *Battery Monitor* Control Unit - Overview" on page 112.

Battery Monitor's Symmetry Connections, 48V Block M

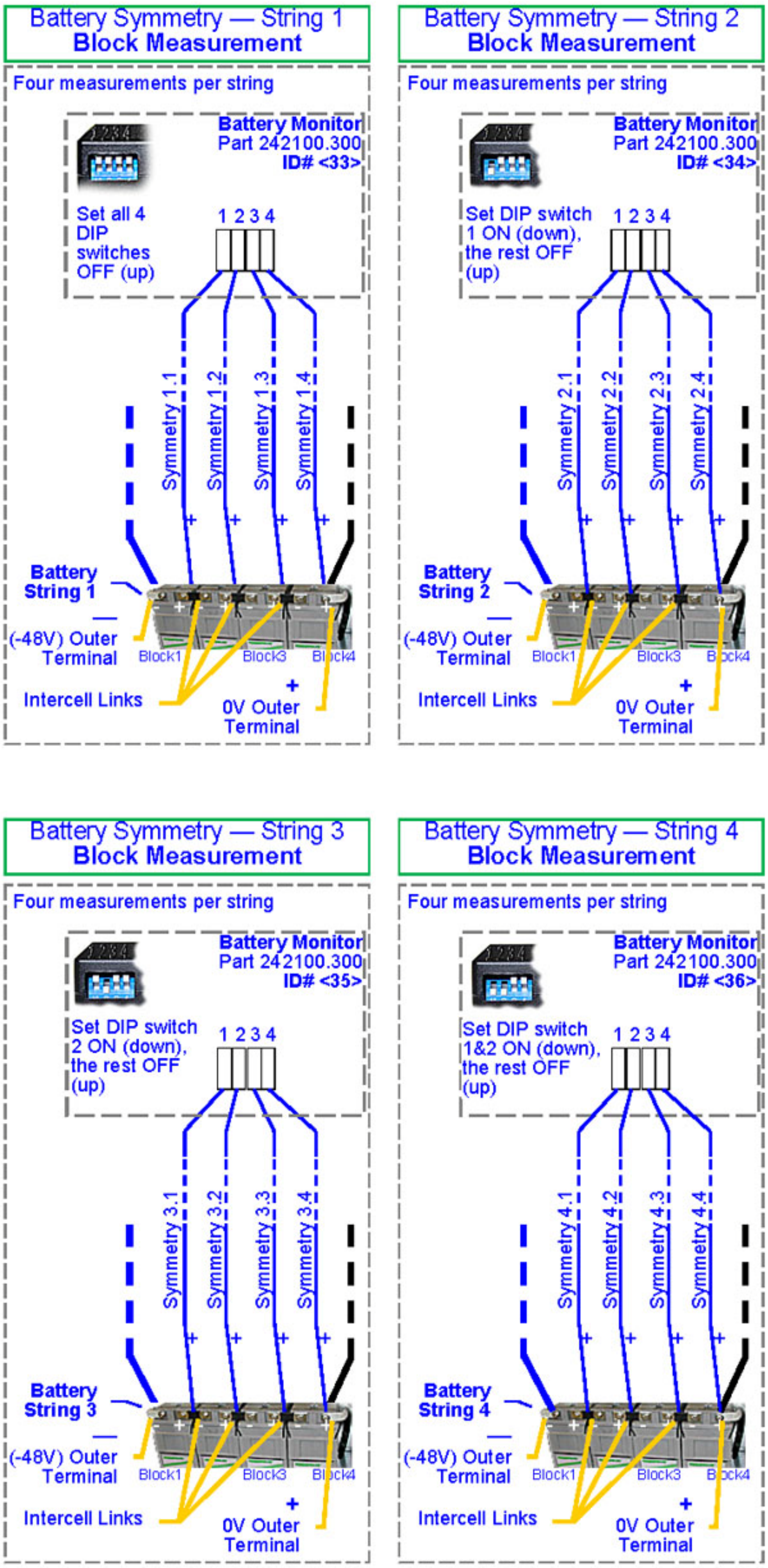
Power systems can use the inputs in Battery Monitors -- connected to the CAN bus -- for battery symmetry measurements.

Each *Battery Monitor* is equipped with 4 battery symmetry inputs, enabling symmetry measurement of 1 battery string using the ***Block Measurement Method***.

Read the "*Installation Guide Battery Monitor CAN Node*", document number 351507.033.

Refer also to "*Installation Guide Battery Monitor – Symmetry Kit*", document number 351497.033, which is included with the kit. The Battery Fuse and Battery Current cables are not shipped with the *Battery Monitor ~ Symmetry Kit.*

Refer to the *PowerSuite Help* for symmetry configuration of *Battery Monitor Control Units.*



*Example of Battery Symmetry Connections using the **Block Measurement Method** with Battery Monitors in 48V DC power systems*

Notice:
Always connect Battery Monitor with ID#<33> to battery string 1 (lowest), with ID#<34> to string 2, and so on. PowerSuite will then refer to the correct battery string.

Battery Monitor's Symmetry Connections, 48V Mid-Point M

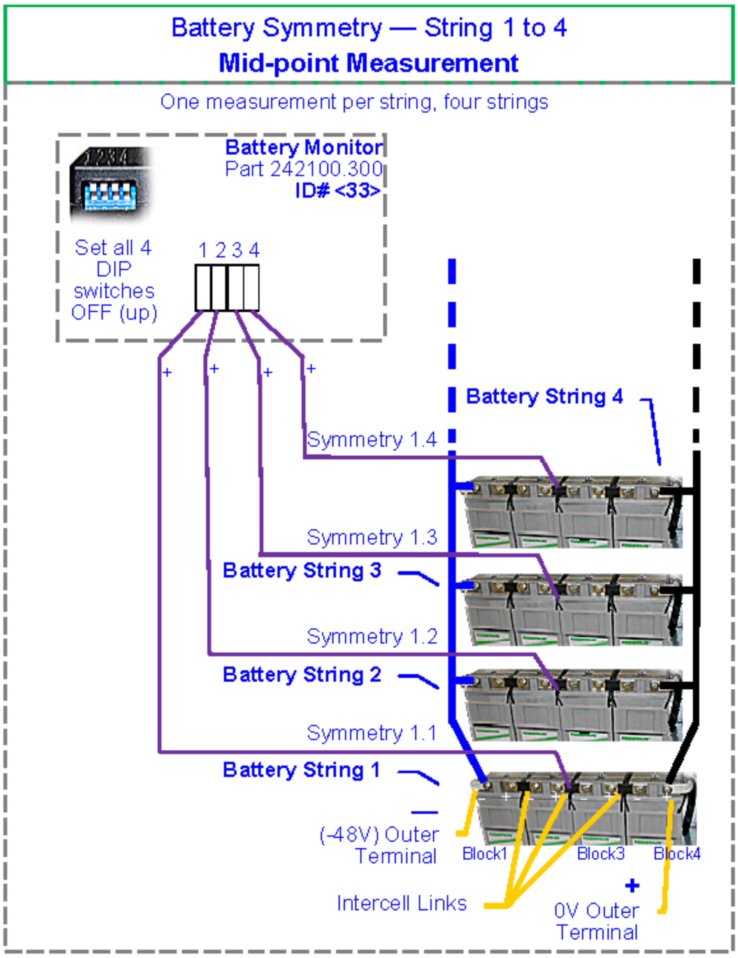
Power systems can use the inputs in Battery Monitors -- connected to the CAN bus -- for battery symmetry measurements.

Each *Battery Monitor* is equipped with 4 battery symmetry inputs, enabling symmetry measurement of 4 battery strings using the ***Mid-Point Measurement Method***.

Read the "*Installation Guide Battery Monitor CAN Node"*, document number 351507.033.

Refer also to "*Installation Guide Battery Monitor – Symmetry Kit*", document number 351497.033, which is included with the kit. The Battery Fuse and Battery Current cables are not shipped with the *Battery Monitor ~ Symmetry Kit.*

Refer to the *PowerSuite Help* for symmetry configuration of *Battery Monitor Control Units.*



*Example of Battery Symmetry Connections using the **Mid-Point Measurement Method** with Battery Monitors in 48V DC power systems*

Notice:
Always connect Battery Monitor with ID#<33> to battery strings 1 (lowest), 2, 3 and 4. Then Battery Monitor with ID#<34> to string 5, 6, 7 and 8. And so on. PowerSuite will then refer to the correct battery string.

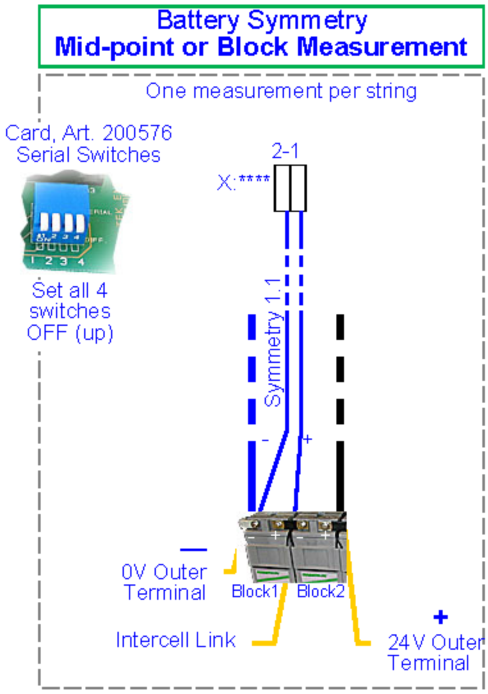
Symmetry in 24V Systems

Each *Smartpack* controller is equipped with 8 battery symmetry inputs (on connectors CON4 and CON3), enabling symmetry measurement of 8 battery strings using the *Mid-Point* or *Block Measurement Method.*

Controller's Battery Symmetry Connections, 24V

In 24V power systems using 12V battery blocks, the ***Mid-Point Measurement Method*** and the ***Block Measurement Method*** are equal, as the strings consist of only two battery blocks. Only 2 symmetry wires per battery string are required.

You can implement any of these methods using one or two *Battery Connection Kits* and the appropriate number of *Battery Symmetry Kits*, which contain a single wire with suitable cable lugs, etc.

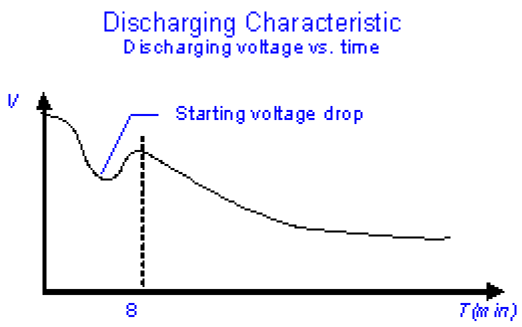


Example of terminal connection points for the controller's Symmetry ***Block or Mid-Point measurement methods*** *in 24V DC power systems*

Refer to the system's quick start guide for connection details, and to the *PowerSuite Help*, for symmetry reconfiguration, or when configuring *Battery Monitor Control Units.*

Symmetry Measurements during Discharge Mode

Symmetry measurements may be performed both during the batteries recharge and discharge modes (Continuous Symmetry Mode).



To obtain more realistic and accurate results, the symmetry measurements should be performed when the batteries are in discharge mode (Discharge Symmetry Mode).

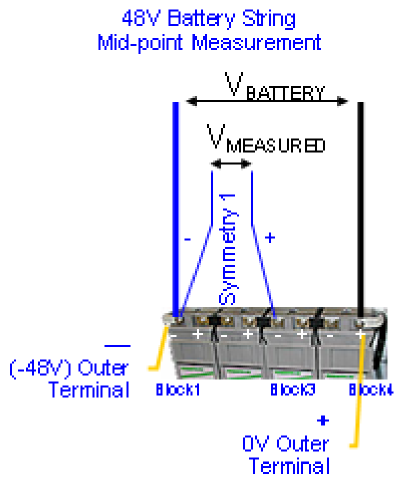
But the battery voltage is quite unstable during the transition from recharge to discharge mode, and the measurements should be delayed until the voltage has stabilized (Discharge Delay)

Battery Symmetry Calculations

Symmetry measurement is a battery monitoring method for automatically detecting unbalanced battery blocks. Read also "Battery Symmetry Measurements" on page 57.

Mid-point Measurement Calculation -- Example

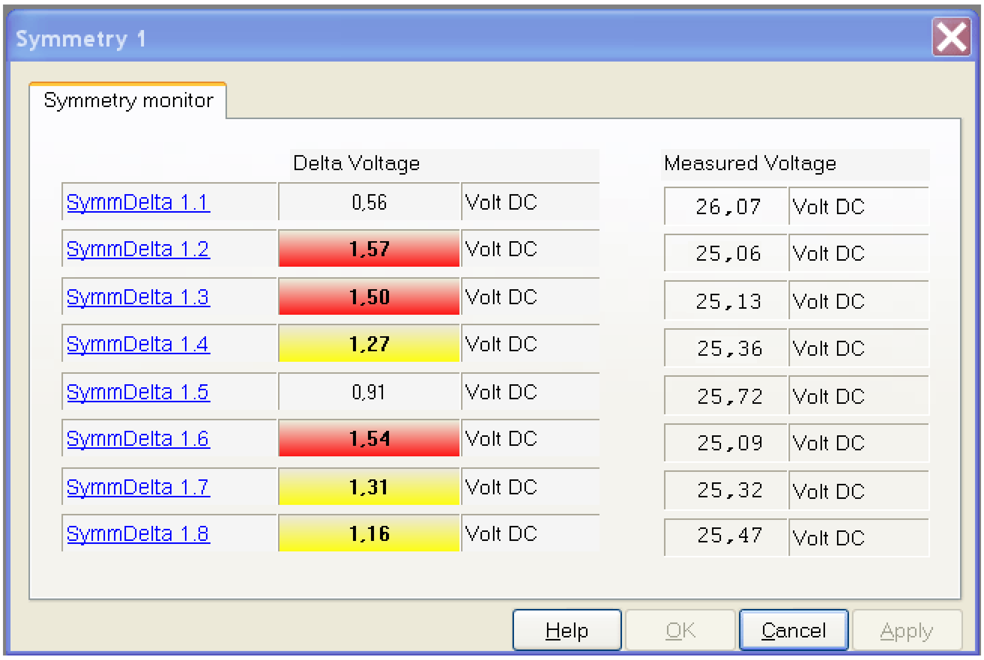
This example describes how *PowerSuite* calculates the battery symmetry of a 48V battery bank with 8 battery strings, and using the mid-point measurement method (24V). The example requires 8 symmetry inputs and alarm monitors.



Symmetry 1 measurement for battery string 1

The battery bank's voltage is 53.26V, and is displayed by the "BatteryVoltage" alarm monitor in the Power Summary pane in *PowerSuite*.

The *PowerSuite* Symmetry dialogue box displays the 8 "SymmDelta x.x" alarm monitors' status and voltages as follows:



The 8 "SymmDelta x.x" alarm monitors are configured to generate alarms when the Delta voltage is 1.5V (Major Alarm) and 1.0V (Minor Alarm). Clicking on the monitors name you can check their configuration.

The calculation is based on following formula:

$$(V_{BATTERY} / 2) -- V_{MEASURED} = | V_{DELTA} |$$

For the first "SymmDelta 1.1" monitor, *PowerSuite* calculates as follows:

$$(53.26 \text{ V}/ 2) -- 26.07 \text{ V} = | 0.56 \text{ V} |$$

The "SymmDelta 1.1" monitor in *PowerSuite* determines that symmetry voltage is correct, as the delta voltage is below the monitor's configured Minor Alarm limit:

$$1.0\text{V} >| 0.56 \text{ V} |$$

The "SymmDelta 1.2" monitor in *PowerSuite* determines that symmetry voltage is incorrect, as the delta voltage is over the monitor's configured Major Alarm limit:

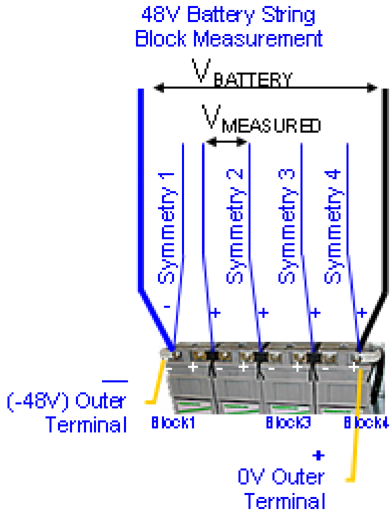
$$1.5\text{V} <| 1.57 \text{ V} |$$

The "SymmDelta 1.4" monitor in *PowerSuite* determines that symmetry voltage is incorrect, as the delta voltage is over the monitor's configured Minor Alarm limit, but below the Major Alarm limit:

$$1.5\text{V} >| 1.27 \text{ V} | > 1.0\text{V}$$

Block Measurement Calculation -- Example

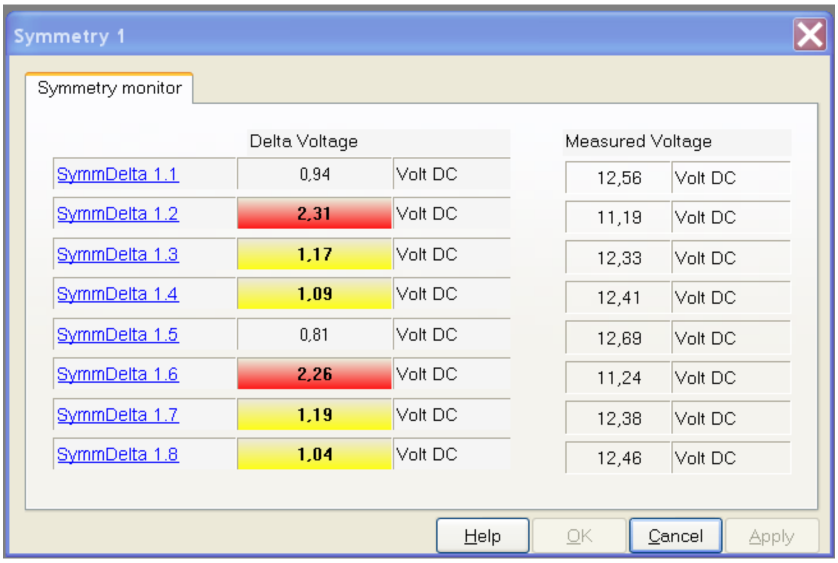
This example describes how *PowerSuite* calculates the battery symmetry of a 48V battery bank with 2 battery strings, and using the block measurement method (12V). The example requires 8 symmetry inputs and alarm monitors, four for each battery string.



Symmetry 2 measurement for battery string 1

The battery bank's voltage is 54.00V, and is displayed by the "BatteryVoltage" alarm monitor in the Power Summary pane in *PowerSuite*.

The *PowerSuite* Symmetry dialogue box displays the 8 "SymmDelta x.x" alarm monitors' status and voltages as follows:



The 8 "SymmDelta x.x" alarm monitors are configured to generate alarms when the Delta voltage is 1.5V (Major Alarm) and 1.0V (Minor Alarm). Clicking on the monitors name you can check their configuration.

The calculation is based on following formula:

$$(V_{BATTERY} / 4) -- V_{MEASURED} = | V_{DELTA} |$$

For the first "SymmDelta 1.1" monitor, *PowerSuite* calculates as follows:

$$(54.00\ V/ 4) -- 12.56\ V = | 0.94\ V |$$

The “SymmDelta 1.1” monitor in *PowerSuite* determines that symmetry voltage is correct, as the delta voltage is below the monitor’s configured Minor Alarm limit:

1.0V >| 0.94 V |

The “SymmDelta 1.2” monitor in *PowerSuite* determines that symmetry voltage is incorrect, as the delta voltage is over the monitor’s configured Major Alarm limit:

1.5V <| 2.31 V |

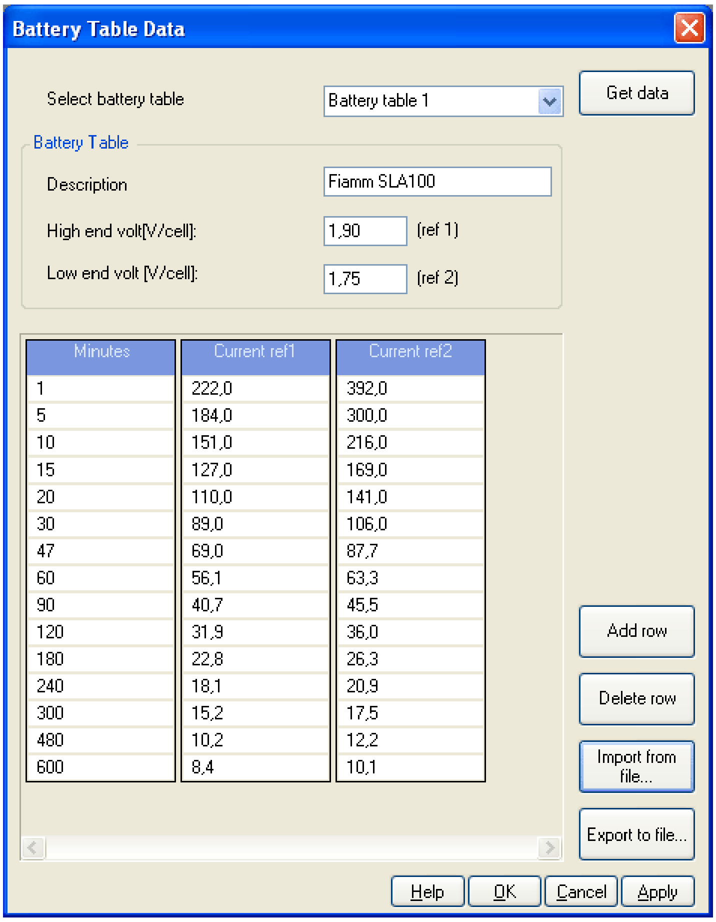
The “SymmDelta 1.4” monitor in *PowerSuite* determines that symmetry voltage is incorrect, as the delta voltage is over the monitor’s configured Minor Alarm limit, but below the Major Alarm limit:

1.5V >| 1.09 V | > 1.0V

Battery Tables

PowerSuite enables you to select a specific Battery Definition Table to upload to the controller.

Refer also to the Battery Table Data dialog box topic, in *PowerSuite Help*.



In this dialogue box, you can select, edit, export and import battery tables.

How to Select Tables

You can select battery tables, clicking on the drop-down arrow, then selecting the table and clicking on the "Get Data" button. Following battery tables are available:

- ***Eltek Valere* Standard**
  A non-editable battery definition table created by *Eltek Valere* from an average of commonly used battery tables
- **Battery Table 1**
  An editable battery definition table for Fiamm SLA100 batteries. You can adapt the table to the discharge performance of the system's battery bank, by changing, adding or removing rows of data. You can also edit the table Description, the High and Low End Voltage values.
- **Battery Table 2**
  An editable battery definition table for M12V155FT batteries. You can adapt the table to the discharge performance of the system's battery bank, by changing, adding or removing rows of data. You can also edit the table Description, the High and Low End Voltage values.
- **Import a Battery Table from a file** in your computer.
  The file must have the TBL format

Discharge Performance Data

You can find the discharge performance data for a certain battery type, by reading the manufacturer's battery data sheet.

A battery definition table in *PowerSuite* consists of a name and two sets of discharge data at different periods of time. One set refers to the "Ref 1" end-of-discharge voltage and the other set to the "Ref 2" end-of-discharge voltage.

The table consists of following editable parameters:

- A "Description" or table name.
  Type a name that describes the battery type that the table defines
- Two different end-of-discharge voltages, "High End Volt" (Ref 1) and "Low End Volt" (Ref 2)
- A three columns table:
  1. The discharge period of time in "Minutes"
  2. For the "High End Volt" (Ref 1) end-of-discharge voltage, the current in ampere at different discharge times
  3. For the "Low End Volt" (Ref 2) end-of-discharge voltage, the current in ampere at different discharge times

> ✓ The "BatteryQuality" and "BatteryTotCap" alarm monitors use the performance data on the battery table's "Current ref 1" column.
>
> ✓ The "BatteryRemCap" and "BatteryTimeLeft" alarm monitors use the performance data on the battery table's "Current ref 2" column.
>
> ✓ You find the alarm monitors in the Battery dialog box, on the "Status" tab, in *PowerSuite Help*

How to Use or Save the Table

You can do the following with the selected battery table:

- Click the **"Export to File"** button
  to export the Battery Table to a file in your computer.

Thus, saving a backup copy of the adapted battery table to the computer.

OR

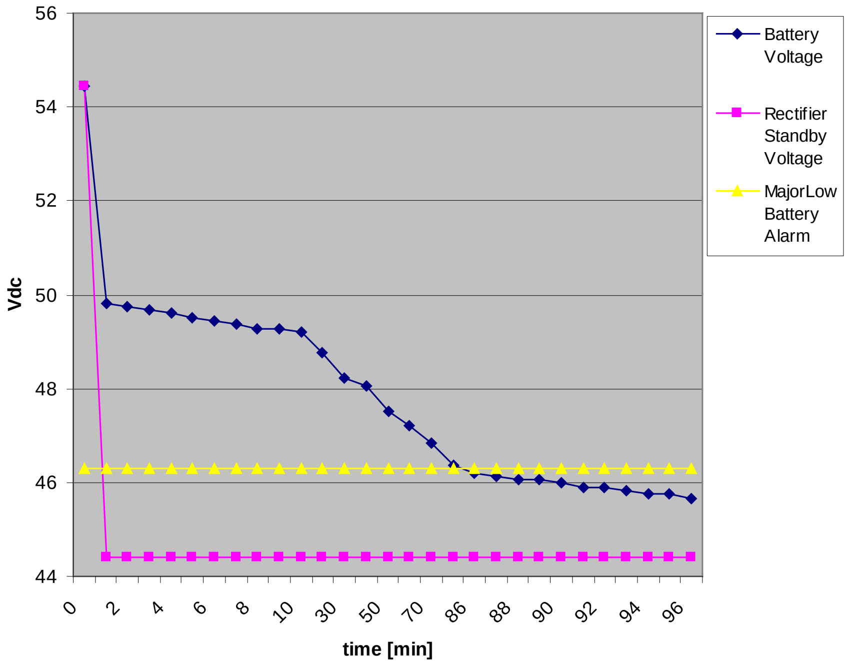
- Click the **“Apply”** button
  to **upload the Battery Table to the controller**
  PowerSuite will then use the discharge performance data in the table

Battery Tests

The purpose of battery testing is to estimate the battery capacity, based on calculations on discharge tests and discharge data preconfigured in a battery definition table entered via *PowerSuite*. You find more information about the “Battery Tables” on page 66.

Read also the “Discontinuance Battery Test” on page 72, as it is a special battery test with a completely different testing purpose.

To evaluate the state of the battery bank, the controller starts a battery test by reducing the rectifiers’ output voltage so that the batteries take over the full load current.

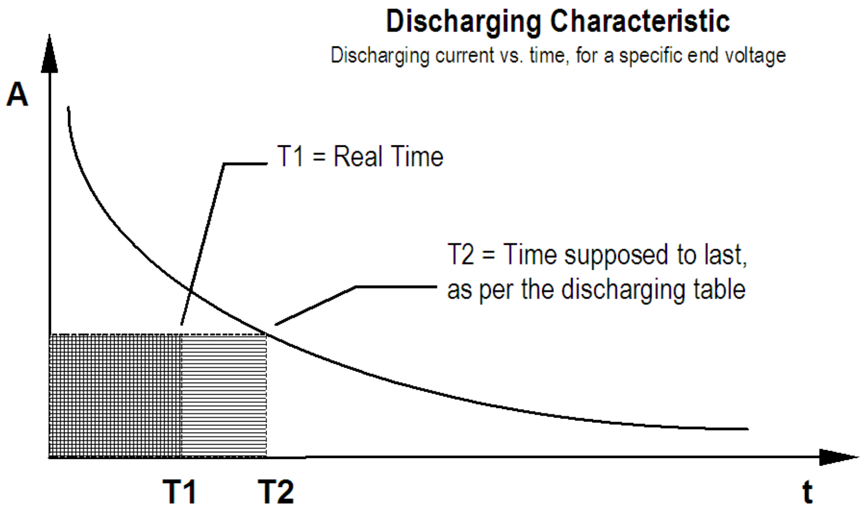


The batteries become then gradually discharged down to a specific End-of-Discharge Voltage, (“End Voltage (volt/cell)”).

