Quick Start Guide

What Is This Guide?

This quick start guide serves as a brief overview of the Z-Cell BMS, the ZBM battery, and the basic configuration steps needed to integrate them into a working energy system.

It covers the basics of setting up the BMS, connecting it to the ZBM batteries, the Internet, and integrating it with the rest of your energy system.

This guide is not generally a replacement for the full reference manual, and it is definitely not a replacement for the proper training, or the appropriate local required certifications for this kind of electrical work.

It also does not replace the required training on the other components of the energy system you are integrating with.

Physical Mounting

The BMS is an IP20 rated device, and thus needs to be mounted indoors, or in a weatherproof enclosure.

The BMS will need to be physically connected to the batteries via a twisted pair cable (see the Battery communications section), and to DC power.

Depending on your inverter integration, you may also need to make a CAN bus connection between the BMS and the inverter. This is also a twisted pair connection.

The BMS can connect to the network either via physical ethernet or via WiFi.

Taking the environmental and other connection requirements into account, mount the BMS on a standard DIN rail (“Top hat” variety).

BMS DC Power

The BMS is a DC powered device, with an allowed input range of 9-65V.

The power supply connection terminals are on the left hand side of the terminal block when the BMS is mounted in an upwards orientation. See fig. 1.

Figure 1: BMS terminal connections
They are also labelled on the top panel.

While the BMS is reverse-polarity protected, care should be taken to connect the power supply correctly.

Where possible the BMS should be connected to power at all times. As it is possible for ZBM’s to be discharged fully to 0%, the BMS should not be connected to the battery side of the bus - though this may depend on the ability of your inverter to supply a reference voltage even when the batteries are not available (performing maintenance).

Generally, where AC mains power is available, it is better to connect the BMS on the AC side with a suitable power supply.

Power consumption is approximately 100mA at 24V, or around 50mA at 64V - ensure the power supply is adequately specified.

Battery Communications

The Z-Cell BMS communicates with the batteries via RS-485. Multiple batteries may be connected to a single BMS, in a linear bus topology. Each battery is connected to the next via a standard UTP patch cable via the included RJ-45 connector on the battery.

Note that the numbering of batteries (covered later) is arbitrary and not related to the actual order of the batteries in the chain - and batteries can be renumbered at will.

It is highly recommended you also physically label the batteries with the designated numbers to assist in troubleshooting later on. Battery numbers may be any number from 1 through to 99, though we recommend not using ‘99’, as it is the factory default.

Connect each battery to the next battery in the chain via “straight through” patch cables, as seen in fig. 2.

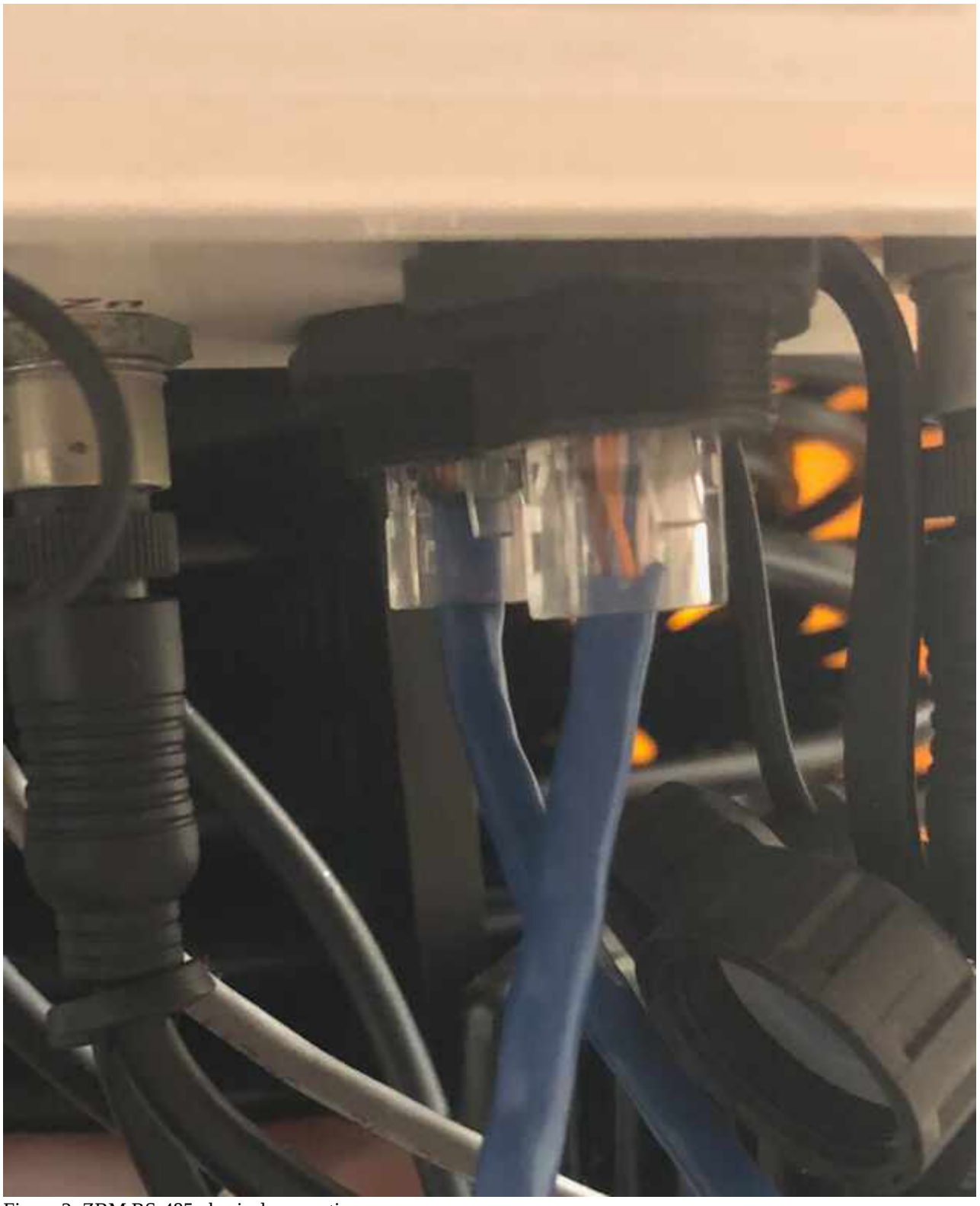


Figure 2: ZBM RS-485 physical connections

The battery at either end of the chain will only have a single connection. Unless your total cable length is very long, there is generally no need for any termination on the far end, as the RS-485 communications rate is relatively low. By default the RS-485 is not terminated on the BMS side - if you are considering a very long cable run contact Redflow for information on termination.

requirements.

On the BMS side, you will need to make a patch lead that exposes the required RS-485 connections to attach to the screw cables. For either 568A or 568B patch leads, the BMS end will look like fig. 3.

Figure 3: RS-485 patch lead

Connect these into the appropriate screw terminals on the BMS according to the following table. These connections work for either 568A or 568B patch leads - if you aren't sure what type of patch lead it is, use the RJ-45 pin numbers to determine the correct wires.

568A/B Colours	RJ-45 Pin	BMS Terminal Connection
Blue	pin 4	RS-485 A
Blue/White	pin 5	RS-485 B
Brown/White	pin 2	RS-485 SH (shared ground)

Note that incorrect or sloppy connections of the RS-485 is one of the leading causes of problems with the initial installation - take care with the connections and double check the pin assignments on any pre-packaged UTP cables you use.

CAN Bus

CAN bus is used to connect the BMS to other pieces of equipment - generally inverter chargers.

While CAN is not supported or required by all equipment, it is the most common way we interface with inverter chargers. This quick start guide contains a step-by-step example of connecting to Victron equipment.

There is no particular wiring or connector standard for CAN, so unlike the RS-485 to ZBM connection you will need to consult the documenation for the device you are connecting to to see what connections to make. The other equipment end may be a DB-9, an RJ-45 connector, or just screw terminals.

The BMS has three screw terminals for CAN connections - "H", "L" and "SH". The "H" and "L" terminals should be on a single twisted pair.

The BMS has a built in 120Ω termination resistor built in, you will need to provide the same termination at the other end of the CAN bus. Contact Redflow if need the BMS to be in the middle of the bus, and thus require the termiantion resistor to be removed.

Ethernet

The ethernet connection to the BMS uses a standard RJ-45 connector. If using a wired network connection, simply plug a standard patch UTP patch cable into the connector, and into the local switch or router switchport.

Relay

The BMS relay can be used to integrate with external systems that provide a relay-controllable contact for adjusting some sort of system behaviour.

The BMS supplied relay is SPDT, and rated for a maximum of 6A current at 65V (DC).

The “NC”, “C” (common) and “NO” connections are all on the terminal block.

Introduction

The Redflow BMS is a networked device. After the basic connections and configuration is complete, all interactions with the device will be via a web browser over the TCP/IP network (either locally or remotely).

No two networks are identical, and thus the networking options in the BMS are complex. Depending on the complexity of the network you are installing the BMS into, you may need help from a local network administrator or similar. They may need to allocate a switch port, or change firewall settings. It is useful to be aware of these issues before installation . You may want to send this document to the local network expert ahead of time.

The Redflow BMS supports the following physical network types:

- Ethernet
- WiFi (802.11n)

It also supports a CAN interface, which will be covered in this document, though it is not used for general network access.

A Note About Internet Access

The Redflow BMS can work with no internet access available to it, though it is prefereble that it is given access to the internet. With internet access the BMS will automatically connect to the Z-Cell Cloud service (https://cloud.zcell.com), which allows:

- remote access to the BMS, from anywhere in the world
- ability for Redflow engineers to offer support directly
- collection of battery data, for pro-active fault detection

Internet access will also allow you to easily install the latest BMS firmware.

All data transferred is encrypted. If you would like to lock down the access needed to the bare minimum, you need only allow:

- outbound port 22 TCP access (cloud encrypted tunnel)
- outbound port 443 TCP access (list and download new BMS firmware)
- outbound port 123 UDP (NTP time sync protocol)

Ethernet Connections

The BMS has an on-board 10/100 ethernet port. It can be connected to a network switch via a standard UTP patch cable. Connecting to the network via ethernet is generally the most reliable and easy way to get the BMS connected.

There are two LED indicators on the port - green and yellow.

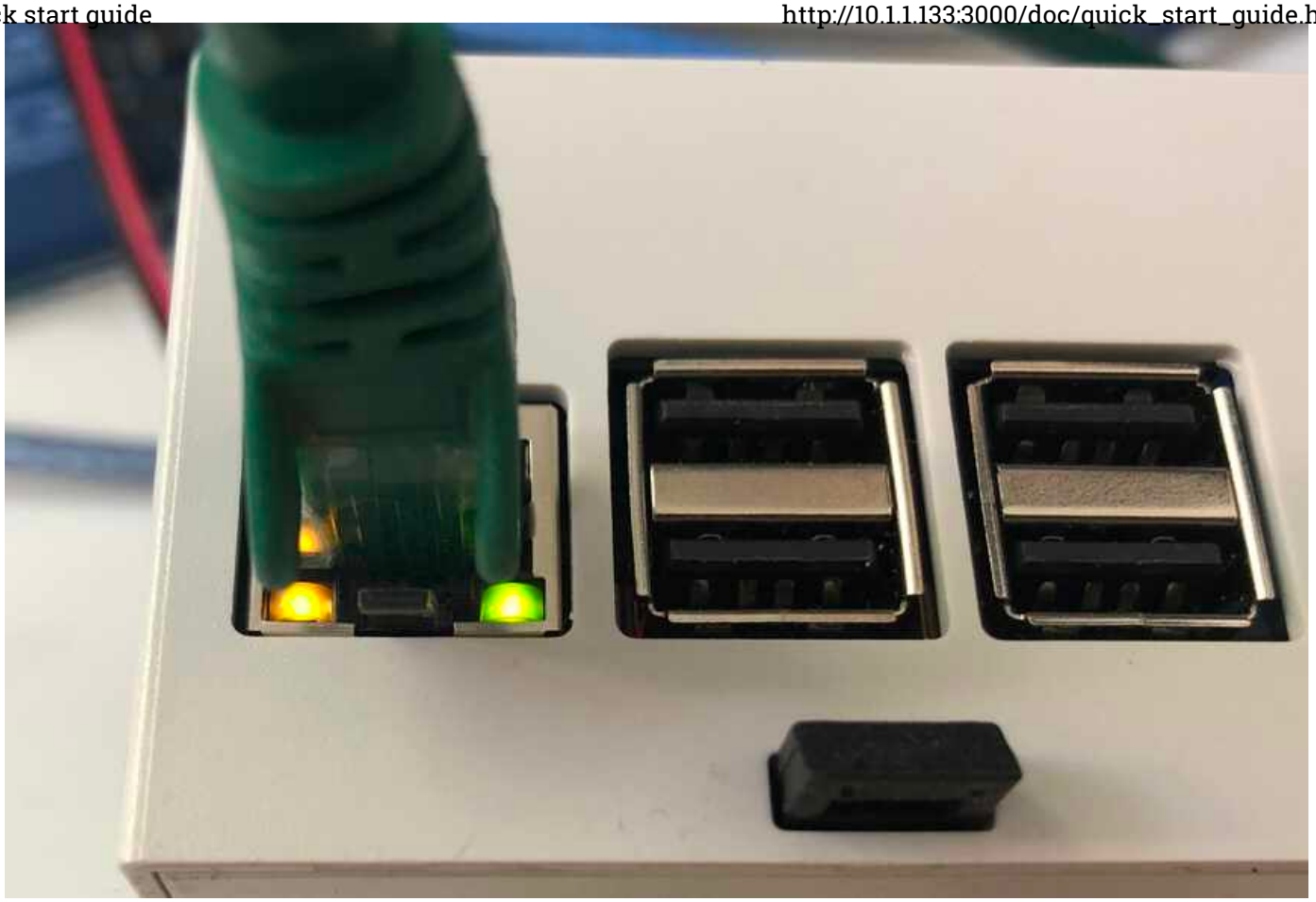
The green LED will be either lit or flashing for a connected ethernet connection. If the LED is not lit, there is a fundamental cabling problem - things to check:

- bad/unplugged cable
- remote switch port is not enabled

The yellow LED may or may not be lit. If it is lit it indicates the presence of a 100M connection. Not lit indicates a 10M connection.

There are no significant bandwidth requirements for the BMS, 10M is sufficient in all cases.

Note that these indicators are purely related to the physical cabling connection and not the port configuration. It is important that you verify the link is ok at this point (green LED present) before you move forward.



Ethernet connected at 100Mbit

DHCP

By default the BMS is setup to obtain an IP address from a DHCP server. This will work on a large percentage of networks, and is generally the easiest way to get the BMS online.

Because this is the most common network configuration, this is the default for the BMS “out of the box”.

There are a few ways to verify that the BMS has obtained an IP address.

Check your DHCP server

Your router or server may have a method to list the DHCP leases allocated to clients. Any lease obtained shortly after connecting the BMS to power is most likely the BMS. You can confirm by opening a web browser and visiting:

```
http://x.x.x.x:3000
```

Where x.x.x.x is the IP address allocated to the BMS.

Note that this IP address is dynamically allocated by the local DHCP server and it is possible it will change over time.

Use the Z-Cell cloud BMS locator

If the BMS is able to connect to the internet, and is connected to the cloud.zcell.com service (which is enabled by default), the local IP address can be seen via the following address:

```
https://cloud.zcell.com/where
```

Note that the above address does not require any authentication, but it will only show any BMS’s that are connected to the same network as the browser making the request. Thus if you are (for example) using your mobile phone via 4G, you will not be able to see a BMS connected to a customer’s network.

Via the authenticated https://cloud.zcell.com web interface.

This will require that a Redflow support person has allocated the BMS in question to your cloud account. This can in most cases be done immediately over the phone. This will not only enable you to verify connectivity, but also access the BMS remotely, from anywhere in the world.

Static IP configuration

The BMS also fully supports Static IP configuration, for those networks that require it (or where it is desired that the BMS have a static IP).

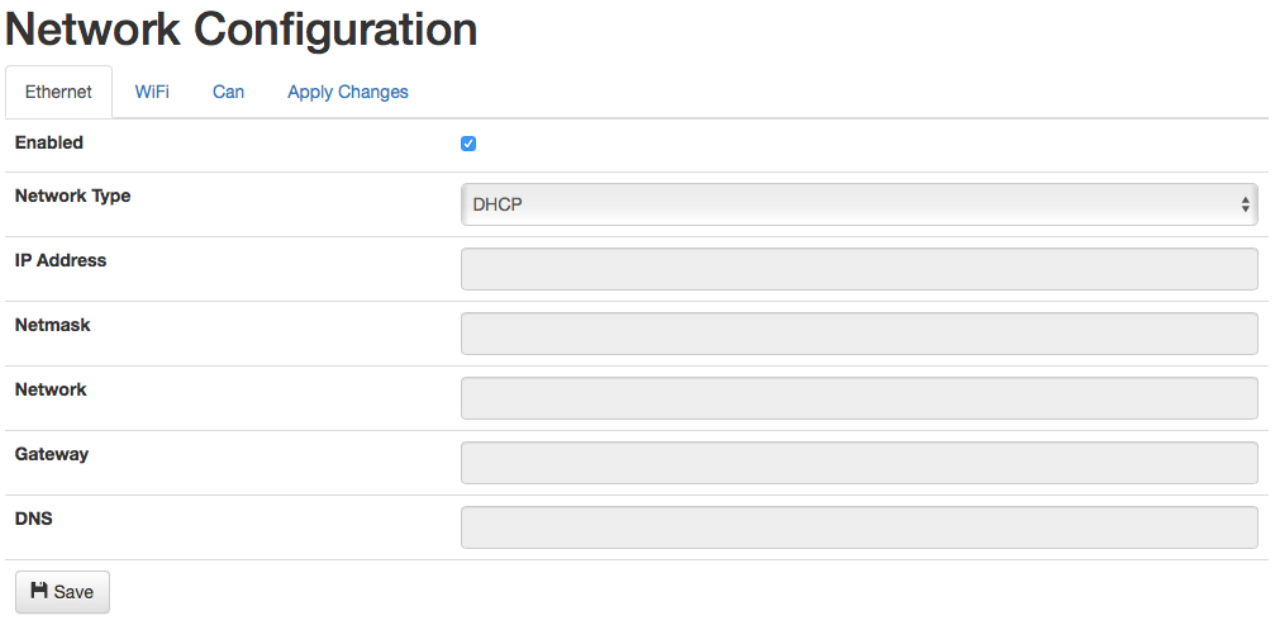
Note that a static IP is *not* required for the BMS to be remotely accessible via cloud.zcell.com. Generally speaking, a static IP is only required if local access is desirable and/or there is no local DHCP server.

