INSTALLATION & OPERATING MANUAL

HCX Advanced Hybrid Controller

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System Controller HCX Advanced

1. Description

HCX Advanced (formerly known as HCC Extended) is a pluggable microprocessor controller that provides monitoring and control for a broad range of UNIPOWER Hybrid Power Systems. The HCX provides optimum battery cycling, generator management and renewable energy source prioritization. The HCX also monitors all system parameters including: DC voltage, rectifier/converter current, system capacity, battery parameters, and circuit breaker status with capacity to monitor additional external analog or digital inputs.

Alarm and warning notifications are indicated by front panel LEDs, and through potential free alarm contacts that allow remote signaling. External monitoring of alarms and statistical data is accomplished through a USB connection using PC-based PowCom™ Hybrid software. Remote management is provided through an Ethernet port allowing control over a TCP/IP network and includes web based support. Alarms can be mapped via SNMPc traps to customer OSS platforms such as HP Openview™.

NOTE For more details related to PowCom™ Hybrid software, refer to the PowCom™ Hybrid User Guide.

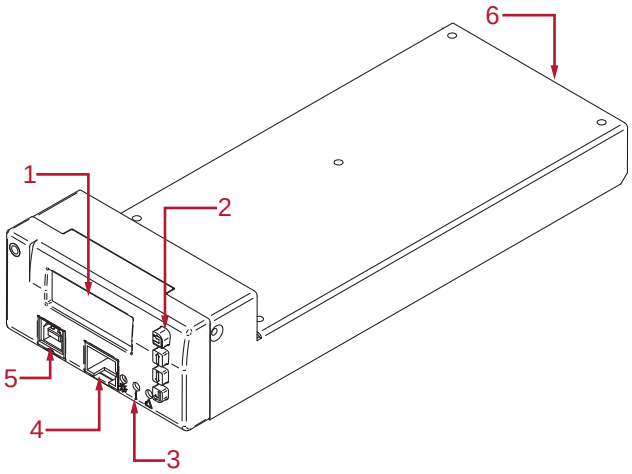


Figure 1-1 Controller Features

1. Display (LCD)
2. Push-Buttons (CANCEL, UP, DOWN, ENTER)
3. Signal LEDs (Green, Yellow, Red)
4. Ethernet Port
5. USB Port
6. Rear Interface Connector

The controller consists of the following elements:

1.1 Main Unit

This is the master unit of the system, communicating with all the modules (rectifiers, converters) and units (Alarm Relay Board). It is fully hot-pluggable.

Features include: visual alarm indication, USB and RS232 communication circuit for remote operation, web interface and RS485 for internal communication with up to 64* rectifier nodes and extended units (up to 4x extension boards and 1x alarm relay board).

* The number of rectifiers that are support can be increase to 256 when using a 4x64 Multiplexer board. See 1.5 below.

1.2 Internal Connection Board

The internal connection board is used as an interface between the main unit and the system.

It contains: input for reading current, battery and load breaker monitoring, outputs for operating two individual contactors LVBD and PLD, (further PLDs can be used with the Controller Alarm Relay Board), RS232, RS485, CAN communication connector and system Vout connector.

1.3 External Connection Board

The external connection board is connected to the internal connection board and is used for signal connection.

It contains: 4 potential free alarm contacts (additional 6 alarms with Extension Alarm Relay Board), 12 multi purpose contacts (setup by default for symmetry measurements or general use with input voltage up to 100VDC), inputs for 2 temperature probes, 2x digital inputs and outputs, +5VDC and System voltage output.

1.4 Extended Boards

A variety of extended boards or units may be added to the system. These units are used for extended measurements or signal outputs or for extended system communication.

2. Specifications

2.1 INPUT

Voltage	18-60VDC
Current	<200mA at 48V
Power Consumption	12W max.

2.2 INTERFACE

Signal LED's	Green - Power ON, Yellow - System warning, Red - System alarm
Internal Communications	RS485 Data Bus (up to 64 modules + extended units)
MicroSD Card	up to 4Gb
External communications	USB connection (front access) for direct communication with PC via PowCom™ Hybrid software, RS232 interface (rear connector) for remote control via modem, 100 Mbps Ethernet interface for remote monitoring and control via TCP/IP, Web server interface + SNMPv1,v2
Signal Inputs	Battery current reading (shunt input) System voltage reading Analog inputs for battery symmetry reading, site monitoring or general use Battery temperature sensors Load fuse failure Battery fuse failure 2 x Digital inputs Ambient temperature sensor
Signal Outputs	LVBD/PLD disconnection LVBD/PLD reconnection 1 x relay for GenSet control 1 x relay ready for additional site control 2 x alarm relays (additional 6 alarm relays with Alarm Relay Board) 2 x Digital outputs
Software	Configuration file upgradeable by PowCom™ Hybrid with appropriate license via USB/Ethernet FW upgradeable via Ethernet

2.2 BASIC FUNCTIONS

Intelligent battery cycling with user selectable battery algorithm and depth of discharge with preference of renewable resources
Intelligent Generator control
500 event alarm log
User-selectable alarm parameters
Web interface for remote operation via PC
Temperature compensated charging
Limited battery charging current
Limited output power
LVBD control
PLD control
Alarm relay test
Inventory, Peak load, Site, Maintenance and service
Statistical data log
Real time clock with battery backup
MicroSD card with data logging function

2.3 ALARMS

2 potential free alarm contacts (additional 6 free alarm contacts with Alarm Relay Board)
Low system voltage
High system voltage
Load/Battery disconnection
Mains Error
Distribution fuse failure
AC low voltage
Battery failure
Module failure
High battery temperature
Symmetry fault
Battery fuse failure
High load
AC high voltage
Urgent module failure
Communication failure
Partial load disconnection 1
Temp. probe failure
High distribution load
Battery is discharging
Overvoltage shutdown
Low Battery temperature

Partial load disconnection 2
Partial load disconnection 3
16 x Additional User Definable Alarms
Fuel Level Low
GenSet Alarm
GenSet Battery Failure
GenSet Battery Discharged
GenSet Connection Interrupted
Ground Fault
PV Surge Fail
PV Array Disconnected
Distribution Surge Arrester Failure
Genset on Manual
Genset Failed to Start

2.4 GENERAL

Dimensions, in. (mm)	3.38 (85.8) W x 1.6 (40.6) H x 8.23 (209.0) D
Weight	0.44 lbs.(0.2kg)
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +85°C
Safety	IEC60950-1, UL60950-1 & CSA22.2 No. 60950-1-03
EMC	EN61000-6-2, EN61000-6-3, EN300 386-2
Environment	Storage: ETS 300 019-2-1 Transport: ETS 300 019-2-2 Operation: ETS 300 019-2-3

NOTE: The power system setup may limit the availability of some controller functions.

3. Operation

3.1 Basic Description

To achieve optimal running of the system, HCX controller operates in various modes to accurately manage the hybrid cycle:

Start-up charge
The Start-up charge mode ensures the battery is fully charged and ready for cycling operation.

Charge
The battery is charged with intelligent charging algorithm.

Float
Battery is fully charged but power source is still available. It is typical for applications where the solar/wind energy is used or generator keeps running due to some failure.

Discharge
The battery is discharged to pre-defined depth of discharge.

Disconnected
The system is switched to Disconnected mode if a failure condition appears.

Maintenance
This mode is used for switching the generator ON/OFF independently on operation mode.

Equalization
This is a periodic limited overcharge of the battery which can, to some extend, restore battery capacity, revive battery efficiency and extend battery life.

3.2 Starting up

When the system voltage is present on the DC side, the controller is turned ON and the generator and alarm relays are switched to NO position. It takes several seconds for the controller to analyze the system and test all addresses of connected modules and units. During this time the green LED on the controller front panel is blinking. No alarm signals are given during this period.

When the controller identifies a module or a unit, it is automatically added to its inventory. Modules and units remain in the system memory until a master reset or reconfiguration is performed.

3.3 Adding / Removing Modules and Units

Adding Modules and Units
The controller constantly scans for new modules and units. When, for example, a rectifier is added to the system it remains invisible until detected by the controller.

It takes some time for the rectifier to reach the value of the system voltage and share the current with other rectifiers. Until then the rectifier current value is 0A.

Removing Modules and Units
When a module or a unit is removed from the system Communication Failure alarm is generated.

To remove the alarm press "Reconfigure" in the Inventory window in PowCom™ Hybrid software. It can be also done via the front panel, see Accept removed parts on page 19.

Reconfiguration removes all non-communicating modules and units from the inventory.

NOTE: Make sure there are no communication faults caused by any other failure before doing this. It makes all communication faults disappear, but it will not fix any problems so it must only be used if the communication fault is caused by the module or unit being intentionally removed.

3.4 Controller Failure

If the controller fails to operate, 2 alarm relays will be activated (in alarm position.)

3.5 Control Buttons

To browse the controller menu, 4 push-buttons are used to scroll and select.

- **CANCEL** - is used to cancel the current selection on the menu hierarchy. When pressed the menu returns one step back.
- **UP ARROW** - is used to move up in the menu hierarchy, to select options or adjust limits.
- **DOWN ARROW** - is used to move down in the menu hierarchy, to select options or adjust limits
- **ENTER** - is used to select and confirm an option or to move forward one level in the menu hierarchy.

If the controller is left unattended the display returns to the Main menu automatically after 2 minutes.

3.6 Display Icons

The controller icons are displayed at the top of LCD screen, indicating the status of various system parameters.

Battery Current, Distribution Current and Rectifier Current are displayed below the icons after controller start-up.

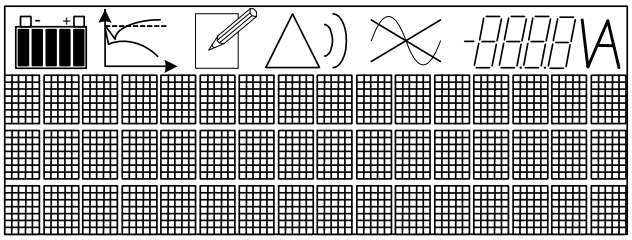


Figure 3-1 Display Icons

Battery Icon

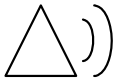
The battery icon displays the battery charge status in 20% increments. To predict the remaining capacity, immediate load current and voltage are also taken into account.

During battery charging the icon pulses. Once the battery is fully charged only the rightmost segment blinks.

Update Mode

This icon is displayed in editing mode when editable parameters in the Menu tree are accessed. The value can be updated by pressing the ENTER button when the desired value is shown.

Warning and Alarm Icons

Warning  Alarm

The Warning icon appears when a warning is present. The alarm icon indicates an alarm situation.

Mains Failure Icon

This icon indicates mains failure.

System Voltage Measurement

The system voltage with 2 decimal points is displayed.

4. Menu

The controller display is configured into a set of scrollable menus that provide an easy way to find the information or settings required. The information below describes how to navigate through the controller display and explains various menu options and system behavior.

NOTE: See full Menu Tree on pages 22 & 23.

4.1 Main Menu

The Main menu is divided into several sections which are further divided into sub-menus, see Menu Tree. Functions of sub-menus are explained further on.

4.2 Show Alarms

This window displays the current alarm status. If several alarms come up at once, 2 small triangles (▼▲)appear in the right upper corner. Use the arrow keys to scroll through the alarms. Any removed alarm disappears from the alarm list automatically as well as any new one is added to the alarm menu immediately. Some alarms need to be reset manually by holding ENTER for a short time (for details see Alarms / Messages, section 5).

4.3 Show Messages

This item displays ongoing messages. If there are more messages at once, scroll down to view all of them. New or removed messages are updated on the menu immediately.

4.4 Show Data

This menu displays detailed information about site and system components.

4.4.1 Show Module Data

This menu displays information from each rectifier and consists of four levels, each containing different rectifier information:

Use ENTER to get to the information wanted, UP/DOWN to scroll between the rectifier numbers and CANCEL to move a level higher in Menu Tree.

NOTE: Rectifier modules are numbered from left to right and top to bottom when the system is viewed from the front.

NOTE: Rectifiers that are not communicating may not have correct or updated information.

The first sub-level displays Communication status (*Com*), Rectifier Current (*I*), Rectifier Output Voltage (*U*), and the Current Share input (*Im*).

The second sub-level includes information about Internal rectifier temperature (*internal*), Rectifier Over-voltage limit (*OVP*) and the Current Limit. Once the rectifier is selected on the display, press ENTER and a new menu with the alarm information is shown.

Module alarms are indicated by 3 letter flags;

- MNS - No mains input.
- LOW - Output voltage low (depends on rectifier type).
- OFF - No operation, caused by mains failure, other failure or when module is turned off manually or automatically.
- OVS - Overvoltage shutdown.
- FAN - Fan failure. The consequences of a fan failure depend on the type of rectifier.
- CUR - Current sharing fault. Rectifier output current deviates too much from the average value.
- TMP - Temperature is high. This alarm must be reset manually.

The fourth sub-level displays input voltage (if available), rectifier serial number (if available) and rectifier software version (if available).

4.4.2 Show SLI Data

If UNIPOWER SLI inverters and an SLI translation board are installed, this menu displays basic information regarding the SLI unit.

If SLI inverters are not installed the window is invisible.

4.4.3 Show Unit Data

This menu option is displayed in two levels.

The first sub-level shows Unit Number, Communication status (Com), and Unit current (*I*).

The second sub-level shows Unit number, Serial number, and Software version. (Controller Alarm Relay Board or Controller Extension Board are examples of communication unit.)

4.4.4 Show System Data

The Hybrid system data are shown here:

- Operation Mode (Start up charge, Charge, Discharge, Disconnected, Float, Maintenance)
- Voltage Reference (*U1* or *U2*)

4.4.5 Show battery data

The battery related data are shown here:

- Discharged capacity - the amount of discharged Ah
- Battery state (Start up charge, Charge, Discharge, Disconnected, Float)
- Float voltage U1 [V]
- Boost Voltage U2 [V]
- Temperature Compensation Factor [V/°C]
- Battery Current Limit [A]
- Battery Capacity (capacity based on battery type and no. of strings)
- Number of batteries
- Low voltage alarm [V]
- Load/Battery disconnection [V]

4.4.6 Show GenSet Data

The basic GenSet data are shown here:

- GenSet state (ON, OFF, No Operation)

NOTE: The Generator is switched to No Operation mode and is switched OFF when the GenSet Alarm or Fuel Level Low Alarm is present for more than 5 minutes.

- Fuel level [L]

4.4.7 Temperature

This menu shows the battery temperature in degrees of Celsius, measured by the battery temperature sensor (if installed) and the controller internal temperature measured by the controller internal temperature sensor.

4.4.8 External Measurements

If configured, external measurements can be read here. Use the arrow keys to scroll down the measurements.