Average current and test duration are measured and compared with the data on the battery definition table.

The battery capacity is calculated as the ratio between the actual test duration and the expected test duration with an average current, as specified in the battery definition table.

The controller evaluates then if the discharge duration is acceptable, and eventually raised a battery alarm.



PowerSuite implements 3 types of battery tests, and 3 different methods to initiate the tests.

Read more about the topic in the "Battery" dialog box, on the Test tab in *PowerSuite Help*.

Types of Battery Tests

Via *PowerSuite*, the system controller implements 3 types of battery tests:

- Simplified Battery Test
- Normal Battery Test
- Discontinuance Battery Test

While two of them may be used to evaluate the battery bank's capacity, the Discontinuance test is used to detect defect battery cells. Read also the "Discontinuance Battery Test" on page 72.

Simplified Battery Test

The Simplified Battery Test **does *not* use the battery definition table** as test reference in calculations, thus not being able to compute a reliable battery capacity.

The Simplified Battery Test may only indicate if the batteries are "good" or "bad".

The test starts by reducing the rectifiers' output voltage so that the batteries supply the load and get discharged until their *end-of-discharge voltage* is reached ("End Voltage (volt/cell)").

The test is automatically stopped before the battery voltage drops to *end-voltage*, if the batteries are discharged for a longer period of time than ("Max Duration (minutes)") OR if a maximum amount of energy is discharged from the batteries ("Max Discharge (Ah)").

The following three parameters for test termination criteria are user-editable, but they should be within the range specified in the battery definition table:

- "End Voltage (volt/cell)", user-editable
- "Max Duration (minutes)" , user-editable
- "Max Discharge (Ah)" , user-editable

NOTICE: The batteries are "**good**" if the test is automatically stopped due to the test duration has reached the ("Max Duration (minutes)") limit OR the ("Max Discharge (Ah)") limit, before the ("End Voltage (volt/cell)") limit. Otherwise, the batteries are "**bad**".

Read more about the topic in the "Battery" dialog box, on the Test tab in *PowerSuite Help.*

Normal Battery Test

The Normal Battery Test **uses the battery definition table** as test reference for calculations.

The test starts by reducing the rectifiers' output voltage so that the batteries supply the load and get discharged until their *end-of-discharge voltage* is reached ("End Voltage (volt/cell)").

The test is automatically stopped before the battery voltage drops to *end-voltage*, if the batteries are discharged for a longer period of time than ("Max Duration (minutes)") OR if a maximum amount of energy is discharged from the batteries ("Max Discharge (Ah)").

The following three parameters for test termination criteria are:

- "End Voltage (volt/cell)", specified in the definition table
- "Max Duration (minutes)", user-editable
- "Max Discharge (Ah)", specified in the definition table

NOTICE: A valid battery **test result is only evaluated when** the battery test has terminated due to the batteries being **discharged to the end-of-discharge voltage**.
Tests terminated due to elapsed maximum test duration or manually aborted will be discarded.

Read more about the topic in the "Battery" dialog box, on the Test tab in *PowerSuite Help.*

Discontinuance Battery Test

Read the "Discontinuance Battery Test" on page 72.

Battery Test Start Methods

Via *PowerSuite*, the system controller implements 3 different methods to initiate battery tests:

1. Manual Start Method
2. Interval Start Method
3. Automatic Start Method

Note that a fourth method -- the Discontinuance Start Method -- is only used to enable and initiate Discontinuance Battery Tests.

Read also the "Discontinuance Battery Test" on page 72, as it is a special battery test with a completely different testing purpose.

"Guard Time" or Start Delay

This *PowerSuite* battery test parameter may be used to avoid initiating a battery test right after an AC mains supply outage, when the battery bank might be discharged.

Regardless of the start method you select, you can configure how many hours, after the last AC mains outage, a battery test initiation shall be delayed. You can configure the "Guard Time" with a maximum of 1000 hours or 41.6 days

NOTICE: In power systems with frequent AC mains outages and long "Guard Time" value, e.g 336 hours (14 days), the "Guard Time" may inhibit all battery tests.

Read more about the topic in the "Battery" dialog box, on the Test tab in *PowerSuite Help*.

1. *Manual* Start Method

You may start and stop the battery tests manually, by using the "**Start Test**" and "**Stop Test**" buttons in the "Battery" dialog box, on the Test tab in *PowerSuite Help*, or via the Smartpack controller's front panel.

PowerSuite might notify you that the power system is busy, or that the battery test may not be initiated at the moment.

2. *Interval* Start Method

You may schedule to start a battery test automatically at a specified date and time, and repeat the test at a specified intervening period of time.

Also, you can exclude the Interval Test during from one to 3 months every year. Interval battery tests due to start during these months will be inhibit.

For instance, you could schedule *PowerSuite* to initiate a battery test May the 19^{th} 2007, at 08:00 hours and repeat the battery test every 180 days at the same time. Battery tests due to start during June, July and August are to be inhibit.

3. *Automatic* Start Method

A battery test may be initiated automatically when an AC mains supply outage has occurred.

If the mains outage lasts long enough for the batteries to get discharged until their *end-of-discharge voltage* is reached ("End Voltage (volt/cell)"), the battery test is evaluated and logged.

Discontinuance Start Method

The Discontinuance Start Method is only used to enable and initiate a Discontinuance Battery Test.

Read also the description of the "Discontinuance Battery Test" on page 72, as it is a special battery test with a completely different testing purpose.

You may schedule to start and stop a Discontinuance Battery Test automatically:

- At a specified date and time (specified in the "Interval Test" sub-tab)
- Make the test last a defined number of minutes ("Max. Duration (minutes)" between 1 and 10 minutes), (specified in the "Discontinuance Test" sub-tab)
- And repeat the test at a specified intervening period of time ("Repeat Frequency (days)" between 0 and 7 days), (specified in the "Discontinuance Test" sub-tab)

Discontinuance Battery Test

Discontinuance Battery Test is a testing and monitoring method for automatically detecting unbalanced battery strings.

This test is a special battery test with a completely different testing purpose; see topic "Types of Battery Tests" on page 69.

Open circuit battery strings and short-circuited cells are often caused by battery cell failures, which result in imbalance of the string voltage and current.

Though imbalance of battery string voltages are detected by traditional "Battery Symmetry Measurements" on page 57, it may take time for the fault to be observed, especially if the alarm limits are quite high.

On the other hand, imbalance of battery string currents is detected much earlier by the Discontinuance Battery Test.

NOTICE: Discontinuance Battery Test can be used in conjunction, or instead of battery symmetry monitoring.

Hardware Requirements

To use the Discontinuance Battery Test, the power system's battery bank must be implemented with battery blocks with the same capacity, have at least 2 battery strings, and each string must have an individual shunt.

How Does It Function

In simple terms, the system controller monitors the individual battery string currents, and raises an alarm if one of the currents is a % of deviation away from the "average" or "arithmetic mean" string current.

The Discontinuance Battery Test totals the string currents, and computes an arithmetic mean string current value. Then, it calculates a percentage deviation against the individually measured string currents.

If the calculated % of deviation exceeds the "**DeltaStringCurr**" alarm monitor limit, the monitor will raise an alarm.

To avoid false alarms due to shunt tolerances, the test will not be evaluated if the total battery current is less than 5% of the shunt value.

You find the "DeltaStringCurr" alarm monitor under the "Status" tab, in the Battery dialog box topic, in *PowerSuite Help.*

Discontinuance Battery Test Calculations

This example illustrates the calculations involved in the Discontinuance Battery Test, while ignoring minor battery tolerance characteristics.

A 30A battery bank consists of 3 battery strings; each should deliver about 10A (the arithmetic mean string current). [(10+10+10)/3]=10

Due to battery cell failures, one of the string currents is measured to 5A, while the other two string currents are measured to 12.5A each. The arithmetic mean is still 10A [(5+12.5+12.5)/3]=10

Each string's % deviation from the mean value can now be calculated as:

The 5A string: (5/10) *100=50%   (50% lower value)

The 12.5A string: (12.5/10) *100=125%   (25% higher value)

If the “DeltaStringCurr” alarm monitor is configured with a 50% deviation limit from the arithmetic mean, then the monitor will raise an alarm on the 5A string.

Battery Boost Charging

Battery Boost Charging (Equalizing Charge) is used to reduce the required recharging time by increasing the charging voltage, e.g. between 2.23V/cell to 2.33V/cell.

You have **3 different methods to initiate** battery boost charging:

- **Manual start method**
  Enables manually start and stop of battery boost charging. You need to enter a Max. Duration (maximum number of minutes the boost charging shall last, unless stopped manually)
- **Interval start method**
  Enables to schedule the automatic start of battery boost charging at a specified date and time, and repeat the boost charging at a specified intervening period of time
- **Automatic start method**
  Enables automatic start of battery boost charging, based on the degree of battery discharge after an AC mains supply outage or after a battery test

To configure and schedule a battery boost charging, you have to select or change:

- **Boost Charging Voltage**
- Boost Alarm Group
- Boost **starting method** and parameter

Temperature Compensated Charging

Due to a battery’s electrochemical characteristics, a fixed charging voltage can provide optimum charging only at a fixed battery temperature. Under actual operating conditions, the battery temperature will vary due to the charge and discharge cycle, ambient temperature fluctuations, etc.

Read also “Effect of Temperature on Charging Voltage” on page 74.

During low battery temperature conditions, the batteries will never reach 100 % capacity with a fixed charging voltage. Likewise, during high temperature conditions the batteries will be overcharged, reducing their lifetime and increasing the risk of a catastrophic thermal runaway event.

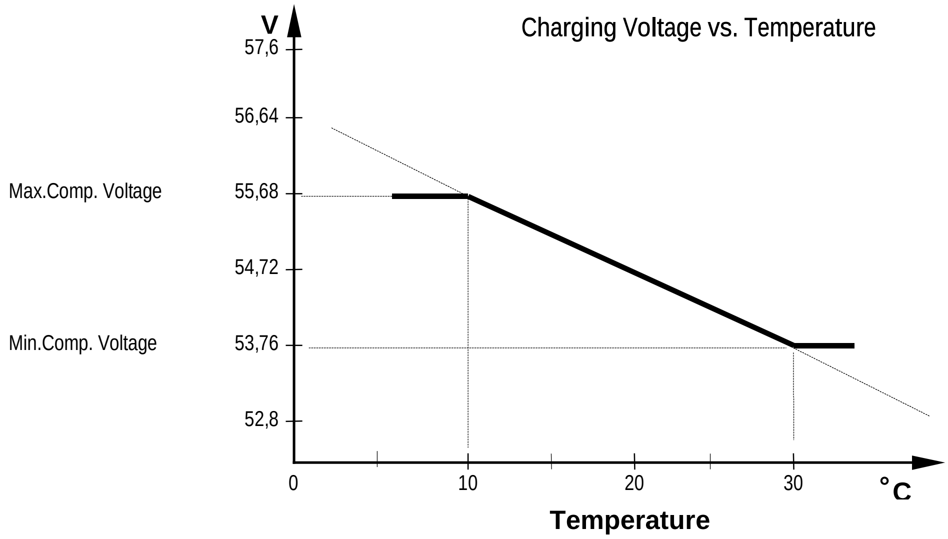
Read also “Effect of Temperature on Battery Capacity” on page 75.

To compensate for these thermal effects, the system controller can adjust the charging voltage proportional to the battery temperature.

Temperature Compensated Charging Equation

The Temperature Compensated Charging Equation can be represented by a straight line, based on the charging voltage at 20 ºC and the desired variation of the charging voltage per degree Celsius.

See the following graph for a representation of the charging voltage versus temperature relationship for a 48V battery bank.



The following two parameters are specified by the battery manufacturer:

- **Reference Voltage (V/Cell)**
  The charging voltage per battery cell, at a reference temperature of for instance 20°C, as recommended by the battery manufacturer
- **Temperature Slope (mV/°C/Cell)**
  The slope of the Temperature Compensated Charging Equation is expressed as the change in millivolts per battery cell per degree Centigrade (the recommended compensation factor for the type of batteries)

In order to protect connected load equipment against too high and too low output voltage, it also is advisable to specify the following parameters:

- **Min Compensation Voltage (V/Cell)**
  Minimum charging voltage per battery cell
- **Max Compensation Voltage (V/Cell)**
  Maximum charging voltage per battery cell

Effect of Temperature on Charging Voltage

As temperature rises, electrochemical activity in a battery increases. Similarly, as temperature falls, electrochemical activity decreases.

Therefore, conversely, as temperature rises, charging voltage should be reduced to prevent overcharge, and increased as temperature falls to avoid undercharge.

NOTICE: In general, to assure optimum service life, temperature compensated charging is recommended.

The recommended compensation factor for a type of batteries could be -3mV/°C/Cell (stand by) and -5mV/°C/Cell (cyclic use).

The figure below shows the relationship between temperatures and charging voltages in both cyclic and standby applications. The standard center point for temperature compensation is 25°C.

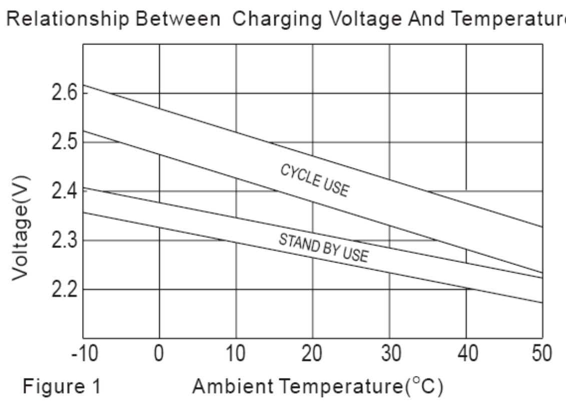


Figure 1

Effect of Temperature on Battery Capacity

Optimum battery life will be achieved when the battery is operating between 20°C and 25°C.

The nominal battery capacity is based on the temperature of 25°C. Above this temperature, the capacity increases marginally, but the working battery should be kept within the temperature design limitations of the product.

Below 25°C, the capacity decreases. This decrease in capacity becomes more prominent at temperatures below 0°C and in heavy discharge rates.

NOTICE: Temperature must be taken into capacity design calculations in applications where the operating temperature of the system is below 20°C.

The chart below illustrates the situation and the decrease in capacity with the decrease in operating temperature.

	Battery temperature											
Discharge time	**-15°C**	**-10°C**	**-5°C**	**0°C**	**5°C**	**10°C**	**15°C**	**20°C**	**25°C**	**30°C**	**35°C**	**40°C**
10min	0.46	0.52	0.58	0.65	0.71	0.78	0.85	0.93	1	1.07	1.15	1.22
1 hour	0.59	0.64	0.69	0.74	0.80	0.85	0.90	0.95	1	1.05	1.09	1.14
10hour	0.71	0.75	0.79	0.82	0.86	0.90	0.93	0.97	1	1.03	1.06	1.08

Battery Charging Current Limitation

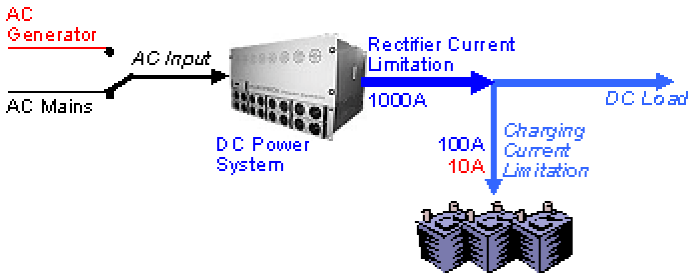
This function is used to avoid too high charging current to the battery bank, in cases where the system load is small, while the batteries are deep discharged.

Read also "Excessive Battery Charging and Discharging" on page 76.

Too high charging current creates excessive heat, and may damage the batteries. When feeding the power system from AC generators instead of the AC mains supply, the Current Limitation value may be set lower than with AC mains supply.

NOTICE: As opposed to the Battery Charging Current Limitation -- the Rectifier Current Limitation reduces the total current output, thus affecting both the batteries and the load.

Using the Battery Charging Current Limitation function you may charge the battery bank while protecting from overcharging.



NOTICE: The Efficiency Manager function may not be used together with Battery Charging Current Limitation, if the Smartpack controller's firmware is older that version 2.03

The Battery Charging Current Limitation is accomplished by a regulation loop, where the controller adjusts the rectifiers' output voltage to a value just above the measured battery voltage. The controller then reads the battery current and checks that it is lower than the Battery Charging Current Limitation's set point.

Excessive Battery Charging and Discharging

Excessive battery charging (overcharging) occurs when the total capacity removed has been replaced by recharging, and the battery remains on charge.

This overcharging creates excessive heat that can cause the battery plates within the cells to buckle and shed their active material. The battery will react to the overcharge by producing an excessive amount of hydrogen and oxygen. These gases are the result of the breakdown of the water molecules within the electrolyte. The water that has been displaced by overcharging can be replaced in a serviceable (non-sealed) battery, but, in the maintenance-free sealed batteries, permanent capacity loss will result.

Excessive battery discharging can cause damage to a battery. The amount of discharge a battery can have without damage depends upon its chemistry.

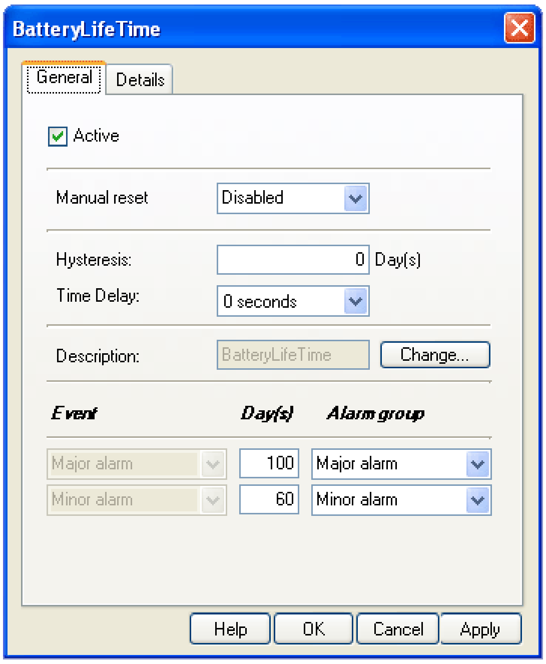
In general, a lead acid battery will not tolerate as deep a discharge as a NiCad or NiMh battery. Sealed lead acid batteries function best if they are discharged to only about 85% of nominal voltage (10.2V on 12V battery).

Battery Temperature Levels ~ "BatteryLifeTime" monitor

The system controller can monitor how many hours the system's battery bank has been within a user-defined temperature range. Ten different ranges may be monitored. For each of them, you can configure the upper and lower temperature values.

The “BatteryLifeTime” alarm monitor -- see under the “Status” tab, in the Battery dialog box topic, in *PowerSuite Help* -- monitors the parameters in the table in the Temperature Monitor tab in *PowerSuite Help*, and calculates the total number of days the battery bank has been within the specified ranges.

The monitor can be configured to activate a Major and a Minor alarm when the number of days exceeds a certain period of time.



“BatteryLifeTime” Monitor Calculations

The “BatteryLifeTime” alarm monitor computes the total number of days the battery bank has been within the specified ranges, by:

- Calculating the weighted number of hours for each range (number of hours multiplied by the weight number or factor).
- Adding up all the ten ranges’ weighted number of hours
- Dividing the total by 24, to find the total number of days.

The “Temperature Monitor” table

	Temperature Range			*Time within Range*
Range #	Low Limit, °C	High Limit, °C	Weight	Hours
01	00	10	1	96
02	11	20	1	20
03	21	30	2	360
04	31	40	2	130
05	41	50	3	120
06	51	60	3	00
07	61	65	4	00
08	66	70	6	00
09	71	75	12	00
10	76	99	64	00

In the example ranges displayed in the table, the calculations of the “BatteryLifeTime” alarm monitor will be:

Range	Calculation	Total (h)
01	1x96	96
02	1x20	20
03	2x360	720
04	2x130	260
05	3x120	360
	Total	**1456**

"BatteryLifeTime" = 1456 hours / 24 = 60.7 days

In the example, the "BatteryLifeTime" alarm monitor will raise a minor alarm, as it is configured to do so when the monitor's counter reaches 60 days.

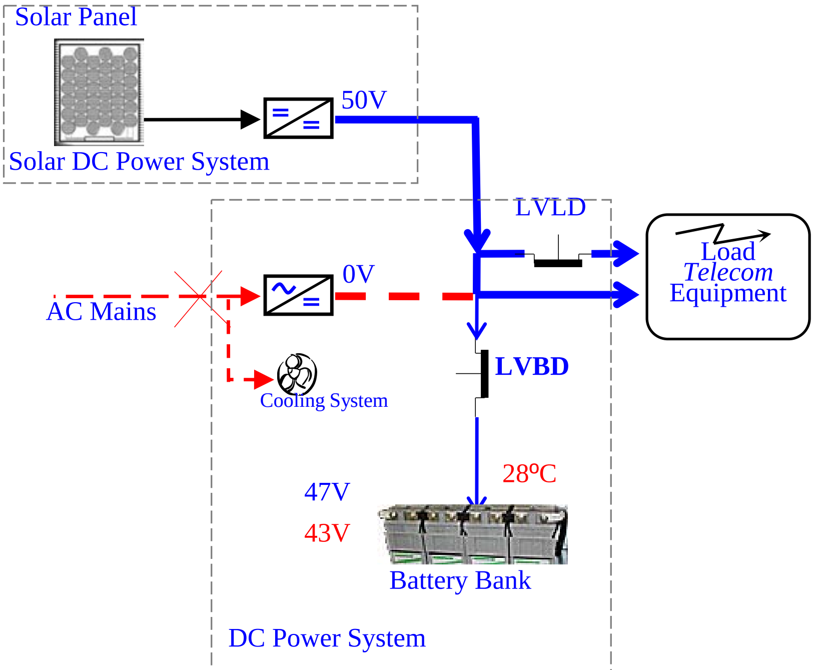
You can reset the values in the Battery Lifetime Temperature monitor either by selecting "ServiceOption > BattLifeTime Rst", via the controller's front keys, or using other GUI.

LVBD - Battery Protection

To protect the power system's battery bank during a critical condition or when the battery temperature is too high, the system's controller disconnects and reconnects the battery bank from the load using the LVBD contactor.

The example in the figure shows a fan cooled DC power system with Mains failure, using a solar system as an additional primary supply.

For information about the example's voltage limits and criteria, read the topic "Typical Parameters for Alarm Monitors" on page 84 or the LVBD dialog box topic, in *PowerSuite Help*



In the example, the system's controller **trips the LVBD contactor** (disconnects the battery bank from the load) when all the following conditions are met:

- The AC Mains supply fails (critical condition)
- The battery voltage has dropped down to e.g. 43V (Disconnect Voltage)

In the example, the system's controller **reconnects the LVBD contactor** when all the following conditions are met:

A. The AC Mains supply is ON again (Normal Condition and **Mains Dependent**)

B. The LVBD contactor has been disconnected longer than the **Delay After Disconnect** period of time

C. The rectifier system output voltage has risen to e.g. 47V (**Reconnect Voltage**)

D. The battery temperature is lower than e.g. 28ºC (the temperature limit configured in the "BatteryTemp" alarm monitor) (**Temperature Dependent**)

NOTICE: In this example -- while the Mains supply is OFF -- an additional solar system may recharge the battery bank.
The LVBD contactor will NOT be reconnected because the Mains supply is still OFF (**condition A**).
In this situation, the controller may reconnect the LVBD contactor, if you **check** the **"Mains Independent" option**, which you find in the LVBD dialog box in *PowerSuite Help.*

NOTICE: In this example, the fan cooled system stopped due to the Mains outage, which caused a battery temperature increase above 28ºC.
The LVBD contactor will NOT be reconnected because the battery temperature is not lower than 28ºC (**condition D**).
In this situation, the controller may reconnect the LVBD contactor, if you **uncheck** the **"Temperature Dependent" option**, which you find in the LVBD dialog box in *PowerSuite Help.*

Load Functions

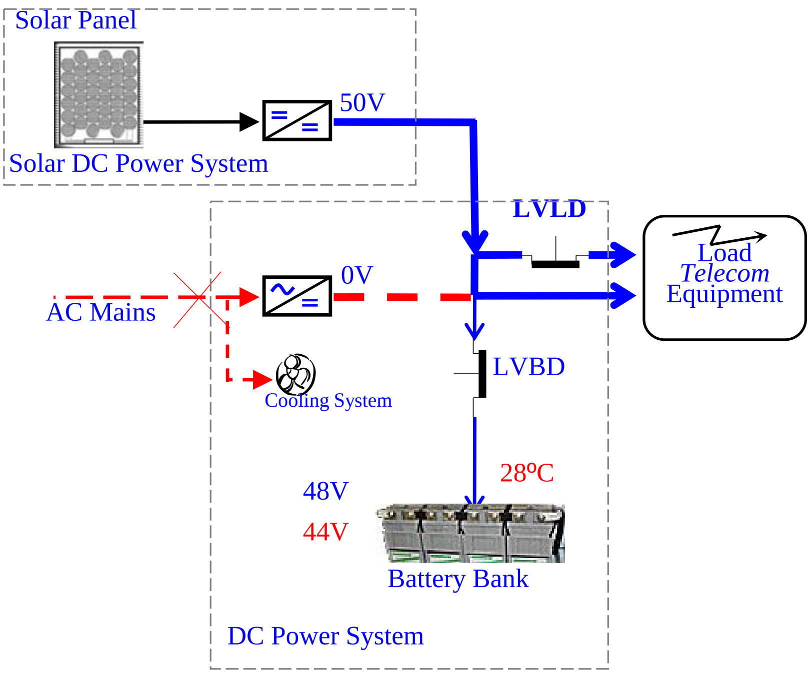
This section explains the functionality related to the system's DC load.

LVLD ~ Non-Priority Load Disconnection

To extend the power system's battery bank capacity, during a critical condition -- or when the load's backup leasing time has expired -- the system's controller disconnects and reconnects the non-priority load output circuits using the LVLD contactor.

The example in the figure shows a fan cooled DC power system with Mains failure, using a solar system as an additional primary supply.

For information about the example's voltage limits and criteria, read the topic "Typical Parameters for Alarm Monitors" on page 84 or the LVLD dialog box topic in *PowerSuite Help.*



In the example, the system's controller **trips the LVLD contactor** (disconnects the non-priority load circuits) when the following conditions are met:

- The AC Mains supply fails (critical condition)

  AND

- The battery voltage has dropped down to e.g. 44V (Disconnect Voltage)

  OR

- The non-priority load's backup leasing time has expired (Disconnect Delay Time)

In the example, the system's controller **reconnects the LVLD contactor** when all the following conditions are met:

A. The AC Mains supply is ON again
(Normal Condition and **Mains Dependent**)

B. The LVLD contactor has been disconnected longer than the **Delay After Disconnect** period of time

C. The rectifier system output voltage has risen to e.g. 48V (**Reconnect Voltage**)

NOTICE: In this example -- while the Mains supply is OFF -- an additional solar system may recharge the battery bank.
The LVLD contactor will NOT be reconnected because the Mains supply is still OFF (**condition A**).
In this situation, the controller may reconnect the LVLD contactor, if you **check** the **"Mains Independent" option**, which you find in the LVLD dialog box in *PowerSuite Help.*

Load Current Calculation

The **load current is calculated** by the controller, not measured.