You will need to be able to access the BMS to be able to set the static IP configuration. If a DHCP server is available, you may be able to follow the instructions in the previous section to allocate a dynamic IP, and then access it via that temporary IP to set the new dynamic IP.

Alternatively, you can use the BMS default AP wireless connection (described below) to connect directly to the BMS via wifi to configure the ethernet static IP connection.

Once you have gained access, access the BMS via its IP address and enter the networking setup screen via the “Configuration => Network” menu.

Click on the “Ethernet” tab.



Networking ethernet configuration
Once you have changed the “Network Type” to “Static”, you can populate the IP address, netmask and other details. These values will be determined by the local network configuration - if in doubt, consult the local network adminstrator.

Click “Save” when the changes are complete, and then click on the “Apply Changes” tab and click “Restart”.

It is important to note that at this point, the BMS will restart and you may no longer be able to access it via the current IP address - you will need to change your URL to the new IP address you just allocated. The BMS should be accessible again within a few minutes.

WiFi Connections

By default, the BMS WiFi will be in ‘AP’ mode. This means that it presents a unique wireless SSID for you to connect to via your computer or mobile device. This is useful for several purposes. Most commonly it is used to either configure a custom ethernet configuration where required (see above) or to configure the WiFi to connect to a different access point (in the absence of ethernet connectivity).

It is important to note that the latter option (connecting the BMS to an existing wireless access point) is mutually exclusive with

the BMS being in ‘AP’ mode. You can however use AP mode to configure the WiFi, and afterward access the BMS either on the local network or via the cloud (if internet access is available).

If the WiFi connection is the exclusive method of access to the BMS, any problems (configuration errors or problems with the wifi network) will result in the BMS being inaccessible. Although it will continue to operate normally, it will not be reachable via a web browser for configuration or monitoring.

In this case it is possible to reset just the networking configuration to allow it to be repaired - see the “Resetting networking configuration” section below.

Connecting to the default ‘AP’ mode network

If you scan for wireless networks via your computer or mobile device you should see something like the following appear:

```
zcell-bms-abcd
```

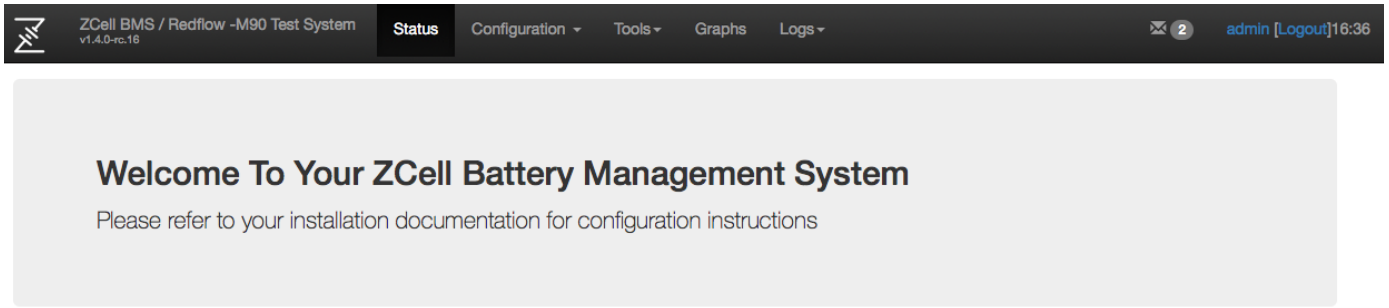
Connect to that network, and supply the password ‘zcellzcell’. You should now be connected.

At this point you can connect directly to the BMS via the following URL:

```
http://zcell:3000
```

IMPORTANT NOTE: it is not sufficient to type in just ‘zcell:3000’ - most browsers/devices will not properly access the device and instead try to do a web search - which will fail due to a lack of internet access. The leading ‘http://’ is *essential*.

At this point you should see the BMS main status screen.

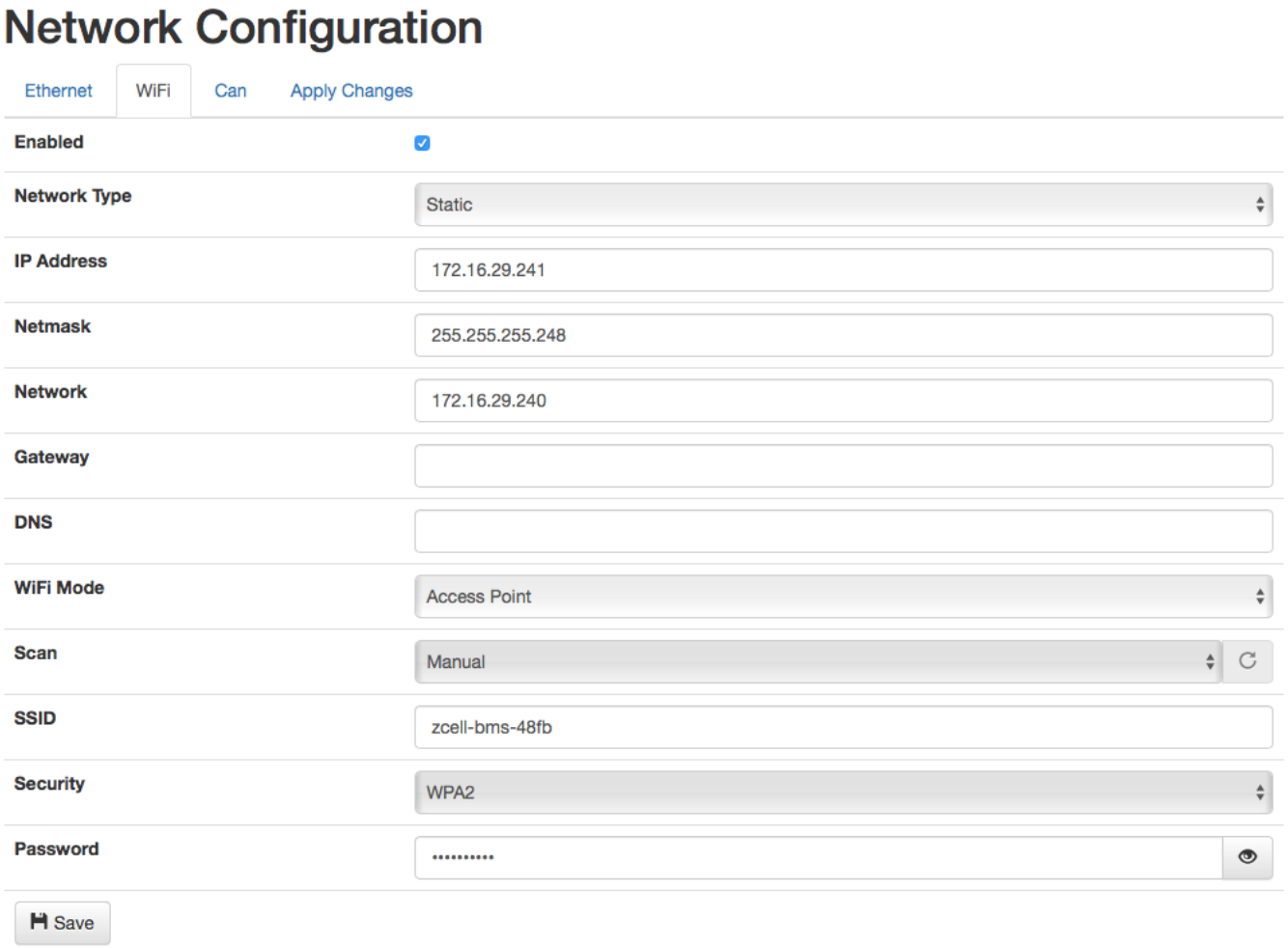


Main status screen

Configuring the WiFi to connect to a local network

Your network administrator will need to supply you with the following details:

- Network SSID
- Encryption type (WPA, WPA2 - note that WEP is not supported)
- Pre-shared key (the password)



Networking wifi configuration
The default configuration (seen above) will show the WiFi setup for “AP” mode. You need to change these details to connect to the local network. Change the following entries:

- Network Type => DHCP (almost all wifi networks are DHCP based)
- WiFi Mode => Client (this means to connect to another AP, instead of acting as an AP)

At this point you can click on the “refresh” button to the right of the “Scan” option to refresh or populate the list of available wifi networks.

After the scan completes (takes a few seconds), you should see the list of local AP’s. Choose the one you want to connect to.

If the SSID of the AP you need to connect to is hidden (your network administrator should be able to tell you this) then you can choose “manual” and manually type the name in the field below. Generally this is not necessary.

Choose the correct security encryption type in the next field, and type the PSK (password) in the final field. There is an icon to the right of the password field to press if you would like the password to be visible while typing.

Now that the network connection is configured, you can press the “save” button, and then click on the “Restart” button on the “Apply changes” tab. At this point, if you are connected via the wireless, you will lose that connection, and will have to reconnect via the local LAN.

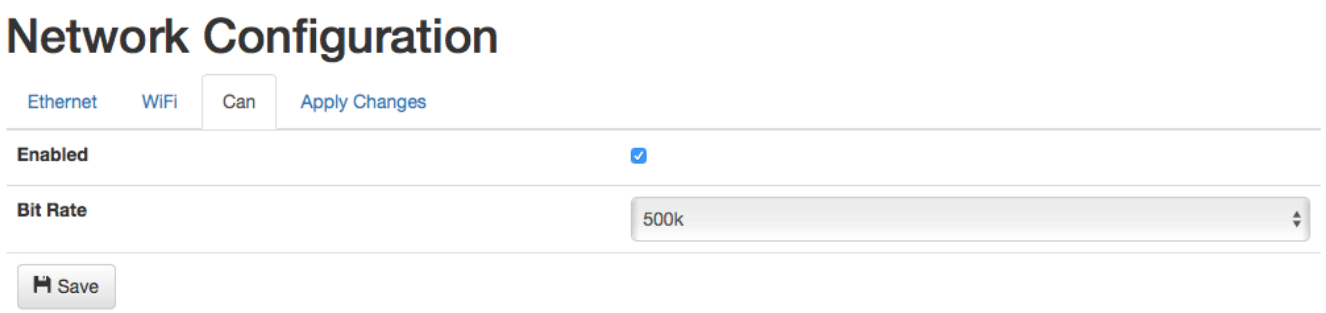
As per the section above on Ethernet, you may be able to get the information on the new IP address either from the ZCell cloud, at https://cloud.zcell.com/where, or from your local router.

CANbus Connections

CAN is not a TCP/IP network used for accessing the BMS. Rather, it is an industry standard protocol for connecting different pieces of industrial equipment together. Despite not being used for BMS administrative access, it is still a network and it is configured in the same place.

If you are not using a CAN network you can safely leave the settings on this tab alone.

Even if you are using a CAN network, generally speaking the default settings are correct. However if your CAN network is not running at 500Kbit, you can change the setting on this page.



CAN bus configuration

Resetting Networking Configuration

If a mistake in configuration is made and the BMS is no longer accessible via the network, it is possible to reset just the network configuration and leave the rest of the BMS configuration intact.

Note however that this does require restarting the BMS, and thus there will be a period where the BMS is not managing the batteries.

Resetting the networking configuration requires a USB keyboard to be plugged into the BMS.

Resetting ethernet configuration

On the keyboard, press the ‘ESC’ key and confirm that a beep is heard. This confirms the BMS has detected the keyboard, and it is ready to accept commands.

Type “r” and then “e” (mnemonic - Reset Ethernet). After pressing the “e” you will hear a long beep. This indicates that the BMS is asking for confirmation to perform the operation. Press “y” to confirm.

This will:

- reset the ethernet to a DHCP configuration
- reboot the BMS

If you make a mistake entering the characters, just press ESC and the BMS will be ready to receive a command again.

Resetting wifi configuration

As above, connect a keyboard to the BMS. The command to reset the wifi is “r” and then “w” (mnemonic - Reset Wifi). Press “y” to confirm. This will:

- reset the wifi to AP mode, with the SSID “zcell-bms-abcd” (‘abcd’ is unique for each BMS)
- reset the password to “zcellzcell”

The BMS is a modern, web-enabled device. All configuration and management requires only a web browser, either from a desktop/laptop computer, or a mobile device. No special software is required and the system is operating system and platform agnostic.

Access Methods

While the BMS is accessible via a web browser, how you access it depends on whether or not you are locally situated (on the same network as the BMS) or remote.

Via cloud.zcell.com

The easiest way to access your BMS is via the Z-Cell cloud web service.

The cloud is a web service that all BMS's connect to, it acts as a proxy to provide access to any of your BMS's from anywhere in the world, via a secure, encrypted tunnel. The only tool you need is a web browser.

It can be accessed via the URL:

```
https://cloud.zcell.com
```

Note that authentication is required - to arrange an account contact Redflow.

Login with your username and password on the login screen you see (fig. 4).

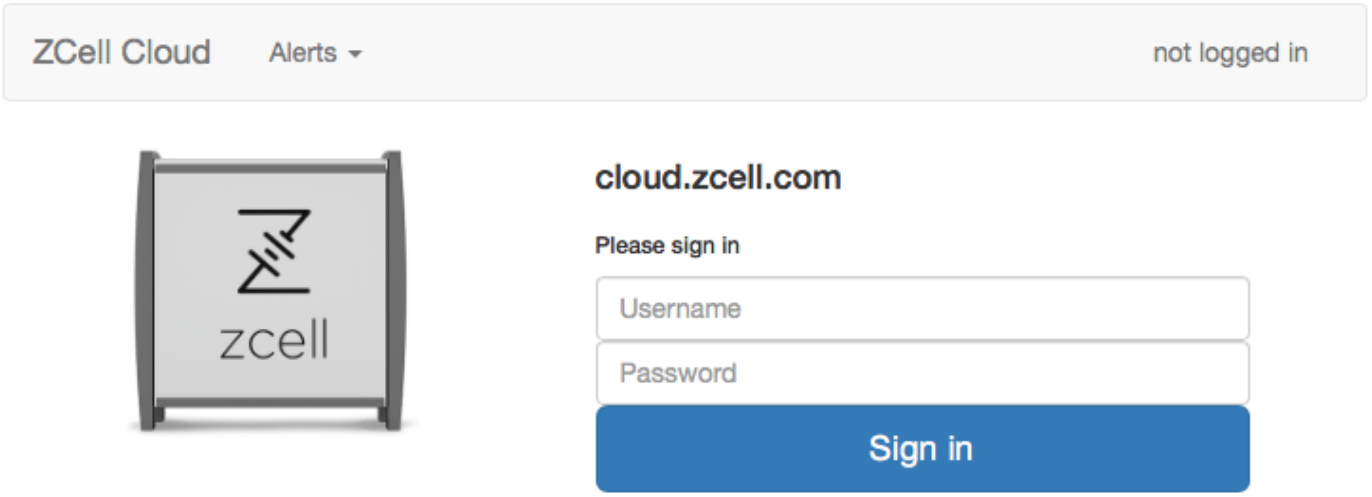


Figure 4: Cloud login screen

Once you are logged in, you will see a summary of BMS systems. Each ZCell cloud account can access one or more remote BMS - Redflow will assign the BMS you own or are responsible for to your account.

An example of the summary screen is shown in fig. 5.

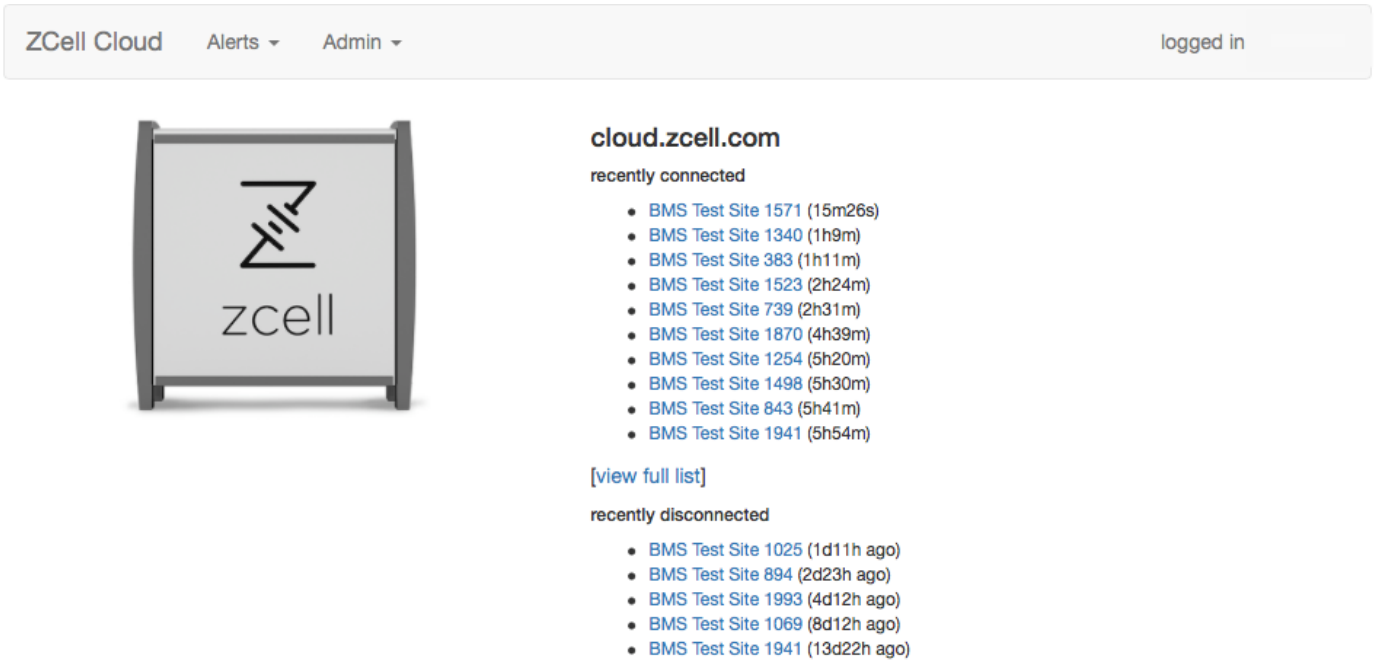


Figure 5: Cloud BMS summary

The summary screen shows the BMS systems that are online, and offline, though it is limited to showing 10 systems in each list.

From this summary screen you can click straight through to any BMS to access it via the cloud proxy.