4.4.9 Symmetry Measurements

The battery block voltage for each battery branch is displayed here. Use the arrow keys to scroll through the measurements.

4.5 Adjust Limits

The Adjust Limits menu allows the user to set or change the system parameters and alarm limits.

It has several menu options, each with their own sub-menus. Parameters can be set and adjusted by selecting the different sub-menus.

4.5.1 Alarm limits

- This menu allows to change the limits for following alarms:
- High voltage alarm [V]
- Over voltage shutdown [V]
- Partial load disconnection 1 [V]
- Partial load disconnection 2 [V]
- Partial load disconnection 3 [V]
- Load/Battery reconnection [V]
- High load [%]
- High temperature alarm [°C]
- Low temperature alarm [°C]
- Low AC voltage [V]
- High AC voltage [V]

NOTE: The High Load alarm is activated when the load current exceeds the capacity of the installed modules multiplied by the high load limit. This is an indication that the system requires increased rectifier capacity.

CAUTION: Adjusting the controller alarm and limit settings may have serious impact on system behavior. Only qualified installers should adjust these limits.

To change these limits use the arrow keys and press **ENTER** to select. See the Appendix relating to Configuration in your system manual for the default settings.

4.5.2 Battery Settings

This menu contains settings for the following battery parameters and limits:

- Symmetry limit (V)

4.5.3 System Specific Limits (also External Limits)

These limits are used only in specific systems.

- External Limit 1 Name of limit
- External Limit n Name of limit

There are eight user adjustable limits for PLS logic. If these limits are enabled they can be adjusted via the front panel (Adjust limits → System specific limits → Ext. limit 1-n) or via PowCom™ Hybrid software (Supervision → Set Parameters → System specific limits).

4.5.4 Module On/Off

Module On/Off is used for switching individual rectifier modules on or off. This function needs to be enabled in the Config Wizard.

- Module No.: 1 (On/Off)
- Module No.: n (On/Off)

4.5.5 FMD settings

This submenu allows setting of:

- FMD Voltage [V]
- FMD OVP [V]

This menu sets the reference voltage (FMD voltage) and OVP limit for secondary voltage units if these are available in the system.

4.6 Miscellaneous

The miscellaneous menu is used for setting and checking various system parameters.

4.6.1 Maintenance Mode

Used for switching the generator ON or OFF independently of Battery status and Depth of Discharge.

4.6.2 Set Time

The time and date are displayed and can be set using the buttons on the controller front panel. They can also be set via PowCom™ Hybrid software (Supervision → Set date/time). The clock has a battery back-up and keeps the correct time even if the controller is turned off.

4.6.3 Relay Test

This function switches alarm relays On/Off manually regardless of any system alarms. It is mainly used for testing of alarm relays and related devices.

4.6.4 Alarm Blocking

This function disables all system alarms and alarm relays. The only active and visible alarm is “Alarms are blocked”. (This function is usually used during system servicing as a prevention against false alarm triggering.)

4.6.5 Version

Shows the controller software version, configuration number and serial number.

4.6.6 SD Card Info

Provides the following information about the microSD card status:

- OK - card is working properly
- NA - not installed (cannot be detected)
- FAIL - file system error (identifies hardware, but can’t be used for reading or writing)

4.6.7 Set New Password

When selected, first enter the old password. Set a new password and confirm it by entering the new password again.

NOTE: Make sure the new password is remembered or written down. If the password is forgotten or access is denied, contact UNIPOWER technical support for assistance.

4.6.8 Shunt Current

Displays the current rating of the battery shunt, in Amperes [A]. This parameter shows the value of current in the current/voltage ratio of the shunt.

4.6.9 Shunt Voltage

Displays the voltage drop of the battery shunt at rated current, in millivolt [mV]. This parameter shows the value of voltage in the current/voltage ratio of the shunt.

Example

A shunt with rating 400A/60mV is set as follows: 400A is set as Shunt current and 60mV as Shunt voltage.

4.6.10 Current Offset

Current offset is used for calibration of the current measurement in order to avoid measurement offset. To calibrate, turn all battery breakers OFF and adjust the Current Offset to zero.

4.6.11 Voltage Offset

This function sets the output DC voltage measurements offset. Measure the voltage on the DC busbars with a calibrated voltmeter and enter the measured value in the Voltage Offset menu.

4.6.12 Audible Alarm

An audible alarm can be switched On/Off in this menu option. When switched On and an alarm occurs the controller makes a sound until any key is pressed.

4.6.13 Network Address

For systems with more than one controller installed in the network setup, this network address must be set to be able to communicate with the PowCom™ Hybrid software. This setting must not be confused with the controller IP address setting.

The default setting is 2 and it should not be changed for most applications.

4.6.14 Baud rate

The speed of communication for the RS232 interface can be set here. There are two options 38400 bps or 9600 bps.

NOTE: The baud rate setting in both PowCom™ Hybrid software and the controller must be the same.

4.6.15 Init modem

When selected, the controller sends a message to initiate a modem. The initiation message sets the modem to auto-answer after two rings. See the instructions specific to your modem if it requires additional initialization to operate.

4.6.16 Accept removed parts

A unit or module removed from the system generates the Communication failure alarm. Select YES to remove all non-communicating units or modules from the inventory and clear the alarm.

NOTE: Make sure there are no communication faults caused by any other failure before doing this. It makes all communication faults disappear; but it will not fix any problems, so it must only be used if the communication fault is caused by the module or unit being intentionally removed.

4.7.17 Reset to defaults

This command returns all settings of the system to default values without deleting logged data or system information. It is recommended to try this instead of Master Reset if a reset is needed. After a reset always check all limits and adjust them to the required levels.

4.7.18 Master reset

A master reset completely resets the controller and deletes all stored data including the password. If possible, perform a backup of the controller data to a PC before doing a master reset. After a master reset always check all limits and adjust them to the desired levels.

CAUTION: A Master Reset deletes all information from the system.
Use the master reset feature only as a last resort.

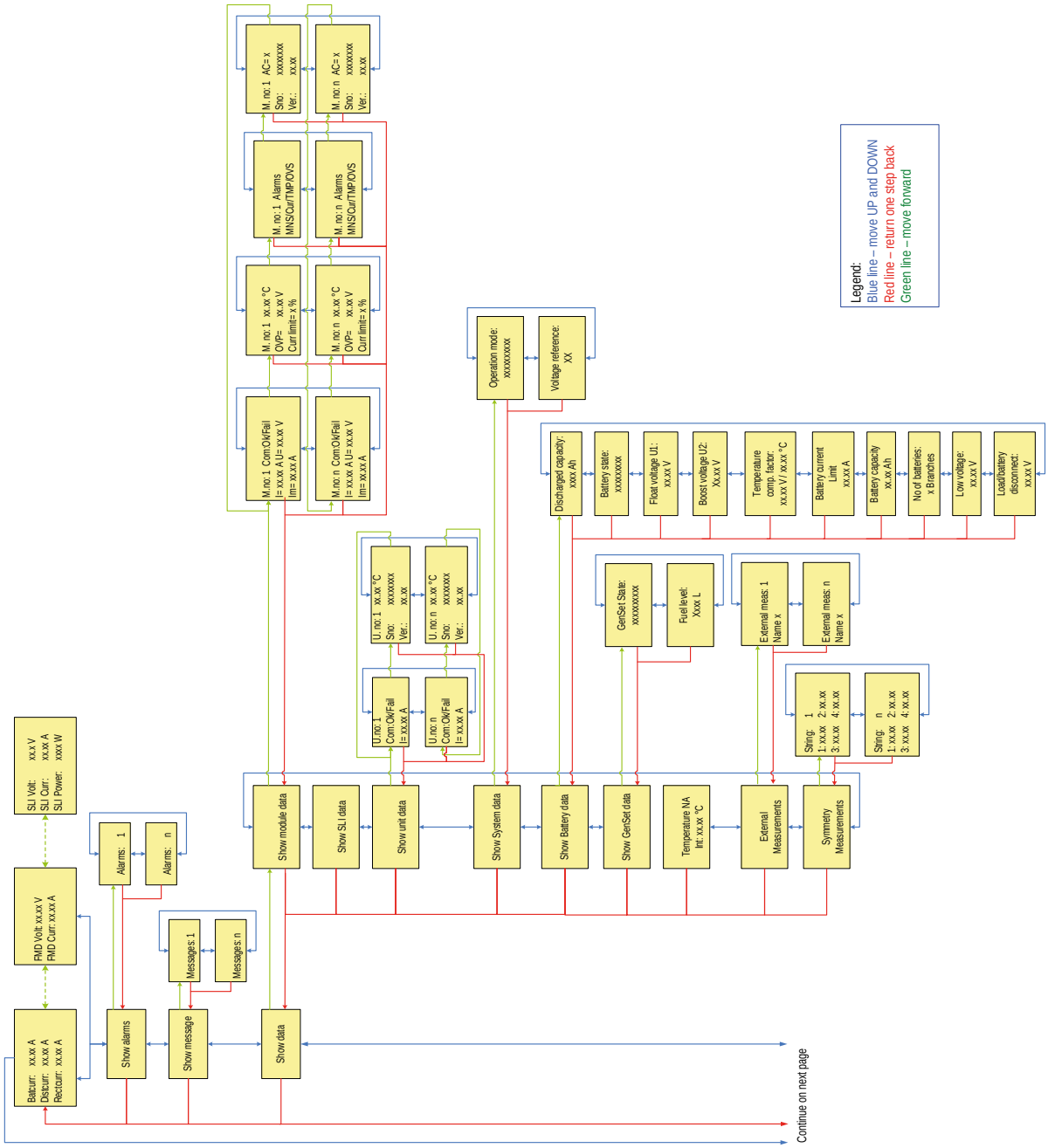


Figure 4-1 Menu Tree part 1

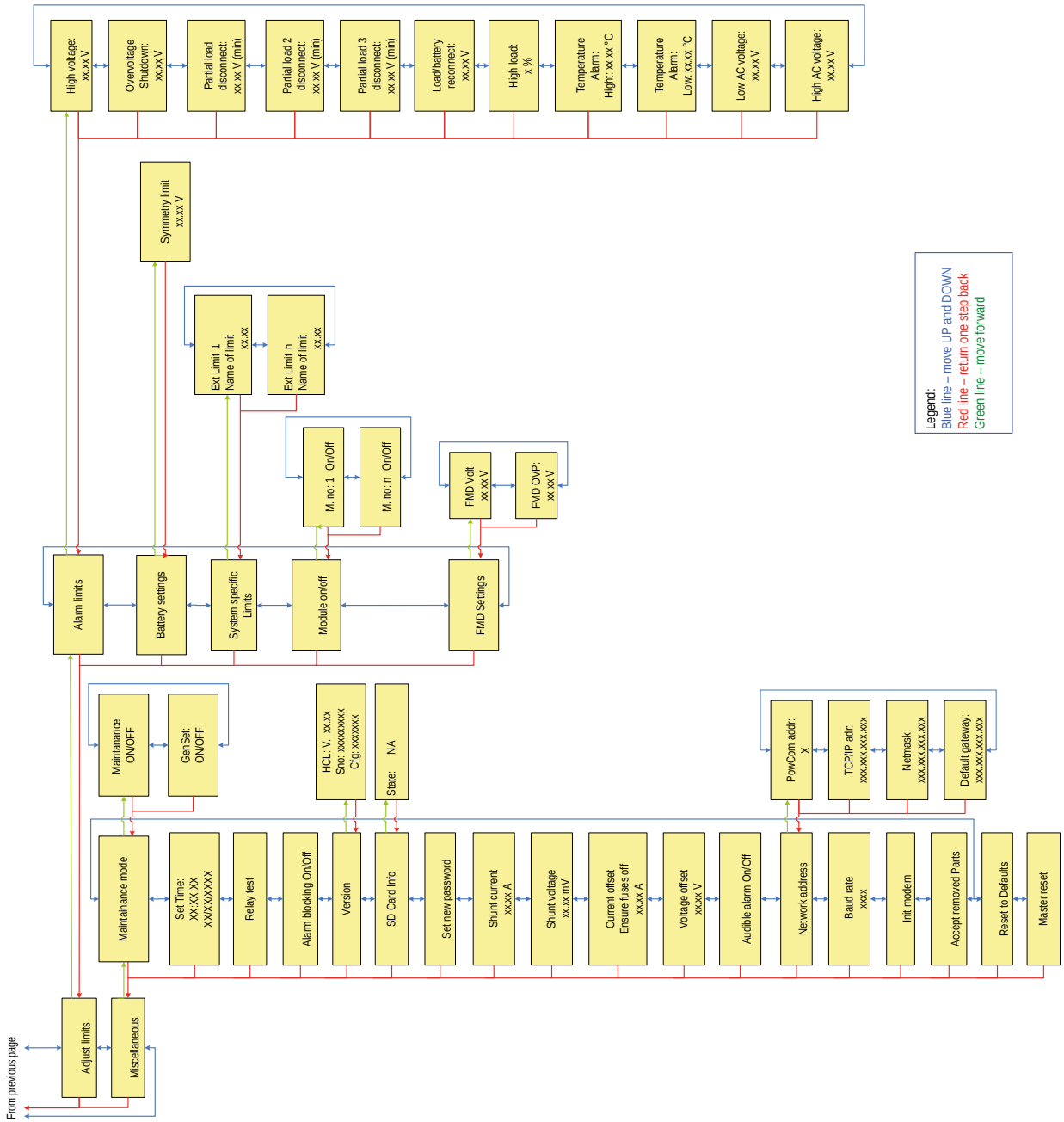


Figure 4-2 Menu Tree part 2

5. Controller Alarms / Messages

This chapter describes the controller alarms in standard system operation and configuration:

Low system voltage
This alarm is generated when the system voltage drops below the limit - *Low voltage alarm.* (The limit is calculated from data in Battery file.)

High system voltage
This alarm occurs when the system voltage exceeds the limit set in section 4.5.1 - *High voltage alarm*. (The limit is set manually.)

Load/Battery disconnection
This alarm is generated when the system voltage drops below the limit - *Load/Battery disconnection* for more than 30s. Load/Battery disconnection must be allowed in the configuration.

Mains Error
This alarm is activated when AC mains is missing for two or more rectifiers (except for the systems with one rectifier only) and the GenSet is ON for more than 30 seconds.

Distribution fuse failure
This alarm occurs when a distribution circuit breaker is switched OFF and a load is connected to the breaker. If a load is not connected the alarm is not generated, whether the breaker is ON or OFF.

AC low voltage
This alarm is generated when the AC Mains voltage drops below the limit set in section 4.5.1 - *Low AC voltage* and the GenSet is ON for more than 30 seconds. This alarm is activated only when rectifiers with AC mains voltage reading are used in the system.

Battery failure
This alarm is not used in this controller.

Module failure
This alarm occurs when one of the installed modules indicates a failure alarm.

