OPUS
Power System

User Manual

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1. IMPORTANT NOTICE ABOUT FIRMWARE UPDATE

When updating firmware of the VIDI+ Advanced Controller, it is highly recommended to perform a reboot of the system controller module before doing the actual update. This minimizes risks of the update running into problems.

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2. CONVENTIONS USED IN THIS DOCUMENT

Acronyms and Terms Used in this Document

Acronyms	Term
ABC	Automatic boost charge
BM	Battery Monitor (module)
CSV	Comma separated values
DB	Database
DHCP	Dynamic host configuration protocol
DNS	Domain name server
EBPU	Efore bypass unit
EFD	Earth fault detection
EIM	Efore inverter module
FQDN	Fully qualified domain name
HTML	Hypertext markup language
HTTP	Hypertext transfer protocol
BM	Battery Monitor (module)
CSV	Comma separated values
DB	Database
DHCP	Dynamic host configuration protocol
DNS	Domain name server
EBPU	Efore bypass unit
EFD	Earth fault detection
EIM	Efore inverter module
FQDN	Fully qualified domain name
HTML	Hypertext markup language
HTTP	Hypertext transfer protocol
HTTPS	Hypertext transfer protocol secure
LVD	Low voltage disconnect (feature or module)
MBC	Manual boost charge
MBT	Manual battery test
MIB	Management information base
NBT	Natural battery test
NTP	Network time protocol
PBC	Periodic boost charge
PBT	Periodic battery test

PCL	Programmable control logic
PLD	Partial load disconnect
RBC	Remote boost charge
RBT	Remote battery test
SAM	Serial adapter module
SMTP	Simple mail transfer protocol
SNMP	Simple network management protocol

Symbols Used in this Document

Symbol	Explanation
	Refers to clarification or particularly important additional information, for which reason the information is emphasized.
	Refers to a single action to be performed by the user (in contrast to a step list with several steps to be performed in a certain order).
	Indicates that property damage may result if the proper precautions are not taken. In order to prevent accidents, always treat the warnings presented in this document seriously.
	Indicates notes containing useful information or tip
	Indicates that personal injury may result if the proper precautions are not taken. In order to prevent accidents, always treat the warnings presented in this document seriously.

Change History of this document DOC078611

Rev.	Changes	Date & Author
A.00	1st version.	05.09.2019 VHa
A.01	Manual updated to be compatible with latest controller and rectifier Firmware revisions.	15.04.2020 TRä
A.02	Made corrections and additions to Modbus and SNMP definitions.	27.10.2020

User Manual and Firmware Revision Compatibility

Module Name	Abbreviation	FW Revision
Advanced Controller	AB	3.8
Standard Controller	SB	2.4
Rectifier	MRC	1.35
Display Unit	UIF	1.4
Battery Monitor Module	BM	1.2
Low Voltage Disconnection Module	LVD	1.2
Serial Adapter Module	SAM	1.1
Rectifier	MHE	1.07

This User Manual applies generally to all earlier firmware revisions of the OPUS system but new OPUS system features are according the stated module firmware revision.

3. INTRODUCTION

An OPUS power system has five main parts:

1. System modules
2. Rectifiers
3. Distribution
4. Batteries
5. Inverters and bypass switches

This document is the User Manual for the whole OPUS system, but the main emphasis is on the system controller functionality. Electromechanical installation and maintenance tasks are covered in the Installation and Start-up Manual for the system.

3.1. System Modules

The following two modules are installed in all standard OPUS systems:

- VIDI+ system controller module
- UIF (user interface) module

The VIDI+ system controller is a supervisor of an OPUS power system. The task of the system controller is to control and monitor system modules and functions. The VIDI+ controller consist of two separate boards, the standard controller and the advanced controller. In addition to the controller module can be included an IO board which contains an input for Earth Fault Detection, eight more alarm/temperature inputs and alarm relays. The VIDI+ controller provides a comprehensive but still easy-to-use local user interface, which can be accessed via the UIF module. In addition to the functionality of the local UIF a remote Web or terminal user interface via Ethernet or serial port connection provides more information from the system and enables among others:

- Event log and enhanced alarm log
- Battery test logs and graphical presentation of battery tests
- System power, battery temperature and battery discharge logs
- Log data exporting
- More configuration options
- SNMP and SMTP alarm notification
- Device naming

In addition to the VIDI+ and UIF modules, the following system modules are available:

- DFM (Distribution Fuse) module for monitoring load fuses
- LVD (Low Voltage Disconnect) module for additional LVD control, current measurement and alarm/temperature inputs
- BM (Battery Monitor) module for battery block voltage measurements, current measurement and alarm/temperature inputs
- SAM (Serial Adapter) module for different serial interfaces

3.2. Controller Modules and Busses

As the system controller module is the brains of the power system, all the system modules (UIF, rectifiers, etc.) are connected to it. The OPUS power system uses a digital control bus called PowerCAN to provide communication between the system modules. PowerCAN is based on industry-standard CAN bus technology, but the communication protocol is proprietary to Efore.

A VIDI+ controller has two separate CAN busses:

ExtBus Extension module bus. All extension modules, such as LVD, BM and SAM modules are connected to this bus. The UIF module is also connected to this bus, although it has a dedicated connector on the system controller module.

RectBus1 Rectifier bus 1. All PowerCAN-compatible rectifier modules, such as MRC or MHE rectifiers, are connected to this bus.

In addition to the CAN busses, the controller module has many connections for internal and external signals such as voltage and current measurement, LVD control, alarm and temperature inputs, and alarm outputs.

The UIF module provides a local user interface and it features a graphical LCD display and input controls.

The PowerCAN busses must be terminated at both ends with 120 ohm resistors. This can be accomplished with small RJ-45 terminator plugs which are shipped with the system. In a normal system configuration, the plugs are only installed on only one end of the bus. The ExtBus bus is terminated internally at the UIF module, and the RectBus1 is terminated internally at the VIDI+ system control module.

If only one end of a PowerCAN bus is terminated, the bus works when the cable is short enough and there are not many devices on the bus. However, to ensure proper functionality in all circumstances, it is recommended to make sure the bus is always terminated at both ends.

A SAM module enables the OPUS system connection to an external serial interface bus or a module using a serial interface bus connection to the VIDI+ controller. EIM inverter and EBPU bypass modules used in the OPUS system are controlled to the VIDI+ controller via a SAM module.

3.3. Voltage Versions

There are OPUS power systems available for all common DC voltages used in industrial and telecommunication applications: 24 V, 48 V, 60 V, 110 V, 125 V and 220 V. The different voltage versions usually require different rectifiers, electro mechanics, and batteries. However, the same VIDI+ system controller modules can be used for all voltage versions. The voltage version and all of the related voltage parameters are defined by the VIDI+ parameter system.

3.4. Rectifiers

The VIDI+ controller is designed to work with different rectifier modules. However, this manual assumes that MRC or MHE rectifiers are being used.

Normally, the rectifiers are controlled and monitored by the VIDI+ controller. The controller controls output voltage and power levels of the rectifiers on the basis of battery charge modes, temperatures and various control algorithms. Problems in rectifiers will be indicated as alarms on the user interfaces.

The rectifiers can also work independently from the system controller. If a rectifier cannot communicate with the system controller, the rectifier restores the default voltage. An exception to this is when the default voltage is higher than previous voltage set by the system controller, in which case the default voltage is not restored.

The default voltage depends on the voltage version of the rectifier. The default voltage and the Rectifier Voltage Group parameter of MRC/MHE rectifiers are presented in the following table:

Voltage Version	Default voltage	Rectifier Voltage Group Parameter
24 V	27.24V	2
48 V	54.48 V	4
60 V	68.1 V	5
110 V	122.58 V	9
125 V	136.8 V	10
220 V	245.3 V	18

Load sharing functionality of the rectifiers does not require the presence of the system controller. All rectifiers sharing the same load must be interconnected with a CAN bus, and at least one end of the CAN bus must be terminated.

3.5. Inverter and Bypass Modules

EIM inverter and EBPU bypass modules are controlled and monitored by the VIDI+ controller via the SAM module. By the controller are set the operation parameters to the modules. The controller shows measurements from the modules and activates alarms concerning the modules if the alarms are enabled and alarm conditions are filled up.

The EIM inverter and EBPU bypass modules can also work independently from the system controller. If the modules cannot communicate with the VIDI+ controller, the modules continue working according the set parameters but measurement and alarm information is no longer updated. If the VIDI+ controller is however functional, The Communication Error alarm from the modules is activated.

3.6. Batteries

The OPUS power system is designed to be used with lead-acid, nickel-cadmium and nickel-metal hydride batteries. Any battery type that behaves similarly to these can be used, provided that the cell voltage parameters are set up properly.

The following battery-related terms are used in this document and the VIDI+ controller in general:

Cell The smallest natural battery element. The nominal voltage of a single cell is usually about two volts for the common battery types.

Block A number (one or more) of battery cells connected in series, forming a physical block that can be replaced as a single entity. Usually a battery block consists of one, three, or six battery cells. For example, the standard lead-acid battery block used in cars contains six battery cells and has a nominal voltage of 12 volts.

String A number (one or more) of battery blocks connected in series. The nominal voltage of a battery string equals the voltage version of the system. For example, a 48 V system usually contains one or more strings each having four 12 V blocks.

Bank A number (one or more) of battery strings connected in parallel.

As the batteries are often the most expensive component of a power system, the VIDI+ controller has many features for protecting batteries, extending their life, and monitoring their condition:

- Low voltage disconnect protects the battery from deep discharge
- Periodic boost charge extends battery life by equalising the cell voltages
- Temperature compensation extends battery life by reducing charge voltage in high temperatures
- Battery tests can be used to monitor battery condition
- Various alarms can be used to inform the operator about bad operation conditions

In a rectifier power system, batteries are charged by rectifier (AC-to-DC converter) modules. When there is no AC (mains power) available, the batteries supply all the current required by the load, until the mains return or the batteries are exhausted.

3.6.1. Battery Configuration

In the OPUS system is three parameters that affects to the system voltage version. These are system Voltage Version, Cells per Block and Nominal Cell Voltage. Usually the nominal cell voltage of a battery is 2 V. Set the other two parameters according an installed battery. The Cells per Block parameter means a number of cells in one battery block. The default value to this parameter in the VIDI+ controller is six, which is commonly used battery type (6*2 V = 12 V). The system Voltage Version parameter describes how many block is connected in series in a battery string. Below are instructions how to set the parameters.

If you use the Web or Terminal interface, you must log in as an admin user to be able to change parameters. More information of different user levels on the remote interface can be found from Section 6.8 (User Levels). If the local user interface is used and the password for the local user interface is nonzero, the password will be asked before any parameter can be changed.

1. Check that the Expert Mode parameter is enabled from System Parameters. This enables that all parameters are shown on the display and they can be changed.
2. Check that a battery fuse (fuses) is switched off.
3. Set a corresponding value for the battery in the Cells per Block parameter of the System Parameters.
4. Next the controller shows related parameters to this parameter change and new values of the related parameters. These values can be changed manually but it is easier to accept these values and continue changes as below guided.
5. Next change the parameter Voltage Version on the System Parameters to a right value.
6. Next the controller shows related parameters to this parameter change and new values of the related parameters. In this phase change the Rectifier Voltage Version parameter to the right value and accept others as they are. The Rectifier Voltage Version parameter for MRC/MHE rectifiers is: 2 for 24V, 4 for 48V, 5 for 60V, 9 for 110V, 10 for 125V and 18 for 220V.
7. If you did not change the rectifier voltage version parameter in the previous step but accepted all parameters, you can change it now from the System Parameters.
8. Check battery cell voltage values from the Parameters • Battery Parameters. If the values are not according to the battery, change them.
9. After these actions test the system output voltage levels in different charge modes: the float charge (FC), the boost charge (BC), the temperature compensation (TC), the battery test (BT).
10. If the system is at the time in FC mode, check that the system output voltage is correct.
11. If a temperature sensor is connected to the system and it is configured as a battery temperature sensor, enable the TC mode from the Parameters • Charge Parameters • Temperature Compensation. Check that the system output voltage level correspond the charge mode and the temperature level. Disable the TC mode.
12. Select Start Manual Boost Charging from the Actions menu. Check that the system output voltage level is correct. Stop the MBC.
13. Select from the Actions menu Start Manual Battery Test. The system output voltage is for a moment on the rectifier’s lowest output voltage level but then the battery test is terminated and the system returns to the previous charge mode.

14. Switch on the battery fuse (fuses).
15. If the battery is empty it should be in the Charge State.

3.7. Modbus/TCP

Modbus/TCP implementation of the Efore Opus system supports two simultaneous client-server connections at a time. Server side will end connection, if there is over 1 minute interval between messages. It is recommended for client side to send messages to server at least once in 30 seconds.

Server of the Opus system will wait for Modbus requests on Modbus default TCP port 502

Following modbus functions can be used:

- read multiple registers (fc 3)
- read/write registers (fc 23)

3.7.1. Memory Areas

'Holding registers' area is used to provide information about the system. Each memory address holds 16 bits of data and the data can be only read. Writing to 'holding registers' area is discarded. Because these are holding registers, address range is 4:0001 – 4:0039. Unused areas between the used data areas can be read. They are set to '0'.

Other memory areas are not used and will return illegal data address if they are tried to read/write.

The first memory address contains data version counter. It is a counter that is incremented every time data is updated. Data is updated before replying to Modbus/TCP read requests. Therefore two consecutive reads returns different data version counter value (if the first memory address is read). Counter runs from 0 to 65535 and is then restarted from 0. Data version counter is linked to a connection. If there are two simultaneous connections to a server each will have their own independent counter that starts from 0.

Memory Address	Data Field
1	Data version counter
2	Operating mode
3	Battery test state
4	Boost charge state
- - -	
10	System Voltage (0,1 V)
11	Load current (0,1 A)
12	Battery current (0,1 A)
13	Total rectifier current (0,1 A)
14	Total inverter current (0,1 A)
15	Maximum battery temperature (0,1 C)
16	Maximum system temperature (0,1 C)
17	Midpoint Voltage (0,1 V) (since AB 4.0)

Memory Address	Data Field
18	Rectifier phase 1 AC Input Voltage (0,1 V) (since AB 3.9)
19	Rectifier phase 2 AC Input Voltage (0,1 V) (since AB 3.9)
20	Rectifier phase 3 AC Input Voltage (0,1 V) (since AB 3.9)
- - -	
30	System voltage alarms
31	System fault alarms
32	Miscellaneous system alarms
33	Rectifier alarms
34	Inverter system alarms
35	Other modules alarms
36	Battery alarms
37	Low voltage disconnection alarms
38	External alarms

3.7.2. Operation modes

Operation mode field describes current mode of the system in a following way. If the corresponding bit is high, the state is active. Temperature compensation can be active simultaneously with the boost charge.

Memory Address	Bit	Data
2	0	Float charge active
	1	Battery test active
	2	Boost charge active
	3	Temperature compensation active
	4-15	Unused

If the battery test is active, more specific data can be found in its field.

Memory Address	Bit	Data
3	0	Periodic battery test
	1	Manual battery test
	2	Natural battery test
	3	Remote battery test
	4	Battery connection test (since AB 3.8)
	5-15	Unused

If the boost charge is active, more specific data can be found in its field.

Memory Address	Bit	Data
4	0	Automatic boost charge
	1	Periodic boost charge
	2	Manual boost charge
	3	Remote boost charge
	4-15	Unused

3.7.3. Measurements

Each of these measurements are stored in their own 16 bit memory address. Their value is multiplied with 10 to show first decimal. This makes the range to -3.276,8 - +3.276,8.

Memory Address	Data Field
10	System Voltage (0,1 V)
11	Load current (0,1 A)
12	Battery current (0,1 A)
13	Total rectifier current (0,1 A)
14	Total inverter current (0,1 A)
15	Maximum battery temperature (0,1 C)
16	Maximum system temperature (0,1 C)
17	Midpoint Voltage (0,1 V) (since AB 4.0)
18	Rectifier phase 1 AC Input Voltage (0,1 V) (since AB 3.9)
19	Rectifier phase 2 AC Input Voltage (0,1 V) (since AB 3.9)
20	Rectifier phase 3 AC Input Voltage (0,1 V) (since AB 3.9)

3.7.4. Alarms

Alarms are divided into several logical groups and memory addresses.

Memory Address	Bit	Data	
30		System voltage alarms	
	0	Mains fault	Mains Fault alarm activates when all the rectifiers report a mains fault.
	1	Phase fault	Phase Fault alarm activates when all the rectifiers in a certain mains phase report a mains fault.
	2	Low system voltage	Low System Voltage alarm activates when the measured system voltage drops too low
	3	High system voltage	High System Voltage alarm activates when the measured system voltage is too high

Memory Address	Bit	Data	
	4	Float charge deviation	System voltage deviates more than specified from the set value.
	5	Inverter system mains fault	Inverters Mains Fault alarm activates when bypass switch reports a mains supply fault.
	6	Low system voltage warning	Low System Voltage warning alarm activates when the measured system voltage drops too low (since AB 3.8)
	7	High system voltage warning	High System Voltage warning alarm activates when the measured system voltage is too high (since AB 3.8)
	6-15	Unused	

Memory Address	Bit	Data	
31		System fault alarms	
	0	Earth fault	The alarm is activated if the measured power line to PE resistance is less than the given value..
	1	Load fuse fault	Load fuse has tripped
	2	Battery fuse fault	Battery fuse has tripped
	3	Rectifier overload	There are not enough redundant rectifiers in the system
	4	Inverter overload	There are not enough redundant inverters in the system.
	5	Bus fault	This alarm activates if all the modules in a communication bus stop communicating with the system controller
	6	Shunt fault	This alarm activates if a current shunt is not properly configured or the current measurement is not inside reasonable limits. (Bit might be different for early software versions)
	7	System over temperature	System Over Temperature alarm activates when ambient temperature is too high (Bit might be different for early software versions)
	8	No system temperature sensor	This alarm activates if there is no system temperature sensor available. (Bit might be different for early software versions)
	(9	DCP Bus Fault	This alarm activates if there is communication problem in the

Memory Address	Bit	Data	
			distributed controller bus. Placeholder value, not in real use.)
	10-15	Unused	

Memory Address	Bit	Data	
32		Miscellaneous system alarms	
	0	Boost charge active	This alarm activates when any Boost Charge mode is active.
	1	Configuration conflict	This alarm activates if there are problems in system configuration
	2	Inventory full	This alarm activates if the system cannot handle all the modules installed to the system
	3-15	Unused	

Rectifier alarms' field shows if any rectifier module in the system has any alarms. i.e. communication error on one module will set communication error alarm in 'Rectifier alarms' field.

Memory Address	Bit	Data	
33		Rectifier alarms	
	0	Communication error	System Controller is unable to communicate with a module.
	1	Nvram fault	Module reports a NVRAM fault in itself.
	2	Config fault	Some of module configuration is missing.
	3	Module fault	The self-diagnostics of a system module indicate that the module is faulty and should be replaced.
	4	Bad firmware	Module has a bad firmware and it should be updated.
	5	Rectifier fault	The self-diagnostics of a rectifier module indicate that the rectifier module is faulty and should be replaced.
	6	Rectifier over voltage	Rectifier module reports too high DC voltage.
	7	Rectifier over temperature	Rectifier module reports too high internal temperature.
	8	Rectifier mains fault	Rectifier module reports either too low or high Mains Voltage.
	9	Rectifier wrong voltage version	The alarm is activated if any rectifier in the system has different voltage group

Memory Address	Bit	Data	
			than the value of Rectifiers Voltage Group parameter.
	10-15	Unused	

'Inverter system alarms' field shows if any inverter/bypass module in the system has any alarms. i.e. communication error on one module will set communication error alarm in 'Inverter system alarms' field.

Memory Address	Bit	Data	
34		Inverter system alarms	
	0	Communication error	System Controller is unable to communicate with a module.
	1	Nvram fault	Module reports a NVRAM fault in itself.
	2	Config fault	Some of module configuration is missing.
	3	Module fault	The self-diagnostics of a system module indicate that the module is faulty and should be replaced.
	4	Bad firmware	Module has a bad firmware and it should be updated.
	5	Inverter system fault	This alarm activates when there is a critical error in the inverter subsystem.
	6	Inverter fault	An inverter module reports a critical fault in the module itself.
	7	Bypass fault	Bypass module reports a critical fault in the module itself.
	8-15	Unused	

Other modules alarms field shows if any other module than rectifier or inverter in the system has any alarms. i.e. communication error on one module will set communication error alarm in 'Other modules alarms' field.

Memory Address	Bit	Data	
35		Other modules alarms	
	0	Communication error	System Controller is unable to communicate with a module.
	1	Nvram fault	Module reports a NVRAM fault in itself.
	2	Config fault	Some of module configuration is missing.
	3	Module fault	The self-diagnostics of a system module indicate that the module is faulty and should be replaced.

Memory Address	Bit	Data	
	4	Bad firmware	Module has a bad firmware and it should be updated.
	5-15	Unused	

Memory Address	Bit	Data	
36		Battery alarms	
	0	Battery block low voltage	This alarm activates if a battery block voltage is measured to be below the configured limit..
	1	Battery block high voltage	This alarm activates if a battery block voltage is measured to be above the configured limit.
	2	Battery String Asymmetry	This alarm activates if voltage measurement of any of the battery block in a battery string differs too much from the average block voltage in the battery string.
	3	Automatic boost charge fault	Automatic Boost Charge Fault is activated if ABC Time Limit is exceeded before battery charge current drops below Stop Current.
	4	Battery Test Fault	Battery Test Fault is activated if battery voltage drops below Stop Voltage before the Battery Test Time Limit or Discharge Limit is exceeded.
	5	Battery Over Temperature	This alarm activates if any of the battery temperature sensors indicate that battery temperature is above the configured limit.
	6	No Battery Temperature Sensor	Battery Temperature Compensation feature is enabled but there is no battery temperature sensor. .
	7	Battery Temperature Sensor Fault	A battery temperature measurement is not inside reasonable limits.
	8	Battery Connection Test Fault	Activates if a battery connection test is failed. (Since AB 3.8)
	9	Battery Lifetime Warning	Activates if calculated battery lifetime is running out. (Since AB 3.8)
	10	Battery Midpoint Voltage Deviation	Activates when battery midpoint voltage deviates from setpoint. (Since AB 4.0)
	11-15	Unused	

Memory Address	Bit	Data	
37		Low voltage disconnect alarms	
	0	Load LVD Disconnect Warning	This alarm warns that a Load LVD may be disconnecting shortly.
	1	Load LVD Disconnect Imminent	This alarm warns that a Load LVD is about to disconnect in about ten seconds..
	2	Battery LVD Disconnect Warning	This alarm warns that a Battery LVD may be disconnecting shortly.
	3	Battery LVD Disconnect Imminent	This alarm warns that a Battery LVD is about to disconnect in about ten seconds.
	4	Contactor Fault	Load or Battery LVD contactor is not responding to control commands.
	5-15	Unused	

Memory Address	Bit	Data	
38		External alarms	
	0	Ext. Alarm Group 1	An external alarm connected to external alarm group 1 is active..
	1	Ext. Alarm Group 2	An external alarm connected to external alarm group 2 is active.
	2	Ext. Alarm Group 3	An external alarm connected to external alarm group 3 is active..
	3	Ext. Alarm Group 4	An external alarm connected to external alarm group 4 is active.
	4-15	Unused	

4. PRINCIPLES OF OPERATION

4.1. Parameter System

Because of highly flexible design of VIDI+, it can be used in many different applications with different voltage, current and power levels, battery types, etc. However, flexibility often entails complexity. One of the main objectives in the design of the VIDI+ controller has been to hide this complexity from the user.

One of those points is the parameter system of VIDI+. All modern power system controllers have quite a collection of parameters. This is true for VIDI+ also. In VIDI+, those parameters are also

interlinked. This means that a parameter may affect default, minimum, and maximum values of other parameters, in what are called parameter dependencies.

For example, the Float Charge Voltage parameter depends on the following parameters:

Identifier	Name	Description
CellMinV	Minimum Cell Voltage	
CellMaxV	Maximum Cell Voltage	
CellFloatV	Float Charge Voltage of a Cell	
BlocksPerString	Voltage Version	Number of blocks per string
CellsPerBlock	Cells Per Block	Number of cells per block

The default value of Float Charge Voltage is determined by the following formula:

def{FloatV} = CellFloatV * BlocksPerString * CellsPerBlock

For example, in a 48 V system with lead-acid batteries, this would be:

def{FloatV} = 2.27 V * 4 * 6 = 54.48 V

CellFloatV, BlocksPerString, and CellsPerBlock are called master parameters for the FloatV parameter. FloatV is called a dependent parameter for the master parameters.

When the value of any master parameter is changed, VIDI+ shows all of the dependent parameters and suggests a new value for these parameters. The user may then keep the old value or accept the new default value.

For example, if you change the value of the CellFloatV parameter from 2.27 V to 2.23 V (which may be more suitable for OPzS battery type), VIDI+ suggests a new float charge voltage of 53.52 V.

Some parameters, such as CellFloatV and other cell voltage parameters, are considered ‘expert-mode’ parameters, as they need not be changed during normal operation of a power system. If such parameters need to be changed or audited, the Expert Mode parameter, in the System Parameters group, needs to be enabled.

In the user interface, the full parameter names are always used instead of the parameter identifiers. The identifiers may be used in some places in the documentation to clarify the mathematical notation and keep it concise.
The parameter of the VIDI+ controller are presented in Section 8 (Parameters).

