Venus GX (VGX) manual

1. Introduction

1.1 Description

In many ways the **Venus GX (VGX)** and the **Color Control GX (CCGX)** are the same device. They share a lot of hardware, and they run on identical software - our 'Venus OS' - therefore firmware numbering is the same; and new version releases always apply to both devices at the same time.

As many of the functions of the two devices are identical, the CCGX Manual should also be consulted if something is not specifically covered in this VGX manual.

This manual refers to the latest firmware version. A device connected to the internet will perform new-version updates automatically. Check the latest firmware version here.
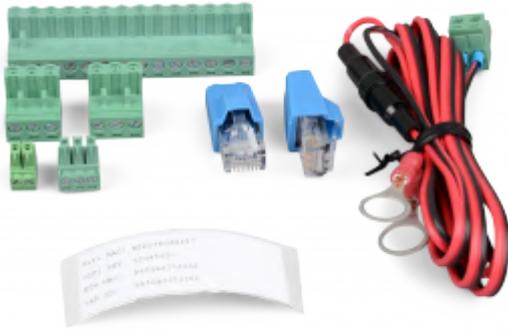
Venus GX/CCGX comparison table
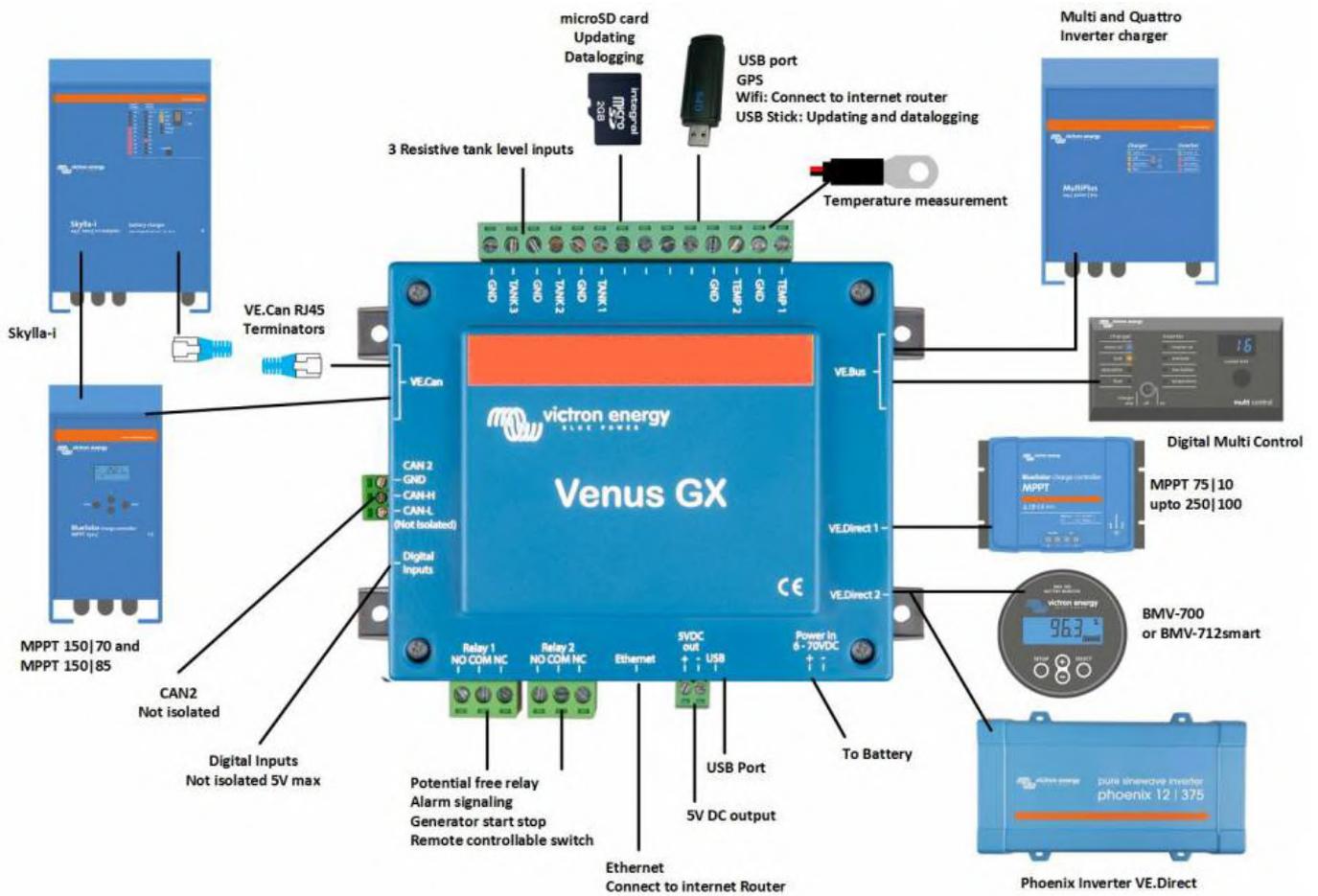
See the Victron GX product range page.

1.2 What's in the Box?

- Venus GX (VGX)
- VE.Can terminator (2 pcs).
- Power cable with inline fuse and M8 terminal eyes for battery- or DC busbar-attachment.
- Terminal Blocks for all the connectors on each side.
- Label showing WiFi key and product details.

1.3 Overview of connections

2. Accessing the device

Because the Venus GX has no visual display or buttons, you need either a smartphone, tablet or laptop to access it.

This access is called Remote Console. There are three ways to access the Remote Console:

1. Through the online VRM Portal, which requires internet, see chapter 2.1;
2. By using the built-in WiFi Access Point, see chapter 2.2;
3. Or, via the local LAN/WiFi network; see chapter 2.3.
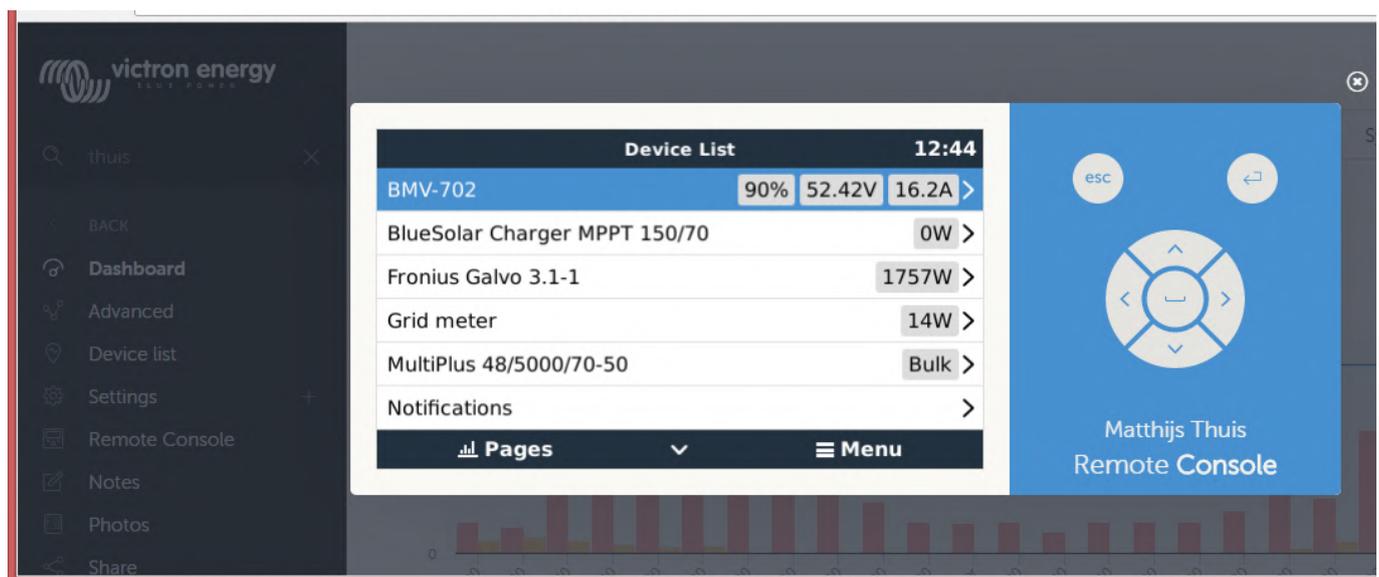
2.1 Accessing via VRM

This method requires a working internet connection, both on your phone/tablet/laptop as well as for the Venus GX. For a new install, this means that it needs to be connected by Ethernet cable.

Step by step instructions:

First, connect the Venus GX to the internet by plugging it into a working Ethernet network which has a DHCP server, as most networks do, and which is connected to the internet. The Venus GX will immediately connect to VRM.

Then once visible on VRM, click the 'Remote Console' link to open the window. Which will look like below screenshot.

More information about 'Remote Console' on VRM is explained in the CCGX Manual, VRM Remote Console chapter.

2.2 Accessing via the built-in WiFi Access Point

This method requires the VictronConnect App to be installed on your smartphone, tablet or laptop.

Steps:

1. Make sure you are no further than a few metres away from the Venus GX
2. Go to the WiFi settings on your phone / tablet / laptop.
3. After searching, the Venus GX will show up in the list, as `Venus-HQ1940DEFR4-3b6`. Where HQ... is the serial number as printed on the side of the box.
4. Connect to WiFi using the 'WiFi key' which you will find printed on the side of the box ...and also on a card in the plastic bag. Keep that in a safe place.

5. Open VictronConnect, it will start scanning the WiFi network automatically.
6. Once found, select the GX device from the list.
7. Open the Remote Console

Notes:

- If you cannot use VictronConnect, you can use a web browser and navigate to the IP address 172.24.24.1
- For added security it is possible to disable the WiFi Access Point. See Settings → Wi-Fi → Create access point. See below chapter explaining the Push button for how to restore access in case ever necessary.

Instruction video

Step by step instruction video on how to connect to a GX device using the VictronConnect App.

Video

Detailed instruction video

This second video was made before VictronConnect got the feature to find a device on a network. All the explanations in the video regarding IP Addressing can be ignored, and use VictronConnect as in above video instead.

Video

2.3 Accessing via the local LAN/WiFi Network

2.3.1 Introduction and common installations

This section explains how to connected to Remote Console when the Venus GX is connected to the local computer network, with either an Ethernet cable, or having it configured to connect to a local WiFi network.

This method does not require an internet connection. Just a local computer network is sufficient.

Once connected, connect to the GX Device by running the VictronConnect App on a phone, tablet or laptop. Note that will need to be connected to the same computer network as the Venus GX.
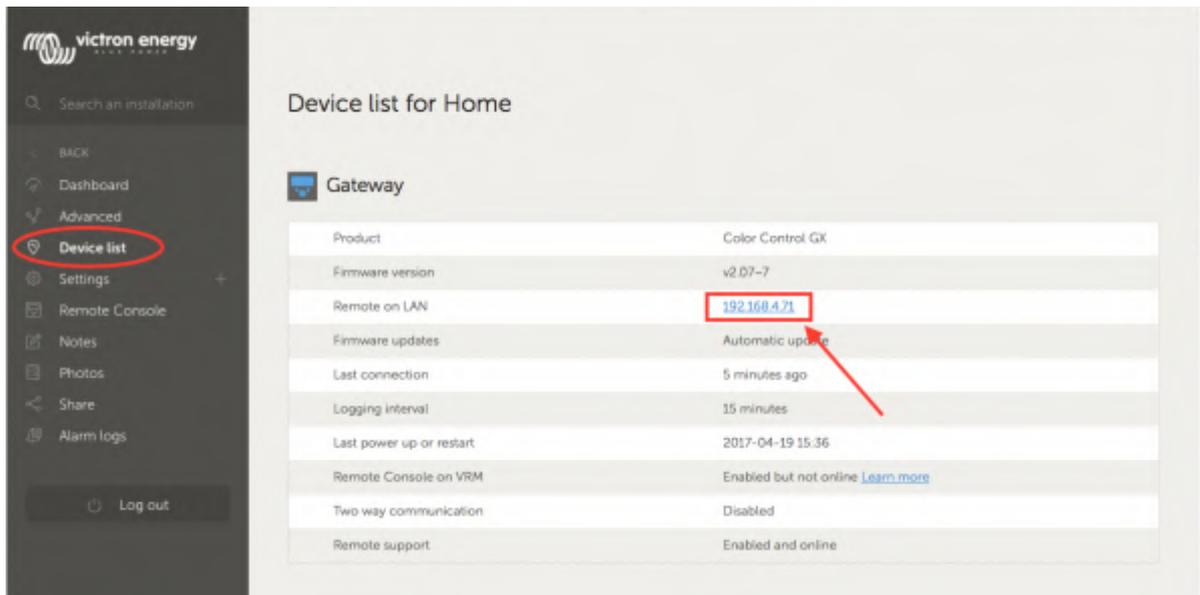
This video shows how its done:

Video

2.3.2 Alternative methods to find the IP Address

In case VictronConnect can't be used, here are a few other methods to find the Venus GX, ie. its IP Address.
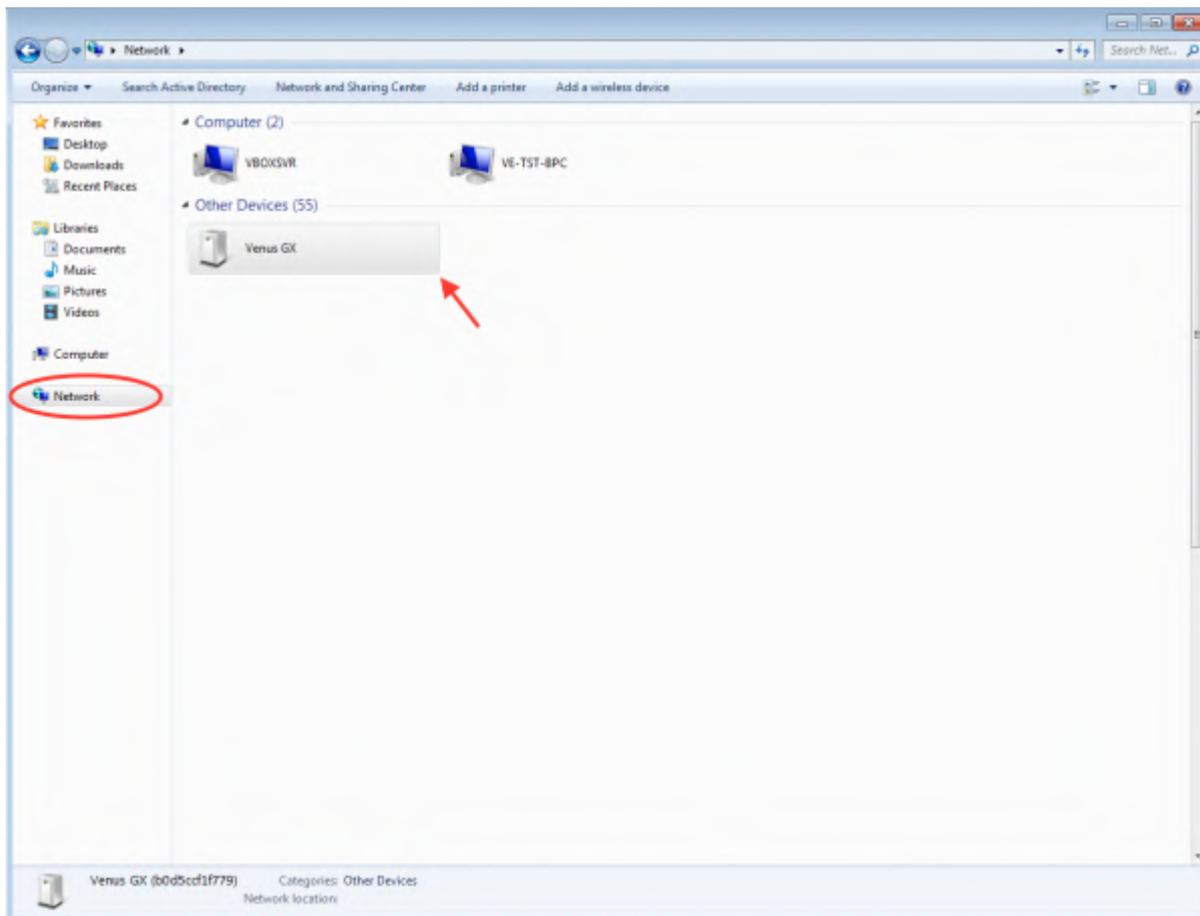
IP Address on VRM

On the VRM Portal, you'll find the IP address on the Device List page of the installation. Note that this does require the Venus GX to be connected to the internet.
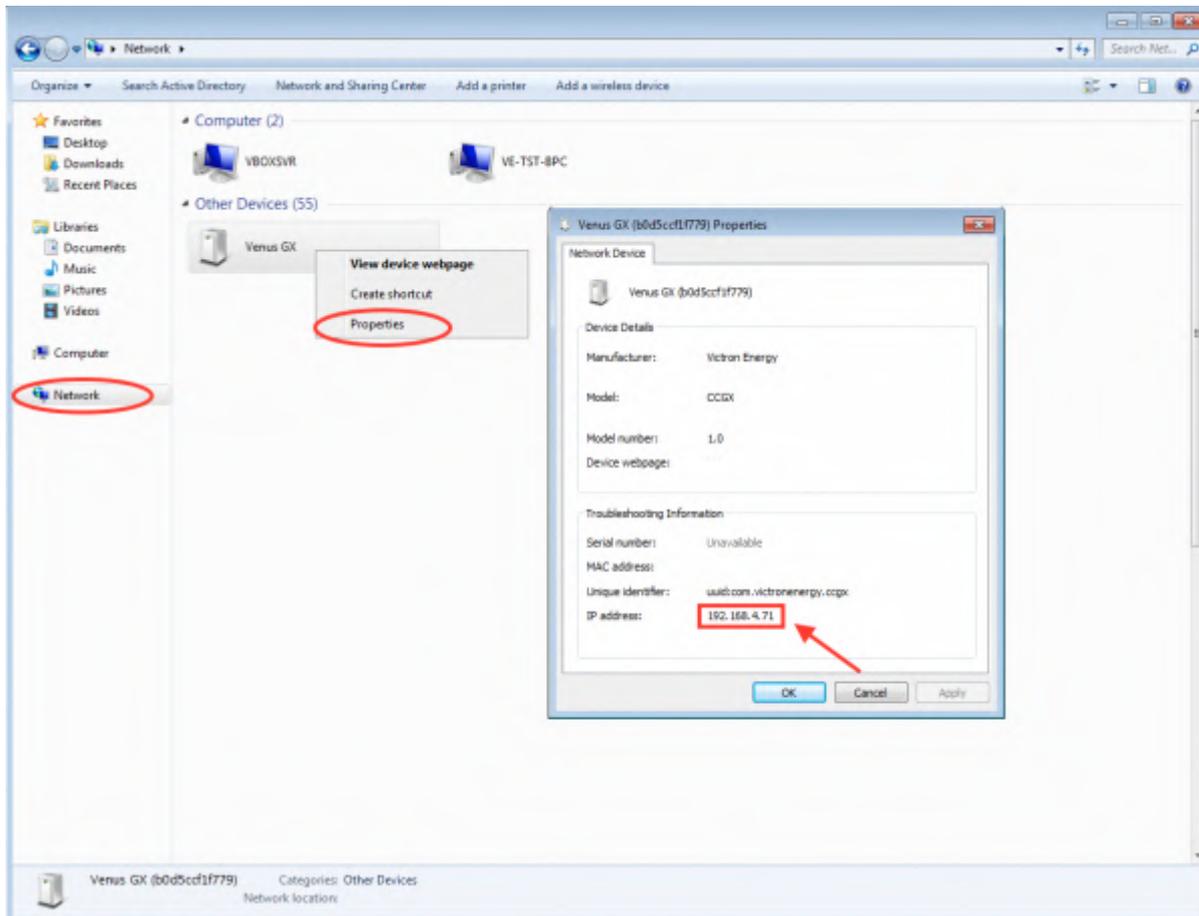
Network (on Microsoft Windows)

In a local network, for example at home, you can also find the Venus GX in the Windows 'Network' overview:

Double-clicking the icon will open up Remote Console on LAN.

Open the 'Properties' window to see the IP address.

This uses Universal plug-and-play broadcast technology.

3. LEDs and Push-button

3.1 LEDs

Boot-up

On the side of the Venus GX, there is a LED. During power-up it it goes through these states:

- Stage 1: Both green and red illuminate briefly and faintly (it's hard to see the green) for approximately 1 second.
- Stage 2: Red illuminates for approximately 1 second.
- Stage 3: Green illuminates for approximately 0.5 seconds.
- Stage 4: Both green and red illuminate briefly and faintly (it's hard to see the green) for approximately 1 second.

During operation

- Slow blinking: built-in WiFi access point disabled
- Fast blinking: built-in WiFi access point enabled (default)

Slow blinking is once per second. Fast blinking is twice per second.

3.2 Small button located to the right of the green 14-Terminal Connector Block

Short press: WiFi Access point on/off

A single short press toggles the internal WiFi access point on and off. The LED indicates its state: when the LED blinks green slow, then the built-in Access Point is disabled. when the LED is green and blinking fast, then the built-in Access Point is enabled.

Long press: reset all network settings to factory defaults

Press and hold the small button for a minimum of four seconds. The LED will stay on for 2 seconds to indicate that the log press has been recognised; then release the button again.

- Ethernet is set back to DHCP
- WiFi Access Point is enabled
- Remote Console password is disabled
- Remote Console on LAN and on VRM is enabled

The same button is available on the Octo GX, button is marked SD_BOOT and available under the lid at the top.

4. Digital Inputs

The Venus GX has five digital inputs. The channels are accessible via the RJ-12 socket on the side. This is available for self-wiring by the user/installer.

4.1. Wiring details

The inputs are non-isolated. They operate at 3V3 levels, and can withstand up to 5V input. Each input has an internal 10k pull-up resistor to 3V3. We recommend wiring it to a potential free relay or otherwise open collector/optocoupler output.
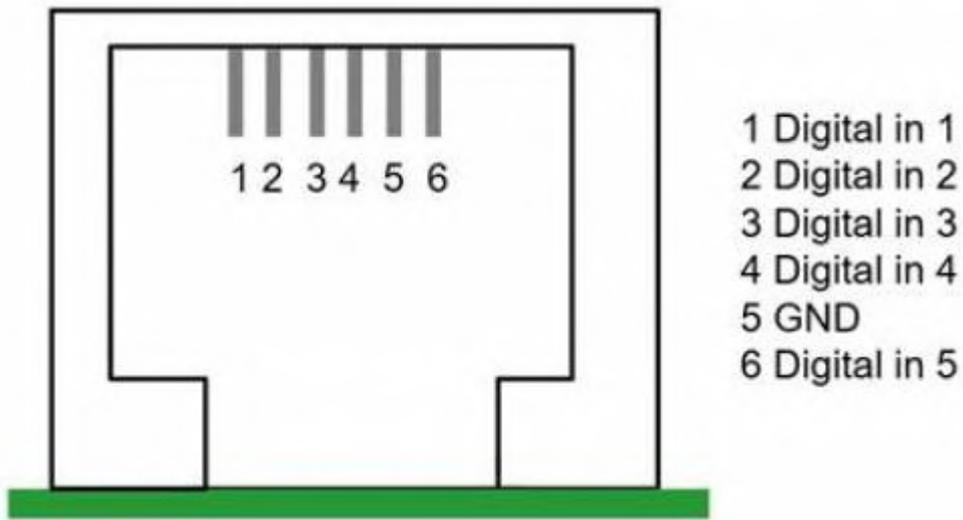
RJ12 pinout	Input
pin1	input1
pin2	input2
pin3	input3
pin4	input4
pin5	gnd
pin6	input5

4.2. Configuration

Each of the digital inputs can be configured as a pulse meter, or as one of a number of predefined sensors that can also be configured as alarms.

The possible configurable functions are:

Function	States
Pulse meter	N/A
Door alarm	Open/Closed
Bilge pump	On/Off
Bilge alarm	Ok/Alarm
Burglar alarm	Ok/Alarm
Smoke alarm	Ok/Alarm
Fire alarm	Ok/Alarm
CO2 alarm	Ok/Alarm
Generator	Running/Stopped

The function of each input can be configured in the GUI under Settings → I/O → Digital Inputs.

Digital input 1	Disabled
Digital input 2	Disabled
Digital input 3	Pulse meter
Digital input 4	Door alarm
Digital input 5	Disabled

| ⅏ Pages | ≡ Menu |

Once the input is configured for its intended purpose, it will show up with other devices.

| **Device List** | 08:45 |
Bilge alarm	Ok ›
Bilge pump	On ›
Pulse meter	145m³ ›
Notifications	›
Settings	›

| ⅏ Pages | ≡ Menu |
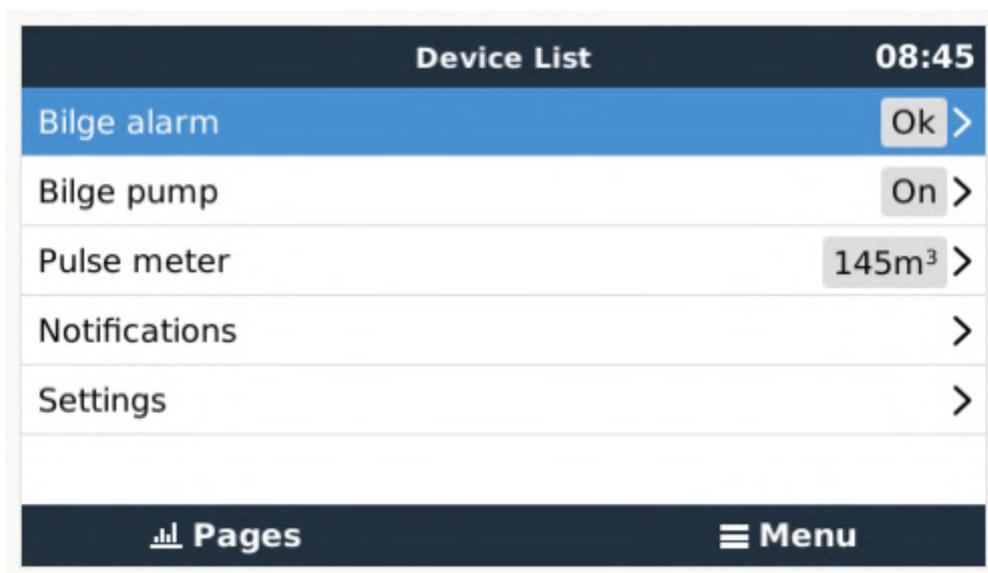
Other parameters related to that function can be configured by entering the device menu and selecting Setup. For pulse meters, you can configure the unit, the multiplier (the volume represented by each pulse) and reset the counter.

‹	**Setup**	11:48
Volume unit	Cubic metre
Inverted	OFF
Multiplier	0.1
Reset counter	0

| ⅏ Pages | ≡ Menu |
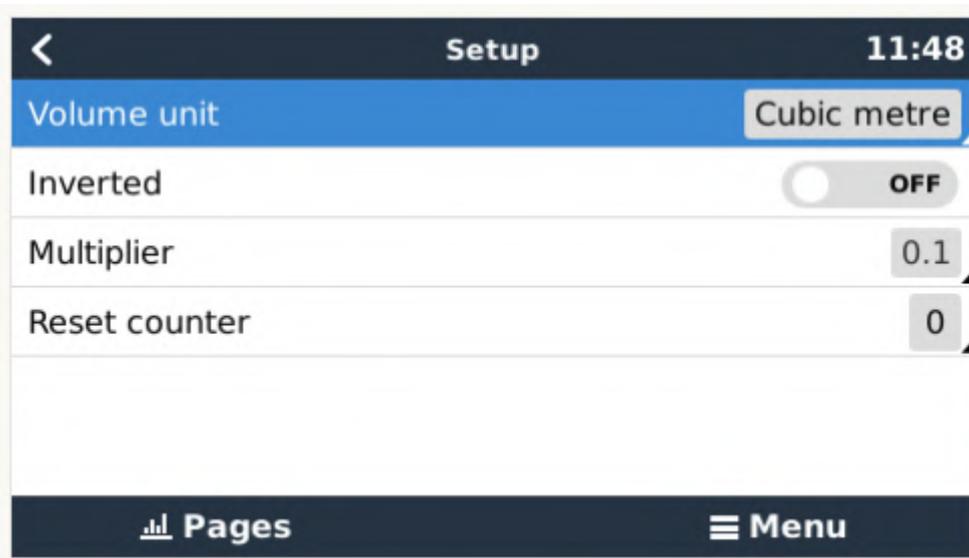
For other sensors and alarms, you can decide whether the input should be treated as an alarm condition, whether the labels should be inverted, and whether the logical levels should be inverted.

- To swap the labels attached to the alarm, set *Inverted* to on.
- If a logical low input (0V) should be considered a positive condition, set *Inverted alarm logic* to on.
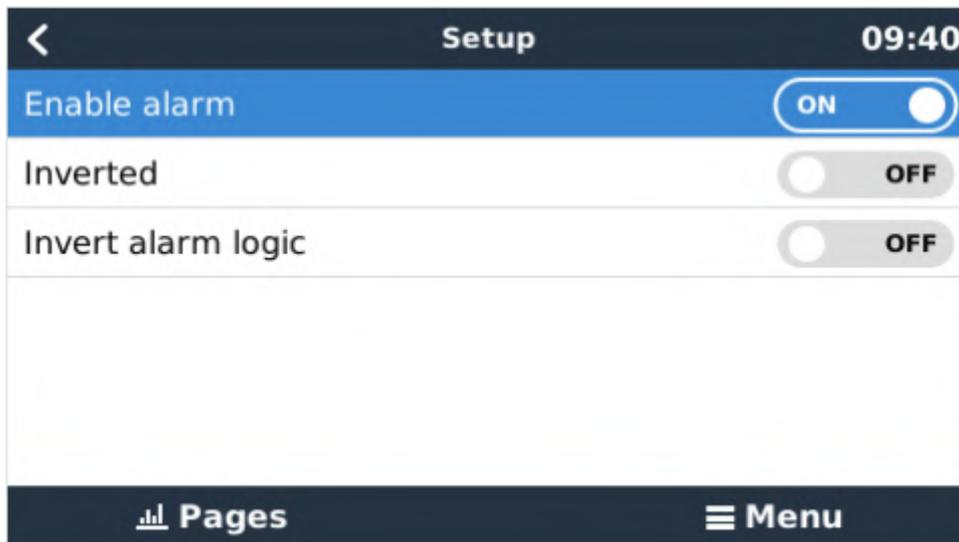
4.3. Read-out of digital inputs via Modbus-TCP

The values/states of the digital inputs are available on Modbus-TCP. For more details about this, please download a copy of the document "Modbus-TCP register list" from our website. And see our Modbus-TCP FAQ.