High battery temperature
This alarm occurs when battery temperature exceeds the limit set in section 4.5.1 - *High temperature alarm*.

Symmetry fault
This alarm is generated when the voltage difference between battery string middle point measurement and calculated value is greater than the value set in section 4.5.2 - *Battery Settings*.

This value is calculated from the system voltage.

If automatic reset is not toggled in the configuration, the alarm needs to be reset manually.

Battery fuse failure
This alarm occurs when the battery circuit breaker is switched OFF and the system voltage is 0.65V higher than the battery voltage. The alarm does not occur when a battery is not connected.

High load
This alarm is activated when the load current exceeds the capacity of the installed rectifiers multiplied by the limit set in section 4.5.1 - *High load*.

AC high voltage
This alarm occurs when AC Mains voltage exceeds the limit set in 4.5.1 - *High AC voltage* and the GenSet is ON for more than 30 seconds. This alarm is activated only when rectifiers with AC mains voltage reading are used in the system.

Urgent module failure
This alarm occurs when two or more installed modules send failure alarm.

Communication failure
This alarm occurs when installed modules or units are not communicating or are removed from the system. For detail see section 3.3.

PLD Disconnection
This alarm occurs when the system voltage drops below the limit set in section 4.5.1 - *Partial load disconnect*.

Voltage disconnection needs to be allowed in the configuration.

Temp. probe failure
This alarm always appears when:

- The temperature probe is disconnected and temperature compensation is enabled.
- Battery temperature is above + 80°C or below -20°C, temperature compensation can be enabled or disabled. (If disabled and temperature is below -40°C the alarm does not appear.)
- Battery temperature is 10°C higher than the temperature of the internal temperature sensor.
- Battery temperature is 50°C lower than the temperature of the internal temperature sensor.
- Battery temperature is 15°C above the High Temperature limit

This alarm does not appear when:

- The temperature probe is disconnected and temperature compensation is disabled.
- Temperature compensation is disabled and the temperature drops below -40°C.

High distribution load
Is not used in this controller.

Battery is discharging
This alarm appears when the battery is discharging with current higher than 2% of the current rating of the shunt and the system voltage drops 1V below the voltage reference (U1 or U2).

This information is set as a message this controller.

Overvoltage shutdown
This alarm appears when the system voltage exceeds rectifier overvoltage shut down limit and the rectifiers are switched OFF. The rectifiers usually need to be restarted.

Low battery temperature
This alarm is activated when the battery temperature drops below the temperature set in4.5.1 - *Low temperature alarm*.

PLD2 Disconnection
This alarm occurs when the system voltage drops below the set limit, set in section 4.5.1 - *Partial load 2 disconnect*.

Voltage disconnection needs to be allowed in the configuration.

PLD3 Disconnection
This alarm occurs when the system voltage drops below the set limit, set in section 4.5.1 - *Partial load 3 disconnect*.

Voltage disconnection needs to be allowed in the configuration.

Alarms are blocked
This alarm occurs when the *Alarms are blocked* function is used, see section 4.6.4.

16 x Additional User Definable Alarms
These alarms are set off when user defined alarms meet the alarm condition.

The alarm text is defined by the user.

Fuel Level Low
This alarm occurs when the fuel level falls below the GenSet Fuel Low Alarm Level alarm limit set via the Config Wizard. When this alarm is active for more than 5 minutes, the Generator is switched to No Operation mode and then switched OFF.

Both functionality and visibility can be disabled via the Config Wizard.

GenSet Alarm
This alarm occurs based on the signal from the GenSet alarm output. If this alarm is active for more than 5 minutes, the Generator is switched to NO Operation mode and then switched OFF.

Both functionality and visibility can be disabled via the Config Wizard. It is also possible to invert the alarm logic.

GenSet Battery Failure
This alarm controls GenSet Battery charging when the generator is running.

An alarm occurs when the voltage measured by Multipurpose Input 9 is lower than the system voltage plus 13.0V (see GenSet connection, section 3.2) and the Generator in ON for more than 30 seconds. This alarm is latched in GenSet OFF state or Not Operational. (It is removed in GenSet ON state or by Alarm Reset button.)

Both functionality and visibility can be disabled via the Config Wizard.

GenSet Battery Discharged
This alarm controls the GenSet Battery. When the voltage measured by Multipurpose Input 9 is lower than the system voltage plus 9.6V (see GenSet connection, section 3.2) and the Generator is OFF or in No Operation mode, for more than 30 seconds.

Both functionality and visibility can be disabled via Config Wizard.

GenSet Connection Interrupted
This alarm occurs when the voltage measured by Multipurpose Input 9 is lower than the system voltage for more than 30 seconds.

Both functionality and visibility can be disabled via the Config Wizard.

Ground Fault
This alarm occurs when a ground fault is detected by the GFD module.

PV Surge Fail (SC SPD Fail)
This alarm occurs when an SPD fault is detected in the PV String Combiner.

PV Array Disconnected
This alarm is generated when a PV Array Disconnected fault is detected.

Distribution Surge Arrester Failure (PVDU SPD Fail)
This alarm occurs when a PV Array Disconnected fault is detected.

Genset Failed to Start
This alarm occurs if the controller requested a generator start but the input AC voltage is not available.

Genset on Manual Mode
This alarm occurs when the controller requests a generator to be Off but the input AC voltage is still available (Genset was started manually outside of controller).

6. Connection to Controller via PowCom™ Hybrid software

6.1 Connecting to the Controller via USB - Direct Communication

For controller connection a USB cable with Standard A plug to Standard B plug is required.

The Controller requires PowCom™ Hybrid software which can be downloaded from the UNIPOWER web site at: https://www.unipowerco.com/powcom/PowCom_Hybrid_setup.zip.

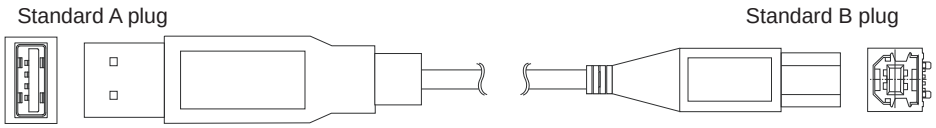


Figure 6-1 USB Cable

1. Connect the B plug of the USB cable to USB interface on the controller front panel.

2. Connect the A plug of USB cable to the USB port on the PC.

3. Start the PowCom™ Hybrid software.

4. Choose *Communication* from the PowCom™ Hybrid software menu, and select *USB Communication*, see Figure 6-2. If present, the controller will be connected automatically through the USB interface.

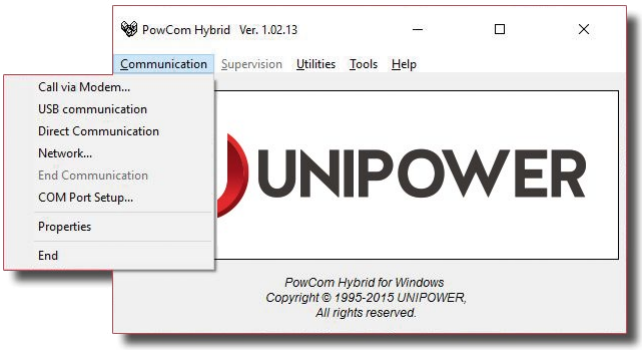


Figure 6-2 Communication

5. Enter Password (1234 by default).

NEED MORE INFORMATION? The PowCom™ software package available from UNIPOWER is delivered with a manual and is available on the web site at https://www.unipowerco.com/powcom/PowCom_Hybrid_setup.zip. See this manual for more information.

6.2 Connecting to Controller via a Network

1. Connect an appropriate patch cable to the Ethernet port on the controller front panel and to the network interface.
2. If the IP address is not set in the controller, it has to be done manually. The TCP/IP address, Net mask and Default gateway can be entered in 2 ways: via the front panel (Miscellaneous > Network Address) or via PowCom™ Hybrid software (Supervision > TCP / IP address) using Direct Communication.

NOTE: Every controller should have a unique IP address by which it is recognized in the network. Ask your network administrator for TCP/IP address, Net mask and Default gateway details.

3. Start the PowCom™ Hybrid software.
4. Choose *Communication* from the PowCom™ Hybrid software menu, and select ***Network***.
5. Enter the IP address into the "Server:port" text box or select one from the list as shown in Figure 6-3 and press the "Get list" button. (The port number is always 9000.)
6. Then press the "Connect" button.
7. Enter the password (1234 by default) and press OK, Figure 6-4.
8. Check the PowCom™ Hybrid software documentation for further information about the interface.

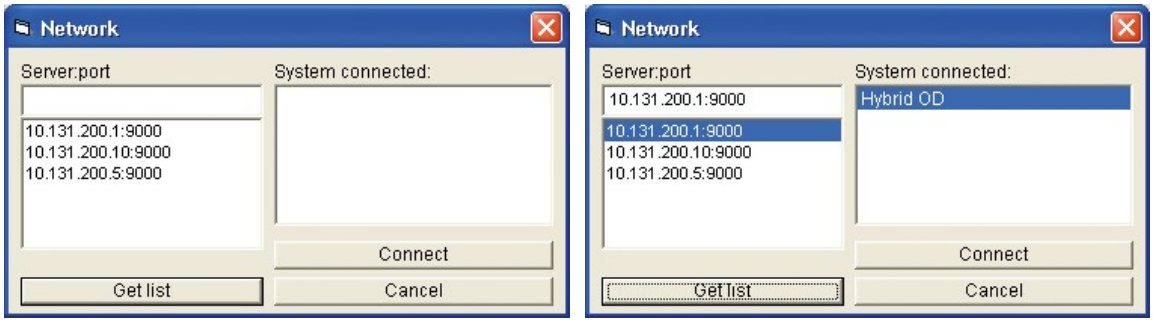


Figure 6-3 Network Connection

Figure 6-4 Password

7. Connecting to the Controller via the Web Interface

The controller can be also monitored via an Ethernet 100 BASE-T network using the built-in Web Interface software application.

The Web Interface allows monitoring and setting of the main system parameters and alarms. The browser is automatically refreshed approximately every half-minute.

The Web Interface requires an up to date graphical Internet browser (MS Internet Explorer, Mozilla Firefox or other).

UNIPOWER does not guarantee compatibility with older browser software versions.

NOTE: For connectivity verification in the network between the PC and the controller, it is possible to use ICMP (Internet Control Message Protocol). It is chiefly used by the operating systems of networked computers to send error messages—indicating, for instance, that a requested service is not available or that a host or router could not be reached.
The **ping** tool is used directly by user network applications. It sends an "Echo request" and expects an "Echo replay". The controller can work with max. 1024 Bytes only (Windows ping default).

7.1 Connection

For Ethernet connection via the Web Interface, follow the instructions below:

1. Connect an appropriate patch cable to the Ethernet Connection on the controller front panel and to the network interface.
2. If the IP address is not set in the controller it has to be done manually. The TCP/IP address, Net mask and Default gateway can be entered in 2 ways: via the front panel (Miscellaneous > Network Address) or via PowCom™ Hybrid software (Direct communication > Supervision > TCP / IP address).

NOTE: Every controller should have a unique IP address by which is recognized in the network. Ask your network administrator for TCP/IP address, Net mask and Default gateway details.

3. Start the Internet browser on the computer and enter the IP address in the Address bar after HTTP and you should get a connection box, see Figure 7-1.
4. When logging in for the first time, enter 'admin' as Username and leave the Password field blank. If a User Account already exists, enter the appropriate Username and Password.

NOTE: The Password can be edited after login using the Configuration - Admin menu on the left side. See Admin Configuration 7.2.8.1 for further information regarding login, user levels and password editing.

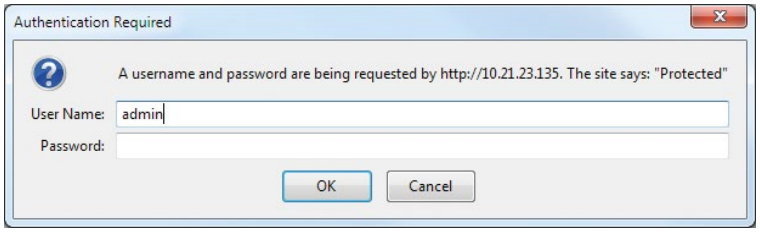


Figure 7-1 Connect

7.2 Web Interface Menu

After logging in, the web interface is displayed with the system overview as shown in Figure 7-2 with the Menu on the left, System parameters and settings in the middle and Alarms on the right side of the window.

NOTE: Alarms are displayed with red triangles whilst messages have yellow ones.

The first six menu options are used for system monitoring and to display system parameters, measurements and other details.

The configurations menu is used for setting the system parameters and limits.

The logs menu displays a variety of system logs; some of which are updated automatically while others are user updated.

NEED MORE INFORMATION? The information displayed in the Web Interface corresponds to the settings available in the controller display menu described in detail earlier in this manual.

7.2.1 Overview

After login, an overview with the basic system measurements is displayed in the interface:

- System Voltage [V]
- Load Current [A]
- Battery Current [A]
- Rectifier current [A]
- Temperature [°C] - Battery temperature measured by HCX.
- Operation mode
- GenSet state
- Solar Current

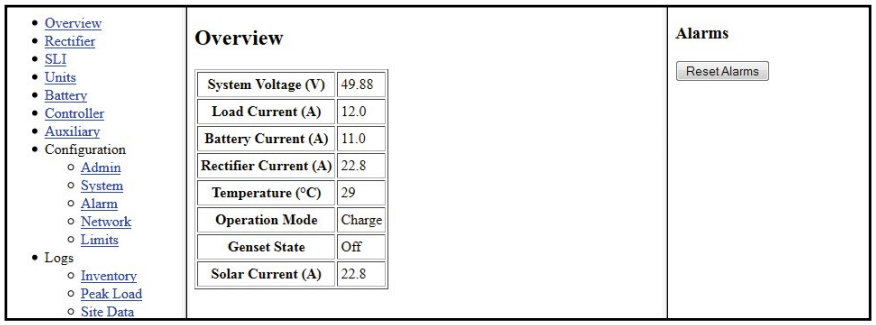


Figure 7-2 Web Interface Overview

7.2.2 Rectifier

The rectifier window displays Rectifier data, Rectifier Status and Rectifier Alarm Status. To select the required rectifier scroll down the menu. All logged rectifiers are listed here.