Minimum and maximum dependencies affect the minimum and maximum value for a parameter, naturally. For example, the minimum value for float charge voltage is determined by the following formula:

min{FloatV} = CellMinV * BlocksPerString * CellsPerBlock

An example for a 48 V system is:

min{FloatV} = 1.75 V * 4 * 6
= 42.00 V

Thus, you cannot change the value of the float charge parameter to less than 42 volts. This should cover all normal situations. However, should some special situation so require, you can go below this limit by changing the CellMinV parameter to less than 1.75 V.

If a master parameter is changed such that the value of a dependent parameter leaves the allowed range, VIDI+ prompts for new values for each such parameter.

Detailed instructions on auditing and changing parameters using the local user interface are available in Section 5.6 (Parameters).

4.2. Busses, Modules, Ports, and Devices

4.2.1. Busses and Modules

Different types of modules can be connected to a VIDI+ controller via the PowerCAN bus. The VIDI+ system controller is a module itself, and so is the UIF module.

As stated earlier, the VIDI+ controller has two PowerCAN busses, named ExtBus and RectBus1. In addition to these, there is a virtual bus called Controller Bus in between the standard and advanced control modules.

The serial adapter module (SAM) of the OPUS system, connected to the ExtBus, provides a serial interface bus enabling a serial interface connection to other modules or outside the OPUS system. The EIM inverter and EBPU bypass modules used in the OPUS system communicate via a SAM module. The VIDI+ controller reads measurement and alarm information from the inverter and bypass modules. The VIDI+ controller can also set some parameters to the modules. If there is a need to see more detailed information from the inverter or bypass modules, see the inverter and bypass module manuals.

To make identification of modules easier, the modules are assigned a short name in the VIDI+ user interfaces. The name is a combination of type letter and module index. The following table describes the naming scheme:

Module Type	Name	Example
VIDI+ system control module	A1	
UIF module	A2	
LVD modules	An	A3
BM modules	An	A4
Bus adapter modules	An	A5
Rectifiers	Gx	G1
Inverters	Ux	U2
Bypass modules	An	A6

4.2.2. Ports

Many system modules have electrical I/O connections. For example, the standard system controller module itself has the following connections, excluding the power and bus connections:

Four alarm/control/temperature inputs

Four alarm/control relays

Current shunt input

Contactor driver

System voltage measurement

All these connections are called **ports**. In the VIDI+ system **Inventory** menu, the ports are listed under the module the port belongs to. The ports are identified by short names. The port names always start with a lowercase ‘p’. If there are multiple ports of the same type in a module, an index number is appended to the port name. The following table lists the various port types and their naming syntax.

Port Type	Name	Example
Alarm/control/temperature input	pDTn	pDT1
Alarm/control relay output	pKDn	pKD1
Contactor driver	pKn	pK1
Current shunt input	pIn	pI1
EFD measurement	pD2.16	
Battery block voltage input	pUbln	pUbl1
Battery voltage measurement	pUbtn	pUbt1
Controller internal temp. meas.	pT16	pUbt1

4.2.3. Devices

Each port can be configured for certain use or uses. Configured ports are called **Devices**. Examples of devices are:

Alarm/control/temp input configured as Battery Fuse Alarm device

Alarm/control/temp input configured as Battery Temperature Sensor device

Contactor driver configured as Load LVD device (PLD)

There can be multiple devices of the same type in a system. For this reason, the devices are numbered. The numbers are called device indices or sometimes device IDs. For example, the first battery LVD device has device index 1.

In addition to plain index numbering, some devices can be grouped. Each group has its own number. For example, distribution fuses are usually numbered by their group instead of as individual fuses (the state of which is usually unknown to the system controller).

The device name is a combination denoting device type, usage, and index. The table below gives the port types, supported device types, and the naming/numbering scheme.

Port Type	Device Type	Name	Example
Alarm/control/temp input	Battery Fuse Alarm	Fbx.y	Fb1.0
...	Load Fuse Alarm	Flx.y	Fl2.1
...	External Alarm	Xax	Xa3
...	External Control	Xcx	Xc1
...	Battery Temperature Sensor	Tbx	Tb1
...	System Temperature Sensor	N/A	

Alarm/control relay output	Alarm Relay	Yax	Ya1
...	Alarm Control	Ycx	Yc2
Current shunt input	Battery Current Measurement	Rbx	Rb1
...	Load Current Measurement	Rlx	Rl1
Contactor driver	Battery LVD	Kbx	Kb1
...	Load LVD	Klx	Kl1
EFD measurement	System earth fault alarm	N/A	
...	AC load earth fault alarm	N/A	
Battery block voltage input	Block Voltage Measurement	Bx.y	B1.2
Battery voltage input	Battery Voltage Measurement	Bx	B1

Each device can be given a custom specific name. The name can have 16 characters. The System Parameters contains a parameter Device Names. If this parameter is enabled, user given device names are shown also on the local display. If an user specific device name has not been given, the default name of the device is used (default device name types presented in the table above).

4.2.4. Inventory Limit

The number of modules and devices that can be controlled by a VIDI+ controller is limited to a certain figure. The maximum numbers of specific module and device types are specified on the VIDI+ controller datasheet.

The VIDI+ controller remembers all modules and their devices that have been connected to the controller at some point. This is necessary because otherwise the configuration of a module and its devices would be forgotten when the module is disconnected from the system, even if the disconnection is temporary. If a module is removed from the system, a Communication Error alarm from this module is activated and it stays active until Remove Missing Modules action is run.

Inventory limits may be exceeded when new units are installed or units are replaced with new ones. In this situation, the controller tries to free space in its inventory by discarding old (disconnected) modules of the same type. If this does not help, the new modules will be ignored. This kind of situation will be signalled by an Inventory Full alarm.

The full inventory problem may be solved by manually commanding the controller to remove all missing modules from inventory. This command can be executed from the user interfaces.

4.3. Charge modes

When mains power is available, VIDI+ adjusts the output voltage of the rectifiers according to the system charge state. The supported charge states are described below.

4.3.1. Float Charge

This is the default charge state. The batteries are charged with a voltage optimal for continuous operation. The float charge voltage is specified by the Float Charge Voltage parameter, in the Charge Parameters group. The default float charge voltage is 2.27 V per battery cell.

The temperature compensation feature can be used in Float Charge mode.

4.3.2. Boost Charge

Boost charging enables faster battery charging and equalises battery cell voltages. During boost charge, batteries are charged with higher voltage than in float charge. The default boost charge voltage is 2.40 V per battery cell.

Boost charge can be activated manually, automatically after a mains fault, periodically at set intervals or with a remote signal, which is connected to one input of the OPUS system.

If enabled, automatic boost charge (ABC) begins after a mains fault once the battery charge current exceeds the Start Current limit for five seconds. The default value of Start Current is 10% of the nominal system current. Automatic boost charge can also start after controller restart, provided that the Start Current value is exceeded, as a prolonged mains fault usually causes the controller to power down.

The automatic boost charge will stop after the charge current drops below the Stop Current value set or when the maximum boost charge time is exceeded. The default for Stop Current value is 5 % and the default Time Limit value is 20 hours.

If periodic boost charge (PBC) is enabled, the system will automatically boost charge the batteries at the intervals specified. This helps to keep block and cell voltages balanced. You can set the boost charging frequency.

The remote boost charge (RBC) method enables the boost charge mode starting with an external input signal. The RBC settings are done using the configurable logic of the VIDI+ controller. The configurable logic can be accessed only via a remote user interface (web or terminal interface). The external input signal must be configured as a control input. This will be done from the inventory menu (see more information from the Section 9.10 (Alarm Inputs)). When the input is set as a control input, it is shown on the Control Inputs list of the configurable logic page of the VIDI+ controller under the Administration menu. Open the Control Inputs list and define settings. You can invert the input signal state, set the activation or deactivation delay to the action. Select from the System Control list Start Boost Charging. More detailed instructions to the configurable logic settings can be found from the help page of the web/terminal interface or from the Section 6.12.6 (Programmable Configuration Logic). From the parameter page of the RBC (Parameters • Charge Parameters • Boost Charge • Remote Boost Charge) can be defined whether the RBC is stopped if the state of the external signal changes. On this page are defined also other RBC parameters.

Periodic, automatic and remote boost charging methods are disabled if any of the following conditions are true:

- Battery test alarm is active (non-acknowledged)
- Battery over temperature alarm is active
- Battery temperature sensor fault alarm is active
- ABC (automatic boost charge) fault alarm is active (non-acknowledged)
- Battery temperature is not within the allowed limits
- Battery fuse alarm is active

Manual boost charging (MBC) is disabled if any of the alarms listed above is active and has not been acknowledged.

On the System Alarms exist the Boost Charge Active alarm (Parameters • Alarm Parameters • System Alarms). If this alarm is enabled, its state is active always when any boost charge mode is active. With this alarm can be informed to outside the system that the system is in the boost charge mode. The same information can be given also with the configurable logic using the System State event, more information on the Section 6.12.6 (Programmable Configuration Logic).

If boost charging does not begin as expected:

1. Check the alarms list
2. Check the battery temperature

If any boost charge mode is active when a firmware updating to any system module is started, the boost charge mode will be terminated and the system goes to the float charge mode.

4.3.3. Battery Charge Current Limiting

Charge current limiting is a feature that prevents batteries from being charged with an excessive current. Charge current limiting is disabled by default. It can be enabled from the Charge Current Control parameter group which belongs to Charge Parameters.

Battery charge current limiting works on two levels:

System-Wide Limit	Defined under Charge Parameters, this limit is for total battery current. Total battery current is the sum of individual battery current measurements.
Device-Specific Limits	These limits are defined by the Charge Limit parameter for each battery current measurement device.

The controller attempts to control the output voltage of rectifiers such that none of the limits are exceeded. In other words, all of the charge current limits are in effect simultaneously.

4.3.4. Battery Tests

Battery tests are used to monitor the state of the batteries. The system controller manages battery testing by lowering output voltage of the rectifiers to a standby level. In this state, the rectifiers will not source current until the battery voltage reaches the standby voltage. If the batteries are in poor condition and the battery voltage suddenly falls very low, the rectifiers will return to float charge mode and supply power to the load without interruption.

The battery test ends successfully after a user-configured time or energy limit has been exceeded. The energy limit will be exceeded when the configured amount of energy, measured in ampere-hours (Ah), has been discharged from the batteries. If the battery voltage drops below the **Stop Voltage Limit** parameter before time or energy limit is reached, the battery test fails. If the battery test fails, the controller activates Battery Test Fault alarm. **Stop Voltage** and **Time Limit** are configurable parameters.

In the first moments of a battery test, it is normal for the battery voltage to first dropping significantly and then returning to a higher level. To prevent this behaviour from causing failure of the battery test, two additional parameters are available: **Shutdown Voltage** and **Ignore Time**. At the beginning of the battery test, the **Stop Voltage** value is ignored until the time set as the **Ignore Timer** value has elapsed. During that time, only the **Shutdown Voltage** limit is in effect. If the battery voltage drops below **Shutdown Voltage** at any point in the battery test, the battery test fails.

VIDI+ controller features a precharge timer which is used to make sure battery tests are performed only on fully charged batteries. The precharge timer is reset on mains fault and controller start-up. Battery tests are only possible after the precharge timer has exceeded value of the Precharge Time parameter. However, VIDI+ user interfaces provide a possibility to reset the precharge timer manually.

There are five variations of the battery test: **Manual Battery Test** (MBT), **Periodic Battery Test** (PBT), **Battery Connection Test** (BCT), **Natural Battery Test** (NBT) and **Remote Battery Test** (RBT).

MBT can be started manually from a user interface.

PBT can be configured to start a certain number of times per year. It is useful for automation of the battery testing. However, PBT will not start if either any of the following alarms is active:

Battery Test Alarm

Battery Fuse Alarm

Battery Over Temperature Alarm

Allowed starting time of the PBT can be defined separately to each weekday. Also can be set ten date when PBT is forbidden.

BCT, when enabled, a short Battery Test is executed periodically to check that connection to batteries is working. As rectifier voltage is dropped to standby level during the test, the current should come from battery. If total current drawn from rectifiers during the test is less than the trigger level, the test result is pass.The next execution can be seen and changed in the Actions menu in the local user interface and Administration -> Timers page in the web interface

NBT, when enabled, starts automatically when the system detects a mains fault. The test fails if the battery voltage drops below the limits before the mains fault ends and the configured NBT **Time Limit** setting has not been exceeded. An active Battery Test Alarm prevents NBT starting.

RBT can be started via a remote signal which is connected to an input of the OPUS system. This input must be set as a Control Input from the inventory menu (see more information from the Section 9.10 (Alarm Inputs)). The RBT settings are done using the configurable logic of the VIDI+ controller. The configurable logic can be accessed only via a remote user interface (web or terminal interface). When the input is set as the control input, it is shown on the Control Inputs list of the configurable logic page of the VIDI+ controller under the Administration menu. Open the Control Inputs list and define settings. You can invert the input signal state, set the activation or deactivation delay to the action. Select from the System Control list Start Battery Test. More detailed instructions to the configurable logic settings can be found from the help page of the web/terminal interface or from the Section 6.12.6 (Programmable Configuration Logic). From the parameter page of the RBT (Parameters • Battery Tests • Remote Battery Test) can be defined whether the RBT is stopped if the state of the external signal changes. On this page are defined also other RBT parameters.

If MBT, PBT, NBT or RBT battery test fails, a Battery Test Fault is activated.

If Battery Connection Test (BCT) fails, a Battery Connection Test Fault is activated.

On the configurable logic page exist the System State event where is the Battery Test Active state. The battery test active state is active always when any battery test mode is active. With this state signal can be informed to outside the system that a battery test is going on.

VIDI+ provides a battery test log which shows both successful and failed battery tests. Natural battery tests which have ended prematurely due to end of mains fault will be removed automatically from the battery test log. The battery test log can be accessed from the remote interface only. On the web interface it is possible to see graphical voltage-time or voltage-Ah curves representing the recorded battery tests.

VIDI+ provides also a battery discharge log which shows a depth of battery discharging. This log is updated after each battery test.

If any battery test mode is active when a firmware updating to any system module is started, a battery test will be terminated and the system goes to the float charge mode. The battery test data will be saved

4.3.5. Temperature Compensation

High temperature has a detrimental effect on battery life. However, if high temperature cannot be avoided, battery life can be improved by means of temperature compensation.
If enabled, the temperature compensation mode controls the rectifiers' output voltage automatically according to the battery temperature. In high temperatures the charge voltage is decreased and in low temperatures it is increased.

If the temperature compensation mode is active when a firmware updating to any system module is started, the temperature compensation mode will be terminated and the system goes to the float charge mode.

4.3.6. Rectifier Default Voltage

A default voltage is programmed into all OPUS rectifier modules during manufacturing. The default voltage depends on the rectifier module type and voltage version.

Upon rectifier start-up, the rectifiers use the default voltage as the voltage set point. When the master controller has finished initialisation, it will send a new set point voltage to the rectifiers as determined by the charge state.

If a rectifier is unable to communicate with the system controller, it maintains the last voltage set by the system controller unless it is higher than the default voltage of the rectifier, in which case the rectifier reverts to the default voltage.

This mechanism ensures that batteries are not overcharged or over-discharged in the event of system controller malfunction during battery test or boost charge.

4.4. Mains Fault

When all present rectifiers report a mains fault, the VIDI+ controller assumes that the mains supply is down and enters the Mains Fault state. If enabled, the Mains Fault alarm will activate after this.

If the system is started up without rectifiers, for example from batteries, the controller assumes that there is a mains fault. This is because MRC/MHE rectifiers are unable to communicate with the VIDI+ controller when the rectifiers have no AC power. The Mains Fault will happen also if the system is powered by MRC/MHE rectifiers, but the rectifiers are not connected to the VIDI+ controller.

During mains fault only one battery test mode is possible: the Natural Battery Test, which is started automatically upon beginning of mains fault if enabled (see Section 4.3.4 (Battery Tests)).

The VIDI+ controller assumes that a mains fault has ended when at least one rectifier reports that the mains supply is OK.

4.5. Low Voltage Disconnect (LVD)

If the duration of a mains fault exceeds the capacity of the batteries, the batteries generally must be disconnected from the load before they become too deeply discharged. Deep discharge may destroy the batteries or shorten their life considerably.

For this purpose, the LVD (low voltage disconnect) feature is used. An LVD feature requires two components: contactor control hardware and a contactor. The VIDI+ system controller module provides one contactor driver (an LVD device). An LVD device may be configured for the following uses:

None LVD control feature is not used.

Battery LVD contactor is connected between the system and the batteries (battery bank or individual battery string in the case of multiple-battery LVDs). This LVD set-up is called Battery LVD.

Load LVD contactor is connected between the system and load branch. This LVD set-up is called Load LVD, or sometimes PLD (for partial load disconnect).

In normal operation, the contactor is closed (conducting). When a load or batteries are to be disconnected from the system, the contactor is opened.

An LVD can be controlled in one of the following modes:

Voltage The voltage is disconnected when the system voltage falls below Disconnect Voltage limit. It will be reconnected when the system voltage exceeds Pickup Voltage. A warning alarm is activated (if enabled) when the difference between the system voltage and Disconnect Voltage is less than or equal to the Voltage Margin value for the alarm.

Time A timer is started at the beginning of a mains fault. When the time exceeds the Disconnect Time setting, the LVD contactor will be disconnected. It will be reconnected shortly after the mains power returns. A warning alarm is activated (if enabled) when the time to disconnection is less than or equal to the Time Margin value for the alarm.

Discharge The battery discharge counter starts to run on a mains fault. Battery discharge is measured in ampere-hours (Ah). The LVD contactor will be disconnected when the discharge exceeds the Disconnect Discharge limit and reconnected when mains power returns. If a warning alarm is enabled, it will be activated when the remaining discharge before disconnection is less than or equal to the Discharge Margin value for the alarm.

Just before the LVD contactor is disconnected, an **LVD Disconnect Imminent** alarm will be activated. From disconnection of the battery LVD usually follows a total system power-off. Later on, the alarm can be seen in the alarm log and the reason for the shutdown can be determined.

Both latching and non-latching contactor types can be used with VIDI+. The type of the contactor must be configured for each LVD device.

4.6. Alarms

VIDI+ provides comprehensive alarm functionality. There are more than 40 alarms to warn the operator of potential or active problems.

All alarms can be individually enabled or disabled and routed to any combination of alarm relays. A single alarm relay can be used for multiple alarms. An activation delay can be set for each alarm.

Enabled alarms always have one or more alarm sources. There are different types of alarm sources:

System A system-level alarm, such as **System Low Voltage**.

Bus An alarm related to an entire module bus as stated in the alarm information. For example, a bus fault alarm can have ExtBus1 as the alarm source.

Module An alarm is caused by one or more specific physical modules. A list of modules in the alarm state is always shown. For example, the rectifier over temperature alarm may have rectifiers G1 and G4 as the alarm sources.

Device An alarm related to one or more of the system devices. For example, a contactor fault alarm can have LVD device KI1 as the alarm source.

All alarm events have the following two state variables:

Active or non-active

Acknowledged or non-acknowledged

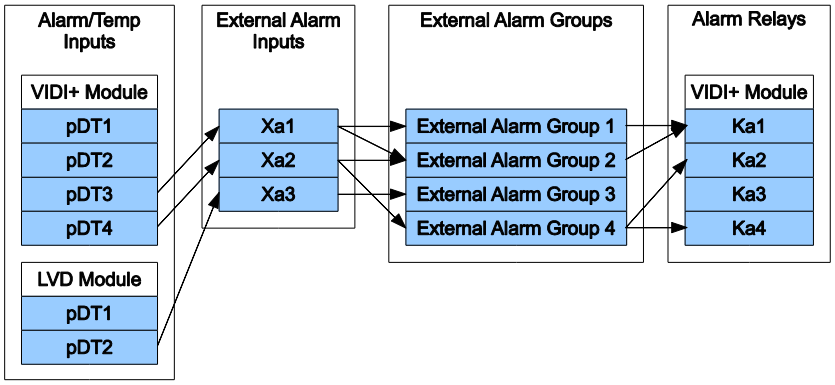
An alarm is active as long as any source for the alarm (for example, a mains fault) is active. An alarm can be acknowledged by the operator at any point, also when the alarm is no longer active. Acknowledging an active alarm will not remove it from the active alarms list, but the alarm will be removed from the list of non-acknowledged alarms.

The alarms are recorded into an alarm log. On VIDI+, all alarms activations, acknowledgements and deactivations are stored into event log, too.

A listing of alarms and related parameters is available in Section 10 (Alarms).

4.6.1. External Alarms

Any multi-function alarm/temperature input can be configured for use as an external alarm. External alarms are grouped into four external alarm groups. An external alarm group may contain any combination of external alarms.



The above diagram represents a possible mapping of alarm inputs to alarm groups, and finally to alarm relays. For example, if an alarm is activated at input pDT3 of VIDI+ system controller module, the external alarm input Xa1 will activate, which in turn activates External Alarm Groups 1 and 2, and consequently the alarm relay output Ka1.

4.7. LED Indications

4.7.1. Local Display Module

LED color and action	Meaning
Green, steady	All OK, no active or non-acknowledged alarms
Green, blinking	No active alarms but at least one unacknowledged alarm
Red, steady	At least one active alarm
Red, blinking	Mains fault
Yellow, steady	Initialisation
Yellow, blinking	‘this module selected’ indication

4.7.2. MRC Rectifier

LED color and action	Meaning
Green, steady	All OK

LED color and action	Meaning
Green, blinking	Communication error
Red, steady	Fatal error, service needed: Memory/parameter error Fuse fault DC fault Fast DC over voltage protection (FOV) Other permanent error preventing rectifier operation
Red, blinking	Temporary failure: Mains fault Over temperature Selective DC over voltage protection (SOV) DC under voltage alarm Other temporary error
Yellow, steady	Test mode
Yellow, blinking	LED test

4.7.3. MHE Rectifier

LED color and action	Meaning
Green, steady	Normal operating mode
Green, blinking	1. Communication error or master controller not present 2. MHE rectifier software update running via master controller
Red, steady	Fatal error, service needed 1. Memory / parameter error 2. Selective DC overvoltage protection (SOV) 3. Fast DC overvoltage protection (FOV) 4. Other permanent error preventing rectifier operation
Red, blinking	Temporary failure 1. Mains fault 2. Over temperature 3. DC under voltage alarm 4. Other temporary error
Yellow, steady	1. Rectifier start-up phase. - User can set start-up delay 0-120 sec. LED is yellow during the start-up period - If Temporary fault state is present during start-up phase, the LED will have steady yellow state until fault state disappears and unit starts. 2. Test mode
Yellow, blinking	1. Minor fault: e.g. Load sharing fault 2. LED test by System Controller

4.7.4. LVD Module

LED color and action	Meaning
Green, steady	All OK. Autonomous mode on or master present
Green, blinking	Initialisation, communication error with a master controller and autonomous mode not on
Red, steady	Fatal error, device must be replaced
Red, blinking	Contactor fault or over current
Red, one blink	Boot-up LED test
Yellow, steady	Test mode
Yellow, blinking	LED test or ‘this module selected’ indication

4.7.5. BM Module

LED color and action	Meaning
Green, steady	All OK
Green, blinking	Initialisation, communication error with a master controller
Red, steady	Fatal error, device must be replaced
Red, blinking	At least one of the configured block measurements have low voltage
Red, one blink	Boot-up LED test
Yellow, steady	Test mode
Yellow, blinking	LED test or ‘this module selected’ indication

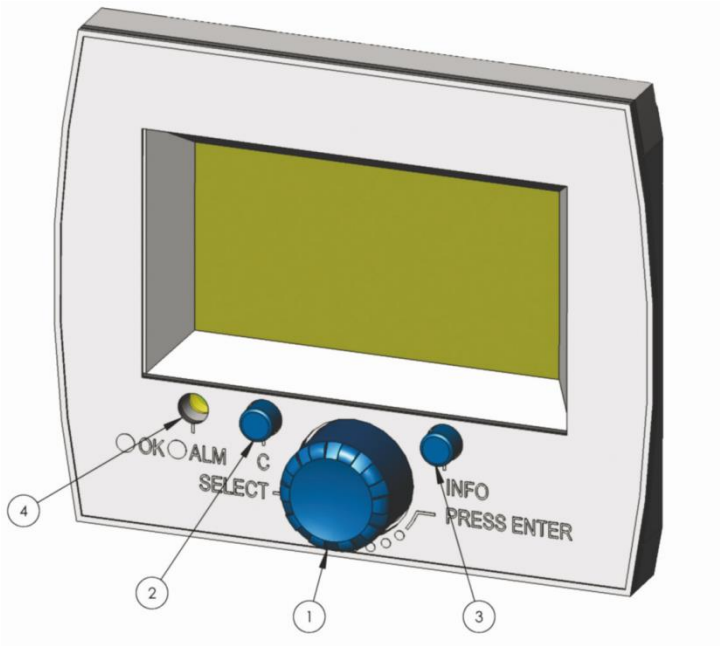
4.7.6. SAM Module

LED color and action	Meaning
Green, steady	All OK
Green, blinking	Initialisation, communication error with a master controller
Red, steady	Fatal error, device must be replaced
Red, blinking	None
Red, one blink	Boot-up LED test
Yellow, steady	Test mode
Yellow, blinking	LED test or ‘this module selected’ indication

LED indications of the EIM inverter and EBPU bypass modules are described in their user manuals.