5. Factory reset

See above chapter 3.2 on the push button.

6. More information

- Color Control GX manual
- GX - Generator auto start/stop
- CCGX Frequently asked questions
- How to update a GX device
- CCGX Remote VEConfigure and remote firmware updates
- VRM Portal
- VRM Portal - trouble shooting Remote Console
- Open source

AC-coupled PV with Fronius PV Inverters

This document describes how to setup Energy-storage, Off-grid/Micro-grid and Backup systems with AC-coupled PV, using Fronius PV Inverters. For Fronius information on the same subject, see their MicroGrid flyer.

The Victron system monitor, the Color Control GX includes built-in Fronius monitoring.

Frequency shifting

To make sure that the Fronius PV inverter works well with Victron inverter/chargers, both must be configured with the right 'frequency shift settings':

- The Fronius PV Inverter must be set to Setup MG, short for Micro-Grid.
- For off-grid systems, load the Multi or Quattro with the PV Inverter support Assistant
- For on-grid / energy-storage systems, load the Multi or Quattro with the ESS Assistant. Read information about ESS in the ESS Design & installation manual.

And the 1:1 limit rule must be adhered to.

Fronius / Victron specifics

This is a very easy setup. The Fronius Setup Microgrid has been developed in close cooperation with Victron. During commissioning, set the PV Inverter to Setup MG50 (or Setup MG60 for 60 Hz systems). Everything is then pre-configured. The Setup MG settings match the default Victron Assistant settings.

Compatible ROW inverters (for "European type AC grid") are:

- Fronius Primo (1~, 3 kW up to 8.2 kW) → Software *fro27140.upd* or higher (see FAQ Q5!)
- Fronius Symo (3~, 3 kW up to 20 kW) → Software *fro27140.upd* or higher (see FAQ Q5!)
- Fronius Eco (3~, 25 kW or 27 kW) → Software *fro27140.upd* or higher (see FAQ Q5!)
- Fronius Agilo (3~, 75 kW up to 100 kW) → Software *update19.tl* or higher
- Fronius IG Plus V (1~, 2~, 3~, 2.5 kW up to 12 kW) → from *IGF 5.0.66* on with settings according to the Victron recommendations

For new systems the Fronius Symo and Fronius Eco inverters are recommended for 3~ applications. The Fronius Primo inverters are recommended for 1~ applications. Please note that all these inverters are transformerless and therefore PV-Modules that require pole-grounding (on the Plus or Minus pole) cannot be connected.

The use of Fronius Galvo inverters is not recommended anymore for new applications - the Fronius Primo is the best substitute and offers higher efficiency, wider DC voltage range and two MPP trackers.

Compatible UL inverters (for "US type AC grid") are:

- Fronius Primo UL (1~, 3.8 kW up to 15 kW) → Software *fro27470.upd* or higher (see FAQ Q5!)
- Fronius Symo 10-24 480V (3~, 10 kW up to 24 kW) → Software *fro27140.upd* or higher (see FAQ Q5!)
- Fronius Symo 10-15 208-240V (3~, 10 up to 15 kW) → Software *fro27140.upd* or higher (see FAQ Q5!)

For the UL inverters, some more Microgrid Setups are available (e.g. for connection with Neutral conductor or without). Also the UL inverters can be used in 60Hz as well as in 50Hz applications. More information can be found in the user manuals.

When setting up a system, always update both the Fronius and the Victron devices to their latest firmware versions. For the latest Fronius firmware and information how to update use this link: Fronius firmware update

Setting up the Fronius with Setup MG50/MG60

When not pre-ordered with a MicroGrid setup, follow these steps:

1. Make sure that the Fronius PV inverter is updated to at least the firmware version mentioned above. See Inverter list above.
2. After making the inverter operational according to the manual, select the language and after this the country specific setup.
3. Here choose MG50 or MG60 depending on the system frequency.

4. Ready to start up.

Setting up the Victron Multi or Quattro

1. After connecting the MultiPlus or Quattro with the battery, you can now connect a computer through the VE.Bus (in combination with the Victron interface MK2USB) to configure the system with the latest version of the software VE.Configure.
2. Go to the tab Assistants:
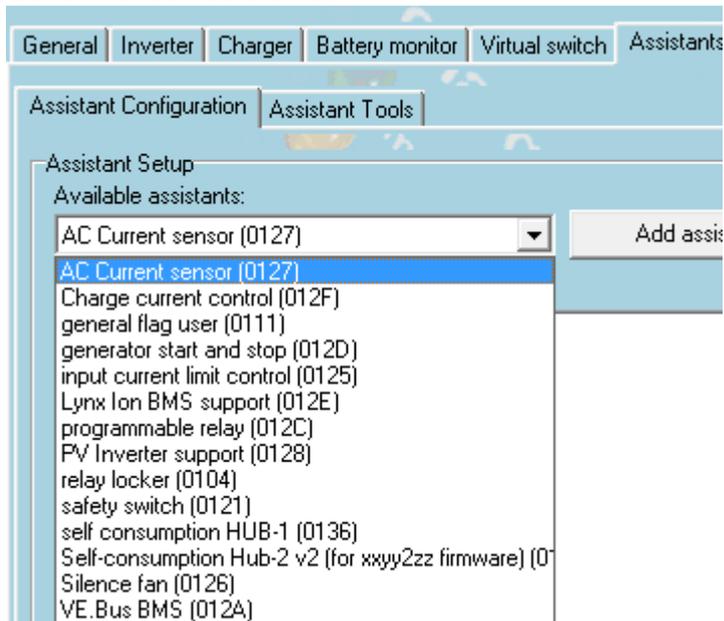
3. Add one of the Assistants that regulate output frequency:
    1. ESS Assistant
    2. PV Inverter support
4. Note that it is not necessary to change the default settings in the Assistant.
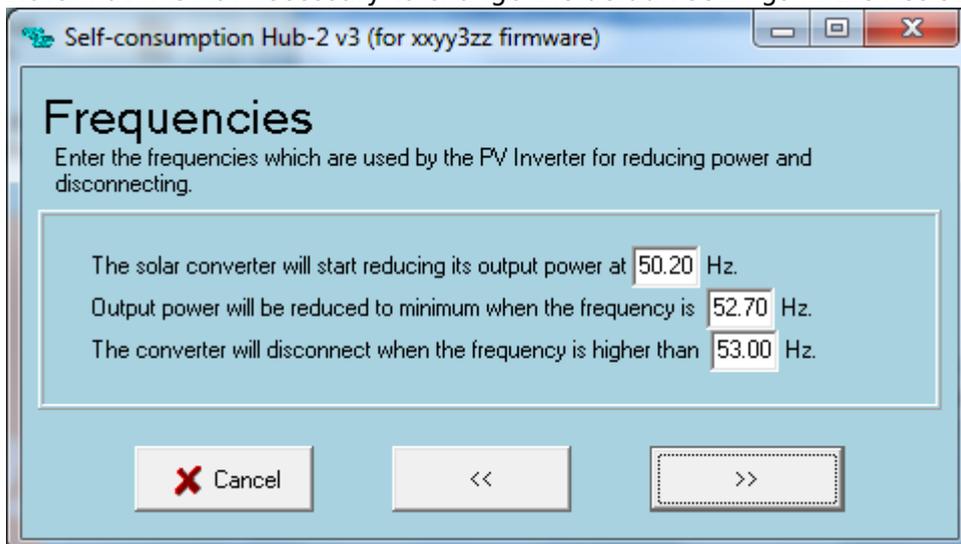
5. Complete the rest of the Assistant and write the new settings to the MultiPlus or Quattro.

Table for settings for 50Hz and 60Hz frequency

State	50Hz	60Hz	.
Start	51.0	60.2	Hz

Minimum	52.7	62.7	Hz
Disconnect	53.0	63.0	Hz

More information on adding Assistants is here.

Remote system monitoring

The Victron system can be monitored through Victron VRM Portal if a Color Control GX is present at the site. The Fronius PV inverter data can be integrated into the Color Control GX and therefore also in the VRM portal. So the VRM portal is the recommended monitoring platform also for AC-coupled installations.

However, also Fronius offers an equivalent monitoring solution. The Fronius portal is called Fronius Solar.web. The PV system data can be transfered to the portal if the inverter is equipped with a Datamanager 1.0 or Datamanager 2.0.

The usage of both portals in parallel is possible.

A video instruction how to set up the Datamanager 2.0 + Solar.web can be found here.

Zero Feed-in

It is possible to make a Zero feed-in system with Victron & Fronius. The Venus device will the control the Fronius output power. See the ESS manual, chapter 4.3.11 Fronius Zero feed-in for details.

Frequently Asked Questions

Q1 Why doesn't the frequency settings in the Multi and the Fronius need to be the same?

The first two frequencies do not need to be the same since the Multi actively regulates.

Q2 I have an Fronius IG inverter (not Plus), can that work?

No, the IG inverters cannot be made to work in a MicroGrid system. The appropriate substitute for an IG 30 is the GALVO 2.5-1 or an IG Plus 25V-1 (depending on the desired DC voltage range).

Q3 The system is locked to 53 Hz and does not resume

See here.

Q4 Can I use the Fronius Smart Meter?

That depends on the type of system and software configuration.

A Fronius Smart Meter can be used in these two situations:

1. when used only for reporting to Solarweb
2. when used for limiting export, in a system where the Victron system is not configured as an ESS system.

The Fronius Smart-Meter can not be used for the Fronius built-in export limiting feature when part of a Victron ESS system. Instead, use the Victron ESS Fronius Zero-feed in feature, see chapter 4.3.11, Fronius Zero Feed-in, in the ESS manual.

Q5 How can I get the Fronius firmware that improves flickering?

Fronius has a special firmware available, on request, that fixes light flickering issues that occur on certain installations under certain circumstances.

For Fronius PV inverters produced after 2018-week 16, contain the flicker-fix already straight from production.

To update earlier and/or already installed PV Inverters, contact Fronius Tech Support for the file. The required file is fro29130.upd. Which works for all snap-inverter models (Primo, Symo and Eco). There is no, and will be no, fix available for Fronius Galvos.

Automatic Generator start/stop

1. Which relay and control to use?

Various Victron products have functions to automatically signal when to start and stop a generator. Here is advice on when to use which product and method.

Option 1: GX device like CCGX or Venus GX

When there is a GX device (CCGX, Venus GX, or other) in the system, the best option is to use its Generator Start Stop mechanism. Its the most feature-rich generator start/stop system that we have to offer. It provides for basic functions as starting and stopping on Battery State of Charge, Battery voltage as well as High load situations. And also has many advanced features, including automatic test runs and silent times.

Option 2: BMV Battery Monitor

The next most used option is a BMV-700 Battery Monitor or similar model. It can start the generator on low battery voltage and/or low battery state of charge. See the BMV-700 manual for configuration.

Option 3: Using the relay in the Multis or Quattros

The Multis, MultiPlus-IIs, Quattros, EasySolars and the rest of the VE.Bus family also have Generator start/stop feature with a relay. There are two different ways to configure them:

1. Generator Start/stop function of the Virtual Switch (recommended)
2. Generator start/stop Assistant (more advanced / complex)

Combining the options

Lastly, its of course also possible to combine above mentioned methods, by wiring the open contacts in parallel to each other, or in series, to the Generator.

2. How to wire generators with a three-wire interface

All above Victron products and devices have a single relay; which will close when the generator needs to starts; and then expect the generator to then keep running until the relay is opened again. Or the other way around.

When having a generator that requires a start pulse and a stop pulse, such as for example Cummins/Onan generators; additional wiring is required.

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To start such a genset, the open/close contact needs to be converted into a start and stop pulse. Below solution, using standard available timing relays, does exactly that: when the open/close contact closes it generates the start pulse, and when the open/close contact opens again it generates the stop pulse.

Note that this solution should only be used on gensets that have their OWN control panel monitoring and automatically stopping on loss of oil pressure and other sensors. In other words: do not wire this directly to the starter motor and fuel solenoid.

BLOCK DIAGRAM
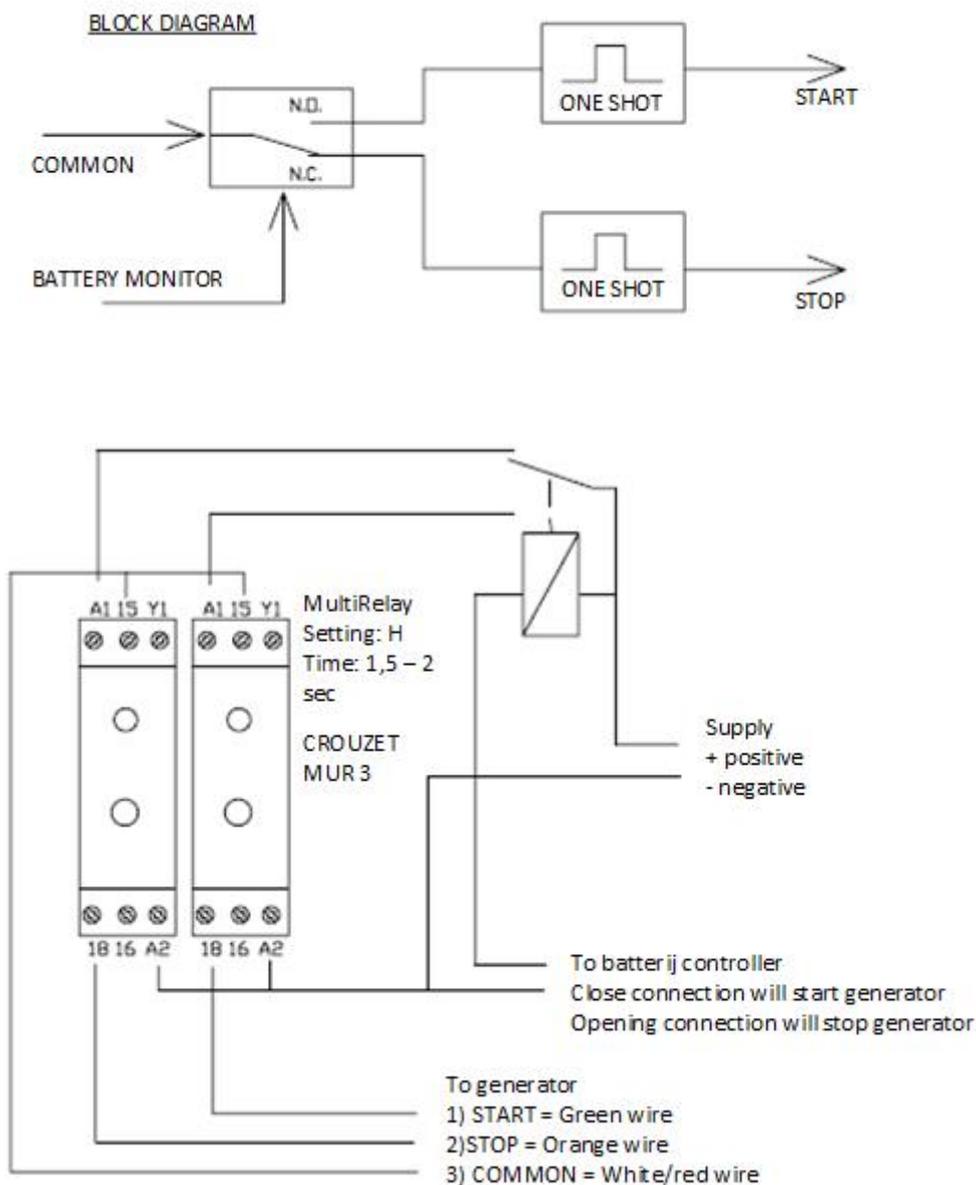
Alternative using Assistants

(provided by Thierry Cortasa)

hi

just for information, one solution using multiplus relay for start stop a three-wire generator. i use k1

_____

and k2 relais and relai programmable assistant

first to close k1 if voltage under 24v (for exemple) segond to open k1 if ac1 avalable third to close k2 if voltage uper 27v (for exemple) last to open k2 if ac1 not avalable

in this case you have a three-wire system with out any think more needed !

i have some systeme using this solution and all looks ok

Color Control GX manual

The Color Control GX (CCGX) sits at the heart of your energy installation. All the other system-components - such as inverter/chargers, solar chargers, and batteries - are connected to it. The CCGX ensures that they all work in harmony.

Monitoring can be done either with the CCGX in front of you - or from anywhere in the world using an internet connection and the VRM Website

The CCGX also provides Remote firmware updates and even allows the settings to be Changed Remotely.

The Color Control GX is part of the GX product family. GX products are Victron's state-of-the-art monitoring solution that run our Venus OS operating system.

All the information in this manual refers to the latest software. Your device will update itself to the latest version automatically.

1. Installation

1.1 Overview of connections
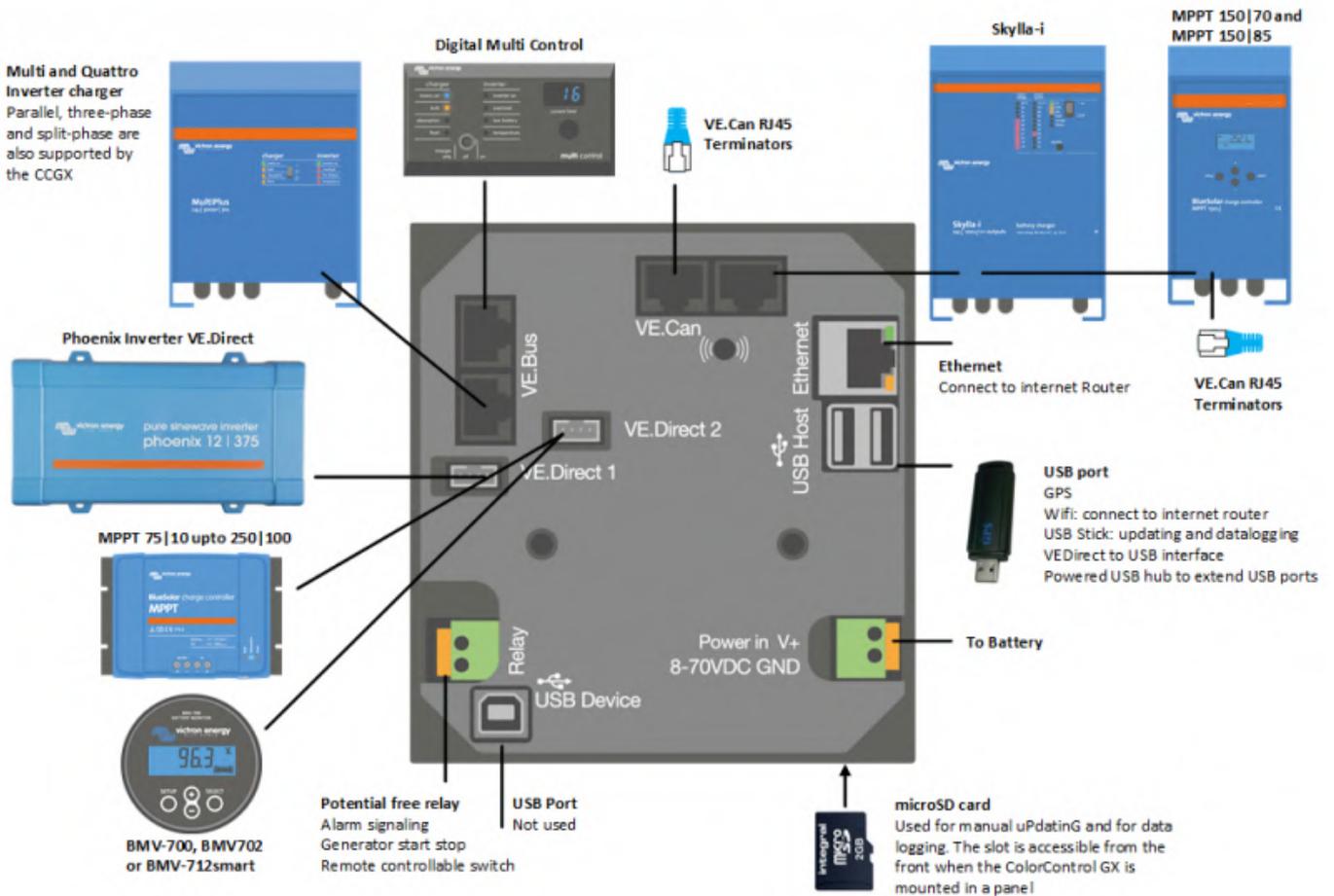
1.2 Snap-on ferrite beads for class B EMI compliance

In order to reduce Electromagnetic emissions in compliance with class B EMI you should place the provided snap-on ferrite beads around every connection cable as close as possible to the Color Control.
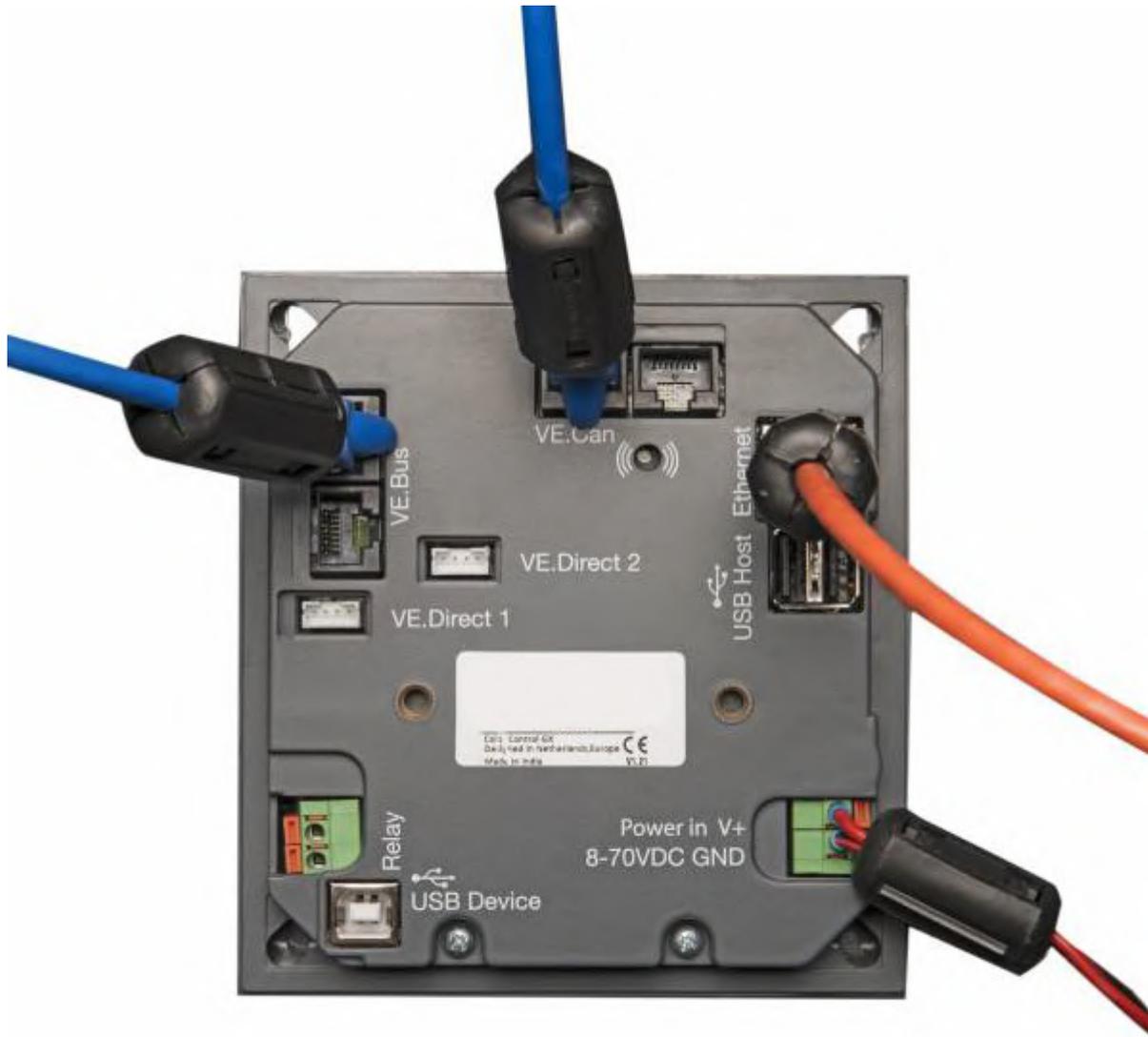
HQ1700 and later

For serial numbers HQ1700 and later, mount a single snap-on ferrite bead (supplied with the unit)

around the power leads like this:

HQ1654 and earlier

For serial numbers HQ1654 and earlier, mount the snap-on ferrite beads as below:

1.3 Power

Power the device using the *Power in V+* connector. It accepts 8 to 70 V DC. The device will not power itself from any of the network connections. Be sure to use a 1A slow blow fuse.

Powering in systems with VE.Bus BMS

When the CCGX is used in an installation with a VE.Bus BMS, connect the *Power in V+* on the CCGX to the terminal labelled '*Load disconnect*' on the VE.Bus BMS. Connect both negative leads to the negative stub of a common Battery.

A Cautionary word about Powering from the AC-out terminal of a VE.Bus Inverter, Multi or Quattro:

If you power the CCGX from an AC adaptor connected to the AC-out port of any VE.Bus product (Inverter, Multi or Quattro), then a deadlock will occur after the VE.Bus products are powered-down

for any reason (after any operational fault or during a black start). The VE.Bus devices will not boot-up until the CCGX has power …but the CCGX will not boot-up until *it* has power. This deadlock can be rectified by briefly unplugging the CCGX VE.Bus cable at which point you will observe the VE.Bus products will immediately begin to boot-up.

Or a modification can be done to the RJ45 cabling. See FAQ Q21 for more information about this.

Isolation

Because the CCGX is connected to many different products, please ensure that proper care is taken with isolation to prevent ground loops. In 99% of installations this will not be a problem.

- The VE.Bus ports are isolated
- The VE.Direct ports are isolated
- The VE.Can ports are isolated
- The USB ports are not isolated. Connecting a Wi-Fi Dongle or GPS Dongle will not create a problem as it is not connected to another power supply. Even though there will be ground loop when you mount a separately-powered USB hub, during extensive testing we have not found that it caused any issues.
- The Ethernet port is isolated, except for the shield: use unshielded UTP cables for the Ethernet network

Extending USB ports by use of a self-powered USB hub

Although the number of USB ports can be extended by using a hub, there is a limit to the amount of power that the *onboard USB port* can provide. When extending the number of USB ports, we recommend you always use *powered* USB hubs. And to minimize the chance of issues, be sure to use good-quality USB hubs. As Victron also offers a VE.Direct to USB adapter, you can use this arrangement to increase the number of VE.Direct devices you can connect to your system, please see this document for the limit of how many devices can be attached to various different GX devices.

1.4 Connecting Victron products

1.4.1 Multis/Quattros/Inverters (VE.Bus products)

In order to keep this document short we are going to refer to all Multis, Quattros and Inverters as *VE.Bus* products.

The earliest version of the VE.Bus devices which can be connected to the CCGX is 19xx111 or 20xx111, which were released in 2007. VE.Bus firmware 26xxxxx and 27xxxxx are also supported … but 18xxxxx is not.

Note that it is not possible to use the Remote On/Off (header on the VE.Bus control PCB) in combination with a CCGX. There should be wire between the left and middle terminal, as it is when shipped from the factory. In case a wired switch that disables the system is required, use the Safety Switch Assistant.

Single VE.Bus products

To connect a single VE.Bus product, connect it to one of the VE.Bus sockets on the back of the CCGX. Both sockets are identical, use either one. Use a standard RJ45 UTP cable, see our pricelist.

Parallel, split- and three-phase VE.Bus systems

To connect multiple VE.Bus products, configured as a parallel, split-phase or three phase VE.Bus system, connect either the first or the last VE.Bus product in the chain to either one of the VE.Bus sockets on the back of the CCGX. Use a standard RJ45 UTP cable, see our pricelist.

Systems consisting of five or more VE.Bus products, connected to a CCGX with serial number HQ1628 or earlier require the 'CCGX dongle for large VE.Bus systems (Product Number: BPP900300100).

VE.Bus systems with Lithium batteries and a VE.Bus BMS

- Connect the CCGX to the socket labelled 'MultiPlus/Quattro', or to one of the Multis/Quattros in the system. Do not connect it to the *Remote panel* socket on the VE.Bus BMS.
- Note that it will not be possible to control the On/Off/Charger Only switch. This option is automatically disabled in the CCGX menu when a VE.Bus BMS is used. The only way to control a Multi or Quattro when used with a VE.Bus BMS is to add a Digital Multi Control to the system. Setting the input current limit is possible in systems with a VE.Bus BMS.
- Combining MultiPlus/Quattro with a VE.Bus BMS and a Digital Multi Control is possible. Simply connect the Digital Multi Control to the RJ-45 socket on the VE.Bus BMS labelled *Remote panel*.
- To allow auto-power-down in the CCGX in case of a low battery, make sure the CCGX is powered via the VE.Bus BMS: connect *Power in V+* on the CCGX to *Load disconnect* on the VE.Bus BMS. And connect both negative leads to the negative stub of a common Battery.