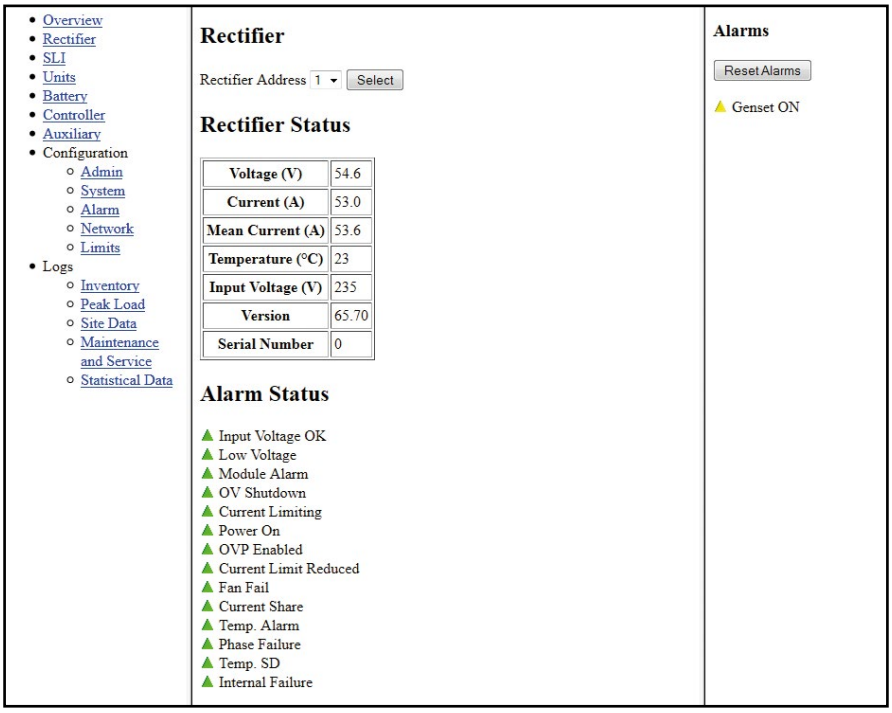


Figure 7-3 Web Interface Rectifier

7.2.3 SLI

This menu shows basic information about SLI units, if SLI inverters and an SLI translation board are installed.

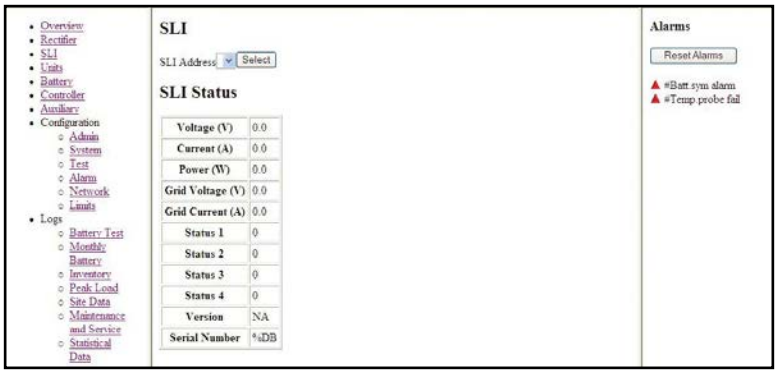


Figure 7-4 Web Interface SLI

7.2.4 Units

This menu shows basic information about any extension units that are connected to the system.

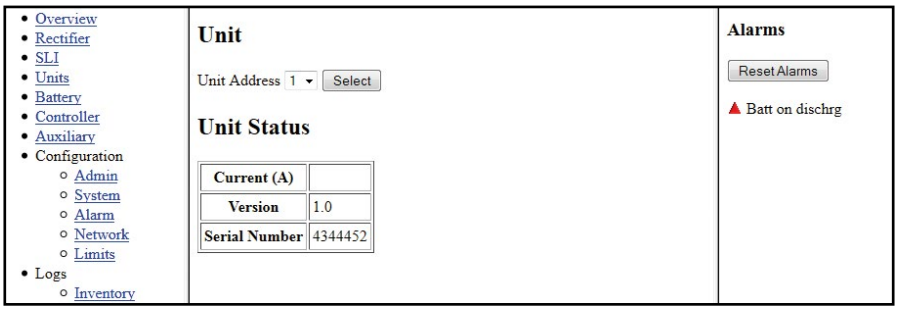


Figure 7-5 Web Interface Units

7.2.5 Symmetry Voltage

This menu shows battery symmetry measurements.

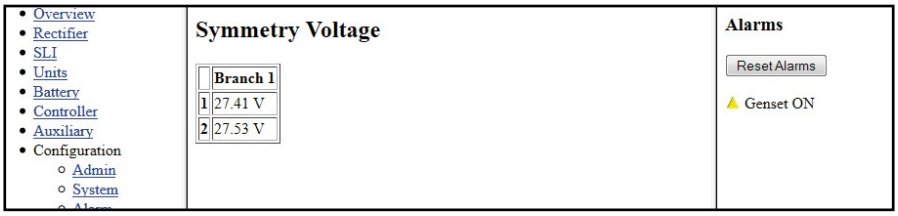


Figure 7-6 Web Interface Battery

7.2.6 Controller

This menu shows various controller information (type, serial number, software version and configuration number).

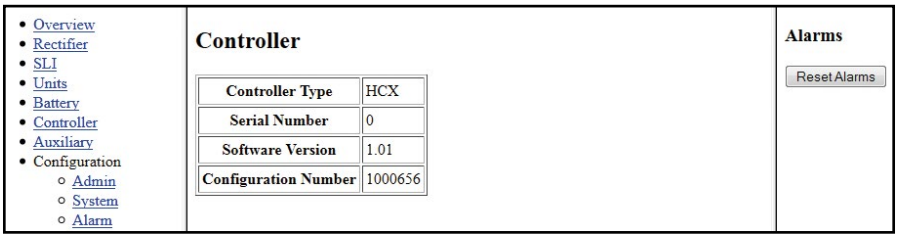


Figure 7-7 Web Interface Controller

7.2.7 External/Auxiliary

This menu shows any external/auxiliary measurements that have been programmed into the configuration.

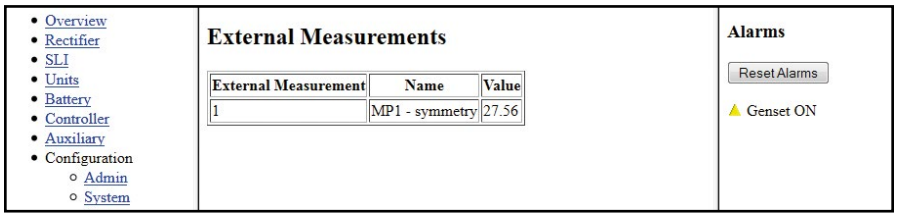


Figure 7-8 Web Interface External/Auxiliary Measurements

7.2.8 Configuration

7.2.8.1 - Admin

System information, Date/Time and Login information can be set or viewed in this menu.

The Web Interface has three access levels:

- Read-Only access allows the user to view but not to edit the system settings.
- Standard access allows the user to change the system settings.
- Administrative rights include the ability to change user names and passwords and set SNMP parameters.

Change the required settings and press the Submit or Update buttons to save changes.

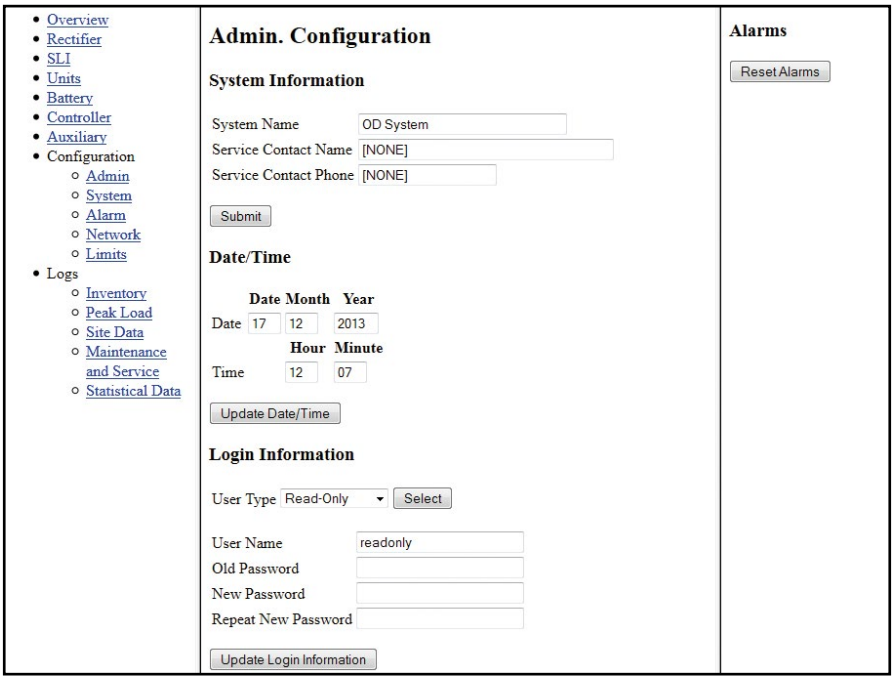


Figure 7-9 Web Interface Admin. Configuration

7.2.8.2 - System

This menu displays basic system settings and battery information. Some parameters are set from the Battery file and some are adjustable via the Hybrid Config Wizard, see Figure 6-16.

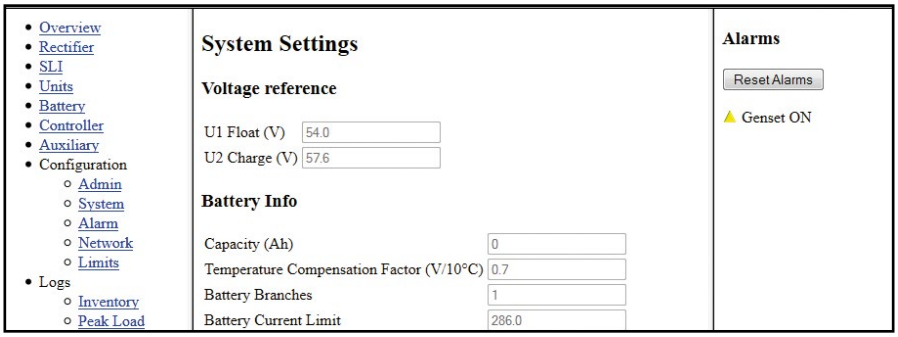


Figure 7-10 Web Interface Configuration | System

7.2.8.3 - Alarm

This menu allows setting of Alarm limits. The limits depend on system requirements, typical values are shown below.

NOTE: Low Voltage Alarm and Low Voltage Disconnection limits are set from the Battery file and are not configurable via the Web Interface or Hybrid Config Wizard.

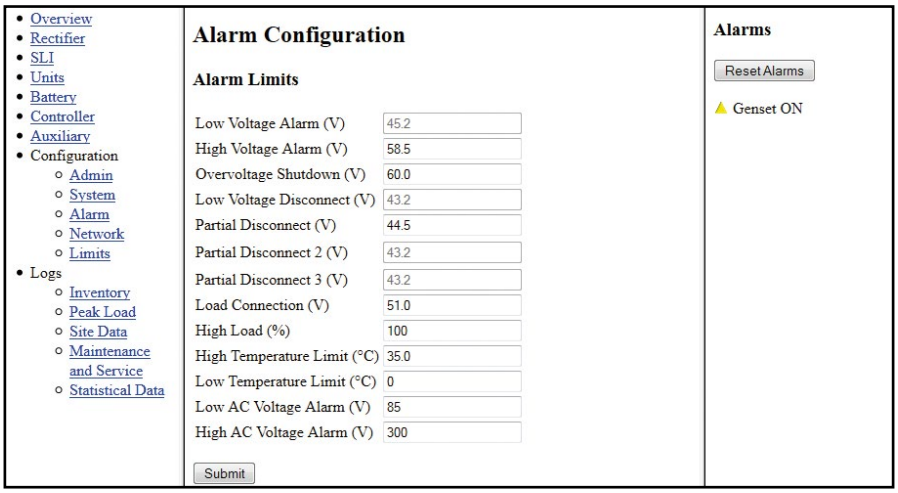


Figure 7-11 Web Interface Configuration | Alarm

7.2.8.4 - Network

The system IP-address, Netmask, Gateway and Host name can be set here. In this window it is also possible to set up the trap recipients for SNMP traps as well as community names.

NOTE: Do not change IP address, netmask or gateway unless you are sure that you can reach the new address otherwise connection will be lost.

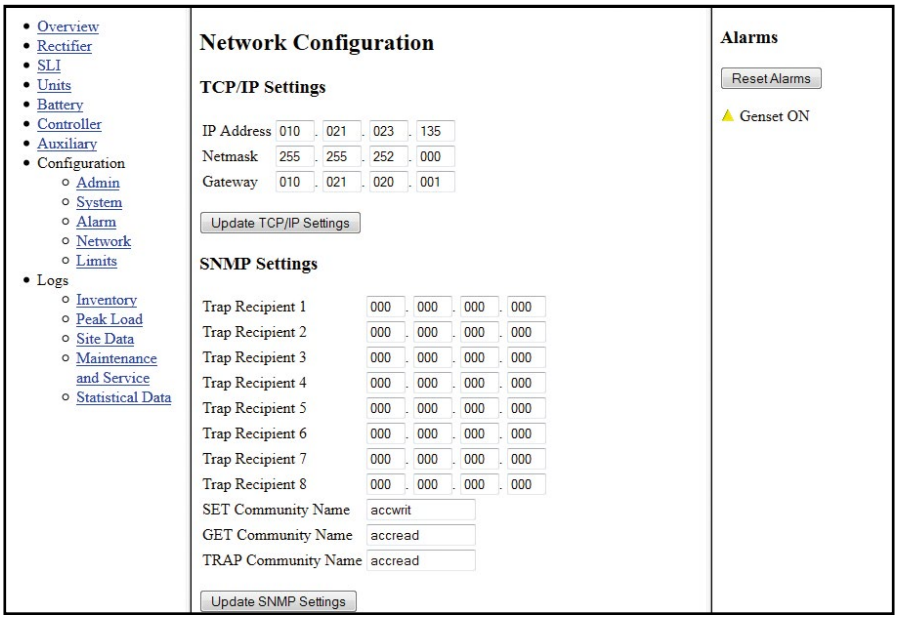


Figure 7-12 Web Interface Configuration | Network

7.2.8.5 - Limits

This menu allows the user to see and change values of programmable External limits that have been assigned in the configuration of the system.

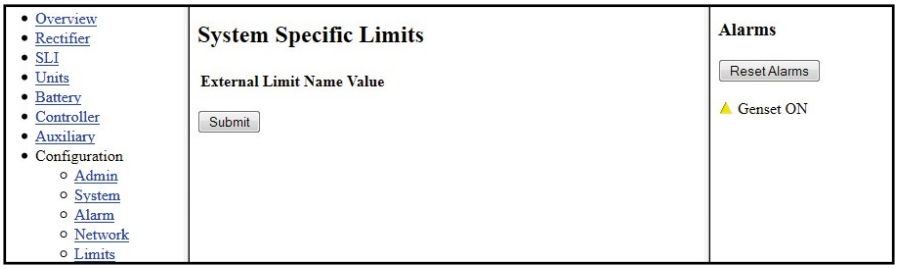


Figure 7-13 Web Interface Configuration | Limits

7.2.9 Logs

Items in this menu allow access to different system logs.