For the full list, or to see more details, click on the 'View full list' link.

The full BMS view provides more detail on each BMS, including how long it has been connected to the cloud for, IP address details, and any alarm indicators. See fig. 6.

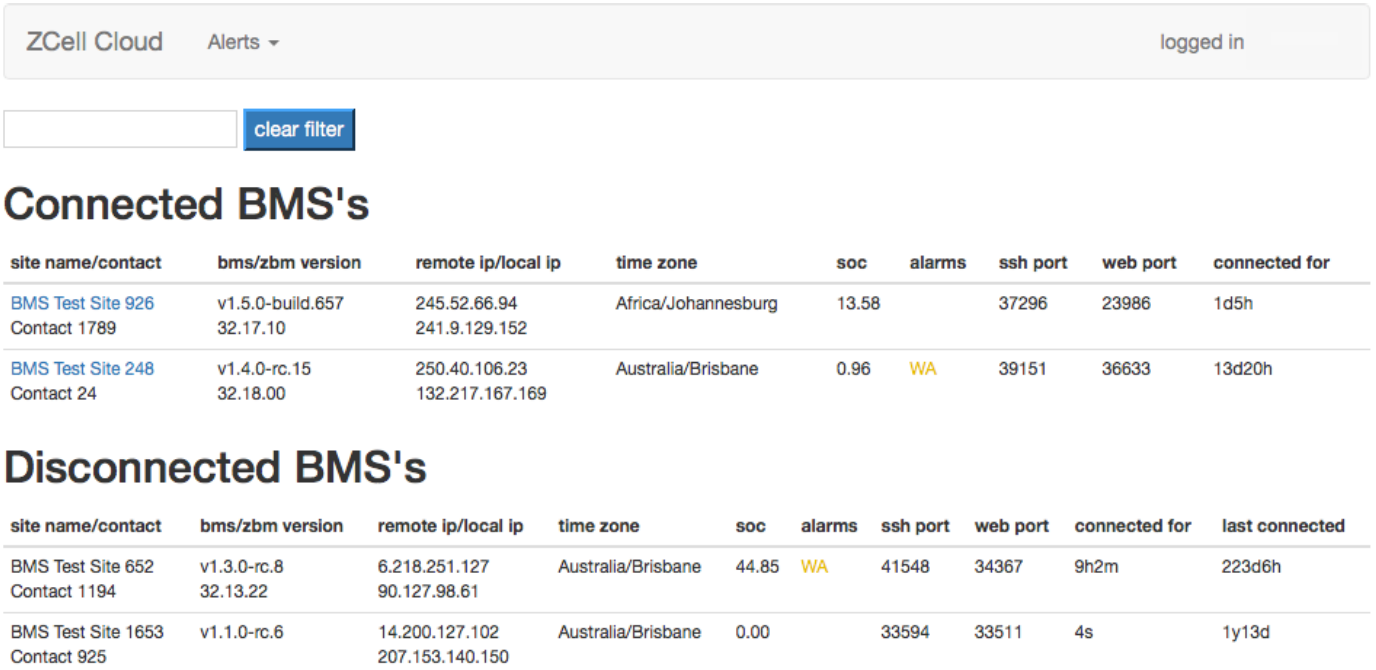


Figure 6: Cloud full list

This overview provides a lot of detail on each BMS, useful for a quick at-a-glance overview of the health of all systems. For each BMS you can see:

- The BMS name and contact details
- The version of the BMS software, and the (lowest) version number of the connected batteries
- The local and remote IP address of the BMS
- The time zone of that BMS
- The state of charge of the system
- Any alarms current on that system
- How long the BMS has been connected to the cloud for

By clicking on the site name, you can connect via the cloud proxy directly to the BMS.

The same information is present in the “Disconnected BMS’s” section below, however as those BMS’s are not currently connected to the cloud, it will not be possible to connect to them via the proxy.

Locally

To access a BMS locally, you will need to be on the same network, with the BMS connected via ethernet or wifi.

You will need to know the local IP address of the BMS - there are several ways you might be able to discover this.

Statically assigned

If you statically assigned the IP address, you will obviously know what the IP address is! If a static IP address was assigned for you, consult your network adminstrator to find out what it is.

Dynamically assigned by DHCP server

If the BMS gets an IP address from a DHCP server (true in most cases), there are a couple of options.

You may be able to access the web interface of the router and look at the list of DHCP leases, or you may be able to ask the network administrator what the IP address is.

If the BMS is connected to the cloud, you may also be able to discover the local IP address by accessing:

```
https://cloud.zcell.com/where
```

Once you know the IP address of the BMS, you can access it directly in a web browser by typing in the following URL:

```
http://a.b.c.d:3000/
```

Where a.b.c.d is the IP address.

Modbus Concepts

The BMS communicates with the ZBMs via the Modbus protocol. While an in-depth knowledge of Modbus is not required to use the BMS and connect the ZBMs, a few key concepts are necessary to assist with having a smooth installation, and dealing with any troubleshooting that is required.

- Modbus is a single master/many slave protocol

The BMS is the master, and the ZBM's are the slaves. The BMS is the initiator of all communications, and will address queries to individual ZBM's as necessary.

- ZBM's must each have a unique Modbus address

Each ZBM is assigned a Modbus address, and this is the identifier that the BMS will used to communicate with that battery.

- If two devices have the same Modbus address, *neither device* will be able to communicate

From the BMS's point of view, neither of those devices will be on the bus at all. To remediate this, it will be necessary to unplug one device, renumber the other, then reconnect the first device.

- The Modbus RTU (serial) connection is a single, daisy-chained twisted pair bus

Each battery connects to either the next battery in the chain, or to a BMS, and may connect to another "downstream" battery.

These connections are via the RJ-45 connections on the underside of the control box on the front of the battery.

Note that the order that the batteries are connected in physically is *entirely* unrelated to the number that is assigned to them, though it is prudent to number them sequentially, as they are physically connected.

- All ZBM's come from the factory configured with a Modbus address of "99".

This means that if you are installing more than one battery, you must connect one at a time, renumber it and then add the next.

The numbering scheme is arbitrary, so number batteries in the way that makes the most sense for your installation.

Adding Batteries

The BMS makes it simple to add batteries.

Click the Configuration => Battery Setup menu.

You will be presented with an interactive page for adding batteries - see fig. 7.

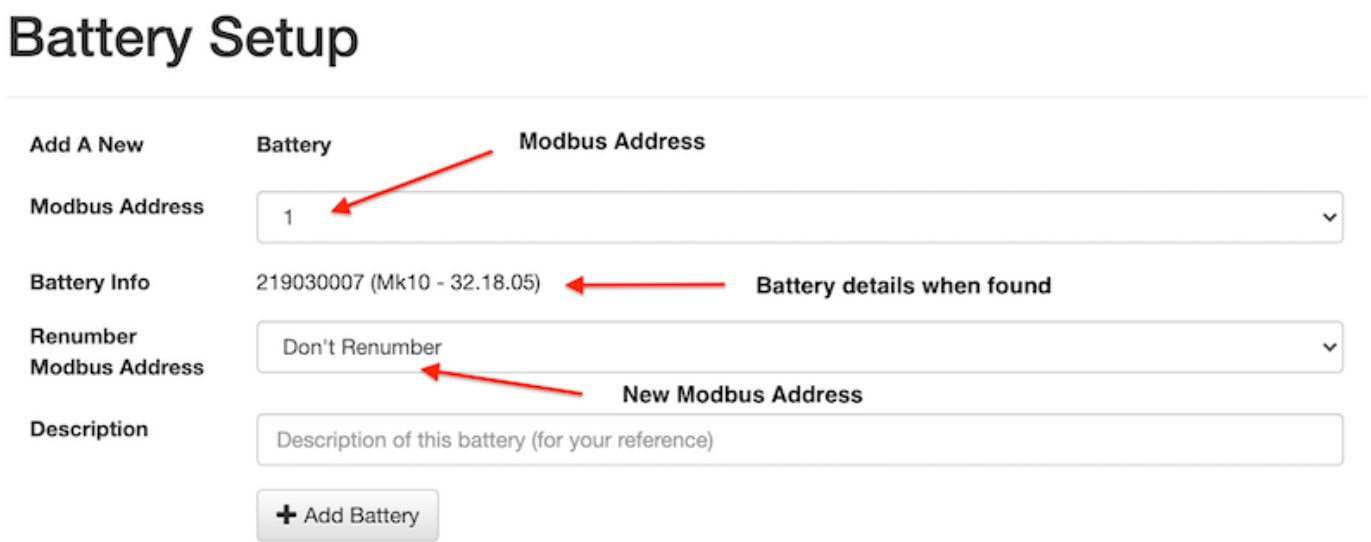


Figure 7: Adding batteries

At this point, you need to ensure the DC bus is energised so that the battery control electronics will be powered and communications are possible.

Each time you choose a number in the “Modbus Address” field, the BMS will continually scan for a battery with that number. When it finds a battery, you will see the “Battery Info” field change to show the serial number, controller type, and firmware version of the discovered battery.

Note that if you see “No Battery Found” after choosing a Modbus Address, the BMS cannot communicate with a battery at that address, and there is no point continuing until you have resolved the communications problem.

There are several potential reasons for this failure:

- incorrect Modbus address chosen (does not match battery)
- Modbus address conflict (more than one battery on communications bus with that number)
- DC power down or insufficient to power battery electronics
- bad RS-485 wiring

The serial number field refreshes every few seconds to assist in debugging the problem.

Once the battery is detected, you may want to choose a new Modbus address for this battery (in the “Renumber” field) and optionally type in a description.

Clicking “Add battery” will add the battery to the system, and you can repeat the process for the next (if any).

Typically, for a new installation, you will have several batteries all on the same Modbus address - #99.

In that case, it will not be possible to add them unless you disconnect all but one. The easiest way to achieve that is to disconnect all but the battery closest to the BMS, add and renumber it, then connect just the next one, add and renumber, and so on until all batteries are numbered. There is no need to disconnect the DC power, just the communications cable.

When scanning for new batteries the BMS will automatically scan for the address 99 if no battery can be found. If a battery is found with address 99, the page will then be configured to renumber it to the next highest address for you.

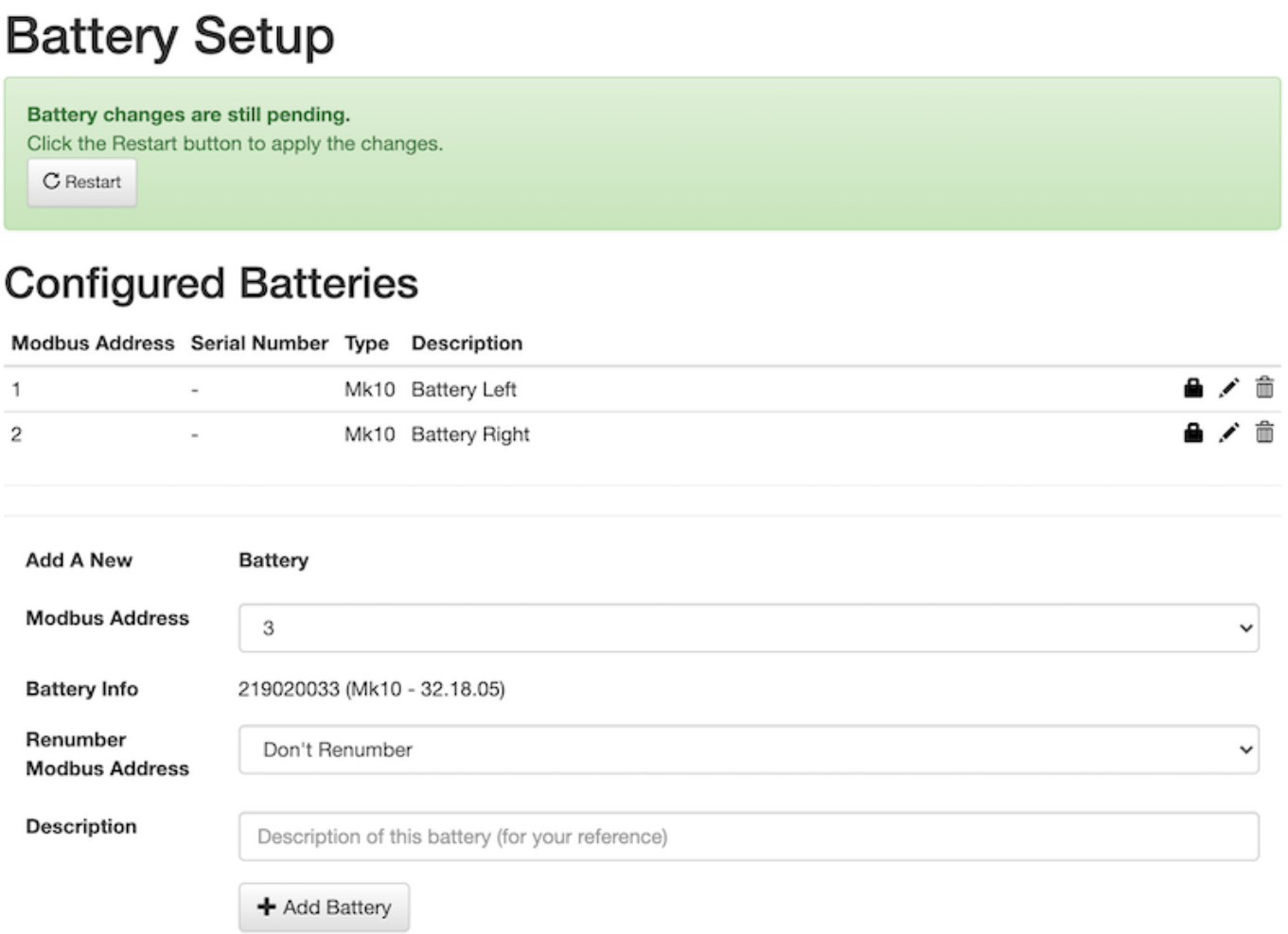


Figure 8: Adding batteries - finishing
Once the process is complete, you must restart to finalise the changes - see fig. 8. Click the “Restart” button and the BMS will restart with the new battery configuration.

Bringing Them Online

New batteries will start in an “offline” state. To bring your batteries online, follow the following steps.

Click the “Status” menu to return to the main status screen.

You will see a status line for each battery - showing as “offline”. Click anywhere on the line to show the battery detail page. It will look like fig. 9.

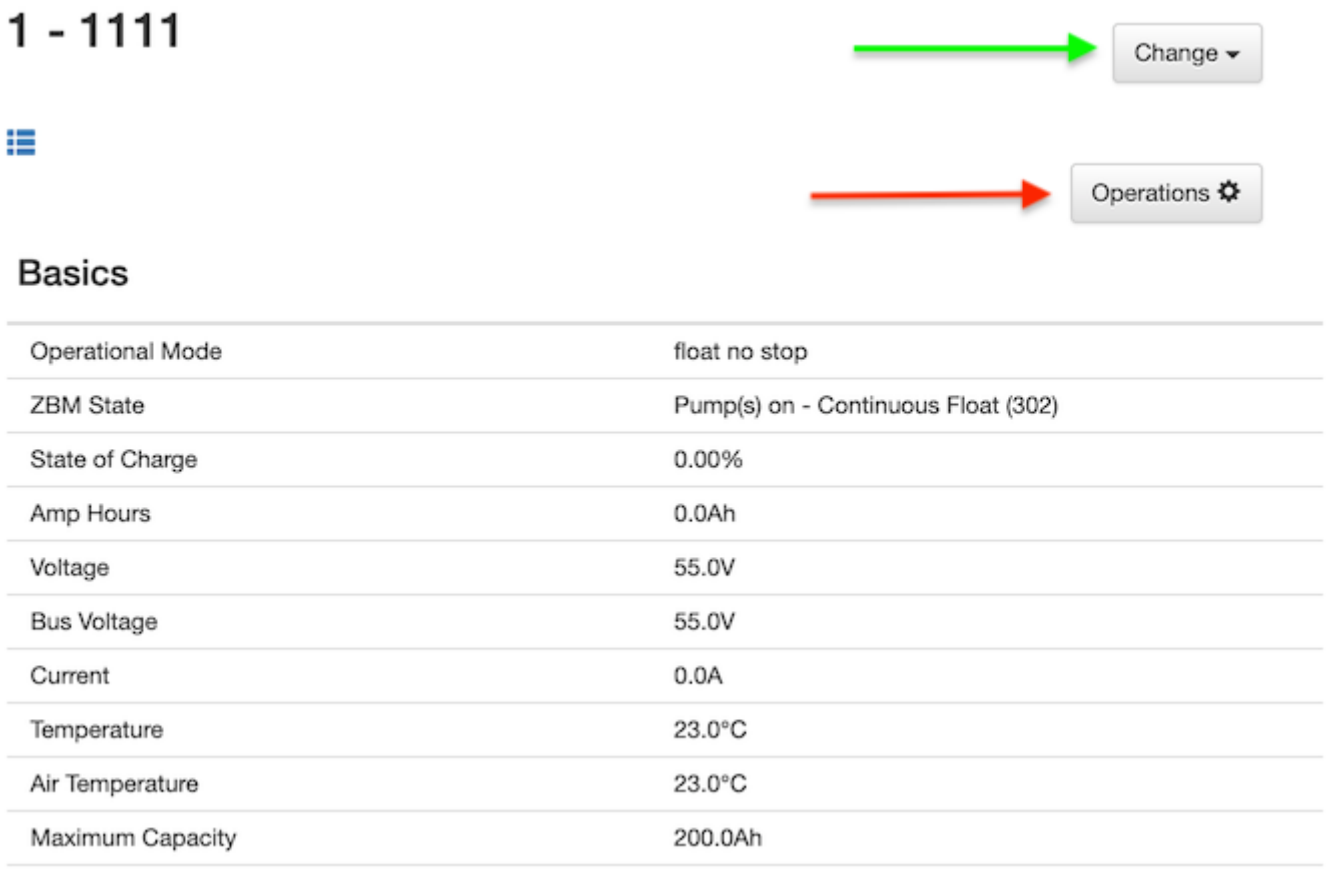


Figure 9: Bringing batteries online
As a shortcut, you can change between batteries with the dropdown in the top right hand corner (green arrow).