Combining the CCGX with a Digital Multi Control

It is possible to connect both a CCGX and a Digital Multi control to a VE.Bus system. The ability to switch the product On, Off or set it to Charger Only via the CCGX will be disabled. The same applies to the input current limit: when there is a Digital Multi Control in the system, the input current limit which is set at that control panel will be the master-setting, and changing it on the CCGX will not be possible.

Connecting multiple VE.Bus systems to a single CCGX

Only one VE.Bus system can be connected to the VE.Bus ports on the back of the CCGX. The professional way to to monitor more systems is to add a second CCGX.

If you do require to connect more than one system to the same CCGX, use an MK3-USB. Functionality will be limited:

- Only the system connected to the built-in VE.Bus ports is used to generate the data on the Overview pages.
- All connected systems will be visible on the Device-list
- All connected systems will be taken into account for Energy consumption and distribution calculations (kWh graphs on VRM)
- Only the system connected to the built-in VE.Bus ports is used for the Generator start/stop logic
- The CCGX will not send proper data to VRM any more. The Venus GX does send information of both systems to VRM: its therefor better to use a Venus GX for systems like this.
- In case of an ESS system, only the system connected to the built-in VE.Bus ports is used in the ESS mechanisms. The other one is displayed in the device list only.

Alternatively the VE.Bus to VE.Can interface (ASS030520105) can be used. Add one for each additional system. Note that we advise against it; this interface is a deprecated product. Make sure that the VE.Can network is terminated and powered. For powering the VE.Can network, see Q17 in our data communication whitepaper.

1.4.2 Battery Monitor BMV-700 series; and MPPTs with a VE.Direct port

Either one or two compatible products can be connected directly on the back of the CCGX using a standard VE.Direct cable. There are two types of VE.Direct cable available:

1. Straight VE.Direct cables, ASS030530xxx
2. VE.Direct cables with an angled connector on one end. These are designed to minimize the required depth behind a panel, ASS030531xxx

VE.Direct cables have a maximum length of 10 metres. It is not possible to extend them. If longer lengths are required, use the VE.Direct to VE.Can interface. Note that this only works for BMV700 and BMV702. Not for the BMV712, MPPT solar chargers and Inverters with a VE.Direct port. See next paragraph for more information on that VE.Can interface.

Connecting more than two devices to your CCGX using VE.Direct

First of all, note that the maximum of VE.Direct devices that can be connected is 5 for the CCGX. How they are connected, so direct, via USB or via CAN, does not change the maximum. See here for the Venus GX, Octo GX, and other limits.

- Option 1: Use the VE.Direct to USB interface. The CCGX has two USB ports. Use a USB-hub when more than two USB ports are required.

- Option 2: The BMV700 and BMV702 can also be connected using the VE.Direct to VE.Can interface. Note that the BMV712, MPPTs and VEDirect Inverters cannot be connected using this canbus interface as it does not translate the data into canbus messages. When using the VE.Direct to VE.Can interface, make sure that the VE.Can network is terminated, and also powered. For powering the VE.Can network, see Q17 in our data communication whitepaper.

Notes about older VE.Direct MPPTs

- The MPPTs need to run firmware version v1.09 or later. See the Victron Professional website https://professional.victronenergy.com/ to obtain files and for update instructions.
- An MPPT 70/15 needs to be from year/week 1308 or later. Earlier 70/15s are not compatible with the CCGX, and unfortunately upgrading the MPPT firmware will not help. To find the year/week number of your model, look for the serial number which is printed on a label on its back. For example number HQ**1309**DER4F means 2013, week 09.

1.4.3 Skylla-i, Lynx Shunt VE.Can, Lynx Ion + Shunt and MPPTs with a VE.Can port

To connect a product with a VE.Can port, use a standard RJ45 UTP cable. (Available with straight and elbow connectors)

Don't forget to terminate the VE.Can network at both ends using a VE.Can terminator. A bag with two terminators is supplied with each VE.Can product. They are also available separately.

Other notes:

1. In order to work with the CCGX an MPPT 150/70 needs run firmware v2.00 or newer.
2. You can combine a Skylla-i control panel with a CCGX.
3. You can combine a Ion Control panel with a CCGX.
4. The Skylla-i, Lynx Shunt VE.Can, Lynx Ion + Shunt and the MPPTs with a VE.Can port all power the VE.Can network ...so it won't be necessary to power the VE.Can network separately in these circumstances. All the protocol converters - for example the VE.Bus to VE.Can interface; and the BMV to VE.Can interface, do not power the VE.Can network.

1.4.4 BMV-600 series

Connect the BMV-600 using the VE.Direct to BMV-60xS cable supplied. (ASS0305322xx)

1.4.5 DC Link box

Connect the DC Link box, using the RJ-12 cable supplied. Then connect the BMV-700 to the CCGX -see **1.2.2** above for instructions.

1.4.6 VE.Can Resistive Tank Sender Adapter

See its page and manual on our website for details about the Adapter.

To connect a product with a VE.Can port, use a standard RJ45 UTP cable.

Don't forget to terminate the VE.Can network on both ends using a VE.Can terminator. A bag with two terminators is supplied with each VE.Can product. They are also available separately (ASS030700000). (Available with straight or elbow connectors.)

Make sure that the canbus is powered, see the Power chapter in the Tank Sender Adapter manual for details.

1.4.7 NMEA Tank senders from other manufacturers

A tank sender must meet the following requirements to be visible on the CCGX:

- Transmit the NMEA2000 Fluid Level PGN, 127505
- The NMEA2000 device class needs to be 'General', 80
- The NMEA2000 function needs to be 'Transducer', 190

Since v2.17 the following functions are accepted as well:

- The NMEA2000 device class 'General', 80 and function 'Sensor', 170
- The NMEA2000 device class 'Sensors', 75 and function 'Fluid Level', 150

A single function reporting multiple Fluid Levels is currently not supported.

For some tank senders it is also possible to configure the capacity and the fluid type from the CCGX - for example the Maretron TLA100. This facility may be available with other senders made by other manufacturers - it's well-worth trying.

To connect an NMEA2000 network to the VE.Can port on the CCGX, use a VE.Can to NMEA2000 cable.

Alternatively, instead of a VE.Can to NMEA200, you can use a 3802 cable from Oceanic Systems. The difference is that it lends itself well to connecting a single NMEA-2000 device into a VE.Can network. It's also able to power a lower voltage NMEA-2000 network directly from a 48V Victron system.

1.5 Connecting a PV Inverter

Measuring the output of a PV Inverter will provide the user with an overview of both actual power balance and the energy distribution. Note that these measurements are only used to display information. They are not needed, nor used, by the installation for its performance.

Besides monitoring, the GX device can also curtail some types and brands of PV Inverters, ie. reduce their output power. This is used, and required, for the ESS Zero feed-in feature.

Direct connections

Type	Zero feed-in	Details
Fronius	Yes	LAN Connection, see GX - Fronius manual
SMA	No	LAN Connection, see GX - SMA manual
SolarEdge	No	LAN Connection, see GX - SolarEdge manual
ABB	Yes	LAN Connection, see GX - ABB manual

Using a meter

For PV Inverters that cannot be interfaced digitally, a meter can be used:

Type	Zero feed-in	Details
AC Current Sensor	No	Connected to inverter/charger analog input. Lowest cost - least accurate. AC Current Sensor Manual
Energy Meter	No	wired to the CCGX, or connected wirelessly using our Zigbee to USB/RS485 interfaces. See the Energy Meters start page
Wireless AC sensors	No	See the Wireless AC Sensor manual - Discontinued

1.6 Internet connectivity

Connect the CCGX to the internet to get all the advantages of the VRM Portal. The CCGX sends data from all connected products to the VRM portal - from where you can monitor energy usage, view the current status of connected products, configure email alarms and download data in CSV and Excel formats.

To monitor this data from your smartphone or tablet download the iOS or Android VRM App.

In addition to remote monitoring, an active internet connection allows the CCGX to regularly check for a new firmware versions - which will be automatically downloaded and installed.

There are several ways to connect a CCGX to the internet:

- Run a network cable between a router and the CCGX Ethernet LAN port
- Connect to a router wirelessly using a USB Wi-Fi dongle plugged into the CCGX
- Via the mobile (cellular) network, using a 3G or 4G router
- GX GSM - a cellular USB modem
- USB Tethering on a mobile phone

This video explains how to connect LAN, WiFi and a GX GSM:

Video

The chapters below describe the options in detail.

1.6.1 Ethernet LAN port

When you connect an ethernet cable between a router and CCGX, the Settings>Ethernet page of your CCGX will confirm connection.

1.6.2 Wi-Fi USB dongle

Using a Wi-Fi dongle it is possible to connect to WEP, WPA and WPA2 secured networks. There are four supported USB Wi-Fi dongles. Two of them are also available from stock at Victron Energy:

- Partno. BPP900100200 - CCGX WiFi module simple (Nano USB), small, low cost.
- Partno. BPP900200300 - Asus USB-N14, slightly higher cost and also better reception than the Nano USB. Supported since software version 2.23.

WiFi modules that are no longer available, but still supported, are:

- Partno. BPP900200100 - Startech USB300WN2X2D
- Partno. BPP900100100 - Zyxel NWD2105
- Partno. BPP900200200 - Gembird WNP-UA-002, slightly higher cost and also better reception.

Although other Wi-Fi dongles may work, they have not been tested and we do not offer support for other dongles.

The Wi-Fi menu shows the available networks. When a network is selected, it is possible to fill in the password (if the password is not already known) to connect to the network. Setting up via WPS (Wi-Fi Protected Setup) is not supported.

When the CCGX finds multiple Wi-Fi networks of which the password is known, the strongest network is selected automatically. When the signal of the connected network becomes too weak, it will automatically switch to a stronger network - if it knows the password of that network.

1.6.3 Mobile (cellular) network using a 3G or 4G router

To connect the CCGX to a mobile (cellular) network, such as a 3G or 4G network, use a cellular router. Connect the CCGX to that router with either a LAN cable or the router's Wi-Fi network.

Make sure you use a router that is designed for unattended setups. Do not use low cost consumer-grade routers intended for business or leisure travel. A more expensive professional router will quickly pay for itself, and you won't have wasted journeys simply to perform a re-set. Examples of such professional routers are the H685 4G LTE from Proroute, as well as the Industrial 4G router range from Pepwave.

More information in this blogpost.

Note that the CCGX does not support USB 3G/4G dongles.

1.6.4 USB tethering using a mobile phone

This is a useful facility when it works - but don't rely on it because it has not proved very dependable. Consult the internet for instructions about tethering for your phone and its particular operating system. We have heard of it working on:
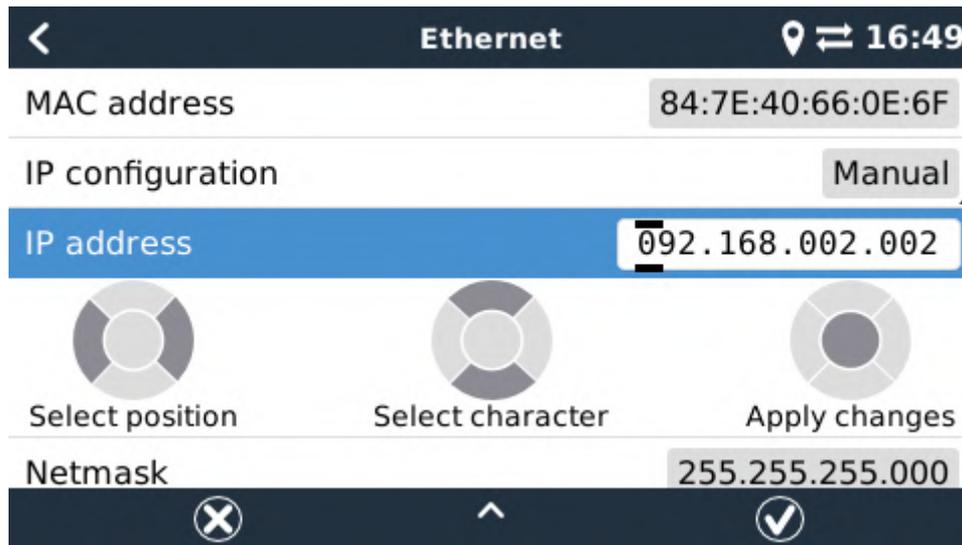
- Samsung Galaxy S4

...but not on:

- iPhone 5s with iOS 8.1.1

1.6.5 IP Configuration

Almost no installations will need the IP address configuration to be inserted manually as most systems support automatic IP configuration (DHCP) - and that is also the CCGX default setting. If you do need to configure the address manually, select the following template:

Complete details of IP requirements, as well as used port numbers will be found in the VRM FAQ -ports and connections used by the CCGX.

1.6.6 Connecting both Ethernet and Wi-Fi (failover)

It is possible to connect the CCGX to both Ethernet and Wi-Fi. In this case, the CCGX will try to determine which interface provides an active internet connection and then use that interface. When both have an active internet connection, the Ethernet connection is used. The CCGX will automatically check again for active internet connections when something changes on the interfaces.

1.6.7 Minimize internet traffic

In situations where internet traffic is expensive, for example a satellite uplink or with roaming GSM/cellular charges, you may want to minimize the internet traffic. The steps to take are:

- Disable auto-update
- Do not enable remote support
- Reduce the Logging interval to a very low frequency. Note that state changes (charging → inverting, or bulk→float) and also alarms will cause extra messages to be sent

To find out how much data allowance you need to buy the best way is to let the system run for a couple of days and monitor the internet RX and TX counters in your 3G or 4G router. Or even better,

some mobile companies will report the data used via a website.

The amount of data used is also very dependent on the system:

- More products connected to the CCGX will generate more data.
- A state change (from inverter to charger for example) will trigger a data transmission, so a system with very frequent state changes will also tend to generate more data. This is especially true in certain Hub-1 and Hub-2 systems.

Note that CCGX versions prior to v1.18 will check for software updates daily even when auto-update is switched off. This was changed in v1.18. Disabling auto-update also disables the check - saving a lot of data.

We recommend setting-up your data plan in such a way as to avoid costly 'excess' charges. Make sure you put a cap on your data usage; or use a pre-paid plan.

One customer - burdened with global costs of between twenty cents and several euros per mb of data - invented a clever solution: Using a VPN he modified the IP to route ALL traffic to and from the CCGX via his VPN. Using a firewall at the VPN server allows him to control traffic according to time, connection type, place and destinations. Although this is beyond the scope of this manual it works, and - with the help of a Linux and networking expert - it can work for you.

1.6.8 More information about setting up an internet connection and VRM

- Setting up a VRM account
- Trouble shooting connectivity between the CCGX and the VRM Portal
- VRM Portal alarms and monitoring
- VRM Portal - Frequently asked questions

1.7 Connecting a USB GPS

Use a GPS to track remote vehicles or boats and, optionally, get an alarm when they leave a designated area (geofencing). It is also possible to download a gps-tracks.kml file which can be opened with Navlink and Google Earth for example.

Victron does not sell USB-GPS, but the CCGX will support third-party GPS modules which use the NMEA0183 command-set - almost all do. It can communicate at both 4800 and 38400 baud rates. Plug the unit into either of the two USB sockets …connection may take a few minutes, but the CCGX will automatically recognize the GPS. The unit's location will automatically be sent to the VRM online portal and its position shown on the map.

The CCGX has been tested for compatibility with:

- Globalsat BU353-W SiRF STAR III 4800 baud
- Globalsat ND100 SiRF STAR III 38400 baud
- Globalsat BU353S4 SiRF STAR IV 4800 baud
- Globalsat MR350 + BR305US SiRF STAR III 4800 baud

1.8 Connecting a Fischer Panda Generator

See GX - Fischer Panda generators.

1.9 Connecting NMEA-2000 tank senders

A thrid party NMEA2000 tank sender must meet the following requirements to be visible on the GX Device:

- Transmit the NMEA2000 Fluid Level PGN, 127505
- The NMEA2000 device class needs to either General (80) in combination with function code Transducer (190), or Sensor (170). Or, the NMEA2000 device class needs to be Sensors (75), in combination with function Fluid Level (150).

A single function reporting multiple Fluid Levels is currently not supported.

For some tank senders it is also possible to configure the capacity and the fluid type on the GX Device - for example the Maretron TLA100. This facility may be available with other senders made by other manufacturers - it's well-worth trying.

To connect an NMEA2000 network to the VE.Can port on the CCGX, use a VE.Can to NMEA2000 cable.

Alternatively, instead of a VE.Can to NMEA200, you can use a 3802 cable from Oceanic Systems. The difference is that it lends itself well to connecting a single NMEA-2000 device into a VE.Can network. It's also able to power a lower voltage NMEA-2000 network directly from a 48V Victron system.

Tested NMEA2000 tank senders:

- Maretron TLA100
- Navico Fluid Level Sensor Fuel-0 PK, partno. 000-11518-001. Note that this sender requires a 12V powered NMEA2000 network; it breaks when connected to a 24V-powered NMEA2000 network. And note that you need a Navico display to configure the Capacity, Fluid type, and other parameters of the sensor.

Most likely others work as well. If you know of one working well, please edit this page -or- get in touch with us on Community -> Modifications.

1.10 Connecting IMT Solar Irradiance, Temperature and Wind Speed Sensors

1.10.1 Compatibility

Ingenieurbüro Mencke & Tegtmeyer GmbH (IMT) offer a range of digital silicon irradiance sensor models within the Si-RS485 series that are all compatible with a Victron GX device.

The optional/additional external module temperature, ambient temperature and wind speed sensors are also supported.

Optional/additional external sensors are either connected to the solar irradiance sensor with pre-installed plugs or pre-wired to the solar irradiance sensor (external module and ambient temperature only). When external sensors are connected via an appropriate solar irradiance sensor, all measurement data is transmitted to the Victron GX device with the single interface cable.

Each model solar irradiance sensor within Si-RS485 series has a different capability with regards to external sensors (or comes with an external sensor pre-wired), so carefully consider any future desires/requirements before initial purchase.

It is also possible to connect an independent IMT Tm-RS485-MB module temperature sensor (visible as 'cell temperature') or IMT Ta-ext-RS485-MB ambient temperature sensor (visible as 'external temperature') directly to the Victron GX device, without a solar irradiance sensor or in addition to one.

1.10.2 Operation

The IMT Si-RS485 series solar irradiance sensors operate using RS485 electrical interface and Modbus RTU communication protocol.

The required interface software is pre-installed within the Venus OS, however the Victron GX device must be running recent firmware - FW v2.40 is the minimum requirement.

Physical connection to the Vicron GX device is via USB port and requires a Victron RS485 to USB interface cable.

A suitable external DC power source (12 to 28 VDC) is also required - the sensor is NOT powered via USB.

1.10.3 Wiring Connections

The schematic in the installation guide below depicts the wiring configuration in a typical installation.

IMT Si-RS485TC Series Solar Irradiance Sensor - Victron Installation Guide
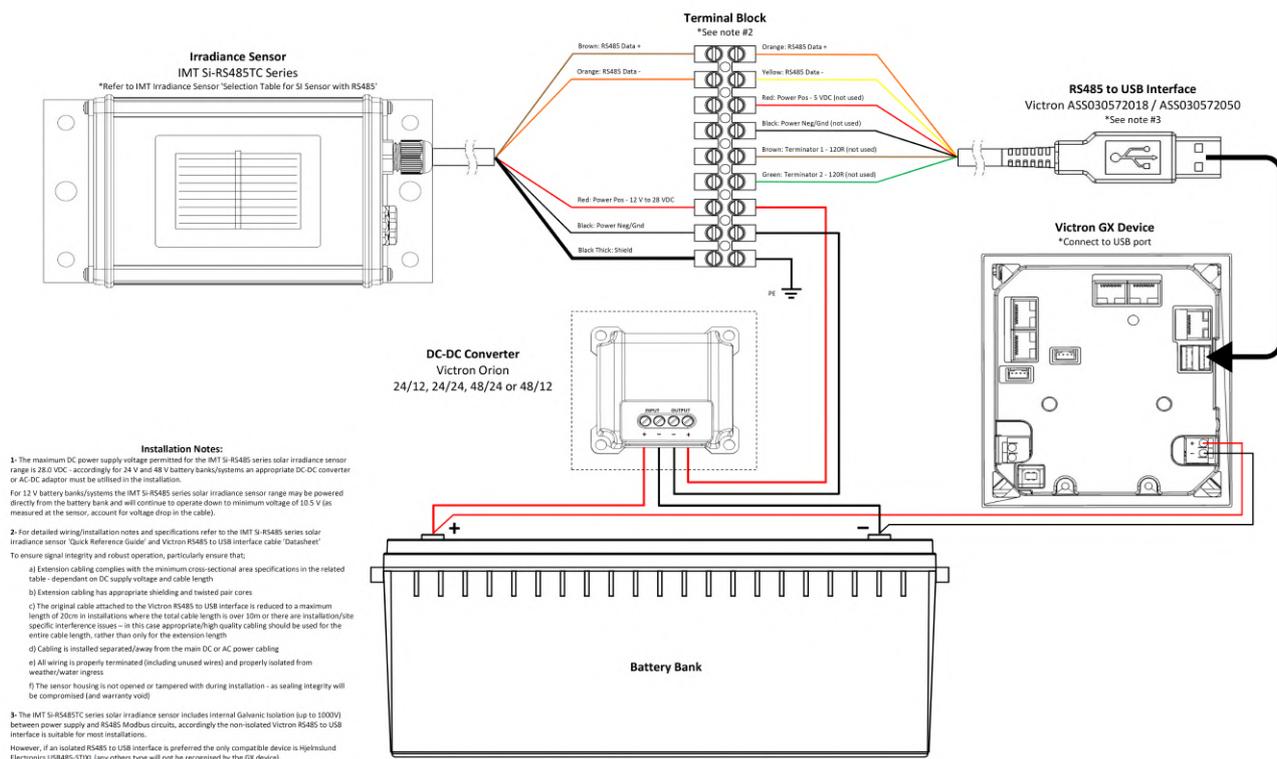
The table below describes the colour and function of each wire in the installation.

IMT Si-RS485 Series Irradiance Sensor	Victron RS485 to USB Interface	Description
Brown	Orange	RS485 Data +
Orange	Yellow	RS485 Data -
Red	-	Power Pos - 12 to 28 VDC
Black	-	Power Neg/Gnd - 0 VDC
Black Thick	-	Cable Shield - PE
-	Red	Power Pos - 5 VDC (not used)
-	Black	Power Neg/Gnd - 0 VDC (not used)
-	Brown	Terminator 1 - 120R (not used)
-	Green	Terminator 2 - 120R (not used)

1.10.4 Installation Notes

1- The maximum DC power supply voltage permitted for the IMT Si-RS485 series solar irradiance sensor range is 28.0 VDC - accordingly for 24 V and 48 V battery banks/systems an appropriate Victron DC-DC converter (24/12, 24/24, 48/12 or 48/24) or AC-DC adaptor must be utilised in the installation.

For 12 V battery banks/systems the IMT Si-RS485 series solar irradiance sensor range may be powered directly from the battery bank and will continue to operate down to minimum voltage of 10.5 V (as measured at the sensor, account for voltage drop in the cable).

2- For detailed wiring/installation notes and specifications refer to the IMT Si-RS485 series solar irradiance sensor 'Quick Reference Guide' and Victron RS485 to USB interface cable 'Datasheet'.

To ensure signal integrity and robust operation, particularly ensure that;

- Extension cabling complies with the minimum cross-sectional area specifications in the related table - dependent on DC supply voltage and cable length

- Extension cabling has appropriate shielding and twisted pair cores

- The original cable attached to the Victron RS485 to USB interface is reduced to a maximum length of 20cm in installations where the total cable length is over 10m or there are installation/site specific interference issues – in this case appropriate/high quality cabling should be used for the entire cable length, rather than only for the extension length

- Cabling is installed separated/away from the main DC or AC power cabling

- All wiring is properly terminated (including unused wires) and properly isolated from weather/water ingress

- The sensor housing is not opened or tampered with during installation - as sealing integrity will be compromised (and warranty void)

3- The IMT Si-RS485TC series solar irradiance sensor includes internal Galvanic Isolation (up to 1000V) between power supply and RS485 Modbus circuits, accordingly the non-isolated Victron RS485 to USB interface is suitable for most installations.

However, if an isolated RS485 to USB interface is preferred the only compatible device is Hjelmslund Electronics USB485-STIXL (any others type will not be recognised by the GX device).

1.10.5 Multiple Sensors

It is possible to connect multiple IMT Si-RS485 series solar irradiance sensors to a common Victron GX device, however a dedicated Victron RS485 to USB interface is required for each individual unit.

Multiple units cannot be combined on a single interface (as this is not supported by the related Venus OS software).

1.10.6 Configuration

There is normally no need for any special/additional configuration – the default 'as shipped' configuration is compatible for communication with a Victron GX device.

However, in cases where the IMT Si-RS485 series solar irradiance sensor has been previously used in another system and/or the settings changed for any reason, it is necessary to restore the default configuration before further use.

To revise the configuration, download the IMT 'Si-MODBUS-Configuration software tool'. Follow the instructions in the IMT 'Si Modbus Configurator Documentation'. and check/update the following settings:

- MODBUS Address: 1
- Baud Rate: 9600
- Data Format: 8N1 (10 Bit)

For further support related to configuration of the IMT Si-RS485 Series irradiance sensors please contact IMT Solar directly.