8. SNMP

A general SNMP (Simple Network Management Protocol) Manager can supervise a variety of networked equipment simply by importing a text file called MIB (Management Information Base). The SNMP Manager program can access and control the DC Power Systems by adding the MIB describing the HCX SNMP Agent to its collection of MIB files.

SNMP support complies with SNMPv2c. The MIB is a simple Custom MIB.

NOTE: For more information contact UNIPOWER Customer Services.

Readable system information

- System Name
- Controller Type
- Controller software version
- Controller Serial number
- DC output description
- Battery Description
- Battery Capacity

This is basically the system information set from PowCom™ Hybrid software when the system is installed, plus some additional controller information.

Readable Measurements

- System Voltage
- Load Current
- Battery Current
- Rectifier Current (Total)
- Battery Temperature
- AC input Phase voltages (when rectifier support this)
- FPV current (total)
- Irradiation (%)
- Battery State
- Generator State
- System State
- Ah Discharged / SoC
- Alarm History Table
- Mod**ules Tables**

Readable Alarm data

- Number of active alarms
- Alarm text of the 16 programmable alarms
- Alarm Data 1-3
- Ext Alarm data 1-2

System Parameters

The most common system parameters and limits can be read and some can be set through the system parameters group.

Alarm data 1-3, Ext Alarm data 1-2, Hybrid Alarms 1-2 and Hybrid Status are bit patterns that contain the current alarm status etc. See following table for more information.

Table 8-1 - Alarm Data

Bit	Description	Comment
	Alarm data 1	
0	Low voltage alarm	
1	High voltage alarm	
2	Low voltage disconnect	Ref: Battery/Load disconnected alarm
3	Mains failure	
4	Distribution fuse failure	Ref: Load breaker failure
5	Low AC Voltage	
6	Battery failure	
7	Rectifier module alarm	
	Alarm data 2	
0	High temperature alarm	
1	Symmetry failure	
2	Battery fuse failure	
3	High Load alarm	
4	High AC Voltage	
5	Urgent module alarm	
6	Communication fault	
7	Partial load disconnect 1	
	Alarm data 3	
0	Temp probe failure	
1	Reserved	
2	Batteries on discharge	
3	Output overvoltage shut down alarm	
4	Low battery temperature alarm	
5	Partial load disconnect 2	
6	Partial load disconnect 3	
7	Alarms blocked	Other alarms disabled during maint.

Bit	Description	Comment
	Extra Alarms 1 (Alarm data 4)	Ext alarm 1-8 (user defined alarms)
0	Ext alarm 1	
1	Ext alarm 2	
2	Ext alarm 3	
3	Ext alarm 4	
4	Ext Alarm 5	
5	Ext Alarm 6	
6	Ext Alarm 7	
7	Ext Alarm 8	
	Extra Alarms 2 (Alarm data 5)	Ext alarm 9-16 (user defined alarms)
0	Ext alarm 9	
1	Ext alarm 10	
2	Ext alarm 11	
3	Ext alarm 12	
4	Ext alarm 13	
5	Ext alarm 14	
6	Ext alarm 15	
7	Ext alarm 16	
	Hybrid Alarms 1	
0	Fuel Level Low	
1	GenSet Alarm	
2	GenSet Battery Failure	
3	GenSet Battery Discharged	
4	GenSet Connection Interrupted	
5	Ground Fault	
6	SC SPD Fail	
7	PV Array Disconnected	
	Hybrid Alarms 2	
0	PVDU SPD Fail	
1	Genset Failed to Start	
2	Genset on Manual Mode	
3-7	Reserved	
	Hybrid Status	
0	Genset ON	
1	System in Maintenance	
2	SD card error	
3-7	Reserved	

Traps sent from controller when events occur.

- All of the 24 standard alarms sent individually with a variable showing if the alarm is set or cleared.
- All of the 16 programmable alarms sent individually with a variable showing if the alarm is set or cleared.

- Hybrid Alarms and Hybrid status sent individually with a variable showing if the alarm is set or cleared.
- Trap sent when the Battery / Genset / System state change.

Traps are sent to up to 8 trap recipients that can be set up from the web interface.

9. Controller Data Logging - microSD Card

This section applies only to controllers with a microSD card fitted.

The data logging function collects system data which can be later used for analysis or statistical calculations.

The controller logs the data at regular 1 minute intervals with the date and time stamp. The data is saved in separate files for each day in comma separated values file format (e.g.:20100518.csv).

The data header contains three segments separated by colon (e.g: A:Bat:Voltage). First letter stands for the type of the signal (A - Analog signal, D - Digital signal, Time - Time signal), second segment corresponds with the component and the third one names the signal.

The data can be downloaded via PowCom™ Hybrid software. Choose *Tools* in PowCom™ Hybrid software menu and select *Download SD card*.

The controller supports max. 4GB microSD card, sufficient for more than 20 years of data logging. The file format is standard "comma separated values /.csv/" which can be processed by spreadsheets or imported into diverse databases. The logged data is detailed below in table 9-1.

Table 9-1 - Logged Data

Header	Description	Units
Time:yyyyMMdd.HH.mm	Time value	
A:Bat:Voltage	Battery voltage	[V]
A:Bat:Current	Battery current	[A]
A:Bat:Ah	Ampere-hour counter	[Ah]
A:Bat:Temperature	Battery temperature	[°C]
A:FMP:Current	FMP rectifier total output current	[A]
A:FVP:Current	FVP rectifier total output current	[A]
A:Load:Current	Total load current	[A]
A:HCX:Temperature	HCX internal temperature	[°C]
A:HCX:BatState	HCX controller battery state	
A:HCX:GenState	HCX controller generator state	
A:HCX:SysState	HCX controller system state	
D:HCX:Alarm1	ACC compatible alarms	
D:HCX Alarm2	User defined Alarms	
D:HCX:Alarm3	Hybrid system related alarms	
A:Gen:Fuel	Generator fuel level	[Liter]
A:HCX:Radiation	Irradiation measurement	[%]

NOTE: HCX:Alarm1 - HCX:Alarm3 are recorded in decimal format and need to be converted to binary code for proper alarm identification. Then each bit of the string represents a specific alarm, see Table 9-2.
The Alarms.bit0 is the rightmost digit.

Table 9-2 - Alarm Data

Alarm 1: ACC Compatible Alarms		
Bit	**Signal**	**Alarm Description**
0	LSV	Low System Voltage
1	HSV	High System Voltage
2	LVBD	Load/Battery Disconnected
3	MER	Mains Error
4	DFF	Distribution Fuse Failure
5	ALV	AC Low Voltage
6	BTF	Battery Failure
7	MDF	Module Failure
8	HBT	High Battery Temperature
9	SYM	Symmetry Fault
10	BFF	Battery Fuse Failure
11	HLO	High Load
12	AHV	AC High Voltage
13	UMF	Urgent Module Failure
14	COM	Communication Failure
15	PD1	PLD 1 Disconnection
16	TPF	Temp. Probe Failure
17	HDL	High Distribution Load
18	BSD	Battery is Discharging
19	OVS	Overvoltage Shutdown
20	LBT	Low Battery Temperature
21	PD2	PLD 2 Disconnection
22	PD3	PLD 3 Disconnection
23	BLK	Alarms are Blocked

Alarm 2: User Defined Alarms		
Bit	**Signal**	**Alarm Description**
0-15	UA0 - UA15	User Alarm 0 - 15

Alarm 3: Hybrid Related Alarms		
Bit	**Signal**	**Alarm Description**
0	GSA	GenSet Alarm
1	GLF	GenSet Fuel Level
2	GBF	GenSet Battery Failure
3	GBD	GenSet Battery Discharging
4	GCI	GenSet Connection Interrupted
5	GND	Ground Fault
6	PVS	PV Surge Fault
7	PVA	PV Array Disconnected
8	DSA	Distribution Surge Arrester Failure
9	DSF	Genset Failed to Start
10	GOM	Genset on Manual Mode
11	—	Not used
12	—	Not used
13	—	Not used
14	—	Not used
15	—	Not used
16	GSS	GenSet State
17	GSM	System in Maintenance
18	SDE	SD Card Error

APPENDIX A1 - Upgrading the firmware

Introduction

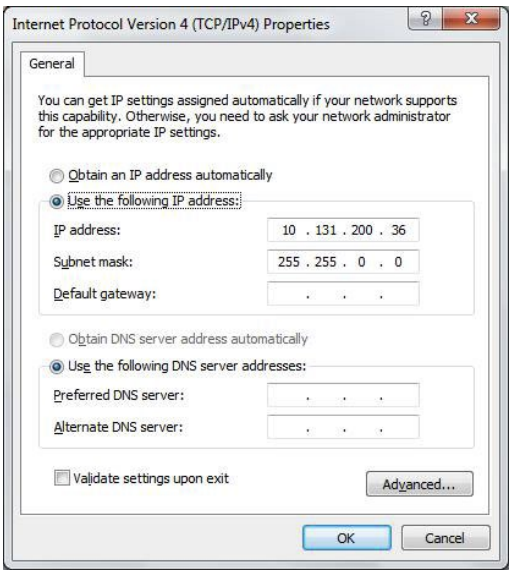
The controller firmware can be upgraded via the Ethernet port on the controller. This appendix describes the controller upgrade procedure during operation.

Equipment needed:

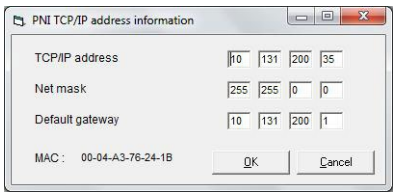
- PC with an Ethernet port and installed Site Tool software, version 1.xx.
- HCX firmware (.hcx file).
- These upgrade instruction.
- One cross-Ethernet cable for direct connection between the controller and the computer (or standard Ethernet cable for remote connection between the controller and the computer).

Procedure

1. Start the system with the controller to be updated.
2. Connect the controller to the computer with an Ethernet cable.
3. If you use a cross-Ethernet cable, set-up the computer's IP address within the same range as the controller. Go to **Network and Sharing centre | Local Area Connection | Properties | Internet protocol version 4 (TCP/IP v4) | Properties**. Check the radio button **Use the following IP address:** and define an IP address.

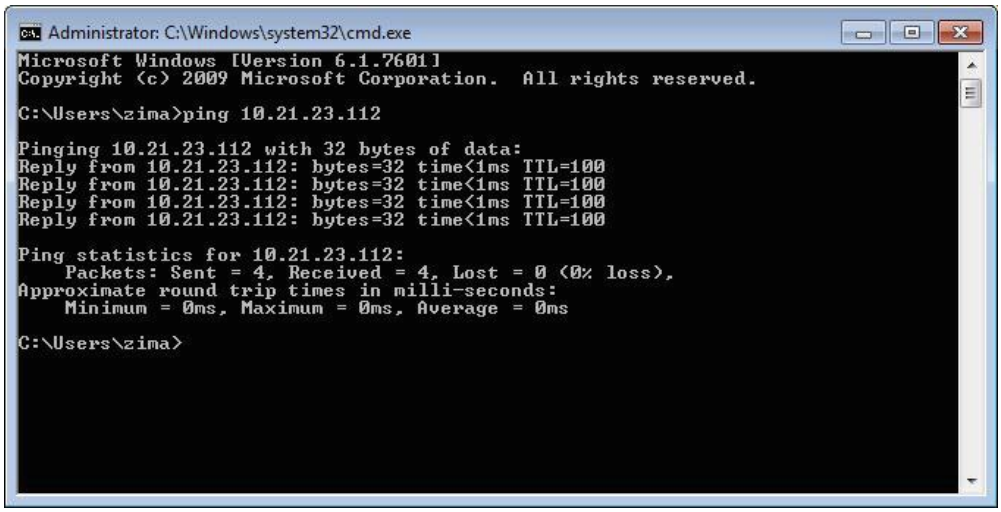


Example of computer IP address

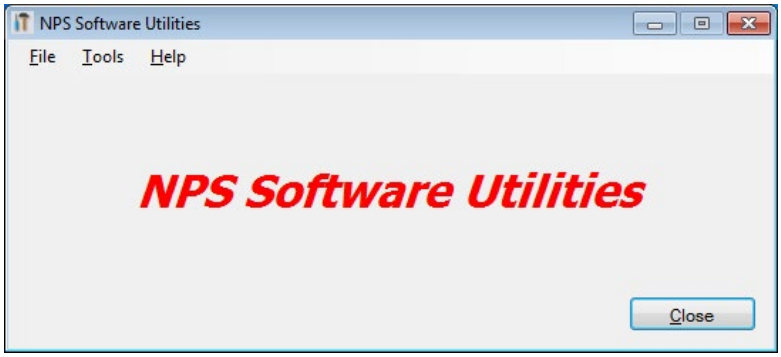


Example of Controller IP address

4. Test connectivity between the computer and the controller. Open a Command prompt line and “ping” the controller’s IP address.