5. LOCAL USER INTERFACE

5.1. General



The local user interface of the VIDI controller is provided by the User Interface (UIF) module. The UIF module comprises a graphical LCD display, the Status LED (4), and the following controls:

1. Selector wheel with pushbutton
2. Cancel button
3. Help button

The Selector is used to select items in menus, change various values, and scroll the display. It can be rotated in either direction. The currently selected item (if any) can be activated by pushing the Selector.

The cancel button always returns to the previous menu, cancels the current action, or moves backward in certain configuration dialogs.

The Help button always gives help related to the current page or selected item. Pressing the Help button twice gives help on the help display itself.

You can change the contrast of the LCD display by pushing the Selector down and rotating the Selector while pushing it. It may be necessary to change the contrast if the ambient temperature has changed or the UIF module has been changed.

Some operations, such as changing configuration settings, are privileged. If the local interface password is other than 0000 (the default), the controller asks for the password before allowing access to privileged operations. If the password is 0000, all password prompts are disabled for the local interface.

If you choose to use a password, it can be changed from the **`System Parameters`** menu. Please write the password down and store it in a safe place. A forgotten password can be recovered by the remote interface.

Refer to Section 5.11 (Menu Structure) for the structure of the local interface display menus.

5.2. The First Start-up

In normal system shipments, the VIDI+ controller has been configured by Efore at the factory. However, should you receive an unconfigured VIDI+ controller, a few basic configuration tasks need to be performed. VIDI+ will automatically ask for all the required information.

5.2.1. Base Parameters Dialog

There are three base parameters for which safe default values cannot be assumed.

These are:

- Voltage Version
- Nominal Current of System
- Nominal Battery Capacity

If these parameters are not set, the Base Parameters Dialog will appear on the local interface. The dialog asks the user to set valid values for each of these parameters. After that, default values are assigned for all other parameters. The default value of many parameters depends on the three base parameters as described in Section 4.1 (Parameter System).

After setting of the base parameters (and the module/device configuration that will follow the Base Parameters Dialog), you should check that all important parameters are set as you want.

5.2.2. New Modules Dialog

If there are new modules installed in the system that do not require configuration, the New Modules Dialog will appear. Currently, UIF and AB are the only such modules. This dialog can be dismissed by pressing the Selector or the Cancel button.

5.2.3. Unconfigured Modules Dialog

The Unconfigured Modules Dialog will appear if there are new modules installed in the system and VIDI+ cannot configure them automatically.

It should be noted that all device-specific configurations are stored in both the controller module and the modules containing the devices. For example, the `Mains Phase` attribute of the MRC/MHE rectifier is stored both in the rectifier itself and in the VIDI+ controller module. If the controller module needs to be replaced, the new controller module will load the device- or module-specific configurations from the modules. However, because the new controller cannot be sure whether the module configuration is actually correct (you could be moving the module in from another system), the Unconfigured Modules Dialog will prompt for its configuration.

The dialog will first show a list of unconfigured modules. Each of these modules can be selected and configured. If you know the configurations are valid, just choose the `Accept Current Configs` item.

A module is configured device by device. When the configuration of a device is correct, choose the Accept item to move to the next device. The Cancel button can be used to move to the previous device. Once the device configuration is accepted, it will take effect immediately.

When the module is fully configured, it will be removed from the list of unconfigured modules.

5.3. Main Display

The `Main Display` shows the most important status information for the system. If the user interface is left untouched for two minutes, the interface resets itself and shows the Main Display.

```
Float Charge
54.45 V 186 A
Load 132 A
No Alarms
```

The top row shows the system state, which can be:

- Float charge
- Periodic battery test
- Manual battery test
- Natural battery test
- Remote battery test
- Automatic boost charge
- Periodic boost charge
- Manual boost charge
- Remote boost charge
- Temperature compensation

The meanings of these states are described in Section 4.3 (Charge Modes).

The second row shows the system voltage and the total current supplied by the rectifiers.

The third row shows the current supplied to the load. The current flowing to the batteries can be calculated as a difference of rectifier and load currents. In the above example the batteries are being charged with 54 A.

The fourth row shows the number of currently active alarms. If the system is being accessed remotely, for example via the Web interface, on the last row is shown `Remote Login` and all local interface usage are disabled.

Press Cancel or the Selector in the `Main Display` to enter the `Main Menu`.

5.4. Main Menu

The `Main Menu` contains the following items:

Main Display	The default display shows the most important status information.
Measurements	This shows system, rectifier, inverter, bypass and battery measurements.
Parameters	All system-level parameters can be seen and modified here.
Inventory	This shows modules and devices installed on various system busses. Module- and device-specific configuration is accessed under the Inventory menu.
Alarms	This shows the active and non-active alarms and provides access to alarm-related configurations and actions.
Actions	This selection provides access to manual system operations and tests.

All menus can be operated in the same way as the Main Menu. Turn the selector wheel to change the selected item. Push the Selector to enter the selected item (page, submenu, or action). Press the Cancel button to return to the previous menu (or the Main Display in the case of the Main Menu). Press the Help button to get help text related to the current page.

5.5. Measurements

5.5.1. System Measurements

```
System Measurements
Voltage Version...48V
System Voltage..54.5V
Rect. Current..150.3A
Batt. Current...94.7A
Load Current....55.6A
Temperature.....28.4C
```

`Voltage Version` is the nominal voltage of the system. `System Voltage` is the measured system voltage. `Rect. Current` is the total current supplied by the rectifiers.

`Batt. Current` is the total battery current, which is positive when batteries are being charged and negative when batteries are being discharged. If there is no battery current shunt resistor installed and configured, the battery current is shown as zero. If there are multiple battery current shunt resistors available, the reading is the sum of the measured currents.

`Load Current` is always calculated by subtracting the battery current from the rectifier current. The calculation does not take into account the marginal current consumption of the system modules. Load current measurement devices do not affect this reading.

`Temperature` is the measured ambient temperature of the system. At least one ambient temperature sensor has to be enabled for a valid reading to be obtained. If multiple ambient temperature sensors are configured, the highest reading is used and shown here.

5.5.2. Battery Block Measurements

```
Battery Measurements
Max Temp........28.2C
Total Current...94.7A
Discharged.....12.5Ah
Battery charges
Temperatures
String 1
```

`Max Temp` indicates the temperature of the battery temperature sensor, or the temperature of the warmest-reading battery temperature sensor if multiple battery temperature sensors are installed and configured.

`Total Current` is the total battery current, positive when batteries are being charged and negative when batteries are being discharged. This measurement is also available from the System Measurements page.

`Discharged` is a reading indicating the amount of energy discharged from the batteries. It is always positive or zero. A value of zero means that the batteries are judged to be full.

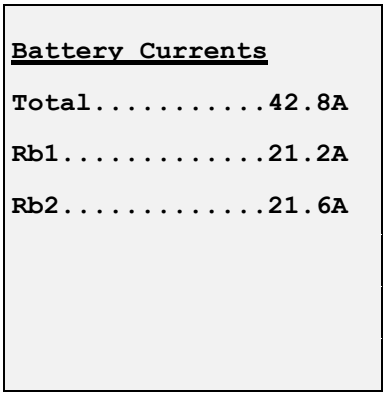
The following line indicates the charge direction of the battery, which is either Charges, `Discharges` or `In Stand-by`. Normally a battery current shunt resistor is used to measure the battery current, and thus the charge direction. In stand-by means that battery current is so small that charge direction cannot be determined reliably. If there is no battery current measurement available at all, the controller assumes that batteries are charged when there is no mains fault, and discharged when there is a mains fault.

`Temperatures` show a list of functional battery temperature sensors and measurements on a separate page.

The System Measurements page can be reached from
Main Menu • Measurements • System.

If there are functional battery block voltage devices available in the system, the remaining lines present voltage measurements of each battery string. There is a separate page for voltage measurements of each configured battery string.

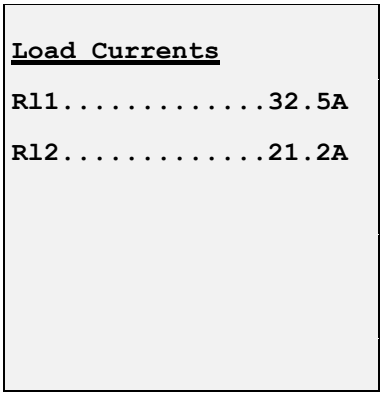
5.5.3. Battery Current Measurements



`Total Current` is the total battery current, positive when batteries are being charged and negative when batteries are being discharged. This measurement is also available from the System Measurements page.

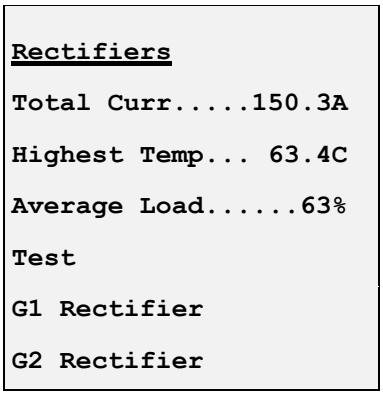
`Rb1` and `Rb2` are individual battery currents measured from the individual battery shunt resistors. The currents are positive when batteries are being charged and negative when batteries are being discharged.

5.5.4. Load Current Measurements



`Rl1` and `Rl2` are individual load currents measured from the individual load shunt resistors.

5.5.5. Rectifier Measurements



The rectifier measurements page shows total rectifier loading and a list of available rectifiers. The list can be scrolled by means of the Selector wheel.

`Total Curr` is the total output current of the rectifier modules. The same reading is available from the `System Measurements` page, on the `Rect. Current` line.

`Highest Temp` is the highest temperature reported by any individual rectifier module. It may be useful for diagnostics in high-temperature environments.

`Average Load` is the average load percentage of the rectifier modules, computed as a ratio of rectifier output current to maximum output current.

The `Test` menu allows the user to adjust the output voltage of rectifiers directly. This can be used for testing purposes. The adjustable output voltage range is limited by system parameters. The output voltage returns to the automatically regulated value immediately when the test menu is exited or when the user interface times out.

The rectifier module entries below the `Test` menu provide access to information on individual rectifier modules. The information looks like this:

```
G1 Rectifier
Present
Current.........31.2A
Temp.......... 60.4C
Load.............72%
Mains Voltage..234.0V
Output Voltage..54.5V
```

After the header line, the status of the rectifier module is shown. Any alarms and faults reported by the rectifier module will be shown here.

`Current` is the DC output current measured by the rectifier module.

`Temp` is the internal temperature measured by the rectifier module.

`Load` is the load percentage of the rectifier module.

`Mains Voltage` is the input mains voltage measured by the rectifier module.

`Output Voltage` is the DC output voltage measured by the rectifier module.

`Show Module` provides access to configuration, serial numbers, revision data, and other such information for the rectifier module. The same information can be accessed from the `Inventory` menu.

5.5.6. Inverter Measurements

```
Inverters
AC Voltage.......232V
AC Freq..........50Hz
AC Current.......3.8A
AC Power.........58VA
Avg Load...........2%
Max Temp..........33C
```

The inverter measurements page shows total inverter measurements and a list of available inverters. The list can be scrolled by means of the Selector wheel.

`AC Voltage` is the average AC voltage of the inverter modules.

`AC Freq` is the average AC frequency of the inverter modules.

`AC Current` is the total AC current of the inverter modules.

`AC Power` is the total AC power of the inverter modules.

`Avg Load` is the average load percentage of the inverter modules.

`Max Temp` is the highest temperature reported by any individual inverter module. It may be useful for diagnostics in high-temperature environments.

The inverter module entries below `Max Temp` row provide access to information on individual inverter modules. The information looks like this:

```
U1 Inverter
Present
AC Voltage.......232V
AC Freq..........50Hz
AC Current......0.10A
AC Power.........23VA
Load..............2%
```

After the header line is shown the status of the inverter module. Any alarms and faults reported by the inverter module will be shown here.

`AC Voltage` is the output AC voltage measured by the inverter module.

`AC Freq` is the AC frequency measured by the inverter module.

`AC Current` is the AC output current measured by the inverter module.

`Load` is the load percentage of the inverter module.

`Temperature` is the internal temperature measured by the inverter module. This row can be seen by rotating the Selector wheel clockwise.

`Show Module` provides access to the serial numbers, revision data, and other such information for the inverter module. The same information can be accessed from the `Inventory` menu.

5.5.7. Bypass Measurements

The bypass measurements page shows bypass measurements. The list can be scrolled by means of the Selector wheel.

```
Bypass Module
Present
AC Out.........:Mains
Inv. AC Volt.....232V
Inv AC Freq......50Hz
Mains AC Volt....228V
Mains AC Freq....50Hz
```

The status of the bypass module is shown after the header line. Any alarms and faults reported by the bypass module will be shown here.

`AC Out` shows the current AC source of the bypass module.

`Inv AC` **`Volt`** shows the average AC voltage of the inverter modules.

`Inv AC Freq` shows the average AC frequency of the inverter modules.

`Mains AC Volt` shows the AC voltage of the mains.

`Mains AC Freq` shows the AC frequency of the mains.

`Output AC Volt` is the AC output voltage of the bypass module.

`Output AC Cur` is the AC output current of the bypass module.

`Output AC Freq` is the AC output frequency of the bypass module.

`Output AC Power` is the AC output power of the bypass module in kW and in kVA.

`Show Module` provides access to the serial numbers, revision data, and other such information for the bypass module. The same information can be accessed from the `Inventory` menu.

5.6. Parameters

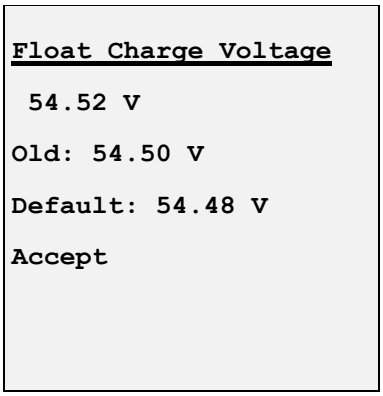
The parameters are divided into several groups, some of which are divided into several subgroups and so on. The hierarchy of the parameters is described in Section 8.1 (Parameter Groups).

Parameters have mutual dependencies. A parameter may affect the default, minimum, and maximum values of other parameters. This is described in more detail in Section 4.1 (Parameter System).

5.6.1. Parameter Page

There is a parameter page for each parameter. From a parameter page, you can view the current value of the parameter and modify that value. If a local interface password is set, modifying the value requires entry of the password. The password itself is a system parameter.

The following is an example of the parameter page for the Float Charge Voltage parameter.



The title line shows the name of the parameter.

The second line shows the current value of the parameter. If the value is blinking, this indicates that the value can be changed by turning the selector wheel. If the value is not blinking, editing can be started by selecting the value. However, if the local interface password is required but not yet entered, it must be entered before the value can be changed.

After the correct value has been set, editing can be finished by pushing the Selector. To confirm the parameter change, select the **`Accept`** item. If the parameter has dependencies, the depending

parameter will be shown after **Accept** is selected. An informational message about parameter dependencies will be shown before the first depending parameter.

To cancel editing of a parameter, or to exit the parameter page, press the Cancel button. If you are on a parameter page for a dependent parameter, pressing the Cancel button will return you the previous parameter page.

If the parameter has a valid previous value, the `Old` line shows this value. It can be restored by selecting the **Old** item.

The default value of the parameter is indicated by the `Default` line. The default value can be used by selecting the `Default` item.

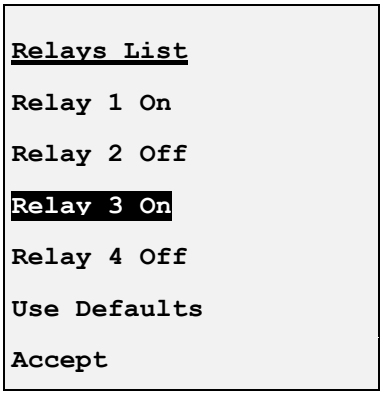
To see help text related to a parameter, press the Help button.

5.6.2. Device List Parameters

There is a special parameter type called a device list. Device list parameters allow selection of any combination of related devices. The device list parameters are used for

- Selection of alarm relays selection for each alarm
- Alarm inputs' selection for external alarm groups

The device list selection screen can look like this:



In this example, relays 1 and 3 are selected as an output relays for the related alarm. The selection cursor is at Relay 3.

The device list shows all the possible devices for the selection. If you think that some devices are missing, check the device usages from the Inventory menu. Please note that the index numbers shown in the device list refer to device indices, not port indices.

The device list page is used as follows:

To toggle the state of a relay (On/Off), move the cursor over the relay and push the Selector.

To restore the default settings, move the cursor over the Use Defaults item and push the Selector.

To accept changes select the Accept item

To cancel your changes, press the Cancel button

If you press the Cancel button after changing device selections, the interface will ask you whether you want to accept or reject the changes.

5.7. Inventory

Under the Inventory menu you can find all of the modules and devices installed into the system. Many devices have device-specific configuration parameters, which can be modified from the Inventory menu only.

To make it easier to find the item a user is seeking, the inventory has three submenus, for different groupings of the devices and modules:

By Connection This submenu shows which modules are installed on each system bus.

By Module Type This submenu groups the modules according to their types (controllers, rectifiers, LVD modules, etc.).

By Function This submenu groups devices by their types.

The following sections should clarify this division further.

Every time you select a PowerCAN module from a module list, the LED for the module will blink in yellow. If you select a PowerCAN device from a device list, the LED for the module to which the device belongs will blink. This feature is provided to make it easier to know where a module is physically located.

The inventory lists only modules and devices that are present or that were present at some point since the controller was last powered up.

5.7.1. Locating Modules

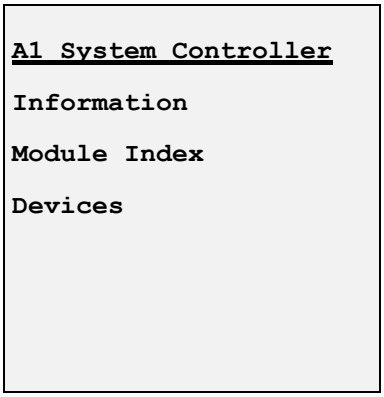
To find a specific module, you have two options:

Enter the `By Connection` submenu, select the bus to which the module is connected to, and select the module from the list

Enter the `By Module Type` submenu, select the type of module you are interested in, and select the module from the list

5.7.2. Module Information

After selecting a module from the Inventory menu, you will be presented with a screen like this:



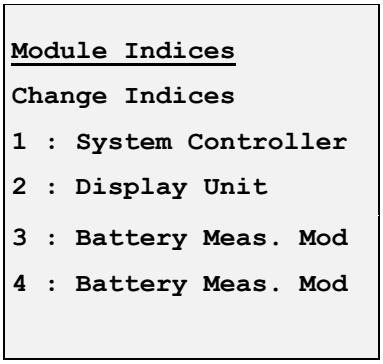
Here, `A1` is the module name, and `System Controller` is its type. The number 1 in the module name is the index number of the module. It can be changed from the Module Index page.

The module Information includes general information about the module, such as status, part number, serial number, and SW and HW versions.

By selecting the `Devices` item, you will be presented with a list of all devices provided by the module.

5.7.3. Changing Node Index

You will find the node index change page under each module entry in the inventory, by selecting the `Module Index` item.



This page allows you to change the index number of a module. For example, if you find that the index numbers of two Battery Measurement modules do not match with the numbering in the system schematics, you can change the module numbering here.

Please note that the module indices of the System Controller and Display Unit cannot be changed. The System Controller module is always A1, and the Display Unit is always A2.

Module numbers of rectifiers and inverters are changed at the device level (the Slot parameter), see Section 5.7.7 (Changing Device Index).

5.7.4. Locating devices

You have two options for location of devices:

Locate the module to which the device belongs to, and select `Devices`

Choose `by Function` submenu from the `Inventory` menu, then select the type of the device and locate the device from the list

Usually it is faster to use the second method. However, if you want to know what device is configured for a certain port of a specific module, you should use the first method.

The `By Function` submenu has the following device categories:

Rectifier Devices	Contains all rectifiers' modules.
Inverter Devices	Contains all inverter modules.
Bypass Devices	Contains all bypass modules.
Current Measurement	Contains all current measurement devices, i.e. current
Voltage Measurement	Contains all system and battery block/cell voltage measurement inputs.
Temperature Measurement	Contains all system and battery temperature measurement devices. These are either dedicated temperature measurements or Alarm/Temp inputs.

Alarm Input	Contains all alarm input devices. These are either dedicated alarm inputs or Alarm/Temp inputs.
Earth Fault Alarm	Contains all Earth Fault Alarm devices (usually only one).
Alarms Relays	Contains all the alarm relay devices.
Low Voltage Disconnect	Contains all Battery and Load LVD devices.

When you select a device category, a list of devices is shown. Example:

```
Alarm Devices
A1-pDT1: Ld Fuse Fl1.1
A1-pDT2: Bt Fuse Fb1.1
A1-pDT2: (Used as Temp
A1-pDT4: Ext Alarm Ai1
```

In this example there are four Alarm/Temp inputs, of which three are used as an alarm inputs and one is used as a temperature input.

The syntax of the device entries on the display is

<Module>-<Port>: <Type> <Device>

In other words, the part before the colon indicates the physical module and port of the device, and the part after the colon indicates the current configuration (usage and index) of the device.

5.7.5. Device Information

When you select a device in the inventory, a device information page is shown. The exact contents of the page depend on the type of the device: different devices have different configuration parameters.

To each device can be given a user defined name which describes the use of the device. For example a battery temperature input can be named like “Battery temp.”. Devices can be named only via Web or Terminal interfaces. If the Device Names parameter in the `System Parameters` is enabled, user defined names can be seen in the local interface instead of original device names (e.g. A1-pK1). If some device does not have an user defined name, the original device name will be used.

For example, if you enter the device page of an LVD device, the following information is shown:

```
A1 System Controller
LVD Control pK1
Module Information
Usage.........Ld. LVD
Load Group.........1
Contactor T..Latching
Control Mode..Voltage
```

The first row indicates the module to which the device belongs to.

The second row indicates the type and index of the port, i.e. the input or output connection of the module to which the device is assigned. If the Device Names parameter is enabled here is shown a name of this device

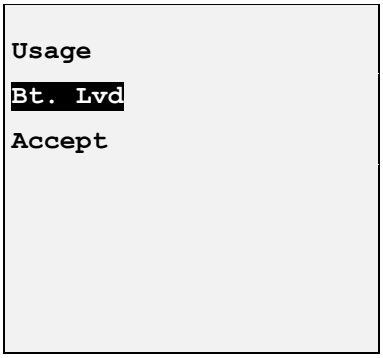
On third row, the device usage is shown. Device usage depends on device type. For LVD devices, the possible usages are as follows: Unused, Ld. LVD and Bt. LVD.

The rest are device- and usage-specific parameters and items. All the device-specific configuration parameters are described in Section 9 (Device Parameters)

The last item for LVD devices is `Test` (not shown in the above example). It can be used to test functionality of the LVD contactor (i.e. connect and disconnect the contactor). There is no Test item for measurement devices, but usually a measured value is shown if available.

5.7.6. Changing Device Usage

The usage of a device can be changed by selecting the `Usage` row on a device page. A page like this appears:



If a password is enabled, the user it will be prompted for it when trying to change the usage. When the usage text is blinking, it can be changed by rotating the Selector. To accept changes, push the Selector once (so that the text stops blinking) and select Accept. To cancel changes, press the Cancel button.

The new usage setting takes effect immediately after it is accepted.

5.7.7. Changing Device Index

Almost all devices have some kind of index number related to the device, which is presented with the device name. Different devices have different names for the related index number(s), but the idea is the same: an index number is required so that devices can be distinguished from each other, and so that the same device names appear in user interfaces, schematics and the real system hardware.

The following list has a few examples of what the index numbers are called for different device types:

Rectifiers	Slot
LVD	Load Group
Fuses	Fuse Group, Index
Alarm Relays	Index

To change the index of a device, go to the appropriate device page and select the Index item, i.e. push The Selector when the cursor is on the row indicating the index number. A page similar to the following appears:

```
Alarm
Change Index numbers
A1-pAT1: Ai1->Ai1
A1-pAT2: Ai2->Ai2
```

This shows index mapping of all external alarm inputs (only two inputs in this example): module and port names, original index and the current index number. Initially the original and the current indices are the same.

Let us assume you want to swap global indices of these external alarm inputs. You would first select the first input (at A1-pAT1). The row starts to blink and the module and port numbers are omitted. After changing the index to 2 using the Selector, the row would appear as

```
Ai1->Ai1
```

When done, push the Selector to confirm the change (press Cancel button to cancel). Then do the same for the second device, but set the index number to 1. The result should look like this:

```
Alarm
Change Index numbers
A1-pAT1: Ai1->Ai2
A1-pAT2: Ai2->Ai1
Restore previous
Accept
```

Now that the indices are correct, select Accept to confirm the changes.

If you want to start from the beginning, select Restore previous. Pressing the Cancel button will do the same thing, but it will also return you to the previous page.

5.7.8. Changing Device Attributes

As mentioned above, different devices have different sets of configuration parameters. An important aspect of device configuration is the device attributes. Device attributes are used to control the behaviour of the devices.

A simple example is the Polarity attribute for external alarm inputs. The attribute can have the following values:

NC (Normally Closed): The alarm is inactive when the connected circuit is closed and active when it is open.

NO (Normally Open) The alarm is active when the connected circuit is closed and inactive when it is open.