As shown by the red arrow, click the ‘Operations’ button to go to the battery operations page - see fig. 10

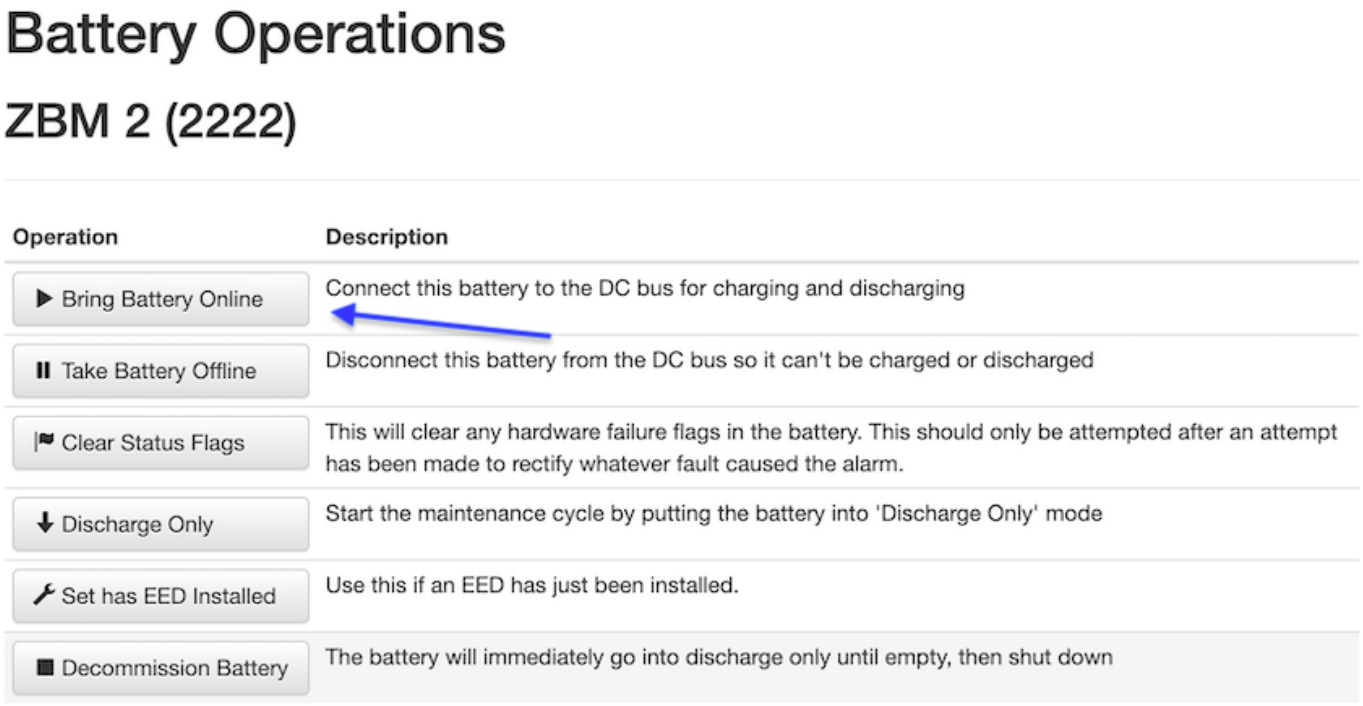


Figure 10: Battery Operations
As shown by the blue arrow, click the ‘Bring Battery Online’ button.

Once online, the batteries will connect to the bus, and if sufficient voltage is available, start charging.

Victron (CCGX)

This is a step-by-step guide to connecting a set of Redflow ZCell/ZBM2 batteries to an energy system using Victron Energy components.

This is a differences guide only!

It assumes you already know how to set up a working Victron Energy system (and how to set up and use ESS if it is an on-grid system).

The installer must is already be trained in the design and installation of Victron Energy based systems. If this is not the case, they need to undertake Victron Energy system training first.

Redflow is not a Victron Energy training provider - Redflow’s own training is differences training (as is this installation guide). It assumes you, as an installer, already know how to install a Victron based energy system based around a smart (e.g. Lithium and Lithium BMS) based battery - or at the very least using a conventional Lead-Acid battery.

Prerequisites

- The ZCell physical installation has been done in accordance with Redflow guidelines and training
- The ZCell BMS has been physically installed and powered up (see the BMS guide section for physical BMS interface details)
- The BMS is successfully communicating with the ZCell cluster using CANbus
- For an on-grid system - that the system has been designed, wired and intended to be configured in accordance with the Victron Energy ESS Design and Installation Manual
- That all firmware and software elements have upgraded to at least the minimum required versions and preferably to the latest production releases of all components concerned

It is strongly recommended to upgrade to the latest production releases and to re-check and further update these system components at regular intervals. These system elements and their functionality and feature sets are regularly improved over time by both Redflow and Victron based on learnings obtained and issues resolved in the field.

Absolute minimum recommended versions for new installations are (as at March 2019):

- CCGX / Venus GX needs to be running version 2.22 or later (normally set the CCGX to auto-update to new releases)

- MultiGrid/MultiPlus/Quattro systems need to be upgraded to Firmware 433 as the absolute minimum using VE.Flash.
- MultiGrid/MultiPlus/Quattro systems need to be running the latest ESS Assistant (or at the very least, version of 016C - released on 4th July 2018) and preferably the latest release. See `https://www.victronenergy.com/live/assistants:how_to_update_an_assistant`
- VE.Direct MPPT solarcharger units (if used) need to the latest released firmware.
- The Redflow BMS needs to be running the latest release (or at least 1.6.0). Use the Tools->Upgrade BMS page while the BMS is Internet-connected to ensure you are running the latest production release.
- ZCell batteries should be running battery firmware 32.18.00 or later. The latest battery firmware is carried within the BMS software update package and can be upgraded using the Tools->Upgrade Battery BMS menu item.

Once all system elements are upgraded, follow these instructions:

Install And Configure ESS For Use With ZCell Systems (On-Grid Installations Only)

Note: ESS is not required and generally not installed in off-grid installations.

Use VE.Configure to load in the “ESS Assistant” to your Multi/Quattro just as you would for any other ESS based Victron installation, in accordance with:

```
https://www.victronenergy.com/live/ess:design-installation-manual
```

Work through the annotated screen shots in the screenshot examples.

This shows a typical set of screen shots as one works through the VE.Configure pages to load and configure the ESS Assistant into a Multi or Quattro.

It is important to load these voltage and other assistant settings as noted in the attached guide.

If these are not set correcting the system may not operate correctly.

Notes:

- These screen shots are from an earlier ESS Assistant version. The latest versions require you to enter the battery capacity in Amp-hours into the Assistant as well. Use 200Ah per ZCell - e.g. for a (say) 4 battery system, use 4 x 200 = 800 Ah.
- The voltages in the cutoff table are non-critical as long as they are less than 42V.
- The sustain voltage is non-critical as long as it is 40V or less (40V works fine too).
- The settings for downstream PV should be ‘as appropriate’ for your system.
- There is no need to adjust other charger voltages or battery type in VEConfigure after loading the assistant, as the DVCC function overrides all the other firmware voltage/current settings in practice once it is enabled and active using CANBus
- As for all ESS based systems, the ESS Assistant must be loaded into all Multi/Quattro units in a multi-unit system.

Enable The Victron DVCC Mode (For All ZCell Systems)

The Dynamic Voltage and Charge Current mode is designed for ‘smart’ battery systems that communicate via CANBus from a BMS to the CCGX (such as the Redflow BMS and ZCell units)

DVCC is appropriate for and recommended for use with both On-Grid ESS and Off-Grid (non ESS) Victron Energy systems.

DVCC enables the system-wide dynamic control of current and voltage limits based on BMS information. It is a major enhancement in how Victron Energy systems operate.

The charging cycle for batteries is no longer based on the old ‘lead acid’ notion of initial/bulk/absorption phases. Instead, the charging control systems engage (and switch between) Constant Current (CC) and Constant Voltage (CV) target modes, as DC bus conditions change.

The DVCC control mode is ideally suited to the operation of smart batteries with near-linear charge/discharge characteristics such as the Redflow ZCell.

Tote that on-screen displays when DVCC is operational show ‘Absorption’ when in CV mode, and ‘Bulk’ when in CC mode.

Note: Older model Victron Energy based MPPT solarchargers (that don’t have VE.Direct connection paths) do not support DVCC. All the VE.Direct based units do support it. Only use VE.Direct MPPT models for new installations.

With those pre-requisites undertaken, and with CANBus communications from the BMS to the CCGX screen already operating (as per other knowledge base articles), turning DVCC on is easy:

- In the CCGX Setup -> System Settings menu, turn on DVCC (as per the screen shot in fig. 11)
- Then under the DVCC switch, please turn off SVS (This option will appear directly under the DVCC item when you enable DVCC):

See fig. 11.

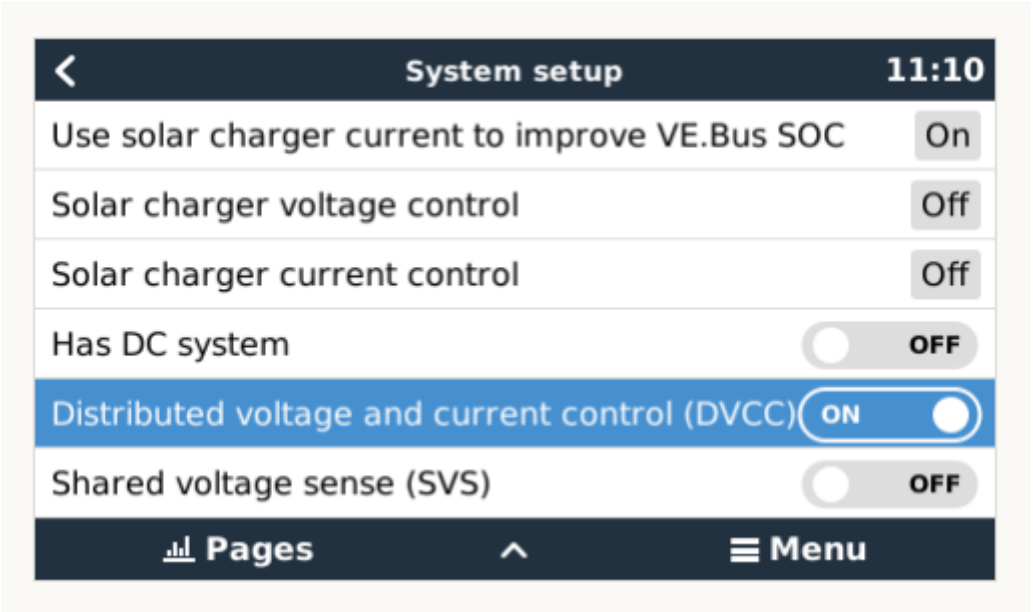


Figure 11: Victron CCGX DVCC on, SYS off
Note: SVS is ‘shared voltage sense’ - an intended improvement to the way the Victron Energy system senses bus voltage. However, SVS is (at the time of writing) incompatible with the ZCell battery and BMS operating cycle and- hence … just turn it off.

If SVS isn’t turned off, the system will ‘hunt’ in terms of target voltage and current over time and will be unable to smoothly bring a ZCell through its post-maintenance pre-charge phase to start to charge it up again. Leaving SVS on may also lead to system voltage surges during substantial changes in bus operating conditions over time, with the potential for intermittent ZCell protective shutdown/restart cycles occurring as a result.

ESS Setup

Please see fig. 12 through fig. 27 for examples screenshots of the setup process.