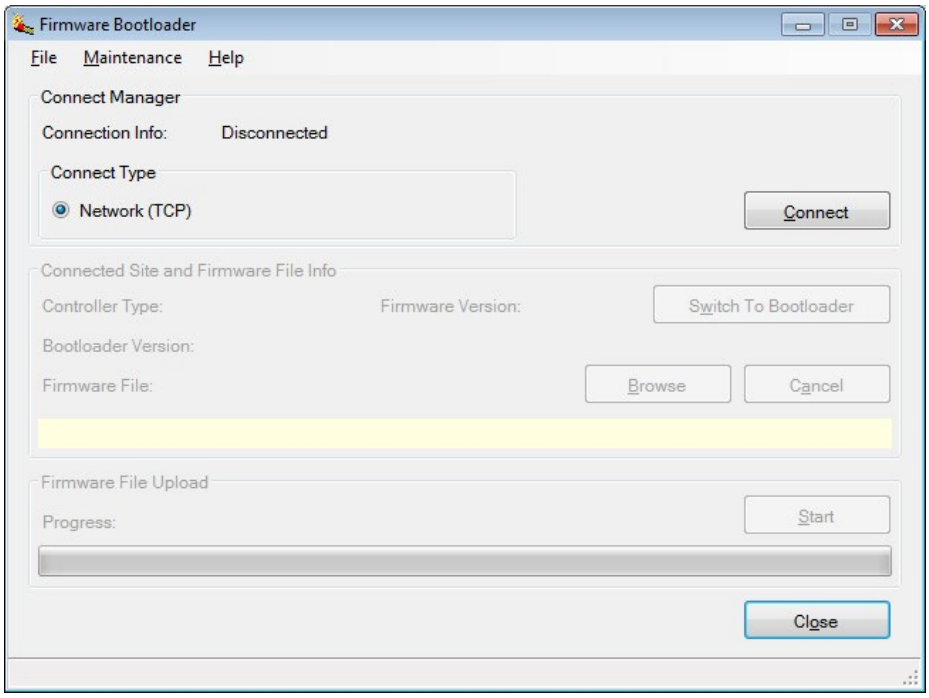


5. Open the NPS Software Utilities application on the computer.

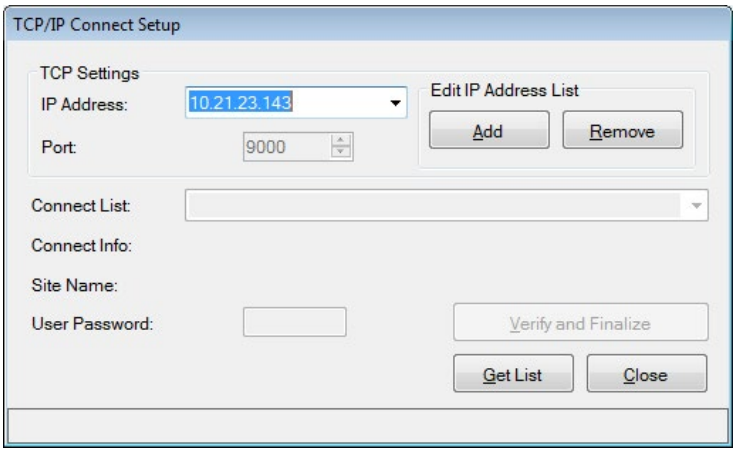


6. Choose menu item **Tools** and then select **Firmware Bootloader**.

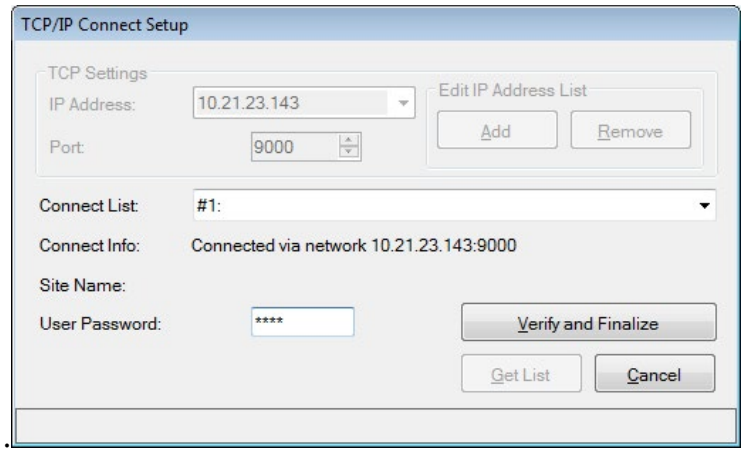
7. Click on the **Connect** button.



8. Type the Controller IP address and click on the **Add** button then click on the **Get List** button.

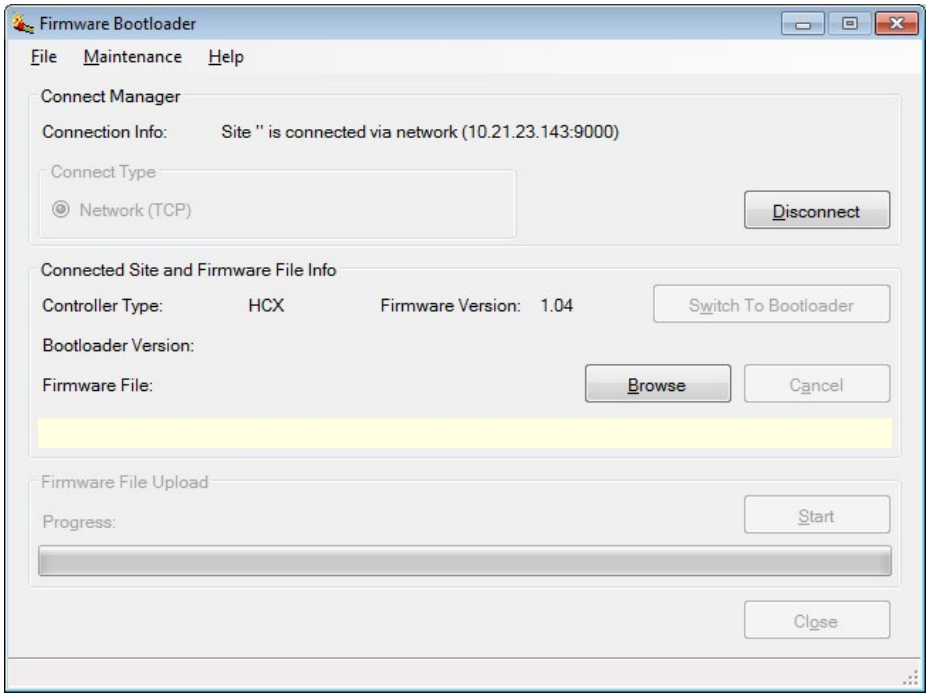


9. Enter the password in **User Password:** (1234 is the default), then click on the **Verify and Finalize** button.

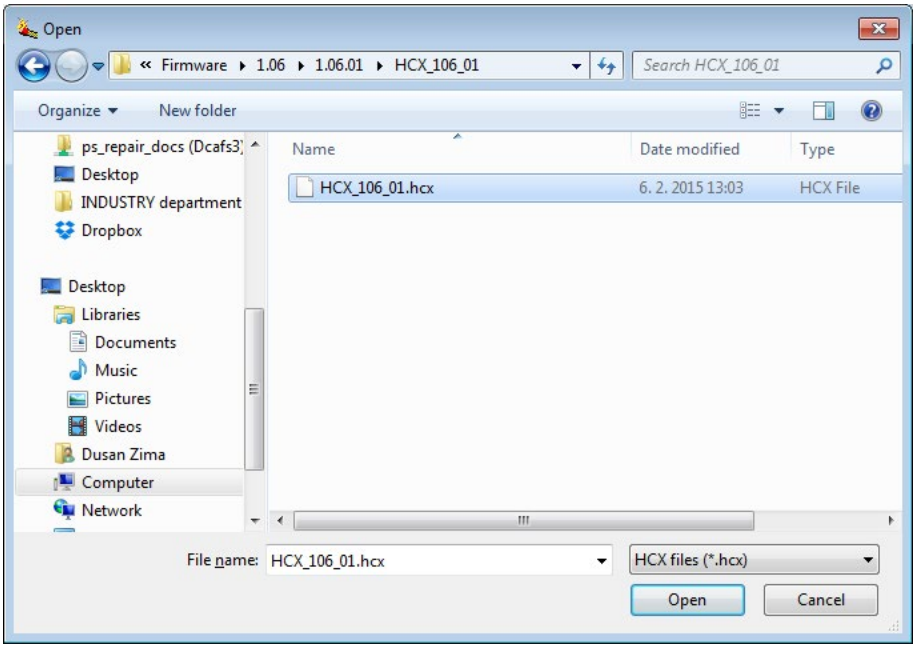


You are now connected to the controller.

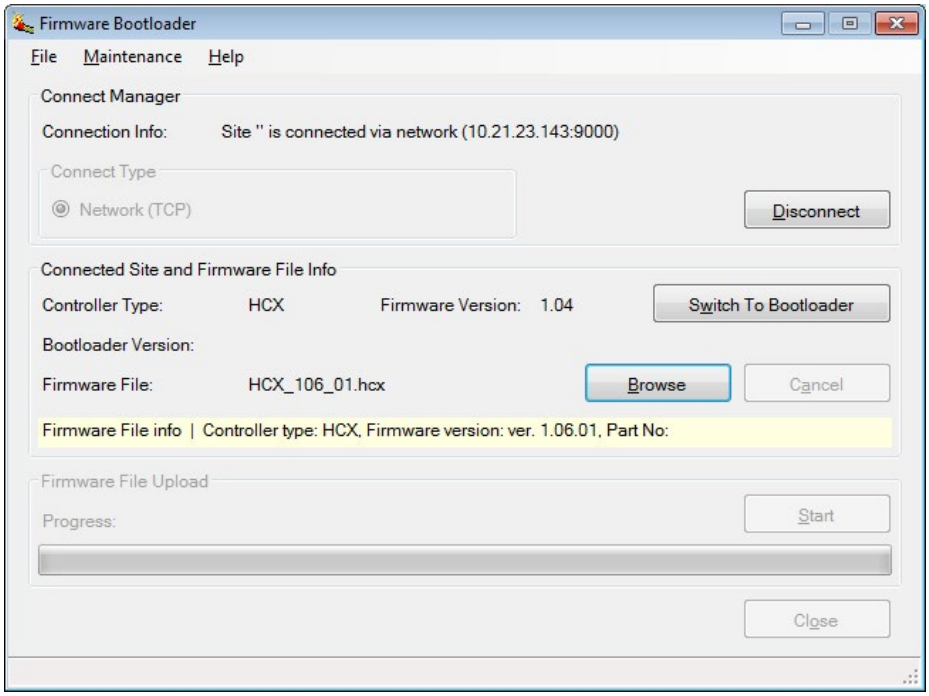
10. Click on the **Browse** button.



11. Find, Select, and open the file HCX, name: "HCX_*version*.hcx" (where '*version*' is the revision number being installed).

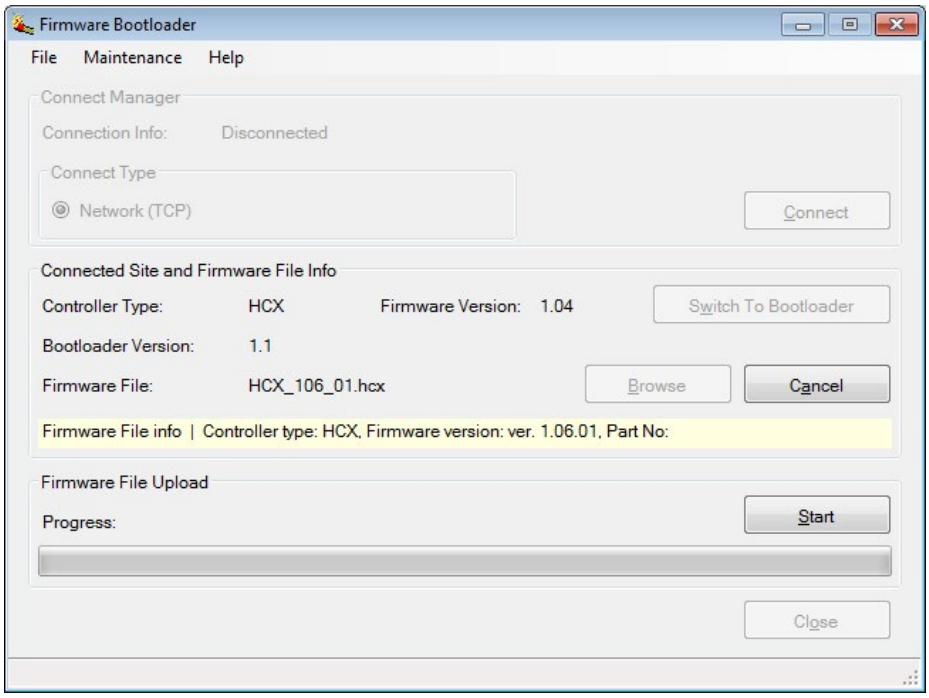


12. Click on the **Switch To Bootloader** button.

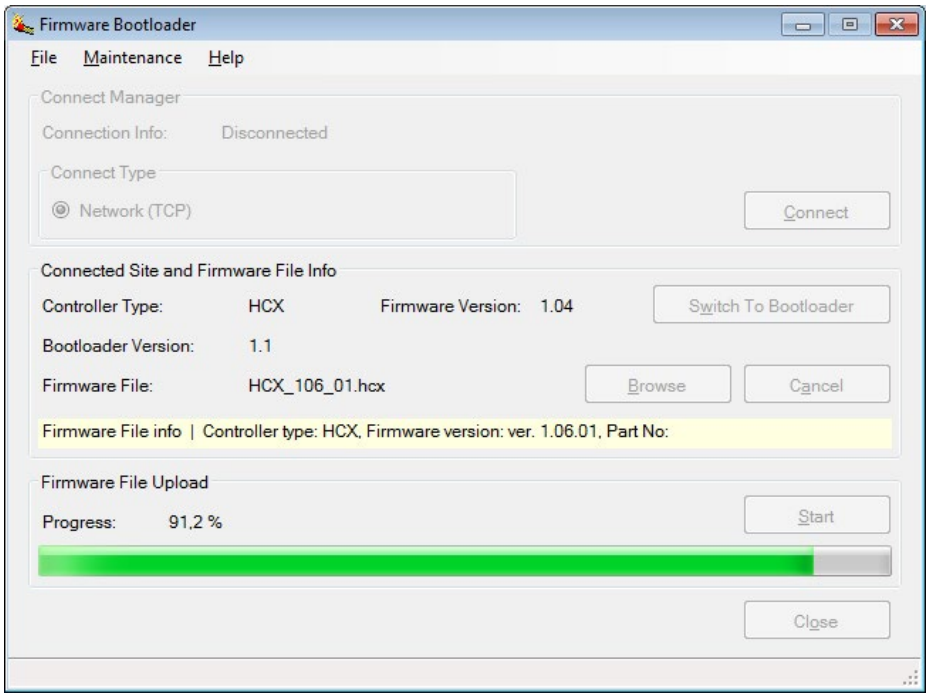


You are ready to burn the new firmware.

13. Click on the **Start** button.

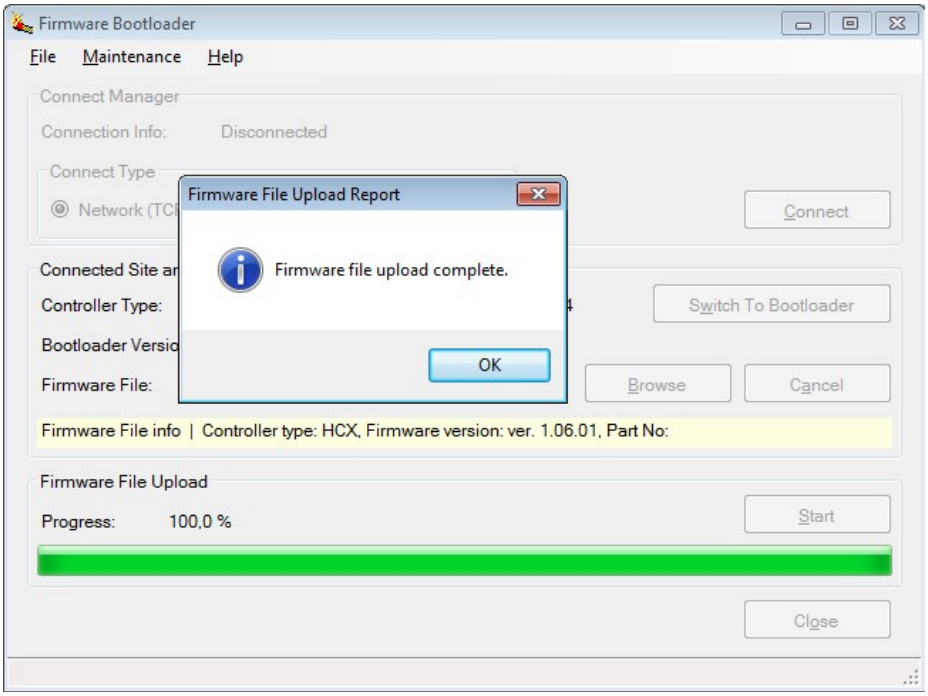


During firmware upload you will see a progress bar.