To change a device attribute, enter the appropriate device page and select the attribute you want to change. A device attribute page appears. The layout of the page is similar to that of the parameter page, and the usage is identical. See Section 5.6.1 (Parameter Page) for more information on changing the attribute values.

To see a list of the device attributes available for different device types, refer to Section 9 (Device Parameters)

5.8. Alarms

The `Alarms` submenu in the Main Menu contains all of the necessary tools to configure, monitor, and handle system alarms. The `Alarms` menu looks like this:

```
Alarms
Active alarms
Non-ack Alarms
All Alarms
Alarm Relays
Actions
Alarm Parameters
```

The following sections of this guide describe the functionality of each submenu.

5.8.1. Alarm Logs

Alarm events always have two important status flags associated with them:

Active — An alarm is active when at least one source (module, device, or system error) related to the alarm is active

Acknowledged — Initially, an alarm is initially not acknowledged. Acknowledgement is always done by the user. Some alarms, such as the Battery Test Alarm, are deactivated only after the user has acknowledged them.

The alarm events are listed in the three alarm log lists, according to their status. The following table shows how the status flags affect the visibility of alarms in the logs:

Alarm Log	Active	Acknowledged
Active Alarms	Yes	Yes or No
Non-Acknowledged Alarms	Yes or No	No
All Alarms	Yes or No	Yes or No

The LED in the user interface indicates the status of alarms. As long as there are active alarms, the LED will be red. If there are no active alarms but there is at least one non-acknowledged alarm, the LED will be blinking in green. The LED will be steady green only if there are no alarms (active or non-acknowledged).

5.8.2. Alarm Information and Acknowledgement

When the user selects an alarm from an alarm log list, the controller shows information about the alarm. The following example is for the Low System Voltage alarm:

```
Low System Voltage
Activated
 0h 29m 20s ago
Duration
 0h 15m 31s
Acknowledge
```

On VIDI+ the activation time is shown as calendar time. If the alarm is no longer active, the duration of the alarm condition is shown.

To acknowledge an alarm, select the Acknowledge item on an alarm information page.

5.8.3. Batch Actions on Alarm Masses

All non-acknowledged alarms can be acknowledged by selecting `Alarms • Actions • Acknowledge All`.

All non-active alarms can be deleted by selecting `Alarms • Actions • Clear All`.

5.8.4. Setting Alarm Parameters

There are two identical ways to access the alarm parameter menus from the local user interface, with identical effects:

1. `Alarms • Alarm Parameters`
2. `Parameters • Alarm Parameters`

All alarms have at least three parameters:

Enabled/Disabled Determines whether the alarm is enabled.

Delay Defines the activation delay for the alarm, to one-second precision. The range of the activation delay is one second to 99 minutes 59 seconds. Activation delays are used to filter out glitches and temporary problems that would not require operator intervention.

Relays List Each alarm can be routed to zero, one or more of the alarm output relays. In other words, the relays activated when the alarm is issued are selected from the Relays List page.

In addition to these, many alarms have additional parameters, such as activation thresholds.

5.8.5. Configuring Alarm Relays

As described in the previous section, the alarm relays related to an alarm are configured from the Alarm Parameters page. The different configuration options for alarm relays are presented in the Section 6.14. The instructions for working with a device list parameter are found in Section 5.6.2 (Device List Parameters).

To see which alarms are assigned to a certain relay, select the relay from the `Alarms • Alarm Relays` list. A page listing all the assigned alarms (if any) appears.

To test the operation of alarm relays without making any alarms active, enter the `Actions • Test Devices • Alarm Relays` page.

5.9. Actions

You can access most of the manual system operations and commands under the `Actions` menu.

5.9.1. Device Tests

`The Device Tests` page allows a user to test LVD contactors and alarm relays. After the state of a device is changed manually, it will remain under manual control until the user leaves the test page or a display time-out (about two minutes) occurs.

5.9.2. Manual Boost Charging

Boost charging allows faster charging of the batteries to full capacity. Refer to Section 4.3.2 (Boost Charge) for more information on boost charging.

Manual boost charging can be started from `Actions • Boost Charge • Start Manual Boost Charge`. If a boost charge mode is already active, it can be stopped here.

Certain alarms prevent the automatic and periodic boost charge modes from starting. These alarms must be acknowledged before manual boost charging can be started. However, the controller will inform the user of any such non-acknowledged alarms in the event that manual boost charging is attempted.

The maximum time limit for manual boost charging can be set from the `Actions • Boost Charge • Configure Parameters • Manual Boost Charge` menu. Please note that the same parameters can be accessed from the `Parameters • Charge Parameters` menu.

5.9.3. Manual Battery Tests

Starting and stopping of manual battery tests is similar to that of manual boost charging described in the previous section. Manual battery test operations can be accessed from the `Actions • Battery Tests` menu.

Refer to Section 4.3.4 (Battery Tests) for more information on battery tests in general.

5.9.4. Factory Parameters

Factory parameters are saved in the system after initial configuration of the system at the factory. The factory parameters include the correct voltage version, system nominal current and other parameters as requested in the original system order. Any parameter changes made by the end customer are usually not included in the factory parameters, unless factory parameters have been overwritten by the customer.

Factory parameters do not contain, or affect, any device-specific or module-specific configurations.

If you suspect that the integrity of the system parameters has been compromised, you can restore the factory parameters from the `Actions • Load Factory Params` menu. This operation requires entering the system password if it is not the default. After restoring the factory parameters, please check the correctness of all the important parameters.

Please note that restoration of the factory parameters cannot be undone.

It is also possible to save the current state of parameters as factory parameters. This can be accomplished from `Actions • Save Factory Params` menu, but the Expert Mode parameter in the System Parameters must be enabled for this menu to be visible. After the factory parameters have been rewritten, the original factory parameters will be lost.

5.9.5. Restarting Controller

In some rare cases it may be necessary to restart the system controller. Restarting the controller does not affect to the system parameter or device settings.

Restarting the controller does not interrupt the power supply from the rectifiers. However, in use of a non-latching LVD contactor connected directly to the system controller module, the contactor will be disconnected for a short time. Also the alarm relays will be activated for a while.

The controller can be restarted from `Actions • Restart Controller`.

5.9.6. Reset Battery Discharge

If the battery discharge log is wanted to be cleared, it can be done by selecting `Actions • Clear Batt. Disc.`

5.9.7. Clear All Data

All system data can be cleared from the `Actions • Clear All Data` menu. This clears all parameters, device configurations and log data from all system modules. After this action the VIDI+ controller asks user to set system parameters and device configurations.

5.10. Common Tasks

This section contains instructions for accomplishing some commonly required tasks.

5.10.1. Setting the Low Voltage Alarm Limit

1. Go to the `Parameters • Alarm Parameters • System Alarms • Low System Voltage • Low SysV Limit` page
2. Enter the new voltage limit
3. Select Accept
4. You are done!

5.10.2. Setting LVD Pickup and Disconnect Parameters

There are multiple sets of LVD parameters:

Load LVD Defaults	Defines the default parameters for all load LVD devices. When you change a default parameter, the controller will prompt you on changing the corresponding parameter for all load LVD devices to the new default.
Battery LVD Defaults	Similar to Load LVD Defaults, but applies to all battery LVDs.

Device-Specific Each LVD device has its own set of parameters which can be set individually.

Usually, it is recommended to change the device-specific LVD parameters directly:

1. Locate the LVD device - for example, go to `Inventory • By Function • Low Voltage Disconnect` and select the correct LVD device
2. Select the parameter you want to change
3. Enter the new value
4. Select Accept
5. You are Done

5.10.3. Setting the Battery Charge Current Limit

See Section 4.3.3 (Battery Charge Current Limiting) for description of battery charge current limitation feature.

To enable and set the system-wide charge current limit:

1. Enter the `Parameters • Charge Parameters • Charge Current Control` menu
2. Set the `Charge Current Limit` parameter to the correct value
3. Make sure the `Enabled/Disabled` parameter is set to `Enabled`

To set the charge current limit for a specific current measurement device (i.e. to limit the charge current of a specific battery string):

1. Locate the battery current measurement device from the Inventory, for example, go to `Inventory • By Function • Current Measurement` and select the correct device from the list
2. Select the `Charge Limit` parameter and push the Selector on it
3. Specify the new value and select Accept

Please note that for device-specific charge current limitation to work, the system-wide charge current limiting must have been enabled in the system charge parameters.

5.10.4. Changing Start Times of Periodic Tasks

Periodic boost charge and periodic battery testing can be configured to start a certain number of times per year. These numbers can be changed in the parameters menu.

By contrast, the next start time of these operations can be checked and changed from the actions menu: `Actions • Boost Charge • Periodic Start Time` for periodic boost charge and `Actions • Battery Tests • Periodic Start Time` for periodic battery test.

5.10.5. Setting the Earth Fault Detection Threshold

Earth fault detection works by measuring leak resistance from the system DC bus bar (both positive and negative) to protective earth of the system (the PE ground). If the leak resistance is below the selected alarm threshold, the Earth Fault alarm is activated. The alarm shows whether a leakage is between the system plus (Earth Fault: +Rail) or minus (Earth Fault: -Rail) bus par and the PE ground.

The activation delay time for the Earth Fault alarm should be at least 10 seconds. If a smaller delay is used, the risk of false alarms during system voltage transitions increases.

1. Enter the `Parameters • Alarm Parameters • System Alarms • Earth Fault` menu.
2. Make sure the `Enabled/Disabled` parameter is set to `Enabled`.
3. Check the alarm activation Delay time.
4. Select the `Threshold` parameter and choose a leak resistance threshold: 100 kOhm, 500 kOhm or 1 MOhm.

It is recommended to test the Earth Fault alarm after any changes to the alarm parameters. Testing can be done by connecting a properly selected resistor between a DC bus bar (first positive and then negative pole, but not both at the same time) and PE. However, there can be a risk of electric shock when one performs such a test, so proper electrical work procedures must be followed!

For the Earth Fault alarm to function properly, the VIDI+ system control module must have an I/O card installed (a factory-installed option), and an Earth Fault Alarm device must have been configured and enabled. The device, if it is available, can be found via from Inventory • By Function • Earth Fault Alarm.

5.10.6. Removing Obsolete Modules from Inventory

As described in Section 4.2.4 (Inventory Limit) the inventory database of the VIDI+ controller contains both present and old (removed) modules.

It is recommended that, after permanently removing modules from the system, you free the internal resources allocated for those modules in the VIDI+ controller. This can be accomplished from the inventory menu: `Inventory • Remove Missing Modules.` The operation removes information about all devices not currently present in the system.

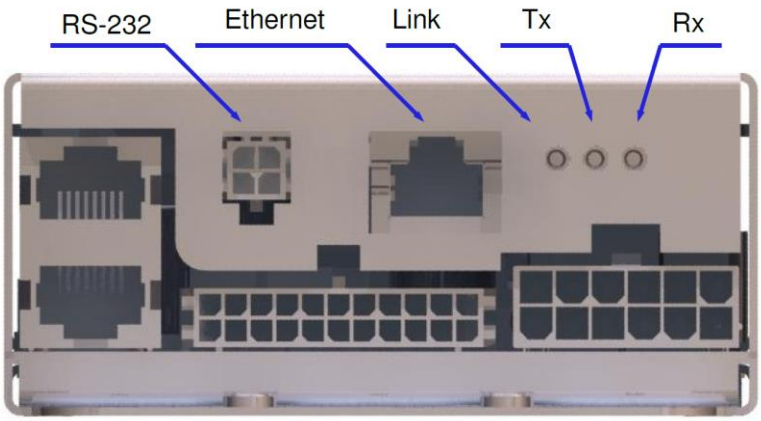
If a module has been removed from a system but the Remove Missing Modules action has not been performed, the Communication Error alarm is active. By selecting this alarm can be seen more detailed information from the alarm source and the activation time. The alarm is not deactivated although it is acknowledged. To deactivate the alarm perform the action Remove Missing Modules.

5.11. Menu Structure

A diagram in the appendix A illustrates the local user interface menu hierarchy in a simplified form. Dynamic menu structures have been omitted. Parameter and alarm parameter submenus are presented in the appendices B and C

6. REMOTE INTERFACES

6.1. Introduction



The VIDI+ provides two hardware ports for remote connections:

- RS-232
- 10/100 Mbps Ethernet

Both ports are isolated. The three LEDs to the right of the RJ-45 connector are the status indicators for the Ethernet port. The following user interfaces are accessible via the remote connection ports:

- TCP/IP configuration utility (Ethernet only)
- Web interface (Ethernet only)
- Terminal interface

The following protocols, using TCP/IP Protocols are supported:

HTTP/HTTPS	Web interface
Telnet/SSH	Terminal interface
SNMP	Get, Set, Trap, Inform. v1, v2c, v3.
SMTP	Alarm e-mail sending
NTP	Time synchronization
DHCP	Automatic TCP/IP configuration

The following sections describe these interfaces and protocols in more depth.

6.2. RS-232 Port

The VIDI+ has a four-pin Molex Micro-Fit™ connector which provides the connection for the isolated RS-232 port. There is an adapter cord available from Efore that provides the standard D9 serial port connector. The adapter cord is an optional item and should be requested explicitly in OPUS system orders if required.

The default communication settings for the RS-232 port are:

Baud rate	115200 bps
Data bits	8
Parity	None
Stop bits	1

Flow control Off

Baud rate, parity and stop bits settings are included in the VIDI+ communication parameters group and can be modified. These parameters are accessible through all user interfaces.

The RS-232 port provides the same text-based user interface as the SSH and Telnet protocols provide for the Ethernet connection. See Section 6.6 (Terminal Interface) for more information.

Most terminal program can be used to use the terminal interface. However, the following terminal programs have been tested to work:

- Microsoft® HyperTerminal
- PuTTY
- Minicom

6.3. Ethernet port

A standard RJ-45 modular jack connector is used for Ethernet connection.

Similar RJ-45 connectors are also used for other system busses such as the PowerCAN bus. Connecting Ethernet cable into PowerCAN connector (or vice versa) shouldn't do any damage, but may disrupt communications in both busses for as long as the cable is connected.

Efore takes no responsibility whatsoever of any damages or problems caused by wrong connections.

Connecting to a VIDI+ system via an Ethernet port requires that the system has a valid TCP/IP configuration. There are several ways to set up the configuration:

1. Configuration via local interface (Parameters • Communication Parameters)
2. Configuration via RS-232 terminal interface
3. Using the TCP/IP Configuration Utility

In addition to manual configuration, the VIDI+ can obtain the TCP/IP configuration by using the DHCP protocol. This requires a DHCP server to be available in the local Ethernet subnet. DHCP functionality is enabled by default. When enabled, the current TCP/IP configuration can be seen by inspecting the related configuration parameters, or using the TCP/IP configuration utility.

There are two ways to make a connection from a PC to the VIDI+:

1. Connect both PC and VIDI+ to an Ethernet hub or switch (possibly via an office or site network).
2. Connect the PC directly to the VIDI+ by means of a cross-connected Ethernet cable.

6.3.1. Indirect Connection

It is termed an indirect connection when the VIDI+ is connected to an office or site network via an Ethernet switch or hub. In this configuration all TCP/IP features of VIDI+ can be used. This it is the recommended approach unless there are security concerns.

Efore strongly recommends that a VIDI+ controller of an OPUS system is never connected directly to the public internet. Although data security is one of the main priorities in VIDI+ controller design, there is no systematic process in place to keep security patches of the installed VIDI+ controller up-to-date.
Efore takes no responsibility whatsoever of any damages caused by security breaches to VIDI+ controllers.

6.3.2. Direct Connection

To connect a PC directly to the VIDI+, you must use a cross-connected Ethernet cable. A normal straight-connected cable used to connect a PC to an Ethernet hub or switch will not work.

If the PC normally uses DHCP to obtain its TCP/IP configuration, a DHCP lease may expire while the PC is connected to the VIDI+, causing the TCP/IP configuration of the PC to change. To prevent this, always use a static IP address for the PC when connecting directly to the VIDI+.

If unsure of which static IP address to use for the PC for direct connection, you may try the following:

IP address 192.168.200.1

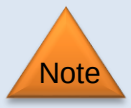
Netmask 255.255.255.0

Assuming the previous configuration for the PC, the following configuration can be used for the VIDI+:

IP address 192.168.200.2

Netmask 255.255.255.0

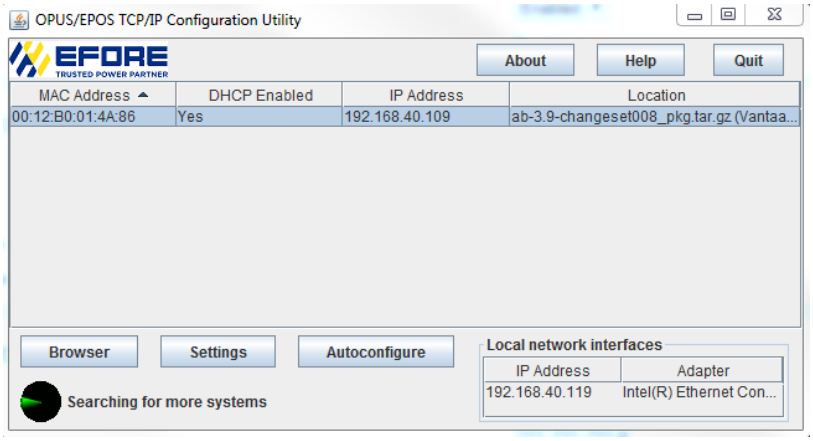
A gateway and DNS servers are not necessary for either PC or the VIDI+ in the direct connection method.



When connecting to VIDI+ using a web browser in direct connection method, make sure the browser does not have any web proxies enabled. In direct connection these web proxies would be no longer reachable by the PC, preventing the web connection.

6.4. TCP/IP Configuration Utility

TCP/IP configuration utility is a Java™-based PC tool that can be used to locate and configure Ethernet-enabled EPOS/OPUS systems in the local Ethernet subnet.



The main window of the utility looks like the image above.

The utility has an online help system, so only a few major points are explained here.

6.4.1. Locating the Systems in the Network

The configuration utility starts to scan for any compatible EPOS/OPUS system upon startup, and it keeps scanning as long as the utility is running.

To configure a system or to connect to it, first select the system from the list. There are three actions that can be performed:

Browser Connect to a system by means of the default Web browser program. The TCP/IP settings must have been set properly before the browser can be used.

Settings Opens a dialog that can be used to configure the system manually, or to enable DHCP so that the system can obtain TCP/IP configuration automatically from the DCHP server. Also, text specifying the location of the system can be set manually.

Autoconfigure When the PC is connected directly to the system via a cross-connected Ethernet cable, Autoconfigure can be used to configure the IP details of the EPOS/OPUS system automatically. Please note that this has nothing to do with DHCP configuration, and the DHCP client should be disabled from the PC before this.

If the utility does now show a system as expected, consider the following points:

- Only systems in the same subnet can be found. An Ethernet subnet usually covers all of the Ethernet nodes connected with switches or hubs, but does not extend over routers, gateways or firewalls.
- If the utility does not show any systems, it might be that there is a firewall software installed on the PC that is blocking the scan queries. The utility communicates with the EPOS/OPUS systems by using UDP broadcast packets on port 51111.
- Version 1.0 of the Configuration Utility supports only ESC-MA.48 controller of the EPOS Mini systems.
- Version 1.1 of the Configuration Utility supports ESC-MA.48 controller of EPOS Mini systems and VIDI+ controller of OPUS systems.

6.5. Web Interface

6.5.1. Introduction

The web interface can be accessed using any HTML 4.01 standards-conforming Web browser, such as:

- Mozilla Firefox, tested with versions 2 and 3
- Mozilla SeaMonkey, tested with version 1.7
- Microsoft Internet Explorer, tested with version 5 and 6

Both HTTP and HTTPS (HTTP over SSL) protocols are supported. The URLs for the VIDI+ Web interface are:

HTTP http://ip.address/

HTTPS https://ip.address/

The ip.address is the numeric or literal IP address of the VIDI+. See Section 6.3 (Ethernet port) for more information on how to configure and determine IP address of the VIDI+.

When connecting to the web interface of VIDI+ using HTTPS, your browser may complain about an untrusted certificate. This happens because VIDI+ self-signs the SSL certificates it uses for secure connections. It is safe to trust the certificate, and it is recommended to allow the browser to remember the certificate permanently.

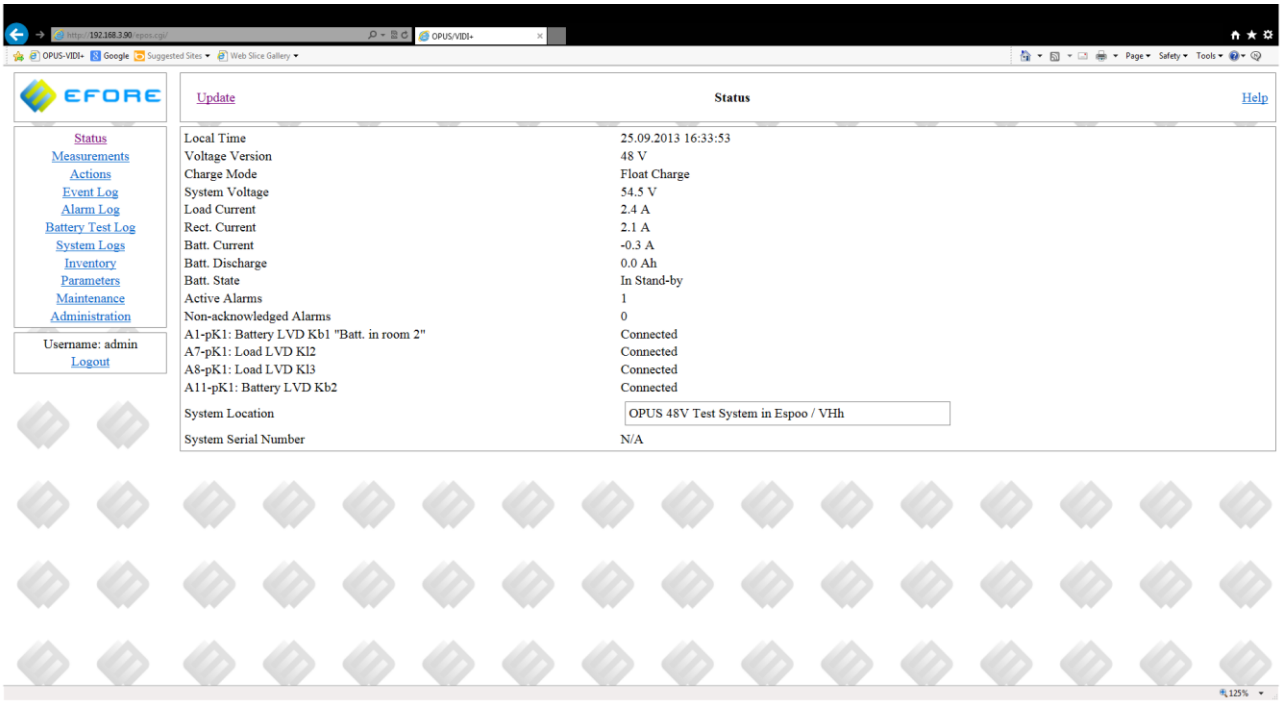
6.5.2. Login

The web interface session must be started by logging in. The login screen asks for user name and password. See Section 6.8 (User Levels) for more information on user levels and passwords. It is also possible to select the language for the session from the login screen. The available depend on the version of the VIDI+ software.

Only one user can be logged in at a time, this includes usage of the local user interface. When there is a remote user logged in, the local user interface returns to the main display and indicates that a remote user has logged in. No actions are possible from the local user interface during a remote login session.

6.5.3. Usage

Normally, after a successful login, the following page appears:



Almost all Web interface pages have the same basic layout. On the left is a menu frame that can be used to select the content page. On the right, there is a header frame at the top, with the content frame below that.

The header frame usually have Update and Help links. Update link refreshes the currently visible page. Opening the Help link shows a help page related to the current page. The help pages are the primary source of detailed help information regarding the web interface, and the information provided on the help pages is not replicated in this manual.

It is always recommended to use the Update link instead of the refresh button of the web browser. On some pages pressing the refresh button will not result in the expected behaviour, because the browser does not have enough information to request update of the page in a correct way.

On many pages there is also a footer frame with a Back link. Following the Back link returns the user to the previous page. On some pages, this has a different effect than pressing the Back button of the browser.

After you have finished using the web interface, it is always a good idea to log out. If the web interface is not accessed for 10 minutes, the session will be automatically ended and the user will be logged out.

6.5.4. Structure

Almost all operations found via the local interface are also available on the Web interface. The Web interface also provides some advanced features such as uploading and downloading of the system parameters and performing the system firmware updates.

Below is a brief description of information that can be found on each Web interface page:

Status	Shows status information for the system at a glance.
Measurements	Detailed information about various system measurements and alarm inputs.
Actions	Option to start and stop battery test, boost charging and clear the battery Ah counter.
Event Log	A log of various system events.
Alarm Log	The alarm log.
Battery Test Log	A display of all completed and ongoing battery tests.
System Logs	Logs of battery discharge, battery temperature and system output power.
Inventory	Module and device inventory for the system, shown in a tree-like structure. All device- and module-specific configurations and measurements are also accessible via the Inventory menu.
Parameters	System parameters, including alarm matrix configuration.
Maintenance	Certain maintenance testing operations.
Administration	Various administrative actions, such as changing of the date and time, management of passwords, system location text, loading of factory default parameters, and performing system firmware updates.