## 1.10.7 User Interface - GX Device

Upon connection to the Victron GX device and power up the IMT Si-RS485 Series irradiance sensor will be automatically detected within a few minutes and appear in the 'Device List' menu.
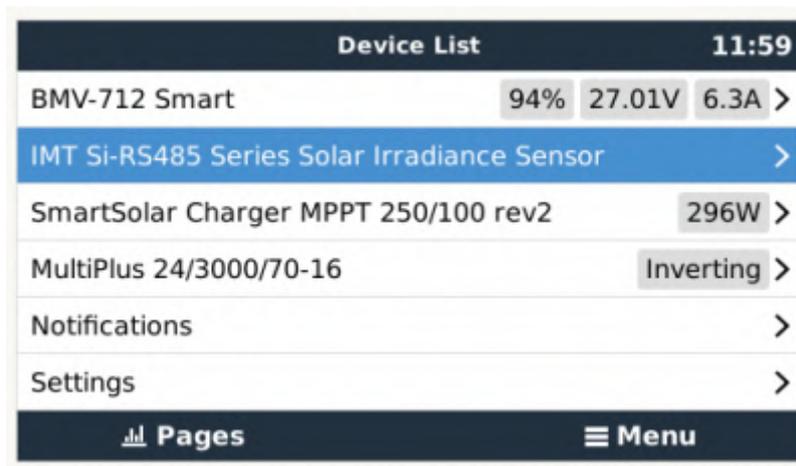
Within the 'IMT Si-RS485 Series Solar Irradiance Sensor' menu all available parameters will be automatically displayed (dependent on the sensors connected) and update in real time.
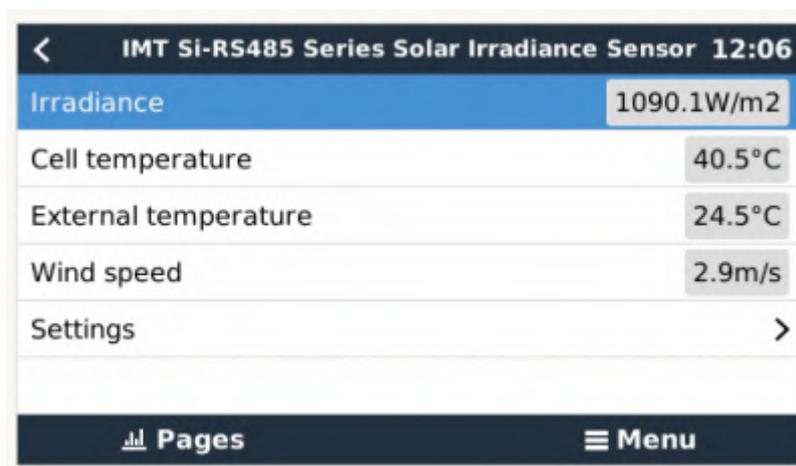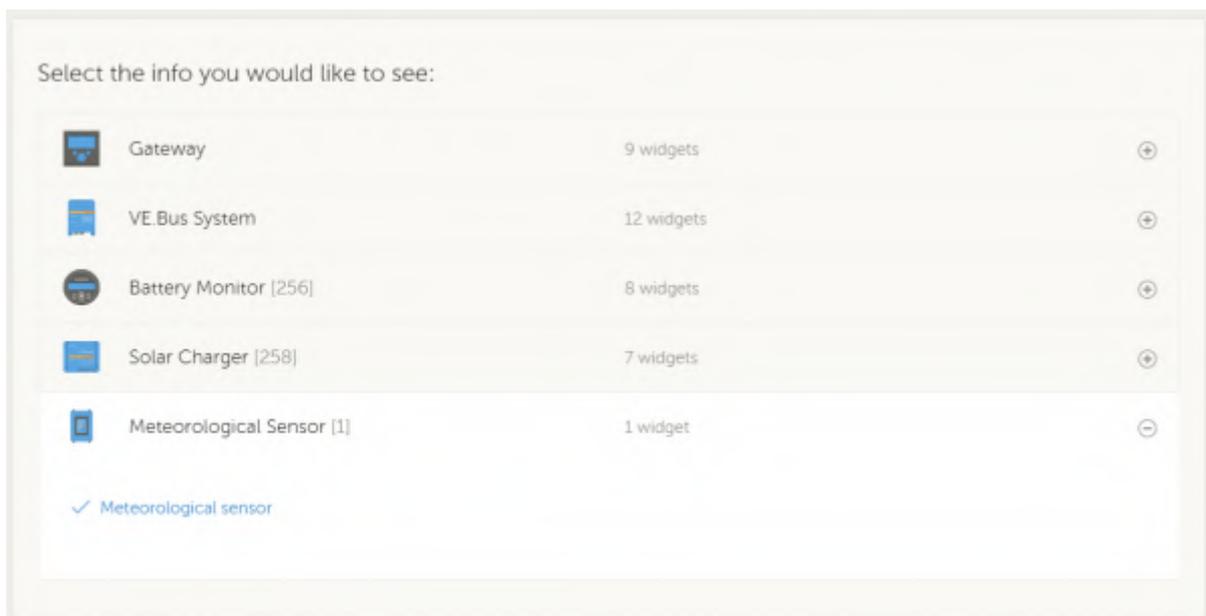

Within the 'Settings' sub-menu it is possible to manually enable and disable any optional/additional external sensors that are connected to the IMT Si-RS485 Series irradiance sensor.
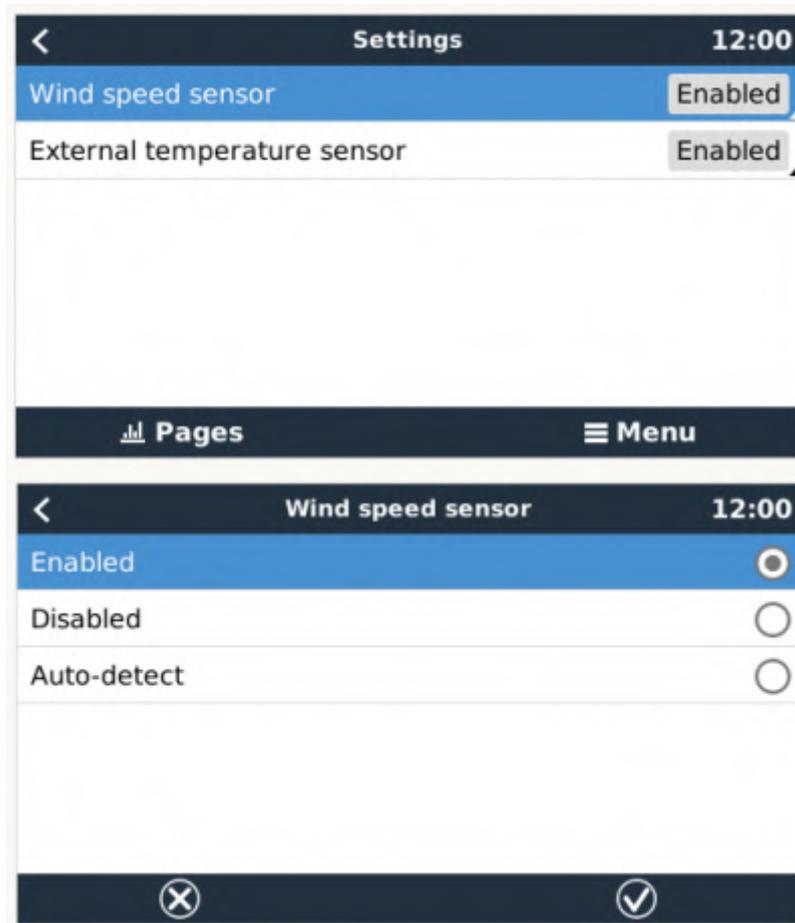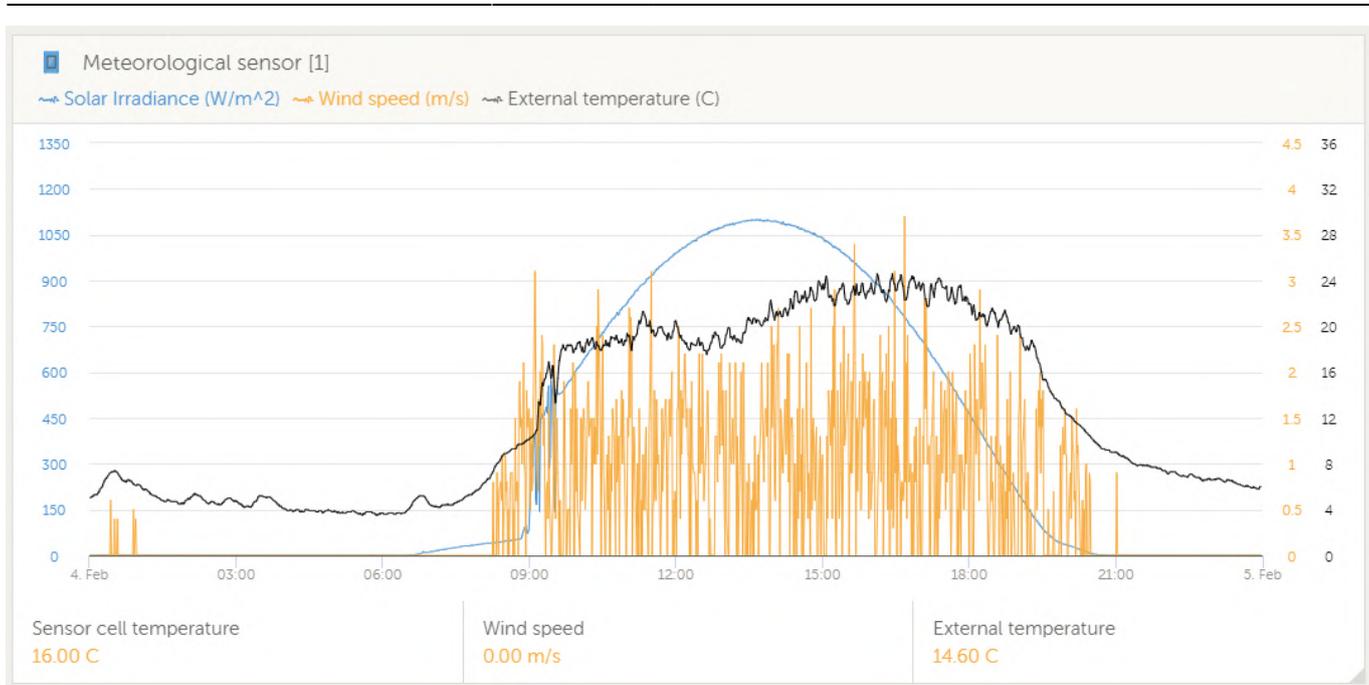
1.10.8 Data Visualisation - VRM

To review logged historical data on the VRM portal, expand the 'Meteorological Sensor' widget list and select the 'Meteorological Sensor' widget.

Data from all available sensor types will be automatically displayed in the graph. Individual sensors/parameters can also be disabled/enabled by clicking on the sensor name/legend.

Meteorological sensor [1]
⤳ Solar Irradiance (W/m^2)   ⤳ Wind speed (m/s)   ⤳ External temperature (C)

Sensor cell temperature	Wind speed	External temperature
16.00 C	0.00 m/s	14.60 C

2 Configuration

2.1 Configurable parameters

After completing the installation and setting up the internet connection (if required), go through the menu from top to bottom to configure the CCGX:

Item	Default	Description
General		
Remote support	Off	Enable this to allow Victron engineers to access your system in case there is a problem.
Access level	User and installer	Set this to 'User' to prevent accidental and unwanted changes to the configuration.
Audible alarm	On	When there is an alarm on the CCGX or a connected product, the CCGX will beep - unless this setting is set to 'Off'.
Demo mode	Off	Turn 'On' to demonstrate product and installation features to a client or at an exhibition. This simulation mode will allow better understanding without (yet) changing any settings.
Firmware		
Online updates: Auto update	Check and update	We recommend the factory default. A reason to disable it would be to eliminate the risk of a firmware update causing problems.
Online updates: Update to	Latest release	Use the default setting unless you want to participate in test versions. End-user systems should certainly be set to 'Latest release'.
Offline updates		Use this menu to install a new version from a microSD card or USB stick. Insert the card or stick that holds the new firmware .swu file.
Stored backup firmware		With this feature you can go back to the previously installed firmware version.
Date & time		
Date/Time local	Automatic from internet	When connected to the internet, time will be automatically synchronised regardless of this setting. Toggle the setting Manually input the time where no internet connection is present.
Change time zone		Select the correct time zone.
Remote console		
Disable password check		Password authentication not required for remote console access.
Enable password check		Choose password to allow remote console access.

Item	Default	Description
Enable on VRM	No	Enabling on VRM will allow connection to the CCGX from anywhere via the VRM portal. Trouble shooting Remote Console on VRM
Enable on LAN	No	Enabling will allow direct connection to the CCGX by typing its IP address or Venus.local into a web browser, or in VictronConnect when connected to the same network. Only Enable this function on trusted networks. Disable password check, or set password first
System setup		
AC input 1	Generator	Select Generator or Grid. (We will shortly be adding the setting 'Shore power' instead of grid.)
AC input 2	Grid	Same choices as above.
Battery monitor	Automatic	Select the SOC source. This function is useful where there is more than one BMV. More details.
Synchronize VE.Bus SOC with battery		Continuously copies the SOC from the battery monitor to the VE.Bus system. This feature is automatically enabled when the active SOC source is not a VE.Bus device, and there is no Hub-2 Assistant configured. The purpose of this is to be able to use the BMV SOC to trigger some Multi or Quattro features - such as Genset start/stop. Multis and Quattro's don't use the SOC for any other purpose. More information
Use solar charger current to improve VE.Bus SOC		Send the total charge current from all connected Solar chargers to the VE.Bus device to improve its SOC computations. This feature is automatically active when 'Synchronize VE.Bus SOC with battery' is not active. Requires Multi Firmware version >= 402. More information
Solar charger voltage control		Use the 'charge voltage' information provided by the VE.Bus device to control the amount of power fed from solar chargers back to the grid. Active if the ESS or Hub-1 assistant is present. (See also: '*Feed-in excess solar charger power*' in the ESS settings.)
Solar charger current control		Limit the charge current of the connected solar chargers if a CAN.bus BMS is present - using the *maximum charge current* information provided by the BMS.
Has DC system	No	Enable this for boats, vehicles and installations with DC loads and chargers - in addition to Multi and MPPT chargers. This won't be applicable to most off-grid installations; and any discrepancy between the DC current measured by the Multi, and by the BMV, will be attributed to a 'DC system'. This may be power-in from an alternator, or power-out from a pump, for example. A positive value indicates consumption. A negative value indicates charging, for example by an alternator. Note that the value shown will always be an approximation, and is affected by the variation in sample rate between elements of the system.
Display & language		
Brightness		Configure the brightness between 0 and 100%
Display off time		Set time-to-off between 10s / 30s - 1m / 10m /30m - or never
Show mobile overview	No	Enable this to show the mobile overview page which is designed for Marine and Remote Vehicle applications. This overview gives direct access to the AC Current limit as well as the *On/Off/Charger-only* settings and pump control. Also shows up to four tank levels.
Language	English	Choose between English, Dutch, Chinese, German, Spanish, French, Italian, Swedish, Turkish and Arabic.
VRM online portal		
Log interval	15 minutes	Set to anything between 1 minute and 1 day. Choose longer times on systems with an unreliable connection. Note that this setting does not affect reporting problems and state changes (bulk → absorption) to the VRM Portal. These events initiate an immediate transmission of all parameters.
Rest of parameters		See section 5.3, Datalogging to VRM, for more details
Wireless AC Sensors		
Select the position for each AC sensor (PV Inverter on AC-input 1, 2 or on AC-output). More information about the Wireless AC sensors.		
Energy meters		
Configure the Energy meters, used for one of three things: Measure the output of a PV Inverter Measure and regulate a Hub-4 system Measure and regulate a ESS system Measure the output of an AC Generator.		
ESS		
Configure Energy storage system (ESS) ESS system.		
Hub-4		
Configure Hub-4 system Hub-4 system.		
Ethernet		
Select the configuration type (DHCP vs. manual configuration) and IP settings.		
Wi-Fi		
Manage wireless networks and IP settings.		
GPS		
Format		Select the format in which to show the Latitude and Longitude.
Speed unit	km/h	Choose between km/h, meters per second, miles per hour, or knots.
Generator start/stop		
Configure generator autostart settings and conditions. GX - Generator auto start/stop		
Tank pump		
Configure automatic starting and stopping of pump based on tank level(sender) information. Pump auto start/stop with Color Control GX		
Relay		
Function	Alarm relay	Select the relay function. Possible functions are 'Alarm relay', 'Generator start/stop', 'Tank pump' and 'None' (disabled).

Item	Default	Description
Polarity	Normally open	Select the polarity of the relay on the back of the CCGX. 'Normally open' or 'Normally closed'. (Note that setting it to normally closed increases the CCGX power draw.)
Services		
ModbusTCP	Off	This setting enables the ModbusTCP service.
VRM two-way communication	No	Enable remote configuration and firmware updates. VE Power Setup manual

When using a VE.Bus system, it is possible to configure the severity of problems on the VE.Bus system that should cause a notification to show up on the CCGX (and make it beep):

- Disabled: The CCGX will never beep or show a notification
- Alarm only: The CCGX will only beep and a show a notification when the VE.Bus system switched off in an alarm condition.
- Enabled (default): The CCGX will beep and show a notification

When all done, don't forget to change the access level to user when required.

2.2 Battery State of Charge (SOC)

2.2.1 Which device should I use for SOC calculation?

There are three products types that calculate State Of Charge (SOC). The CCGX itself does not calculate SOC, it only retrieves it from the connected devices.

The three products that calculate SOC are:

1. Battery Monitors, such as the BMVs, the Lynx Shunt, or the Lynx Ion BMS
2. Multi and Quattro inverter/chargers
3. Batteries with built-in battery monitor and a (mostly CAN bus) connection to the CCGX.

When to use what?

If you have a battery with build-in battery monitor, such as a BYD or Freedomwon battery; its easy. Use that.

If not, then the options depend on the type of system:

1. If the MultiPlus or Quattro inverter/charger is the only source of charge to the batteries and the only draw then it can function as a basic battery monitor because it counts what went in and counts what comes out. No need for a dedicated battery such as the BMV.

2. If the systems consists of an inverter/charger, MPPTs and a GX device, then there is still no need to add a dedicated battery monitor.

3. For any other system types, such as a boat or vehicle with DC lights and other loads, a dedicated battery monitor will be required.

2.2.2 The different solutions explained in detail

(A) Battery and Multi or Quattro (a typical backup system)

No battery monitor is required: the Multi or Quattro is the only product connected to the battery and has full control over all charge and discharge currents. Therefore it can calculate the correct SOC itself.

Configuration:

1. Enable and configure the Battery Monitor in VEConfigure.
2. In the CCGX, in Settings → System setup, verify the selected Battery Monitor. It should be set to the Multi or Quattro.

(B) Battery with Multi or Quattro and MPPT Solar Chargers **-ALSO-** An EasySolar with CCGX built-in

No battery monitor is required, as long as all MPPT Solar Chargers are *Victron* products and are connected to the CCGX. The CCGX will continuously read the actual charge current from all solar chargers, and send the total to the Multi (or Quattro) which then uses that information in its SOC calculations.

Configuration:

1. Enable and configure the Battery Monitor in VEConfigure.
2. On the CCGX, in Settings → System setup, verify the selected Battery Monitor. It should be the Multi or Quattro.
3. In the same menu, verify that the option 'Use solar charger current to improve VE.Bus SOC' is enabled. Note that this is not a setting - it just an indicator of an automatic process.

Note that this feature requires recent firmware versions in both the Multis or Quattros (402 minimum), and the CCGX (v2.06 minimum).

(C) Batteries with a built-in battery monitor

In cases where the system includes a battery which has a built-in battery monitor and SOC calculation - such as many of the batteries listed here - a dedicated battery monitor is not required.

Configuration:

1. Connect the battery communications cable to the CCGX according to the instructions.
2. In the CCGX, in Settings → System setup, verify that the selected Battery Monitor is the battery.

Note that the *Battery Monitor* setting in VEConfigure3 is irrelevant. For systems like this, changing this setting will have no effect on the charge or any other parameters in this type of system.

(D) Other system types

When there are more chargers, or loads, connected to the battery than just the Multi or MPPT Solar Chargers, a dedicated Battery Monitor will be required. Examples are:

- House loads in Marine or Vehicle system.
- PWM Solar Chargers
- AC chargers, such as Skylla-is, Phoenix chargers, non Victron chargers, etc.
- Alternators
- DC-DC chargers
- Wind turbines
- Hydro turbines

In case a battery with built-in monitor is used, such as explained in (C), then that is the dedicated battery Monitor. Refer to section (C).

Otherwise, install a BMV or Lynx Shunt VE.Can.

Configuration:

1. Configure the battery monitor as per its documentation.
2. In the CCGX, in Settings → System setup, verify the selected Battery Monitor. It should be the BMV or Lynx Shunt Battery Monitor.
3. Finished.

Note that the *Battery Monitor* setting in VEConfigure3 is irrelevant. For systems like this, changing this setting will have no effect on the charge - or any other parameters - in this type of system.

2.2.3 Notes

- Note that this is all about showing an accurate state of charge to the user, rather than being required for an efficient system. The SOC percentage is not used for battery charging. It is, however, required when a generator needs to be started and stopped automatically based on battery SOC.
- For hub-2 installations we recommend you do **not** add a BMV to the system as it will only confuse the user when there are two SOCs with different readings being displayed.

More information:

- VRM Portal FAQ - difference between BMV SOC and VE.Bus SOC
- CCGX Manual - configurable parameters. See Battery Monitor selection and Has DC System.

2.2.4 Selecting SOC source

(Settings → System Setup → Battery monitor)

In the image below you can see a range of selectable choices for the SOC values which are shown in the main Overview screen. Choose the source you want to see on the main Overview screen of your CCGX.

In the image above we have chosen the *Automatic* setting. When automatic is selected the System setup screen will be as shown in the image below.
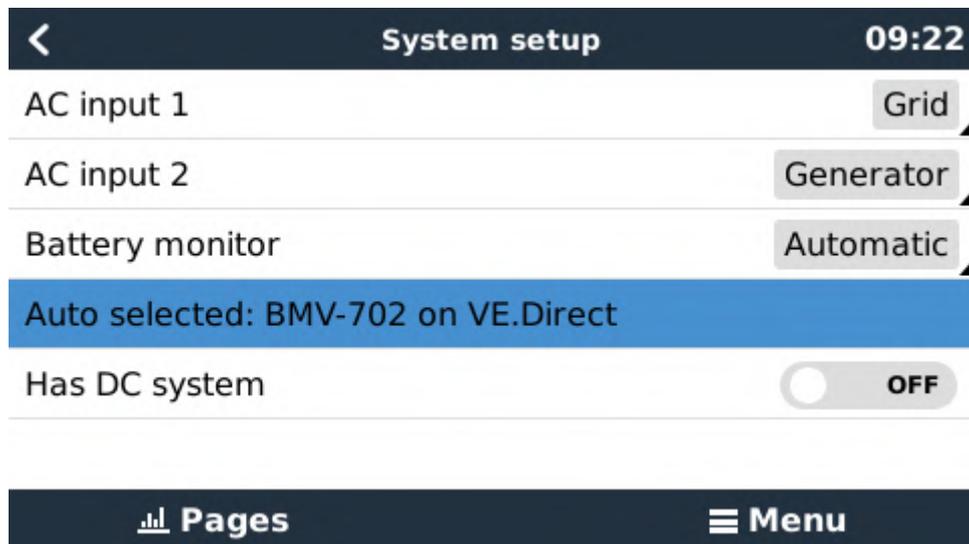
The 'Automatic' function uses the following logic:

1. When available, it will use a dedicated Battery Monitor, such as the BMV or a Lynx Shunt, or a battery with built-in battery monitor.
2. When there is more than one of those connected, it will use a random one - although you can select one manually.
3. when there is no dedicated Battery Monitor, it will use the VE.Bus SOC.

When should I use the 'No battery monitor' option?:

Use that in systems where:

1. there is a Multi or Quattro installed
2. no BMV or other battery monitor is installed
3. the system has other DC loads, or other chargers, connected to the same battery, which are not connected to the CCGX.

A short explanation: the VE.Bus SOC as determined by the Multi or Quattro will be incorrect in above

situation. As it will not take the discharge and charge currents by those other DC Loads, and also unmonitored chargers, into account.

2.2.5 Details on VE.Bus SOC

- While the Inverter/Charger is in bulk, the SOC will not rise above the value as set in VEConfigure3 for the "State of charge when Bulk finished" parameter on the General tab; default 85%. In a system with Solar chargers, make sure that the Absorption voltage as configured in the MPPT is slightly above the same setting in the inverter/charger. The latter needs to recognize that the battery voltage has reached the absorption level. If it doesn't, the SOC will be stuck at the earlier mentioned End-of-bulk percentage, default 85%.

2.3 Customize the logo on the Boat & Motorhome page

It is possible to use a custom logo onto the Boat & Motorhome page.
Type the following address into the web browser of a device connected to the same network. Using this address as a template: (inserting your device's IP address between the square brackets). The IP address can be found by going to Settings > Ethernet or Wifi. Once the page is loaded, Choose an image file from your device. Re-boot the GX device.

3 VE.Bus Inverter/charger monitoring

3.1 Input current-limiter setting

'Overruled by remote' setting in VEConfigure

This chapter explains the implications of enabling or disabling user control of the input current-limiter setting, as seen here in the menu:
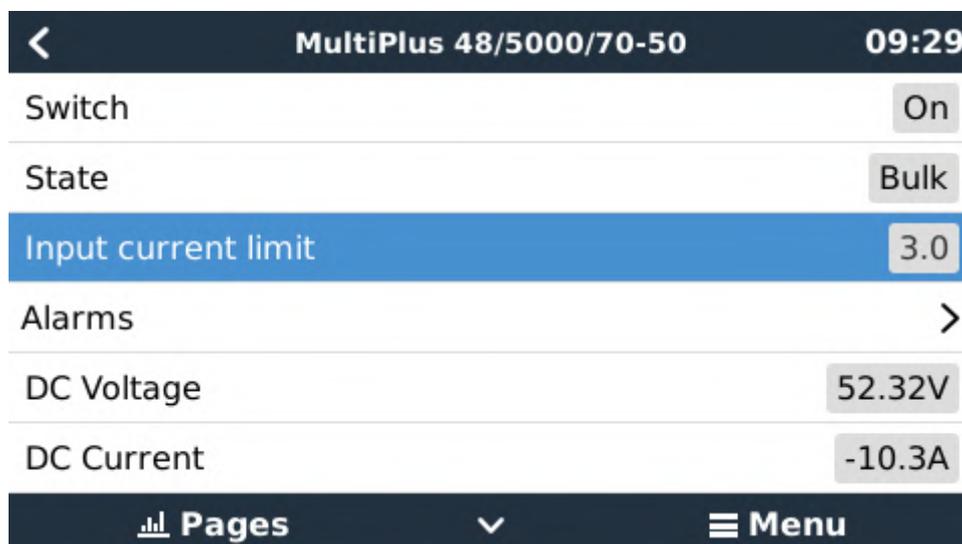
The limit as set by the user in the CCGX will be applied to all inputs where 'Overruled by remote', configured with VEConfigure, is enabled:

Using the example of a boat with two AC inputs and a Quattro where:

1. A Genset capable of delivering 50A is connected to input 1;
2. Shore power is connected to input 2. (Available power depends on the rating of the harbour power-supply.)

Configure the system exactly as in above VEConfigure screenshot. Input 1 has priority over input 2, therefore the system will automatically connect to the genset whenever it is running. The fixed input current limit of 50A will be applied. And when the genset is not available, and mains is available on input 2, the Quattro will use the input current limit as configured in the CCGX.

Two more examples: (In both cases if you *disable* 'Overrule by remote', setting a current limit in the CCGX will have no effect. And if you *enable* 'Overrule by remote' for both inputs, the current limit set in the CCGX will be applied to both inputs.)

Systems where it is not possible to control the input current limit

It is not possible to control the input current limit in certain installations. In these cases, the CCGX menu will not allow changing the setting:

1. Installations with a VE.Bus BMS
2. Installations with a Digital Multi Control (or its predecessors)
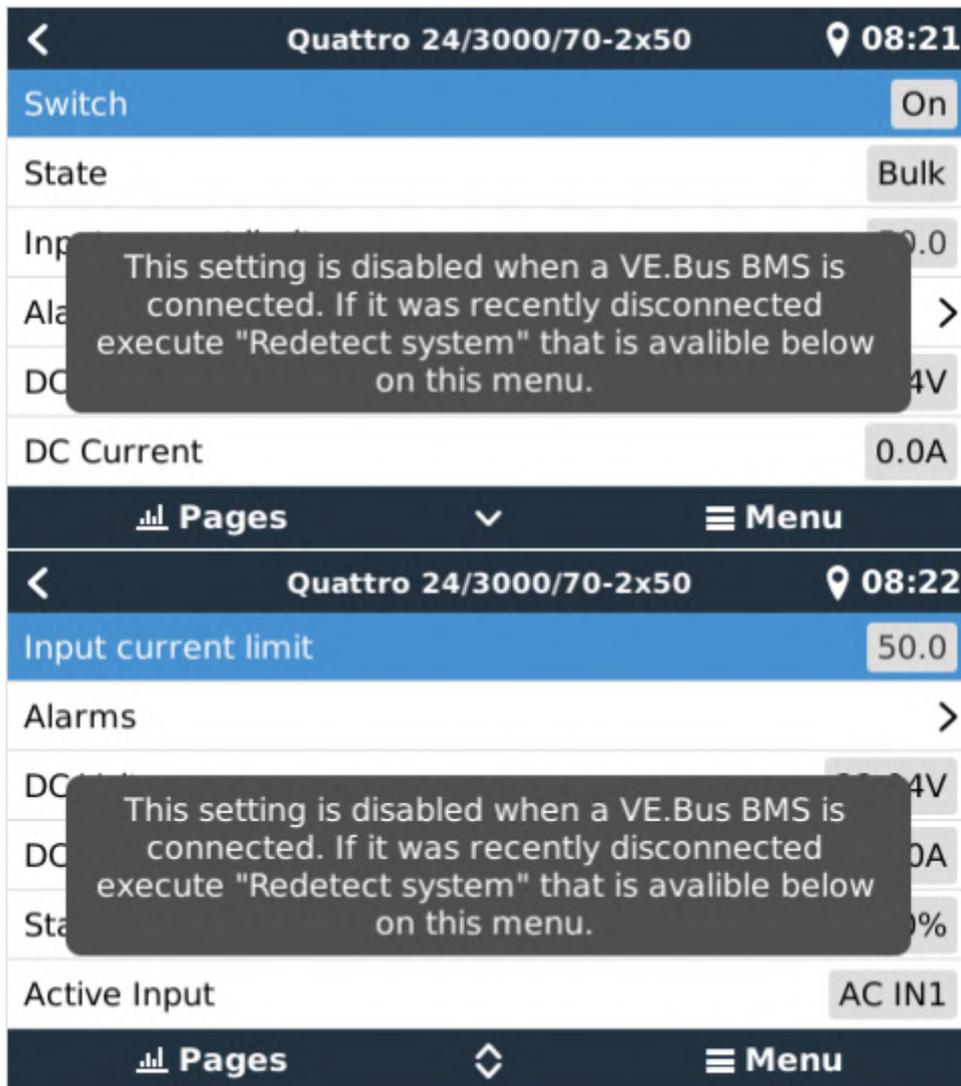
Also the *on/off/charger only* switch in the CCGX will be disabled in the case.

In installation with a VE.Bus BMS, use the rocker switch instead - or add a Digital Multi Control to the installation.

Minimum input current limit values

When PowerAssist is enabled in VEConfigure, there is a minimum input current limit. The actual limit differs for each model.

After setting the input current to a value below the limit, it will automatically be increased again to the limit.

Note that is still possible to set the input current limit to 0. When set to 0, the system will be in passthrough (charger disabled).

Parallel and three phase systems

The configured AC input current limit is the total limit *per phase*.

3.2 Phase rotation warning

The AC supply, either Generator or Grid, to a three phase inverter/charger system needs to be in the correct rotation, also known as sequence. If not, then the Inverter/chargers will not accept the AC supply and remain in Inverter mode.