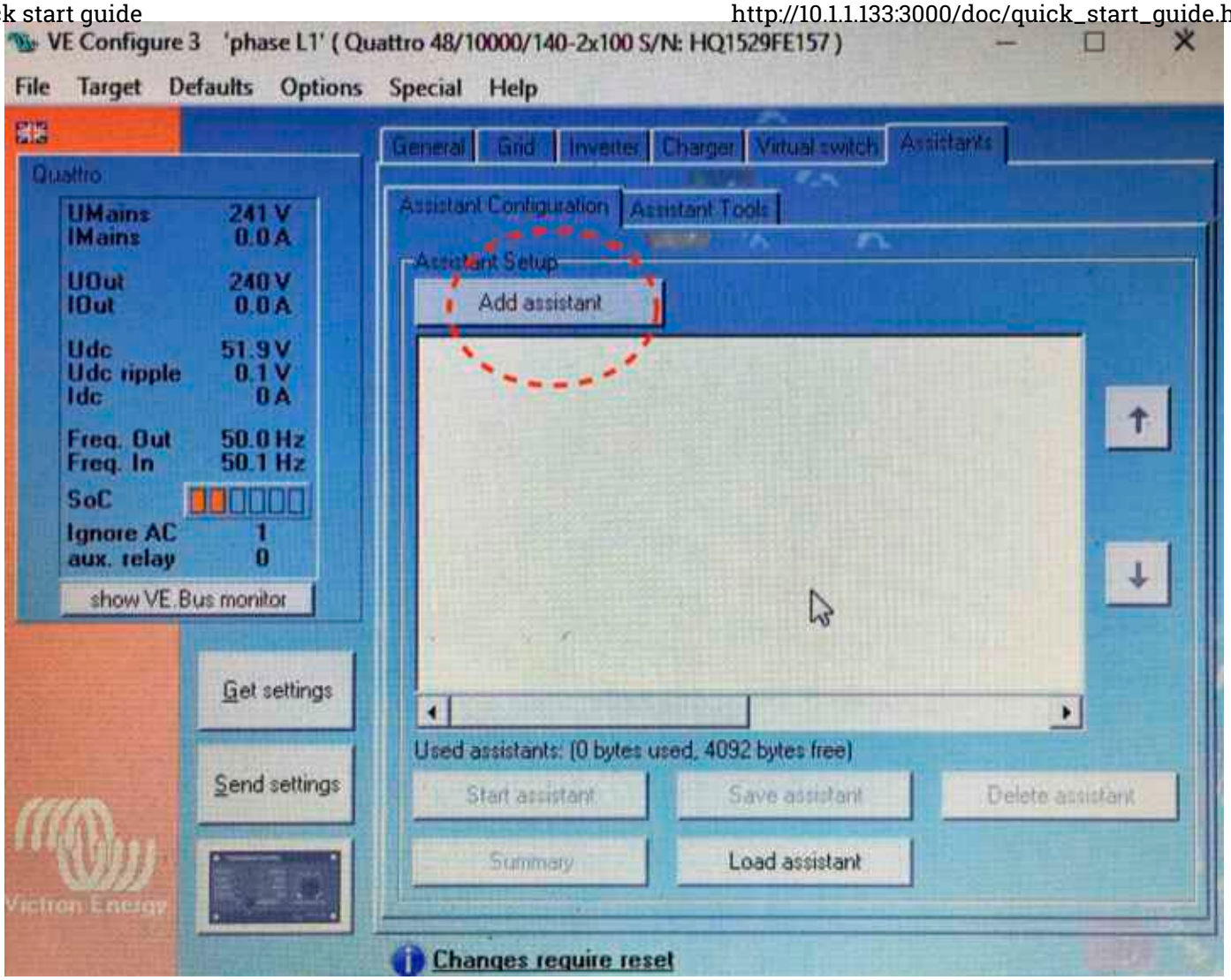


Figure 12: Victron ESS setup screenshot 1

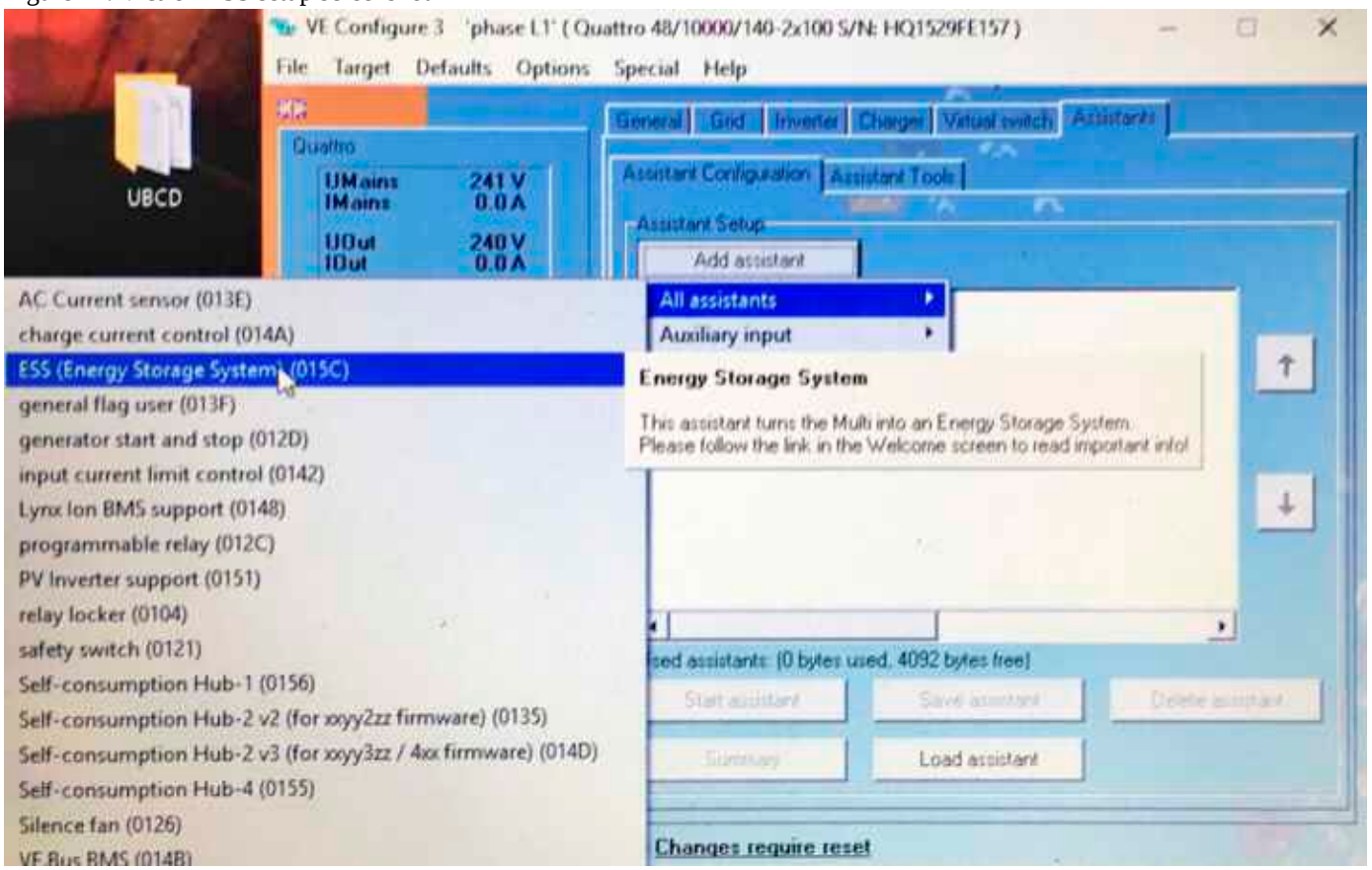


Figure 13: Victron ESS setup screenshot 2

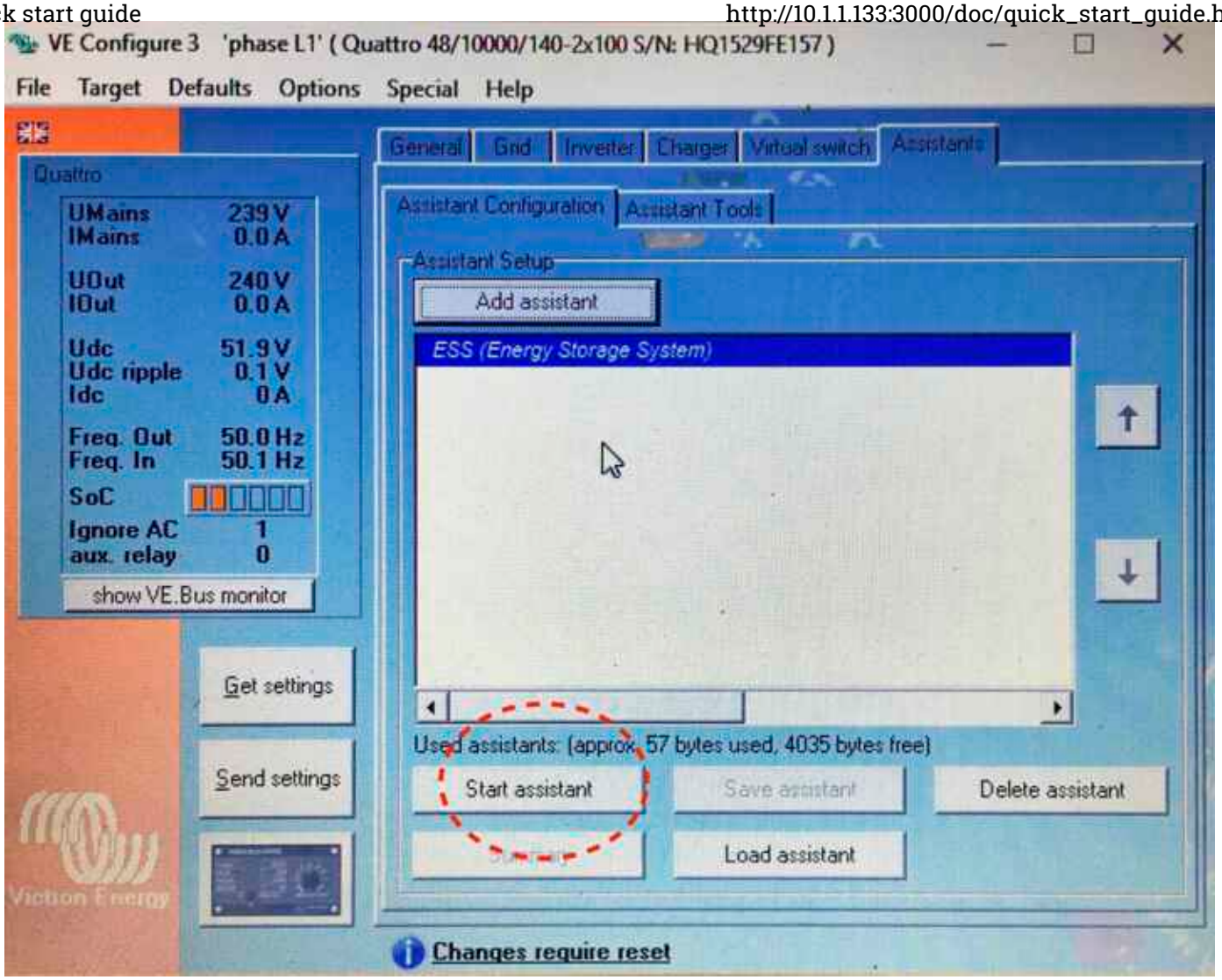


Figure 14: Victron ESS setup screenshot 3

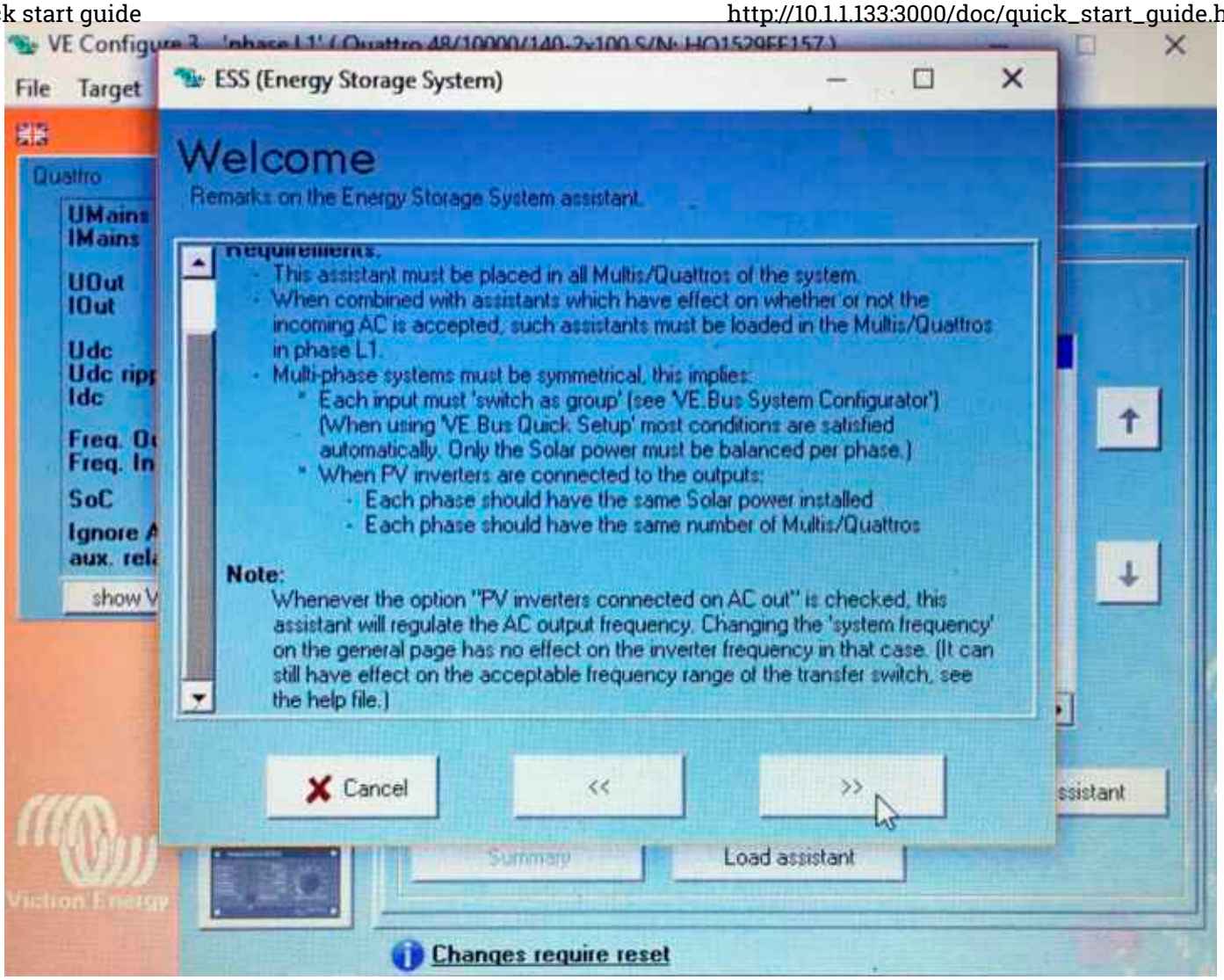


Figure 15: Victron ESS setup screenshot 4

Figure 16: Victron ESS setup screenshot 5

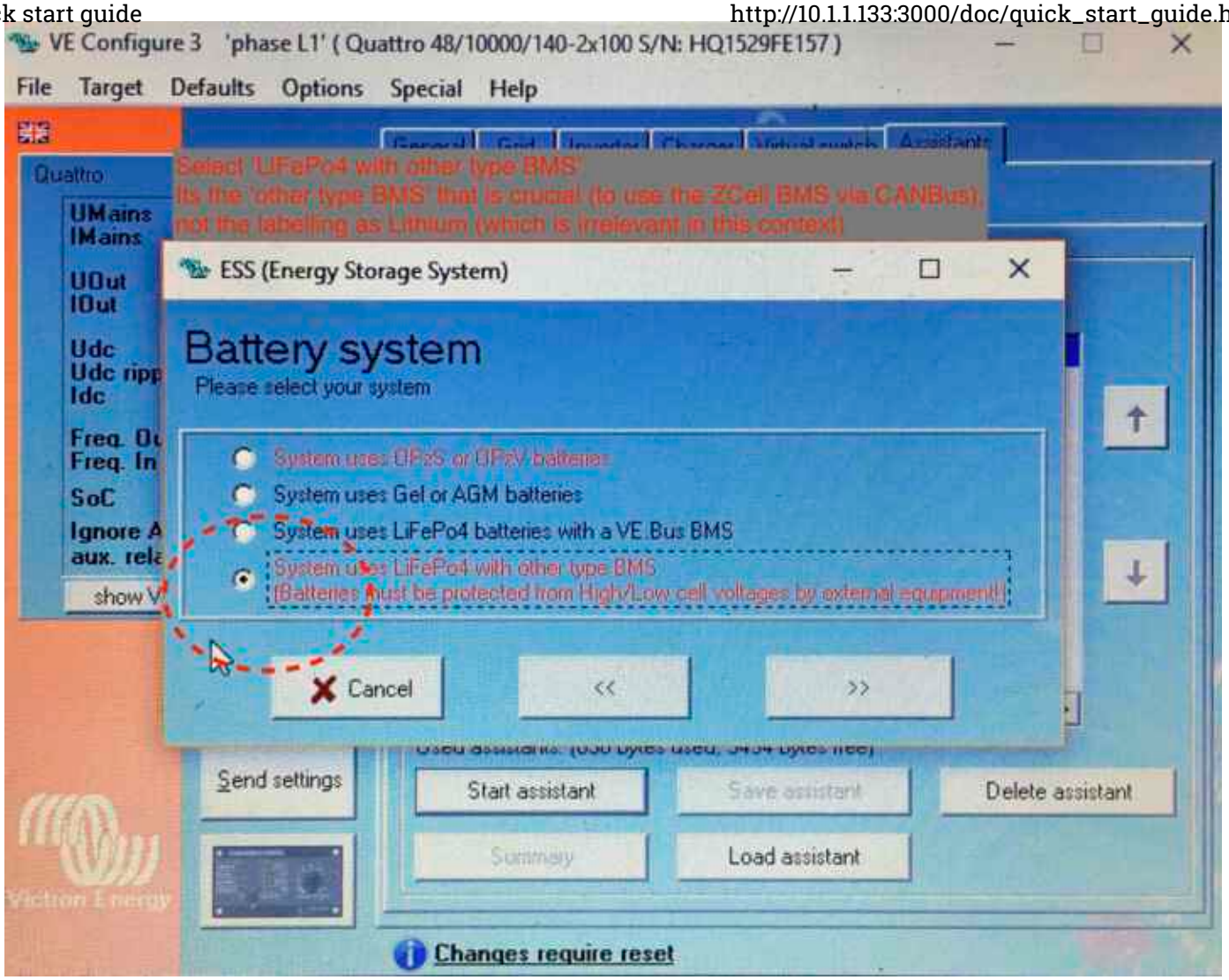


Figure 17: Victron ESS setup screenshot 6

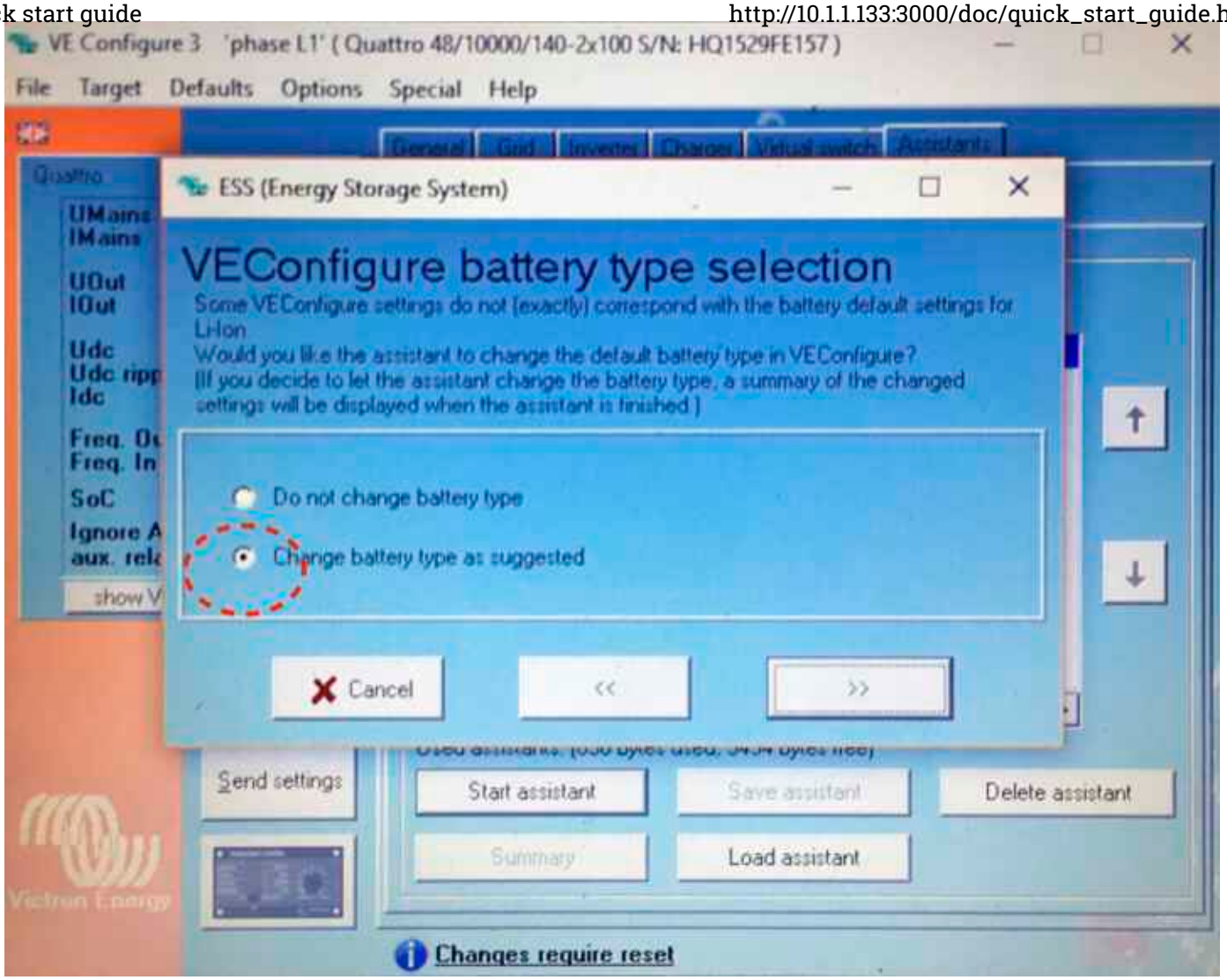


Figure 18: Victron ESS setup screenshot 7

Figure 19: Victron ESS setup screenshot 8

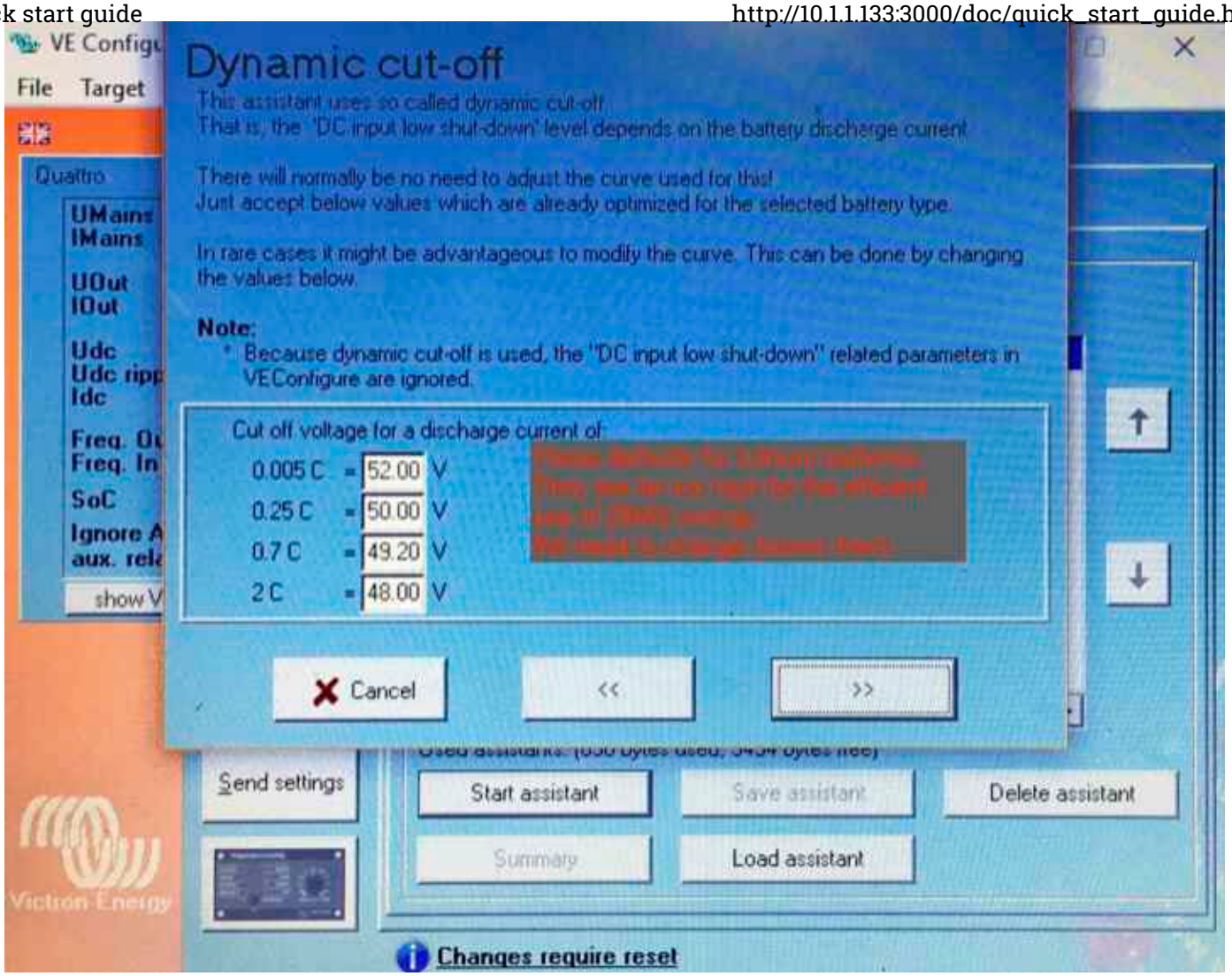


Figure 20: Victron ESS setup screenshot 9

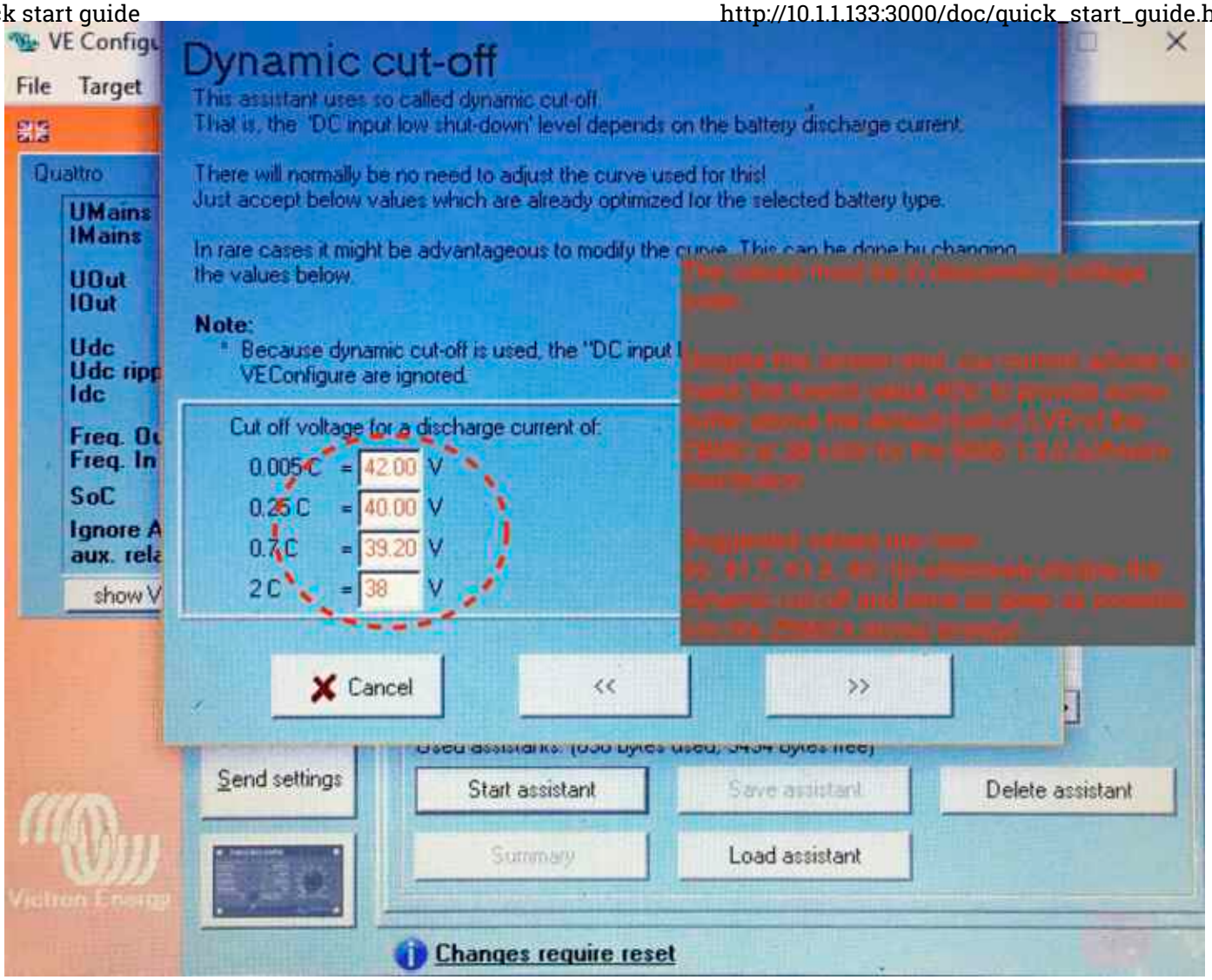


Figure 21: Victron ESS setup screenshot 10

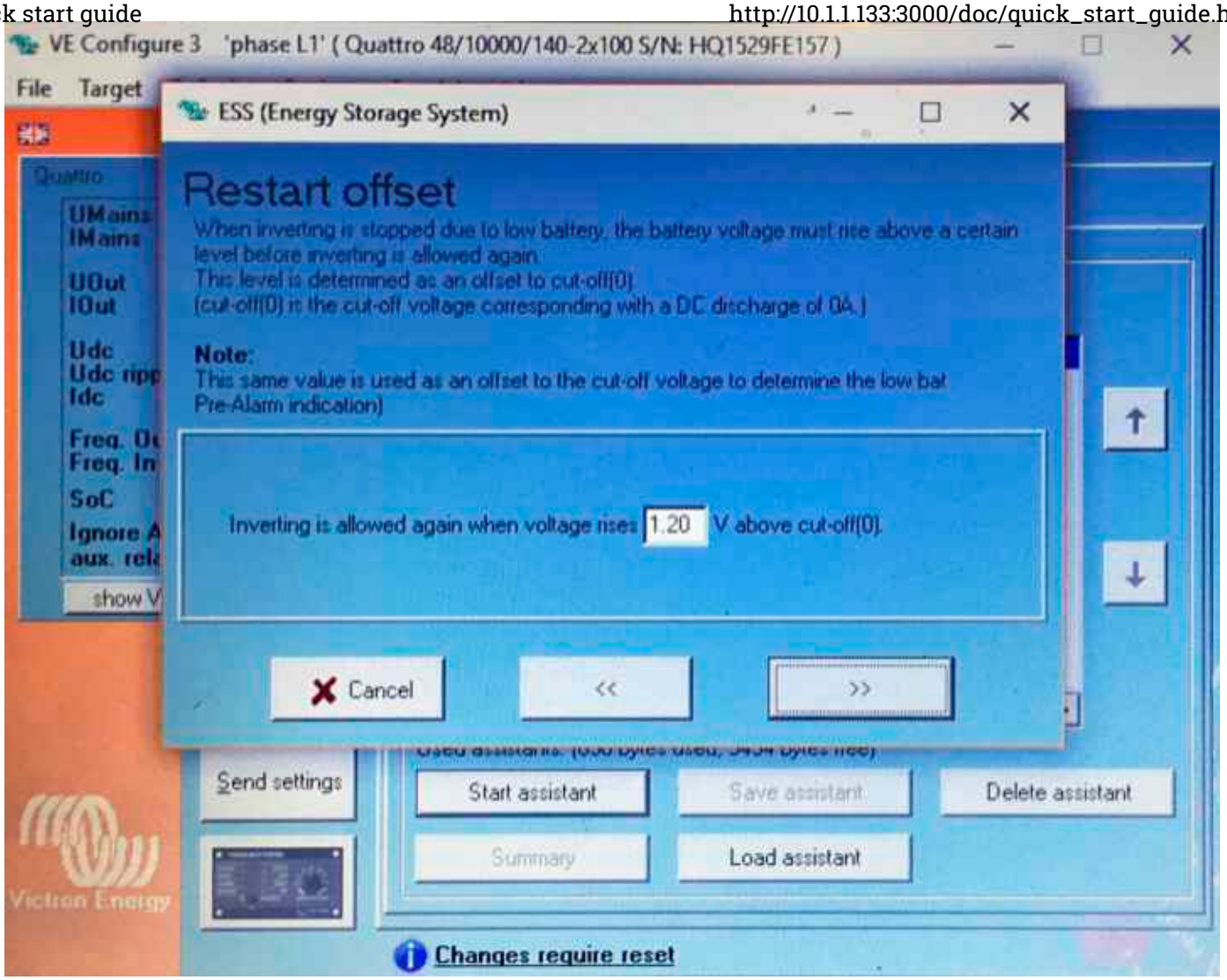


Figure 22: Victron ESS setup screenshot 11

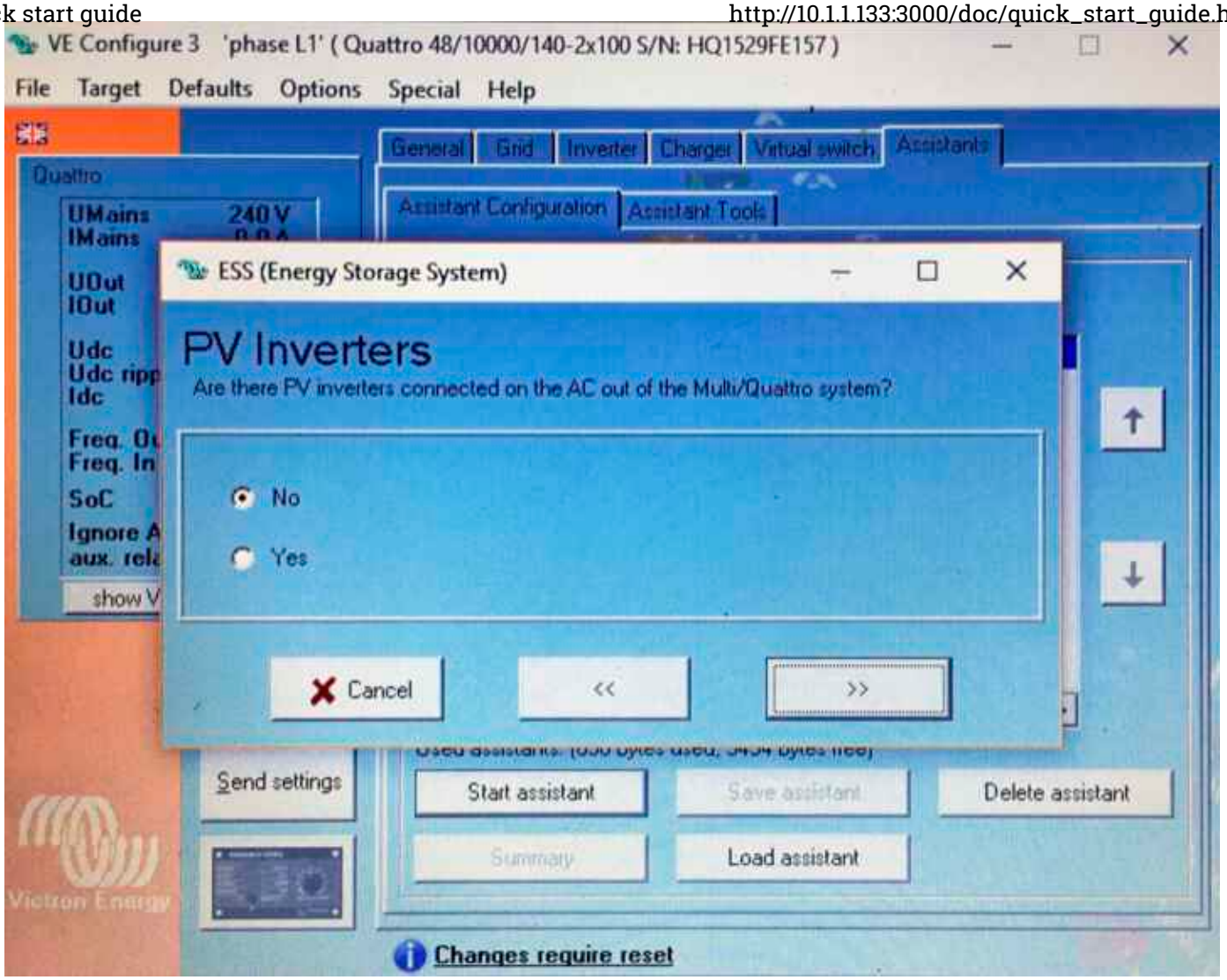


Figure 23: Victron ESS setup screenshot 12

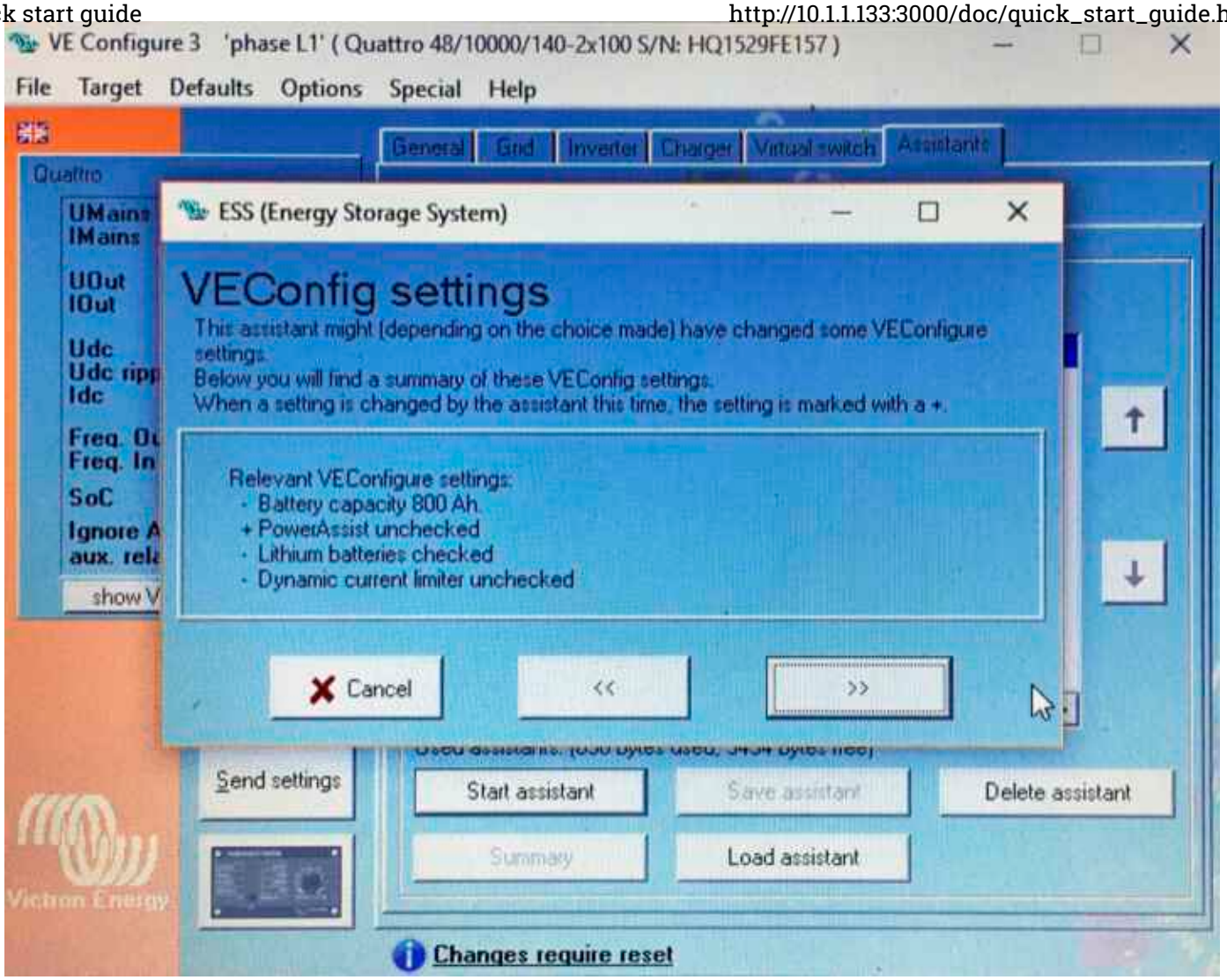


Figure 24: Victron ESS setup screenshot 13

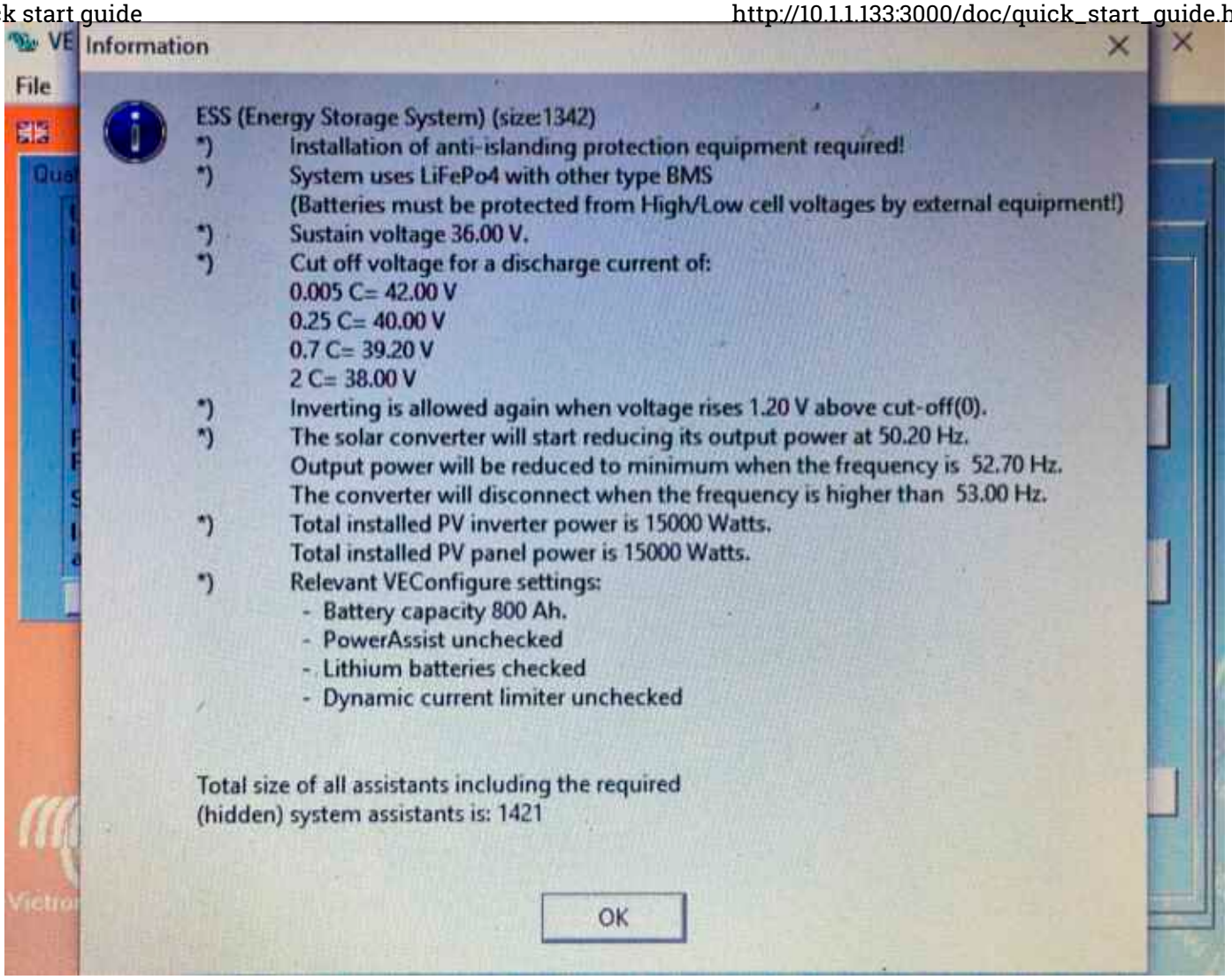


Figure 25: Victron ESS setup screenshot 14

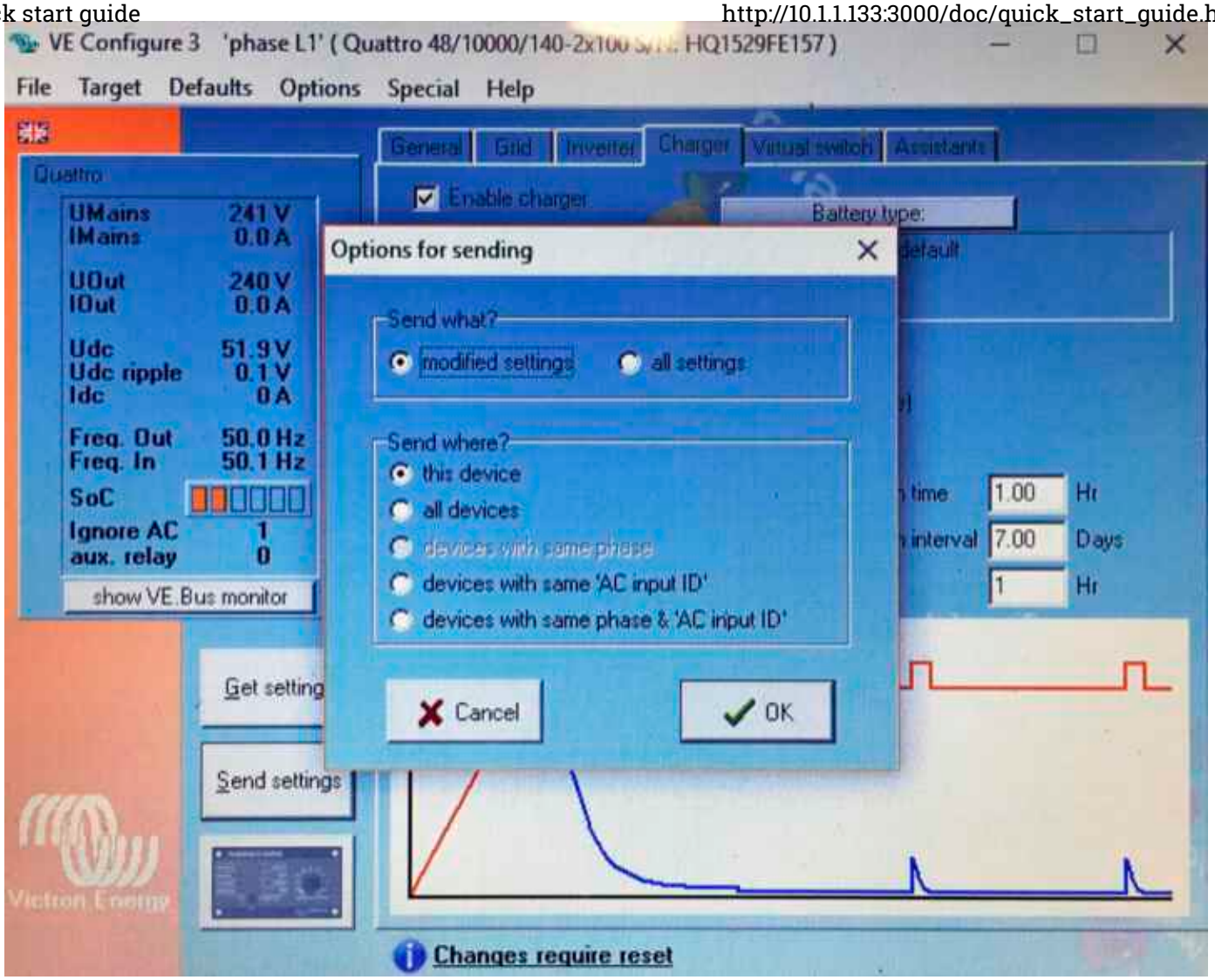


Figure 26: Victron ESS setup screenshot 15

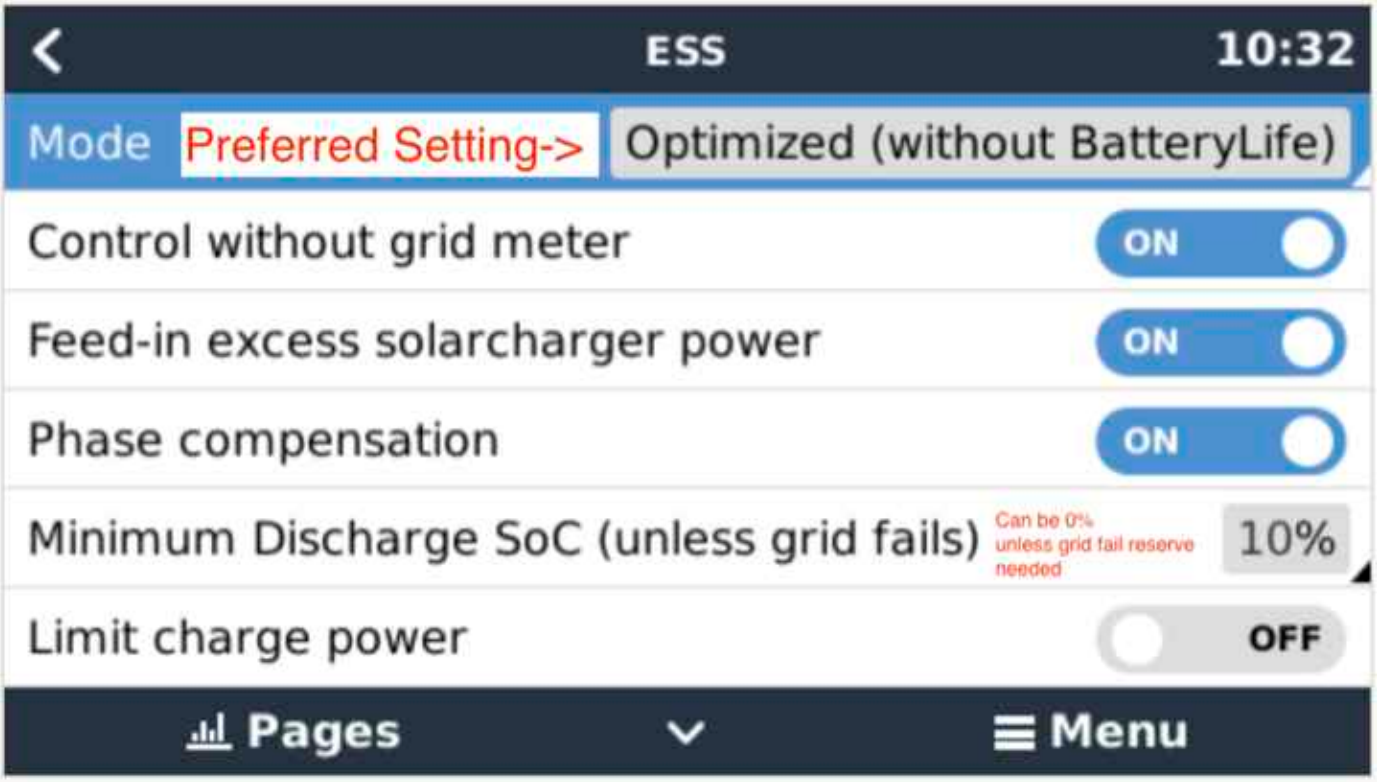


Figure 27: Victron ESS setup screenshot 16

Other Post-Installation Settings To Adjust In A Redflow