6.6. Terminal Interface

The terminal interface can be accessed with the Telnet and SSH protocols via an Ethernet port and by means of terminal software via RS-232.

6.6.1. Telnet

Telnet is an unencrypted terminal protocol for TCP/IP. Unencrypted means that all packets, including password data, are transmitted in clear-text form.

To connect to a VIDI+ via Telnet, start a telnet program and open a connection to the IP address of the VIDI+.

6.6.2. SSH

The SSH (Secure Shell) protocol is indented as a secure replacement for Telnet. All messages are transmitted in encrypted form.

On the first SSH connection from any given PC to a certain VIDI+ controller, the SSH program is likely to warn about unknown peer. This is normal, as each VIDI+ controller generates a new SSH server certificate upon the first start-up.

6.6.3. RS-232

See Section Section 6.2 (RS-232 Port) for more information on using the RS-232 port.

To start a terminal session, open a terminal program, select an appropriate serial port and make sure the serial settings are OK, then press Enter several (3-10) times until a `Login:` prompt appears.

If possible, use VT100 terminal emulation mode.

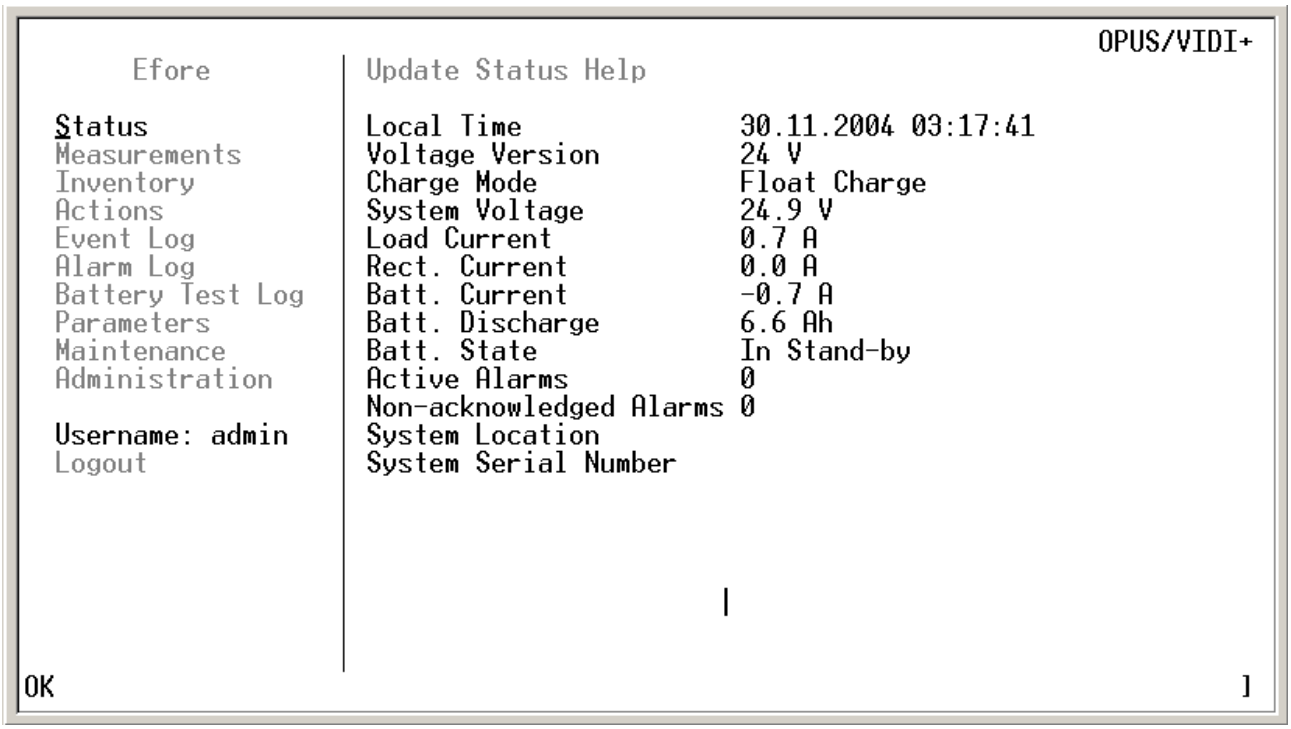
6.6.4. Login

A remote interface username and password is required for login. See Section 6.8 (User Levels) for more information on this matter.

6.6.5. Usage

The terminal interface is actually a text-based version of the Web interface. All the pages of the web interface are available from the terminal interface, too. However, because of the limited capacity of the terminal display, some pages may not be as user-friendly as on the Web interface. For this reason, it is always recommended to use the Web interface whenever possible.

The following image is a screenshot from the terminal interface window:



Just as in the Web interface, there are two frames: the menu frame on the left and the content frame on the right. The following key bindings are available:

Up/down arrow	Move cursor up/down
Left/right arrow	Move back/forward in page history (Left = Back)
Tab	Switch between left (menu) and right (content) frames
Enter	Open (follow) a link ; choose the selected value
Esc	Open/close the menu
q	Quit (logout)
u	Update current page (refresh)
ctrl-L	Redraw the whole terminal screen

f	Show only current frame
/	Search
n	Search for next
.	Toggle link numbering on/off

6.6.6. Uploading/Downloading Files

Files can be uploaded and downloaded via the RS-232 interface. File transfer is not supported on Telnet and SSH interfaces.

The following file transfer protocols are supported:

xmodem Very simple protocol supported by almost all common terminal programs.

zmodem More advanced file transfer protocol. Better error handling capabilities and automatic activation on file upload and download. This is the default protocol used by VIDI+.

The protocol can be changed from the Setup • Modem connection options menu (activate the menu by pressing the Esc key).

Example: downloading a parameters XML file

1. Use the menu frame to open the Parameters page.
2. Press Tab to switch to the right frame.
3. Move the cursor to the link titled params.xml under the text Download System Parameter File
4. Press Enter.
5. In some versions, a file name prompt appears. Just press Enter.
6. A dialog appears:
   Download will start automatically...
7. Press OK.
8. Depending on your terminal program, the download may or may not start automatically. If it does not, start the download manually. Refer to documentation of the terminal program if necessary.
9. A file called params.xml should be available on your computer. If the terminal program didn't prompt for download location, look for the file in the current work directory (which may be C:\).

Example: uploading a parameters XML file

10. Use the menu frame to open the Parameters page.
11. Press tab to switch to the right frame.
12. Move the cursor over the text field (empty underlined row) under the text Upload System Parameter File.
13. Press Enter.
14. Write a parameter file name (e.g. params.xml).
15. Press Enter.
16. Move the cursor to the link titled [Upload]

17. Press Enter
18. A dialog prompting you to start the upload appears.
19. Start the upload from your terminal program. Select from the menu Transfer\Send File. Select the file to be uploaded and choose the used protocol. Press Send.
20. The VIDI+ checks the upload parameters, and prompts for accepting the changes. Note that uploading parameters may affect depending parameters, too.

6.6.7. Changing Parameters

To change the value of a parameter in the terminal interface, follow these steps:

1. Open the Parameters page in the menu frame.
2. Press Tab to switch to the right frame.
3. Navigate in the Parameters page until you find the parameter to be modified.
4. Move the cursor to the `Current value` field.
5. Press Enter to start editing the value. You can use the left and right arrow keys to move the cursor to the text field. Press the down arrow key when finished. Do not press Enter, as that cancels the changes.
6. Move the cursor over the [Apply] button and press Enter.

6.7. IEC61850 SCADA and Profibus adapters

There are adapters available to support other typical communication protocols. IEC61850 SCADA and PROFIBUS adapters are commercial PLC units from WAGO. Communication between VIDI and the WAGO unit is managed via Modbus. See separate manual or datasheet of the adapter for further details.

6.8. User Levels

There are three user levels available for remote interfaces of VIDI+:

User	Read-only access
Power	Access to basic maintenance actions
Admin	Full access

Each user level has a password. The default passwords are

User	1000
Power	2000
Admin	3000

It is highly recommended to change these passwords to non-default values. However, it is also recommended to write down the new passwords and store them in a safe place. Only authorised Efore service personnel have the knowledge and tools to reset lost passwords.

Remote user interface passwords are not related to the local user interface password in any way.

The following table shows the actions that are possible for the three user levels:

Action	User	Power	Admin	Notes
Clear Alarm Log		•	•	
Clear Event Log			•	
Clear Battery Logs		•	•	
Clear System Logs		•	•	
Clear PCL Settings		•	•	
Restore Factory Defaults			•	
Save Factory Defaults			•	(1)
Remove Missing Modules		•	•	
Clear Inventory Database			•	(1)
Factory Reset (Clear All)			•	(1)
Restart Control Unit		•	•	
Start MBT		•	•	
Start MBC		•	•	
Stop BT		•	•	
Stop BC		•	•	
Clear Battery Ah counter		•	•	
Modify System Parameters			•	
Modify Inventory Parameters			•	
Perform Maintenance Operations		•	•	
Clear Alarms		•	•	
Clear Events			•	
Acknowledge Alarms		•	•	
Set Location/Serial Number Text		•	•	
Set Date/Time		•	•	
Perform Firmware Update			•	
Download Parameter File	•	•	•	
Upload Parameter File			•	
Download Inventory Database File	•	•	•	
Upload Inventory Database File			•	
Download Configurable Logic Settings File	•	•	•	
Upload Configurable Logic Settings File			•	
Download MIB File	•	•	•	
Export Event Log	•	•	•	
Export Alarm Log	•	•	•	
Export Battery test Data	•	•	•	

Action	User	Power	Admin	Notes
Export System Logs	•	•	•	

(1) Expert Mode required

6.9. Controller Network Security

All remote connections for VIDI controller can be separately enabled or disabled. See section 8.2.9 (Network Services). In Network Services menu the support for SSH, Telnet, HTTP, HTTPS, Modbus, SNMP and UDP Listener can be separately enabled or disabled. There is separate possibility to allow/disallow remote configuration by UDP Listener with a dedicated option.

SHA1-passwords are supported when the passwords are changed. Minimum length of a password is 8 characters. SHA1 passwords are supported system-wide.

Event log shows origin IP and username. Root logins are completely disabled and disabling is enforced on every reboot.

The webserver used offers also hardening by operating on strict whitelist-based file read policy, making it hard to launch file-inclusion-based and related attacks against the system.

6.10. SNMP communication

VIDI+ controller supports SNMP (Simple Network Management Protocol) version 1, 2c and 3 functionality. SNMP traps are UDP datagrams (packets) that are sent to an appropriately configured NMS (network management station).

An SNMP MIB file called EFORE-MIB.TXT or EFORE.MIB , provided by Efore, can be used with the NMS software for proper decoding of SNMP traps sent by the VIDI+.

VIDI+ controller (firmware v2.9 upwards) supports SNMP v1, v2c, v3 for SET, GET, GETNEXT, GETBULK, traps and informs for issuing communications. Basic measurements (read-only) and the alarm log table (read-only) are available. The only writable object is the operation state. It can be used to launch manual battery test, or boost charge. Additionally all SNMPv2-MIB basic OIDs (sysDescr, sysObjectID, sysUpTime, sysContact, sysName, sysLocation, sysServices) have been implemented as readable object instances.

VIDI+ controllers with firmware upto v2.8 supports only SNMP v2c traps. Due to SNMP functionality differences with different versions of the firmware, it is recommended to use latest version of VIDI+ firmware in the controllers and latest version of EFORE-MIB file in the NMS manager.

Alarm trap When alarm traps are enabled, one alarm trap is sent per alarm event. Sending can be configured to occur on alarm state changes (activation, acknowledgement, or deactivation) or at specified intervals when an alarm is in a certain state or certain states. Alarm traps contain information on the alarm code, alarm message, activation time, duration, and alarm relays

Inform trap Alarm trap with reply request.

6.10.1. Communication parameters

SNMP communication parameters are set from web user interface with administration access rights.

Table 1 SNMP communication related parameters

Web interface path	Parameter	Description
Parameters -> Communication Parameters -> SNMP Settings	*Community*	255 characters
	Engine ID	SNMP v3 engine id (empty=use MAC)
	Username	8-255 characters
	Security Level	noAuthNoPriv,authNoPriv,authPriv
	Authentication Algorithm	MD5, SHA
	Authentication Password	8-255 characters
	Encryption Algorithm	DES, AES
	Encryption Password	8-255 characters
	Write support	yes, no
	Trap type	v2c, v3, v3inform
	Network Management Station	IP address
	Trigger	Disabled, Active, NonAck, Both,Always
	Period	SNMP traps sending period
	Send Overview	Disabled, Enabled

Note: See the minimum 8 character requirement with user-definable passwords. The SNMP engine won't work with too short passwords

6.10.2. EFORE-MIB OID presentation

Table below presents the EFORE-MIB objects with corresponding enterprise OID values.

Table 2 EFORE-MIB OID presentation

EFORE-MIB:: objects	*Enterprise OID*	*Remarks*
Efore	enterprises.26896	
eforeSystems	enterprises.26896.1	
Vidi	enterprises.26896.1.1	
vidiAlarmTrap	enterprises.26896.1.1.10	
vidiAlarmsOverviewTrap	enterprises.26896.1.1.11	
vidiAlarmId	enterprises.26896.1.1.100	
vidiAlarmMessage	enterprises.26896.1.1.101	
vidiAlarmCode	enterprises.26896.1.1.102	
vidiAlarmState	enterprises.26896.1.1.103	
vidiAlarmAckState	enterprises.26896.1.1.104	
vidiAlarmStartTime	enterprises.26896.1.1.105	
vidiAlarmDuration	enterprises.26896.1.1.106	
vidiNumActiveAlarms	enterprises.26896.1.1.110	
vidiNumNonAckAlarms	enterprises.26896.1.1.111	
vidiAlarmRelays	enterprises.26896.1.1.112	
batteryControllerOperation	enterprises.26896.1.2	
bcoChargeState	enterprises.26896.1.2.1	
bcoTemperatureCompensation	enterprises.26896.1.2.2	
bcoTestMode	enterprises.26896.1.2.3	
bcoBoostChargeMode	enterprises.26896.1.2.4	
batteryControllerMeasurement	enterprises.26896.1.3	
bcmSystemVoltage	enterprises.26896.1.3.1	
bcmLoadCurrent	enterprises.26896.1.3.2	
bcmBatteryCurrent	enterprises.26896.1.3.3	
bcmTotalRectifierCurrent	enterprises.26896.1.3.4	
bcmTotalInverterCurrent	enterprises.26896.1.3.5	
bcmMaxBatteryTemperature	enterprises.26896.1.3.6	
bcmMaxSystemTemperature	enterprises.26896.1.3.7	
bcmMidpointVoltage	enterprises.26896.1.3.8	(since AB 3.9)
bcmPhase1RectifierInputVoltage	enterprises.26896.1.3.9	(since AB 3.9)
bcmPhase2RectifierInputVoltage	enterprises.26896.1.3.10	(since AB 3.9)
bcmPhase3RectifierInputVoltage	enterprises.26896.1.3.11	(since AB 3.9)
batteryControllerAlarm	enterprises.26896.1.4	
bcaAlarmTable	enterprises.26896.1.4.1	
bcaAlarmEntry	enterprises.26896.1.4.1.1	
bcaAlarmSerial	enterprises.26896.1.4.1.1.1	
bcaAlarmType	enterprises.26896.1.4.1.1.2	
bcaAlarmActive	enterprises.26896.1.4.1.1.3	
bcaAlarmAcknowledged	enterprises.26896.1.4.1.1.4	
bcaAlarmActivateTime	enterprises.26896.1.4.1.1.5	
bcaAlarmDuration	enterprises.26896.1.4.1.1.6	

bcaAlarmSources	enterprises.26896.1.4.1.1.7	
eforeProducts	enterprises.26896.2	
eforeEposAcu	enterprises.26896.2.1	
eforeOpusVidi	enterprises.26896.2.2	

6.10.3. Object groups and alarm types

Table 3 specifies object groups, which can be retrieved, including 'sysLocation' object. Objects related to group (1) are grouped under object name 'vidi'. Objects related to group (2) are grouped under object name 'batteryControllerOperation'. Objects related to group (3) are grouped under object name 'batteryControllerMeasurement'. Objects related to group (4) are grouped under object name 'bcaAlarmTable'. Object group 'bcaAlarmTable' is dynamic and is not generated if web interface 'Alarm log' is empty. These objects are column objects as part of table implementation. The value (N) is the row index number in the web interface 'Alarm log' presentation. Table column member can be pointed with integer (N), starting from number one.

Table 3 Object groups

SNMPv2-MIB::		Type	R/W	Description
sysDescr.0		DisplayString		Declaration of the controller type and software version
sysObjectID.0		OBJECT IDENTIFIER		Always enterprises.26896.2.2 / 1.3.6.1.4.1.26896.2.2 signifying eforeOpusVidi
sysUpTime.0		TimeTicks		Amount of hundredths of seconds since the SNMP subsystem was last started.
sysContact.0		DisplayString		User definable thru web interface, from SNMP parameters
sysName.0		DisplayString		User definable thru web interface, from SNMP parameters
sysLocation.0		DisplayString		User definable thru web interface
sysServices.0		INTEGER		72 (hos offering applications)
EFORE-MIB::		**Type**	**R/W**	**Description**
1)	vidiNumActiveAlarms.0	INTEGER	R	Number of currently active alarms
	vidiNumNonAckAlarms.0	INTEGER	R	Number of currently non-acknowledged alarms
	vidiAlarmRelays.0	INTEGER	R	Bitfield indicating activated alarm relays
2)	bcoChargeState.0	INTEGER	R/W	floatCharge(1)/batteryTest(2)/boostCharge (3)
	bcoTemperatureCompensation.0	INTEGER	R	true(1)/false(2)
	bcoTestMode.0	INTEGER	R	off(1)/periodic(2)/manual(3)/natural(4)/remote(5)/ bconnection(6) (bconnection since AB 3.8)
	bcoBoostChargeMode.0	INTEGER	R	off(1)/automatic(2)/periodic(3)/manual(4)/remote(5)
3)	bcmSystemVoltage.0	INTEGER	R	System voltage in milliunits
	bcmLoadCurrent.0	INTEGER	R	Load current in milliunits
	bcmBatteryCurrent.0	INTEGER	R	Battery current in milliunits
	bcmTotalRectifierCurrent.0	INTEGER	R	Total rectifier current in milliunits
	bcmMaxBatteryTemperature.0	INTEGER	R	Maximum battery temperature in milliunits
	bcmMaxSystemTemperature.0	INTEGER	R	Maximum system temperature in milliunits
	bcmMidpointVoltage.0	INTEGER	R	Midpoint voltage in milliunits (since AB 4.0)

	bcmPhase1RectifierInputVoltage.0	INTEGER	R	Rectifier phase 1 input AC voltage (since AB 3.9)
	bcmPhase2RectifierInputVoltage.0	INTEGER	R	Rectifier phase 2 input AC voltage (since AB 3.9)
	bcmPhase3RectifierInputVoltage.0	INTEGER	R	Rectifier phase 3 input AC voltage (since AB 3.9)
4)	bcaAlarmType.N	INTEGER	R	See AlarmTypeTC definitions
	bcaAlarmActive.N	INTEGER	R	true(1)/false(2)
	bcaAlarmAcknowledged.N	INTEGER	R	true(1)/false(2)
	bcaAlarmActivateTime.N	DateAndTime	R	Time when the alarm was activated
	bcaAlarmDuration.N	TimeInterval	R	Time how long the alarm has been active
	bcaAlarmSources.N	DisplayString	R	Textual description of alarm source(s)

The ‘bcaAlarmTable’ group (4) represents the web interface ‘Alarm log’ information. If the user is only interested about the active alarms, the ‘bcaAlarmActive’ column should be investigated as whole. If the ‘bcaAlarmActive.N’ column member has value ‘true(1)’, this row index value (N) should be mapped with other corresponding table members with equal row index value (N). See the example below related to table 8 and table 9. If the mapping operation is problem for the SNMP management station software, the issue can be avoided with proper alarm mappings for relays. By investigating the ‘vidiAlarmRelays’ object, user defined bit mapped active alarms will be received.

All the possible alarms related to Table 8 object row index ‘bcaAlarmType.N’, can be found from the table below.

Table 4 AlarmTC enumerations

AlarmTC enumerations	
unspecifiedAlarm (1)	rectifierOverVoltage(112)
mainsFault (2)	rectifierOverTemperature(113)
phaseFault(3)	rectifierMainsFault(114)
lowSystemVoltage(4)	rectifierWrongVoltage(115)
highSystemVoltage(5)	inverterSystemFault(121)
floatChargeDeviation(6)	lowSystemVoltageWarn(8)
inverterSystemMainsFault(7)	inverterFault(122)
highSystemVoltageWarn(9)	bypassFault(123)
earthFault(21)	batteryBlockLowVoltage(131)
loadFuseFault(22)	batteryBlockHighVoltage(132)
batteryFuseFault(23)	batteryStringAsymmetry(133)
rectifierOverload(24)	automaticBoostChargeFault(134)
inverterOverload(25)	batteryTestFault(135)
busFault(26)	batteryOverTemperature(136)
dcpBusFault(27)	noBatteryTemperatureSensor(137)
shuntFault(28)	batteryTemperatureSensorFault(138)
systemOverTemperature(29)	batteryLifetimeWarning(140)
batteryConnectionTestFault(139)	midpointVoltageDeviation(141) (since AB 3.9)
noSystemTemperatureSensor(30)	loadLvdDisconnectWarning(201)
boostChargeActive(41)	loadLvdDisconnectImminent(202)
configurationConflict(42)	batteryLvdDisconnectWarning(203)
inventoryFull(43)	batteryLvdDisconnectImminent(204)
communicationError(101)	contactorFault(205)
nvramFault(102)	externalAlarmGroup1(301)
configFault(103)	externalAlarmGroup2(302)
moduleFault(104)	externalAlarmGroup3(304)
badFirmware(105)	externalAlarmGroup4(305)
rectifierFault(111)	

Example:

Web interface presentation for ‘Alarm log’ contains following information resulted from simulated “mainsFault” alarm. Alarm called “lowSystemVoltage” is the result as the battery drains out and the voltage reaches the user definable threshold level.

index	Type	Active	Acknowledged	ActivationTime	Duration	Sources
2	*lowSystemVoltage*	*true*	*false*	*2014-8-27, 12:46:58.0*	*2300*	*Low Voltage*
1	*mainsFault*	*true*	*false*	*2014-8-27, 18:44:26.0*	*17500*	*Mains Fault*

Web interface ‘Alarm log’ presentation would result values for SNMP GET operations for following variables:

- EFORE-MIB::bcaAlarmType.1 = INTEGER: mainsFault(2)
- EFORE-MIB::bcaAlarmActive.1 = INTEGER: true(1)
- EFORE-MIB::bcaAlarmType.2 = INTEGER: lowSystemVoltage(4)
- EFORE-MIB::bcaAlarmActive.2 = INTEGER: true(1)

6.10.4. SNMP Traps

To receive SNMP traps, you need to have an SNMP management station (“manager”). If SNMP traps are enabled, SNMP trap is sent periodically. The same resending period is used for SNMP traps as for alarm e-mails. See SNMP trap related parameters from Table 6. Traps have following properties:

Table 5 SNMP Traps v2c, v3, v3 inform

SNMP version	v2c, v3, v3inform
Parameters	User configurable
Enterprise OID	enterprises.26896.1.1.10
Trap type	Enterprise Specific (6)
Specific type	17
Variable OID	EFORE-MIB::vidiAlarmTrap
Variable data	sysLocation, vidiAlarmId, vidiAlarmMessage, vidiAlarmCode, vidiAlarmState, vidiAlarmAckState, vidiAlarmStartTime, vidiAlarmDuration, vidiAlarmRelays

6.11. SMTP

When SMTP (Simple Mail Transfer Protocol) alarm e-mail notification is enabled, information about the selected alarms is sent in an email message to the specified recipients. Sending can be configured to occur at specified intervals or only when a particular alarm changes state.

SMTP configuration can be found from Parameters • Communication Parameters • SMTP.

Multiple e-mail recipients can be specified through separation of the addresses with commas

6.12. Administration

6.12.1. System Location

Name and location of the installed system can be described in this menu. Right name helps to connect to right system if several OPUS systems located in the same communication network.

6.12.2. System Serial Number

Serial number of the installed system can be described in this menu. Serial number helps to identify the physical system if several OPUS systems located in the same communication network.

6.12.3. Passwords

Refer section 6.8 (User Levels) and default passwords for remote login. User names and password can be changed in this menu.

6.12.4. Date/Time

Date/Time configuration can be found on the Administration • Date/Time page.

On this page, both local and UTC (Universal Time Coordinated, also known as Greenwich Mean Time, GMT) time is shown. The difference between the local and UTC times is determined by the time zone, which can be set from the same page.

If the local or UTC time is wrong, first check that the time zone is correctly set, and then adjust the local time to the correct value.

The VIDI+ has NTP (Network Time Protocol) client support. It is recommended to use NTP to maintain the correct date and time whenever possible. Using NTP requires that an NTP server be available in the network. Efore recommends that end users use an NTP server supported by the local site network.

The Date/Time page provides a list of public NTP servers. The list of predefined servers is sourced from support.ntp.org, and the regulations and rules specified there apply. All NTP servers listed are provided and maintained by third parties and Efore is not affiliated with those parties. Usage of the predefined servers is fully at the responsibility of the end user. Efore does not provide any support for addressing problems related to use of any servers or services not maintained by Efore.