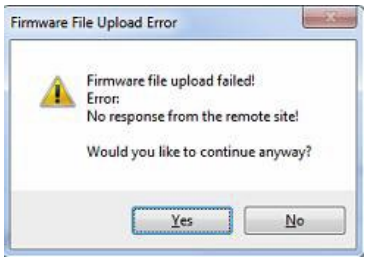
At the same time, you will see the message FW upd... and the LEDs will start flashing. The Green LED will flash slowly and the Amber LED will flash faster.

14. The following pop-up window appears on the screen after the upload is successfully completes. Click on the **OK** button and then **Close** the underlying Window.



15. Click on the **Close** button to end the programme.

NOTE: If you see the following programming failure window, run the programming step again by clicking the **Yes** button,



WARNING: Do not turn off the DC power during programming! It can cause unpredictable behaviour of the controller and it will not be possible to re-program the firmware later. It will remain in Bootloader mode.

APPENDIX A2 - Downloading data from the SD card

Introduction

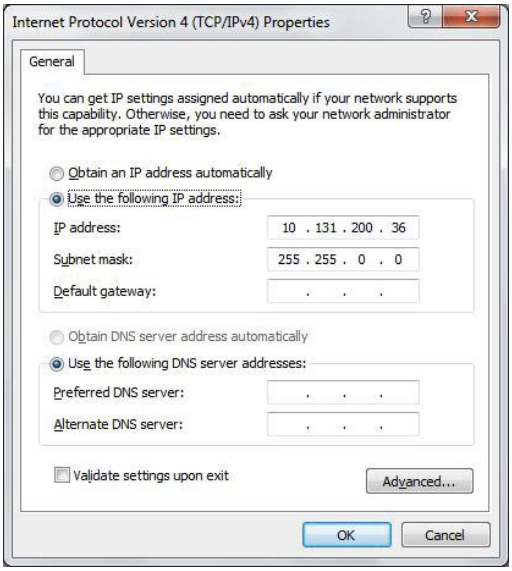
Data can be downloaded from the SD card via the Ethernet port on the controller. This appendix describes the download procedure.

Equipment needed:

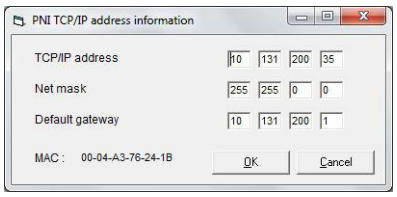
- PC with an Ethernet port and installed Site Tool software, version 1.xx.
- These download instruction.
- One cross-Ethernet cable for direct connection between the controller and the computer (or standard Ethernet cable for remote connection between the controller and the computer).

Procedure

1. Start the system with the controller.
2. Connect the controller to the computer with an Ethernet cable.
3. If you use a cross-Ethernet cable, set-up the computer's IP address within the same range as the controller. Go to **Network and Sharing centre | Local Area Connection | Properties | Internet protocol version 4 (TCP/IP v4) | Properties**. Check the radio button **Use the following IP address:** and define an IP address.

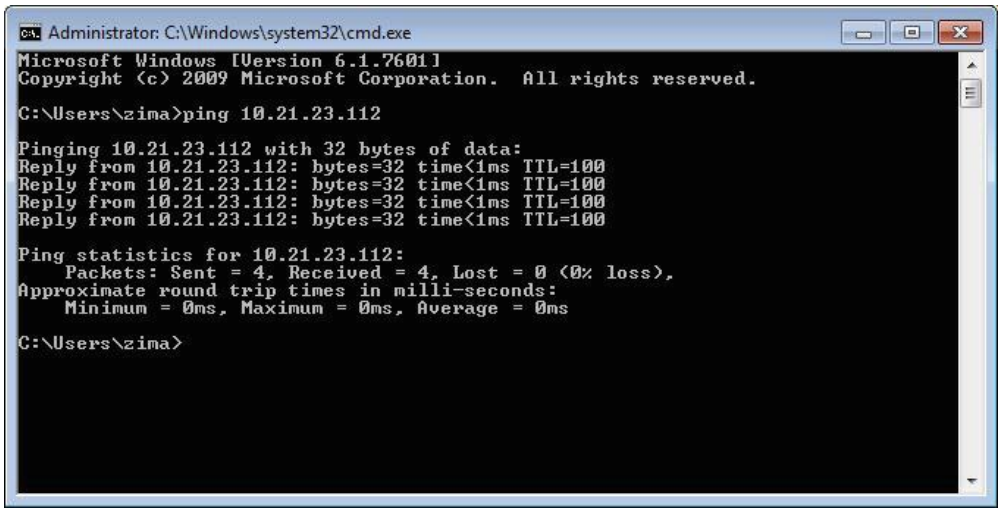


Example of computer IP address

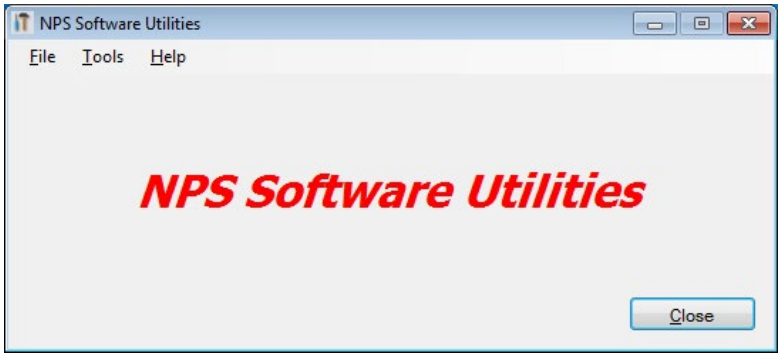


Example of Controller IP address

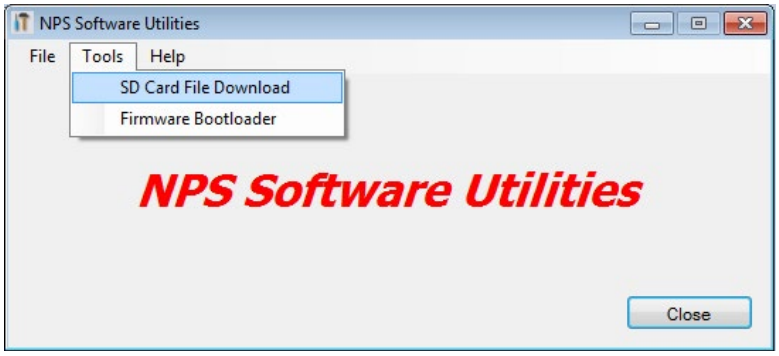
4. Test connectivity between the computer and the controller. Open a Command prompt line and “ping” the controller’s IP address.



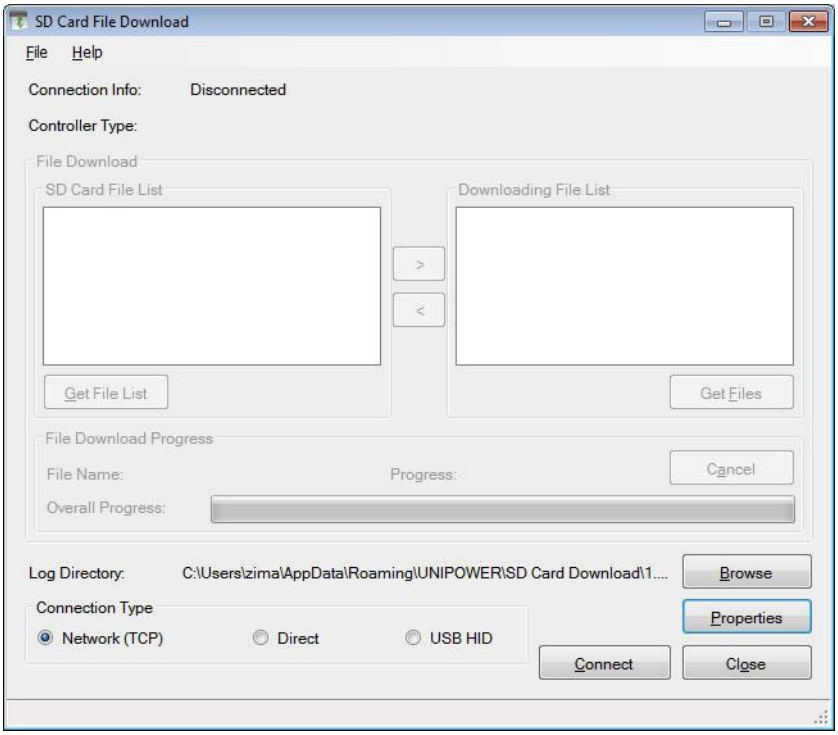
5. Open the NPS Software Utilities application on the computer.



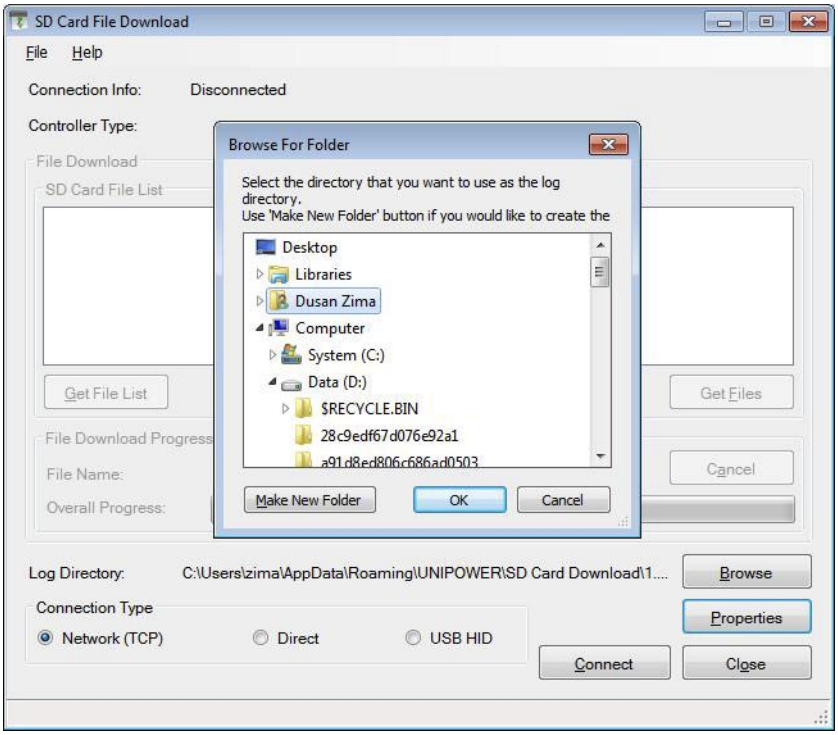
6. Choose menu item **Tools** and then select **SD Card File Download**.



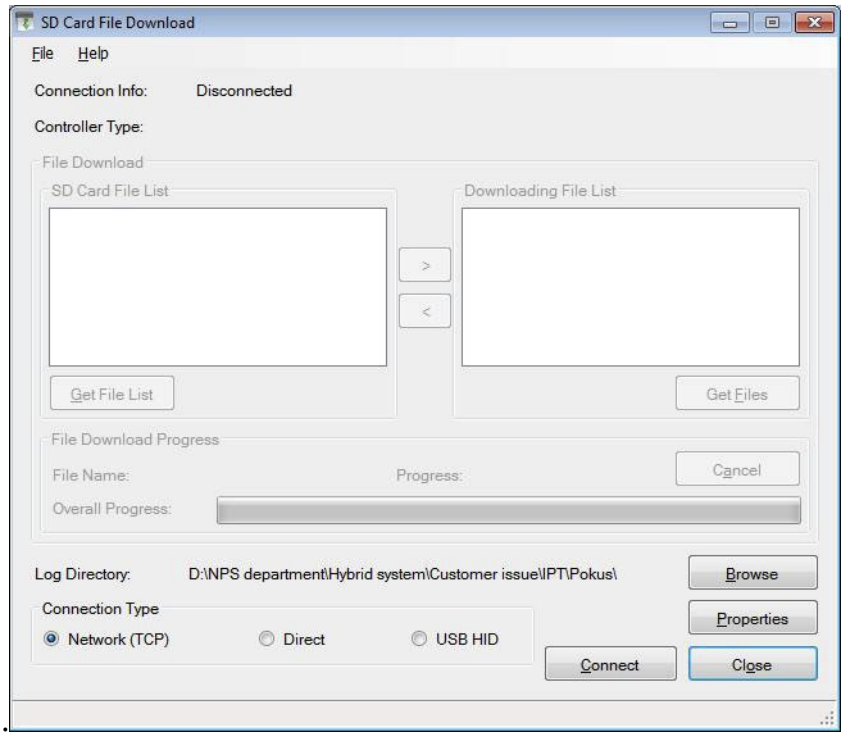
7. Click on the **Browse** button to choose the download location.



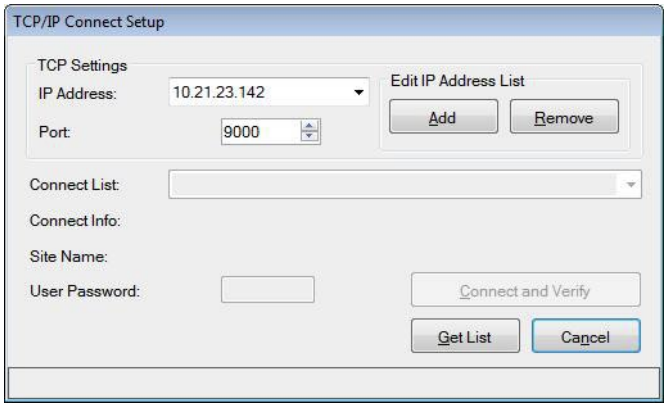
8. Choose or create the location where you want to store the file and click on the **OK** button.