Installation

ESS MinSoC

Note that for correct system operation, the Settings->ESS menu ‘Min SoC’ value must be set to 0% in single-ZCell systems.

This value can, if desired, be set to a non-zero value (but generally not above 50% in multi-ZCell systems). This is to ensure that it is possible for the discharge/maintenance cycle required by the ZCell to operate properly.

In a single ZCell system where MinSoC is desired to be non-zero, consider instead the use of the CCGX ‘Scheduled Charging’ feature (a sub-menu under the ESS Menu) to perform a baseline charge once a day at a time that still allows for the battery to discharge for maintenance successfully when required.

ESS Operating Mode

It is important to ensure the Settings->ESS Menu ‘Operating Mode’ is set to ‘Optimised (Without BatteryLife)’ and not set to ‘Optimised (With BatteryLife)’

The Victron Energy ‘BatteryLife’ feature is incompatible with the need to fully discharge the system periodically in a single ZCell environment.

In a multiple ZCell installation, BatteryLife might in principle be able to be used, but Redflow recommends that BatteryLife is disabled in all Redflow installations for various reasons reasons, including to ensure that battery maintenance cycles can be performed efficiently.

See fig. 28.

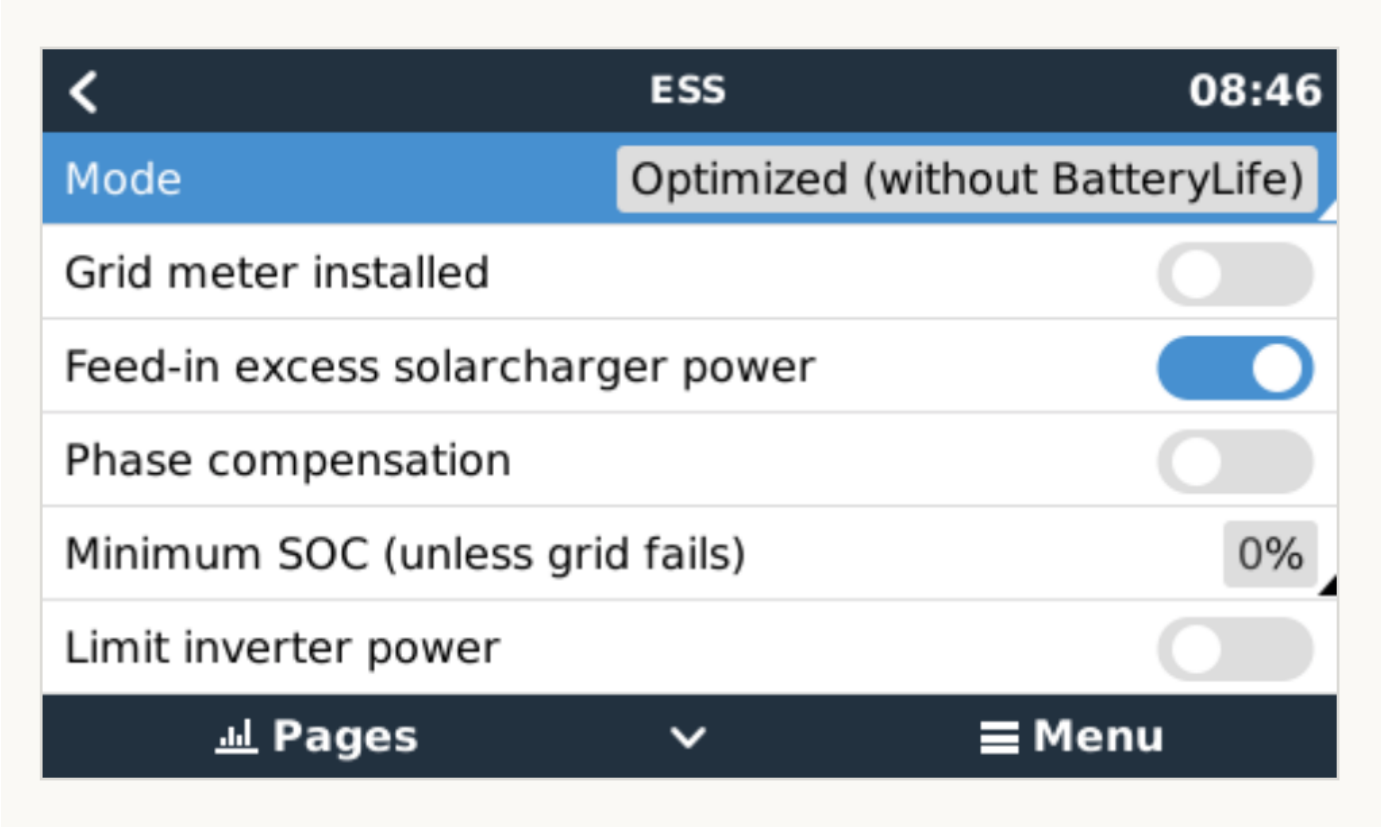