The `Phase rotation warning` will be raised in such case. To resolve the issue, change the wiring on the AC input: swap either one of the phases, effectively changing the rotation from L3 → L2 → L1 to L1 → L2 → L3. Or reprogram the Multis and modify the phase assigned to match the wiring.
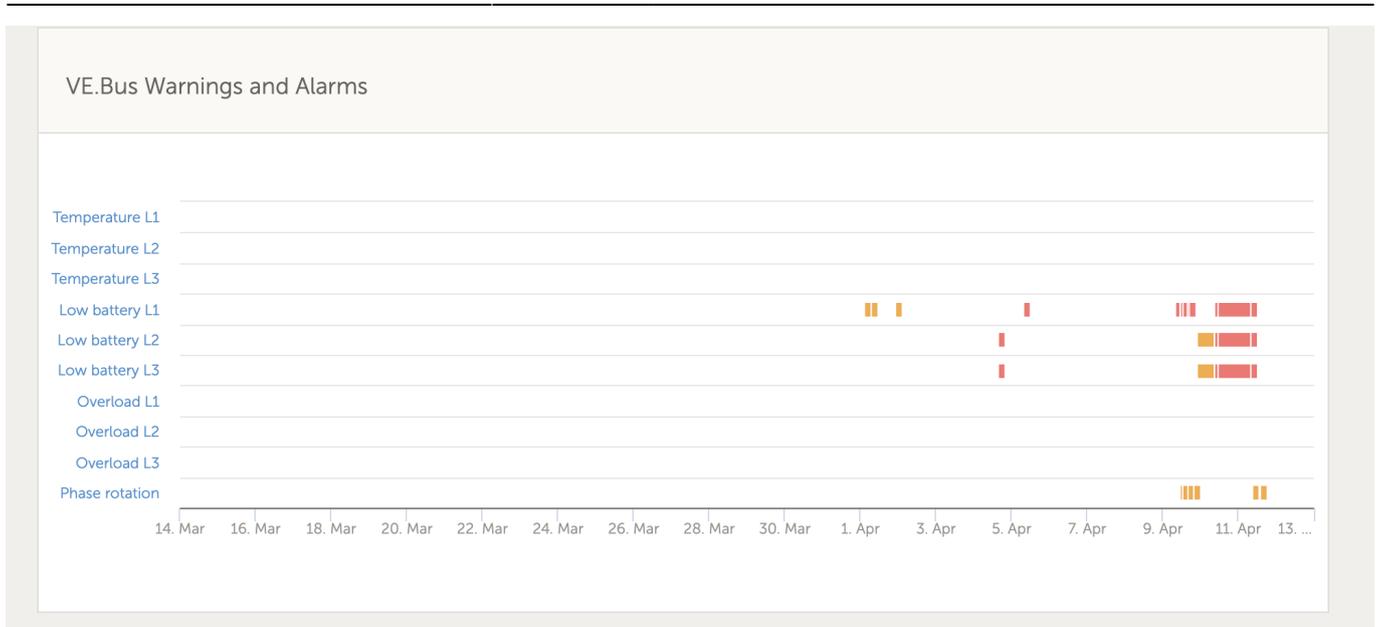
On the GX device itself, the warning will be popup as a notification on the GUI:
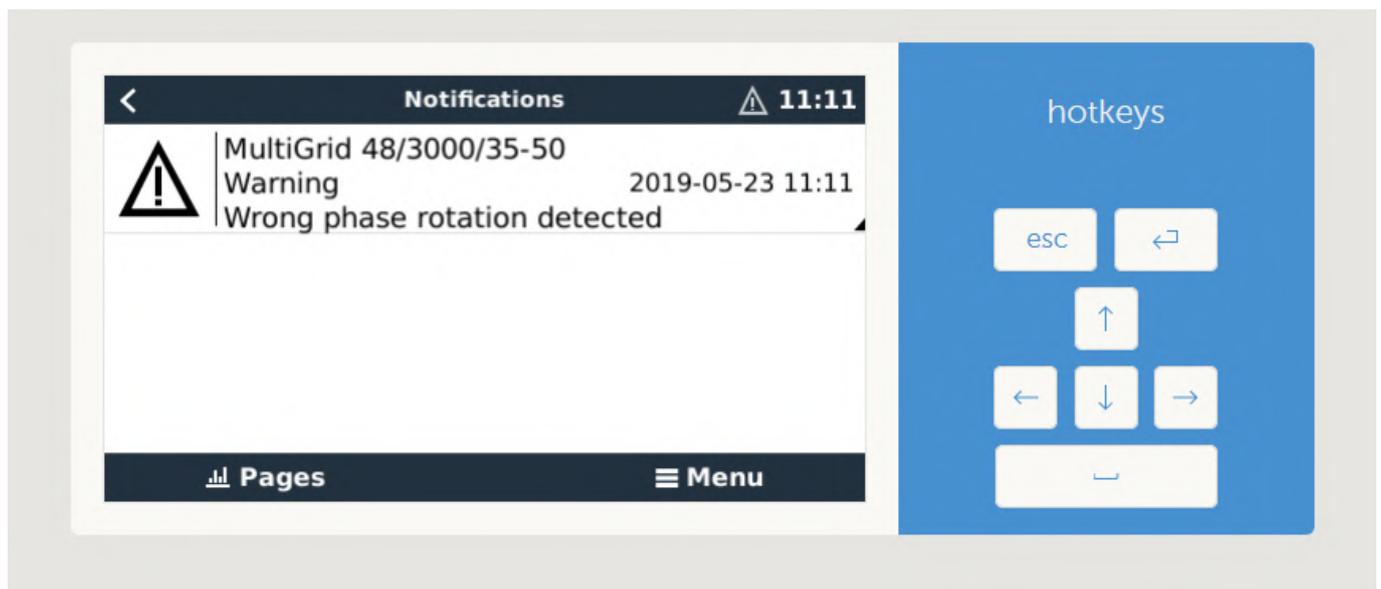
Also, it is visible in the menus:
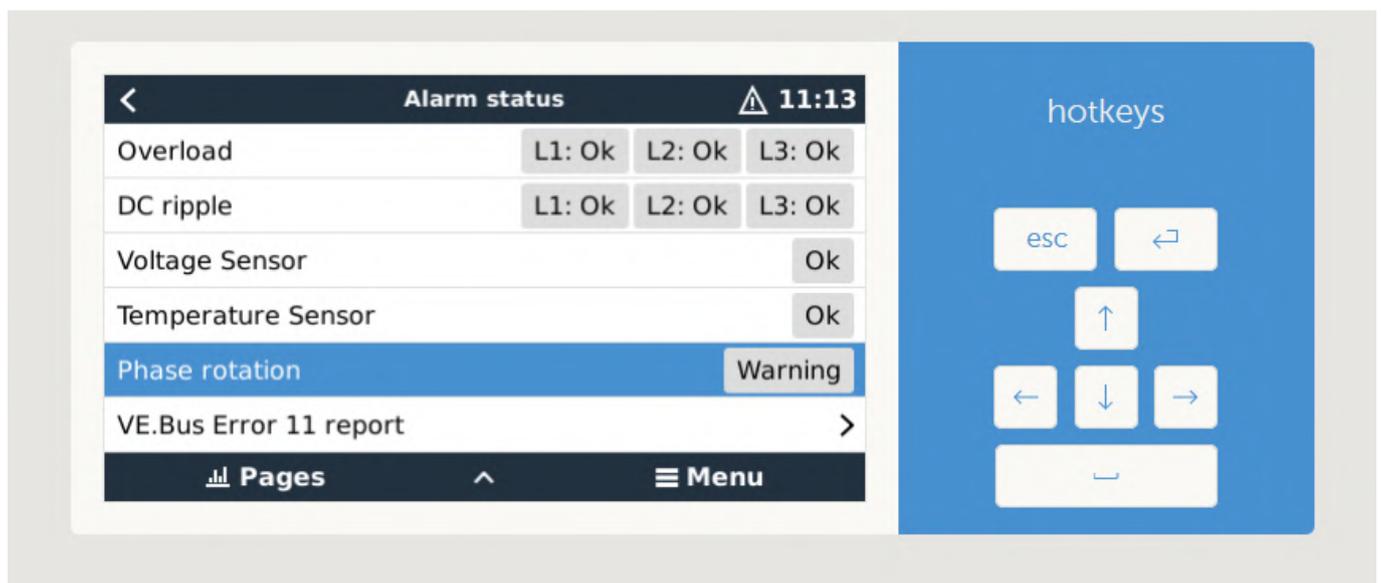
And on the VRM Portal, it is visible on the VE.Bus Alarms & warnings widget on the Advanced page:

And also it will be listed in the Alarm Log on VRM, and an email will be sent; using the VRM Alarm Monitoring system.

3.3 Grid failure monitoring

When this feature is enabled, an alarm is raised when the system hasn't been connected to the AC input configured to be Grid or Shore for more than 5 seconds.
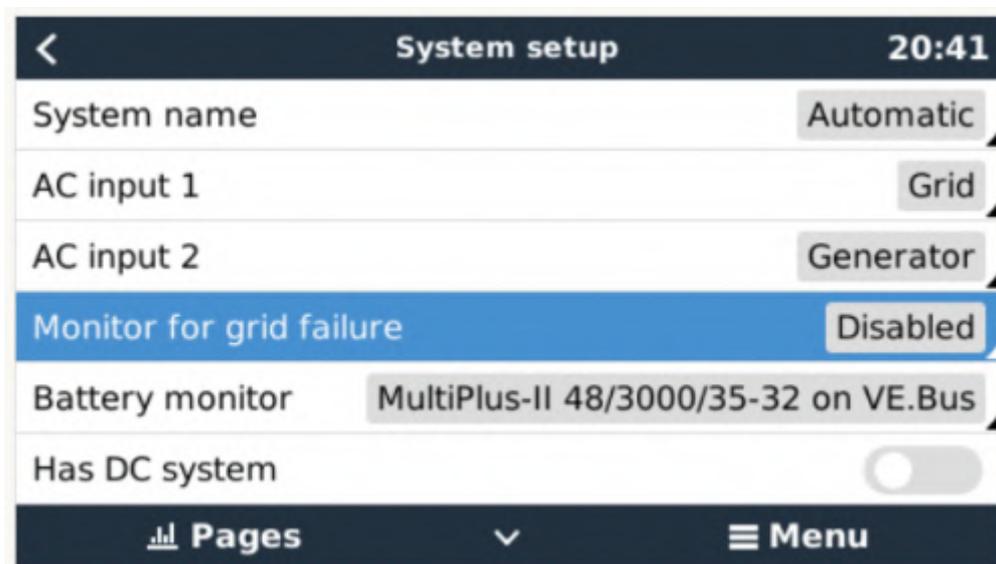
The alarm shows as a Notification in the GUI, and as an alarm on the VRM Portal, and is available on ModbusTCP / MQTT.

Recommend to use for backup systems. But also for yachts or vehicles on shore power.

Note that this settings monitors that the system is connected to grid/shore. Generator monitoring is already available as part of the Generator start/stop function and not part of this.

Do not use this feature in systems that use the Ignore AC Input settings in our inverter/chargers: when the system ignores the AC input, ie runs in island mode, as intended, even though grid is

available, it will report a grid failure.

3.4 Advanced menu
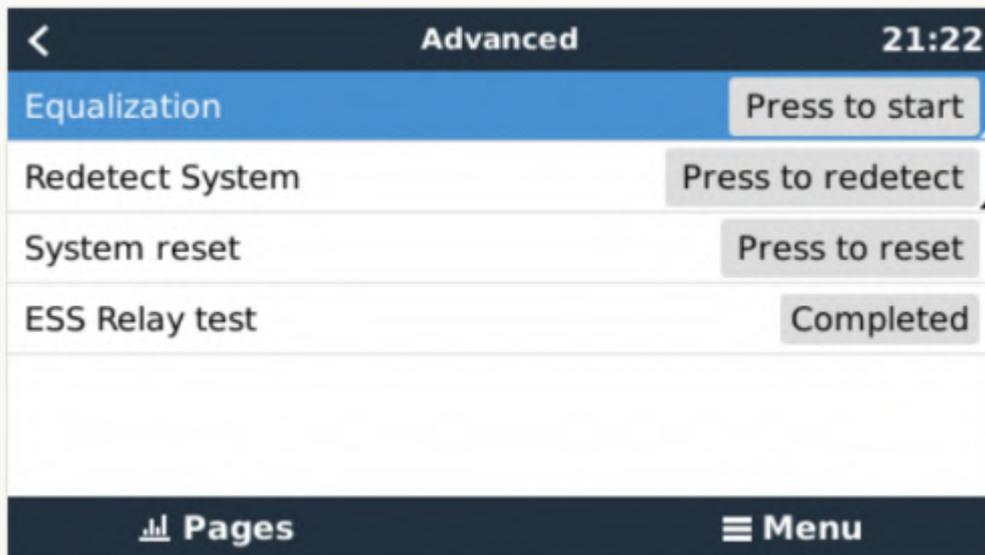
Equalisation

Starts equalisation. See Multi or Quattro documentation for details.

Redetect system

Redetects the type of inverter/charger and its features & configuration. Use this feature when, for example, a VE.Bus BMS used to be part of a system, and is no longer.
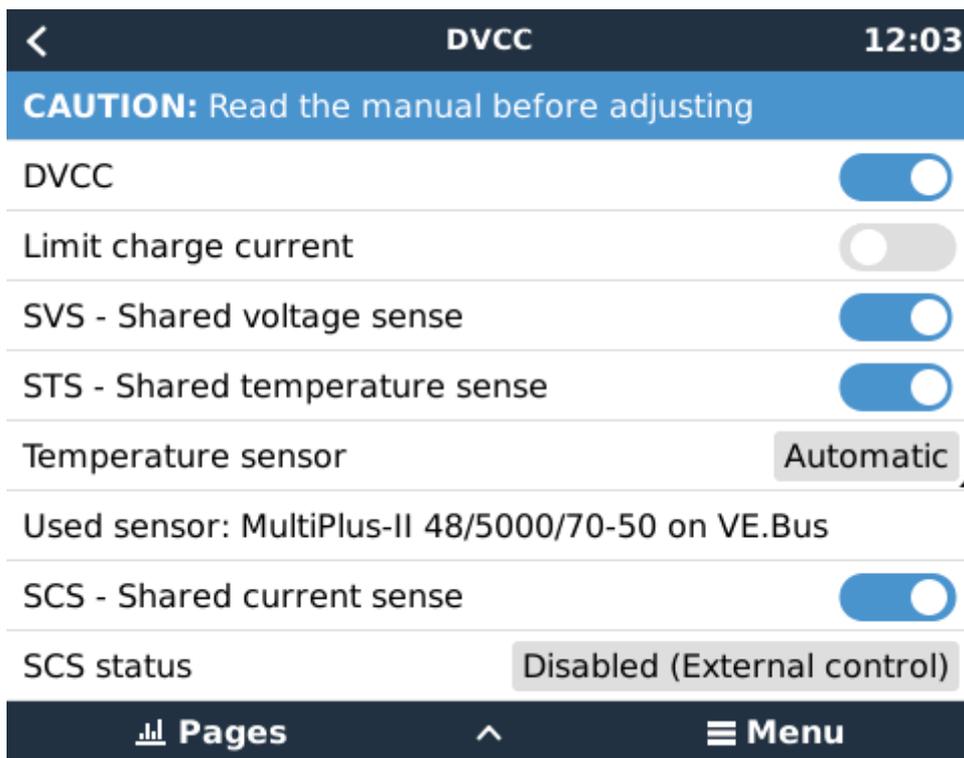
System reset

Restarts the inverter/charger when it has stopped retrying. For example after a (very) heavy overload; or three overloads in a row.

ESS Relay test

Shows the status of the ESS Relay test. Only relevant when its an ESS system. See Q9 in the ESS Manual FAQ for details

4 DVCC - Distributed Voltage and Current Control

4.1 Introduction and features

Enabling DVCC changes a GX device from a passive monitor into an active controller. The available features and effects of enabling DVCC depend on the type of battery used. The effect also depends on the installed Victron components and their configuration.

Example 1 - Managed CAN-bus batteries For example, in systems with an Managed CAN-bus BMS battery connected, the GX receives a Charge Voltage Limit (CVL), Charge Current Limit (CCL), Discharge Current Limit (DCL) from that battery and relays that to the connected inverter/chargers and solar chargers. These then disable their internal charge algorithms and simply do what they're told by the battery. There is no need to set-up charge voltages or choose the charge algorithm type.

Example 2 - Lead batteries For systems with lead batteries, DVCC offers features such as a configurable system wide charge current limit, where the GX device actively limits the inverter/charger in case the solar chargers are already charging at full power. As well as shared temperature sense (STS) and shared current sense (SCS).

This table shows the recommend settings for different battery types:

	Lead (AGM, Gel, OPzS, ...)	VE.Bus Lithium	Freedom-won	BYD	Pylontech	BMZ	MG Electronics
Auto-config	No	No	Yes	Yes	Yes	Yes	Yes
System charge current	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Should you enable SVS?	Yes	No	Yes	No	No	No	No
Should you enable STS?	Yes	No	No	No	No	No	No
Charge Control Method	-	-	Dynamic	Fixed	Fixed	Fixed	Dynamic
Wire ATC & ATD?	n.a.	Yes	No	No	No	No	No

Carefully study below chapters to fully understand DVCC for a particular system.

To enable or disable DVCC, see Settings → DVCC in the menus:
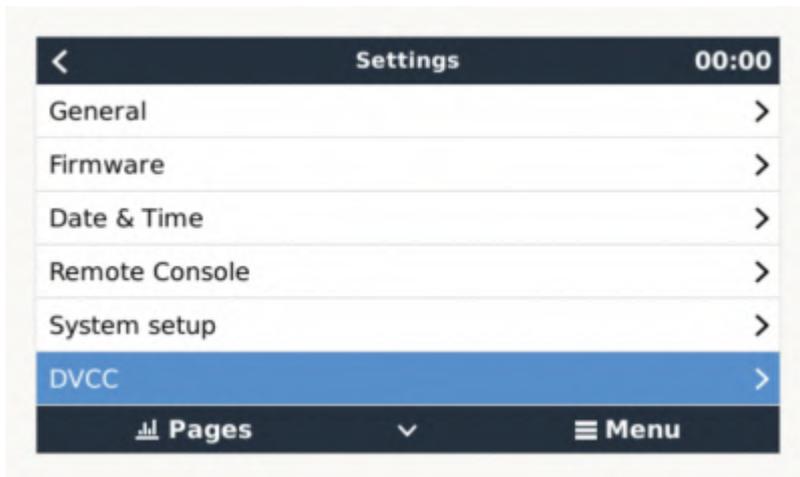
4.2 DVCC Requirements

Battery compatilibity

For CAN-bus connected batteries, check the relevant page on the Battery Compatibility manual to see if enabling DVCC has been tested with your battery-type and is supported. If DVCC is not mentioned in notes relating to your battery, do not enable DVCC.

For Gel, AGM, OPzS and other lead batteries, DVCC can be used without any problem. The same is true for Victron Energy lithium batteries with the VE.Bus BMS, the Lynx Ion + Shunt BMS or the Lynx Ion BMS. DVCC is the *preferred* operating mode for Redflow ZBM2/ZCell batteries using the Redflow CANBus BMS.

Firmware versions

Do not use DVCC in cases where these requirements are not met. In all cases we recommend to install the latest available firmware during commissioning. Once running well, there is no need to pro-actively update firmware without reason. In case of difficulty, the first action is to update firmware.

Required minimum firmware versions:

- Multi/Quattro: 422
- MultiGrid: 424
- CCGX / Venus GX: v2.12
- VE.Direct MPPTs: v1.29
- VE.Can MPPT Solar Chargers cannot be used: they do not yet support the new control mechanisms.
- Lynx Ion + Shunt: v2.04
- Lynx BMS: v1.09

From Venus firmware v2.40, there will be a warning message 'Error #48 - DVCC with incompatible

firmware' when one of the devices has an incompatible firmware while using DVCC.

In case of an ESS System, the ESS Assistant needs to be version 164 or later (Released in November 2017).
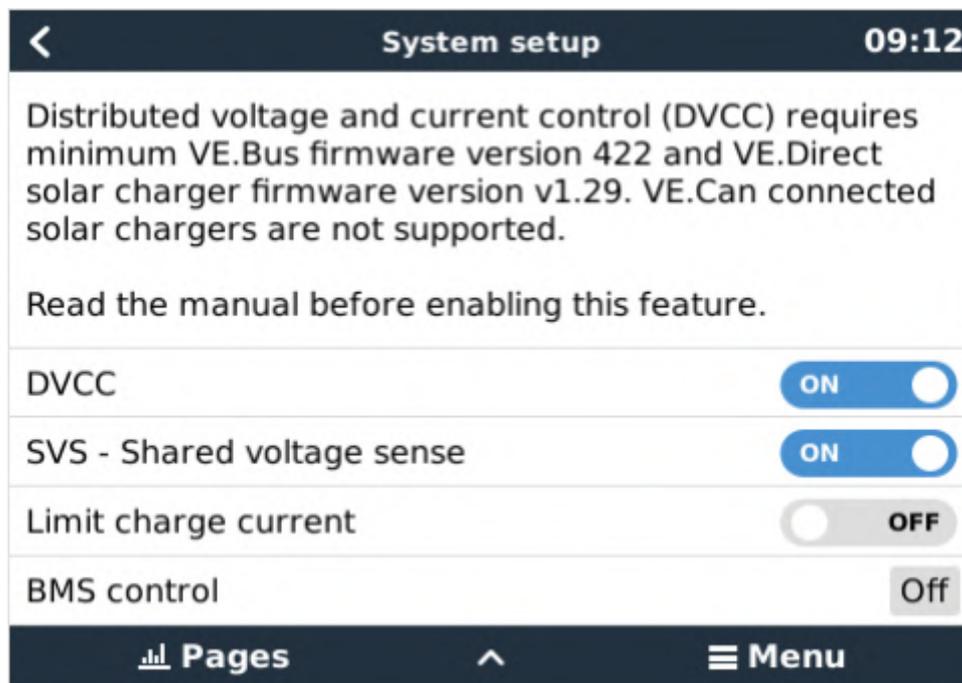
4.3 DVCC effects on the charge algorithm

Our inverter/chargers and MPPT Solar Chargers use their own internal charge algorithm when in stand-alone mode. This means that they determine how long to remain in Absorption, when to switch to Float, when to switch back to Bulk, or Storage. And in those various phases they use the configured parameters in VictronConnect and VEConfigure.

In certain systems, the internal charge algorithm is disabled, and the charger is then working with an externally controlled charge voltage target.

This guide explains the different possibilities:

Selection guide			Resulting charge algorithm	
System type	Battery type	DVCC	Inverter/charger	MPPT Solar Charger
ESS Assistant	Intelligent battery	DVCC on	Battery	Battery
		DVCC off	Don't do this; better enable DVCC	
	Normal battery	DVCC on	Internal	Inverter/charger
		DVCC off	Internal	Inverter/charger
Standard	Intelligent battery	DVCC on	Battery	Battery
		DVCC off	Don't do this; better enable DVCC	
	Normal battery	DVCC on	Internal	Internal
		DVCC off	Internal	Internal

Internal

The internal charge algorithm (bulk → absorption → float → re-bulk), and the configured charge voltages are active.

Inverter/charger indicated charge state: bulk, absorption, float, and-so-forth.

MPPT indicated charge state: bulk, absorption, float and-so-forth. (firmware version v1.42 onwards. Earlier versions have a bug that make the MPPT say "Ext. Control" when it is only being current limited; its internal charge algorithm still active.

Inverter/charger (applies to MPPTs only)

The MPPTs internal charge algorithm is disabled; instead it's being controlled by a charge voltage setpoint coming from the inverter/charger.

MPPT indicated charge state: Ext. control.

Battery

The internal charge algorithm is disabled; and instead, the device is being controlled by the battery.

Inverter/charger indicated charge state: Bulk when in current controlled mode, Absorption when in voltage controlled mode. Never Float; even though currents might be low / battery might be full.

MPPT indicated charge state: Ext. control.

4.4 DVCC features for all systems

These features apply to all types of systems when DVCC is enabled: with or without ESS Assistant, and with lead or other normal batteries as well as when an intelligent CAN-bus BMS connected battery is installed:

4.4.1 Limit charge current

This is a user-configurable maximum charge current setting. It works across the whole system. MPPT Solar Chargers are automatically prioritized over the mains/generator.
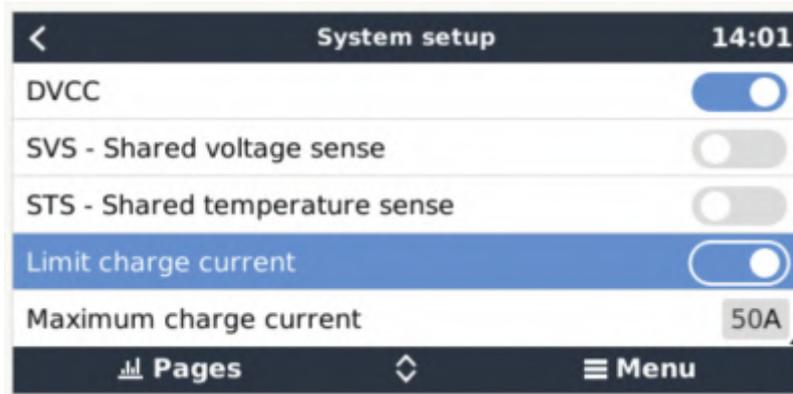
This setting is available in the "Settings → "System Setup" menu on the GX device.

Particulars:

1) In case a CANBUS-BMS is connected and the BMS requests a maximum charge current that is different from the user-configurable setting, the lower of the two will be used.

2) this mechanism only works for Victron inverter/chargers and Solar chargers. Other chargers, such as Skylla-i's are not controlled and also their charge current is not taken into account. The same applies for devices that are not connected to the GX device, such as an alternator. Worded differently: the total charge current of the inverter/chargers and all MPPTs will be controlled, nothing else. Any other sources will be extra charge current, unaccounted for. Even when installing a BMV or other battery monitor.

3) DC Loads are not accounted for. Even when a BMV or other battery monitor is installed. For example, with a configured maximum charge current of 50 Amps, and DC Loads drawing 20 Amps, the battery will be charged with 30 Amps. Not with the full allowed 50 Amps.

4) Current drawn from the system by the inverter/charger is compensated for. For example, if 10A is drawn to power AC loads, and the limit is 50A, the system will allow the solar chargers to charge with a maximum of 60 Amps.

5) In all situations, the maximum charge limit configured in a device itself, ie. the Charge current limit set with VictronConnect or VEConfigure for the Solar chargers or Inverter/chargers will still be in effect. An example to illustrate this: in case there is only an Inverter/charger in the system, and in VEConfigure is charge current is configured to 50 Amps. And on the GX Device, a limit of 100A is configured, then the working limit will be 50 Amps.

4.4.2 Shared Voltage Sense (SVS)

Works with VE.Bus devices and VE.Direct Solar Chargers.

The system automatically selects the best available voltage measurement. It will use the voltage from the BMS or a BMV battery monitor, if possible, otherwise it will use the battery voltage reported by the VE.Bus system.

The voltage displayed on the GUI reflects the same voltage measurement.

Shared Voltage Sense (SVS) is by default enabled when DVCC is enabled. It can be disabled with a switch in the Settings → System Setup menu.

4.4.3 Shared Temperature Sense (STS)

Select the temperature sensor to use; and the GX device will send the measured battery temperature to the Inverter/charger system as well as all connected Solar Chargers.

Selectable sources for the battery temperature are:

- BMV-702 battery monitor
- BMV-712 battery monitor
- Lynx Shunt VE.Can battery monitors
- Temperature inputs on a Venus GX (and same for other GX devices that have a temperature input)
- Multi/Quattro inverter/charger
- Solar Chargers (if fitted with a temperature sensor)

4.4.4 Shared Current Sense (SCS)

This feature forwards the battery current, as measured by a battery monitor connected to the GX device, to all connected solar chargers.

The solar chargers can be configured to use the battery current for its tail current mechanism that ends absorption when the current is below the configured threshold. For more information about that, refer to Solar charger documentation.

This feature only applies to systems that are not ESS, and/or don't have a managed battery, since in both of those cases the MPPT is already externally controlled.

Requires MPPT solar charger firmware v1.47 or newer.

4.5 DVCC Features when using CAN-bus BMS Battery

This chapter applies to all systems where an intelligent battery BMS is installed, and connected via CAN-bus. Note that this does not include the Victron VE.Bus BMS.

Such intelligent BMS sends four parameters to the GX device:

1. Charge voltage limit (CVL): the maximum charge voltage that the battery currently accepts.
2. Charge current limit (CCL): the maximum charge current requested by the battery.
3. Discharge current limit (DCL): the maximum discharge current as requested by the battery.

For all three parameters, some types of batteries transmit dynamic values. For example they determine the maximum charge voltage based on cell voltages, state of charge, or for example temperature. Other makes and brands use a fixed value.

Here is the page in the menus showing the parameters:

For such batteries, there is no need to wire allow-to-charge and allow-to-discharge connections to the AUX inputs on a Multi or a Quattro.

When inverting, ie in Island mode, Multis and Quattros will shut down when the max discharge current is zero. They will automatically start again as soon as either AC mains returns, or when the BMS increases the max discharge current again.

See previous chapter, "Limit charge current", the user setting, for details about how the Maximum charge current is used, how it prioritises solar and more.

All above means that setting up charge voltages or charge profiles in VEConfigure or VictronConnect is not necessary, and will also have no effect. The Multis, Quattros and MPPT Solar Chargers will charge with the voltage as received via CAN-bus from the battery.

4.6 DVCC for systems with the ESS Assistant

- The ESS `Keep batteries charged` mode works properly. It does not without DVCC.
- A fixed solar offset of 0.4V is used instead of a variable 2V. (values for 48V systems, divide by 4 for 12V). Note that this solar offset is only applied when ESS-mode is set to `Optimized` in combination with the `Feed-in excess solar charger` power-setting enabled, or when ESS-mode is set to `Keep batteries charged`.
- Add Auto-recharge feature for the ESS Modes `Optimized` and `Optimized (with BatteryLife)`. The system will automatically recharge the battery (from the grid) when the SOC drops 5% or more below the value of 'Minimum SOC' in the ESS menu. Recharge stops when it reaches the Minimum SOC.
- ESS improved state display: In addition to the charger states (Bulk/Absorption/Float), additional `Discharging` and `Sustain` modes were added. In addition it also shows reasons for the state it is in:
  - #1: Low SOC: discharge disabled
  - #2: BatteryLife is active
  - #3: Charging disabled by BMS
  - #4: Discharging disabled by BMS
  - #5: Slow Charge in progress (part of BatteryLife, see above)
  - #6: User configured a charge limit of zero.
  - #7: User configured a discharge limit of zero.

5. VRM Portal

5.1 VRM Portal Introduction

When connected to the internet, a GX device can be used in combination with the Victron Remote Management (VRM) portal, which enables:

- Easy remote access to all statistics and systems status online
- Remote Console on VRM: access and configure your system as if you were standing besides it
- Remote Firmware updates of connected Solar Chargers and other Victron products.
- Use of the VRM App for iOS and Android.

See chapter 1 for how to connect the device to the internet.

5.2 Registering on VRM

Instructions are in the VRM Portal Getting Started document.

Note that any system will need to first have been able to successfully send data to the VRM Portal. As long is there has been no successful connection, it will not be possible to register the system to your VRM user account. In such case, refer to below Troubleshooting section 5.7.