Even though *PowerSuite* uses the “**LoadCurrent**” alarm monitor to raise alarms when the load current surpasses the current limits, the alarm monitor is not used to “measure” the current (no load shunt).

The system controller calculates the load current as the difference between the rectifier current (RectifierCurrent) and the battery current (BatteryCurrent).

The controller reads the battery shunt to find the battery current. It reads the rectifiers’ internal shunts to find the total rectifier system output current. Thus, the controller can calculate the load current.

During battery charging, the battery current is defined as positive (+); during discharge, it is defined as negative (-).

During battery charging,

$$I_{REC} = I_{LOAD} + I_{BAT}$$

.

This means that:

$$I_{LOAD} = I_{REC} - I_{BAT}$$

.

When the system is running on batteries, I_{REC}=0A.

$$I_{LOAD} = 0 - (-I_{BAT})$$

$$I_{LOAD} = I_{BAT}$$

Control System Functions

This section clarifies the functionality of the control system – which consists of controllers and other type of control units.

Access Levels

The control system protects system parameters and other configured values with following three different access levels:

- **User Access Level**
  is the default level when you access the menus or GUI. Log in is not required.
  You can read all parameters and values (Read Access), but changing them is not allowed.
- **Service Access Level**
  By logging in to this level you can change most of the system parameters and values (Write Access).
  The default Pin-Code or password is <0003>. We strongly recommend changing this password as soon as the power system is installed.
  Notice that factory parameters may not be changed (Read Access).
- **Factory Access Level**
  As the name indicates, only *Eltek Valere* personnel will have access to change certain critical values, such as LVD settings, etc.

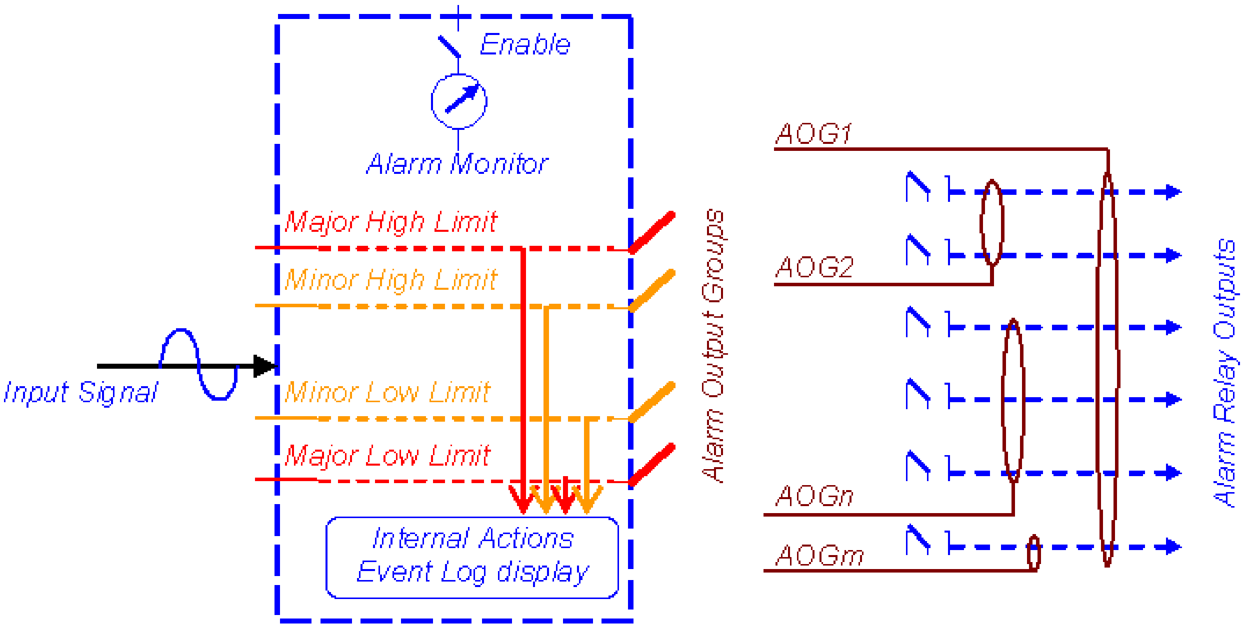
Alarm Monitors

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



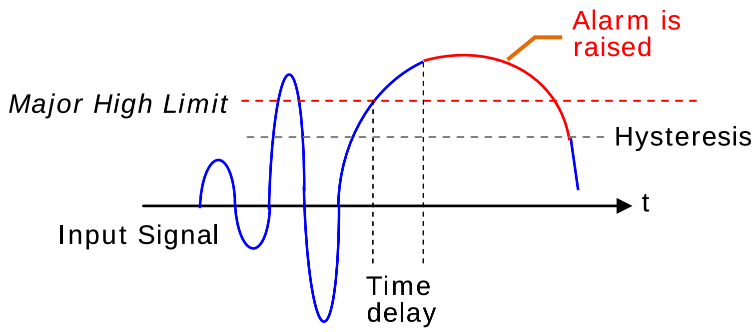
The alarm monitors' most commonly used configuration parameters are: (Refer to the "Alarm Monitor dialog boxes" topic in *PowerSuite Help*)

- **Type of input**
  The measured Input Signal can be
  analogue (e.g. a voltage),
  logical (e.g. an open or close 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 close). 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 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/Close 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 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*).

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,* 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 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 for Logical Alarm Monitors (L1)
Example to monitor logical states such as Open/Close 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]	18,00		(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**
Read also topic “Alarm Reset” on page 33

(b) **Hysteresis and Time Delay**
Read also topic “Alarm Monitors” on page 82

(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

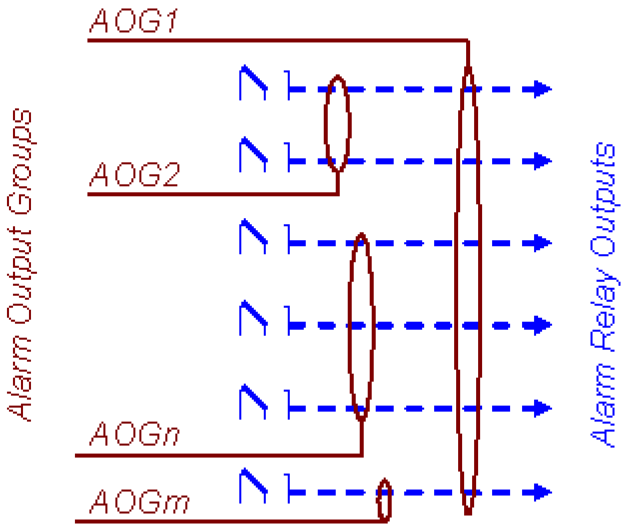
An Alarm Output Group (AOG) is a **user defined software assignment** that consists of grouping together all the **outputs** that **always are activated at the same time**.

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

Read also the topic “System Inputs and Outputs - Overview” on page 103, for an overview of all the power system’s outputs.

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 Help*.

The DC 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 Help*.

The example below shows typical Alarm Output Group assignment in a *Smartpack2-based* system. The *Smartpack2 Basic* controller is equipped with the 3 LVD contactors, and the *I/O Monitor2* control unit with the 6 relay outputs.

Alarm Configuration > **Outputs**

#	Description Alarm Groups	Output	1	2	3	4	5	6	LVBD	LVLD1	LVLD2	Note
1	Major Alarm, AOG		☑	☐	☐	☐	☐	☐				
2	Minor Alarm, AOG		☑	☐	☐	☐	☐	☐				
3	Mains Alarm, AOG		☑	☑	☐	☐	☐	☐				
4	Fuse Alarm, AOG		☑	☐	☑	☐	☐	☐				
5	High Battery Alarm, AOG		☑	☐	☐	☑	☐	☐				

#	Description Alarm Groups	Output	1	2	3	4	5	6	LVBD	LVLD1	LVLD2	Note
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		☐	☐	☐	☐	☐	☐		☑		
21	LVLD, AOG 2		☐	☐	☐	☐	☐	☐			☑	
	-----		☐	☐	☐	☐	☐	☐				
	-----		☐	☐	☐	☐	☐	☐				

In the example above,

- Alarm relay output 1 is used for external common alarm signaling
- 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 89
- 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 aavailable in *Smartpack2 Master* 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>. We strongly recommend changing the passwords as soon as the power system is installed.

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, usually Alarm Output Group 18.

The "OutpBlocked" command uses the Alarm Output Group 18 to facilitate external warning of this function being active (output relays activation is blocked).

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.

Firmware Upgrade

Smartpack2 Master Controllers

To upgrade the firmware of ***Smartpack2 Master* controllers** you can use the "***Eltek Valere Network Utility***" program (EVIPSetup.exe) or an SD card. Read topics
"Firmware Upgrade – Smartpack2 Controllers" on page 90
and
"Firmware Upgrade – Controllers with Ethernet Port" on page 94.

Smartpack2 Basic Controllers

To upgrade the firmware of ***Smartpack2 Basic* controllers** you can use the "***FWLoader***" program or an SD card. Read topic "Firmware Upgrade – Smartpack2 Controllers" on page 90.

Smartpack Controllers

To upgrade the firmware of the ***Smartpack* controller**, you must use the "***FWLoader***" program.
Read "Firmware Upgrade - Smartpack Controller" on page 92, also

LAN Devices

To upgrade the firmware of **LAN devices**, you must use the "***Eltek Valere Network Utility***" program (EVIPSetup.exe). Following LAN devices firmware can be upgraded:

- The ***Smartpack2 Master*** and ***Compack* controller**
  Read "Firmware Upgrade – Controllers with Ethernet Port" on page 94.
- The ***Smartpack* controller's embedded Web Adapter**
  Read "Firmware Upgrade - Smartpack's Embedded Web Adapter" on page 96
- The stand-alone ***WebPower Adapter***
  Read "Firmware Upgrade – Stand-alone WebPower Adapter" on page 96

To get acquainted with available LAN devices and corresponding firmware files, you can read topic "Overview Firmware Files and LAN Devices" on page 96.

> NOTICE:
> Contact the *Eltek Valere* Service Dep. if you need to upgrade the rectifier's firmware or any CAN Bus control units other than controllers.

Firmware Upgrade – Smartpack2 Controllers

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

Upgrade of the ***Smartpack2 Basic*** Controller's firmware, while the system is live, is performed via the power system's CAN bus – using the "***FWLoader***" program -- or via an SD card.

Upgrading the firmware does not delete or change any of the configuration and calibration values stored in the *Smartpack2* controllers.

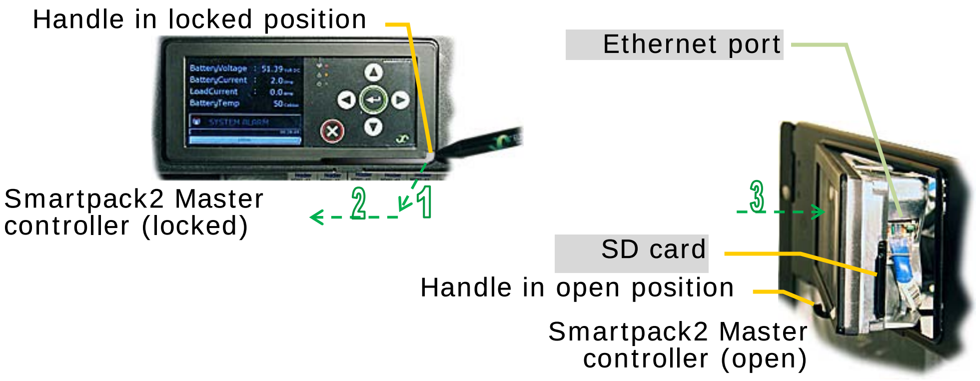
You can upgrade the *Smartpack2* Controller's firmware using one of the following two methods.

Firmware Upgrade from the Smartpack2 Master

Both the ***Smartpack2 Master* and the *Smartpack2 Basic*** controllers' firmware can be upgraded via the SD card.

Do following:

1. **Insert** in the *Smartpack2 Master* controller **an SD card** containing the controller's firmware source file, e.g.
   for the *Smartpack2 Master* <SP2MAST_1.00.BIN> or for the *Smartpack2 Basic* controller <SP2BAS_1.00.MHX>.



2. Select "**Up/Download** > **Software Upgrade**" via the *Smartpack2 Master's* front keypad.

If the firmware file is <SP2MAST_1.00.BIN>, it will be automatically downloaded to the *Smartpack2 Master* controller.
If the firmware file is <SP2BAS_1.00.MHX>, then the controller will request to enter the *Smartpack2 Basic* controller's CAN bus ID number, if several such controllers are connected the bus.

WARNING: Uploading the firmware may take a long time.

Firmware Upgrade from a Computer

Smartpack2 Master Controllers

The *Smartpack2 Master* controllers' firmware can be upgraded using a personal computer to run the "***Eltek Valere Network Utility***" program (EVIPSetup.exe) to transfer the firmware file to the controller.

Do following:

1. **Connect a PC to the *Smartpack2 Master* controller** using a standard Ethernet cable.
   To open the controller and access the controller's Ethernet port, refer to the graphics in topic "Firmware Upgrade from the Smartpack2 Master" on page 90
2. **Start** the "***Eltek Valere Network Utility***" program (EVIPSetup.exe) in a the PC
3. **Select the *Smartpack2 Master* controller** (check correct MAC and IP address) **and** the **correct firmware file** <SP2MAST_1.00.APP.s19>
4. Click on the "**Update Software**" button

You find more detailed information in topic "Firmware Upgrade – Controllers with Ethernet Port" on page 94.

Smartpack2 Basic Controllers

The *Smartpack2 Basic* controllers' firmware can be upgraded using a personal computer to run the ***FWLoader*** program to transfer the firmware file to the controller.

Do following:

1. **Connect a PC — via an USB-to-CAN Converter** (art. 208565) — to one of the power system's CAN bus ends, and move the end-of-line resistor to one of the converter's CAN ports.
   Refer to the connection schematics in the figure below.
2. **Start then the *FWLoader*** program on the PC
3. **Select "*Smartpack2 Basic*"** in the Target Selection
4. **Select "1"** in the Target Address
   (the controller's CAN bus ID number)
5. **Select "COMx"** in Communication Type
   (the communication port that the PC uses to communicate with the USB-to-CAN Converter)
6. Click on the "Open Source File" button and,
   Select the file (*.MHX) to upgrade the *Smartpack2 Basic* controller's firmware with

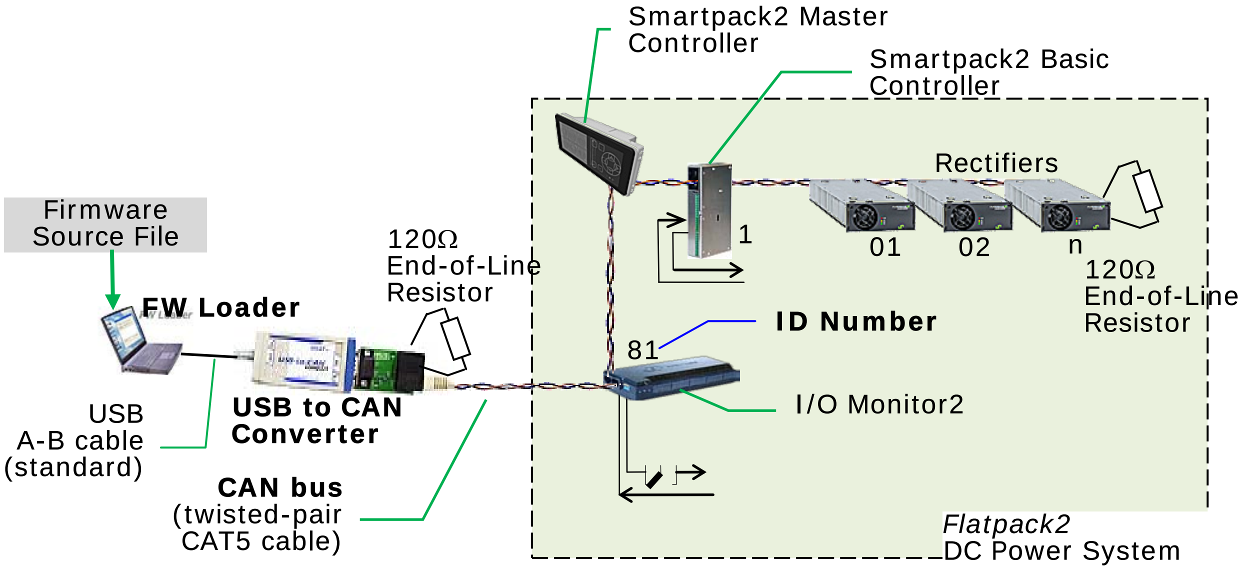
7. Click on the "**Write to Target**" button

While the firmware is loaded to the *Smartpack2 Basic* controller, the *FWLoader* program displays a progress bar.

WARNING: Uploading the firmware may take up to 15 minutes.

Once the firmware has loaded, the *Smartpack2 Basic* controller will automatically restart.

You find a more detailed example in topic "Firmware Upgrade - Smartpack Controller" on page 92.



The example above shows a *Smartpack2*-based *Flatpack2* power system connected to a PC via a USB-to-CAN Converter (art. 208565). The *Smartpack2 Basic* controller's CAN bus ID number is <1>.

Read more about the *FWLoader* program and other control units and CAN nodes in topic "About the *FWLoader* Program" on page 94.

Firmware Upgrade - Smartpack Controller

You can use the *FWLoader* program running on a PC to **upgrade the *Smartpack* controller's firmware**. Read more "About the *FWLoader* Program" on page 94.

NOTICE: The *Smartpack* controller's firmware and the firmware in the controller's embedded Web adapter are different files, and require different upgrade procedures.

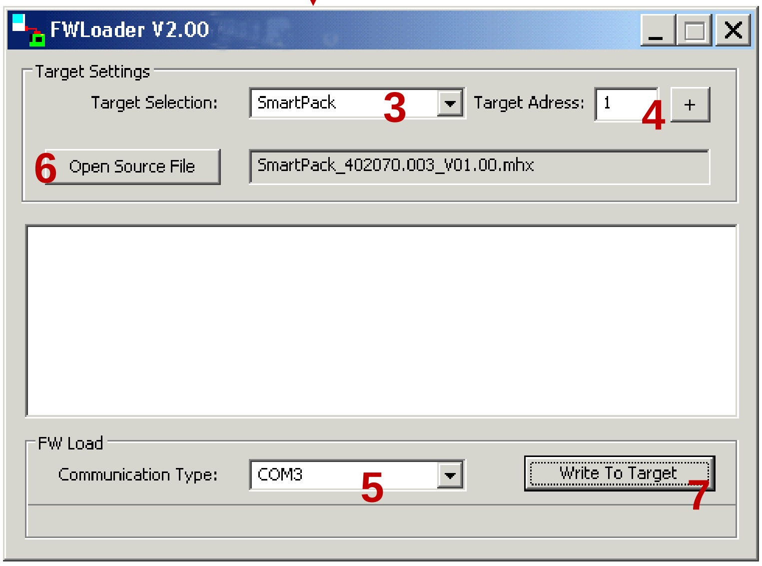
The *PowerSuite* program has to be installed previously on the PC.

To find your controller's firmware version, use the controller's front keys or other GUI or read how in the topic "Tutorials", in *PowerSuite Help*.

NOTICE: You can get a copy of the "*FWLoader*" program, by contacting Eltek Valere's Service Dep.

Do following:

(Example of the "*FWLoader*" program)



1. **Connect a PC to the *Smartpack*,** using a standard USB cable (1)
2. **Start the *FWLoader* program on the PC (2)**

   On the *FWLoader* dialog box:
3. **Select "Smartpack"**, in Target Selection (3)
4. **Select "1"**, in Target Address (4)
5. **Select "COMx"** in Communication Type (5).
   To find the communication port the PC uses to communicate with the controller, read topic Cannot Find the Com Port Number (page 121)
6. Click on the "Open Source File" button (6) and,
   Select the file "*.mhx"
   that contains the firmware to upgrade the controller with
7. **Click on the "Write to Target" button**, (7)
   to load the firmware to the *Smartpack* controller

While the firmware is loaded to the *Smartpack* controller, the *FWLoader* program displays a progress bar, and the controller's display shows the currently programmed segment.

WARNING: Uploading the firmware may take up to 15 minutes.

Once the firmware has loaded, the *Smartpack* controller will automatically restart.

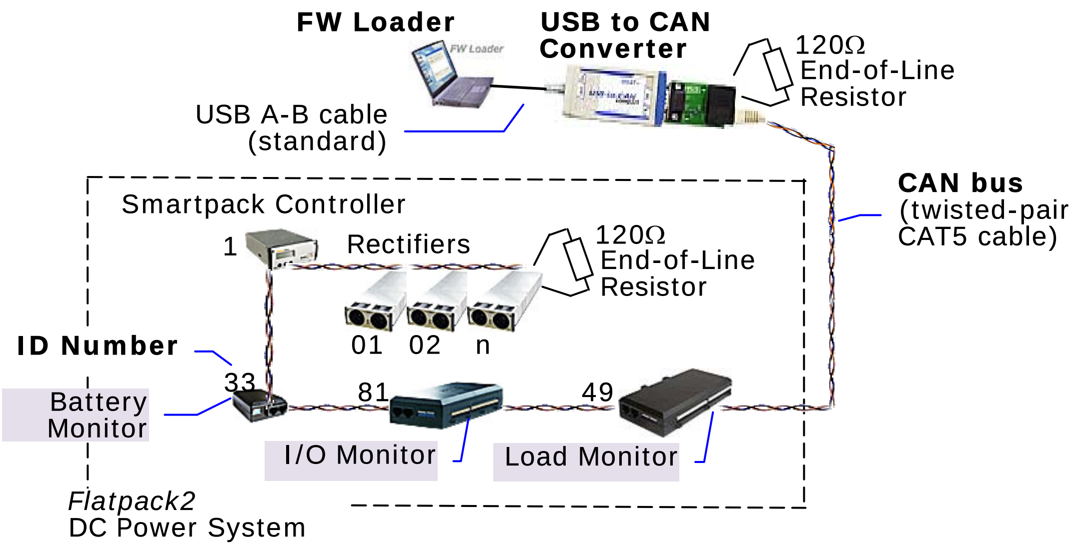
About the *FWLoader* Program

The *FWLoader* (FirmWare Loader) is a PC software application used to upgrade the firmware installed in your power system's control units, such as controller, rectifiers and other CAN Bus nodes.

FWLoader Online Help helps you using the *FWLoader* graphical user interface (GUI).

NOTICE:
Contact the *Eltek Valere* Service Dep. if you need to upgrade the rectifier's firmware or any CAN Bus control units other than controllers.

Using an external PC and the USB-to-CAN Converter (art. 208565) you can upgrade the firmware installed in the *Flatpack2* rectifiers and any of the control units connected the system's CAN Bus.



The example above shows a *Flatpack2* power system with 3 CAN Bus nodes connected: a Battery Monitor, an I/O Monitor and a Load Monitor.

NOTICE:
USB-to-CAN Converter is not required to upgrade the firmware of the *Smartpack* controller. You connect the USB cable directly to the controller's USB port.

Firmware Upgrade – Controllers with Ethernet Port

You can use the "*Eltek Valere Network Utility*" program running on a PC to upgrade the firmware on controllers equipped with embedded Web Adapters, such as the ***Compack* controller** and the ***Smartpack2 Master* controller**.

Also, you can use this program to upgrade other LAN devices, such as the **Web Adapter embedded in the *Smartpack* controller** and the **stand-alone *WebPower Adapter***.

NOTICE: You can visit www.eltekvalere.com to download the "*Eltek Valere Network Utility*" program, or contact Eltek Valere's Service Dep.

Use this utility program, "EVIPSetup.exe", to find your LAN device's firmware version, or access the device or controller's configuration pages in a web browser.

Do following:

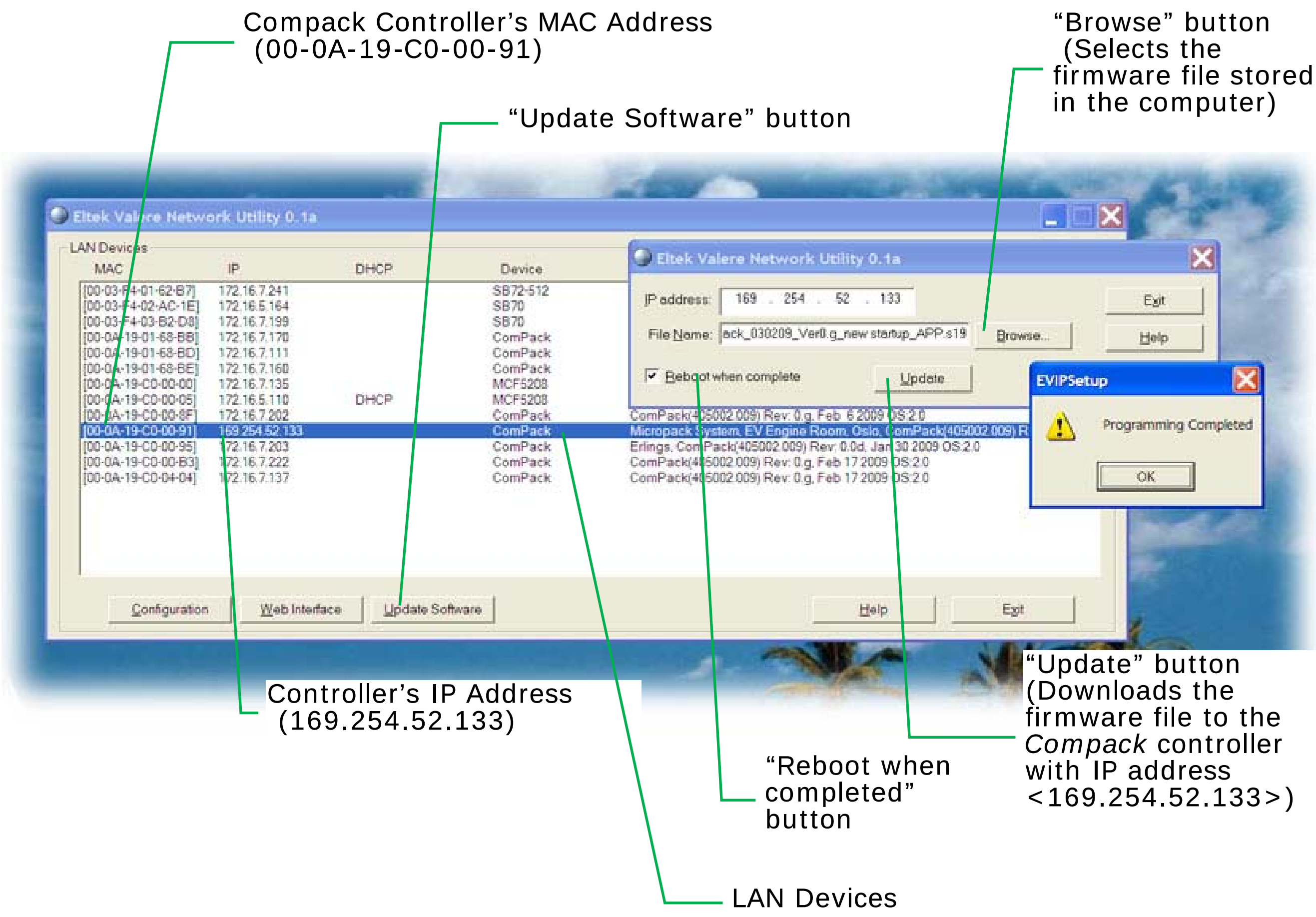
1. **Connect a PC to the controller or LAN device**
   Read topic "Networking the Controller - Access Methods" on page 7

2. **Start the program "*EVIPSetup.exe*",**
   on the computer;

   On the "*Eltek Valere Network Utility*" program:

3. **Select the controller or LAN device**
   that you want to update; Check correct MAC address and IP address
4. **Click the "Update Software" button**
5. **Click the "Browse" button,**
   and select in the computer the firmware file (s19-format) that correspond to the selected LAN device (hardware platform)
   Warning:
   -- The upgrade will be aborted, if the selected LAN device platform and the firmware file do not match!