Figure 28: Victron ESS menu

Quattro/Multi ‘Low Battery’ Alarm

You should disable the ‘Low Battery’ alarm for your Quattro/Multi environment to avoid swamping your CCGC display with spurious Low Battery alarm notifications each time your system is performing battery maintenance.

You can find this setting by selecting your Multi/Quattro on the CCGX menu and navigating to the ‘Alarm Setup’ sub-menu, and then setting the first alarm in the list, ‘Low Battery’, to Disabled.

See fig. 29.

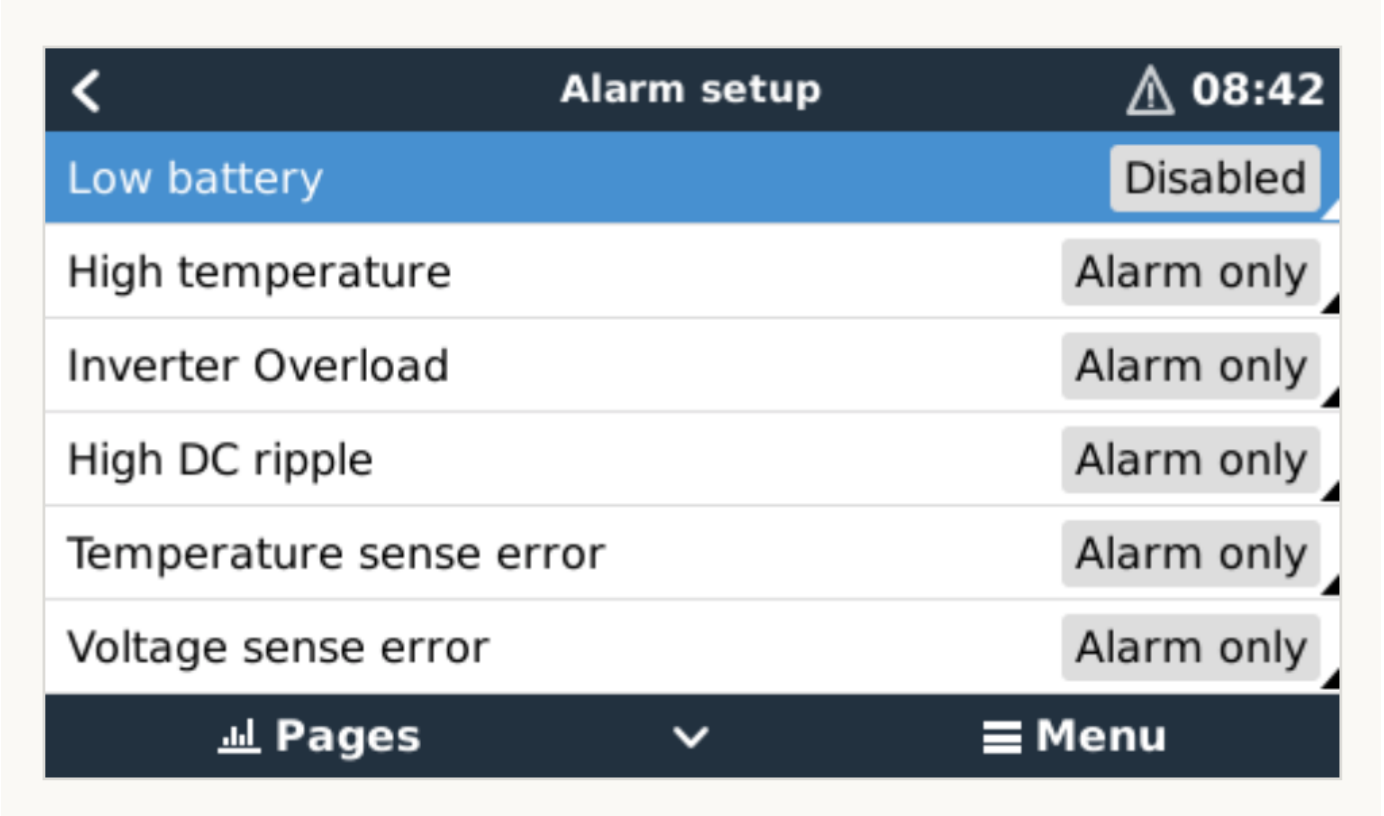


Figure 29: Low battery alarm

System Timezone

The CCGX picks up NTP based (Internet-synchronised) time automatically, but you do have to tell it which timezone it is physically installed into. The system timezone should be set correctly under the Settings->Date & Time menu, to obtain accurate (local time) based logging information and so the time shown on the on-screen CCGX display is correct.

Why Upgrade?

The BMS and ZBM are both field-upgradable units, with upgrades providing fixes for bugs, performance improvements and new features.

Keeping the firmware of both the batteries and the BMS itself up to date is important to ensure the system is always running optimally.

The menu to upgrade both the BMS and the ZBM firmware is located in the tools menu (see fig. 5).