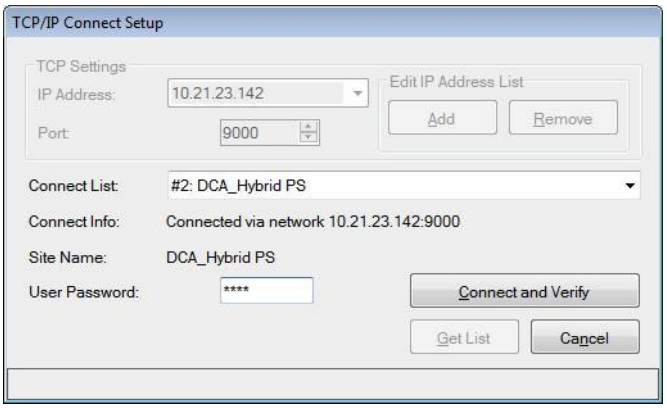
9. Click on the **Connect** button.



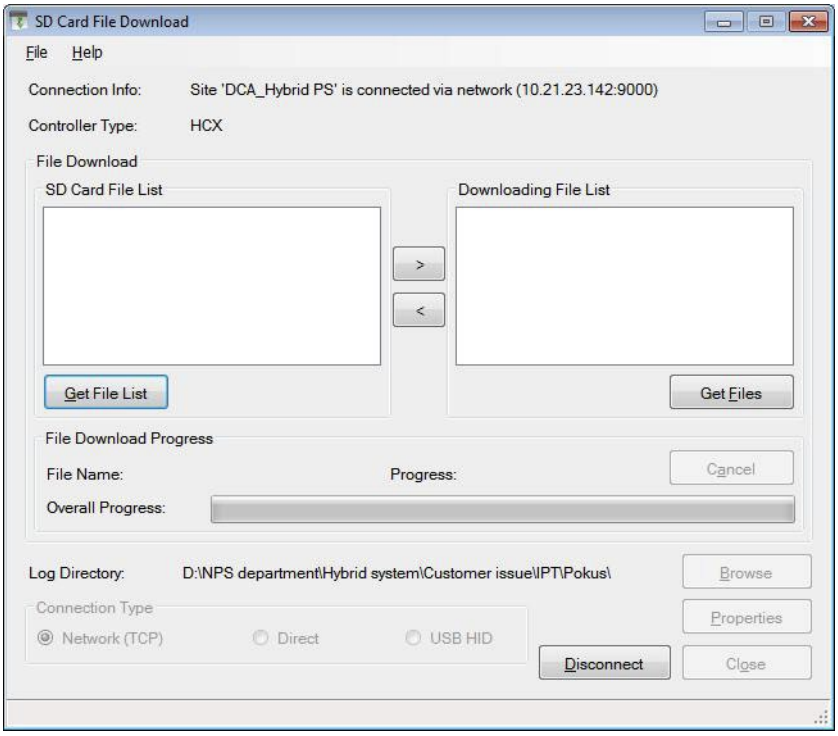
10. Select the controller IP address from the dropdown list or type in a new address and click on the **Add** button then click on the **Get List** button.



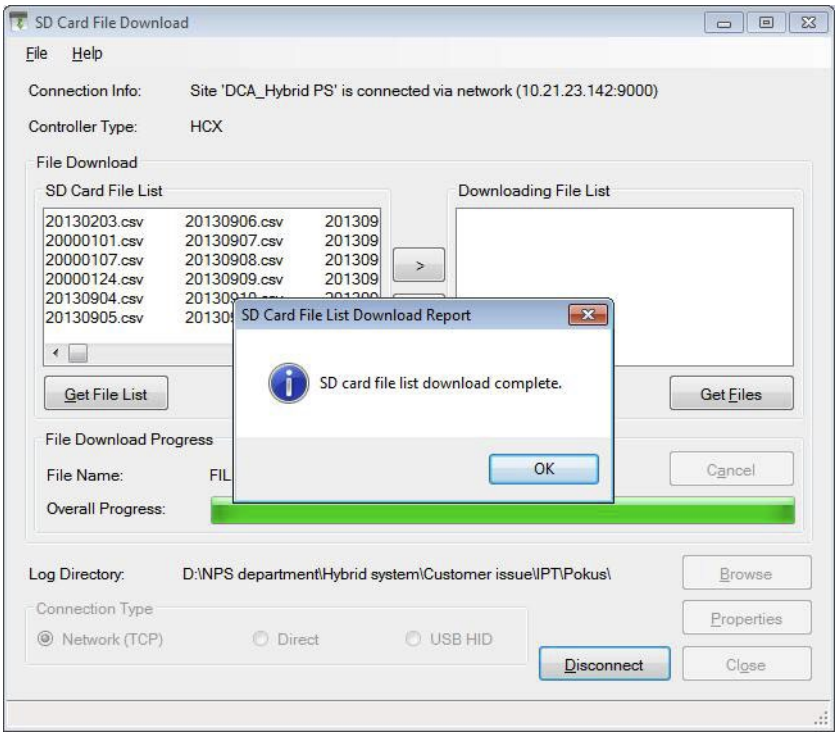
11. Enter the password in **User Password:** (1234 is the default), then click on the **Connect and Verify** button.



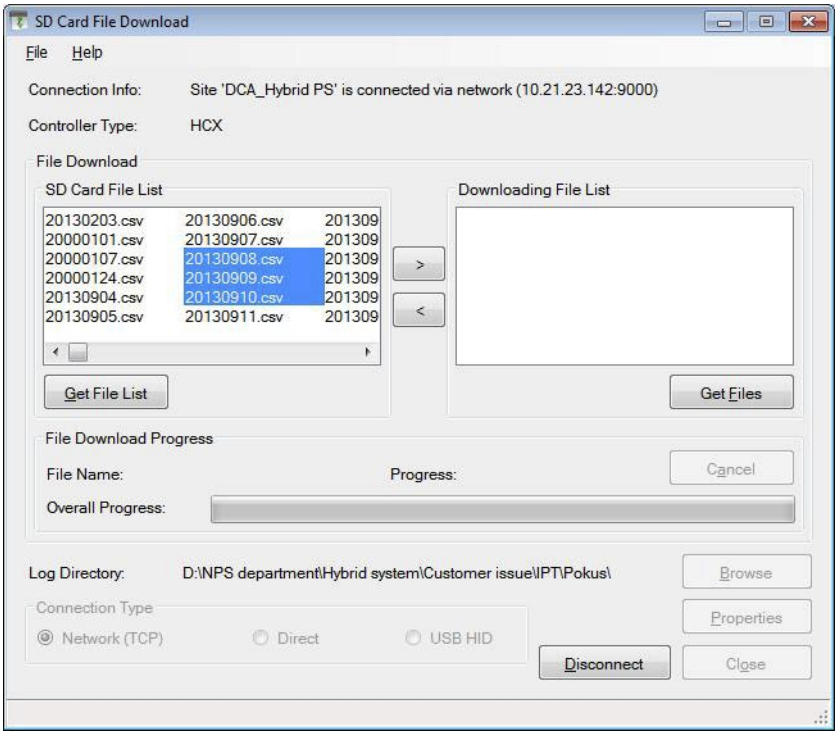
12. Click on the **Get File List** button.



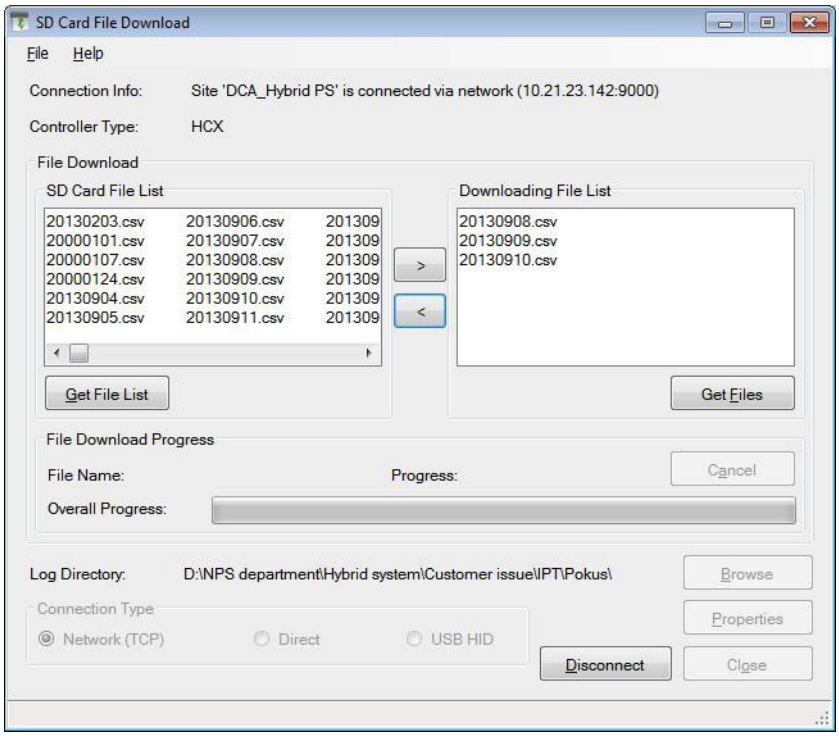
13. When the list is downloaded click on **OK** button



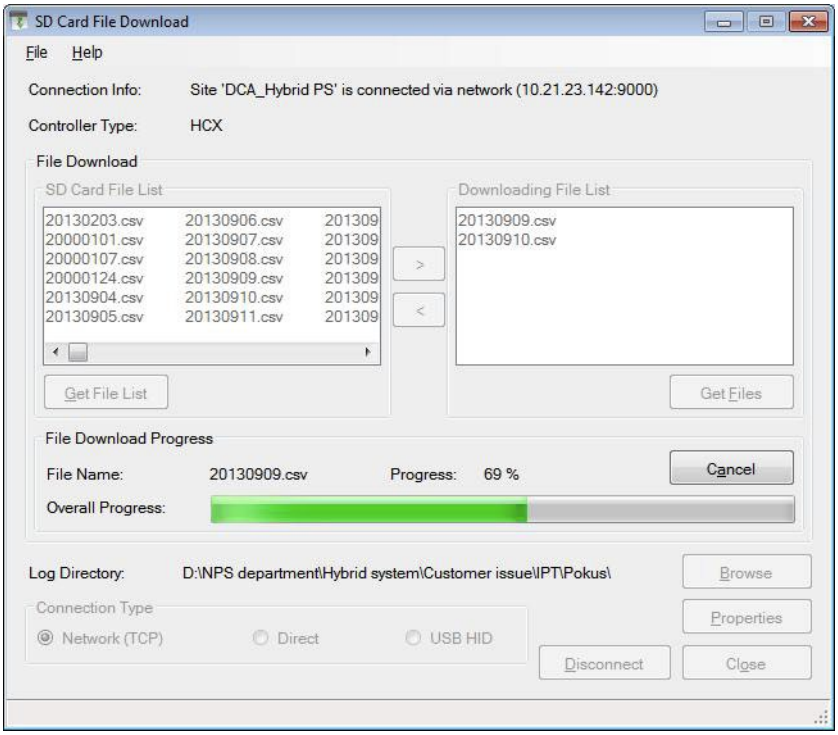
14. Choose the file/files which you want to download to the computer. Use the CTRL or SHIFT keys on the keyboard if needed.



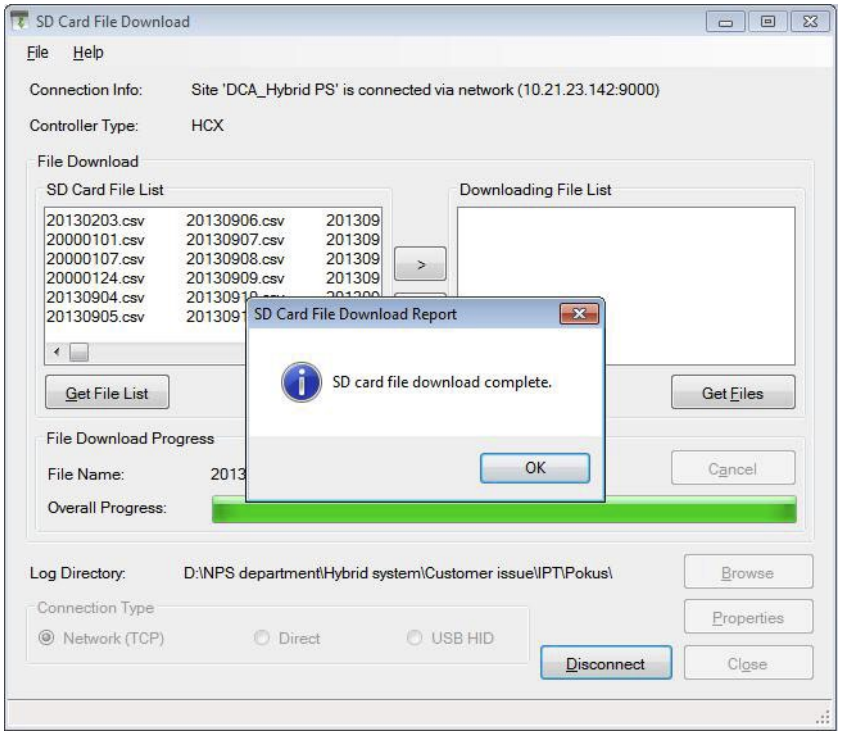
15. Move the selected file/files to the window “Downloding File List” using the > button.



16. Click on **Get Files** button to start to download the selected file/files to the computer.

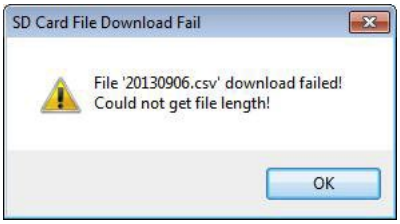


17. A pop-up window appears after successful downloading. Click on the **OK** button and the click on the **Disconnect** button in the underlying window and then click on the **Close** button.



18. Click on the **Close** button to end the programme.

NOTE: If the downloading failed, run download once more by clicking on **Get Files** button to try again.



PRODUCT SUPPORT

Product support can be obtained using the following address and telephone numbers.

Manufacturing facility:
UNIPOWER, LLC
65 Industrial Park Rd
Dunlap, TN 37327
United States

Phone: +1-954-346-2442
Toll Free: 1-800-440-3504
Web site – www.unipowerco.com

When contacting UNIPOWER, please be prepared to provide:

1. The product model number, spec number, S build number, and serial number - see the equipment nameplate on the front panel
2. Your company's name and address
3. Your name and title
4. The reason for the contact
5. If there is a problem with product operation:
   - Is the problem intermittent or continuous?
   - What revision is the firmware?
   - What actions were being performed prior to the appearance of the problem?
   - What actions have been taken since the problem occurred?

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