   To learn more about firmware files, you can read topic "Overview Firmware Files and LAN Devices" on page 96
6. **Check the "*Reboot when complete*"** check box (marked)
7. **Click the "Update" button**
   the utility will download and update the firmware to the controller or LAN device with the selected IP address



(The "*Eltek Valere Network Utility*" program. Example of Compack controller's data)

While the firmware is downloaded to the controller or LAN device, the utility program displays a progress bar.

Once the firmware has loaded, the controller must restart. It will restart automatically, because you left the "Reboot when complete" check box checked (marked).

Firmware Upgrade - Smartpack's Embedded Web Adapter

The procedure to upgrade the firmware of the **Web Adapter embedded in the *Smartpack* controller** -- using the "*Eltek Valere Network Utility*" program -- is the same as described in topic "Firmware Upgrade – Controllers with Ethernet Port" on page 94.

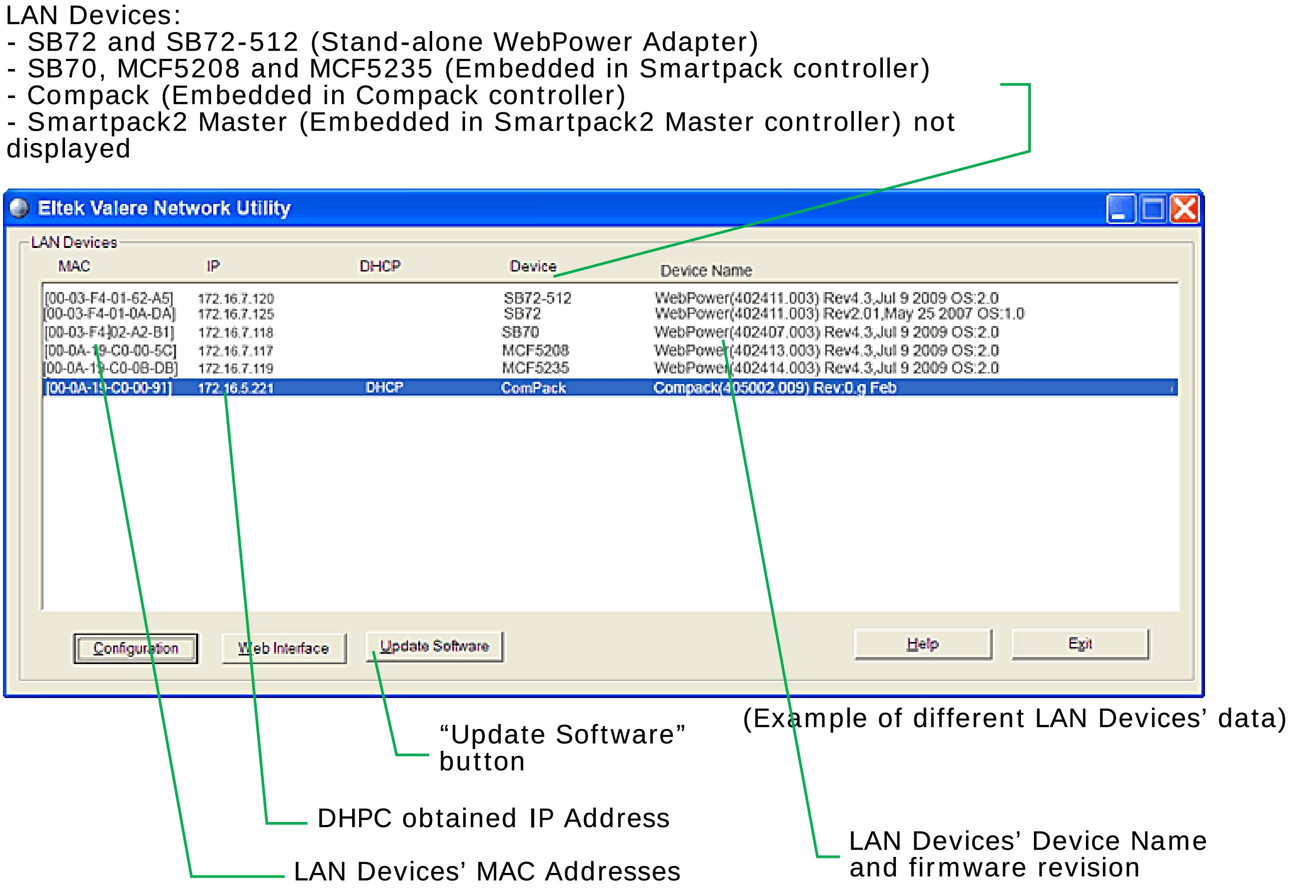
> **NOTICE:**
> The *Smartpack* controller's firmware and the firmware in the controller's embedded Web adapter are different files, and require different upgrade procedures.

Firmware Upgrade – Stand-alone WebPower Adapter

The procedure to upgrade the firmware of the stand-alone *WebPower Adapter* -- using the "*Eltek Valere Network Utility*" program -- is the same as described in topic "Firmware Upgrade – Controllers with Ethernet Port" on page 94.

Overview Firmware Files and LAN Devices

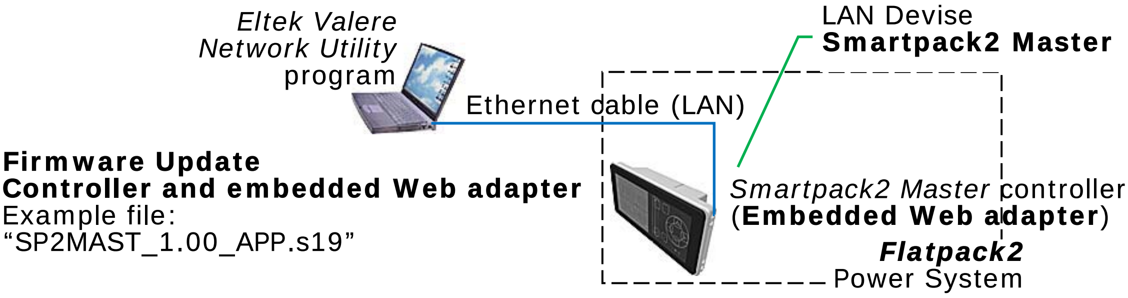
The "***Eltek Valere Network Utility***" program (EVIPSetup.exe) displays useful information about the devices connected to a LAN. The figure shows six different connected devices.



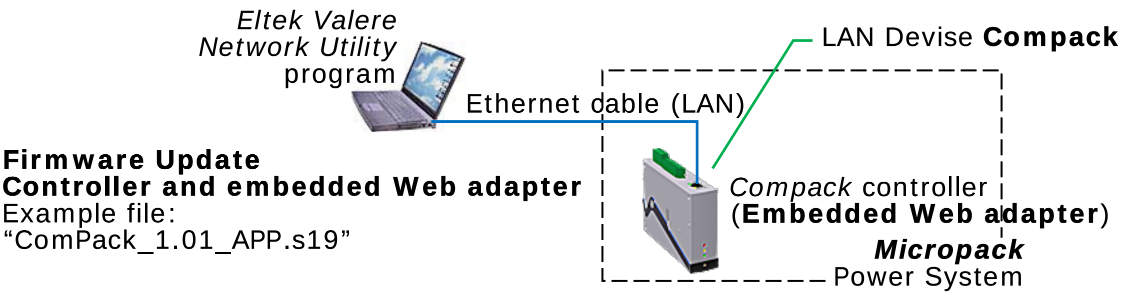
The program's "**Update Software**" button enables you to upgrade the firmware of the selected LAN device, by transferring a firmware file (s19-format) from a LAN connected computer to the device (or hardware platform).

The figures below show examples of firmware files and available type of LAN devices (or hardware platforms).

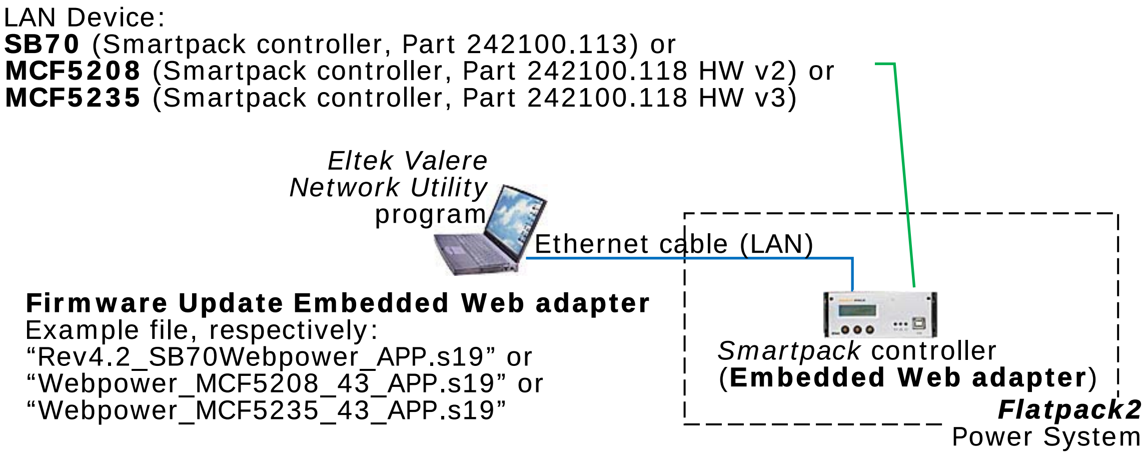
LAN Devices Embedded in the Controller



This example firmware file above is used to upgrade the *Smartpack2 Master* controller (LAN device) in a *Smartpack2*-based power system.

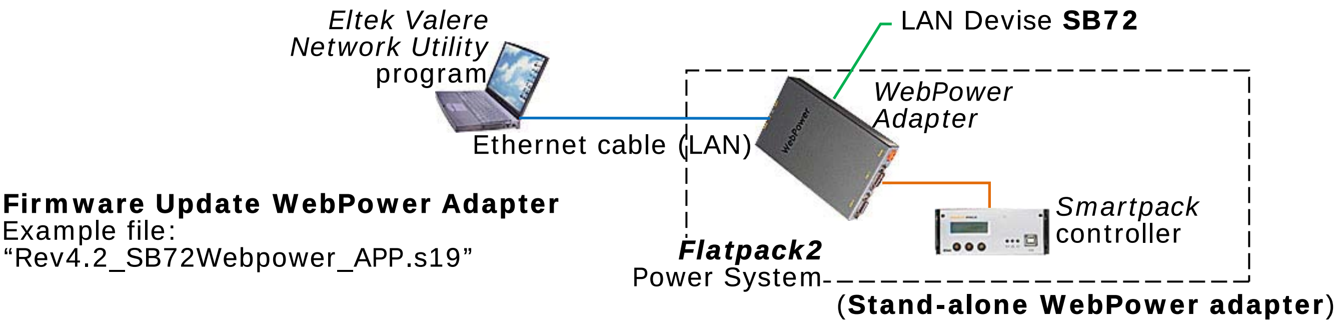


This example firmware file above is used to upgrade the *Compack* controller (LAN device) in a *Micropack* power system.

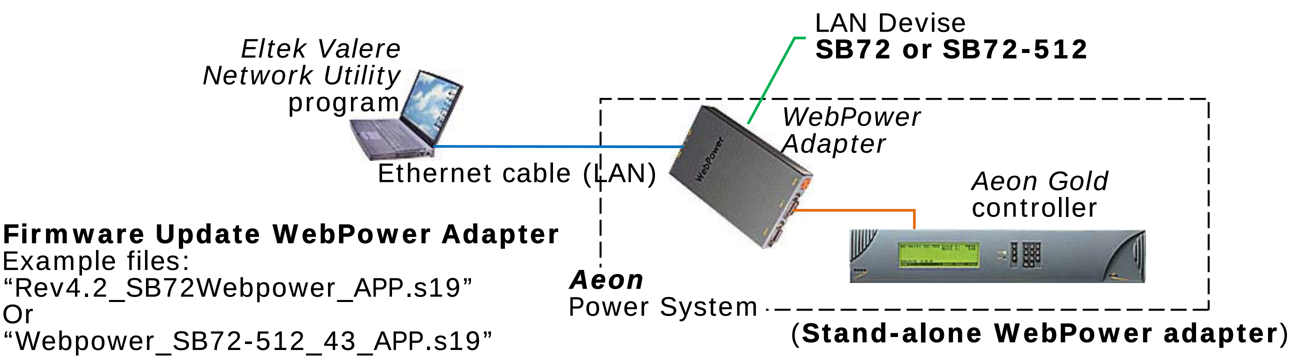


Example firmware files above are used to upgrade the Web adapter (LAN device) embedded in the controller of a *Flatpack2* power system. Each file corresponds to one of the LAN devices (or hardware platforms).

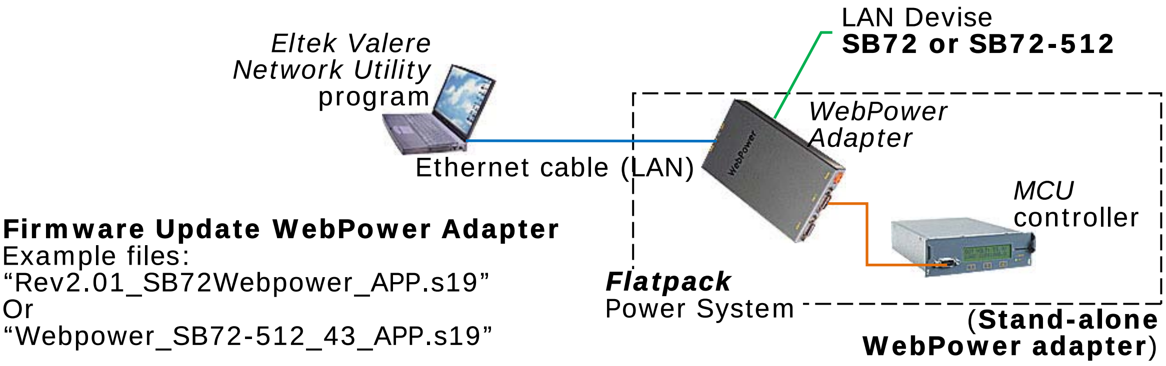
Stand-alone LAN Devices



This example firmware file above is used to upgrade the stand-alone *WebPower Adapter* (LAN device) in a *Flatpack2* power system.



The example firmware files above are used to upgrade the stand-alone *WebPower Adapter* (LAN device) in an *Aeon* power system. Each file corresponds to one of the LAN devices (or hardware platforms).



The example firmware files above are used to upgrade the stand-alone *WebPower Adapter* (LAN device) in a *Flatpack* power system. Each file corresponds to one of the LAN devices (or hardware platforms).

WARNING: The upgrade will be aborted, if the selected LAN device (or software platform) and the firmware file do not match.

CAN bus Addressing

The *Eltek Valere* DC power systems utilize the CAN bus -- a digital interface architecture that supports a dedicated communication channel between the controllers and each of the rectifiers.

Refer also to topic "CAN bus Termination" on page 35.

All rectifiers and control units (controllers and CAN nodes) connected to the *Eltek Valere*'s CAN bus must have a unique address or ID number.

The control system's master controller assigns automatically the rectifiers' addresses (**software assignment**).

The control system's control units and controllers -- except *Compack* and *Smartpack2 Master* -- use DIP switches for configuring their unique CAN bus ID number (**hardware assignment**).

NOTICE:
Compack controllers have no DIP switches, as they are configured from factory with CAN bus ID number <1> (not changeable).

Smartpack2 Master controllers have no DIP switches, as they are configured from factory with CAN bus ID number <11> (not changeable).

Software Assignment -- Rectifiers

Each rectifier in the DC power system is automatically configured by its main controller with a unique CAN bus ID number (software-assignment).

When the rectifiers are hot-plugged in the system the first time, the system's controller dynamically assigns the rectifiers with the next available ID number (software-assignment), and automatically increases the number of communicating rectifiers on the CAN bus. Also, the controller registers the rectifiers' ID numbers, or CAN bus address (01, 02…), together with their serial numbers.

When a previously installed rectifier is again hot-plugged in the power system, it retains its previous ID and serial number, unless reassigned during a Reset Rectifier command.

> WARNING:
> To replace installed rectifiers with new ones, remove the installed rectifiers and wait for the controller to notify communication error with the extracted rectifiers. Push the new rectifiers firmly inwards -- one module at a time, allowing a 2s delay -- to plug them in the power shelf. Start with the shelf position with lowest ID number. Lock their handles.

When a new controller is connected to an existing system, the controller will recalculate the number of connected rectifiers, reassigning them with the same ID numbers as they already have in memory.

Hardware Assignment -- Control Units

The control system consists of one or several CAN bus connected control units.

The control units are factory configured with a unique CAN bus ID number, using DIP switches on the side of units (hardware-assignment).

> NOTICE:
> *Compack* controllers have no DIP switches, as they are configured from factory with CAN bus ID number <1> (not changeable).
>
> *Smartpack2 Master* controllers have no DIP switches, as they are configured from factory with CAN bus ID number <11> (not changeable).

For example, in a distributed DC power system with several *Smartpack* controllers, the master is configured with ID # <1>, the slave with ID # <2> and so on. Refer to "CAN Bus Address Range -- Control Units" on page 100.

CAN Bus Address Range -- Control Units

In the control system's CAN bus, you can address a maximum of 14 CAN nodes of each type, 8 *Smartpack* and *Smartpack2 Basic* controllers and 8 *Smartnode* units. See table below:

Number of nodes >> Control Units' Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Smartpack & Smartpack2 Basic Controllers	1	2	3	4	5	6	7	8	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	<< ID #
Smartnode Control Units	17	18	19	20	21	22	23	24	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	<< ID #
Battery Monitor CAN nodes	33	34	35	36	37	38	39	40	41	42	43	44	45	46	*47*	*48*	<< ID #
Load Monitor CAN nodes	49	50	51	52	53	54	55	56	57	58	59	60	61	62	*63*	*64*	<< ID #
**	*65*	*66*	*67*	*68*	*69*	*70*	*71*	*72*	*73*	*74*	*75*	*76*	*77*	*78*	*79*	*80*	<< ID #
I/O Monitor & I/O Monitor2 CAN nodes	81	82	83	84	85	86	87	88	89	90	91	92	93	94	*95*	*96*	<< ID #
Mains Monitor CAN nodes	97	98	99	100	101	102	103	104	105	106	107	108	109	110	*111*	*112*	<< ID #

ID numbers formatted in grey italics are not available due to software constraints.
** Only 4 of the 8 mounted DIP switches may be used (max. 14 Load Monitors may be connected).

> NOTICE:
> *Compack* controllers have no DIP switches, as they are configured from factory with CAN bus ID number <1> (not changeable).
>
> *Smartpack2 Master* controllers have no DIP switches, as they are configured from factory with CAN bus ID number <11> (not changeable).

The table below shows the DIP switch position on *Smartpack* and *Smartpack2 Basic* controllers:

DIP switch position for *Smartpack & Smartpack2 Basic* controllers

Smartpack & Smartpack2 Basic Controller	ID #	DIP Switch Position 1 -- 2 -- 3 -- 4
Controller 1	1	OFF--OFF--OFF--OFF
Controller 2	2	**ON**--OFF--OFF--OFF
Controller 3	3	OFF-- **ON**--OFF--OFF
Controller 4	4	**ON**-- **ON**--OFF--OFF
Controller 5	5	OFF--OFF-- **ON**--OFF
Controller 6	6	**ON**--OFF-- **ON**--OFF
Controller 7	7	OFF-- **ON**-- **ON**--OFF
Controller 8	8	**ON**-- **ON**-- **ON**--OFF

Note that the controller's ID number corresponds to the DIP switch's binary value plus 1.

The table below shows the DIP switch position on *Smartnode* control units:

DIP switch position for *Smartnode* control units

Smartnode Control Unit	ID #	DIP Switch Position 1 -- 2 -- 3 -- 4
Smartnode 1	17	OFF--OFF--OFF--OFF
Smartnode 2	18	**ON**--OFF--OFF--OFF
Smartnode 3	19	OFF-- **ON**--OFF--OFF
Smartnode 4	20	**ON**-- **ON**--OFF--OFF
Smartnode 5	21	OFF--OFF-- **ON**--OFF
Smartnode 6	22	**ON**--OFF-- **ON**--OFF
Smartnode 7	23	OFF-- **ON**-- **ON**--OFF
Smartnode 8	24	**ON**-- **ON**-- **ON**--OFF

Note that the control unit's ID number corresponds to the DIP switch's binary value plus 17.

The table below shows the DIP switch position on Battery Monitor CAN nodes:

DIP switch position for Battery Monitors

Battery Monitor CAN Node	ID #	DIP Switch Position 1 -- 2 -- 3 -- 4
Node 1	33	OFF--OFF--OFF--OFF
Node 2	34	**ON**--OFF--OFF--OFF
Node 3	35	OFF-- **ON**--OFF--OFF
Node 4	36	**ON**-- **ON**--OFF--OFF
Node 5	37	OFF--OFF-- **ON**--OFF
Node 6	38	**ON**--OFF-- **ON**--OFF
Node 7	39	OFF-- **ON**-- **ON**--OFF
Node 8	40	**ON**-- **ON**-- **ON**--OFF
Node 9	41	OFF--OFF--OFF-- **ON**
Node 10	42	**ON** --OFF--OFF-- **ON**
Node 11	43	OFF-- **ON** --OFF-- **ON**
Node 12	44	**ON** -- **ON** --OFF-- **ON**
Node 13	45	OFF--OFF-- **ON** -- **ON**
Node 14	46	**ON** --OFF-- **ON** -- **ON**

Note that the node's ID number corresponds to the DIP switch's binary value plus 33.

The table below shows the DIP switch position on Load Monitor CAN nodes:

DIP switch position for Load Monitors

Load Monitor	ID	DIP Switch Position

CAN Node	#	1 -- 2 -- 3 -- 4
Node 1	49	OFF--OFF--OFF--OFF
Node 2	50	**ON**--OFF--OFF--OFF
Node 3	51	OFF-- **ON**--OFF--OFF
Node 4	52	**ON**-- **ON**--OFF--OFF
Node 5	53	OFF--OFF-- **ON**--OFF
Node 6	54	**ON**--OFF-- **ON**--OFF
Node 7	55	OFF-- **ON**-- **ON**--OFF
Node 8	56	**ON**-- **ON**-- **ON**--OFF
Node 9	57	OFF--OFF--OFF-- **ON**
Node 10	58	**ON** --OFF--OFF-- **ON**
Node 11	59	OFF-- **ON** --OFF-- **ON**
Node 12	60	**ON** -- **ON** --OFF-- **ON**
Node 13	61	OFF--OFF-- **ON** -- **ON**
Node 14	62	**ON** --OFF-- **ON** -- **ON**

Note that the node's ID number corresponds to the DIP switch's binary value plus 49.

The table below shows the DIP switch position on I/O Monitor and I/O Monitor2 CAN nodes:

DIP switch position for I/O Monitor and I/O Monitor2

I/O Monitor & **I/O Monitor2** CAN Node	ID #	DIP Switch Position 1 -- 2 -- 3 -- 4
Node 1	81	OFF--OFF--OFF--OFF
Node 2	82	**ON**--OFF--OFF--OFF
Node 3	83	OFF-- **ON**--OFF--OFF
Node 4	84	**ON**-- **ON**--OFF--OFF
Node 5	85	OFF--OFF-- **ON**--OFF
Node 6	86	**ON**--OFF-- **ON**--OFF
Node 7	87	OFF-- **ON**-- **ON**--OFF
Node 8	88	**ON**-- **ON**-- **ON**--OFF
Node 9	89	OFF--OFF--OFF-- **ON**
Node 10	90	**ON** --OFF--OFF-- **ON**
Node 11	91	OFF-- **ON** --OFF-- **ON**
Node 12	92	**ON** -- **ON** --OFF-- **ON**
Node 13	93	OFF--OFF-- **ON** -- **ON**
Node 14	94	**ON** --OFF-- **ON** -- **ON**

Note that the node's ID number corresponds to the DIP switch's binary value plus 81.

The table below shows the DIP switch position on Mains Monitor CAN nodes:

DIP switch position for Mains Monitor

Mains Monitor CAN Node	ID #	DIP Switch Position 1 -- 2 -- 3 -- 4
Node 1	97	OFF--OFF--OFF--OFF
Node 2	98	**ON**--OFF--OFF--OFF
Node 3	99	OFF-- **ON**--OFF--OFF
Node 4	100	**ON**-- **ON**--OFF--OFF
Node 5	101	OFF--OFF-- **ON**--OFF
Node 6	102	**ON**--OFF-- **ON**--OFF
Node 7	103	OFF-- **ON**-- **ON**--OFF
Node 8	104	**ON**-- **ON**-- **ON**--OFF
Node 9	105	OFF--OFF--OFF-- **ON**
Node 10	106	**ON** --OFF--OFF-- **ON**
Node 11	107	OFF-- **ON** --OFF-- **ON**
Node 12	108	**ON** -- **ON** --OFF-- **ON**
Node 13	109	OFF--OFF-- **ON** -- **ON**
Node 14	110	**ON** --OFF-- **ON** -- **ON**

Note that the node's ID number corresponds to the DIP switch's binary value plus 97.

Example:

In a DC power system with following control units: 2 *Smartpack* controllers, 1 Smartnode and 2 Load Monitors, you have to set their DIP switches as follows:

- First Smartpack controller:
  ID# 1 (All DIP switches OFF)
- Second Smartpack controller:
  ID# 2 (Only DIP switch 1 ON)
- First Smartnode:
  ID# 17 (All DIP switches OFF)
- First Load Monitor:
  ID# 49 (All DIP switches OFF)
- Second Load Monitor:
  ID# 50 (Only DIP switch 1 ON)

System Inputs and Outputs - Overview

Following links shows you all available **inputs and outputs per control unit**.

The overview also specifies the input's or output's application, and whether the input requires calibration, configuration and scaling.

Read also the *Available Inputs and Outputs* topic for each of the control units, e.g. "Available Inputs and Outputs" on page 110 for the *Smartpack* controller.

Available System Current Sense Inputs

The DC power supply system may implement the following **number of Current Sense Inputs per control unit**:

Input, Output	#	**Type**	Control Unit	Calibration	Configuration	Scaling	Application
Batt. Current Sense Inputs	**1**	**Current Sense**	Battery Monitor	X		X	Battery shunt
Batt. Current Sense Inputs	**2**	**Current Sense**	Smartpack	X		X	Battery shunt
Current Sense Inputs	**8**	**Current Sense**	Load Monitor	X		X	Load shunts
Batt. Current Sense Inputs	**1**	**Current Sense**	Smartpack2 Basic	X		X	Battery shunts

Available System Fuse Monitoring Inputs

The DC power supply system may implement the following **number of Fuse Monitoring Inputs per control unit**:

Input, Output	#	**Type**	Control Unit	Calibration	Configuration	Scaling	Application
Batt. Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Battery Monitor		X	X	Battery fuse
Batt. Fuse Monitoring Config. Inputs	**2**	**Fuse Monitoring**	Smartpack		X	X	Battery fuse
Batt. Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Smartpack2 Basic		X	X	Battery fuse
Fuse Monitoring Config. Inputs	**8**	**Fuse Monitoring**	Load Monitor		X	X	Load breakers and ext. equip.
Load Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Smartpack2 Basic		X	X	Load breakers and ext. equip.
Load Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Smartpack		X	X	Load breakers and ext. equip.