5.3 Datalogging to VRM

Data-logs are transmitted to the VRM Portal over the Internet, if it's available. All related settings are available in the VRM Online Portal menu:
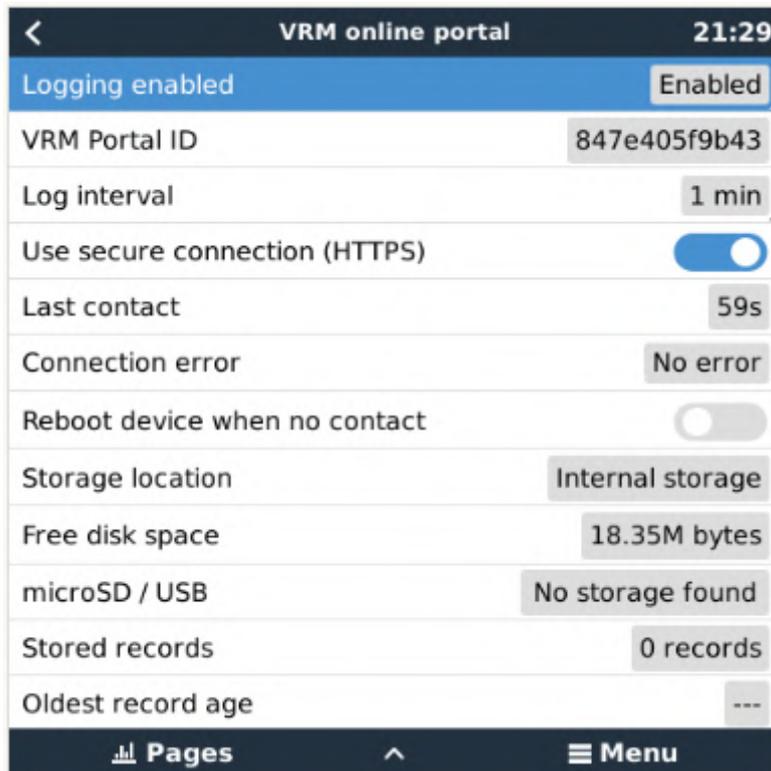
The transmission of the data logs has been designed to work also on bad internet connections. Lines of up to 70% permenant packet loss are still sufficient to get the data out, even if delayed in some cases.

Adding an external storage device

When unable to transmit the logs, then the GX device will store them to non-volatile storage (ie. data is not lost on a power loss or reboot).

The GX device can store 48 hours worth of logs internally. To extend this period, insert a microSD card or USB stick. You can see the internal storage status in the settings.

Note that, when inserting such storage device, any internally stored logs will automatically be transferred to the inserted stick: no data is lost.

With or without an external storage device inserted, the GX Device will always keep trying to connect to the portal and transmit all backlogged logs. That means that even with months worth of backlog, once it re-acquires an Internet connection, all of the backlog is sent out. The data is sent in a compressed manner: sending a lot of backlogged data will use considerably less bandwidth than than sending the data with a continuously available internet connection.
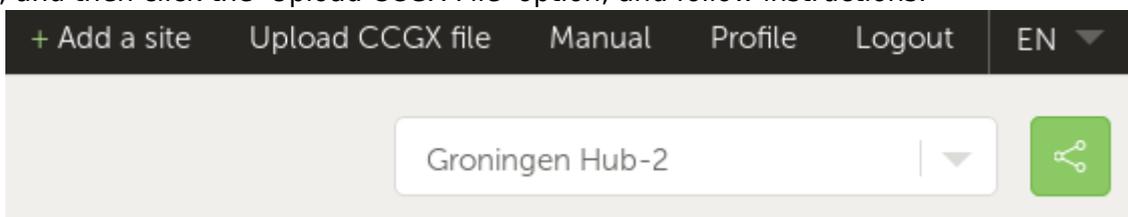
Storage device requirements

- MicroSD cards or USB flash drives must be formatted as FAT12, FAT16 or FAT32 file systems - and not exFAT or NTFS.
- SD and SDHC type microSD cards of 32 GB capacity and smaller are sold containing FAT12, FAT16 or FAT32. They can be used without a problem, unless they are subsequently re-formatted to a different file system.

- SDXC type microSD cards which have greater than 32 GB capacity are often formatted with exFAT, and therefore cannot be used with the CCGX without reformatting and possibly re-partitioning.

Manually transferring datalogs to VRM

For devices permanently without Internet, it is possible to take the data out, and then upload it manually from a laptop.

1. go to Settings → VRM Portal, and click `Eject the storage`. Make sure to never just remove the SD-card/USB-stick, this can lead to corruption and data loss.
2. now, remove the storage device and insert it into a computer or laptop that is connected to the internet.
3. open a webbrowser, and navigate to the VRM Portal.
4. Login, and then click the 'Upload CCGX File' option, and follow instructions:

5. Remove the file from the storage device, and then it re-insert it into the GX Device. Note that uploading the same data twice does not cause any problems; but still it is better not to do that.

With a log interval of once per minute, the required storage space roughly amounts to about 25 MB per month, depending on the number of connected products. So with a 1 GB microSD card, you can store about 3 years of backlog. In other words, any microSD card or USB stick should be sufficient to store the 6 months of data which VRM retains.

When the storage device is full, no more data will be logged.

If multiple storage devices are inserted, the GX device will store the data on the one inserted first. When that is removed, it will **not** use the other one. Instead, it will create an internal backlog buffer. Only inserting a new one will make it switch to using external storage again.

Network watchdog: auto-reboot
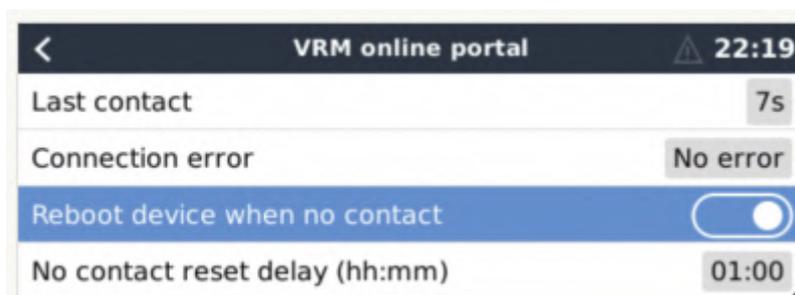
This feature, disabled by default, makes the GX device automatically reboot itself in case it has not been able to connect to the VRM Portal.

Please be careful with enabling this feature on ESS systems: when grid connection is lost, and the GX device reboots, the system can loose power when rebooting takes too long (when grid is present, the Multi's or Quattro's will enter passthru)

5.4 Trouble shooting data logging

This chapter explains what to do when the GX Device cannot transmit data to the VRM Portal.

The communication required to send logs to the VRM Portal is:

1. Working DNS
2. Proper IP address
3. Working internet connection
4. Outbound http(s) connection to on port 80 and 443. Note that should never be an issue, unless on very specialized company networks.

Note that the CCGX does not support a proxy setup.

Step 1: Update the GX Device to the latest available firmware

GX Device firmware update instructions

**Step 2: Verify the network and internet connection**

In the menu Settings → Ethernet or Settings → Wi-Fi, check the following:

1. State must be 'Connected'
2. There must be an IP address, that does not start with 169.
3. There must be a gateway
4. There must be DNS servers

For a GX GSM, see the Troubleshooting guide in the GX GSM Menu.

In case the IP address starts with 169, check whether your network has a DHCP server running. 99%of all networks have a DHCP server running and it is enabled by default on all well-known ADSL, cable and 3G routers. If there is no DHCP server running, then configure the ip address manually.

Ethernet
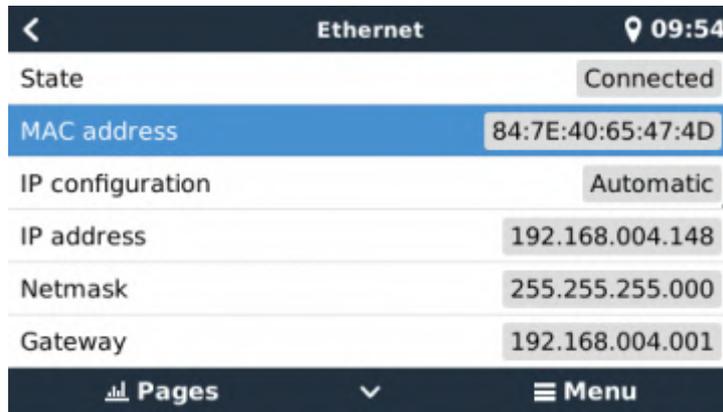
When using Ethernet and State shows 'Unplugged', verify that the Ethernet network cable is not faulty: try another one. The two lights at the back of the CCGX, where the Ethernet RJ45 cable plugs in, should be lit or blinking. Two dead lights indicate a connection problem.

WiFi
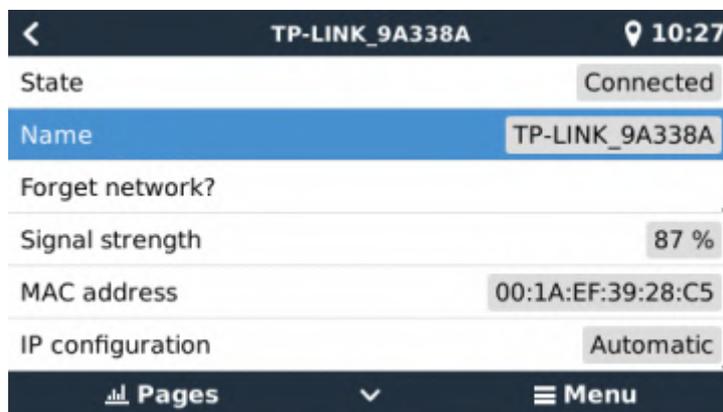
When using Wi-Fi and the menu shows 'No Wi-Fi adapter connected' check the USB connection to the Wi-Fi dongle. Try to remove the dongle and insert it again.

When using Wi-Fi and the State shows 'Failure', it might be that the Wi-Fi password is incorrect. Press 'Forget network' and try to connect again with the correct password.

Step 3. Verify VRM Portal Connectivity

Navigate to Settings → VRM online portal, and check the Connection error status:
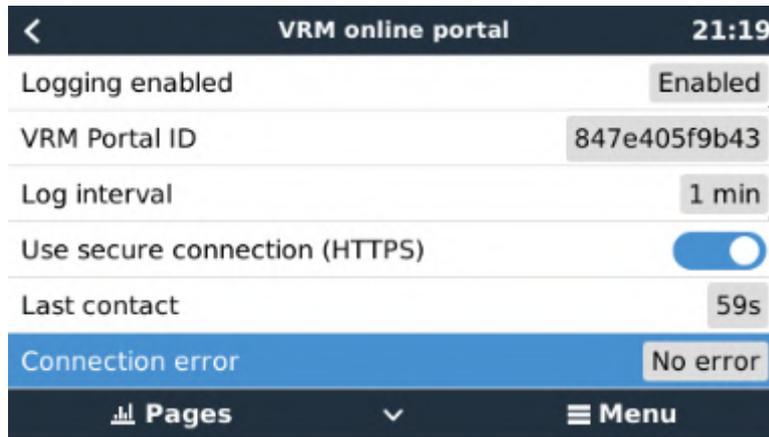
If a Connection error is shown, the CCGX is not able to contact the VRM database. The connection error will show an error code that indicates the nature of the connectivity problem. Also, details of the error message are shown, to facilitate on site IT experts to diagnose the problem.

- Error #150 Unexpected response text: A connection succeeded, but the result was incorrect. This might indicate that a transparent proxy is hijacking the connection. Examples include a WiFi login page or a cellular providers payment page.
- Error #151 Unexpected HTTP Response: A connection succeeded, but the response did not indicate a successful HTTP result code (normally 200). This might indicate that a transparent proxy is hijacking the connection. See #150 above for examples.
- Error #152 Connection time-out: this could indicate a poor quality internet connection, or a restrictive firewall.
- Error #153 Connection error: this could indicate a routing problem. For details, check the shown error message:
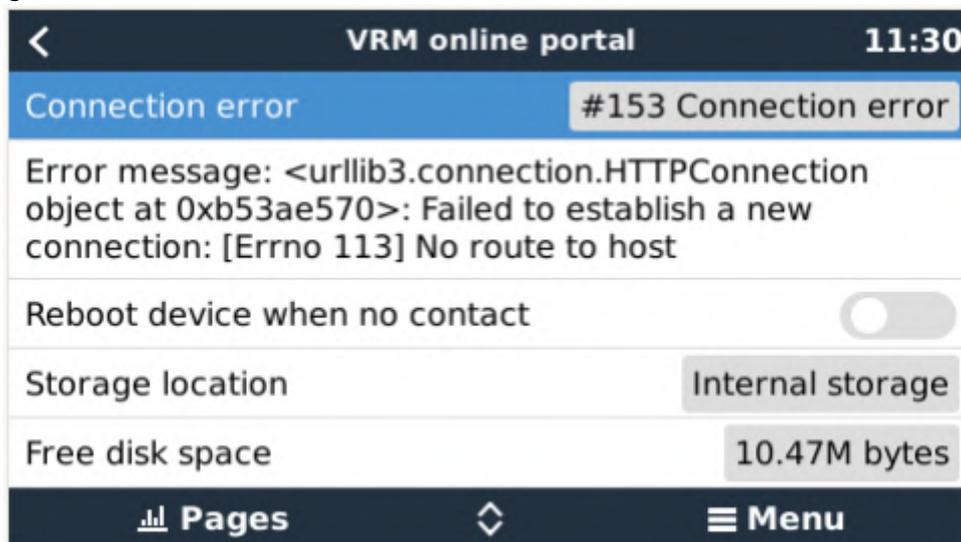
- Error #153 Connection problem, and then specifically an SSL related issue, such as in below screenshot: check the date and time setting of the Gx Device, and also the time zone. And check that your router router is not showing a special disclaimer, login or acceptance page, like often seen in airports, hotels and other public wifi.
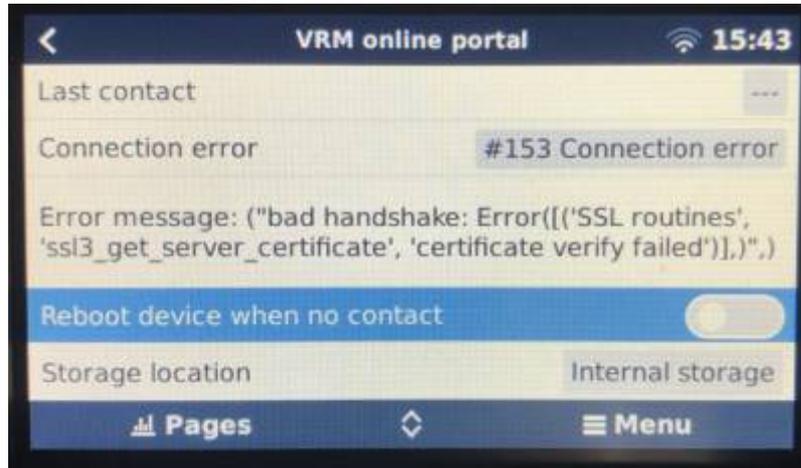
- Error #154 DNS Failure: Make sure that a valid DNS server is configured in the Ethernet or WiFi menu. Typically this is assigned automatically by a DHCP server in a network.
- Error #155 Routing error: VRM is unreachable. This error occurs if an ICMP error is received indicating that no route exists to the VRM server. Make sure your DHCP server assigns a working default route, or that the gateway is correctly configured for static configurations.
- Error #159 Unknown error: this is a catch-all error for errors that cannot be directly categorised. In such cases the Error message will provide information about the problem.
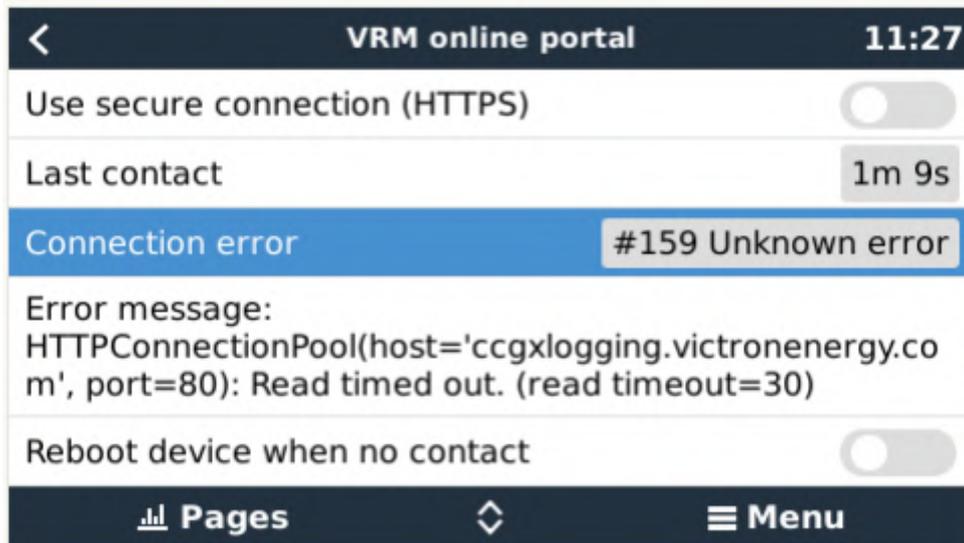
Check 'Last contact'. If this shows dashes, the GX device has not been able to contact the VRM Portal since power up. If it shows a time, but still an error is shown, then the GX device has been able to send data, but has since lost contact.

The 'Buffered items' indicates the number of logs that it has stored to send later. If this is larger than 0, it means that the CCGX can not connect to the VRM Portal. All data is sent using the First in First out principle: the VRM Portal will only show the most up to date information after all old data has been sent.

5.5 Analysing data offline, without VRM

In certain cases, for example for very remote sites where there is no internet available, it can be useful to be able to analyse the data without first having to upload it to the VRM Portal.

1. Install VictronConnect on a Windows or Apple laptop

2. Insert the storage device containing the log file(s)
3. In VictronConnect, use the GX Log Converter feature to convert them to Excel sheets.

5.6 Remote Console on VRM - Setup

This feature allows full remote control of a GX Device, over the internet:
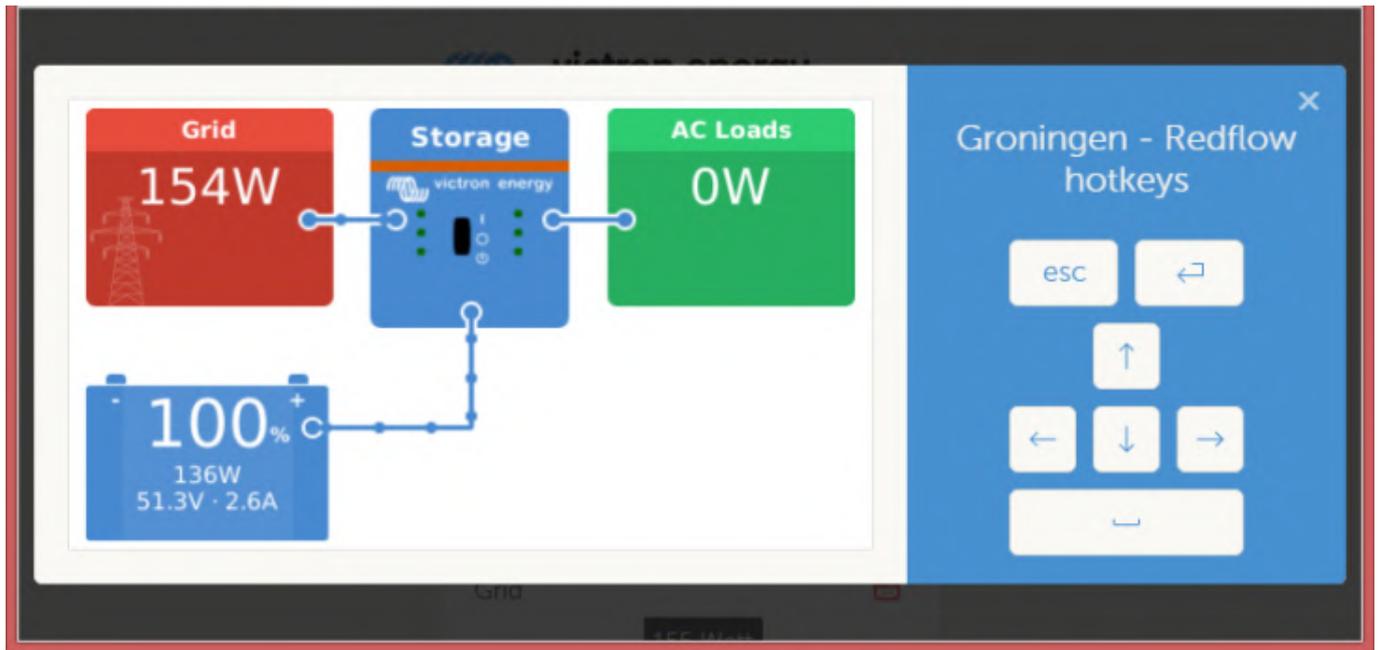
Remote Console on VRM is disabled by default. Activate it by following these steps:

1. Enabling the feature in the Settings → Remote Console menu
2. Either set a password; or disable the password
3. Restart the GX Device.

Now, the Remote Console option will appear in the menu on the VRM Portal. Click it to open the Remote Console:

5.7 Remote Console on VRM - Trouble shooting

Follow these steps to trouble shoot Remote Console on VRM

1. Make sure that Logging to the VRM portal works, see chapter 5.4. Without this; Remote Console on VRM will not work.
2. After enabling the Remote Console feature, make sure to have set (or disabled) the password.
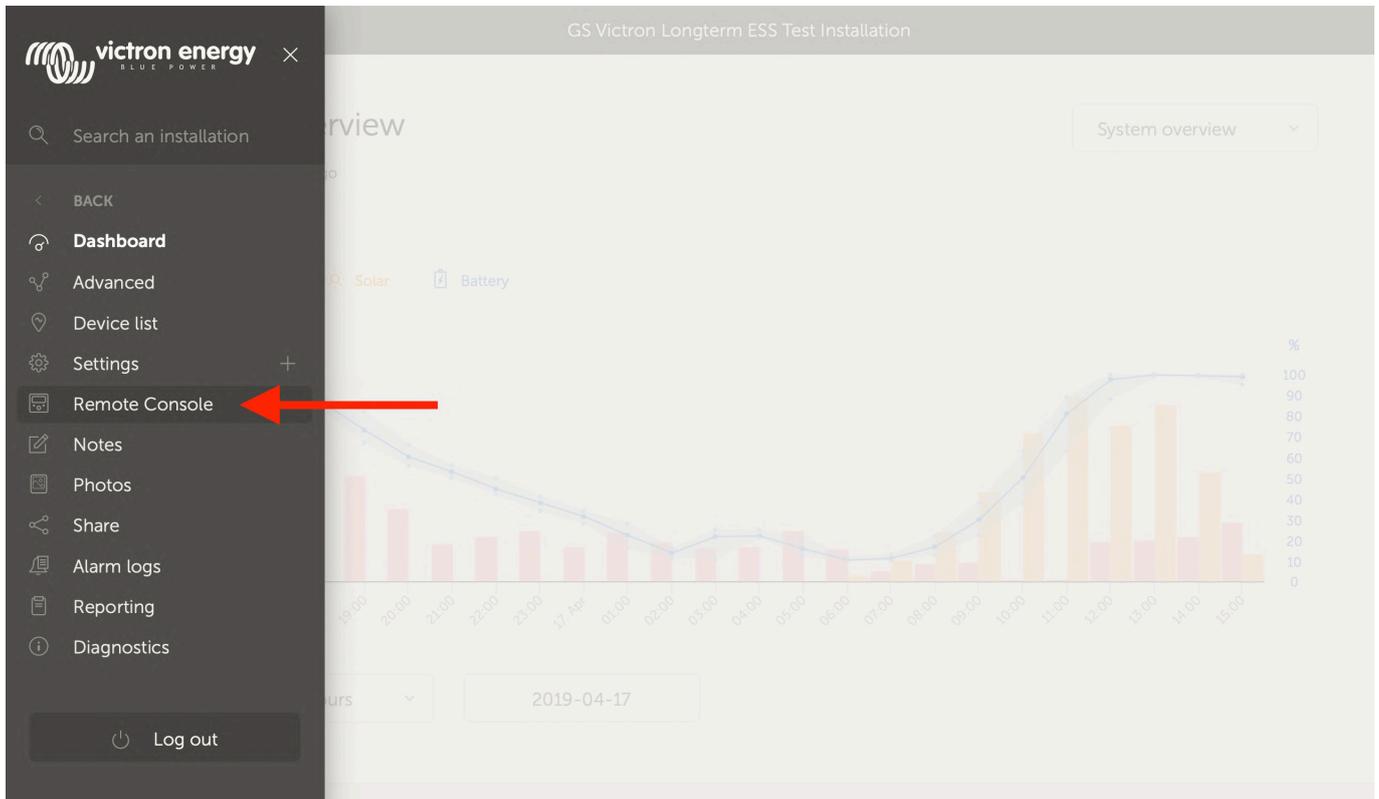3. Also make sure to restart the CCGX after setting (or disabling) the password.
4. Make sure to update the CCGX to the latest firmware version. The last stability improvement for Remote Console was made in version v2.30.
5. After the restart, check the Remote Console on VRM status shows online or a port number. In case it says offline, or port number 0, the CCGX was unable to connect to the Remote Console server. This is normally caused by a (company) firewall, blocking the connection. The solution is then to configure an exception rules in the firewall.
6. Verify that your web browser, on which you're using VRM, can access both of below URLs. Click both of the links, to check them. Note that seeing an Error means that all is OK. The good error is 'Error response, Error code 405, Method Not Allowed'. If you get a timeout or another (browser) error, there may be a firewall blocking the connection.

Technical background

To have Remote Console on VRM working, your web browser and the GX Device need to have a connection between them. This connection is designed such that it doesn't need any special configuration or opening up of firewalls in almost all situations. The 0.1% of situations where it doesn't work out of the box are, for example, large corporate networks with special security, or long range expensive satellite or radio supported networks, such as seen in rural areas of Africa and other

remote areas.

When Remote Console on VRM is enabled, the GX Device will open and maintain a connection to any of the servers pointed to by supporthosts.victronenergy.com. Which currently resolves to two IP addresses (84.22.107.120 and 84.22.108.49), and likely more in the future. The technology used is ssh, and it will try to connect using port 22, 80 and 443, only one of them needs to work. The reason for it to try all three is that on most networks one of them will be allowed by the local firewall.

Once connected to one the the supporthost servers, that reverse ssh tunnel is waiting to be connected from someone needing the connection. Which can be your browser, or a Victron engineer since this same technology is used for the Remote Support functionality; for more information see above.

When using Remote Console on VRM, the browser will connect to either vncrelay.victronenergy.com, or vncrelay2.victronenergy.com, using websockets on port 443.

For more details of used connections by the GX Device, see Q15 of the FAQ.

6. Marine MFD integration by App

6.1 Introduction & requirements

A Glass Bridge is a MFD (Multi-Functional Display) that integrates a boat's systems and navigation status into a large screen or screens at the helm of the vessel, so doing away with multiple gauges, brackets and wiring complications.
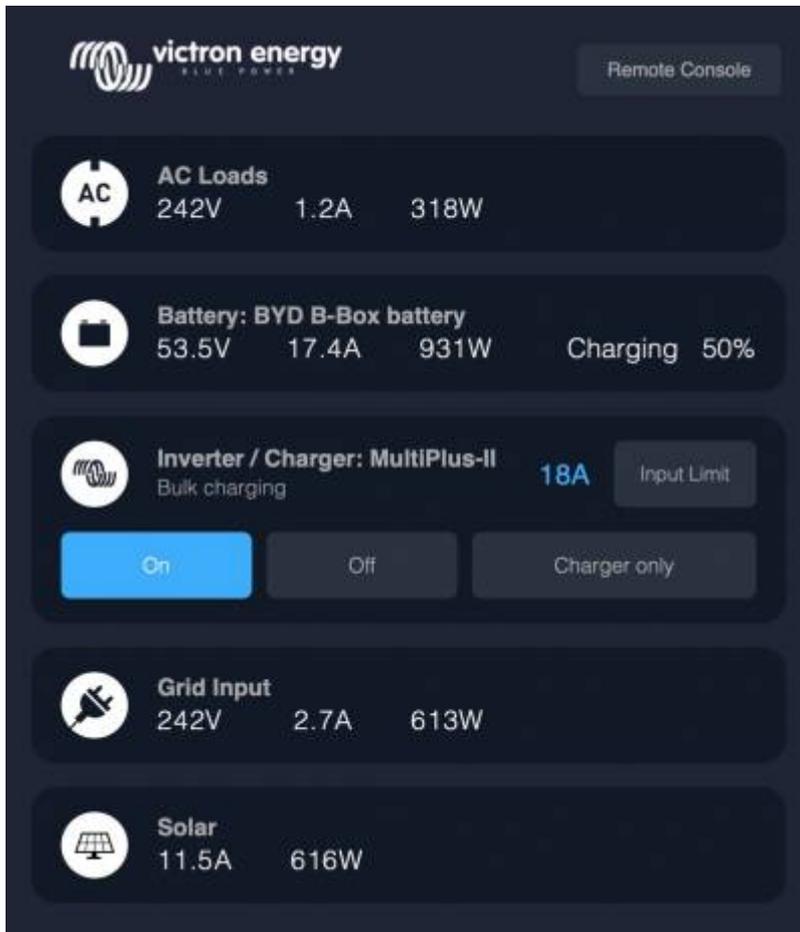
Functionalities:

- Monitor shore power and generator status.
- Monitor battery status for one or more batteries. By using the voltage of for example battery chargers, it can also visualise secondary batteries such as Generator starter batteries.
- Monitor the power conversion equipment: chargers, inverters, inverter/chargers.
- Monitor solar production from an MPPT Solar Charger.
- Monitor AC loads, and DC loads.
- Control shore power input current limit.
- Control the inverter/charger: switch it off, on, or set it to charger-only.
- Optionally open the Victron Remote Console panel; allowing access to further parameters.