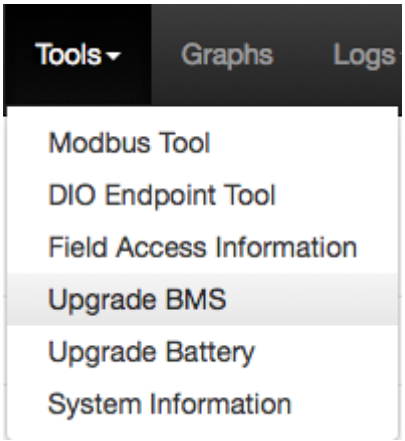


Figure 30: Upgrade Menu

Upgrading The BMS Firmware

Before upgrading, you should take a backup of the existing system configuration. This can be done via the “Configuration => Backup/Restore” menu - consult the users guide for more details on that feature.

After choosing “Upgrade BMS”, the page will load and show a list of available upgrades. This may take a few moments, and requires that the BMS has an internet connection.

If any upgrades are available, you will see a display such as shown in fig. 31.

Note that you should not use the “Manual BMS Upgrade” section unless specifically instructed to do so.

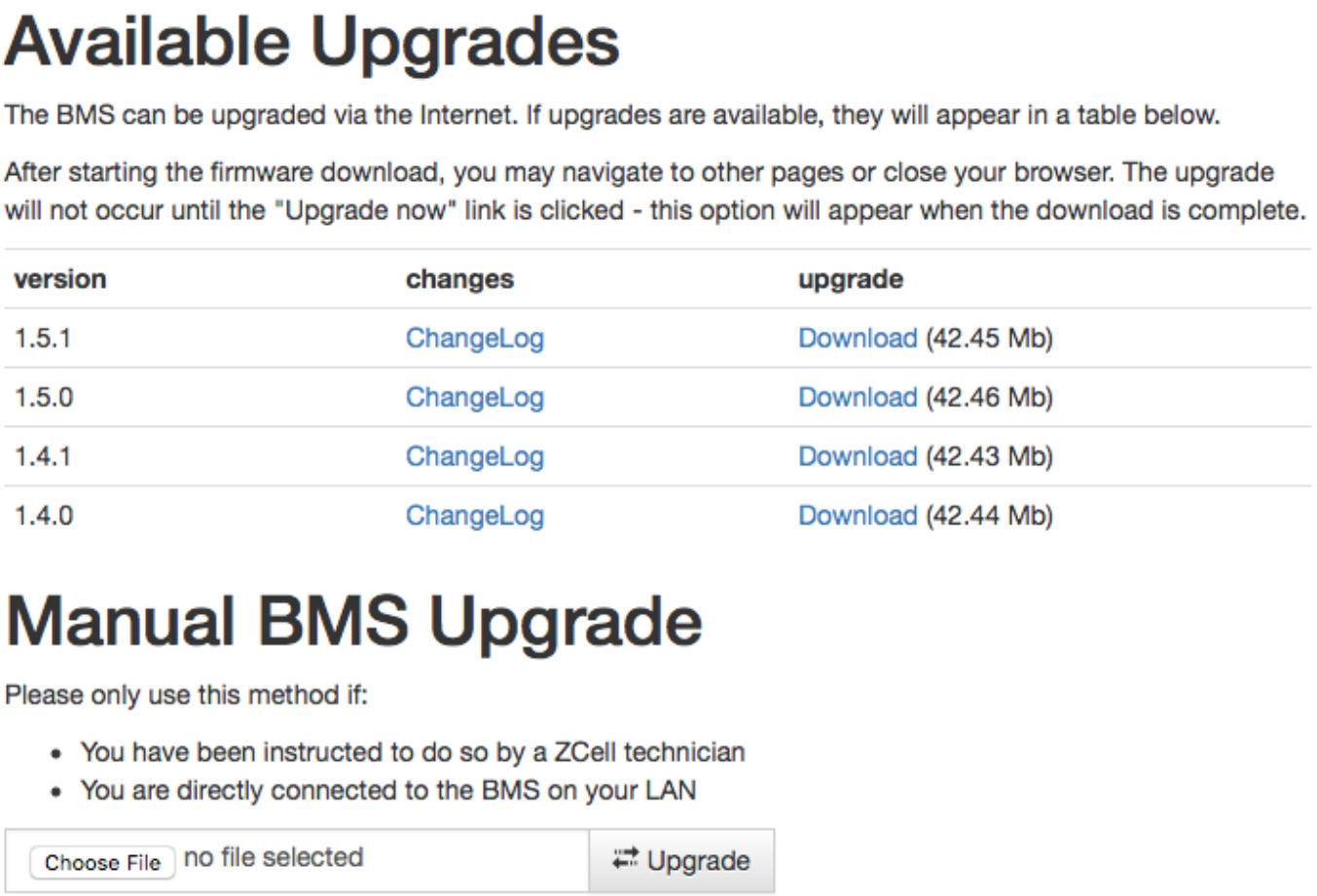


Figure 31: Checking available upgrades

Generally speaking, the most recent version (at the top) will be the one to choose. It is not possible to downgrade the BMS software.

Click on the “ChangeLog” link for the chosen version to check what changes have been made, and see if there are any caveats for the upgrade.

Click once on the “Download” link to start downloading the software. The speed with which this occurs depends on your internet connection speed. However there is no need to leave the browser open - you can reload this page at a later time to see the progress. The download progress bar can be seen in [@fig: upgrading_2].

Note that the upgrade is *not* automatically initiated once the download is complete - it requires manual intervention so that you can be sure the time is appropriate (for instance, not about to start a maintenance cycle).

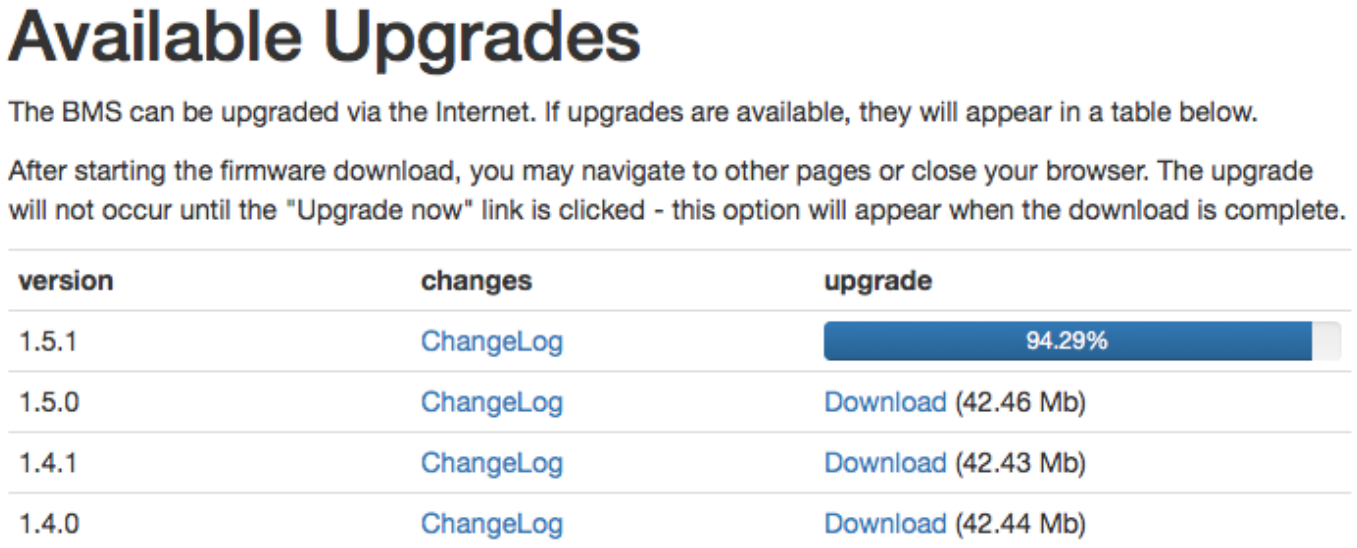


Figure 32: Downloading an upgrade
Once the download is complete, click the “Complete - Upgrade now” link to initiate the upgrade. See fig. 33.

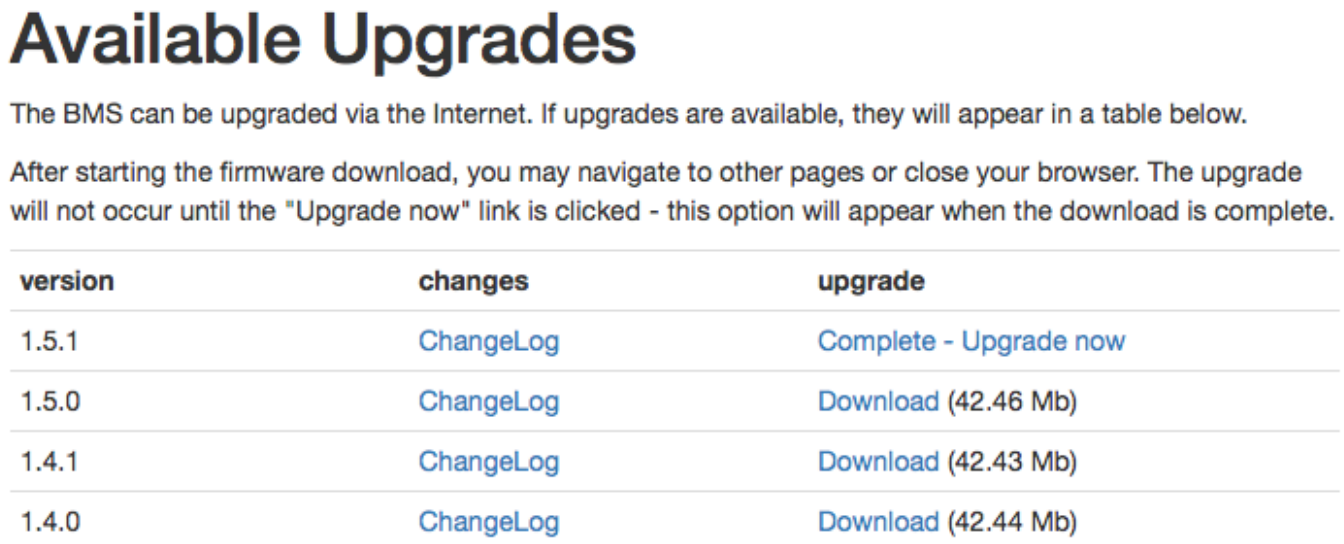


Figure 33: Upgrading

Upgrading The Battery Firmware

Determining if an upgrade is available.

Battery firmware is supplied with the BMS. Thus, when the BMS software is upgraded, you may find that a battery firmware upgrade becomes available.

On the BMS status screen, any batteries that can be upgraded will show their version number with a yellow warning triangle next to them, as seen in fig. 34.

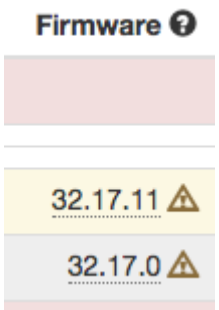


Figure 34: Upgrade available

Upgrading the battery

On the upgrade battery screen (Tools => Upgrade Battery) you will see the following display (fig. 35).

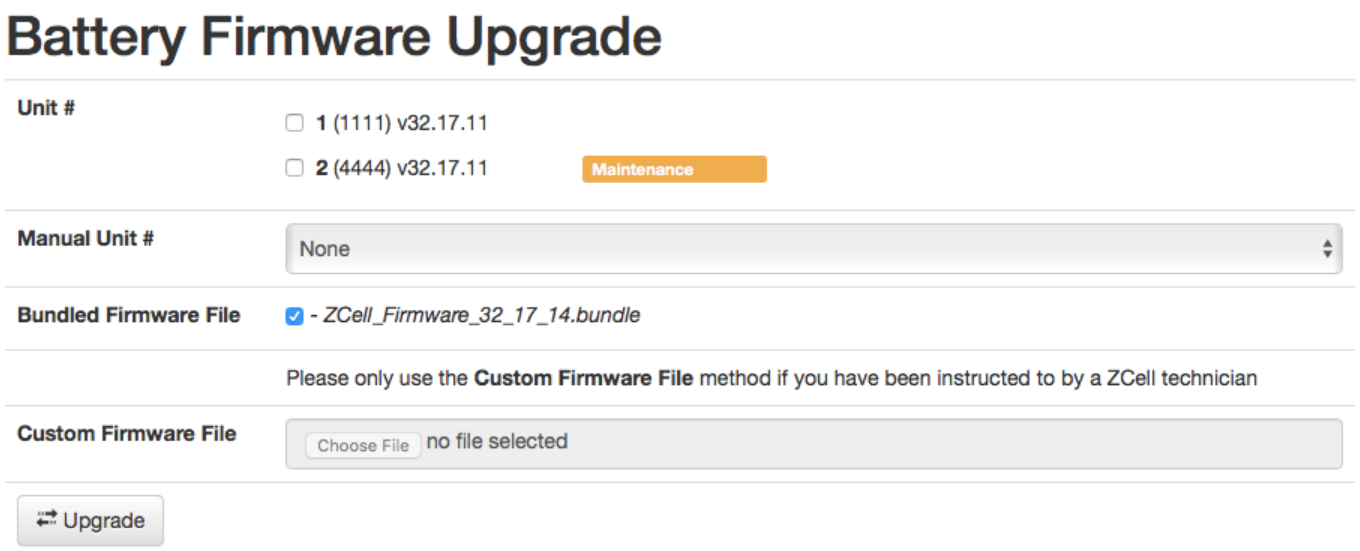


Figure 35: Upgrading one or more batteries
On the upgrade screen, you will see a list of batteries (and their current firmware version), and any notes relevant to that battery, with respect to upgrading.

In this example, one of the two batteries is undergoing maintenance, and should not be upgraded at this time.

You can select more than one battery at a time, however it is generally recommended to only upgrade one at a time to ensure there is minimal disruption to the energy system.

Use the bundled firmware as shown, unless you have been specifically instructed to do otherwise.

Click “Upgrade” to move to the final part of the upgrade process (fig. 36).

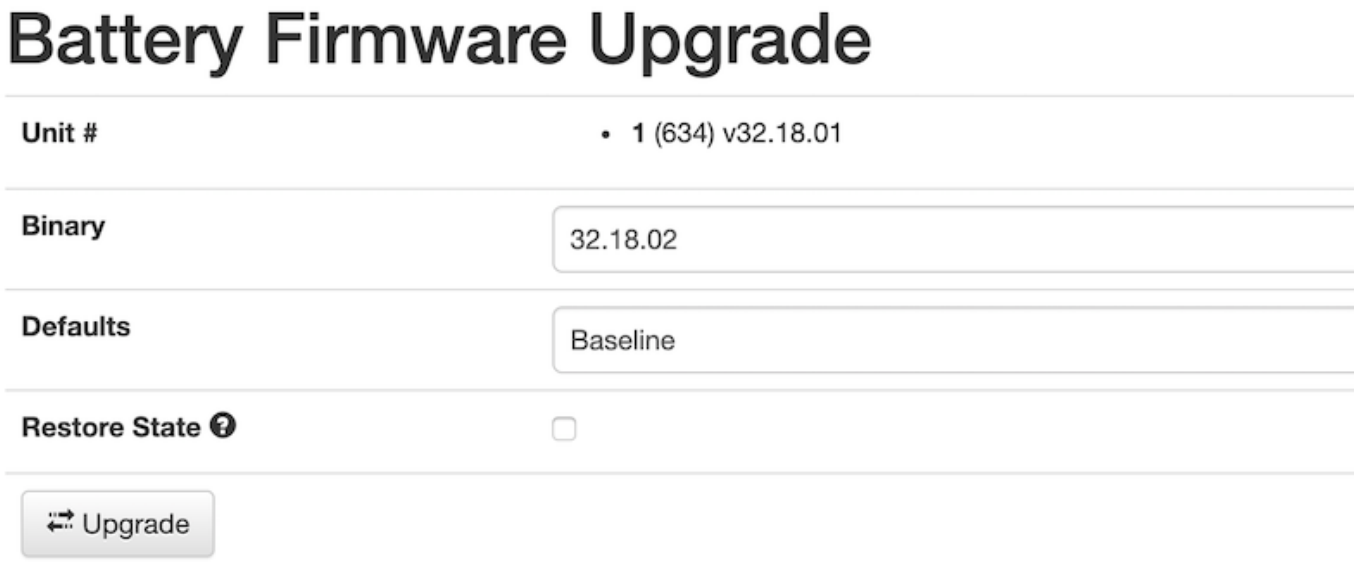


Figure 36: Completing the upgrade
On the final screen, confirm the new firmware version and the batteries it will be applied to.

Ensure you choose the correct defaults setting, either “Baseline” or “Baseline with EED”. If in doubt about which baseline to use, check the “Contacts” column on the main battery status screen. The third symbol will be either an “E” or an “S”. If an “E” is present, ues the EED baseline, otherwise, the standard baseline.

If you are still in doubt over the defaults setting required, please contact Redflow.

You can choose to restore the state of the battery after upgrade. By default, the battery will be offlined after the firmware

upgrade.

Press Upgrade to begin. The upgrade will take several minutes per battery, and as it consumes a large amount of comms bandwidth it is possible that other batteries will appear to stop responding. Be patient and wait for the process to complete.

During this process, a dialog will show the upgrade process in real-time (fig. 37).

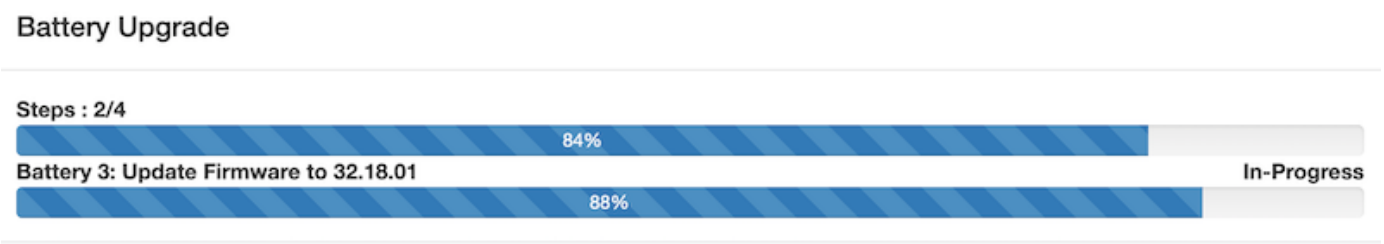


Figure 37: Completing the upgrade
Once completed, close the dialog to return to the upgrade screen, where you may choose to upgrade more batteries.