Available System Alarm Relay Outputs

The DC power supply system may implement the following **number of Alarm Relay Outputs per control unit**:

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
Alarm Relay Outputs	**6**	**NC-C-NO Relay**	I/O Monitor				Ext. control and alarming purposes
Alarm Relay Outputs	**6**	**NC-C-NO Relay**	Smartpack				Ext. control and alarming purposes
Alarm Relay Outputs	**6**	**NC-C-NO Relay**	I/O Monitor2				Ext. control and alarming purposes
Alarm Relay Outputs	**3**	**NC-C-NO Relay**	Compack				Ext. control and alarming purposes

Available System Fan Control Inputs & Outputs

The DC power supply system may implement the following **number of Fan Control Inputs and Outputs per control unit**:

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
OCab Fan Speed Control Outputs	**2**	**Fan Control**	I/O Monitor				Fans in Outdoor Cabinets
OCab Fan Speed Monitoring Inputs	**2**	**Fan Control**	I/O Monitor				Tachometers in Outdoor Cabinets

Available System Programmable Inputs

The DC power supply system may implement the following **number of System Programmable Inputs per control unit**:

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
Config. Inputs	**6**	**Programmable**	I/O Monitor		X		Door, fire, generator switches and other ext. equip.
Config. Inputs	**6**	**Programmable**	Smartpack		X		Door, fire, generator switches and other ext. equip.
Config. Inputs	**6**	**Programmable**	I/O Monitor2		X		Door, fire, generator switches and other ext. equip.
Config. Inputs	**3**	**Programmable**	Compack	X	X		Temperature, door, fire, generator switches and other ext. equip.

Available System Temperature Sense Inputs

The DC power supply system may implement the following **number of System Temperature Sense Inputs per control unit**:

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
Batt. Temp. Sense Inputs	**1**	**Temperature Sense**	Battery Monitor	X		X	Battery temperature (sensor embedded in box)
Batt. Temp. Sense Inputs	**3**	**Temperature Sense**	Smartpack2 Basic	X		X	Battery temperature
Batt. Temp. Sense Inputs	**2**	**Temperature Sense**	Smartpack	X		X	Battery temperature
OCab Temp. Sense Inputs	**2**	**Temperature Sense**	I/O Monitor	X		X	Temp. sensors in Outdoor Cabinets

Available System Voltage Inputs

The DC power supply system may implement the following **number of System Voltage Inputs per control unit**:

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
Batt. Symmetry Inputs	**4**	**Voltage Monitoring**	Battery Monitor	X		X	Batteries
Batt. Symmetry Inputs	**8**	**Voltage Monitoring**	Smartpack	X		X	Batteries

All Available System Inputs & Outputs

Following table lists all available inputs and outputs per control unit, **sorted after the type of input or output**.

The overview also specifies the input's or output's application, and whether the input requires calibration, configuration and scaling.

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
Batt. Current Sense Inputs	**1**	**Current Sense**	Battery Monitor	X		X	Battery shunt
Current Sense Inputs	**8**	**Current Sense**	Load Monitor	X		X	Load shunts
Batt. Current Sense Inputs	**2**	**Current Sense**	Smartpack	X		X	Battery shunt
Batt. Current Sense Inputs	**1**	**Current Sense**	Smartpack2 Basic	X		X	Battery shunts
OCab Fan Speed Control Outputs	**2**	**Fan Control**	I/O Monitor				Fans in Outdoor Cabinets
OCab Fan Speed Monitoring Inputs	**2**	**Fan Control**	I/O Monitor				Tachometers in Outdoor Cabinets
Batt. Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Battery Monitor		X	X	Battery fuse
Fuse Monitoring Config. Inputs	**8**	**Fuse Monitoring**	Load Monitor		X	X	Load breakers and ext. equip.
Batt. Fuse Monitoring Config. Inputs	**2**	**Fuse Monitoring**	Smartpack		X	X	Battery fuse
Load Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Smartpack		X	X	Load breakers and ext. equip.
Batt. Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Smartpack2 Basic		X	X	Battery fuse
Load Fuse Monitoring Config. Inputs	**1**	**Fuse Monitoring**	Smartpack2 Basic		X	X	Load breakers and ext. equip.
Alarm Relay Outputs	**3**	**NC-C-NO Relay**	Compack				Ext. control and alarming purposes
Alarm Relay Outputs	**6**	**NC-C-NO Relay**	I/O Monitor				Ext. control and alarming purposes
Alarm Relay Outputs	**6**	**NC-C-NO Relay**	I/O Monitor2				Ext. control and alarming purposes
Alarm Relay Outputs	**6**	**NC-C-NO Relay**	Smartpack				Ext. control and alarming purposes
Config. Inputs	**3**	**Programmable**	Compack	X	X		Temperature, door, fire, generator switches and other ext. equip.
Config. Inputs	**6**	**Programmable**	I/O Monitor		X		Door, fire, generator switches and other ext. equip.

Input, Output	#	Type	Control Unit	Calibration	Configuration	Scaling	Application
Config. Inputs	**6**	**Programmable**	I/O Monitor2		X		Door, fire, generator switches and other ext. equip.
Config. Inputs	**6**	**Programmable**	Smartpack		X		Door, fire, generator switches and other ext. equip.
Batt. Temp. Sense Inputs	**1**	**Temperature Sense**	Battery Monitor	X		X	Battery temperature (sensor embedded in box)
OCab Temp. Sense Inputs	**2**	**Temperature Sense**	I/O Monitor	X		X	Temp. sensors in Outdoor Cabinets
Batt. Temp. Sense Inputs	**2**	**Temperature Sense**	Smartpack	X		X	Battery temperature
Batt. Temp. Sense Inputs	**3**	**Temperature Sense**	Smartpack2 Basic	X		X	Battery temperature
Batt. Symmetry Inputs	**4**	**Voltage Monitoring**	Battery Monitor	X		X	Batteries
Batt. Symmetry Inputs	**8**	**Voltage Monitoring**	Smartpack	X		X	Batteries

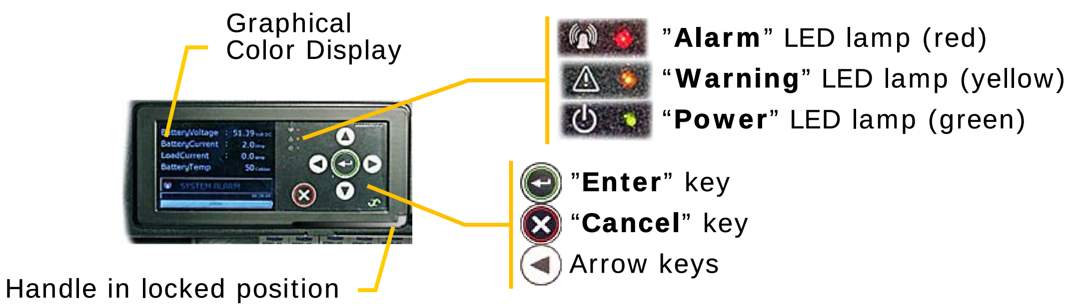
Control Units, Controllers, CAN Nodes, etc

All control units – controllers, monitors, CAN nodes, etc – connected to the power system's CAN bus represent the DC power system's control system.

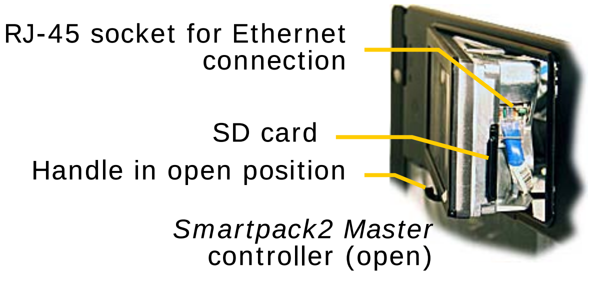
The *Smartpack2* Master Controller - Overview

The *Smartpack2 Master* controller serves 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.



The *Smartpack2 Master* controller is based upon a 3.2" TFT 32k color display for local monitoring and configuration. The display has QVGA (320 x 240) resolution and high contrast, for excellent reading from long distances and angles. For easy screen navigation, it is equipped with a large touchpad, based on the widely used "capacitive sense" principle.



A computer -- connected to the controller's RJ-45 Ethernet socket -- enables system configuration via a standard web browser (*WebPower).*

The *Smartpack2 Master* controller is also equipped with a non-volatile memory card slot, which accepts standard SD Cards (Secure Digital Card).

The SD Card can be used to store a backup of the complete power system configuration and setup. The SD Card is also suitable for extending of system's event log, data log and energy logs, and for firmware upgrading purposes.

The *Smartpack2* Basic Controller - Overview

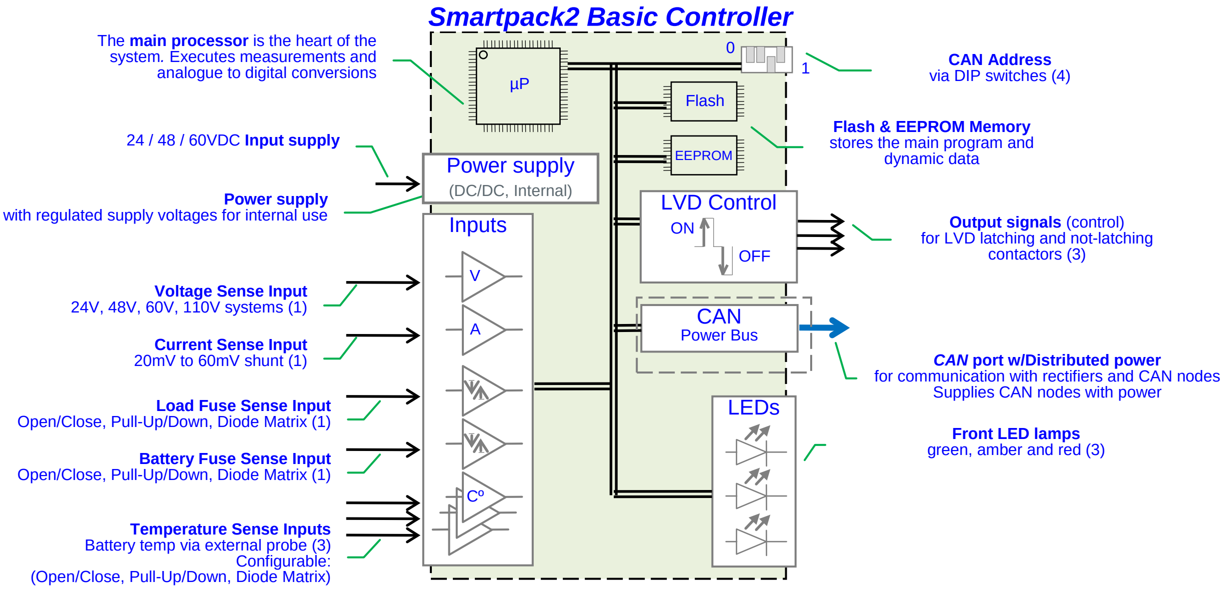
The *Smartpack2* Basic controllers are powerful modules used as slave controllers in the distributed control system of *Smartpack2*-based power supply systems.

They are developed for monitoring and controlling of the power system's internal functionality and to supply distributed power for connected CAN nodes. They can also operate in stand-alone mode, maintaining normal operation of the system, thus providing redundancy and improving system reliability.

You can operate the system locally with a computer, via a standard web browser or using *PowerSuite* program -- or remotely via Ethernet and the Web. The module then communicates via CAN bus with its *Smartpack2 Master,* which uses its Ethernet port to interface with a local PC, SNMP.

Read also about methods of accessing the controller in topic "Networking the Controller - Access Methods" on page 7, and methods of configuring the power system in topic "Power System Configuration & Monitoring – Methods" on page 16.

Block Diagram



Available Inputs and Outputs

Each *Smartpack2 Basic* controller is equipped with several inputs and outputs that you may use for internal system monitoring and control purposes. The following inputs and outputs are internally available for system implementation:

- 1 Voltage sense input
  (for system voltage)
- 1 Battery Fuse Fail input
- 1 Load Fuse Fail input
- 1 Current sense input
- 3 Temperature Sense inputs
  (for battery monitoring)
- 3 LVD outputs
  (for controlling latching and non-latching contactors)

For a complete sorted overview of available inputs and outputs, see "System Inputs and Outputs - Overview" on page 103.

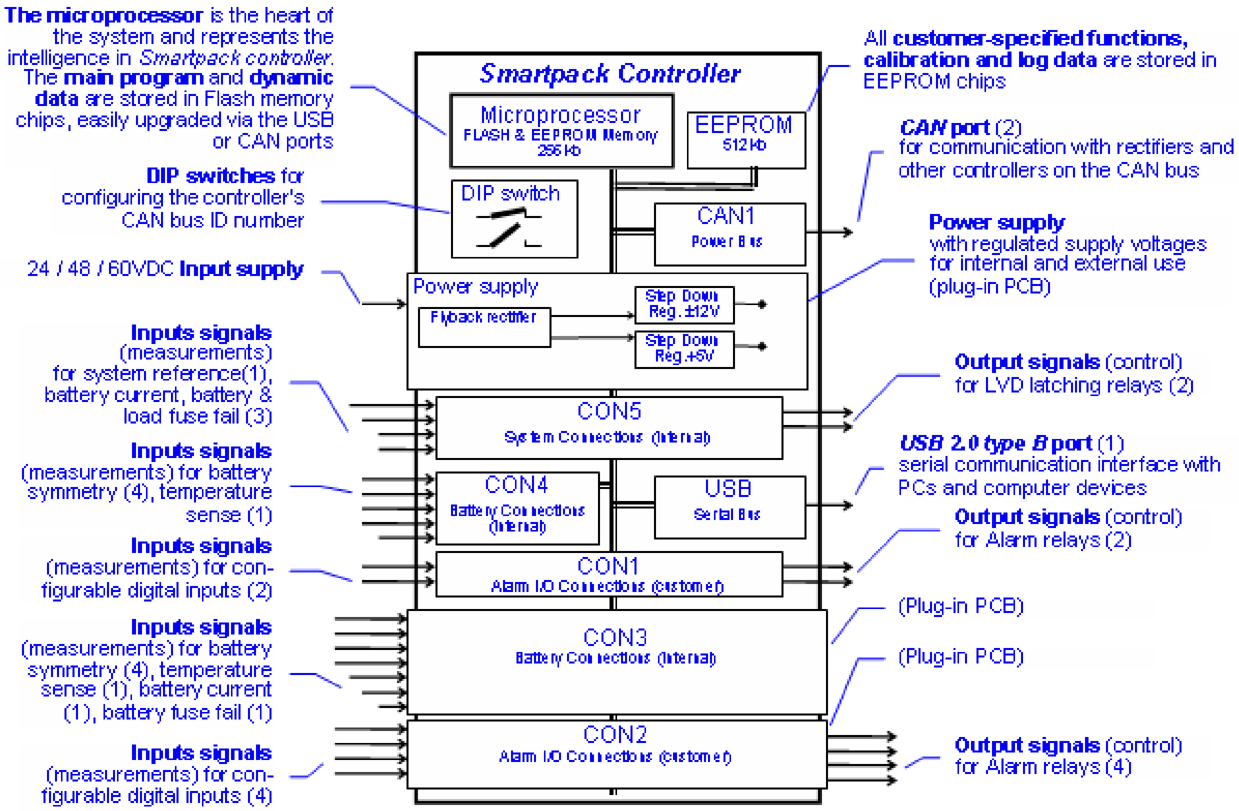
The *Smartpack* Controller - Overview

The *Smartpack* controller is a monitoring and control unit used as the vital nerve center of the DC power plant. You operate the system from the elegant front panel, using three front keys and the LCD-display. They represent the main interface between you and the system.

You can also operate the system locally via a PC using *Eltek Valere*'s *PowerSuite* application, or remotely via modem, Ethernet and the Web. The module then utilizes the USB- or RS-232 ports to interface with a local PC, SNMP or Web adapters.

Read also topics about methods of accessing the controller "Networking the Controller - Access Methods" on page 7, and methods of configuring the power system "Power System Configuration & Monitoring – Methods" on page 16.

Block Diagram



Available Inputs and Outputs

Each *Smartpack* controller may be equipped with several inputs and outputs that you may use for monitoring and control purposes. The following inputs and outputs are available to the user:

- 8 Battery Symmetry inputs
  (4 on CON4 and 4 on CON3)
  Read "Battery Symmetry Measurements" on page 57
- 2 Battery Current inputs
  (1 on CON5 and 1 on CON3)
- 2 Battery Fuse Fail inputs
  (1 on CON5 and 1 on CON3)
- 2 Temperature Sense inputs
  (1 on CON4 and 1 on CON3)
- 1 Load Fuse Fail input (on CON5)
- 6 Configurable Digital inputs
  (2 on CON1 and 4 on CON2)

- o 6 Alarm Relay outputs
  (2 on CON1 and 4 on CON2)

For a complete sorted overview of available inputs and outputs, see "System Inputs and Outputs - Overview" on page 103.

Smartpack Options

The *Smartpack* is a scalable controller with modular design. It can be optimized for different requirements by means of plug-in-kits. Various *Smartpack* controller options are available.

- Smartpack Controller, **Standard**
  (local monitoring features)
- Smartpack Controller, **Ethernet**
  (remote system monitoring via Ethernet)
- Smartpack Controller, **RS232 (front and rear access)**
  (remote system monitoring via modem)
- Smartpack Controller, **Basic Slave**
  (as Standard, but front display, keys and internal power supply are not implemented)

For more information about these *Smartpack* options, read the "*User Guide Smartpack Monitoring and Control Unit*", doc. 350003.013.

The *Compack* Controller - Overview

The *Compack* controller is a DIN rail mounted monitoring and control unit used in the *Micropack* DC power systems. The controller is also used in larger *Eltek Valere*'s Compack-based power systems.

It monitors and controls the whole system, and implements several network protocols for local and remote system configuration via web browser and existing network management system (NMS).

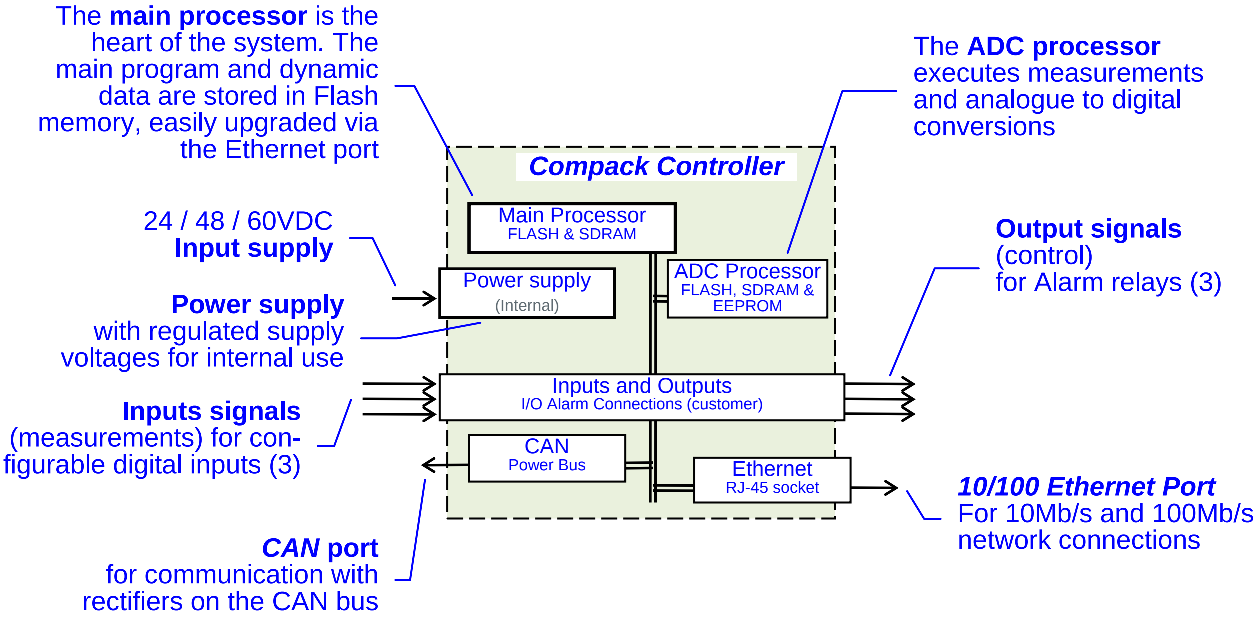
Using the UDP tunneling protocol, the powerful *PowerSuite* application may also be used for system configuration from a local or remote Internet connected personal computer.

You can easily connect the *Compack* controller to an Ethernet networked computer, plugging a standard Ethernet cable to the RJ-45 socket on top of the controller and to any available Ethernet socket on the network.

The *Compack* controller has the following LED indications:

- Alarm (red) indicates an alarm situation (major alarm)
- Warning (yellow) indicates an abnormal situation (minor alarm)
- "Power" (green) indicates that the power supply is ON or OFF
- Read also topics about methods of accessing the controller "Networking the Controller - Access Methods" on page 7, and methods of configuring the power system "Power System Configuration & Monitoring – Methods" on page 16.

Block Diagram



Available Inputs and Outputs

The *Compack* controller's I/O cables are connected to pluggable terminal blocks located on the controller's top. These connections are used for monitoring and controlling the status of external equipment, using configurable inputs and voltage-free alarm relays contacts.

The following inputs and outputs are available to the user:

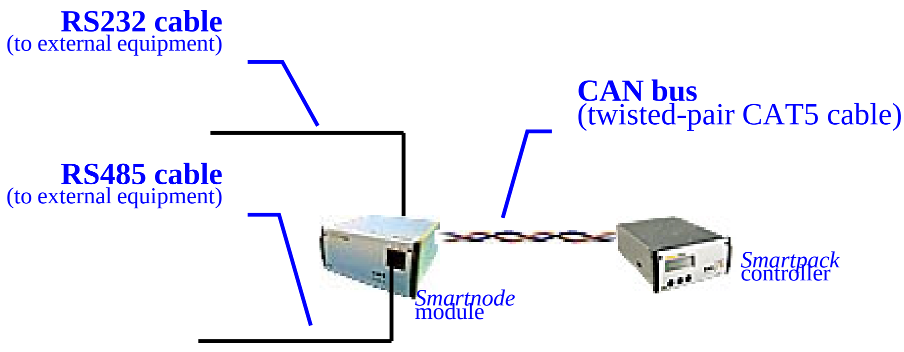
- 3 Configurable Digital inputs
  (Voltage and temperature measurements)
- 3 Alarm Relay outputs
  (NC-C-NO)

For a complete sorted overview of available inputs and outputs, see "System Inputs and Outputs - Overview" on page 103.

For more information about the *Compack* controller, read the "*User Guide Compack Monitoring and Control Unit*", doc. 350011.013.

The *Smartnode* Control Unit - Overview

The *Smartnode* control unit is a CAN bus node that serves as a software protocol translator module. It can be customized to enable the *Smartpack* controller to communicate with third-party equipment using specific RS232 and RS485 serial protocols.



The *Battery Monitor* Control Unit - Overview

The *Battery Monitor Control Unit* is a CAN bus node that enables you to decentralize and increase the number of battery symmetry measurements in your DC power supply system. Also, it monitors the battery compartment temperature using the built-in sensor.

For more information and connection details, refer to the “Installation Guide Battery Monitor CAN node” (351507-033) or the system’s quick start guide.

Refer also to the *PowerSuite Help*, for symmetry configuration of *Battery Monitor Control Units.*

Available Inputs and Outputs

Each *Battery Monitor Control Unit* may be equipped with several inputs and outputs that you may use for monitoring and control purposes.

The following inputs and outputs are available to the user:

- 4 Battery Symmetry Inputs
(for batteries)
- 1 Battery Fuse Monitoring Configurable Input
(for battery fuse)
- 1 Battery Current Sense Input
(for current shunts)
- 1 Battery Temperature Sense Inputs
(temperature sensor embedded in the box)

For a complete sorted overview of available inputs and outputs, see “System Inputs and Outputs - Overview” on page 103.

The *Load Monitor* Control Unit - Overview

The *Load Monitor Control* Unit is a CAN bus node that enables you to decentralize and increase the number of input fuse monitoring and current sense signals in your DC power supply system.

The fuse monitoring inputs are suitable for monitoring a wide range of breakers in both positive and negative DC distributions.

Available Inputs and Outputs

Each *Load Monitor Control Unit* may be equipped with several inputs and outputs that you may use for monitoring and control purposes.

The following inputs and outputs are available to the user:

- 8 Fuse Monitoring Configurable Inputs
(for load breakers and external equipment)
- 8 Current Sense Inputs
(for load current shunts)

For a complete sorted overview of available inputs and outputs, see "System Inputs and Outputs - Overview" on page 103.

The *I/O Monitor2* Control Unit - Overview

The *I/O Monitor2 Control* Unit is a CAN bus node that enables you to decentralize and increase the number of input monitoring and output controlling signals in your DC power supply system.

Also, the *I/O Monitor2* is a required component in *Smartpack2*-based power systems.

Available Inputs and Outputs

- 6 Configurable Inputs
(for door, fire, generator switches and other ext. equip.)
- 6 Alarm Relay Outputs
(NC-C-NO; for external alarming purposes)

For a complete sorted overview of available inputs and outputs, see "System Inputs and Outputs - Overview" on page 103.

The *I/O Monitor* Control Unit - Overview

The *I/O Monitor Control* Unit is a CAN bus node that enables you to decentralize and increase the number of input monitoring and output controlling signals in your DC power supply system. Also, it monitors and controls the compartment temperature inside **fan-cooled outdoor cabinets**.

Available Inputs and Outputs

- 6 Configurable Inputs
(for door, fire, generator switches and other ext. equip.)
- 6 Alarm Relay Outputs
(NC-C-NO; for external alarming purposes)
- 2 OCab Temperature Sense Inputs
(for temperature sensors in Outdoor Cabinets)
- 2 OCab Fan Speed Monitoring Inputs
(for tachometers in Outdoor Cabinets)
- 2 OCab Fan Speed Control Outputs
(for fans in Outdoor Cabinets)

For a complete sorted overview of available inputs and outputs, see "System Inputs and Outputs - Overview" on page 103.

Tutorials

Click on each tutorial topic, to learn about some useful concepts and features to get you configuring your power system as quickly as possible.

How to Configure Alarm Output Groups

Goal:

This tutorial will show you how to configure one of the Alarm Output Groups (AOG) that are usually unassigned from factory.