Victron equipment compatibility:

- All Victron inverter/chargers: From a 500VA single phase device up to a large 180kVA three phase-system, including Multis, Quattros, 230VAC and 120VAC models.
- Battery Monitors: BMV-700, BMV-702, BMV-712 and newer, Lynx Shunt VE.Can, Lynx Ion BMS.
- All Victron MPPT Solar Charge Controllers

Required components:

- Battery system.
- Victron inverter/charger.
- Victron Battery monitor.
- Network cable connection between MFD and a GX device such as a Color Control GX, Venus GX or an Octo GX.
- UTP network cable.

6.2 Compatible MFDs and instructions

- Instructions for Garmin MFDs
- Instructions for Navico MFDs (Simrad, B&D, Lowrance)
- Instructions for Raymarine

Furuno: support on Furuno MFDs is in the pipeline. There is no expected date of availability.

7. Marine MFD integration by NMEA 2000

Since Venus OS v2.40, our GX Devices feature an NMEA 2000-out function. This section will be expanded later, for now read the v2.40 blogpost.

Use our VE.Can to NMEA2000 micro-C male cable to connect the GX Device to the NMEA 2000 network, hereafter referred to as N2K for brevity.

Compared to the integration using the App, as explained in the previous chapter, integration via N2K offers a more customisable configuration. This being at the cost of more hassle in doing such configuration, as well as making sure all PGNs and fields therein are supported and compatible between the Victron system and the MFD.

Supported devices / PGNs

Inverter/chargers

Includes Multis, Quattros, Multiplus-IIs, and so forth.

Data is transmitted out; and its possible to set shore current as well as switch the inverter charger on,

off, inverter only and charger only.

Inverters

Only VE.Bus type inverters are supported: any Inverter connected using VE.Direct is not (yet) made available on the N2K bus.

Battery monitors

Supported. This includes any battery monitor as supported by the GX Device.

Other data and product types

Not supported. Above are the only now supported types. For example tank levels are not yet transmitted out on N2K, nor is any data from a charger (such as the Phoenix Smart Charger

connected via VE.Direct), and nor is data from solar chargers.

8 Error Codes

Different origins of errors

On your GX device, some error codes shown will be from the GX device itself, in that case see below list. But since its the system control panel, it also shows error codes from the connected devices.

- Multi and Quattro inverter/chargers: VE.Bus Error Codes
- MPPT Solar Chargers: MPPT Solar Charger Error Codes

GX Error #47 - Data partition issue

The internal storage in the GX Device is most likely broken: causing it to loose its configuration.

GX Error #48 - DVCC with incompatible firmware

This error is raised when the DVCC feature is enabled whilst not all devices in the system are updated to recent enough firmware. More information about DVCC and minimal required firmware versions in chapter 4 of this manual.

Note for systems with BYD, MG Energy Systems, and Victron Lynx Ion BMS batteries:

Since Venus OS v2.40, released in December 2019, the DVCC feature is automatically switched on in case the systems detects one of mentioned battery/BMS types connected. And it is not possible to switch DVCC off in that case.

This creates an issue for systems installed and commissioned a long time ago, from before DVCC was available and later due to mandatory work for such systems.

The solution is to:

1. Disable automatic updates; Settings → Firmware → Online updates.
2. Roll back to v2.33; See Settings, Firmware and then Stored backup firmware.
3. Make sure that DVCC is disabled again.

Please do consult your installer, to check if the battery system is managed with two wire control (no DVCC needed) or not:

In case there is no charge- and discharge- wiring between BMS, inverter/chargers and charge controllers, then DVCC is required for the above mentioned battery brands, and this also has certain minimum firmware requirements for connected Inverter/Chargers and Solar Charge Controllers.

Whats new since Venus OS v2.40 is (a) that it automatically enables DVCC when it sees the above mentioned battery types, and (b) that when DVCC is enabled, it checks the connected devices for the

minimum firmware, and raises Error #48 in case the firmware of one or more connected devices is too old.

9 More information resources

Training Video

- CCGX Basic Training Video and Exam
- CCGX Frequently asked questions
- CCGX Firmware upgrade to v2.00 or later
- CCGX Manually updating firmware
- CCGX Datasheet
- GX - Generator start/stop
- GX - Fischer Panda generators
- GX GSM
- VRM Portal - manual
- VRM Portal - Remote VEConfigure and remote firmware updates
- Venus OS - Beta testing
- Open source

GX ModbusTCP Manual

1. Introduction

ModbusTCP is a feature on our GX devices eg Color Control GX, and also the Venus GX.

ModbusTCP is an industry standard protocol, that can be used to interface PLCs or other third party equipment with Victron products. Through the ModbusTCP interface you can read and write date to the chargers, battery monitors, inverter/chargers and other products connected to the GX device.

Besides reading this GX ModbusTCP Manual, make sure to also read the ModbusTCP section in our Data communication whitepaper.

By default, ModbusTCP is disabled. To enable it, go into the settings menu, scroll down to 'Services', and then enable the ModbusTCP service.

2. Addressing, Unit-ID and Registers

2.1 Definitions

The ModbusTCP protocol has two fields for addressing. There is the Unit-id, also referred to as Address, Station address or Slave-address in some PLC software. And the other field is the Register address.

- The **Unit-ID** is the device-selector: it tells the GX Device which connected device (ie. which charger, inverter, or battery-monitor) you want to read, or write from. The GX Device then acts as a ModbusTCP gateway.
- The **Register Address** then determines the parameter to read or write: ie. voltage, or current, and so forth.

2.2 Unit-IDs

To see a list of available devices, and their Address, go to Settings → Services → Modbus/TCP → Available services:
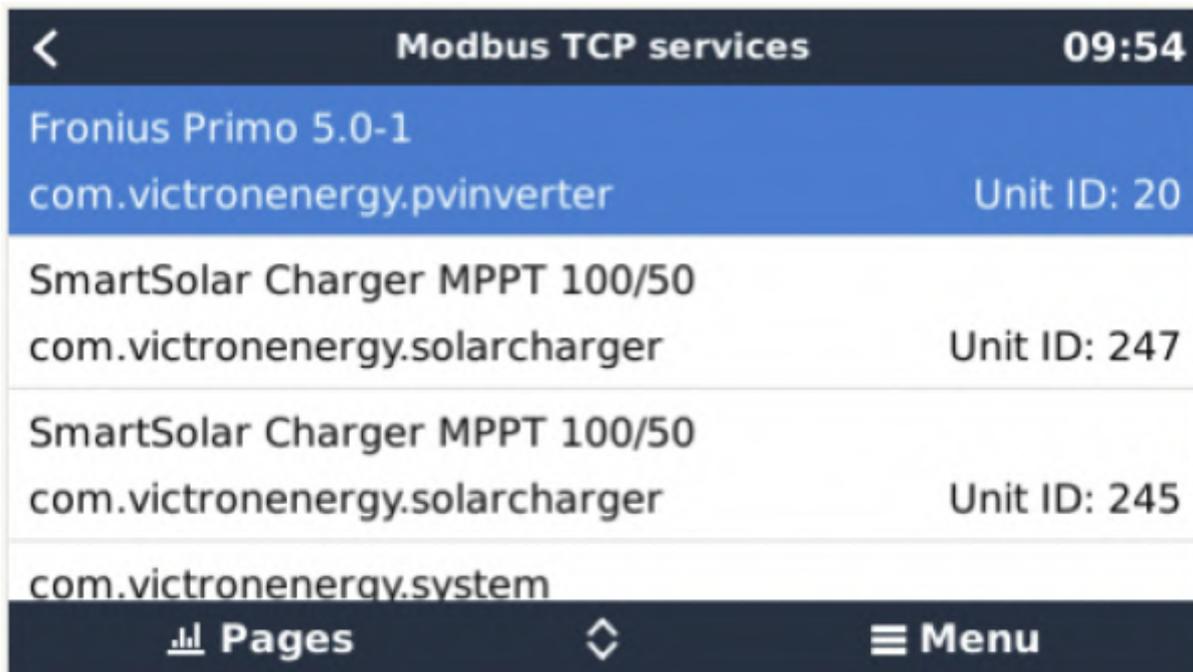
Additionally this information is also documented on the 'Unit ID mapping' tab in the Modbus-TCP excel sheet.

For the overall system data, look for com.victronenergy.system in the excel sheet, and use Unit-ID 100.

Note that both Unit-ID 0 and Unit-ID 100 map to the same internal address. We recommend to use ID 100, since many ModbusTCP clients and PLCs do not work with ID 0.

2.3 Register addresses

The list of available registers is in an Excel sheet, available for download on the Whitepapers section on our website.

Besides registers for connected Chargers, Inverters, and other products, there is also a set of registers that represent the entire system: com.victronenergy.system. This service is also where the *System Overview* pages in the GUI, and the VRM Dashboard get their data.

Note that not all list registers are available for each device. For example a BMV Battery Monitor has lots of readings: historical data such as maximum/minimum, for example. A canbus-connected lithium battery might not have all those parameters available. There is no information available on what type of product has what data available.

Use this table to map the definition in the 'dbus-service-name' in the Excel sheet to a product type:

Device class	Product types	Registers
com.victronenergy.vebus	Inverters (VE.Bus), Multis, and Quattros	3 to 60
com.victronenergy.solarcharger	Solar chargers (both VE.Can and VE.Direct connected)	771 to 790
com.victronenergy.pvinverter	Grid-tie PV Inverters (Fronius, or Energy Meter)	1026 to 1039
com.victronenergy.battery	BMVs, CAN-Bus BMS connected batteries Extra parameter set for Lynx Ion and Lynx BMS product family	259 to 319 1282 to 1301

Device class	Product types	Registers
com.victronenergy.charger	Skylla-i and Skylla-IP44	2307 to 2322
com.victronenergy.inverter	Inverters (with a VE.Direct connection)	3100 to 3128
com.victronenergy.tank	Tank levels	3000 to 3005
com.victronenergy.grid	Energy meters configured to measure the grid	2600 to 2609
com.victronenergy.gps	GPS	2800 to 2807
com.victronenergy.tank	Tank sensors	3000 to 3007
com.victronenergy.genset	Generators	3200 to 3223
com.victronenergy.temperature	Temperature sensors [1]	3300 to 3305
com.victronenery.meteo	IMT solar irradiation sensors	3600 to 3603

(1): These are the auxiliary temperature sensors built-in to our GX devices, such as the Venus GX. For details, see the GX devices datasheet. Battery temperatures as measured by an Inverter/charger, Charger or Solar Charger are available together with the rest of that device's data, not under com.victronenergy.temperature.

3. Supported ModbusTCP function codes

The supported function codes are:

- ReadHoldingRegisters = 3
- ReadInputRegisters = 4
- WriteSingleRegister = 6
- WriteMultipleRegisters = 16

Note that there is no difference between function code 3 and 4.

5. Mapping example

The purpose of this example is to show how to interpret the information in the worksheets of the excel sheet containing the modbustcp mapping. This excel sheet is available for download from our website on the Color Control page.

To request the input voltage of a Multi or Quattro, connected to the VE.Bus sockets on the CCGX, use the following settings: Unit-ID 246, and set the data address of the first request register to 3.

The ModbusTCP reply will contain 2302. Divide it by 10, as specified in cell E3, and then you have the voltage: 230.2 Volts AC.

6. Error codes and trouble shooting

6.1 The common cause: Unit-ID / Register combination

In case a certain read or write is not successful, most likely there is an issue in the unitid/registerid combination.

Besides double checking the mapping, there are two ways to see where the error lies. One is to check the last error as shown in the GX Device menus. And secondly you can look at the error code as is visible on (most but not all) PLCs. See the two sections below for details.

6.2 Looking up the last ModbusTCP Error on the GX Device

To see why a certain register is not available, use the Settings → Services → ModbusTCP menu. It shows the last error, and reason for that error.
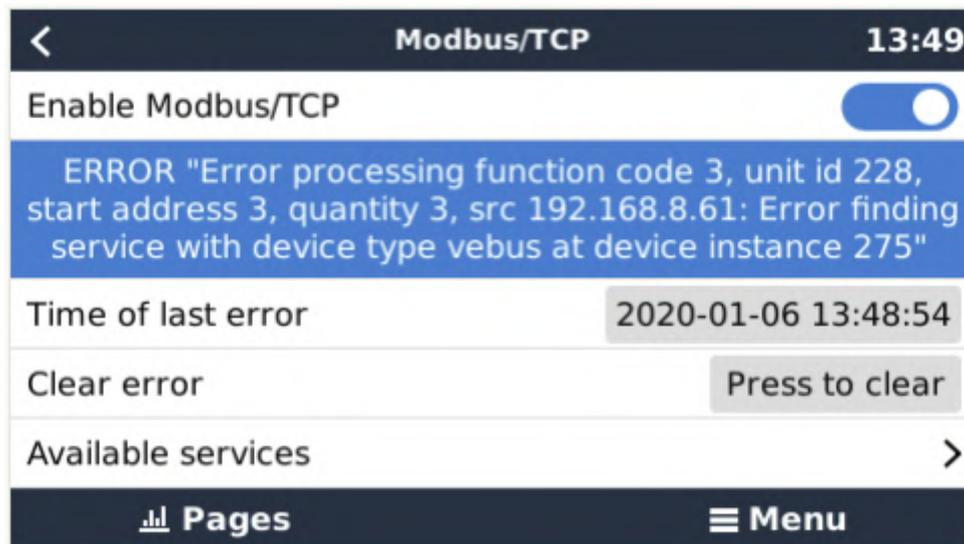
6.3 Error codes

These error codes are returned by our software to the PLC; and most PLC software tools allow seeing them.

Code	Name	Description
0x01	IllegalFunction	The requested function is not supported.
0x02	IllegalDataAddress	The requested Unit-ID is available, but one or more of the requested register(s) does not exist.
0x03	IllegalDataValue	The requested quantity of registers is invalid. See the modbus specs, for the limits per function code.
0x0A	GatewayPathUnavailable	The requested Unit-ID is defined in the mapping list, but there is no device found on the mapped port. Double check the Unit-ID mapping list in the excel sheet, and make sure that the device is properly connected to the CCGX, switched on, and that its data is available on the CCGX display.
0x0B	GatewayTargetDeviceFailedToRespond	Requested Unit-ID not found in the mapping list. Double check the Unit-ID mapping list in the excel sheet.

7. Support

The recommended method for report on ModbusTCP questions is to use the Modifications section on Victron Community. Its frequently visited by many people using ModbusTCP and other methods of integrating with Victron products.

Direct company support is only offered on a limited basis. For such support, contact our Victron representative.

8. FAQ

Q1: Which products can be interfaced via Modbus TCP?

All products that can be connected to the Color Control GX.

Q2: Can I change a configuration setting in a Multi - for example: the absorption voltage?

No.

Q3: Can I request multiple registers at the same time?

Yes, you can! Though make sure not to include non existing registers in your query. Querying register 1 to 100 for example will not work, since registers 1 and 2 do not exist.

Q4: Can I implement more features myself?

Yes, you can! We are, slowly, making the Color Control code open source, and the Modbus-TCP sources are already available on https://github.com/victronenergy.

Q5: In a parallel or three-phase system, how can I address a single unit?

You cannot interface with them individually if they are configured for parallel-working; or as a three-phase system. Neither is it necessary to address units individually as ModbusTCP provides system-totals as well as 'per phase' information.

Q6: Will unit-id's change after a reboot or loss of power?

No.

Q7: Advanced debugging

If all unit-id's and register-addresses have been checked and re-checked, and still the connection doesn't work, you could try looking at the modbustcp log file on the GX device.

Follow these steps:

1. Obtain root access
2. Login with SSH (use for example Putty in Windows - or simply type *ssh root@[ip address here]* on a Linux or Mac terminal console.

3. List the latest log file:
   ```
   cat /log/dbus-modbustcp/current | tai64nlocal
   ```

In case of any errors, the output will look like this:

```
2016-01-08 16:34:24.658248500  INFO 2016-01-08T16:34:24.657 [Server] New
connecion:  "141.138.140.60:41792"
2016-01-08 16:34:24.695846500 ERROR 2016-01-08T16:34:24.689 "Error
processing function code 3, unit id 247, start address 258, quantity 42 :"
"Unit id is available, but start address does not exist"
2016-01-08 16:34:24.753921500  INFO 2016-01-08T16:34:24.753 [Server]
Disconnected:  "141.138.140.60:41792"
```

In most cases the problem will be found in either the unit's id address; or the register addresses. Double check the numbers shown in the output with the numbers as used in your modbustcp software or PLC.

Q8: Does Modbus TCP support ESS?

Yes. See the ESS mode 2 and 3 manual for more details.

How to update a GX device

These instructions apply to all GX Devices, such as the Color Control GX (CCGX) and Venus GX (VGX).

1. Changelog

The change log is available in Victron Professional.

2. Using the right procedure (CCGX only)

Depending on the installed firmware version, the update procedure differs.

Running firmware version v1.74 or earlier? An upgrade is needed. Follow the upgrade procedure to v2.

Otherwise follow instructions below.

3. Via internet or with microSD-card/USB-stick
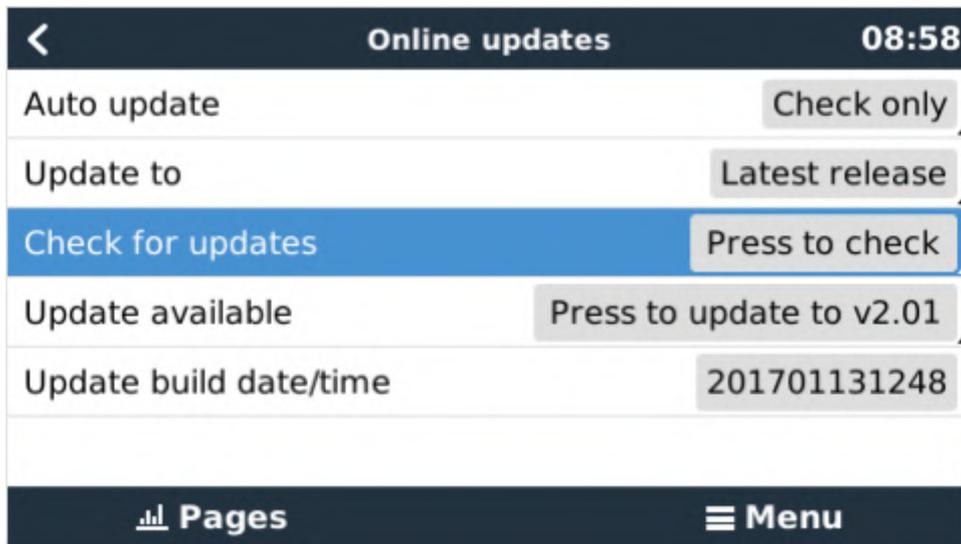
There are two ways to update the firmware:

1. Update it via the internet, either manually or let it check for new updates every day
2. Update it from a microSD-card or USB-stick

3.1 Direct download from the internet

To update from the internet, navigate to: **Settings→ Firmware→Online updates.**
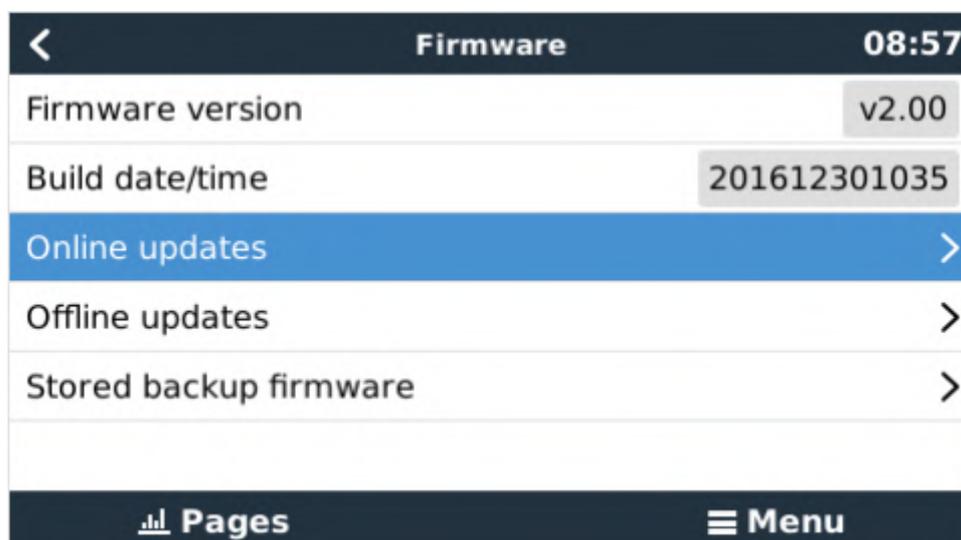
3.2 MicroSD-card or USB-stick

Updating with a microSD-card or USB-stick is called 'Offline updating'. Use it when updating a device that is not connected to the internet.

Step 1. Download

Get the latest swu file:

- Color Control GX: venus-swu.ccgx.swu
- Venus GX & Octo GX: venus-swu-beaglebone.swu
- GX Card in the MultiPlus-II or EasySolar GX: venus-swu-nanopi.swu
- CANvu GX: venus-swu-canvu500.swu

Note that the same files, and the change log, is available on Victron Professional. That also features a dropbox connection, so you can always have the latest file available on your laptop.

Step 2. Install on an sdcard or usb stick

Store the file in the root folder of a USB-stick or microSD-card.

Step 3. Insert the device

Note that you will see a warning "Not using media for storing logs". That warning can safely be ignored.
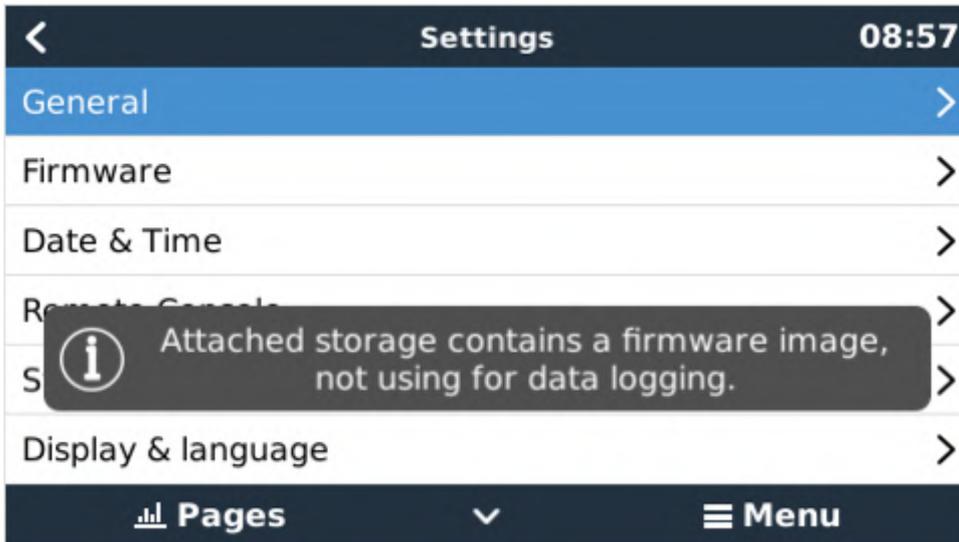
Step 4. Initiate the update

- Navigate to **Settings → Firmware → Offline updates.**
- Press Check for updates
- If the firmware in the microSD-card or USB-stick is newer than the running one, "Update available" item will appear, press it to start the update process.

Open source

Victron Energy has committed itself to make certain of its projects open source. On this page you'll find more information about available sources and projects.

Below some of our own projects, you'll also find a list of other people's open source projects that work with Victron equipment. See bottom of this page.

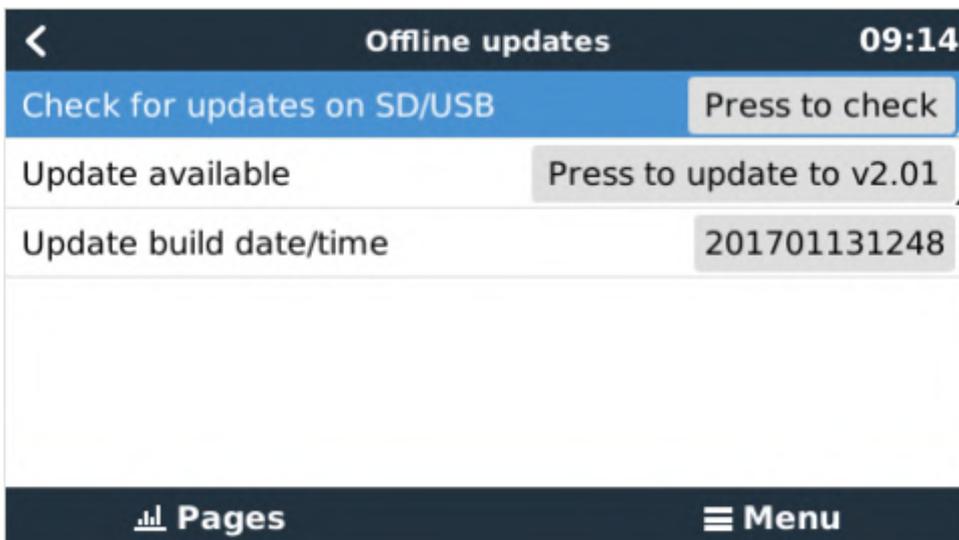Note that all this information is made available as is, for free, without any warranty and we do not commit to giving support. Although ofcourse we like to help out where possible.

Looking for Victron protocol documentation? Read our Data communication whitepaper as well.

Also, see our Modifications forum.

1. Venus OS: the software on our GX product range and also for the Raspberry Pi

Venus OS is the Victron Energy Unix like distro with a linux kernel. Its the software that runs on our of our GX Product range: central and remote monitoring systems.

While being a very successful project for us in its standard configuration, the Venus OS, and compatible hardware platforms can also be the perfect platform for many other projects. Such as:

- Add drivers for certain products, if interesting enough we will add transmission and readout of that data on the VRM Portal. Adding generators readout and start/stop, and also temperature sensors for example would be very interesting!
- Add logic on the product, for example to control the relay, or do other things.

Full information about Venus OS; and compatible hardware as well as how to install on a Raspberry P

1.1 Dockerised Influx database & Grafana dashboard for Venus OS / GX Devices

2. VRM Portal (https://vrm.victronenergy.com/)

While in itself not being an open source project, the VRM Portal database can be queried using the VRM JSON REST API.

Also, you can interface to the GX product range using MQTT, see the dbus-mqtt readme for more information.

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3. Signal K

Signal K is a modern and open data format for marine use. Built on standard web technologies including JSON, WebSockets and HTTP, Signal K provides a method for sharing information independently of the underlying communications protocol (e.g. NMEA0183, NMEA2000, SeaTalk, I2C, 1-Wire, ZigBee, etc) in a way that is friendly to WiFi, cellphones, tablets, and the Internet.

4. Other Victron related open source projects

Many, many people all over the world are writing code to integrate Victron products and protocols into their systems. Below a list of public projects, aiming to help each other.

Tip: make sure to search for 'Victron' on Github and other open source hubs, or for 'Victron git' in Google. That is how I found below links 😃.

Want to list your project here? Please go ahead and change this page yourself! See Login on upper right.

4.1 Multis / Quattros / MK2

- : A primitive HTTP based monitor for a Victron Multiplus inverter. Uses as a data source.

  Fabien Fleutot made a monitoring system for his beautiful old Belgian barge called Elorn
-
    - Github source for controlling Victron BMV and inverters on a raspberry pi.
    - Blog, with posts outlining all the details of the project

- Michel Kuenemann transformed his house, using 1 X RPi B and 4 X LPC1769 Cortex M3 :
    - MyPV 2 minute presentation video
    - MyPV website (Raspberry pi hosted)
    - Project description
    - Source code

- Python library for MK2 (Izak Burger)
- EMDO can do! Energy manager to increase self-consumption quote, switch loads when energy is available. Programmable over BASIC interpreter (MM-BASIC).
    - EMDO101 on kickstarter,swissEmbedded GmbH

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- ○ Open Source BASIC programs on github

want to list your project here? Please go ahead and change this page yourself!

4.2 VE.Direct (MPPT Solar Chargers and BMV Battery Monitors)

Arduino:

- Victron on Arduino - Caravaners Forum
- VE.Direct reading library for Arduino

Other:

- Use VE.Direct compatible Victron equipment with EMON (Open Energy Monitor)

- PvMonit : small real-time web interface and export to emonCMS for history (Brick from OpenEnergyMonitor)
  - ○ PvMonit now knows how to exploit the solar surplus when you are not using it with the "home automation" module

FAQ

Q1. Why is the Bluetooth API not public?

Making the bluetooth API an official public one would mean that we can't change it as simply as we can today; and also it means that we'll get questions about it: bluetooth is not simple. Far more

complicated than a serial port.

And then only our developers will be able to answer them: taking away development resources. Hence we chose to not make the Bluetooth API public.

VE Power Setup manual

1. Introduction

VE Power Setup is a Windows application that can be used for three things:

1. Update the firmware of a VE.Can product connected via USB to your computer (requires a CANUSB adapter, ASS030532000)
2. (deprecated) Remotely updating firmware of a VE.Can product (requires an internet connected GX device). Use the new mechanism instead.
3. (deprecated) Remotely changing the configuration of VE.Bus system: Remote VEConfigure (requires an internet connected GX device). Use the new new mechanism instead.

Note that even for updating a VE.Can product via USB (first option in above list), its easier to not use VE Power Setup. Instead, use the remote firmware update feature (second option in above list) instead. Its then not necessary to obtain the CANUSB adapter. In conclusion, the only reason to use VE Power Setup is when there is no GX device and no internet available.