6.12.5. Timers

Timers are used to set-up periodic intervals for some repeated functions of the system such as perioding boost charging, periodic battery test, battery connection test and battery pre-charge time. Timers are linked to parameters menu settings.

6.12.6. Programmable Configuration Logic

The programmable configuration logic settings can be accessed from the menu Administration • Configurable Logic. Only the admin user can change these settings.

On the Configurable Logic page you can define different kind of events to start different kind of actions in the OPUS system. The configuration logic is based on connections between events and actions.

Events of the configuration logic are:

- Control Inputs: these inputs are alarm input devices of the OPUS system that are configured as an 'External Control'. Only the External Control devices can be seen in the Control Input list. If there is none External Control input in the VIDI+ then the Control Inputs list is empty.
- Alarms: Any alarm of the VIDI+ controller. If an alarm is disabled in the Parameters • Alarm Parameters it can't be used either via the PCL.
- System States: Indication whether a boost charging or a battery test state is active.

Actions of the configuration logic are:

- System Controls: Control of boost charging and battery tests.
- Control Relays: these devices are alarm relays that are configured as Control relays.

System states that can cause some action are:

- Boost Charging Active
- Battery Test Active

System controls that can result from any events are:

- Disable Boost Charging
- Start Boost Charging
- Disable Battery Tests
- Start Battery Test

An event can be connected to any number of entries in the System Control and Control Relays lists. More than one event can be connected to a same action in the System Controls or Control Relays. For all the events, at least one action must be chosen for it to be in use. To select or unselect an entry in a list press the Ctrl button while clicking on the entry.

To submit changes press the Submit button. To discard changes and return to the previous configuration, press the Restore Previous button.

Following parameters can be configured for each event.

- When Alarm Active: (Alarms only) If selected, the event will be active when the alarm is active. If neither this nor 'When Alarm Not Ack-d' is selected, event will be set inactive.
- When Alarm Not Ack-d: (Alarms only) If selected, the event will be active when the alarm has not been acknowledged. If neither this nor 'When Alarm Not Active' is selected, event will be set inactive.
- Disabled: (Other than alarms only) If selected, the event will be set inactive.
- Inverted: If selected, the state of an event will be inverted.
- Activation Delay: On transition from inactive to active state of the event, the specified delay will be applied before the action changes to active state.
- Deactivation Delay: On transition from active to inactive state of the event, the specified delay will be applied before the action changes to inactive state.

It should be noted that while the Configurable Logic provides functionality similar to input/output selection of alarm parameters and Alarm Matrix, these configurations are mostly independent of each other.

Doing changes to the Configurable Logic does not affect alarm parameters in any way. Because the Configurable Logic operates with Control Relays and External Control inputs, selection of external alarm inputs or alarm relays in alarm parameters does not affect the Configurable Logic.

However, all other alarm parameters (Enabled/Disabled, Delay, thresholds) control activation of alarms and thus have effect on Alarm-based inputs of the Configurable Logic, too.

To see an overview of connections and the current states of inputs and outputs, click the Connection Overview Matrix link.

The configuration logic settings can be downloaded and uploaded in XML format. To download the PCL file from the system press the link ‘pcl.xml’ on the Configuration logic page. Save the file or open it with a program suited for the purpose. Only the admin user can upload a PCL file to the system. To do this press the Browse button and select a PCL file. Then press the Upload button.

6.12.7. Custom Language

On top of factory default languages available in VIDI controller, it is possible to upload new langue packages to VIDI controller in this menu. Uploaded language can be selected in user interface and remote interface. Custom language packages can be created in cooperation with manufacturer and local partner capable to translate electrical engineering terminology. Ask separate instruction from the manufacturer for creating additional language packages. Most widely-used languages get to display corresponding flag icons on the user interface. Additional icons may be implemented on a case-by-case basis on request.

6.12.8. Administrative Actions

The Administrative actions page can be found from the Administration menu. Most actions are allowed only for the admin-level user, but some can be performed by the power-level user, too. See Section 6.8 (User Levels) for details on this.

Administrative actions cannot be undone. Think before acting.

Some actions are hidden until the Expert Mode parameter is Enabled from System Parameters.

Clear Alarm Log Clears all alarms from the alarm log, except the currently active alarms.

Clear Event Log Clears all events from the event log. A new event indicating that the event log was cleared will be generated after clearing.

Clear Battery Logs Clears all battery test log entries.

Clear Battery Discharge Log

Clears the battery discharge log entries.

Clear Battery Temperature Log

Clears the battery temperature log entries.

Clear System Power Log Clears the system power log entries.

Clear Programmable Logic Configuration

Clears the programmable logic configuration settings.

Restore Factory Default Parameters

Replaces the current system parameters with factory parameters. Initially the factory parameters have been saved to the controller at the factory after the initial configuration, but it is possible to overwrite those parameters later (see Save Parameters As Factory Defaults).

Save Parameters as Factory Defaults (Expert Mode required)

Save the current parameters as the factory parameters, so that they can be restored later via the Restore Factory Default Parameters action.

Remove Missing Modules Removes all modules and related devices from the inventory database that are no longer present in the system. This may be useful to free space in the inventory database, or to get rid of references to removed modules in certain parts of the user interfaces.

Clear Inventory Database (Expert Mode only)

Clear all modules and devices from the inventory database. All device and module configurations will be lost. The controller software will be restarted.

Factory Reset (Expert Mode only)

Clears all configurations and logs from the system, including those for all connected PowerCAN modules. As the name “Factory Reset” suggests, the controller modules will be like fresh units from the factory (without pre-configuration done) after this action. The controller software will be restarted.

This feature is mainly intended for use only in testing and for the manufacturer service purposes.

Reboot System Control Unit

Reboots the VIDI+ Advanced Controller, including the operating system. This operation takes about a minute, during which the LUIF may indicate that the system master control unit is not responding.

This may be necessary after the firmware of the VIDI+ Advanced Controller has been updated.

Restart System Control Unit Software (Expert Mode only)

Restart the VIDI+ control software. This operation takes a few seconds.

6.13. Downloading and Uploading System Inventory Database

It is possible to download and upload inventory database in XML format from the main Inventory page. This may be useful for backup purposes and cloning of identical or nearly identical systems.

After inventory database XML file has been uploaded, it is possible to select which modules will be affected by the new configurations. On the Inventory Database Import page you can map configurations read from the uploaded XML file to system modules.

Each module configuration found from the uploaded XML file will be shown on the left side of the page. For each such module configuration, a list of possible target modules present in the system is shown on the right side.

Only configurations of modules of an equal type can be mapped. It is possible to omit mapping of a configuration by selecting the “Drop from the list” option from the target list.

To see physical location of a target module, select a module from a target list and press the corresponding Blink button. If the selected module supports this, it will blink its status LED in yellow colour for a few times.

To update list of available target modules, press Refresh button.

When finished, press Submit button. After this, it is recommended to inspect the configurations of the affected modules from the Inventory tree.

6.14. Downloading and Uploading System Parameters

System parameters can be downloaded and uploaded from the main Parameters page of the Web interface. The parameter file is in XML format.

When uploading the parameters, the controller checks which parameters have changed and checks that the new values are valid. If changes affect any dependent parameter, the values are updated if necessary. All dependent parameters are presented to the user.

In some versions of VIDI+ the values determined by internal parameter dependencies override values specified in the uploaded file. This may cause that values of the depending parameters are not updated correctly. This problem can be worked around by uploading the parameters again.

Although possible, it is not recommended to modify the parameter XML files by hand, as this is prone to errors and may cause dependency problems. Efore does not provide support for solving problems caused by manual parameter file changes.

6.15. System Logs and Data Exporting

The VIDI+ controller collects data from the system. The data is stored to different logs and it can be exported in XML and CSV format with or without headers. To export the data select a wanted file format on the Log page and press the Export button. The data of the system is collected to the following logs

Alarm Log The alarm log displays contents of the system alarm log. A user can select to view all, active or unacknowledged alarms. The default view is all alarms. On the exported log is the same data as on the alarm log page at the time.

Event Log The event log shows all events of the system. On the exported log is the same data as on the event log page.

Battery Test Log Each battery test data is stored to the log. On the battery test log page is shown a list of all done battery tests. To see a data of an individual battery test press a link Download in the end of the row. On the battery test data page is shown the battery test configuration parameters and measured data. The exported data contains all measurements.

Battery Discharge Log The battery discharge log displays statistics about a depth of a battery discharge during mains faults or battery tests. A depth of a discharge is calculated as a ratio of discharged ampere hours to the battery nominal capacity. The depth of discharge is determined at an

end of a mains fault or battery test and the statistic is updated. An exported data contains a data of this table.

Battery Temperature Log The battery temperature log displays statistics about battery temperature. The VIDI+ controller calculates the total cumulative time that battery temperature resides in each temperature range. The values are updated once per hour. If there are multiple battery temperature sensors available, the highest measured value will be used. If there is no battery temperature sensor, the values will not be updated. An exported data contains a data of this table. The time column value is a decimal number and the unit is hour (e.g. the value of the table 162 h 59 m can be shown as 162,9931 hours).

System Power Log The system power log shows graphical presentation of total system output power as a function of time. The log data is measured once per second, but the curve data is updated only once per hour. If the unit selected for the X-axis is a day, the maximum time scale is one year. If the unit is an hour, the maximum scale is one month (31 days). The power curve can be seen with different resolutions (small, medium and large). To the exported data the time scale and resolution do not effect.

6.16. Firmware Update

The following OPUS components support firmware update:

- VIDI+ system controller module
- UIF module
- MRC rectifiers
- MHE rectifiers
- LVD module
- BM module
- SAM module

The firmware updates are controlled by the VIDI+ controller.

Efore takes no responsibility whatsoever of any damage caused by failed firmware updates, or damages caused by limited system functionality during the firmware update.

6.16.1. Update Methods

Two update methods are available:

Repository update The VIDI+ connects to the given HTTP repository (usually maintained by Efore), determines which updates are available, and downloads the required update packages.

Package update A firmware update package is uploaded to the VIDI+. The package may contain update images for single or multiple system module type.

The choice of the update method depends on the circumstances. If you want to perform a generic system firmware update, the repository update is the easiest way. However, that requires that the VIDI+ system is able to access the HTTP repository. In some site network configurations, this may not be possible. The package update method can be used in all cases. When updating multiple module types, the package update method also grants better control over the update sequence, provided that you have a separate update package for each module type.

On the firmware update page, there is also an option for allowing downgrading of firmware versions. This should be used only if a newer firmware version has been diagnosed to be incompatible with your system, or if you want to reapply the same firmware version. Re-updating may be useful if you simply want to test the firmware update process.

6.16.2. Performing Firmware Update

The firmware update can be initiated from the Web interface by opening the Administration • Firmware Update page.

Repository Method

Enter a valid update repository URL (for the repository method). If downgrading or same-grading is to be allowed, tick the related Allow downgrading box. Press the Download button.

The controller will connect to the update repository, determine which updates are, and check that all required files exist. This may take some time, especially if the connection to the update server is slow.

Update Package Method

On the firmware update page, select a firmware update package for the Update Package field. If downgrading or same-grading is to be allowed, tick the related Allow downgrading box. Press the Upload button. The upload may take a while, especially if the update package is large or connection to the VIDI+ is slow.

Starting the Update

After the controller has selected the viable firmware updates, the user interface will show which modules will be updated and which versions will be used. The user will need to confirm the start of the update.

After confirmation, the update starts. The user interface will indicate the status and progress of the update for each module present in the system.

Finishing the Update

For all modules the firmware update will be finished automatically and no user actions are required. If the advanced controller board of the VIDI+ controller is being updated, it will reboot itself after the update.

After the firmware update is finished, it is recommended to check the versions and status information for the updated modules from the Inventory menu. It is also a good idea to check that there are no unexpected alarms in the alarm log

6.16.3. Module-Specific Update Notes

The VIDI+

The VIDI+ features two separate controller boards inside the VIDI+ controller module: the standard controller and the advanced controller. The advanced controller provides all of the remote interfaces functionality, and it controls the firmware update process.

The VIDI+ Advanced Controller

- Should be updated last.
- Most system control functions will be operational during the update, but some system functionality may be degraded, disabled or unavailable.
- Controller reboot is required after the update.
- During the reboot, the local display may indicate that the main system controller is not responding. This is normal unless the normal operation does not recover in a few minutes.

VIDI+ Standard Controller

- The standard controller is visible as a PowerCAN module for the advanced controller.
- While the standard controller is being updated, there may be breaks in communication with other system modules, as all PowerCAN traffic is routed via the standard controller.
- All the alarm relays will be active during the update.
- If a non-latching LVD contactor is being used, the contactor will be disconnected during the update.

UIF (Local Display Module)

- The display and the controls are non-functional during the update.

MRC/MHE Rectifiers

- The rectifier will not supply power while being updated.
- If there are two or more unloaded rectifiers in the system, the controller will update two of them at a time, otherwise only one rectifier.
- If updating fails for a single MRC/MHE module even after multiple retries, the update will be aborted. Otherwise, there would be a risk of the system being left without any functional rectifiers.

LVD Module

- The module will be non-functional during the update.
- If a non-latching LVD contactor is being used, the contactor will be disconnected during the update.

BM Module

- The BM module will be non-functional during the update.

SAM Module

- The SAM module will be non-functional during the update.

6.16.4. Firmware Redundancy

All PowerCAN-connected modules have two sets of firmware:

Main The main application firmware.

CANLoader More compact firmware that is used only for updating the main firmware.

If an update of the main firmware of a PowerCAN-connected module fails during the update for any reason, the main firmware will be non-functional as the result. However, it will still be possible to retry the update, because the CANloader firmware is still functional.

The main firmware can update CANloader firmware. If the update of CANloader fails, the module functionality is not degraded except that the main firmware update is not possible. Broken CANloader firmware can be fixed by restarting the firmware update.

The VIDI+ Advanced Controller itself also has two sets of firmware, but the update mechanism is slightly different. The flash memory of the VIDI+ has been divided into two identical areas, each holding a version of the main firmware. On controller start-up, the newer of these two sets of firmware is started, unless it has been marked as non-functional. Should a firmware update fail, there is no danger to system functionality, because the failed firmware will not be started. If the update is successful but the new firmware is non-functional, the old firmware will be re-selected after an unsuccessful run.

7. SYSTEM MAINTENANCE

7.1. General

All control modules and rectifiers can be removed from and installed in the system while the system is operational.

It is usually possible to install and remove fuses in a live system, but because of the high risk of electric shock (due to high voltage and/or current) involved, this may only be done by a properly trained professional.

7.2. Removing Rectifier/Inverter/Bypass Module

Refer to the Installation and Start-up Manual of the system for instructions on unplugging a rectifier/inverter/bypass module from the system.

To remove the old rectifier/inverter/bypass module from the inventory database of the VIDI+ controller, refer to Section 5.10.6 (Removing Obsolete Modules from Inventory).

7.3. Adding a New Rectifier/Inverter/Bypass Module

Refer to the Installation and Start-up Manual of the system for instructions on plugging in a rectifier/inverter/bypass module for the system.

After the rectifier/inverter/bypass module is connected and powered up properly, a dialog reporting an unconfigured module should appear on the local user interface. Enter the correct settings for the new rectifier. Refer to Subsection Section 5.2.3 (Unconfigured Modules Dialog) for information.

7.4. Replacing the System Controller Module

To remove the system controller module, follow these steps:

1. Disconnect the cable set from the power connector (marked ‘PWR’)
2. Disconnect all other cables
3. Remove the fixing screws
4. Remove the module from the system

Install the new module:

1. Install the module in the correct place
2. Attach the screws
3. Connect all cables except the power connector cable set
4. Connect the power connector cable set
5. The controller should power up
6. Configure the new controller module

If the new controller module had been used in another system before, it is highly recommended to perform a factory reset for the new module:

1. Disconnect all PowerCAN bus cables (marked ‘CAN1’, ‘CAN2’) except UIF (marked ‘CAN2/UIF’) from the VIDI+ controller module
2. If the system isn’t powered up yet, power it up now and wait until the controller is ready
3. If you wish to use the Web interface, log in to the system as the admin user
4. Enable Expert Mode from the System Parameters menu
5. From the local interface, select Actions • Clear All Data. Alternatively, from the Web interface, select Admin • Administrative Actions • Factory Reset.

6. Confirm the operation

Factory Reset will erase all configuration data and data logs in the controller, including factory parameters (the parameter settings loaded initially at the factory). If you do not want to lose the factory parameters, you can use a combination of the following functions:

- Clear Inventory to erase all module and device configurations
- Restore Factory Parameters to load the system parameters set at the factory
- To clear the old log data: Clear Alarm Log, Clear Event Log, Clear Battery Logs, Clear Battery Discharge Log, Clear Battery Temperature Log, Clear System Power Log and Clear Programmable Logic Configuration

Connect the PowerCAN cables to the VIDI+ controller. The controller gets the module and device settings from the modules installed in the system.

Refer to Section 5.2 (The First Start-up) for more information on initial configuration of the controller module.

7.5. Adding or Removing Other System Modules

Follow module-specific instructions. Where they do not specify otherwise, follow these common steps to remove a module:

1. Disconnect the power cable set connector (marked ‘POWER’)
2. Disconnect all other cables
3. Remove the module from the system
4. Remove the old module from the controller’s inventory, as described in Section 5.10.6 (Removing Obsolete Modules from Inventory); if a module is to be replaced, this step can be performed after the new module has been installed.

The common steps to install a new module:

1. Install the new module into the system
2. Connect all cables except the power connector
3. Connect the power connector cable set
4. Configure the new module

7.6. Calibrating the Current Shunt Offset

In some circumstances, it may be necessary to compensate for an offset error occurring in a current measurement. The amount of offset error can be determined by generating a situation when current is not flown through the shunt resistor and then reading the measured value from a user interface.

Please note that there is always a certain amount of measurement noise in the current measurements. Transient measurement errors caused by noise shouldn’t be confused with the shunt error, which is a systematic error.

Shunt calibration can be performed from any of the user interfaces:

Web and Terminal Interfaces

1. Log in to the web/terminal interface as the admin user.
2. Open Inventory • By Function • Current Measurement.
3. Select the current measurement device you want to calibrate.
4. Switch off the relevant fuses for making sure no current flows through the shunt resistor to be calibrated.

5. Locate the Shunt Offset device attribute and press the Reset to Default button to clear the old offset.
6. Press the update button a few times and record the updated offset error (the measurement value when the actual amount of current is zero). Measurement noise may cause the value to fluctuate from update to update. If so, determine the approximate average of the offset error.
7. Enter the offset error in the value field for the Shunt Offset device attribute and press Apply. The sign of the offset error depends on the polarity of the current shunt. If the polarity is default, the sign is negative to the offset error.
8. Press the update button a few times to check that offset error is within the limits of measurement noise. Recalibrate if necessary.
9. Switch on the relevant fuses.

Local User Interface

1. Enter the Inventory • By Function • Current Measurement menu.
2. Select the current measurement device you want to calibrate.
3. Press the selector on the Shunt Offset device attribute
4. Switch off the relevant fuses for making sure no current flows through the shunt resistor to be calibrated.
5. Select Update offset until the Result is close enough to zero, considering the measurement noise.
6. Switch on the relevant fuses.

8. PARAMETERS

8.1. Parameter and Alarm Parameter Groups

Diagrams in the appendices B and C illustrate the hierarchy of the parameters and alarm parameters - i.e., how they are grouped in the user interfaces and configuration files. The individual alarm parameters (Enabled/Disabled, Delay, and Relay List) have been omitted from the diagram for the sake of readability

8.2. Parameter Descriptions

The rest of this chapter contains parameter descriptions for the VIDI+ controller. Names of parameters are used in the user interfaces and are referred to in many places in this document.

Parameters can have dependencies as described in Section 4.1 (Parameter System) in some cases; a system parameter affects values of device attributes.

When a depending parameter goes out of a range because a higher-level parameter has been changed, the depending parameter will be set to a default value instead of minimum/maximum value, unless the default value is not valid. If the default value is not valid, the minimum/maximum limit is used.

8.2.1. System Parameters

Expert Mode
Expert Mode allows access to some base parameters which do not directly affect system operation but affect other parameters.

Cells Per Block
Number of battery cells per battery block. In a normal 12 V lead-acid battery block there are 6 cells per block. If block is the same as cell, use value of 1.

Voltage Version
Defines voltage version of the system as number of battery blocks per string. For 12 V battery blocks, value 4 of this parameter means a 48 V system.

Rectifier Voltage Group
Defines voltage group of rectifiers to be controlled. This value must match with the voltage group of the installed rectifiers. Rectifier voltage groups are: 2 for 24V, 4 for 48V etc. When ca. 12 V battery blocks are used, value of this parameter is equal to Voltage Version.

System Nominal Current
Nominal maximum current rating of the system. Also used as default value for current shunt nominal current settings.

Battery Capacity
Total capacity of batteries in Ampere-hours.

Energy Save Mode
Enable/disable energy save mode. When enabled, a minimum number of rectifiers are used to supply power. The unused rectifiers are put into a standby mode. This increases overall system efficiency.

Language
Language selection for the local interface.

Device names
When enabled, user specified device names are shown in local display. If name has not been given, default name of device is used. When disabled, default names are used in the local display.

Main Page Output Config
When enabled, Inverter AC output value is shown in local display's main page. When disabled, Rectifier DC output value is shown in local display's main page.

System Password
Local Interface system password. If the password is 0000, it will not be asked.

Auto Logout Time
Describes, how many minutes of inactivity is allowed before logging the user out

8.2.2. Battery Parameters

• Battery Lifetime Parameters

These parameters control how the remaining battery life is calculated.

Maximum Cell Voltage
Defines maximum charge voltage per cell for all parameters.

Minimum Cell Voltage
Defines minimum charge voltage per cell for all parameters.

Minimum Cell Monitoring Voltage
Defines minimum monitoring voltage per cell for all parameters.

Nominal Cell Voltage
Defines nominal cell voltage.

Float Charge Voltage per Cell
Defines float charge voltage per battery cell.

Boost Charge Voltage per Cell
Defines boost charge voltage per battery cell.

TC Volts per Celcius per Cell
Temperature compensation coefficient, volts per degree of celcius per cell.

8.2.3. Communication Parameters

DHCP Enabled
Whether to enable DHCP support. DHCP can be used to obtain IP settings automatically from a network supporting DHCP. Note! Changing the setting will take effect after the logout.

IP Address
IP Address for TCP/IP in format aaa.bbb.ccc.ddd. Note! Changing the IP address will take effect after the logout.

IP Netmask
IP Netmask for TCP/IP in format aaa.bbb.ccc.ddd. Note! Changing the netmask will take effect after the logout.

IP Gateway
IP address of gateway (router) for TCP/IP in format aaa.bbb.ccc.ddd. Note! Changing the gateway will take effect after the logout.

DNS Server 1
IP address of primary DNS server in format aaa.bbb.ccc.ddd.

DNS Server 2
IP address of secondary DNS server in format aaa.bbb.ccc.ddd.

RS-232 Baud rate
Baud rate for serial port communications.

RS-232 Data Bits
Number of data bits for serial port communications.

RS-232 Parity
Parity checking mode for serial port communications.

RS-232 Stop Bits
Number of stop bits for serial port communications.

8.2.3.1. SMTP Settings

SMTP Server
IP address (numeric or FQDN) of SMTP mail relay server. Single entry only.

Trigger
Defines the alarm states which cause sending of an alarm email.

Period
Period for sending alarm mails in hours/minutes.

From
The email address which is used as the sender of alarm emails.

To
Email address of alarm mail recipient.

8.2.3.2. SNMP Settings

Community
SNMPv1/v2c Community name. Leave empty to disable

Engine ID
SNMPv3 Engine ID. Leave empty to use MAC-address.

Username
SNMPv3 Username

Security level
SNMPv3 security level. Use to enable authentication and encryption

Write support
Switch to enable SNMP SET support. Enable only after configuring safe v2c community and v3 security parameters.

Trap type
Specify the format of traps to send. Version 2c trap, version 3 trap or version 3 inform (confirmed trap).

Network Management Stations
IP address (numeric or FQDN) of SNMP NMS (Network Management Station), which is the host that will receive SNMP traps.

Trigger
Alarm states which cause sending of per-alarm SNMP traps.

Period
Period for sending alarm SNMP traps in minutes/seconds.

Send Overview
Enables or disables sending of alarm overview SNMP traps.

8.2.3.3. EchoAgent Settings

Enabled/Disabled
Enable/Disable EchoVault agent.

8.2.4. Charge Parameters

Float Charge Voltage
Rectifier voltage during float charge. Float charge is the default charge state.

8.2.4.1. Charge Current Control

Enable/Disable
Defines whether Battery Charge Current Control is enabled.

Charge Current Limit
Limit for total battery charge current. Rectifier output voltage is controlled to keep charge current below this limit. Battery current measurement devices have their individual charge limits.

Fast Control Gain
Control gain value for Charge Current Limit operating in fast mode. Smaller value makes charge current control more stable, bigger value makes it faster.

Slow Control Gain
Control gain value for Charge Current Limit operating in slow mode. Smaller value makes charge current control more stable, bigger value makes it faster.

8.2.4.2. Boost Charge

Boost Charge Voltage
Rectifier output voltage during Boost Charging.

BC Minimum Temperature
Minimum ambient temperature for Boost Charge operation.

BC Maximum Temperature
Maximum ambient temperature for Boost Charge operation.

8.2.4.2.1. Manual Boost Charge

MBC Maximum Time
Maximum Manual Boost Charge time.