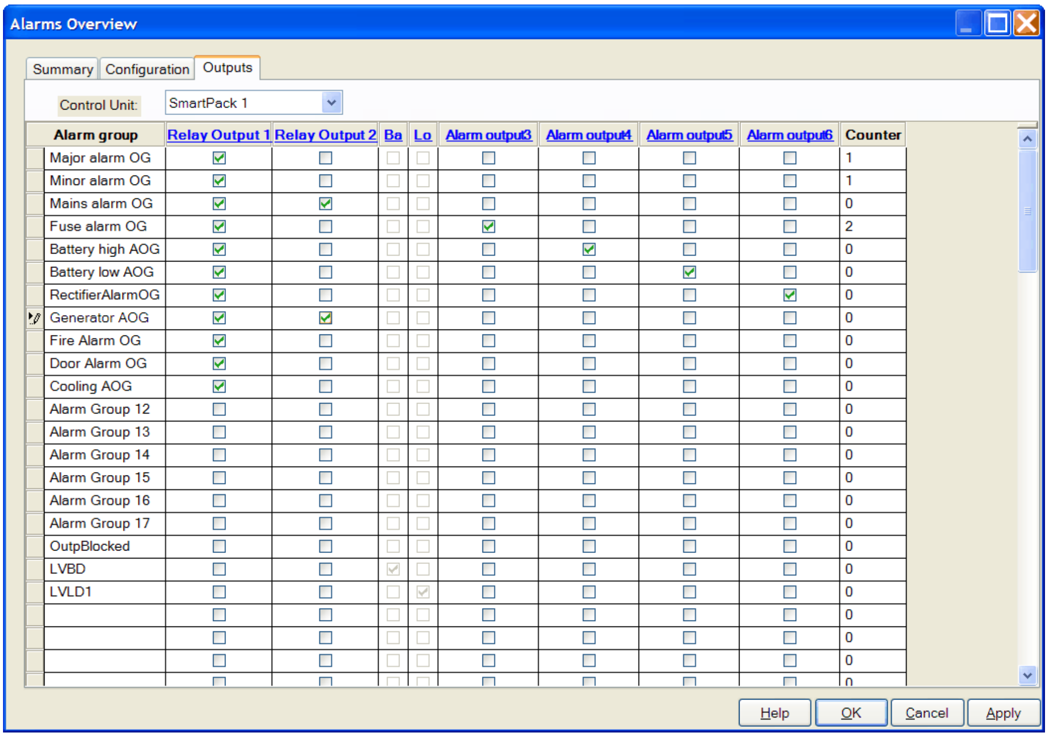
Read more about Alarm Output Groups (page 86), in the Functionality Description section.

NOTICE: To edit Alarm Output Groups' assignments, you have to be logged in with the Service Access Level password.

Description:

In this tutorial, we want to create an Alarm Output Group with the name of "*Generator AOG*", and assign alarm relay outputs 1 and 2 to the group. We will use the unassigned Alarm Group 8.

Start by clicking on the "**Alarms Overview" button**, on the toolbar; then click on the **"Outputs" tab**, and finally select the **"Smartpack 1" control unit**, to display the unit's relay outputs.



To create the Alarm Output Group, perform the following steps:

1. **Edit the group's name** by,
   clicking on "*Alarm Group 8*", on the first column, and change it to "*Generator AOG*"
2. **Assign the alarm relay outputs to the group** by,
   clicking (checked) on the Relay Output 1 and 2 check boxes, on the same row as "*Generator AOG*"
3. **Save the assignment** by,
   clicking on the **Apply** and the **OK buttons** to save the assignment

Now when an alarm monitor assigned to the "*Generator AOG*" Alarm Output Group raises an alarm, the alarm relay outputs 1 and 2 will change from open to close or vise versa.

For information about how to edit an alphanumeric field or a drop-down list, refer to the Glossary section.

How to Configure Alarm Monitors & Programmable Inputs

Goal:

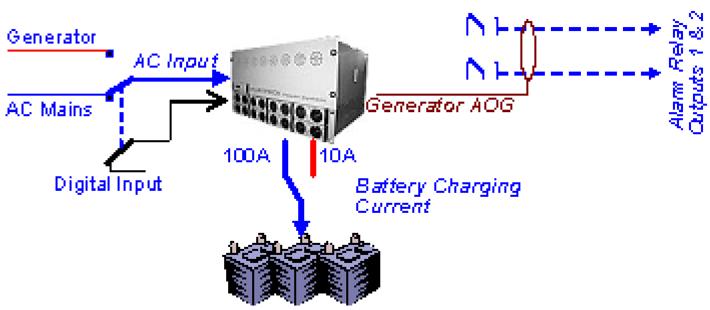
This tutorial will show you how to activate and configure an alarm monitor to check the status of a programmable input, used to monitor an external AC generator. When the AC generator supplies the DC power system, the alarm monitor will limit the battery charging current and activate several alarm output relays.

Read more about Alarm Monitors (page 82) and Alarm Output Groups (page 86), in the Functionality Description section.

NOTICE: To configure alarm monitors, you have to be logged in with the Service Access Level password.

Description:

In this tutorial, we want to configure an alarm monitor for programmable input "*ProgInput 1.1*", to monitor when the AC supply is switched from AC Mains to an external AC generator. Then, when the AC generator is feeding the DC power system, the alarm monitor will limit the system's battery charging current from 100A to 10A. It will also activate the "*Generator AOG*" Alarm Output Group (alarm relays 1 and 2).



To configure the alarm monitor to function as described, you must perform the following steps:

1. Configure the Alarm Output Group
2. Configure the Battery Charging Current Limitation

3. Configure the Alarm Monitor

For information about how to edit an alphanumeric field or a drop-down list, refer to the Glossary section.

Continue with the tutorial's "Step 1 - Configure the Alarm Output Group" on page 116.

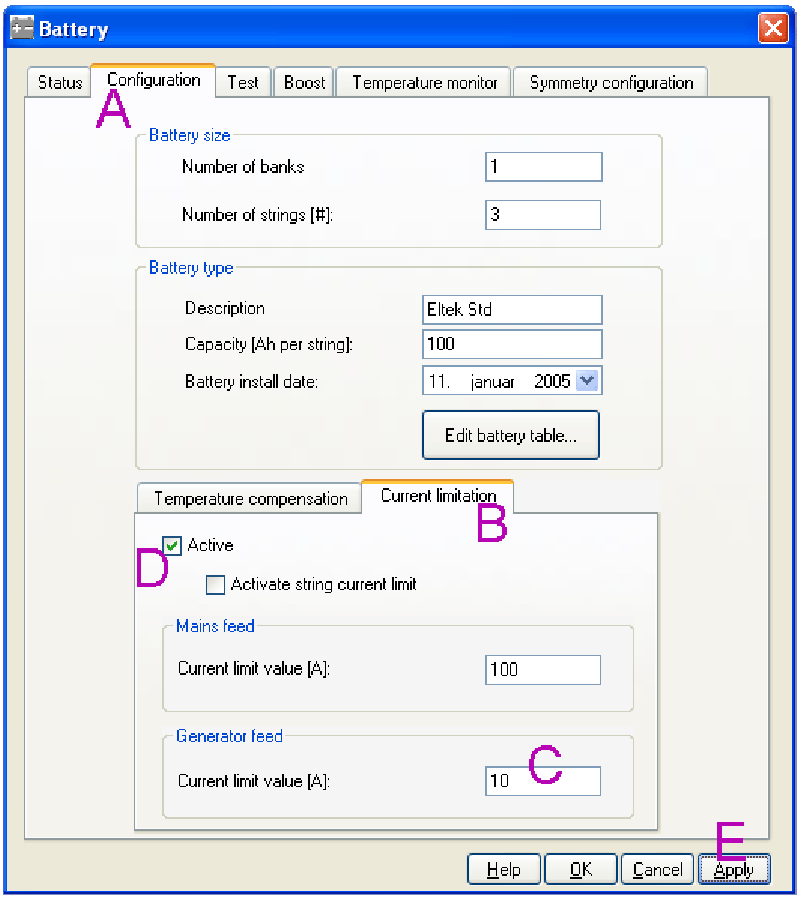
Step 1 - Configure the Alarm Output Group

To name an Alarm Output Group as "*Generator AOG*" and configure it to activate relay outputs 1 and 2, read the tutorial "How to Configure Alarm Output Groups", page 114.

Continue with the tutorial's "Step 2 - Configure the Battery Charging Current Limitation" on page 116.

Step 2 - Configure the Battery Charging Current Limitation

Double-click on the **Battery icon** in the **Power Explorer pane**. Click on the "**Configuration**" tab (A), and on the "**Current Limitation**" tab (B), in the middle of the dialog box.



1. **Enter the Generator Feed charging current limit (C)** by, clicking on the Generator Feed "C*urrent Limit Value (A)*" text field, to insert the cursor, and then typing <10>.

   For information about how to edit an alphanumeric field, refer to the Glossary section.

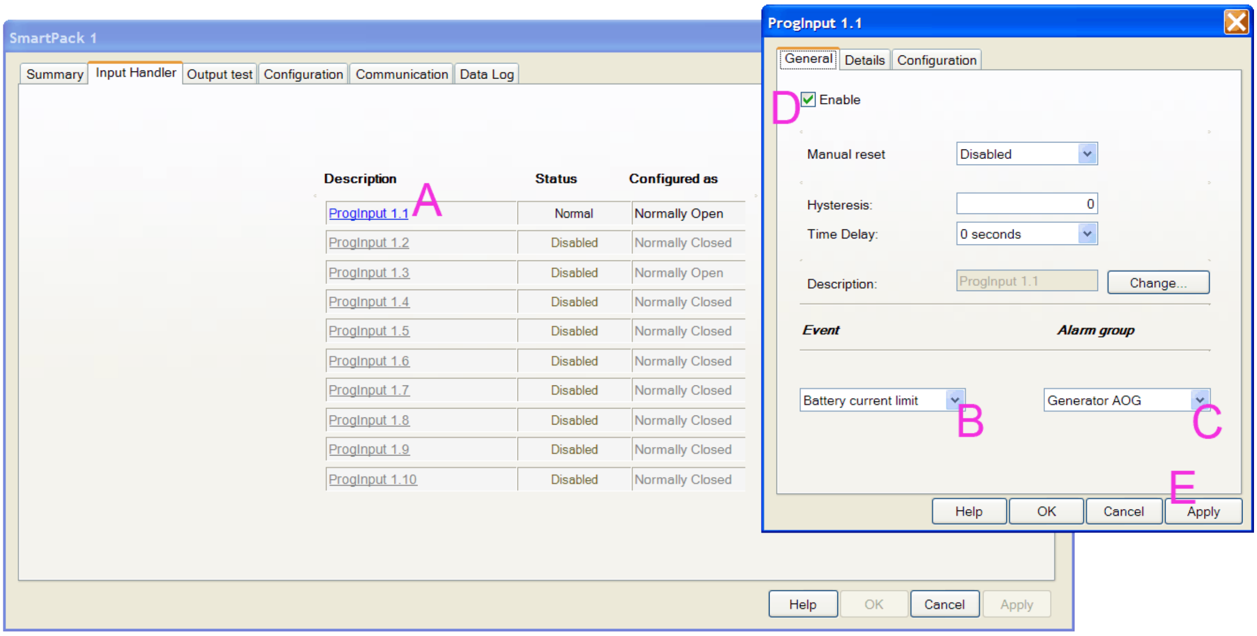
2. **Activate the current limitation (D)** by,
   clicking on the "Activate" check box, to check it
3. **Save the configuration (E)** by,
   clicking on the "Apply" button

You find more information about the Battery Charging Current Limitation (page 75), in the Functionality Description section.

Continue with the tutorial's "Step 3 - Configure the Alarm Monitor" on page 117.

Step 3 - Configure the Alarm Monitor

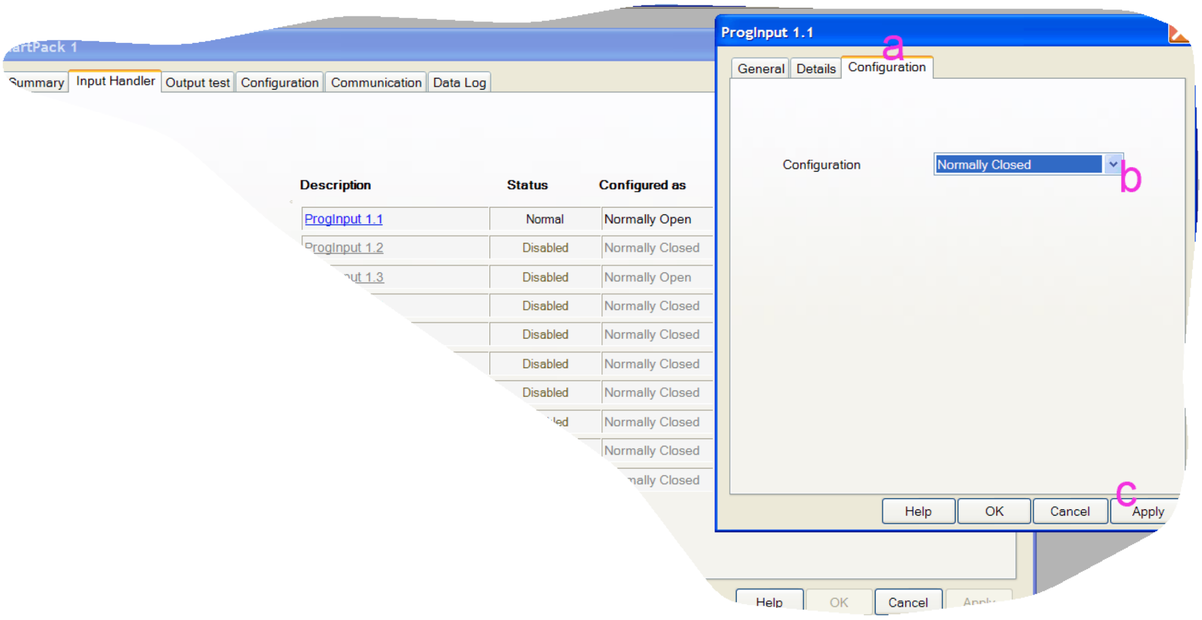
Double-click the **Control Unit icon** in the **Power Explorer pane,** and then click on the "**Input Handler"** tab.



1. **Open the alarm monitor (A)** by,
   clicking on the "*ProgInput 1.1*" link (A)
   The alarm monitor's dialog box "ProgInput 1.1" is displayed
2. **Select the *Battery Current Limit* event (B)** by,
   clicking on the drop-down arrow (B), and selecting *Battery Current Limit* from the list
3. **Select the *Generator AOG* alarm group (C)** by,
   clicking on the drop-down arrow, and selecting *Generator AOG* from the list
4. **Activate the alarm monitor (D)** by,
   clicking on the Enable check box, to check it
5. **Save the alarm monitor configuration (E)** by:
   -- Clicking on the Apply button (E)

6. **Save the configuration (H)** by,
   clicking on the Apply button (H), and
   close the "*Control Unit 1"* dialog box by clicking on its OK button

AND continue selecting the input's activation pattern, as follows: (see figure below)



7. Click on the **Configuration tab (a)**, and
8. **Select the input's activation pattern** by:
   clicking on the drop-down arrow (b), and select *Normally Closed* (The external relay contacts are closed, and the relay coil energized, when the AC Generator is not supplying the DC power system)
9. Click on the **Apply** (c) and the **OK buttons**

The "*ProgInput 1.1*" alarm monitor link is now active and in blue text.

For information about how to use the drop-down list, refer to the Glossary section.

Now you have configured *PowerSuite* so that when the AC generator supplies the DC power system, the alarm monitor will limit the battery charging current and activate several alarm output relays.

Now you are finished with tutorial "How to Configure Alarm Monitors & Programmable Inputs" on page 115.

About *Eltek Valere*

Eltek Valere is a global leader in the development of DC power supply systems, designed to meet the rapid growth within the industrial and telecommunication fields, as well as the increasingly stringent reliability requirements.

www.eltekvalere.com

Energy distribution in industrial, telecommunication and data systems technology require a guaranteed, uninterruptible power supply. To meet this demand, *Eltek Valere* makes in-depth investments in all types of scientific research, technical development, and experimental mathematical modelling of thermal characteristics of components and systems.

Compliance to International Standards

A modern power supply system must fulfil various international standards and regulations, while meeting market requirements. Increased awareness of Electromagnetic Compatibility (EMC), especially in Europe, has resulted in *Eltek Valere*'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 Valere*'s extensive in-house test facility.

Forefront Telecom Power Products

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 bank. Whenever a problem is detected, the operator will be notified immediately, either via the telephone network, or via Ethernet. Shutdowns can thus be avoided for critical applications.

Eltek Valere's software expertise is constantly expanding remote communication capabilities of systems, using standard network protocols.

Eltek Valere accepts no responsibility for any damage or injury to the system, site or personnel caused by drawings, instructions or procedures not prepared by *Eltek Valere*.

FAQs

Frequently Asked Questions, FAQs

In this section you find answers to some of the most Frequently Asked Questions about *Eltek Valere*’s DC power systems.

Generic FAQs

PowerSuite and WebPower

Question:

What’s the difference between *PowerSuite* and *WebPower*?

Answer:

PowerSuite is a program to be installed and run on a personal computer, while *WebPower* is a graphical user interface (GUI) based on HTML pages that the controller serve to a standard web browser for viewing. No program installation required.

WebPower implements the most common configuration task, while *PowerSuite* enables full configuration of the power system.

Type of Logs

Question:

What’s the difference between the types of logs or data records displayed by *Eltek Valere*’s power systems, and where do I find them?

Answer:

The control system implements following 5 types of logs:

- Event Log
- Data Log
- Data Logging
- Energy Log
- Load Monitor Info

Read more in topic Types of System Logs (page 30) in the Functionality Description section.

WebPower FAQs

How to Enable Pop-ups in the browser -- Internet Explorer

Question:

How do I enable Pop-ups in the Internet Explorer browser?

Answer:

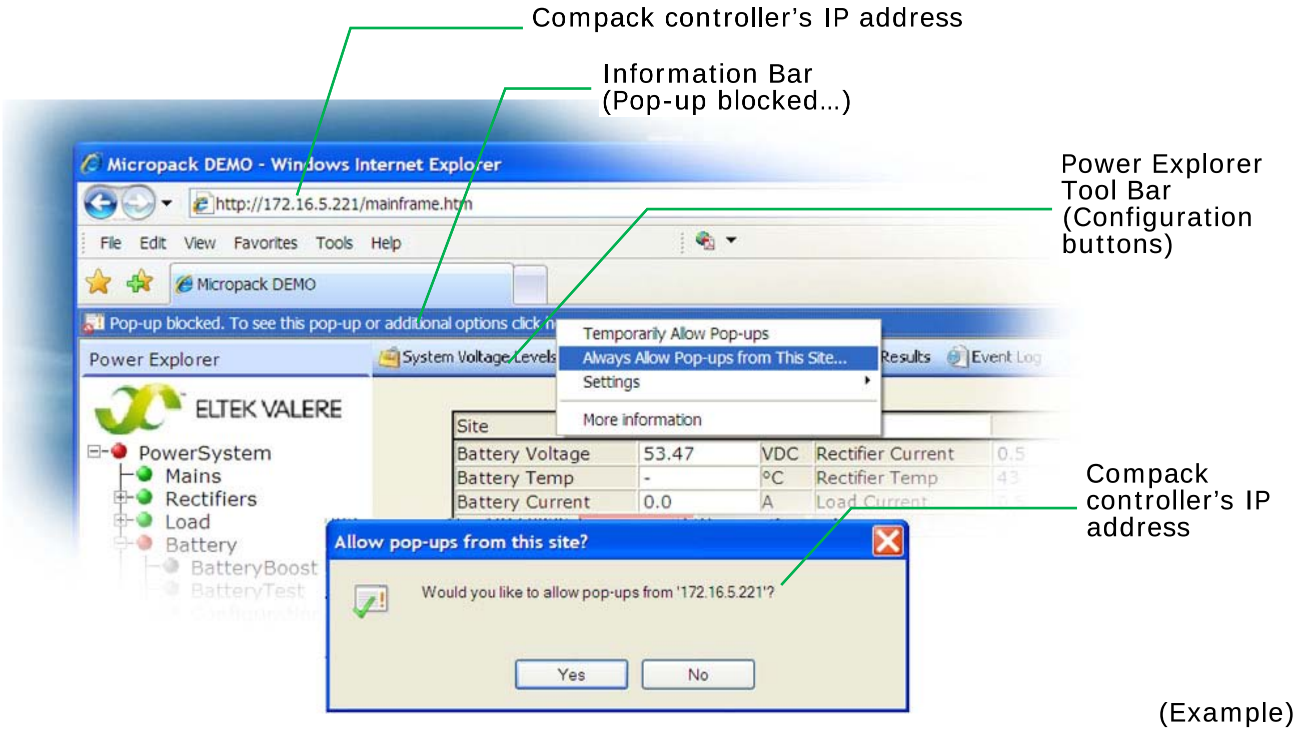
You must allow the Web browser to show pop-ups from the controller’s configuration web pages, as the pages’ navigation buttons, etc. employ Java script-based navigation.

Internet Explorer and other Web browsers usually have the Pop-Up Blocker feature enabled, thus stopping annoying pop-up ads and pop-up windows while “surfing” the Internet.

This topic explains how to configure the Pop-up Blocker to allow pop-ups from the controller’s configuration web pages (e.g. IP address <172.16.5.221>), using Internet Explorer.

Carry out the following steps, if the browser’s Information bar displays that the Pop-up Blocker has blocked the page, after clicking on one the buttons on the Power Explorer tool bar:

1. Click on the **Information bar**
2. Select command “**Always Allow Pop-ups from This Site**”, from the drop-down menu
3. Click “**Yes**”, in the “Allow pop-ups from this site?” dialog box



How to Change WebPower’s Default Log in Passwords

Question:

How do I change the default, factory set user name and password of WebPower's "admin" login account?

If you want to create new User Login Accounts, or edit other registered accounts, then read the topic "How to Create New User Login Accounts in WebPower" on page 125.

Answer:

To view the controller's configuration pages (GUI) in your Web browser and be able change the "admin" account's user name and password, you have to log in using the "admin" login account.

Following table shows the WebPower's default, factory set User Login Accounts.

Login Account	User Name	Password	Access Level	Note
1	admin	admin	Factory (or ADMIN)	Administration access rights
2	control	control	Service (or CONTROL)	Service access rights
3	status	status	User (or STATUS)	Read only access rights
4	--	--	Factory or Service or User	User defined
--	--	--	Factory or Service or User	User defined
10	--	--	Factory or Service or User	User defined

(Case sensitive passwords)

WARNING: For security reasons, it is advisable to change the default passwords with the passwords of your choice.

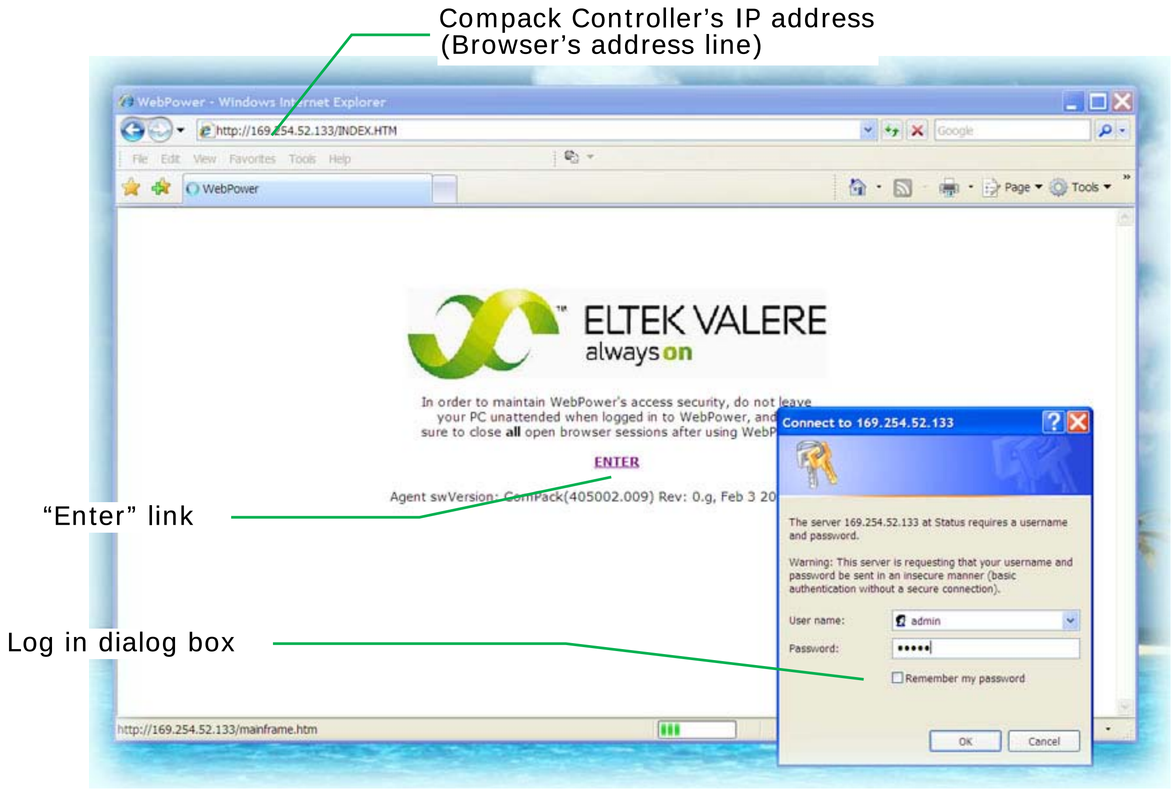
Carry out the following steps to change the "admin" account's user name and password:

1. **Access the controller's configuration pages in your Web browser**
by opening your Web browser (e.g. Internet Explorer) and entering the controller's IP address in the browser's address line.
(E.g. <172.16.5.75>; entering "http://" before the address is not necessary).
For more information, read topic Networking the Controller – Access Methods (page 7) on the Functionality Description section

2. Log in with the <admin> account,

by clicking on the “Enter” link — in the Web browser, in the middle of the page — and entering <admin> as user name and <admin> as password (case sensitive).

Or using another login account with Factory Access Level.



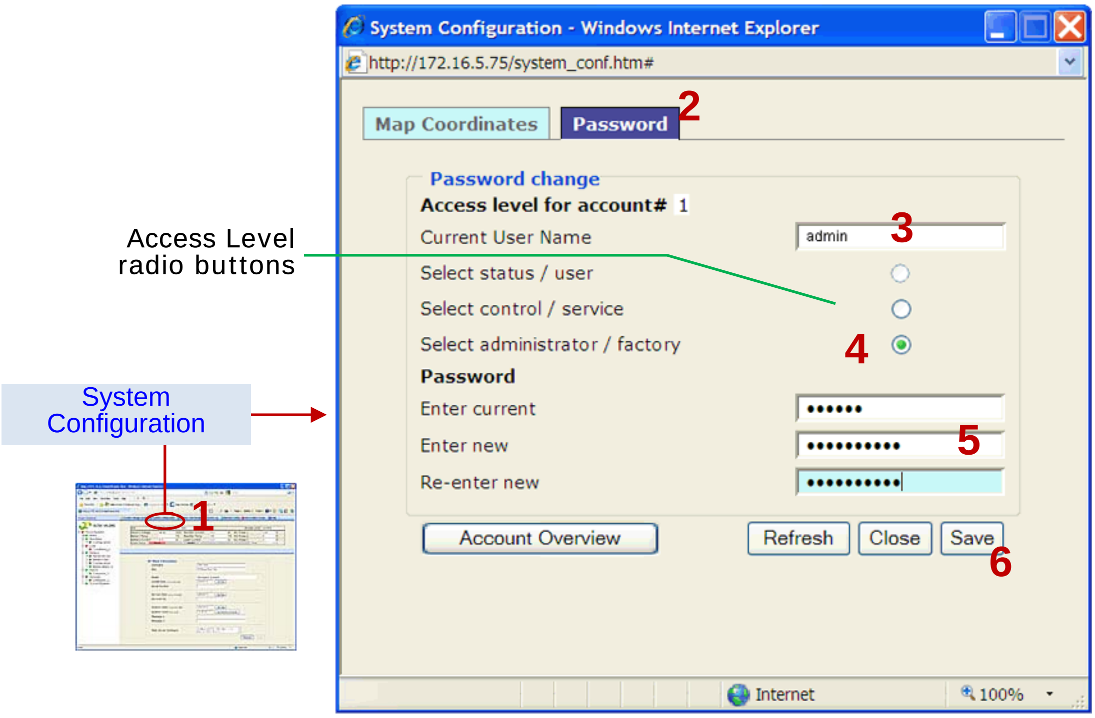
(Example of controller’s configuration pages)

Note that the Web browser must have the Pop-ups function enabled, as the configuration web pages employs Java script navigation.

Read the topic “How to Enable Pop-ups in the browser -- Internet Explorer” on page 122.

3. **Change the current user name and password by,**
— Clicking on the “System Configuration” button (1), on the Power Explorer toolbar
— Clicking on the “Password” tab (2), in the dialog box

— Clicking in the “Current User Name” field (3), and typing the login account’s new user name
— Selecting the Access Level for the login account; e.g. the “administrator/factory” (4)
— Clicking in the Password fields (5), and typing
the login account’s current password (case sensitive) and twice the password you want to change to
— Then clicking on the “Save” button (6), to activate the new password



How to Create New User Login Accounts in WebPower

Question:

How do I create new User Login Accounts in WebPower?

Also, how do I edit existing User Login Accounts in WebPower?

Answer:

To view the controller’s configuration pages (GUI) in your Web browser and be able to create new User Login Accounts or change registered user names and passwords, you have to log in using one of the login accounts with Factory (or ADMIN) Access Level, either the default “admin” account or an already created account with the Factory (or ADMIN) Access Level.

Following table shows the WebPower’s default, factory set User Login Accounts.

Login Account	User Name	Password	Access Level	Note

Login Account	User Name	Password	Access Level	Note
1	admin	admin	Factory (or ADMIN)	Administration access rights
2	control	control	Service (or CONTROL)	Service access rights
3	status	status	User (or STATUS)	Read only access rights
4	--	--	Factory or Service or User	User defined
--	--	--	Factory or Service or User	User defined
10	--	--	Factory or Service or User	User defined

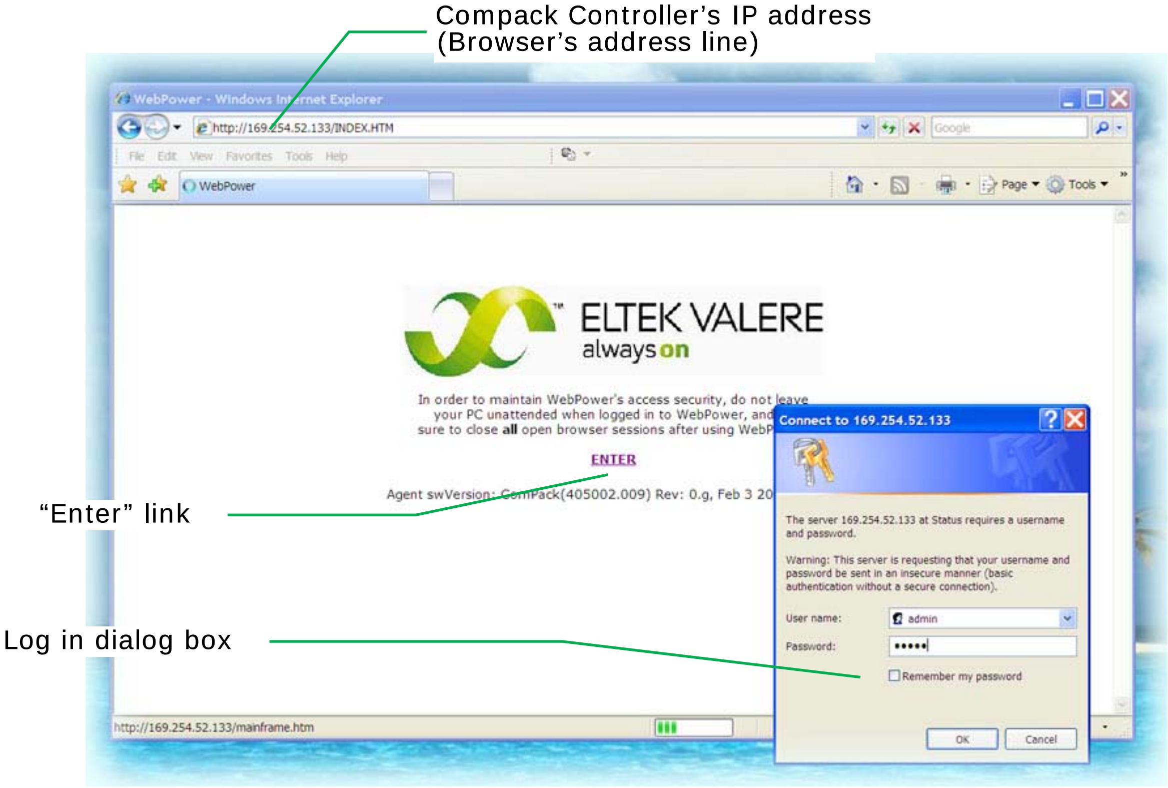
(Case sensitive passwords)

WARNING: For security reasons, it is advisable to change the default passwords with the passwords of your choice.

Carry out the following steps to create a new account, e.g. the unused login account number 4:

1. **Access the controller's configuration pages in your Web browser**
   by opening your Web browser (e.g. Internet Explorer) and entering the controller's IP address in the browser's address line.
   (E.g. <172.16.5.75>; entering "http://" before the address is not necessary).
   For more information, read topic Networking the Controller – Access Methods (page 7) on the Functionality Description section

2. **Log in with the <admin> account,**
by clicking on the “Enter” link — in the Web browser, in the middle of the page — and entering <admin> as user name and <admin> as password (case sensitive).
Or using another login account with Factory Access Level.



(Example of controller’s configuration pages)

Note that the Web browser must have the Pop-ups function enabled, as the configuration web pages employs Java script navigation.
Read the topic “How to Enable Pop-ups in the browser -- Internet Explorer” on page 122.

3. **Create the new Login Account – or edit existing account – by carrying out the following:**
— Click on the “System Configuration” button (1), on the Power Explorer toolbar

— Click on the “Password” tab (2), in the dialog box
(Notice the dialog box shows the access level (4) for the login account you have logged in (3))

— Click in the “Account Overview” button (7),
to open a new dialog box with the overview of registered accounts.
(Notice the “Account Overview” button (7) is not displayed, if you are not logged in with an account with Factory Access Level)

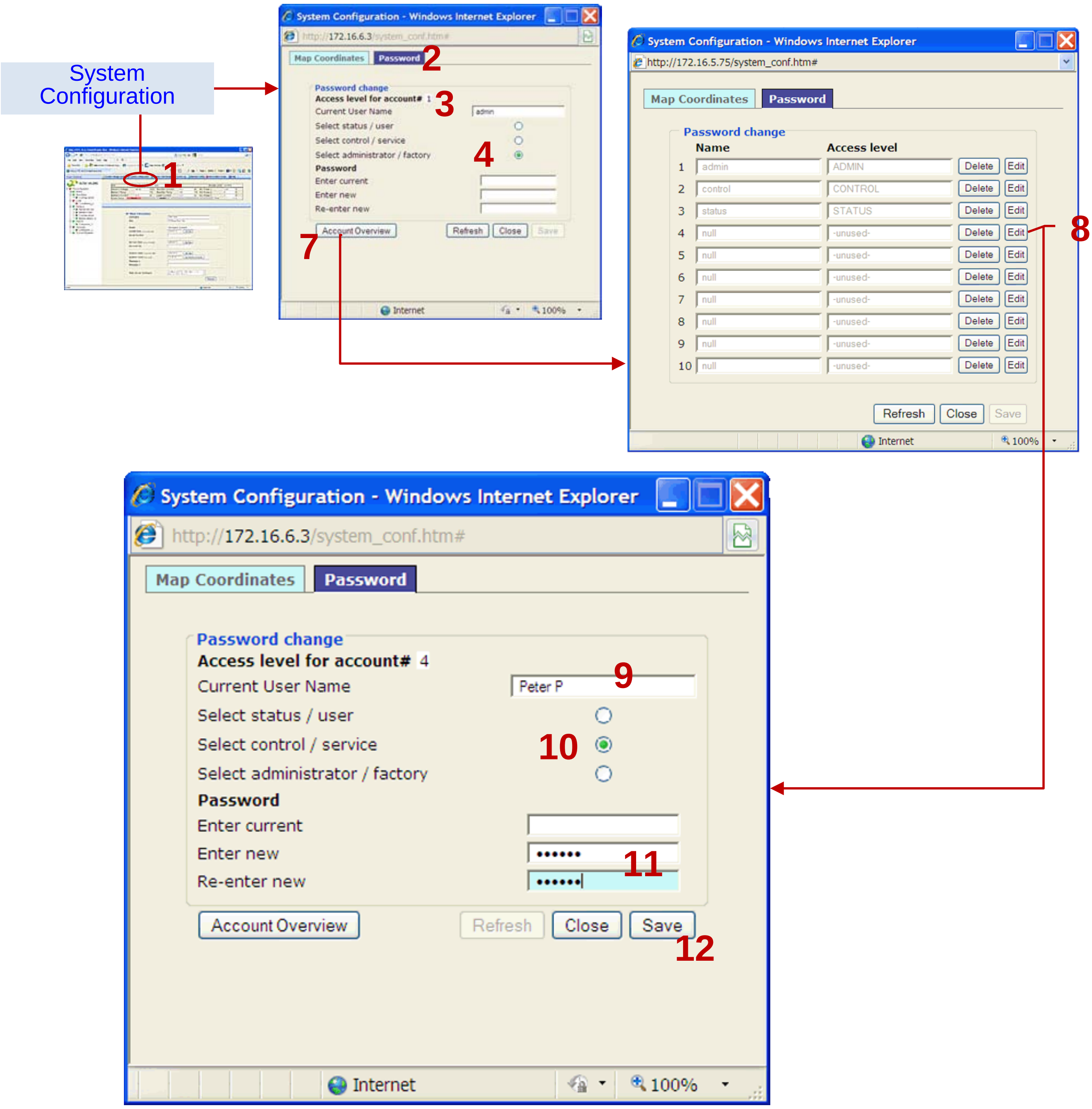
— Click in “Edit” button (8)
for the unused login account that you want to create, e.g. account 4
or for the existing login account that you want to edit.
(A new dialog box for account # 4 is displayed, so you can enter the login data)

— Click in the Current User Name field (9), and type the user name for the new account,
or edit the name of the existing account.

— Select the radio button for the Access Level for the new login account; e.g. the “control/service” (10)

— Click in the Password fields (11), and type
the account’s current password (case sensitive) (not necessary, if creating a new account)
and twice the new password you want to use for this account,

— Then click on the “Save” button (12), to activate the new login account data.



How to Change the Controller’s Device Name

Question:

How do I change the device name of the system controller?

Answer:

In order to facilitate identification of the power system when connected a LAN, it is advisable to log in with the “admin” account and give the system controller a Device name of your choice.

Carry out the following steps to give a Device name to the controller, using the controller’s configuration pages in your Web browser:

1. **Access the controller’s configuration pages in your Web browser**
   by opening your Web browser (e.g. Internet Explorer) and entering the controller’s IP address in the browser’s address line.
   (E.g. <169.254.52.133>; entering “http://” before the address is not necessary)
2. **Log in with the <admin> account,**
   by clicking on the “Enter” link — in the Web browser, in the middle of the page — and entering <admin> as user name and <admin> as password (case sensitive) (unless you have previously changed it).

   Note that the Web browser must have the Pop-ups function enabled, as the configuration web pages employs Java script navigation.
   Read the topic “How to Enable Pop-ups in the browser -- Internet Explorer” on page 122.

3. Change the controller's Device Name by,

(*In WebPower 5 GUI*)

— Clicking on "System Config" icon, in the toolbar

— Clicking on "Network Seeting" in the left command tree, under Device Settings

— Then clicking in the Device Name field and entering the Device Name that describes your power system, e.g. "Micropack System, EV Engine Room, Oslo"

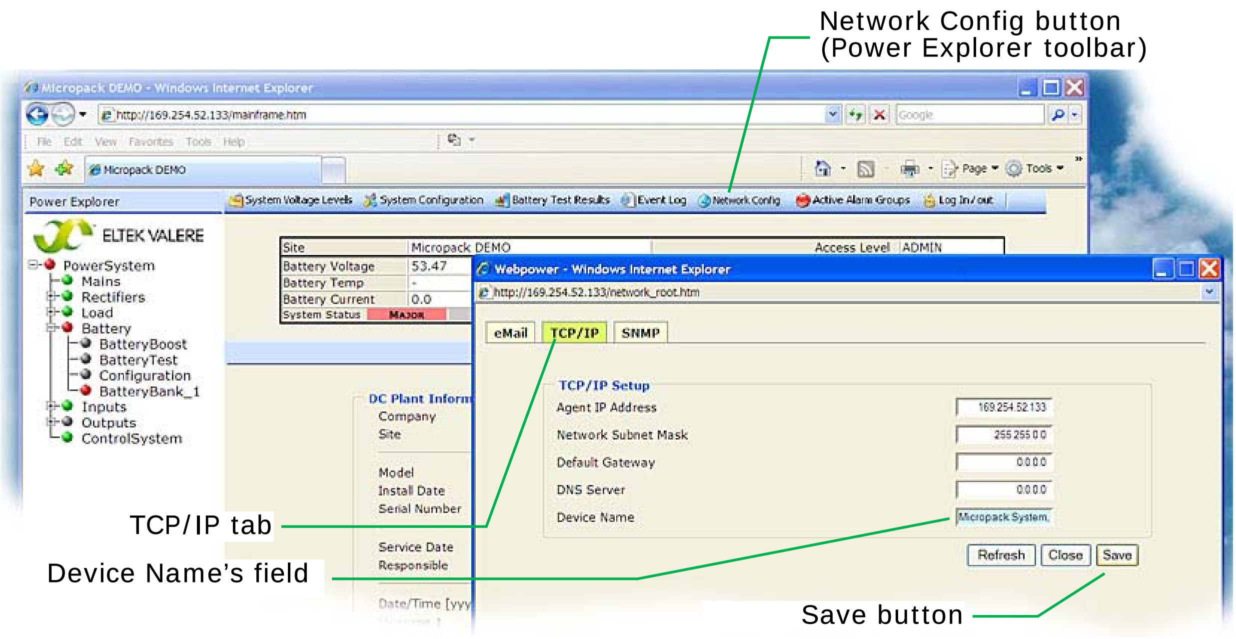
(*In WebPower 3 GUI, as shown below*)

— Clicking on "Network Config" button, in the Power Explorer's toolbar

— Clicking on the "TCP/IP" tab

— Clicking in the Device Name field and entering the Device Name that describes your power system, e.g. "Micropack System, EV Engine Room, Oslo"

— Then clicking on the "Save" button, to active the controller's new device name



(Example of controller's configuration pages)

Now the *Eltek Valere Network Utility* window will display the new device name.

How to Check or Change the Computer's IP Address

Question:

How to check or change the IP address of your LAN Network Card (NIC), when the computer is running the MS Windows operating system?

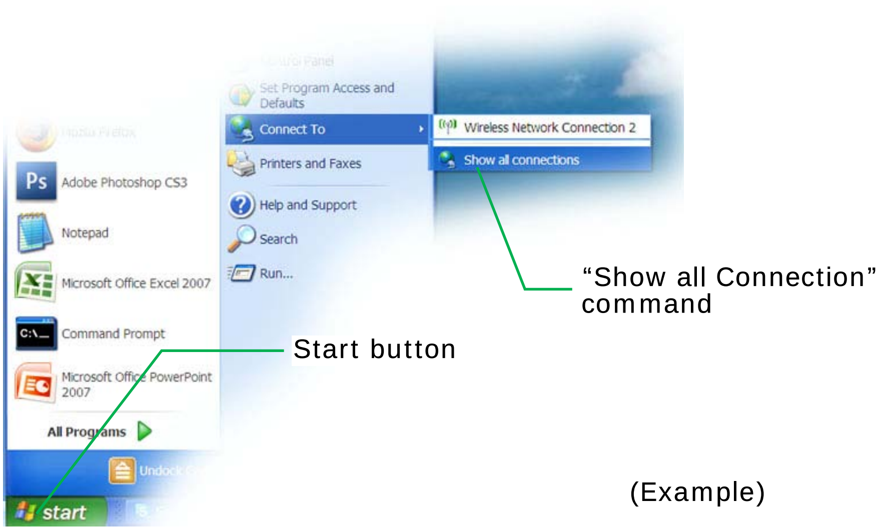
Answer:

In MS Windows, you can always check the IP address, subnet mask, status, etc. of your personal computer's network card (NIC), by opening the "Network Connections" window and looking at the Detail pane on the left side of the window.

Notice that you can also get this information by opening a DOS window and running the command “IPCONFIG”.

Carry out the following steps:

1. **Open the “Network Connections” window by,**
— Clicking on the “Start” button, and
— Selecting the options: “Connect To” and “Show all Connections”



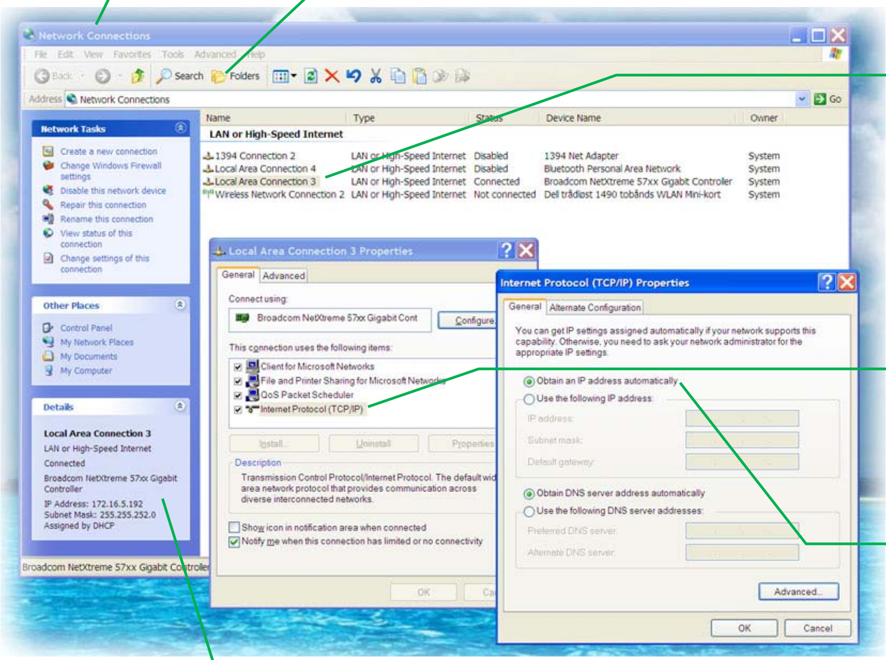
OR
If this command is not displayed in the computer’s “Start” menu,

— Clicking on the “Start” button, and
— Selecting the “Control Panel”
— Clicking on the “Network Connections” icon
that opens the computer’s Network Connections window

2. Find the NIC's IP address and subnet mask used by the computer by,—

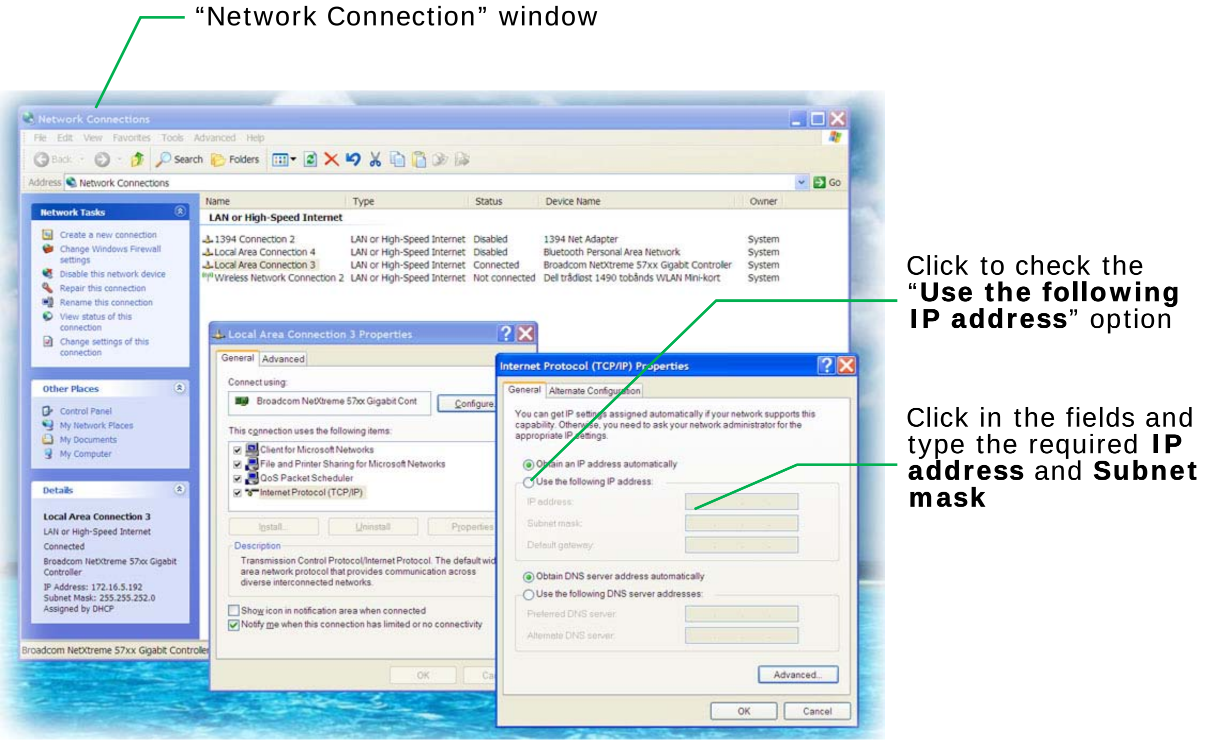
— Selecting the actual network card (NIC),
e.g. "Local Area Connection 3"

— Making a note of the IP address and Subnet mask displayed in the Details panel, on the left side of the window.
E.g. IP address: <172.16.5.192>, Subnet mask: <255.255.252.0>



(Example)

3. **If you need to change the NIC’s IP address and subnet mask used by the computer, do following:**
— Click on the “Use the following IP address” radio button to activate it
— Click in the IP address field, and enter the required IP address
e.g. <169.254.52.132>
— Click in the Subnet mask field, and enter the required subnet mask
e.g. <255.255.255.0>



(Example)

NOTICE:
You might need to change the IP address of your computer, for example if you want to connect the computer to a controller or network device with fixed IP address.

WARNING!
Never enter Network Mask (Subnet masks) <0.0.0.0> or <255.255.255.255> as they are not valid masks, and in the worst case may render the controller or LAN device inaccessible.

PowerSuite FAQs

Cannot Find the Com Port Number

Question:

Why clicking on the “Find COM Port #” button does not display the COM port number?

You find the “Find COM Port #” button on dialog box Site Manager dialog box in *PowerSuite* Online Help.

Answer:

If the COM port number is not displayed when you click on the “Find COM Port #” button, the reason could be that the *Smartpack* USB drivers were not installed in the PC during the *PowerSuite* program installation, or were installed incorrectly.

To install the *Smartpack* USB drivers correctly follow the steps in the topic 2. Switch the Smartpack ON and connect the USB cable in *PowerSuite* Online Help.

Glossary of Terms

2AC Power Shelves

2AC Power Shelves (Dual AC feed: 2 AC inputs per shelf, each feeding 2 rectifiers)

4AC Power Shelves

4AC Power Shelves (Single AC feed: 4 AC inputs per shelf, each feeding 1 rectifier)

AC

Alternating Current

Alarm Monitor

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

When an alarm monitor is enabled, it **compares the measured parameter with pre-programmed 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 (AOG).

PowerSuite uses 3 types of alarm monitors:
Analogue Alarm Monitors (usually measure voltage or other analogue input signals),
Numeric Alarm Monitors (count the number of AC phases, rectifiers or other integers) and
Logical Alarm Monitors (report the state of relay contacts, open or close, or other similar status)

Read more about Alarm Monitors (page 82) in the Functionality Description section.

Alarm Monitors

See Alarm monitor

Alarm Output Group

An Alarm Output Group (AOG) is a user defined software assignment that consists of grouping together all the outputs -- alarm relay outputs and or contactors (LVLD and LVBD); telephone numbers (*Smartnode*) -- that always are activated at the same time.

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

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

Read more about Alarm Output Groups (page 86) in the Functionality Description section.

Alarm Output Groups

See Alarm Output Group

Alarm State

The state of a voltage output or the position of alarm relay contacts when the output is NOT in normal condition (the output is activated).

Alphanumeric Field

In standard Windows interface, alphanumeric fields in dialogue boxes are areas that contain text strings or numeric values that the user may change.

Do following to edit the text strings or numeric values in alphanumeric fields:

1. **Click inside the field**, to insert the cursor in the text or value.
   Use your keyboard's arrow keys to reposition the cursor
2. Use the keyboard's **standard editing keys** (Delete, Backspace and typing keys) to edit the text or value
   Press the ESC key or click on the dialog box's Cancel button or Close ☒ button, if you want to discard the edited changes.
3. Click on the **Apply button**, in the dialogue box, to save the changes

Accepting or Rejecting Entered Data

In standard dialog boxes, clicking on the **Apply** or the **OK buttons** will activate the parameters and data you entered or selected in the box's fields.

Clicking on the **Cancel button** or the **Close button** – the cross, in the dialog box's title bar – will close the dialog box, and all parameters and data you may have selected in the box's fields will be rejected.

Allowed range of values

If you enter values outside a field's allowed range, a **red balloon with an exclamation mark** will appear by the field.

Use the mouse to **point at the exclamation mark**, and a tool tips text box will indicate the field's allowed range.

Alphanumeric Fields

See Alphanumeric field

Ampere-hours (Ah)

A measure of energy that is provided to or drawn from a battery. (A current of one ampere for one hour equals 1Ah).

Amp-Hour Battery Rating

This is the common rating of a battery. Amp-hour rating of battery capacity is calculated by multiplying the current (in amperes) by discharge time (in hours). Amp-hour battery rating is commonly used when describing sealed lead acid batteries used in Telecom and UPS systems.
For example: a battery which delivers 2 amperes for 20 hours would have a 40 amp-hour battery rating (2 * 20= 40).

Battery Block

Consist of two or more battery cells connected together.

Read more about Battery Functions (page 54) in the Functionality Description section.

Battery Boost Charging

Battery Boost Charging or Equalized Charging is a fast charge technique used to reduce recharge time for the batteries and equalize the voltage between individual cells.
The boost charging voltage should always be higher than the float voltage and lower than the OVP voltage.
If a reduction in recharge time is required, starting boost charging will increase the charge voltage and current.

Read more about Battery Functions (page 54) in the Functionality Description section.

Battery Capacity

By accepted convention worldwide, it is described in "AMPERE HOUR" at the 10-hour rate C10 when discharged at 25°C.
i.e.: a battery is 200 Ah at C10, that is the battery will deliver 20 amps current for 10 hours to a cut off voltage of for example 1.80 volts per cell.

Battery capacity is affected by the discharge rate, end-voltage, temperature and age.

Read more about Battery Functions (page 54) in the Functionality Description section.

Battery Cell

An electrochemical system that converts chemical energy into electrical energy.

Read more about Battery Functions (page 54) in the Functionality Description section.

Battery Cut-off Voltage

Battery Cut-off Voltage is the volts-per-cell to which a battery may be discharged safely to maximize battery life.