8.2.4.2.2. Periodic Boost Charge

Enable/Disable
Defines whether Periodic Boost Charge is enabled.

PBC Maximum Time
Maximum Periodic Boost Charge time.

PBC Times in a Year
Number of times Periodic Boost Charge is performed in a year.

8.2.4.2.3. Automatic Boost Charge

Enable/Disable
Defines whether Automatic Boost Charge is enabled.

ABC Maximum Time
Maximum Automatic Boost Charge time.

ABC Start Current
Automatic Boost Charging is activated if battery charge current exceeds Start Current after a mains fault.

ABC Stop Current
Automatic Boost Charging is deactivated if battery charge current drops below Stop Current.

8.2.4.2.4. Remote Boost Charge

Enable/Disable
Defines whether Remote Boost Charge is enabled.

RBC Maximum Time
Maximum Remote Boost Charge time.

Latching Input
When Enabled, RBC will remain active after start until time limit is reached, regardless of the state of the control signal. When Disabled, RBC will be stopped also when control signal deactivates.

8.2.4.3. Temperature Compensation

Enable/Disable
Defines whether Temperature Compensation is enabled.

TC Volts per Celsius
Temperature to voltage ratio of Temperature Compensation.

TC Maximum Voltage
Maximum charge voltage when using Temperature Compensation.

TC Minimum Voltage
Minimum charge voltage when using Temperature Compensation.

TC Nominal Temperature
The temperature at which Temperature Compensation does not have effect on the charge voltage.

8.2.5. Battery Tests

BT Ignore Time
Settling time in the beginning of the test during which Stop Voltage is ignored.

BT Shutdown Voltage
Battery Test is always stopped when battery voltage drops below Shutdown Voltage

BT Min Precharge Time
Minimum charge time before Battery Test can be started after a mains fault.

8.2.5.1. Manual Battery Test

MBT Stop Voltage
Manual Battery Test is stopped when battery voltage drops below Stop Voltage and Ignore Time has passed.

MBT Time Limit
Manual Battery Test testing time in hours / minutes. The test ends successfully when the time limit is reached. The BT Ignore Time specifies the minimum value for this parameter.

MBT Discharge Limit
Maximum battery discharge limit for Manual Battery Test in Ampere hours. The test ends successfully when the discharge limit is reached. Set to zero to disable the limit.

8.2.5.2. Periodic Battery Test

Enable/Disable
Defines whether Periodic Battery Test is enabled.

PBT Times in a Year
Number of times Periodic Battery Test is performed in a year.

PBT Stop Voltage
Periodic Battery Test is stopped when battery voltage drops below Stop Voltage and Ignore Time has passed.

PBT Time Limit
Periodic Battery Test testing time in hours / minutes. The test ends successfully when the time limit is reached. The BT Ignore Time specifies the minimum value for this parameter.

PBT Discharge Limit
Maximum battery discharge limit for Periodic Battery Test in Ampere hours. The test ends successfully when the discharge limit is reached. Set to zero to disable the limit.

8.2.5.2.1. Safe hours

PBT Monday Time Window
PBT can be started on Monday in this time window (starthour:startminutes - stophour:stopminutes).

PBT Tuesday Time Window
PBT can be started on Tuesday in this time window (starthour:startminutes - stophour:stopminutes).

PBT Wednesday Time Window
PBT can be started on Wednesday in this time window (starthour:startminutes - stophour:stopminutes).

PBT Thursday Time Window
PBT can be started on Thursday in this time window (starthour:startminutes - stophour:stopminutes).

PBT Friday Time Window
PBT can be started on Friday in this time window (starthour:startminutes - stophour:stopminutes).

PBT Saturday Time Window
PBT can be started on Saturday in this time window (starthour:startminutes - stophour:stopminutes).

PBT Sunday Time Window
PBT can be started on Sunday in this time window (starthour:startminutes - stophour:stopminutes).

8.2.5.2.2. Forbidden days

PBT Forbidden Day 1
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 2
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 3
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 4
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 5
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 6
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 7
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 8
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 9
PBT is not allowed to start in this day of the year (month.day).

PBT Forbidden Day 10
PBT is not allowed to start in this day of the year (month.day).

8.2.5.2.3. Battery ConnectionTest

Enable/Disable
Defines whether Natural Battery Test is enabled.

BCT Test Period
BCT test period. The battery connection test is run once in every period

BCT Time Limit
Battery Connection Test BCT testing time in minutes / seconds. The test must end successfully before this time runs out. Otherwise the test is judged as failed

Allowed Rectifier Current
The maximum limit for total rectifier current during the test. During the test, the total rectifier current must go below this value for pass result..

8.2.5.3. Natural Battery Test

Enable/Disable
Defines whether Natural Battery Test is enabled.

NBT Stop Voltage
Natural Battery Test is stopped when battery voltage drops below Stop Voltage and Ignore Time has passed.

NBT Time Limit
Natural Battery Test testing time in hours / minutes. The test ends successfully when the time limit is reached. The BT Ignore Time specifies the minimum value for this parameter.

NBT Discharge Limit
Maximum battery discharge limit for Natural Battery Test in Ampere hours. The test ends successfully when the discharge limit is reached. Set to zero to disable the limit.

8.2.5.4. Remote Battery Test

Enable/Disable
Defines whether Remote Battery Test is enabled.

Latching Input
When Enabled, RBT will remain active after start until time, discharge or voltage limit is reached, regardless of the state of the control signal. When Disabled, RBT will be stopped also when control signal deactivates.

RBT Stop Voltage
Remote Battery Test is stopped when battery voltage drops below Stop Voltage and Ignore Time has passed.

RBT Time Limit
Remote Battery Test testing time in hours / minutes. The test ends successfully when the time limit is reached. The BT Ignore Time specifies the minimum value for this parameter.

RBT Discharge Limit
Maximum battery discharge limit for Remote Battery Test in Ampere hours. The test ends successfully when the discharge limit is reached. Set to zero to disable the limit.

8.2.6. LVD Defaults

8.2.6.1. Load LVD Defaults

Ld LVD Control Mode
LVD Control mode defines the basis for connecting and disconnecting the LVD contactor. Voltage: system voltage. Time: mains fault duration. Discharge: battery discharge during mains fault.

Ld LVD Contactor Type
This must be set according to the type of the LVD contactor used.

Ld LVD Disconnect V
LVD contactor is disconnected when system voltage drops below this threshold.

Ld LVD Pickup V
LVD contactor is connected when system voltage rises above this threshold.

8.2.6.2. Battery LVD Defaults

Bt LVD Control Mode
LVD Control mode defines the basis for connecting and disconnecting the LVD contactor. Voltage: system voltage. Time: mains fault duration. Discharge: battery discharge during mains fault.

Bt LVD Contactor Type
This must be set according to the type of the LVD contactor used.

Bt LVD Disconnect V
LVD contactor is disconnected when system voltage drops below this threshold.

Bt LVD Pickup V
LVD contactor is connected when system voltage rises above this threshold.

8.2.7. Inverter Parameters

Default Mode
Defines the default AC source of the bypass switch.

Bypass Mains Min Voltage
Minimum mains AC voltage which bypass switch accepts before switching to inverter supply.

Bypass Mains Max Voltage
Maximum mains AC voltage which bypass switch accepts before switching to inverter supply.

Inverters Disconnect V
Inverters DC supply low voltage disconnect voltage. If system DC voltage drops below this limit, the inverters will be shut down to save batteries.

Inverters Pickup V
Inverters DC supply low voltage pickup voltage. After a low voltage disconnect, the inverters will be activated again when system DC voltage exceeds this limit.

Output Voltage
AC output voltage setpoint for the inverters.

Output Frequency
AC output frequency for the inverters.

Overtemp Alarm Limit
Internal over temperature alarm limit.

EFD Enabled/Disabled

Enable/disable AC output Earth Fault Detection. Should not be enabled if there is a bypass module installed.

8.2.8. Alarm Parameters

8.2.8.1. System Alarms

8.2.8.1.1. System Over Temperature

Enable/Disable
Defines whether System Over Temperature is enabled.

Delay

Defines activation delay time for System Over Temperature.

Relays List
Defines output relay list for System Over Temperature.

Sys Temp Limit
Temperature limit for System Over Temperature.

8.2.8.1.2. Low System Voltage

Enable/Disable
Defines whether Low System Voltage is enabled.

Delay
Defines activation delay time for Low System Voltage.

Relays List
Defines output relay list for Low System Voltage.

Low SysV Limit
Voltage limit for Low System Voltage.

8.2.8.1.3. High System Voltage

Enable/Disable
Defines whether High System Voltage is enabled.

Delay
Defines activation delay time for High System Voltage.

Relays List
Defines output relay list for High System Voltage.

High SysV Limit
Voltage limit for High System Voltage.

8.2.8.1.4. Low System Voltage Warning

Enable/Disable
Defines whether Low System Voltage Warning is enabled.

Delay
Defines activation delay time for Low System Voltage Warning.

Relays List
Defines output relay list for Low System Voltage Warning.

Low SysV Warn Limit
Voltage limit for Low System Voltage Varning.

8.2.8.1.5. High System Voltage Warning

Enable/Disable
Defines whether High System Voltage is enabled.

Delay
Defines activation delay time for High System Voltage Warning.

Relays List
Defines output relay list for High System Voltage Warning.

High SysV Limit
Voltage limit for High System Voltage Warning.

8.2.8.1.6. Mains Fault

Enable/Disable
Defines whether Mains Fault is enabled.

Delay
Defines activation delay time for Mains Fault.

Relays List
Defines output relay list for Mains Fault.

8.2.8.1.7. Charge Voltage Deviation

Enable/Disable
Defines whether Charge Voltage Deviation is enabled.

Delay
Defines activation delay time for Charge Voltage Deviation.

Relays List
Defines output relay list for Charge Voltage Deviation.

Deviation Limit
Maximum deviation percent from the charge voltage.

8.2.8.1.8. Bypass Mains Fault

Enable/Disable
Defines whether Bypass Mains Fault is enabled.

Delay
Defines activation delay time for Bypass Mains Fault.

Relays List
Defines output relay list for Bypass Mains Fault.

8.2.8.1.9. Phase Fault

Enable/Disable
Defines whether Phase Fault is enabled.

Delay
Defines activation delay time for Phase Fault.

Relays List
Defines output relay list for Phase Fault.

8.2.8.1.10. Inverter System Fault

Enable/Disable
Defines whether Inverter System Fault is enabled.

Delay
Defines activation delay time for Inverter System Fault.

Relays List
Defines output relay list for Inverter System Fault.

8.2.8.1.11. Rectifiers Overload

Enable/Disable
Defines whether Rectifiers Overload is enabled.

Delay
Defines activation delay time for Rectifiers Overload.

Relays List
Defines output relay list for Rectifiers Overload.

Redundancy Limit
Minimum number of redundant rectifiers for Rectifiers Overload.

8.2.8.1.12. Inverters Overload

Enable/Disable
Defines whether Inverters Overload is enabled.

Delay
Defines activation delay time for Inverters Overload.

Relays List
Defines output relay list for Inverters Overload.

Redundancy Limit
Minimum number of redundant rectifiers for Inverters Overload.

8.2.8.1.13. Bus Fault

Enable/Disable
Defines whether Bus Fault is enabled.

Delay
Defines activation delay time for Bus Fault.

Relays List
Defines output relay list for Bus Fault.

8.2.8.1.14. Inventory Full

Enable/Disable
Defines whether Inventory Full is enabled.

Delay
Defines activation delay time for Inventory Full.

Relays List
Defines output relay list for Inventory Full.

8.2.8.1.15. Earth Fault

Enable/Disable
Defines whether Earth Fault is enabled.

Delay
Defines activation delay time for Earth Fault.

Relays List
Defines output relay list for Earth Fault.

Threshold
Earth fault alarm threshold resistance. The alarm is activated if the measured power line to PE resistance is less than the given value.

8.2.8.1.16. Boost Charge Active

Enable/Disable
Defines whether Boost Charge Active is enabled.

Delay
Defines activation delay time for Boost Charge Active.

Relays List
Defines output relay list for Boost Charge Active.

8.2.8.1.17. Configuration Conflict

Enable/Disable
Defines whether Configuration Conflict is enabled.

Delay
Defines activation delay time for Configuration Conflict.

Relays List
Defines output relay list for Configuration Conflict.

8.2.8.2. Module Alarms

8.2.8.2.1. Rectifier Fault

Enable/Disable
Defines whether Rectifier Fault is enabled.

Delay
Defines activation delay time for Rectifier Fault.

Relays List
Defines output relay list for Rectifier Fault.

Load Sharing Suppression Limit
System load percentage must be at least the value configured here in order to process Load Sharing Faults from rectifiers

8.2.8.2.2. Rectifier Over Voltage

Enable/Disable
Defines whether Rectifier Over Voltage is enabled.

Delay
Defines activation delay time for Rectifier Over Voltage.

Relays List
Defines output relay list for Rectifier Over Voltage.

8.2.8.2.3. Rectifier Over Temperature

Enable/Disable
Defines whether Rectifier Over Temperature is enabled.

Delay
Defines activation delay time for Rectifier Over Temperature.

Relays List
Defines output relay list for Rectifier Over Temperature.

8.2.8.2.4. Rectifier Mains Fault

Enable/Disable
Defines whether Rectifier Mains Fault is enabled.

Delay
Defines activation delay time for Rectifier Mains Fault.

Relays List
Defines output relay list for Rectifier Mains Fault.

8.2.8.2.5. Rectifier Wrong Voltage Version

Enable/Disable
Defines whether Rectifier Wrong Voltage Version is enabled.

Delay
Defines activation delay time for Rectifier Wrong Voltage Version.

Relays List
Defines output relay list for Rectifier Wrong Voltage Version.

8.2.8.2.6. Communication Error

Enable/Disable
Defines whether Communication Error is enabled.

Delay
Defines activation delay time for Communication Error.

Relays List
Defines output relay list for Communication Error.

8.2.8.2.7. Module Fault

Enable/Disable
Defines whether Module Fault is enabled.

Delay
Defines activation delay time for Module Fault.

Relays List
Defines output relay list for Module Fault.

8.2.8.2.8. Inverter Fault

Enable/Disable
Defines whether Inverter Fault is enabled.

Delay
Defines activation delay time for Inverter Fault.

Relays List
Defines output relay list for Inverter Fault.

8.2.8.2.9. Bypass Fault

Enable/Disable
Defines whether Bypass Fault is enabled.

Delay
Defines activation delay time for Bypass Fault.

Relays List
Defines output relay list for Bypass Fault.

8.2.8.2.10. NvRam Fault

Enable/Disable
Defines whether NvRam Fault is enabled.

Delay
Defines activation delay time for NvRam Fault.

Relays List
Defines output relay list for NvRam Fault.

8.2.8.2.11. Config Fault

Enable/Disable
Defines whether Config Fault is enabled.

Delay
Defines activation delay time for Config Fault.

Relays List
Defines output relay list for Config Fault.

8.2.8.2.12. Bad Firmware

Enable/Disable
Defines whether Bad Firmware is enabled.

Delay
Defines activation delay time for Bad Firmware.

Relays List
Defines output relay list for Bad Firmware.

8.2.8.3. Battery Alarms

8.2.8.3.1. Automatic Boost Charge Fault

Enable/Disable
Defines whether Automatic Boost Charge Fault is enabled.

Delay
Defines activation delay time for Automatic Boost Charge Fault.

Relays List
Defines output relay list for Automatic Boost Charge Fault.

8.2.8.3.2. Battery Test Fault

Enable/Disable
Defines whether Battery Test Fault is enabled.

Delay
Defines activation delay time for Battery Test Fault.

Relays List
Defines output relay list for Battery Test Fault.

8.2.8.3.3. Battery Connection Test Fault

Enable/Disable
Defines whether Battery Connection Test Fault is enabled.

Delay
Defines activation delay time for Battery Connection Test Fault.

Relays List
Defines output relay list for Battery Connection Test Fault.

8.2.8.3.4. Battery Block Low Voltage

Enable/Disable
Defines whether Battery Block Low Voltage is enabled.

Delay
Defines activation delay time for Battery Block Low Voltage.

Relays List
Defines output relay list for Battery Block Low Voltage.

Low BlockV Limit
Voltage limit for Battery Block Low Voltage.

8.2.8.3.5. Battery Block High Voltage

Enable/Disable
Defines whether Battery Block High Voltage is enabled.

Delay
Defines activation delay time for Battery Block High Voltage.

Relays List
Defines output relay list for Battery Block High Voltage.

High BlockV Limit
Voltage limit for Battery Block High Voltage.

8.2.8.3.6. Battery Over Temperature

Enable/Disable
Defines whether Battery Over Temperature is enabled.

Delay
Defines activation delay time for Battery Over Temperature.

Relays List
Defines output relay list for Battery Over Temperature.

Battery Temp Limit
Temperature limit for Battery Over Temperature.

8.2.8.3.7. Battery String Asymmetry

Enable/Disable
Defines whether Battery String Asymmetry is enabled.

Delay
Defines activation delay time for Battery String Asymmetry.

Relays List
Defines output relay list for Battery String Asymmetry.

Asymmetry Limit
Battery string asymmetry limit for Battery String Asymmetry.

8.2.8.3.8. Battery Lifetime Warning

Enable/Disable
Defines whether Battery Lifetime Warning is enabled

Delay
Defines activation delay time for Battery Lifetime Warning.

Relays List
Defines output relay list for Battery Lifetime Warning.

Temperature Lifetime Limit
If Temperature Lifetime Used Factor is higher than this limit, issue the alarm.

Cycle Lifetime Limit
If Cycle Lifetime Used Factor is higher than this limit, issue the alarm.

Deep Discharged Limit
If battery discharge depth has gone over this value even once, issue the alarm. Setting of 100% essentially disables processing.

8.2.8.4. LVD Alarms

8.2.8.4.1. Load LVD Disconnect Warning

Enable/Disable
Defines whether Load LVD Disconnect Warning is enabled.

Delay
Defines activation delay time for Load LVD Disconnect Warning.

Relays List
Defines output relay list for Load LVD Disconnect Warning.

Ld LVD Warn. Voltage Margin
Load LVD Disconnect Warning will be activated if voltage difference to disconnect voltage of Load LVD is lower than this value and Load LVD is in voltage control mode.

Ld LVD Warn. Time Margin
Load LVD Disconnect Warning will be activated when time to disconnect is less than this value and Load LVD is in time control mode.

Ld LVD Warn. Discharge Margin
Load LVD Disconnect Warning will be activated when Load LVD is in Discharge control mode and the difference of battery discharge and LVD Disconnect Ah Limit is less than this value.

8.2.8.4.2. Load LVD Disconnect Imminent

Enable/Disable
Defines whether Load LVD Disconnect Imminent is enabled.

Delay
Defines activation delay time for Load LVD Disconnect Imminent.

Relays List
Defines output relay list for Load LVD Disconnect Imminent.

8.2.8.4.3. Battery LVD Disconnect Warning

Enable/Disable
Defines whether Battery LVD Disconnect Warning is enabled.

Delay
Defines activation delay time for Battery LVD Disconnect Warning.

Relays List
Defines output relay list for Battery LVD Disconnect Warning.

Bt LVD Warn. Voltage Margin
Battery LVD Disconnect Warning will be activated if voltage difference to disconnect voltage of Battery LVD is lower than this value and Battery LVD is in voltage control mode.

Bt LVD Warn. Time Margin
Battery LVD Disconnect Warning will be activated when time to disconnect is less than this value and Battery LVD is in time control mode.

Bt LVD Warn. Discharge Margin
Battery LVD Disconnect Warning will be activated when Battery LVD is in Discharge control mode and the difference of battery discharge and LVD Disconnect Ah Limit is less than this value.

8.2.8.4.4. Battery LVD Disconnect Imminent

Enable/Disable
Defines whether Battery LVD Disconnect Imminent is enabled.

Delay
Defines activation delay time for Battery LVD Disconnect Imminent.

Relays List
Defines output relay list for Battery LVD Disconnect Imminent.

8.2.8.4.5. Contactor Fault

Enable/Disable
Defines whether Contactor Fault is enabled.

Delay
Defines activation delay time for Contactor Fault.

Relays List
Defines output relay list for Contactor Fault.

8.2.8.5. Peripheral Alarms

8.2.8.5.1. Battery Fuse Fault

Enable/Disable
Defines whether Battery Fuse Fault is enabled.

Delay
Defines activation delay time for Battery Fuse Fault.

Relays List
Defines output relay list for Battery Fuse Fault.

8.2.8.5.2. Load Fuse Fault

Enable/Disable
Defines whether Load Fuse Fault is enabled.

Delay
Defines activation delay time for Load Fuse Fault.

Relays List
Defines output relay list for Load Fuse Fault.

8.2.8.5.3. Current Shunt Fault

Enable/Disable
Defines whether Current Shunt Fault is enabled.

Delay
Defines activation delay time for Current Shunt Fault.

Relays List
Defines output relay list for Current Shunt Fault.

8.2.8.5.4. Battery Temperature Sensor Fault

Enable/Disable
Defines whether Battery Temperature Sensor Fault is enabled.

Delay

Defines activation delay time for Battery Temperature Sensor Fault.

Relays List

Defines output relay list for Battery Temperature Sensor Fault.

8.2.8.5.5. No Battery Temperature Sensor

Enable/Disable

Defines whether No Battery Temperature Sensor is enabled.

Delay

Defines activation delay time for No Battery Temperature Sensor.

Relays List

Defines output relay list for No Battery Temperature Sensor.

8.2.8.5.6. No System Temperature Sensor

Enable/Disable

Defines whether No System Temperature Sensor is enabled.

Delay

Defines activation delay time for No System Temperature Sensor.

Relays List

Defines output relay list for No System Temperature Sensor.

8.2.8.5.7. Ext. Alarm Group 1

Enable/Disable

Defines whether Ext. Alarm Group 1 is enabled.

Delay

Defines activation delay time for Ext. Alarm Group 1.

Relays List

Defines output relay list for Ext. Alarm Group 1.

Input List

Defines list of external alarm inputs for this alarm group.

8.2.8.5.8. Ext. Alarm Group 2

Enable/Disable

Defines whether Ext. Alarm Group 2 is enabled.

Delay

Defines activation delay time for Ext. Alarm Group 2.

Relays List

Defines output relay list for Ext. Alarm Group 2.

Input List

Defines list of external alarm inputs for this alarm group.

8.2.8.5.9. Ext. Alarm Group 3

Enable/Disable

Defines whether Ext. Alarm Group 3 is enabled.

Delay

Defines activation delay time for Ext. Alarm Group 3.

Relays List

Defines output relay list for Ext. Alarm Group 3.

Input List

Defines list of external alarm inputs for this alarm group.

8.2.8.5.10. Ext. Alarm Group 4

Enable/Disable

Defines whether Ext. Alarm Group 4 is enabled.

Delay

Defines activation delay time for Ext. Alarm Group 4.

Relays List

Defines output relay list for Ext. Alarm Group 4.

Input List

Defines list of external alarm inputs for this alarm group.

8.2.9. Network Services

Controller network services management

SSH

Enable/disable the SSH service on the controller.

Telnet

Enable/disable the Telnet service on the controller.

HTTP

Enable/disable HTTP web server on the controller. If you disable your current protocol, you will be automatically logged out.

HTTPS

Enable/disable HTTPS web server on the controller. If you disable your current protocol, you will be automatically logged out

Modbus

Enable/disable the Modbus service on the controller.

SNMP

Enable/disable the SNMP service on the controller. Does not disable sender.

UDP Listener

Enable/disable the UDP Listener serviceon the controller. Disabling this hides the controller from OpusConfUtility

UDP Listener Configuration

Allow remote configuration of the controller via the OpusConfUtility.

9. DEVICE PARAMETERS

This section describes all of the device-specific parameters available in the VIDI+ controller. The parameters are grouped according to the applicable device type.

To each device can be given an individual name, which describes the device. The name can have maximum 16 characters from the international UTF-8 standard. Device names can be seen for example on the alarm log. Devices can be named only via Web or Terminal interfaces. If the Device Names parameter in the System Parameters is enabled, user defined names can be seen in the local interface instead of original device names (e.g. A1-pK1). If some device does not have a user defined name, the original device name will be used

On an inventory page of each module and device is a button 'Blink Module LED'. By pressing this button it is possible to see a physical location of a target module if the selected module supports this operation. The module will blink its status LED in yellow colour for a few times.

9.1. MRC Rectifiers

Parameter Name	Value Range	Description
Slot	1..64	Slot number of the rectifier. The slot number affects both device and module names for the rectifier: Gx refers to the rectifier in slot x.
Phase	0 1..3	The mains phase the rectifier is connected to (0 if unknown).

9.2. MHE Rectifiers

Parameter Name	Value Range	Description
Slot	1..64	Slot number of the rectifier. The slot number affects both device and module names for the rectifier: Gx refers to the rectifier in slot x.
Phase	0 1..3	The mains phase the rectifier is connected to (0 if unknown).
Generator Input	Enabled Disabled	This feature is intended for applications, which input supply is limited energy source (i.e. generator). Typical problem can be re-charging of empty batteries with full power right after generator start-up. Generator input feature provides controlled 7 seconds output voltage ramp-up to specified charging voltage. Voltage is controlled based on power taken from input energy source. In the beginning system takes 10% of nominal power and power rises smoothly to full power during 7 sec ramp-up
Rectifier Start-up Delay	00m00s… 02m00s	Rectifiers will turn on the output voltage after given start-up delay.

9.3. EIM Inverters

Parameter Name	Value Range	Description
Id	1..64	Index number of the inverter. The index number affects the module name for the inverter, e.g. U1.

9.4. EBPU Bypass Modules

Parameter Name	Value Range	Description
Id	1..64	Index number of the bypass module. The index number affects the module name for the bypass module, e.g. A9.

9.5. Current Measurement

Parameter Name	Value Range	Description
Usage	None Batt Curr Load Curr	Measurement is disabled. Battery current measurement. Load current measurement.
Index	1..32	Index number of the current measurement device.
Polarity	Default Inverted	A parameter that can be used to change the sign of the current measurement.
Nom. Current	0A..10 kA	Nominal current rating of the current shunt resistor used to measure the current. More specifically, this is the ampere value at which the voltage over the shunt resistor is 60 mV.
Shunt Offset		Offset calibration for the current measurement. The calibration should be performed with zero current through the shunt resistor.
Charge Limit		The maximum battery charge current limit to be used when battery current is measured by this device.
Name	max 16 characters	Name to this device

9.6. Battery Voltage Measurement

Parameter Name	Value Range	Description
Usage	Unused Enabled	Measurement disabled. Measurement enabled.
String/Index	1..6	Index of the battery string being measured.
Name	max 16 characters	Name to this device

9.7. Block Voltage Measurement

Parameter Name	Value Range	Description
Usage	Unused Enabled	Measurement disabled. Measurement enabled.
String/Group	1..6	Index of the battery string being measured.
Block/Index	1..64	Index of the battery block in the string being measured.
Name	max 16 characters	Name to this device

9.8. Temperature Measurement

Parameter Name	Value Range	Description
Input Mode	Temp Alarm	For combined alarm/temp. inputs only: set to Temp mode to use the input for temperature measurement.
Usage	Unused System Battery	'System' is for system temperature measurement. 'Battery' is for battery temperature measurement.
Index	1..32	Index number of the battery temperature sensor.
Name	max 16 characters	Name to this device

9.9. Alarm Relays

Parameter Name	Value Range	Description
Usage	Unused Alarm Control	Enabling/disabling of this relay. The relay used as an alarm relay The relay used as a control relay
Index	1..16	Index number of the alarm/control relay.
Name	max 16 characters	Name to this device

9.10. Alarm Inputs

Parameter Name	Value Range	Description
Input Mode	Temp Alarm	For combined alarm/temp. inputs only: set to Alarm mode to use the input as an alarm input.
Usage	Unused Ld Fuse Bt Fuse Ext Alarm Ext Ctrl	Unused input. Input used to monitor load fuses. Input used to monitor battery fuses. Input used for an external alarm. Input used for an external control.
Group	0..4	Fuse group number for battery and load fuse inputs.
Index	0..31	Index number of the alarm or control. The group and index number cannot both be zero. Example: If the load fuse group is 2 and the index is 4, the device name is Fl2.4.
Alarm Polarity	NC NO	Normally closed - alarm issued when open (high voltage level). Normally open - alarm issued when input closed (low voltage level).
Name	max 16 characters	Name to this device

9.11. Earth Fault Alarm

Parameter Name	Value Range	Description
Earth Fault Detection between DC and PE (on the VIDI+ controller) :		
Usage	Unused Sys EFD	DC Earth fault detection disabled. DC Earth fault detection enabled.
Name	max 16 characters	Name to this device
Earth Fault Detection between AC and PE on Bypass Module :		
Usage	Unused AC EFD	AC Earth fault detection disabled. AC Earth fault detection enabled.
Name	max 16 characters	Name to this device

Note: The threshold resistance for the DC earth fault alarm can be set with the Threshold parameter of the Earth Fault alarm, from the System Alarms menu.

9.12. Low Voltage Disconnect

Parameter Name	Value Range	Description
Usage	Unused Bt. LVD Ld. LVD	LVD is disabled. Battery LVD (contactor in a battery branch). Load LVD (a.k.a. PLD, contactor in a load branch).
Index	1..9	Battery string number, or 1 for the whole battery bank.
Contactor Type	Latching Non-latching	Use of a latching contactor (pulsed drive). Use of a non-latching contactor (continuous drive).
Control Mode	Voltage Time Discharge	LVD control based on the system voltage. LVD control based on mains fault duration. LVD control based on battery discharge, measured in Ah.
Pickup Voltage Disconnect Voltage Disconnect Time Disconnect Ah		The disconnect and pickup threshold values associated with the control mode. The actual value range depends on the system parameters. The default values depend on the Battery LVD Defaults and Load LVD Defaults parameters.
Name	max 16 characters	Name to this device

10. ALARMS

10.1. System Over Temperature

System Over Temperature alarm activates when ambient temperature is too high.

Parameters

- Enable/Disable
- Delay
- Relays List
- Sys Temp Limit

10.2. Low System Voltage

Low System Voltage alarm activates when the measured system voltage drops too low. The reason may be either a mains fault or too high load current for the installed rectifiers.

Parameters

- Enable/Disable
- Delay
- Relays List
- Low SysV Limit

10.3. High System Voltage

High System Voltage alarm activates when the measured system voltage is too high. The reason could be a malfunctioning rectifier or a rectifier with wrong output voltage.

Parameters

- Enable/Disable
- Delay
- Relays List
- High SysV Limit

10.4. Low System Voltage Warning

Low System Voltage Warning alarm activates when the measured system voltage drops too low. The reason may be either a mains fault or too high load current for the installed rectifiers.

Parameters

- Enable/Disable
- Delay
- Relays List
- Low SysV Warn Limit

10.5. High System Voltage Warning

High System Voltage Warning alarm activates when the measured system voltage is too high. The reason could be a malfunctioning rectifier or a rectifier with wrong output voltage.

Parameters

- Enable/Disable
- Delay
- Relays List
- High SysV Warn Limit

10.6. Mains Fault

Mains Fault alarm activates when all the rectifiers report a mains fault.

Parameters

- Enable/Disable
- Delay
- Relays List

10.7. Charge Voltage Deviation

This alarm activates when charge voltage deviates more than defined percent from the set rectifier voltage. Disabled during battery tests and boost charges.

Parameters

- Enable/Disable
- Delay
- Relays List
- Deviation Limit

10.8. Bypass Mains Fault

Inverters Mains Fault alarm activates when bypass switch reports a mains supply fault.

Parameters

- Enable/Disable
- Delay
- Relays List

10.9. Phase Fault

Phase Fault alarm activates when all the rectifiers in a certain mains phase report a mains fault.

Parameters

- Enable/Disable
- Delay
- Relays List

10.10. Inverter System Fault

This alarm activates when there is a critical error in the inverter subsystem, resulting in no AC output from the inverters. Possible reasons include DC supply fault, internal bus error, and synchronization error.

Parameters

- Enable/Disable
- Delay
- Relays List

10.11. Rectifiers Overload

Usually a system has some redundant rectifiers so that the system can supply rated power to load even if rectifiers get broken. This alarm activates if the system load is too high compared to power capacity of non-redundant rectifiers. The number of redundant rectifiers can be configured. Activation delay should be kept long enough in order to avoid unnecessary alarms caused by startup and battery charging.

Parameters

- Enable/Disable

- Delay
- Relays List
- Redundancy Limit

10.12. Inverters Overload

Usually a system has some redundant inverters so that the system can supply rated power to load even if inverters get broken. This alarm activates if the system load is too high compared to power capacity of non-redundant inverters. The number of redundant inverters can be configured.

Parameters

- Enable/Disable
- Delay
- Relays List
- Redundancy Limit

10.13. Bus Fault

This alarm activates if all the modules in a communication bus stop communicating with the system controller.

Parameters

- Enable/Disable
- Delay
- Relays List

10.14. Inventory Full

This alarm activates if the system cannot handle all the modules installed to the system. In this case, the new modules installed will not be usable. You can try removing old modules from the inventory. Please check the module and device limits specified by the manufacturer. This alarm can only be deactivated by acknowledging it.

Parameters

- Enable/Disable
- Delay
- Relays List

10.15. Earth Fault

This alarm activates if the Earth Fault Detector measures too low resistance between the DC power lines (positive or negative) and the PE ground.

Parameters

- Enable/Disable
- Delay
- Relays List
- Threshold

10.16. Boost Charge Active

This alarm activates when any Boost Charge mode is active.

Parameters

- Enable/Disable
- Delay
- Relays List

10.17. Configuration Conflict

This alarm activates if there are problems in system configuration. For example, conflicting node or device indices or parameters exceeding their limits are such problems.

Parameters

- Enable/Disable
- Delay
- Relays List

10.18. Rectifier Fault

The self-diagnostics of a rectifier module indicate that the rectifier module is faulty and should be replaced. In some cases a cold restart of the rectifier module may fix the problem.

Parameters

- Enable/Disable
- Delay
- Relays List
- Load Sharing Suppression Limit
  System load percentage must be at least the value configured here in order to process Load Sharing Faults from rectifiers

10.19. Rectifier Over Voltage

Rectifier module reports too high DC voltage. The rectifier may require cold restart to recover from the fault.

Parameters

- Enable/Disable
- Delay
- Relays List

10.20. Rectifier Over Temperature

Rectifier module reports too high internal temperature. The ambient temperature may be too high.

Parameters

- Enable/Disable
- Delay
- Relays List

10.21. Rectifier Mains Fault

Rectifier module reports either too low or high Mains Voltage.

Parameters

- Enable/Disable
- Delay
- Relays List

10.22. Rectifier Wrong Voltage Version

The alarm is activated if any rectifier in the system has different voltage group than the value of Rectifiers Voltage Group parameter.

Parameters

- Enable/Disable
- Delay

- Relays List

10.23. Communication Error

System Controller is unable to communicate with a system module. This can happen if the module has been disconnected from the bus, removed from the system or is faulty.

Parameters

- Enable/Disable
- Delay
- Relays List

10.24. Module Fault

The self-diagnostics of a system module indicate that the module is faulty and should be replaced. In some cases a cold restart of the module may fix the problem.

Parameters

- Enable/Disable
- Delay
- Relays List

10.25. Inverter Fault

An inverter module reports a critical fault in the module itself.

Parameters

- Enable/Disable
- Delay
- Relays List

10.26. Bypass Fault

Bypass module reports a critical fault in the module itself.

Parameters

- Enable/Disable
- Delay
- Relays List

10.27. NvRam Fault

Module reports a NVRAM fault in the module itself.

Parameters

- Enable/Disable
- Delay
- Relays List

10.28. Config Fault

Some of module configuration is missing.

Parameters

- Enable/Disable
- Delay
- Relays List

10.29. Bad Firmware

Module has a bad firmware and it should be updated.

Parameters

- Enable/Disable
- Delay
- Relays List

10.30. Automatic Boost Charge Fault

Automatic Boost Charge Fault is activated if ABC Time Limit is exceeded before battery charge current drops below Stop Current.

Parameters

- Enable/Disable
- Delay
- Relays List

10.31. Battery Test Fault

Battery Test Fault is activated if battery voltage drops below Stop Voltage before the Battery Test Time Limit or Discharge Limit is exceeded.

Parameters

- Enable/Disable
- Delay
- Relays List

10.32. Battery Connection Test Fault

Battery Connection Test Fault is activated if the sum of all rectifier currents does not go lower than Allowed Rectifier Current during duration of the test. During the test rectifier voltage is dropped to standby level and load current supplied form battery. Test duration is determined by the parameter Time Limit.

Parameters

- Enable/Disable
- Delay
- Relays List

10.33. Battery Block Low Voltage

This alarm activates if a battery block voltage is measured to be below the configured limit.

Parameters

- Enable/Disable
- Delay
- Relays List
- Low BlockV Limit

10.34. Battery Block High Voltage

This alarm activates if a battery block voltage is measured to be above the configured limit.

Parameters

- Enable/Disable

- Delay
- Relays List
- High BlockV Limit

10.35. Battery Over Temperature

This alarm activates if any of the battery temperature sensors indicate that battery temperature is above the configured limit.

Parameters

- Enable/Disable
- Delay
- Relays List
- Battery Temp Limit

10.36. Battery String Asymmetry

This alarm activates if voltage measurement of any of the battery block in a battery string differs too much from the average block voltage in the battery string.

Parameters

- Enable/Disable
- Delay
- Relays List
- Asymmetry Limit

10.37. Battery Lifetime Warning

Defines warning levels for battery lifetime calculations. When triggered, the alarm will be processed.

Parameters

- Enable/Disable
- Delay
- Relays List
- Temperature Lifetime Limit
- Cycle Lifetime Limit
- Deep Discharged Limit

10.38. Load LVD Disconnect Warning

This alarm warns that a Load LVD may be disconnecting shortly. The user may configure voltage, time or discharge margin from the warning to the disconnect point.

Parameters

- Enable/Disable
- Delay
- Relays List
- Ld LVD Warn. Voltage Margin
- Ld LVD Warn. Time Margin
- Ld LVD Warn. Discharge Margin

10.39. Load LVD Disconnect Imminent

This alarm warns that a Load LVD is about to disconnect in about ten seconds.

Parameters

- Enable/Disable
- Delay
- Relays List

10.40. Battery LVD Disconnect Warning

This alarm warns that a Battery LVD may be disconnecting shortly. The user may configure voltage, time or discharge margin from the warning to the disconnect point.

Parameters

- Enable/Disable
- Delay
- Relays List
- Bt LVD Warn. Voltage Margin
- Bt LVD Warn. Time Margin
- Bt LVD Warn. Discharge Margin

10.41. Battery LVD Disconnect Imminent

This alarm warns that a Battery LVD is about to disconnect in about ten seconds. This will most likely shut down the system.

Parameters

- Enable/Disable
- Delay
- Relays List

10.42. Contactor Fault

Load or Battery LVD contactor is not responding to control commands. Either the contactor if faulty or the feedback signal from the aux contacts is invalid.

Parameters

- Enable/Disable
- Delay
- Relays List

10.43. Battery Fuse Fault

A battery fuse has tripped.

Parameters

- Enable/Disable
- Delay
- Relays List

10.44. Load Fuse Fault

A load fuse has tripped.

Parameters

- Enable/Disable
- Delay
- Relays List

10.45. Current Shunt Fault

This alarm activates if a current shunt is not properly configured or the current measurement is not inside reasonable limits.

Parameters

- Enable/Disable
- Delay
- Relays List

10.46. Battery Temperature Sensor Fault

A battery temperature measurement is not inside reasonable limits. The sensor or sensor cables are likely to be damaged.

Parameters

- Enable/Disable
- Delay
- Relays List

10.47. No Battery Temperature Sensor

Battery Temperature Compensation feature is enabled but there is no battery temperature sensor.

Parameters

- Enable/Disable
- Delay
- Relays List

10.48. No System Temperature Sensor

This alarm activates if there is no system temperature sensor available.

Parameters

- Enable/Disable
- Delay
- Relays List

10.49. Ext. Alarm Group 1

An external alarm connected to external alarm group 1 is active.

Parameters

Enable/Disable
Delay
Relays List
Input List

10.50. Ext. Alarm Group 2

An external alarm connected to external alarm group 2 is active.

Parameters

- Enable/Disable
- Delay
- Relays List
- Input List

10.51. Ext. Alarm Group 3

An external alarm connected to external alarm group 3 is active.

Parameters

- Enable/Disable
- Delay
- Relays List
- Input List

10.52. Ext. Alarm Group 4

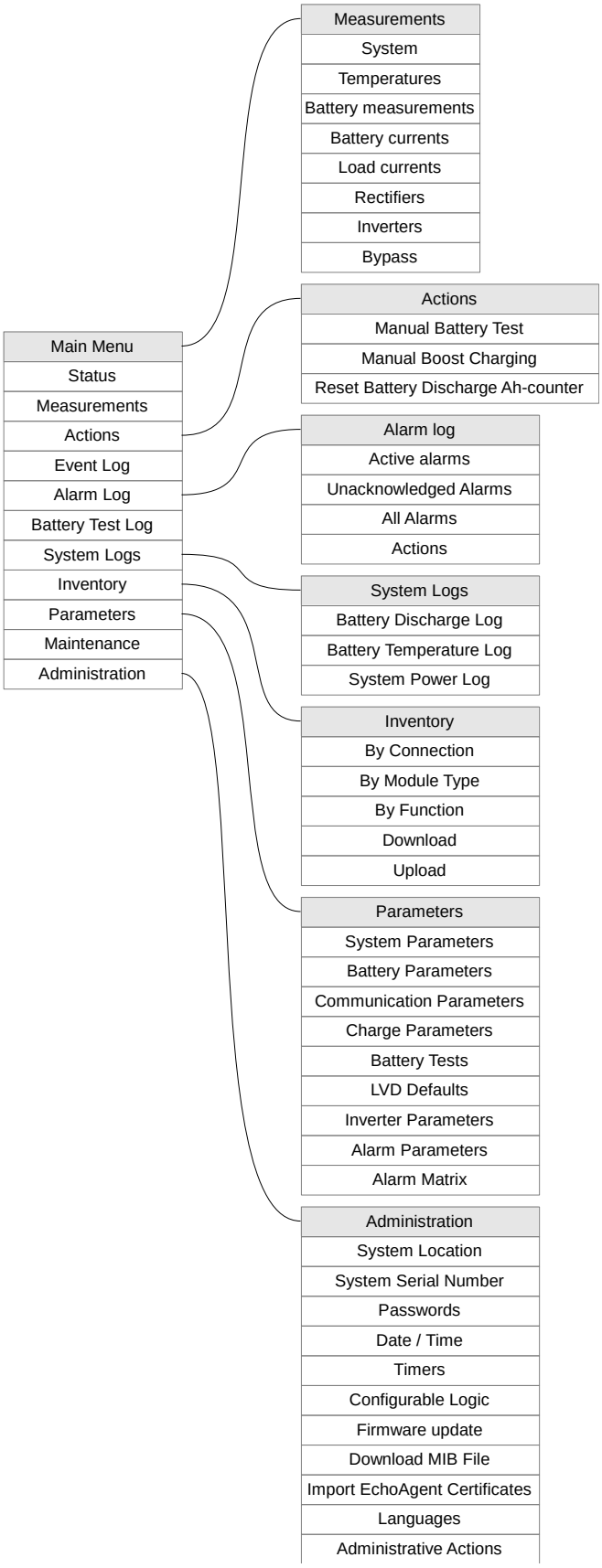
An external alarm connected to external alarm group 4 is active.

Parameters

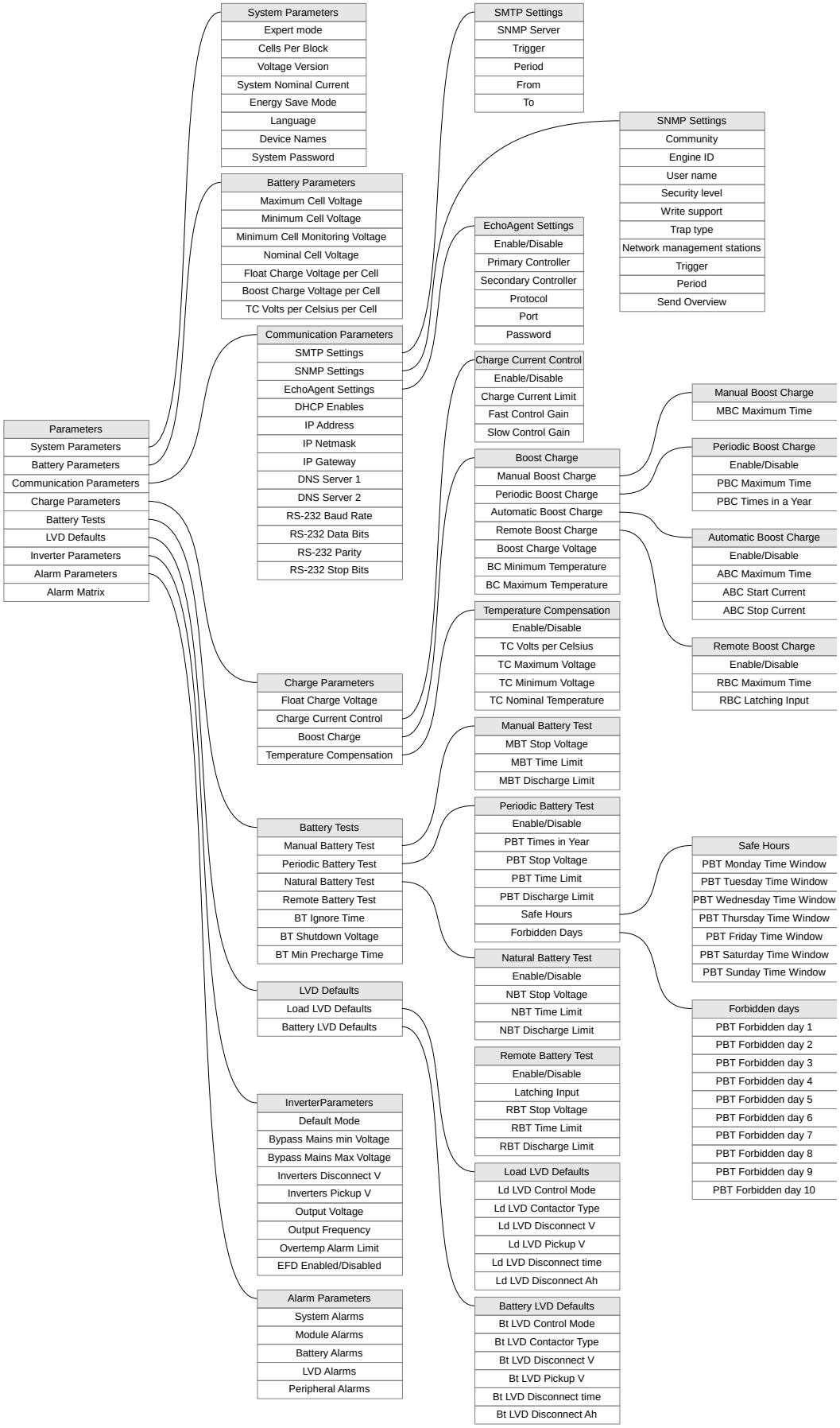
- Enable/Disable
- Delay
- Relays List
- Input List

11. APPENDICES

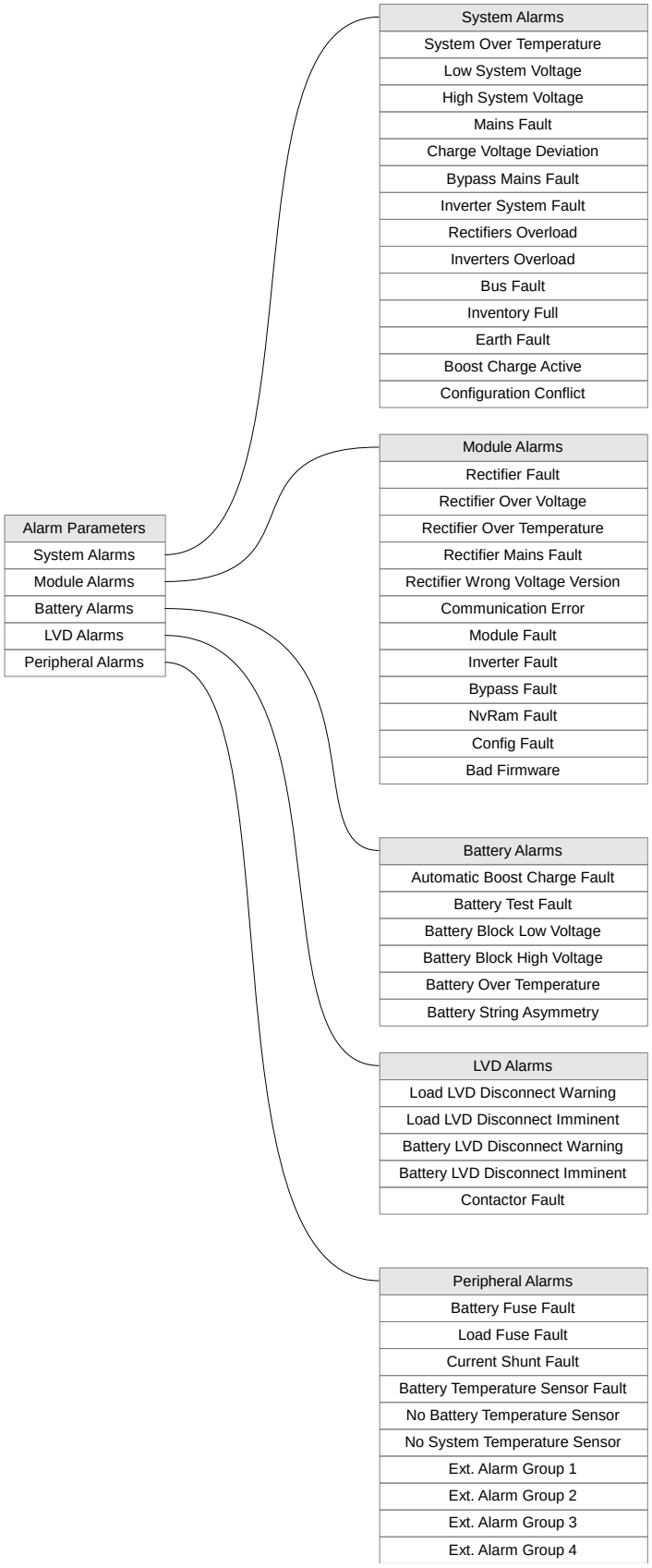
Appendix A: Menu Structure



Appendix B: Parameter Groups



Appendix C: Alarm Parameter Groups



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