This data is specified according to the actual discharge load and run time. As a rule of thumb, high amp loads and short run times will tolerate a lower cut off voltage, whereas a low amps long run time discharge will require a higher cut off voltage.

Read more about Battery Functions (page 54) in the Functionality Description section.

Battery Cycle

A full charge followed by a full discharge (or the other way around). Cycle life is measured by the amount of times a battery may be charged and discharged. Every time a battery is charged and discharged, it uses one cycle. Cycle life is very important in battery applications such as laptop batteries and emergency light batteries. A NiCad battery has a cycle life of 500-1000 or more cycles.

Read more about Battery Functions (page 54) in the Functionality Description section.

Battery Definition Table

It is also called Discharge Table, which indicates a battery's constant current discharge performance data.

A battery model for Telecom applications can be selected by referring to a constant current discharge table for a specific period of time, to a specified end-of-discharge voltage and temperature.

Battery Discharge Characteristic

The discharge capacity of a lead acid battery varies, and is dependant on the discharge current.
A battery could use a rate at the 10 hour rate. i.e. the capacity of the battery at 10 hours discharged to an end voltage of 1.80 Vpc (volts per cell) at a temperature of 25°C.

Battery Float Voltage

A constant voltage applied to a battery to maintain the battery capacity.

Read more about Battery Functions (page 54) in the Functionality Description section.

Boost Mode

Boost Mode is one of the PowerSuite's operation modes, where the rectifiers charge the batteries much faster than while in Float Mode.

Boost Voltage

Indicates the output voltage during fast battery recharge (battery boost charging). Increased charge voltage will reduce the required recharge time.

Browser

Short for Web browser, a software application used to locate and display Web pages. The two most popular browsers are Microsoft Internet Explorer and Firefox. Both of these are graphical browsers, meaning that they can display graphics as well as text. In addition, most modern browsers can present multimedia information, including sound and video, though they require plug-ins for some formats.

CAN Bus

Controller Area Network (CAN or CAN bus) is a serial protocol utilized for communication between *Eltek Valere*'s rectifiers, controllers and other control units.

The CAN bus standard was originally designed to allow microcontrollers and devices to communicate with each other without a host computer.

The CAN specification defines the Data Link Layer, while ISO 11898 defines the Physical Layer.

The CAN bus is a 2-wire interface running over either a Shielded Twisted Pair (STP), Un-shielded Twisted Pair (UTP), or Ribbon cable. Each node uses a Male 9-pin D connector.

Capacity

The electrical energy content of a battery as expressed in ampere-hours (Ah). Capacity is the total number of ampere-hours or watt-hours that can be withdrawn from a fully charged cell or battery under specific condition of discharge.

The capacity is measured by observing the time it takes to discharge a battery at a constant current until a specified cut-off voltage is reached. This capacity in Ah indicates how good the battery condition is.

See also “Battery Capacity” on page **Error! Bookmark not defined.**

Cell mismatch

Cells within a battery pack containing different capacity and voltage levels.

Cell reversal

The stronger cells of a battery (several cells connected in series) impose a voltage of reverse polarity across a weaker cell during a deep discharge.

Charge

The process of replenishing or replacing the electrical charge in a rechargeable cell or battery.

Compack

A versatile microprocessor based controller for monitoring *Micropack* DC power supply systems. The controller is designed for DIN rail mounting.

Control Unit

See Control Units.

Control Units

The control system -- in *Eltek Valere* DC power systems – consists of control units or hardware devices connected to the system’s CAN bus.

Several types of control units may be connected, such as:

- *Smartpack2 Master* controllers
- *Smartpack2 Basic* controllers
- *Smartpack* controllers
- *Compack* controllers

- Smartnode control units
- Battery Monitor units
- Load Monitor units
- I/O Monitor units
- I/O Monitor2 units
- Mains Monitor units
- Other control units or CAN nodes

Controller

A generic expression for one of the power system's microcontrollers: *Smartpack2 Master, Smartpack2 Basic, Smartpack* or *Compack* controllers.

Controllers

See Controller

C-rate

Unit by which charge and discharge times are scaled. A battery rated at 1000mAh provides 1000mA for one hour if discharged at 1C. A discharge of 1C draws a current equal to the rated capacity. The same battery discharged at 0.5C would provide 500mA for two hours.

Critical Condition

A DC power system's state caused when one or several serious circumstances occur. Usually, the DC power supply system is in *critical condition* when the battery bank is the only supply source (negative battery current).

Using *PowerSuite*, you can configure which circumstances (monitors in alarm) the DC power system has to encounter for the system to be in *critical condition*.

Crossover Cable

An Ethernet crossover cable is a type of Ethernet cable used to connect computing devices together directly where they would normally be connected via a network switch, hub or router, such as directly connecting two personal computers via their network adapters.

The 10BASE-T and 100BASE-TX Ethernet standards use one wire pair for transmission in each direction. The Tx+ line from each device connects to the tip conductor, and the Tx- line is connected to the ring. This requires that the transmit pair of each device be connected to the receive pair of the device on the other end. When a terminal device is connected to a switch or hub, this crossover is done internally in the switch or hub. A standard straight through cable is used for this purpose where each pin of the connector on one end is connected to the corresponding pin on the other connector.

Current-limiting chargers

A charger that keeps the charge current constant during the charge process but allows the voltage to fluctuate.

Cycle life

The number of cycles a battery provides before it is no longer usable. (A battery is considered non-usable if its nominal capacity falls below 60 to 80 percent).

A battery cycle is one complete discharge and recharge cycle. It is usually considered to be discharging from 100% to 20% of full charge (**80% DOD or conversely 20% SOC**), and then back to 100%.

Battery life is directly related to how deep the battery is cycled each time. If a battery is discharged to 50% DOD every day, it will last about twice as long as if it is cycled to 80% DOD. If cycled only 10% DOD, it will last about 5 times as long as one cycled to 50%.

The **State of Health, SOH**, is a "measurement" that reflects the general condition of a battery and its ability to deliver the specified performance compared with a full charged battery. It takes into account such factors as charge acceptance, internal resistance, voltage and self-discharge.

During the lifetime of a battery, its performance or "health" tends to deteriorate gradually due to irreversible physical and chemical changes which take place with usage and with age until eventually the battery is no longer usable or dead.

The SOH is an indication of the point which has been reached in the life cycle of the battery and a measure of its condition relative to a full charged battery.

The system battery’s quality and total capacity (SOH) are measured by alarm monitors “BatteryQuality” and “BatteryTotCap”. These alarm monitors are used when battery testing against the “Current Ref 1” parameters in the battery definition tables. Alarm monitor **“BatteryUsedCap” measures the DOD**.

DC

Direct Current

DC Power Supply Systems

Eltek Valere’s modern ranges of DC power supply systems using the ***Smartpack2***, the ***Smartpack*** and or the ***Compack*** as system controllers. The ranges cover integrated, cabinetized and outdoor system solutions.

The ***Smartpack2*****-based systems’** building blocks consist of the *Smartpack2 Master* controller, the *Smartpack2 Basic* controller, the *I/O Monitor2* unit and *Flatpack2* rectifiers as their building blocks.

The ***Smartpack*****-based systems** use the *Smartpack* controller and *Minipack* rectifiers, *Flatpack2* rectifiers or *Powerpack* three-phase rectifier modules as their building blocks.

The ***Compack*****-based systems** use the *Compack* controller, *Micropack* rectifiers and Battery and Load Distribution modules as their building blocks.

In addition to these modules, the systems incorporate AC distribution for the rectifier inputs and DC distribution, batteries, LVD options, etc.

All the *Micropack* building blocks are designed for DIN rail mounting.

DC Power System

See DC Power Supply Systems

DC Power Systems

See DC Power Supply Systems

Delta Voltage

Delta voltage is an absolute calculated value that represents how well balanced the battery blocks that form a string are. PowerSuite uses this expression when calculating battery symmetry.

Delta voltage (Vdelta) is the difference between the calculated and the measured voltages, e.g. (Vbattery / 2) - Vmeasured = | Vdelta |

A Delta voltage of 0V indicates a completely balanced battery string.

DHCP

Dynamic Host Configuration Protocol (DHCP) is a network application protocol used by devices (DHCP clients) to obtain configuration information for operation in an Internet Protocol network. This protocol reduces system administration workload, allowing devices to be added to the network with little or no manual intervention.

DOD

Depth of Discharge; See Cycle life

Drop-down List

In standard Windows interface, a drop-down list in a dialogue box is a field containing a down-arrow button at the field's right side, which displays a list of text strings or numeric values that the user may select from.

When the list is up, the field displays the selected value.

Do following to select values form the drop-down list:

1. **Click on the down-arrow button**, to display the list with available values
2. If the list is longer than displayed, **click on the list's scroll bar buttons** (up or down buttons) to find the value you want to select
3. **Click on the value you want to select**.
   The drop-down list disappears and the selected value is displayed

Accepting or Rejecting Entered Data

In standard dialog boxes, clicking on the **Apply** or the **OK buttons** will activate the parameters and data you entered or selected in the box's fields.

Clicking on the **Cancel button** or the **Close button** – the cross, in the dialog box's title bar – will close the dialog box, and all parameters and data you may have selected in the box's fields will be rejected.

Drop-down Lists

See Drop-down List

Eltek Valere

Eltek Valere is a global corporation that secures worldwide communication by providing critical power solutions for telecom infrastructure. The company is the result of the acquisition of Valere Power by Eltek Energy.

Eltek Valere Network Utility

Simple Windows-based utility program (EVIPSetup.exe) that needs no software installation

It is used to display the controller's network parameters, when connected to an Ethernet LAN.

Also, it enables changing the controller's IP address, configuring the controller via a standard Web browser and upgrading the controller's firmware.

End-of-Discharge Voltage

The voltage point to which a battery can be discharged is a function of the discharge rate. The Recommended End-Voltage Point (REVP) is the voltage at which a battery should be disconnected from the load.
Discharging the battery below the REVP, or leaving the battery connected to a load in a discharged state will "over-discharge" the battery, and may impair its ability to accept charge.

Energy

Voltage multiplied by current expressed in watts.

Equalizing Charge

With time, the charge levels of individual cells of a large battery tend to become slightly unbalanced. The equalizing charge applies an elevated charge voltage for a few hours to balance the cells. Used mainly for large lead acid cells.

Ethernet

Local Area Network technology. Ethernet provides data transfer using a baseband (single-channel) communication technique. Ethernet uses carrier sense multiple access collision detection (CSMA/CD) that prevents network failures when two devices attempt to access the network at the same time. A 10/100 Ethernet port supports 10BASE-T and 100BASE-TX.

See also Ethernet, more…

Ethernet, more…

Ethernet is a large, diverse family of frame-based computer networking technologies that operates at many speeds for local area networks (LANs).

It defines a number of wiring and signaling standards for the physical layer, through means of network access at the Media Access Control (MAC)/Data Link Layer, and a common addressing format.

Ethernet has been standardized as IEEE 802.3. The combination of the twisted pair versions of Ethernet for connecting end systems to the network with the fiber optic versions for site backbones become the most widespread wired LAN technology in use from the 1990s to the present, largely replacing competing LAN standards such as coaxial cable Ethernet, token ring, FDDI, and ARCNET.

In recent years, Wi-Fi, the wireless LAN standardized by IEEE 802.11, has been used instead of Ethernet for many home and small office networks and in addition to Ethernet in larger installations.

Event

See Events

Events

In *Eltek Valere* DC power systems, events are system internal actions used by the controller's alarm monitors.

Alarm monitors measure system internal and external input signals or logical states, and compare the measured parameter with pre-programmed values or limits. The alarm monitors raise an alarm **in the event of the measured parameter reaching one of the limits**.

EVIPSetup.exe

See *Eltek Valere Network Utility* Program

Firmware

Firmware is software stored permanently on ROM or PROM chips. It can also be electrically erased and reprogrammed (flashed) when stored in EEPROM chips.

Flatpack

Eltek Valere's range of *Flatpack* rectifiers used in *Flatpack* DC power supply systems. The systems use the *MCU* controller and *Flatpack* rectifiers as their building blocks. Though the range has been installed worldwide in a variety of system solutions, and it is now replaced by the compact *Flatpack2* range.

Flatpack2

Eltek Valere's modern of *Flatpack2* rectifiers used in *Flatpack2* DC power supply systems. In addition to *Flatpack2* rectifiers, the systems use the *Smartpack2 Master* and *Smartpack2 Basic* controllers or the *Smartpack* controller as their building blocks. The range covers integrated, cabinetized and outdoor system solutions.

Float charge

Similar to trickle charge. Compensates for the self-discharge on a lead acid battery.

Float Mode

Float Mode is one of the PowerSuite's operation modes, where the rectifiers charge the batteries enough to compensate for self-discharging.

FTP Server

Trivial File Transfer Protocol Server (TFTP). A host to provide services according to TFTP; a TCP/IP standard protocol for file transfer with minimal capability and overhead depending on UDP for ts datagram delivery service.

Generator

An *engine-generator* is the combination of an *electrical generator* and an *engine* (prime mover) mounted together to form a single piece of equipment. This combination is also called an *engine-generator* set or a *gen-set*. In many contexts, the engine is taken for granted and the combined unit is simply called a generator.

Gen-Set

See generator

GUI

GUI is pronounced GOO-ee, and is an acronym for **Graphical User Interface**. Usually it is a program interface that takes advantage of the computer's graphics capabilities to make the program easier to use, such as the ***WebPower*** **browser-based** interface or the ***PowerSuite*** Windows application or the **graphical menus in the *Smartpack2 Master*** controller.

Well-designed graphical user interfaces can free the user from learning complex command languages. On the other hand, many users find that they work more effectively with a command-driven interface, especially if they already know the command language.

HTTP

Hypertext Transfer Protocol (HTTP) is a communications protocol for the transfer of information on intranets and the World Wide Web. Its original purpose was to provide a way to publish and retrieve hypertext pages over the Internet.

HUB

A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

I/O

Short for Input /Output. The term I/O is used to describe any program, operation or device that transfers data to or from a computer and to or from a peripheral device. Every transfer is an output from one device and an input into another.

InstallShield Wizard

A graphical screen interface that guides you through the steps required to install a Windows based software application, such as PowerSuite.

InstallShield for Windows Installer by InstallShield Software Corporation.

The InstallShield Software Corporation creates products that distribute and manage digital content by using packaged applications.

IP Address

The Internet Protocol Address

IP version 4 addresses (IPv4) uses 32-bit (4-byte) addresses, which limits the address space to 4,294,967,296 possible unique addresses. However, IPv4 reserves some addresses for special purposes such as private networks (~18 million addresses) or multicast addresses (~270 million addresses).

IPv4 addresses are usually represented in dot-decimal notation (four numbers, each ranging from 0 to 255, separated by dots, e.g. 208.77.188.166). Each part represents 8 bits of the address, and is therefore called an octet.

LAN

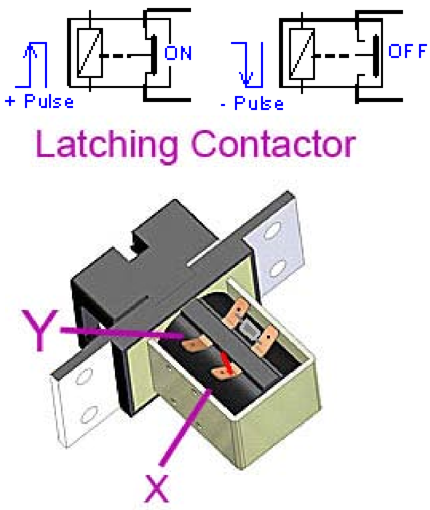
Local Area Network

A local area network is a computer network covering a small physical area, like a home, office, or small group of buildings, such as a school, or an airport. Current LANs are most likely to be based on Ethernet technology.

Latching Contactor

Magnetically latching contactor

The coil of latching contactors is not energized in any state. They change state from open to close, or vice versa, when a reversed pulse voltage is applied to its coil.



Latching Contactors

See Latching Contactor

Local Area Network

A local area network is a computer network covering a small geographic area, like a home, office, or group of buildings.

Current LANs are most likely to be based on switched IEEE 802.3 Ethernet technology, running at 10, 100 or 1,000 Mbit/s, or on IEEE 802.11 Wi-Fi technology.

Each node or computer in the LAN has its own computing power but it can also access other devices on the LAN subject to the permissions it has been allowed. These could include data, processing power, and the ability to communicate or chat with other users in the network.

LVBD

Low Voltage Battery Disconnect contactor

System internal latching contactor that disconnects the battery bank from the load, when a certain voltage limit is reached or other battery critical events occur.

LVD

Low Voltage Disconnect contactor

System internal latching contactor that disconnects the batteries from the load or the output power from non-priority load, when a certain voltage limit is reached or a certain event occurs.

LVLD

Low Voltage Load Disconnect contactor

System internal latching contactor that disconnects the output power from non-priority load, when a certain voltage limit is reached or the mains input fails or other events occur.

MAC Address

Media Access Control Address

Every Ethernet network card has a unique 48-bit serial number called a MAC address, which is stored in ROM carried on the card. Every computer on an Ethernet network must have a card with a unique MAC address. Normally it is safe to assume that no two network cards will share the same address, because card vendors purchase blocks of addresses from the Institute of Electrical and Electronics Engineers (IEEE) and assign a unique address to each card at the time of manufacture.

MCB

Miniature Circuit Breaker

MIB

Management Information Base, a database of objects that can be monitored by a network management system. SNMP uses standardized MIB formats that allows any SNMP tools to monitor any device defined by a MIB

Micropack

Eltek Valere's modern range *Micropack* rectifiers used in *Micropack* DC power supply systems. The systems use the *Compack* controller, *Micropack* rectifiers, Battery Distribution Base and Load Distribution Bases as their building blocks. All units are designed for DIN rail mounting.

The range covers low power solutions in telecom and industrial applications.

Mini Hub

A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets

Minipack

Eltek Valere's range of *Minipack* rectifiers used in *Minipack* DC power supply systems. The systems use either the *Smartpack* or the *Compack* controllers and *Minipack* rectifiers as their building blocks.

Minipack systems implement a unique system design with extractable system shelf for easy access and fast installation. Complete 1U high systems offer up to 1.6kW DC output power, while 2U high systems deliver up to 4.8kW.

Modem

A modem (from **mo**dulate and **dem**odulate) is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information.

NC-C-NO

Acronym for Normally Closed, Common and Normally Open. The expression refers to the position of 3 relay contacts, when the relay coil is de-energized. When the relay coil is energized, the NC-C contacts open, and the C-NO contacts close.

Negative DC Distribution

It is usually implemented in 48V and 60V DC power supply systems, which have the **DC distribution on the negative output** (-48VDC or -60VDC), and the positive on a Common Positive DC Output Rail (0V).

NIC

Network Interface Controller.

A network card, network adapter, network interface controller, network interface card, or LAN adapter is a computer hardware component designed to allow computers to communicate over a computer network. It is both an OSI layer 1 (physical layer) and layer 2 (data link layer) device, as it provides physical access to a networking medium and provides a low-level addressing system through the use of MAC addresses. It allows users to connect to each other either by using cables or wirelessly.

NMS

Network Management Station -An SNMP Manager application which interfaces with the SNMP Agent and provides communication capabilities through standard SNMP messaging commands (SET, GET). The NMS also serves to collect SNMP TRAP events.

A Network Management System (NMS) is a combination of hardware and software used to monitor and administer a network.

NO-C-NC

Acronym for Normally Open, Common and Normally Closed. The expression refers to the position of 3 relay contacts, when the relay coil is de-energized.

When the relay coil is energized, the NO-C contacts close, and the C-NC contacts open.

Nominal voltage

The cell voltage that is accepted as an industrial standard.

Non-Priority Load

Telecom equipment or similar supplied from the DC power system’s load output circuits. The equipment’s continuous operation is NOT essential, and has low backup priority during Mains outages.

Generally, the DC power system temporally stops supplying this equipment during a system critical condition, or when the equipment’s backup leasing time has expired.

Normal Condition

A DC power system’s state when no serious circumstances occur. Usually, the DC power supply system is in *normal condition* when no critical condition occurs.

Normal State

The state of a voltage output or the position of alarm relay contacts when the output is in normal condition (not activated).

Overcharge

Charging a battery after it reaches full charge. On overcharge, the battery can no longer absorb charge and the battery heats up.

OVP

Over Voltage Protection

OVS

Over Voltage Shutdown

When the output voltage of a malfunctioning rectifier reaches a certain limit, the system automatically shuts down to prevent damages.

pComm

RS232 serial protocol used by *Eltek Valere*’s controllers for communication with computers, modems, WebPower adapters and other equipment.

Pop-up

A window that suddenly appears (pops up) when you select an option with a mouse or press a special function key. Usually, the pop-up window contains a menu of commands and stays on the screen only until you select one of the commands. It then disappears. A special kind of pop-up window is a pull-down menu, which appears just below the item you selected, as if you had pulled it down.

Positive DC Distribution

It is usually implemented in 24V DC power supply systems, which have the **DC distribution on the positive output** (24VDC), and the negative on a Common Negative DC Output Rail (0V).

Powerpack

Eltek Valere's modern range of *Powerpack* three-phase rectifiers used in *Powerpack* DC power supply systems. The systems use the *Smartpack* controller and large *Powerpack* three-phase rectifier modules as their building blocks.

PowerSuite

Advanced PC application used to configure and operate *Micropack*, *Minipack*, *Flatpack2* and *Powerpack* DC power supply systems. The program is to be run on computers using the MS Windows operating systems.

Priority Load

Very important telecom equipment or similar supplied from the DC power system's load output circuits. The equipment's continuous operation is essential and has high backup priority during Mains outages.

PSS

Power Supply System

REVP

Recommended End-Voltage Point. Read also "End-of-Discharge Voltage" on page **Error! Bookmark not defined.**

RJ-45

Short for Registered Jack-45, an eight-wire connector used commonly to connect computers onto local area networks (LAN), especially Ethernets. RJ-45 connectors look similar to the ubiquitous RJ-11 connectors used for connecting telephone equipment, but they are somewhat wider.

RS232

Serial communication bus or communication port

RS485

Serial communication bus or communication port

Shunt

A current shunt is usually a resistor of accurately-known very small resistance that allows the measurement of current values too large to be directly measured by a particular ammeter.

The current shunt is placed in series with the load, so that nearly all of the current to be measured will flow through it. The voltage drop across the shunt is proportional to the current flowing through it, and since its resistance is known, a millivolt meter connected across the shunt can be scaled to directly read the current value.

Shunts are rated by maximum current and voltage drop at that current, for example, a 500A/75mV shunt would have a resistance of 0.15 milliohms, a maximum allowable current of 500 amps and at that current the voltage drop would be 75 millivolts.

By convention, most shunts are designed to drop 75mV when operating at their full rated current and most "ammeters" are actually designed as voltmeters that reach full-scale deflection at 75mV.

Smartpack

A versatile microprocessor-based controller used for monitoring *Minipack*, *Flatpack2* and *Powerpack* DC power supply systems in a network.

Smartpack2

A modular, microprocessor-based control system used in modern *Flatpack2* DC power supply systems in a network.

The control system is distributed between the *Smartpack2 Master* controller, the *Smartpack2 Basic* controller and the *I/O Monitor2* control unit.

SNMP

Simple Network Management Protocol, a set of protocols for managing complex networks. The first versions of SNMP were developed in the early 80s. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.

SNMP Agent

An SNMP-compliant device that stores data about itself in Management Information Bases (MIBs) and return this data to the SNMP requesters.

SOC

State of Charge; See Cycle life

Software

Software are programs for directing the operation of computers, microprocessors, controllers, etc. or for processing electronic data.

SOH

State of Health; See Cycle life

TCP/IP

Transmission Control Protocol/Internet Protocol

A protocol suite used by more than 15 million users with a UNIX association and widely used to link computers of different kinds.

The Internet Protocol Suite (commonly known as TCP/IP) is the set of communications protocols used for the Internet and other similar networks. It is named from two of the most important protocols in it: the Transmission Control Protocol (TCP) and the Internet Protocol (IP), which were the first two networking protocols defined in this standard.

Test Mode

Test Mode is one of the PowerSuite's operation modes, where the system controller is performing a specific preprogrammed test of the battery bank.

The Cycle

A process consisting of a single charge and discharge of a rechargeable battery.

Trickle charge

Maintenance charge to compensate for the battery's self-discharge.

Tunnelling Protocol

The term tunnelling protocol is used to describe when one network protocol called the payload protocol is encapsulated within a different delivery protocol.

UDP

The User Datagram Protocol (UDP) is one of the core members of the Internet Protocol Suite, the set of network protocols used for the Internet. With UDP, computer applications can send messages, sometimes known as datagrams, to other hosts on an Internet Protocol (IP) network without requiring prior communications to set up special transmission channels or data paths. UDP is sometimes called the Universal Datagram Protocol.

URL

URL is an abbreviation of Uniform Resource Locator, the global address of documents and other resources on the World Wide Web.

The first part of the address is called a protocol identifier (ftp, http, etc.) and it indicates what protocol to use. The second part is called a resource name and it specifies the IP address or the domain name where the resource is located. The protocol identifier and the resource name are separated by a colon and two forward slashes. For example: ftp://sw.eltekenergy.com/powersuite.exe and http://www.eltekvalere.com/index.html

USB

Universal Serial Bus is a serial bus standard to interface devices to a host computer. USB was designed to allow many peripherals to be connected using a single standardized interface socket and to improve plug and play capabilities by allowing hot swapping, that is, by allowing devices to be connected and disconnected without rebooting the computer or turning off the device. Other convenient features include providing power to low-consumption devices without the need for an external power supply and allowing many devices to be used without requiring manufacturer specific, individual device drivers to be installed.

VPN

A virtual private network (VPN) is a computer network in which some of the links between nodes are carried by open connections or virtual circuits in some larger network (e.g., the Internet) as opposed to running across a single private network. The link-layer protocols of the virtual network are said to be tunnelled through the larger network. One common application is secure communications through the public Internet, but a VPN need not have explicit security features, such as authentication or content encryption. VPNs, for example, can be used to separate the traffic of different user communities over an underlying network with strong security features.

WAN

Wide Area Network is a computer network that covers a broad area (i.e., any network whose communications links cross metropolitan, regional, or national boundaries [1]). Less formally, a WAN is a network that uses routers and public communications links [1]. Contrast with personal area networks (PANs), local area networks (LANs), campus area networks (CANs), or metropolitan area networks (MANs) are usually limited to a room, building, campus or specific metropolitan area (e.g., a city) respectively. The largest and most well-known example of a WAN is the Internet.

WebPower

A common name for the firmware installed in *Eltek Valere*'s controllers – *Smartpack2 Master*, *Compack* and *Smartpack*, web option – and in the external *WebPower* adapter module. The firmware provides a communication protocol translator, a physical layer conversion and Web server software.

WebPower translates the controller's internal protocol into the HTTP protocol over TCP/IP, used to communicate in an Ethernet network, LAN, WAN, VPN or even across the Internet.

The *WebPower* firmware provides a platform-independent graphical user interface (GUI), employed to configure and operate *Micropack*, *Minipack*, *Flatpack2* and *Powerpack* DC power supply systems using a standard Web browser.

In addition, *WebPower* provides an SNMP Agent, allowing *Eltek Valere* DC power systems to be interoperable with SNMP enterprise management solutions, which are commonly in use within the Telecommunications industry.

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ELTEK VALERE
always on

www.eltekvalere.com

Headquarters:
Eltek Valere
Gråterudv. 8, Pb 2340 Strømsø, 3003 Drammen, Norway
Phone: +47 32 20 32 00 Fax: +47 32 20 32 10