Products which can be firmware updated via its VE.Can port are:

- BlueSolar Charger 150/70 CAN-bus
- BlueSolar Charger 150/85 CAN-bus
- All SmartSolar Chargers with VE.Can
- Lynx Shunt VE.Can
- All four Skylla-i Battery Chargers
- Skylla-i Remote Control Panel
- Skylla-IP44
- All our different VE.Can to VE.Bus/VE.Direct and NMEA2000 to VE.Bus/VE.Direct interfaces
- Ion Control

Products that cannot be updated via their VE.Can port are:

- Lynx Ion (update via USB port instead)
- Lynx Ion + Shunt (update via USB port instead)
- VE.Can tank sender adapter (no updates available)
- Color Control GX (update via internet or with an sdcard)
- Venus GX (update via internet or with an sdcard)

Notes:

- Remotely updating firmware in VE.Bus products (Inverters, Multis and Quattros) is not possible and will also not become possible.
- Remotely changing settings is only possible for VE.Bus products.
- Since VE Power Setup version 5.0, the product configuration is preserved during a firmware update. More information in our blogpost about the v5.0 software release.
- Looking for Remote VEConfigure with a "Victron Global Remote 2 (VGR2)"? See. here

2. Updating a VE.Can product via USB

2.1 VE.Can USB update: Instructions

1. Download and install VE Power Setup from our Software downloads page.
2. Obtain the necessary firmware file on the Victron Professional portal.
3. Connect the VE.Can product to the computer, using the CAN-USB Adapter.
4. Follow instructions in VE Power Setup.

3.2 VE.Can USB update: Troubleshooting

Check the information behind the `Need help connecting?` button in VE Power Setup.

3. Remote VE.Can firmware update (DEPRECATED)

Note that this feature is deprecated; and only works for GX devices running old firmware. Instead of following the remote firmware procedure as documented on this page, we recommend to update the GX Device to the latest available firmware version, and then use the procedures documented here.

3.1 Instructions

1. Download and install VE Power Setup from our Software downloads page.
2. Obtain the necessary firmware file on the Victron Professional portal]].
3. Follow the Two-way communication checklist.
4. Start VE Power Setup
5. Click "Connected to a Color Control on VRM", and enter your VRM login credentials
6. Choose the required installation. Sites on which you have Admin-rights and that have two-way-communication enabled will be highlighted in blue:

7. After selecting the site, VE Power Setup will establish communication to the selected site.
8. Once established, it will perform a remote scan, to find all products connected to the Color Control.

3.2 Troubleshooting

1. Check the Two-way communication instructions.

4. Remote VEConfigure (DEPRECATED)

Note that this feature is deprecated; and only works for GX devices running v2.16 or earlier. To remotely configure inverter/chargers in system with GX devices running Venus OS v2.17 or later, see the functionality, as documented here: VRM Remote VEConfigure.

4.1 Requirements

- Remote VEConfigure works for both single unit systems as parallel and three phase systems.
- Remotely changing Assistant configuration is possible.
- VE.Bus firmware versions 416 and 417 can not be configured remotely
- Remote configuring firmware version 418 or later requires the CCGX or Venus GX to run v2.10 or later
- The firmware version of the VE.Bus system must stay the same, in between downloading, changing and uploading settings.

**Using a VE.Bus to VE.Can interface?**

If the VE.Bus device is connected to the CCGX via a VE.Bus to VE.Can interface, as was often the case in a Hub-1 system, this interface cable needs to run firmware version v2.05 or higher. Note that it is possible to first update the firmware in the interface cable, and then remotely configure the VE.Bus system.

4.2 Instructions

1. Download and install VE Power Setup from our Software downloads page.
2. Obtain the necessary firmware file on the Victron Professional portal]].
3. Follow the Two-way communication checklist.
4. Start VE Power Setup
5. Click "Connected to a Color Control on VRM", and enter your VRM login credentials
6. Choose the required installation. Sites on which you have Admin-rights and that have two-way-communication enabled will be highlighted in blue:


7. After selecting the site, VE Power Setup will establish communication to the selected site.
8. Once established, it will perform a remote scan, to find all products connected to the Color Control.
9. Now select the product you want to configure:
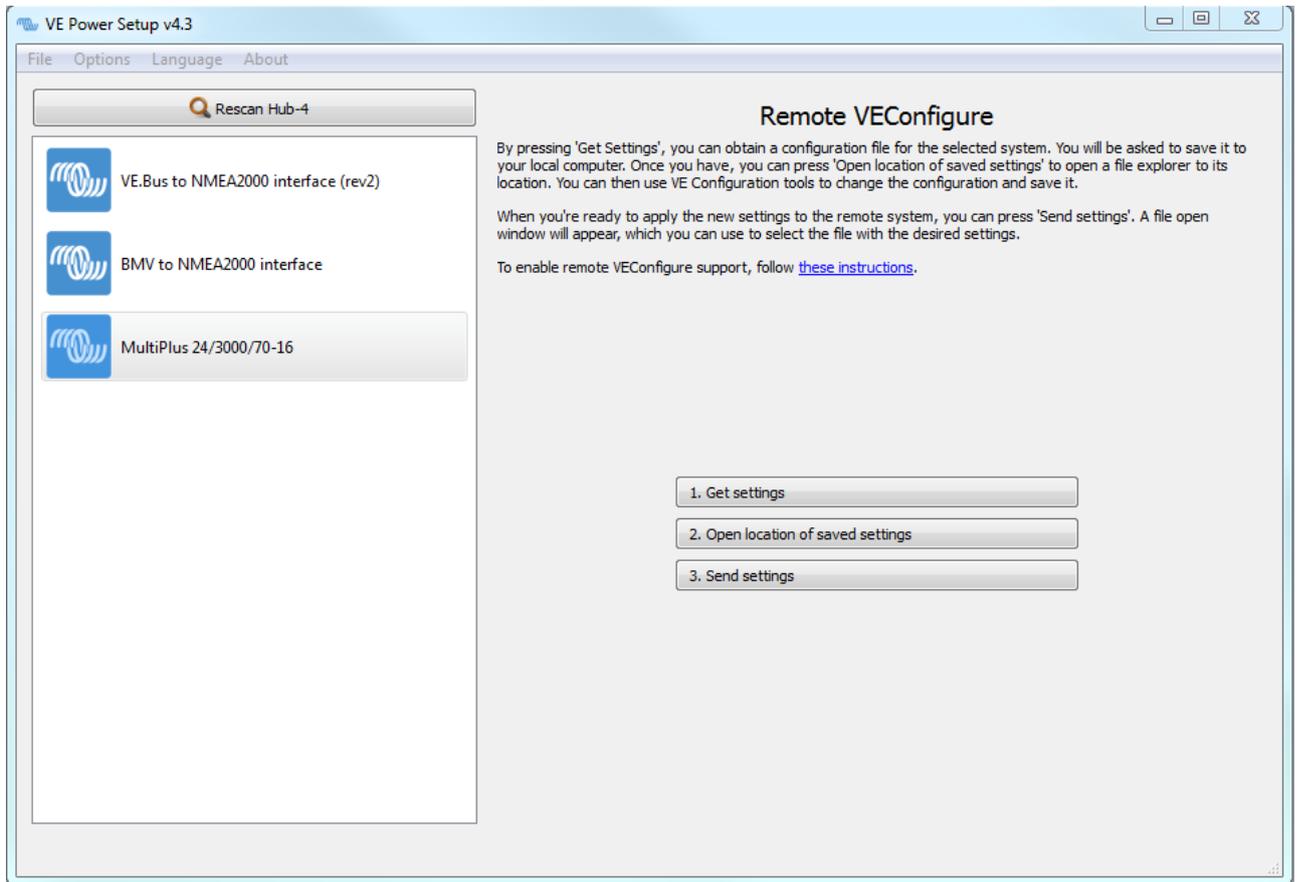
10. Choose "Get settings".
11. Save the settings file with an appropriate name.
12. Choose "Open location of saved settings".
13. Double click on the settings file. Depending on the system configuration "VE.Bus System Configurator" or "VEConfig" will open.
14. Make the required changes.
15. Close the configuration tool. The settings file will automatically be saved.
16. Go back to VE Power Setup, and choose "Send Settings".
17. Select the modified setting file and wait until done.

4.3 Inverter restart - short loss of AC power

Changing certain settings, such as Assistants, will cause the inverter/charger to momentarily switch off and back on again. In such situations, VEConfig will warn when saving the settings:
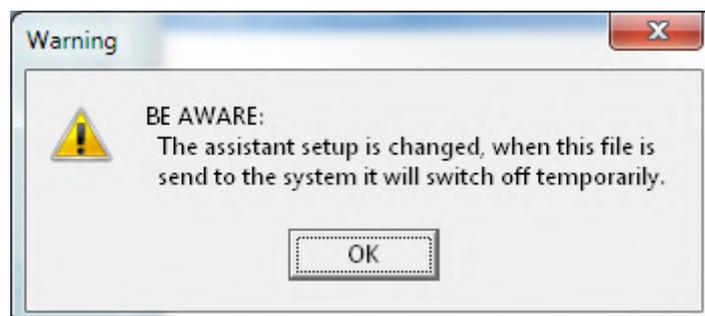
There will be no AC power available during the restart, so in many cases there will also be no internet connection for a short while. This is not a problem, as the file is first sent to the ccgx in full before its written to the unit.

So even though the unit restarts, the writing process should not be effected. It important that the router starts itself when the AC power returns of course.

And it is important that the CCGX (or Venus GX) is powered from DC: it should not lose power during this process.

4.4 Troubleshooting

Problem in the communication link between your computer and the Remote [[venus-os:start|GX device]].

Check the Two-way communication instructions.

Error, remote Color Control gave VEConfig error code 30: MK2 communication error

Verify that both the firmware of the VE.Bus system and the GX device comply to the requirements for Remote VEConfigure.

5. Two-way communication (DEPRECATED)

The information in this chapter describes deprecated functionality. For both remote firmware updates and Remote VEConfigure, we recommend to update the GX device to the latest version, and then use the new functionality:

- VRM: Remote firmware update
- VRM: Remote VEConfigure

(old text continues)

Two-way communication is the name of the technology used for the communication link between your computer and the GX device during Remote Firmware updates and Remote VEConfigure.

5.1 Configuration

1. Use the latest version of the VE Configuration Tools for VE.Bus products.
2. Use the latest version of VE Power Setup.
3. Check that the GX device runs the latest available firmware.
4. Enable Two-way communication on the GX device.
5. Make sure to have Full Control access on the installation: On the VRM Portal, navigate to the site, then to the Settings tab, and click Users. Your login needs to highlight in green and show Full Control.
6. CCGX must be connected to internet, and Two-way communication must show as up in the Device list on the VRM Portal.

This screenshot shows the Device list on the VRM Portal. See GX device firmware version, as well as

Two-way communication status encircled in red:
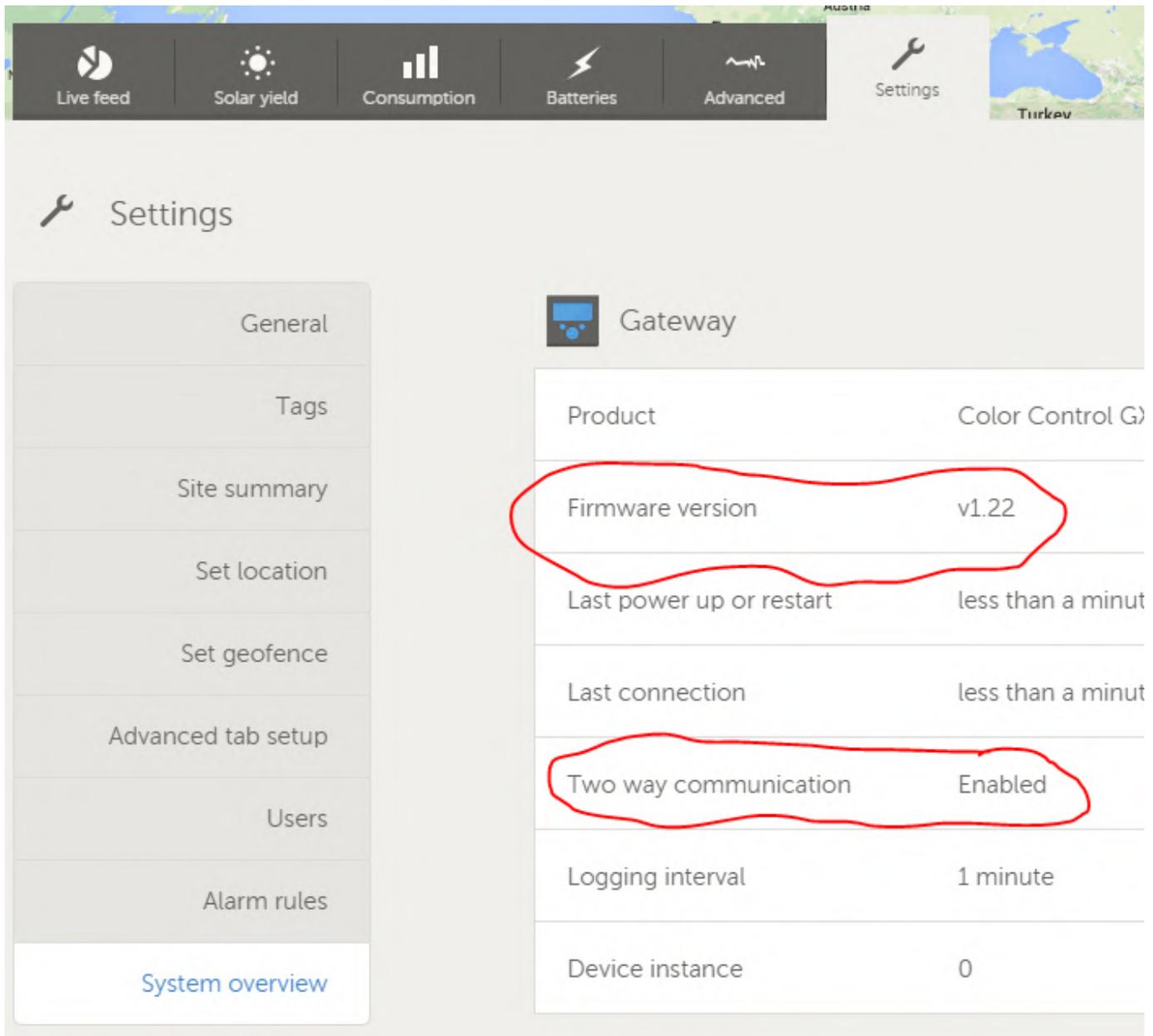
5.2 Two way communication: Troubleshooting

As a first step, carefully go through above steps of configuring Two-way communication.

Error "VRM API not responding"

This error indicates a network or firewall issue between the computer running VE Power Setup and the backend.

There might be a firewall blocking access to it. Your network might also require all traffic to go through a HTTP(s) proxy, which VE Power Setup does not support. Confer with your network administrator if this is the case.

Error "Problem communicating with two-way communication relay server"

This indicates a problem between your current location and the two-way communication relay server.

The relay server, `https://pubsub.pubnub.com/`, is used to connect to the Color Control, despite it being behind a firewall. Access to it from your current location might be blocked by a firewall, or your network requires communication to go through a HTTP(s) proxy, which VE Power Setup does not support. Confer with your network administrator if this is the case.

Windows XP

VE Power Setup runs on Windows XP, but you may have to perform a few manual steps.

- Because Windows XP is no longer maintained by Microsoft, some installations don't have the proper SSL CA certificates installed, so you may need to install them as outlined by the Global Sign website. Power Setup needs the following:
    - digicert1.crt
    - digicert2.crt
    - digicert3.crt
    - starfield.crt
- If you get a crash right at start up, you need to install the Microsoft Visual C 2008 redistributable.

Victron GX product range

Introduction

GX products are Victron's state-of-the-art monitoring solution. The family consists of the different GX products, and their accessories.

The GX-device lies at the heart of the system - providing monitoring, and operating as the communication-centre of your installation. All the other system-components - such as inverter/chargers, solar chargers, and batteries - are connected to it. Monitoring can be carried out locally and remotely - via our free-to-use Victron Remote Management portal (VRM). The GX-device also provides Remote firmware updates and allows inverter/charger settings to be changed remotely.

The GX Family consists of these models:

- Cerbo GX - Our newly released GX product.
- Color Control GX - Our first released GX product, the CCGX has a display and buttons.
- Venus GX - The Venus GX has more analog and digital IO, no LCD and is more cost effective than the CCGX.
- CANvu GX - The CANvu GX is best for harsh environments - when its IP67 rating and touch LCD is a must.
- Octo GX - The Octo GX is particularly suited to medium size installations which have many MPPT Solar Chargers, as it has 10 VE.Direct ports.
- Maxi GX - Compared to the other GX devices, the Maxi GX has most CPU power and most VE.Direct ports: 25. This is the GX device to use for large systems with many VE.Direct MPPT Solar Chargers.

Lastly, there is a GX device built into our MultiPlus-II GX and EasySolar-II GX Inverter/chargers.

Available accessories

- GX Touch 50 - Touch screen display accessory for the Cerbo GX
- GX GSM - A cellular modem. It connects to GX device via USB, and takes a simcard
- WiFi USB sticks
- Energy Meters - Measures PV Inverter Output where PV Inverters cannot be read-out directly. Also used as a grid meter in an Energy Storage System (ESS).
- VE.Can resistive tank sender adapter Allows a standard resistive tank-level sender to be connected to the GX device.

Comparison table

User interface	Cerbo GX	CCGX	Venus GX	Octo GX	CANvu GX	Maxi GX	MultiPlus-II GX and EasySolar-II GX
Appearance							
Display	GX Touch 50 optional touch display [16]	LCD Display & 7 buttons	no display	no display	4.3" touch-screen	2×16 character display	
Remote Console	yes						
Buzzer	yes	yes	yes	no	yes	no	

Documentation	Cerbo GX	CCGX	Venus GX	Octo GX	CANvu GX	Maxi GX	MultiPlus-II GX and EasySolar-II GX
Manual	Cerbo GX manual	CCGX manual	VGX manual	OGX manual	CANvu manual	Maxi GX manual	MultiPlus-II GX manual
Product detail page	page	page	page	page	page	page	page

Victron comm. ports	Cerbo GX	CCGX	Venus GX	Octo GX	CANvu GX[12]	Maxi GX	MultiPlus-II GX and EasySolar-II GX
VE.Direct ports (always isolated)	3 [1]	2 [1]		10 [1]	3 [1]	25	1
VE.Bus (always isolated)	2 paralleled RJ45 sockets					1 RJ45 socket	2 paralleled RJ45 sockets
VE.Can	yes - non isolated	2 paralleled RJ45 sockets – isolated				no [14]	

Communication	Cerbo GX	CCGX	Venus GX	Octo GX	CANvu GX	Maxi GX	MultiPlus-II GX and EasySolar-II GX
USB	3 USB Host ports	2 USB Host ports		1 USB Host port			
Ethernet	10/100 RJ45 socket - isolated except shield				1 port. isolation?[12]	10/100 RJ45 socket	
WiFi	built-in	optional [2]	built-in, but see [3]	built-in, external antenna [11]	optional [2]	no	built-in
Bluetooth Smart	yes [17]	no					
Micro SDcard slot	SDHC cards up to max. of 32GB. [5]				no	yes	no
Second CAN-bus port (also features BMS-Can [18])	no	no	yes - non-isolated	yes - non-isolated	no	no	no
BMS-Can port [15]	yes	no				yes [14]	
Built-in RS485	no	no	no	yes - non-isolated	no		no

IO	Cerbo GX	CCGX	Venus GX	Octo GX	CANvu GX[12]	Maxi GX	MultiPlus-II GX and EasySolar-II GX
Programmable relay [7]	2 x NO/NC [8]	1 x NO	1 x NO/NC [8]	1x NO / NC		2x NO / NC [8]	n/a
Resistive tank level inputs	4 [9]	no	3 [9]	no			
Temperature sense inputs	4 [9]	no	2 [10]	no			
Digital Inputs	4	no	5	3	1	4	no

User interface	Cerbo GX	CCGX	Venus GX	Octo GX	CANvu GX	Maxi GX	MultiPlus-II GX and EasySolar-II GX
Third party compatibility	**Cerbo GX**	**CCGX**	**Venus GX**	**Octo GX**	**CANvu GX**	**Maxi GX**	**MultiPlus-II GX and EasySolar-II GX**
Canbus-BMS batteries	Many battery brands.						
Fronius PV Inverters							
SMA PV Inverters							
ABB PV Inverters							
SolarEdge PV Inverters							
Marine MFD App Support	Generic MFD Manual, Navico, Garmin, Raymarine						
Performance	**Cerbo GX**	**CCGX**	**Venus GX**	**Octo GX**	**CANvu GX**	**Maxi GX**	**MultiPlus-II GX and EasySolar-II GX**
CPU	dual core	single core				quad core	
RAM	1GB	256MB	512MB	512MB	256MB	512MB	512MB
Max. VE.Direct devices [1]	tbd - 15 orso	5	6	10	4	25	25
Other	**Cerbo GX**	**CCGX**	**Venus GX**	**Octo GX**	**CANvu GX**	**Maxi GX**	**MultiPlus-II GX and EasySolar-II GX**
Supply voltage	8 - 70 VDC				8 - 32 VDC	32 - 70 VDC	powered internally, no external supply
Mounting	Wall or DIN rail (35mm) [19]	Panel Integration	Wall mounting	DIN Rail (35mm)	Panel	Wall mount IP65	Built-in
Outer dimensions (h x w x d)	78 x 154 x 48 mm	130 x 120 x 28 mm	45 x 143 x 96 mm	61 x 108 x 90 mm	?	600 x 380 x 210 mm	
Operating temperature	-20 to +50°C				-20 to +70°C	-20 to +50°C	
Battery backupped clock	yes				no	yes	yes
5V output	no		1 A [13]		no		
Standards	**Cerbo GX**	**CCGX**	**Venus GX**	**Octo GX**	**CANvu GX**	**Maxi GX**	**MultiPlus-II GX and EasySolar-II GX**
Safety	tbd	EN 60950		?	?	?	
EMC	tbd	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2					
Automotive	tbd	E4-10R-053535	In progress	?	?	no	

Notes

1. The listed maximum on the `Performance` section in above table is the total connected VE.Direct devices such as MPPT Solar Charge controllers. Total means all directly connected devices plus the devices connected over USB. The limit is mostly bound by CPU processing power. Note that there is also a limit to the other type of devices of which often multiple are connected: PV Inverters. Up to three or four three phase inverters can typically be monitored on a CCGX. Higher power CPU devices can monitor more.

2. Though the CCGX has no built-in WiFi that functionality can easily be added by attaching a USB-WiFi dongle. See CCGX Manual, section 1.4.2 for details.

3. The built-in WiFi in the Venus GX has a very low signal strength - unfortunately. It is strong enough to connect to a phone, tablet or laptop in order to access setup and monitoring. But to connect the Venus GX to the internet either use the built-in Ethernet port or add a USB-WiFi dongle. See CCGX Manual, section 1.4.2 for details. Make sure the Venus GX is running v2.06 or later - early shipments of Venus GX units ran v2.05.

4. The hardware of the Venus GX and Octo GX includes a built-in Bluetooth Smart chipset which hasn't proved satisfactory. Bluetooth Smart for GX devices is coming soon but will not use built-in chipsets.

5. Larger SD memory cards (SDXC) are not supported. SD cards can be used for two purposes:
    1. Logging data, see this section in the ccgx manual for details.
    2. Updating firmware, see this section in the ccgx manual for detials.

6. The second CANbus port is accessible via the GND, CAN-H and CAN-L terminals. Note that the port is not Isolated. See Settings → Services for configuring that port.

7. The programmable relay can be set to act as an alarm relay, automatic genset start stop, or an on/off switch, and is controlled via the GUI and/or ModbusTCP.

8. In the Venus GX hardware there are two relays - at present only one of them is available for use.

9. The tank level inputs are resistive and should be connected to a resistive tank sender. Victron does not supply tank senders. The tank level ports can each be configured to work with either European (0 - 180 Ohm); or US tank senders (240 - 30 Ohm).

10. The Venus GX has two temperature terminals which can be used to measure & monitor all kinds of temperature-inputs. Temperature senders are not included. The required sensor is ASS000001000 - Temperature Sensor QUA/PMP/Venus GX. (Note that this is not the same as the BMV temperature accessory.)

11. Octo GX comes with a small Wifi antenna. You may remove and replace it with any other Wifi antenna having an RP-SMA connector.

12. Requires the CANvu GX IO Extender and wiring kit

13. The 5V output on the Venus GX can be used to power, for example, a USB hub. Note that its output is not current limited or otherwise protected, and it shares the internal power supply in the Venus GX: overdrawing from it will result in shutdown(s) of the Venus GX. It is recommended to install a fuse for prevention.

14. Though the Maxi GX, MultiPlus-II GX and EasySolar-II GX all have a dual set of RJ-45 sockets labelled VE.Can, this port is actually a dedicated BMS-Can port. It can only be used to connected to managed batteries like Freedomwon, BYD, Pylontech and others, at 500kbps. The hardware does not meet the requirements for a VE.Can port; and thus it is not possible to use to port to connect Victron products such as the SmartSolar VE.Can MPPT product range. Note that current version of Venus OS firmware still allows to select the VE.Can function and other baudrates. The result will be unreliable, and future firmware versions will lock the feature to BMS-Can only and 500kbps.

15. A BMS-Can port is a port dedicated to be used for connecting managed batteries, like BYD, Pylontech, Freedomwon and others, only. It is not possible to connect Victron VE.Can products to that port. To connect such managed battery, use our special cables, and see documentation here. Connect the side labelled 'VE.Can' into the BMS-Can/VE.Can port on the GX Device. And connect the other side to the battery. The baudrate of a BMS-Can port is fixed to 500kbps.

16. The GX Touch 50 connects to the Cerbo GX using a single cable; fixed permanently to the GX Touch 50, which on the other end splits into a USB and a connector for the video signal. Both need to be inserted into the Cerbo GX, taking one of the three USB ports. The USB part of the cable is used to power the GX Touch 50. The cable is 2 meters in length; and can not be extended in length.

17. The Bluetooth feature of the Cerbo GX allows to configure its WiFi and Ethernet settings from within VictronConnect.
18. The secondary CAN port, available on some GX devices as per table above, can be configured to be used as a BMS-Can port, as well as other profiles. For details, see manual.
19. DIN rail mounting requires additional accessory - DIN35 Adapter.

VRM: Remote firmware update

1. Introduction

This manual describes how to remotely update firmware. This functionality requires the device to be updated connected to a GX device (CCGX, Venus GX, or other).

Features:

1. Remotely update internet-connected products straight from the VRM Portal
2. No need to install any software
3. Works from laptop, tablet & phone
4. No need to find the right firmware file: the system has all, and will clearly indicate that a newer version is available.
5. Works with VE.Direct products: MPPT Solar Chargers, BMV Battery Monitor, Phoenix Inverters, and more.
6. Works with VE.Can products: MPPT VE.Can Solar Chargers, Skylla-i, and more.

Video

2. Details

2.1 Requirements

- Venus OS v2.17 or later
- System must be connected to the internet and communicating to the VRM Portal.
- The `Two way communication` setting, which is on the GX device menu → Settings → Services, must be enabled.

2.2 Compatible products

Products ranges for which the firmware can be updated remotely:

Products connected via VE.Direct communication port:

- MPPT Solar Charge Controllers (1)
- BMV Battery Monitors
- Phoenix Inverters

Products connected via VE.Can communication port:

- MPPT Solar Charge Controllers
- Skylla-i battery chargers

2.3 How does it work?

1. The new firmware file is first uploaded to the system.
2. Once received and verified, the GX device starts updating the firmware of the connected device. This eliminates any problems that could be caused by an intermittent internet connection. In case the internet does break while performing the update, the system will continue with the firmware update.

2.4 Where to find the firmware file?

It is not necessary to get a file yourself; the VRM Portal already has all the latest firmware files available. See Victron Professional for the change logs.

2.5 Notes on firmware updating in general

There is a lot that can be said about firmware updating:

- Newer is not always better
- Don't break it if it works

They can all be true. Therefore: use this feature with care.

Our main advice is to not update a running system, unless there are problems with it.

Change logs can be downloaded from Victron Professional.

2.6 Limitations

MPPT Solar Chargers connected with VE.Direct

During the update of a VE.Direct connected MPPT Solar Charger, any configuration in the device will be maintained, but in the event that the update fails, which is unlikely, VE.Direct MPPT Charge Controllers will have lost their configuration. Also it is not possible to reconfigure them remotely. All other devices work with a different process and will not lose their settings during an update; even it fails.

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BMVs

Updating firmware on a BMV that is connected via a canbus interface is not possible.

VE.Bus Products (Multis, Quattros, high power Inverters)

Remotely updating firmware in VE.Bus products (Inverters, Multis and Quattros) is not possible and will also not become possible.

Lynx BMS Series

Remotely updating firmware of these Lynx series of products is not possible:

- Lynx Ion - product-id 0x0142
- Lynx Ion + Shunt 350 & 600A model: product-id 0xA130

Remote updating the Lynx Ion BMS 150A, 400A, 600A and 1000A model is possible. Notes:

- The firmware library does not have the files. Download the file from Victron Professional and use the option to self upload a file.
- Make sure that the GX device is powered on the `Aux-power output`. That is the only port that will remain powered during the firmware update process. All others (main contactor, and also Allow-to-charge and Allow-to-discharge signals) will disconnect; causing Multis and also loads to switch off. Once the update is completed, the Lynx BMS will restart and restore everything.
- In case the update fails, it can be retried; just like all other products. But in case of the Lynx BMS, this has to be done within 5 minutes. Otherwise it will go to sleep mode and a push on the start button is required.
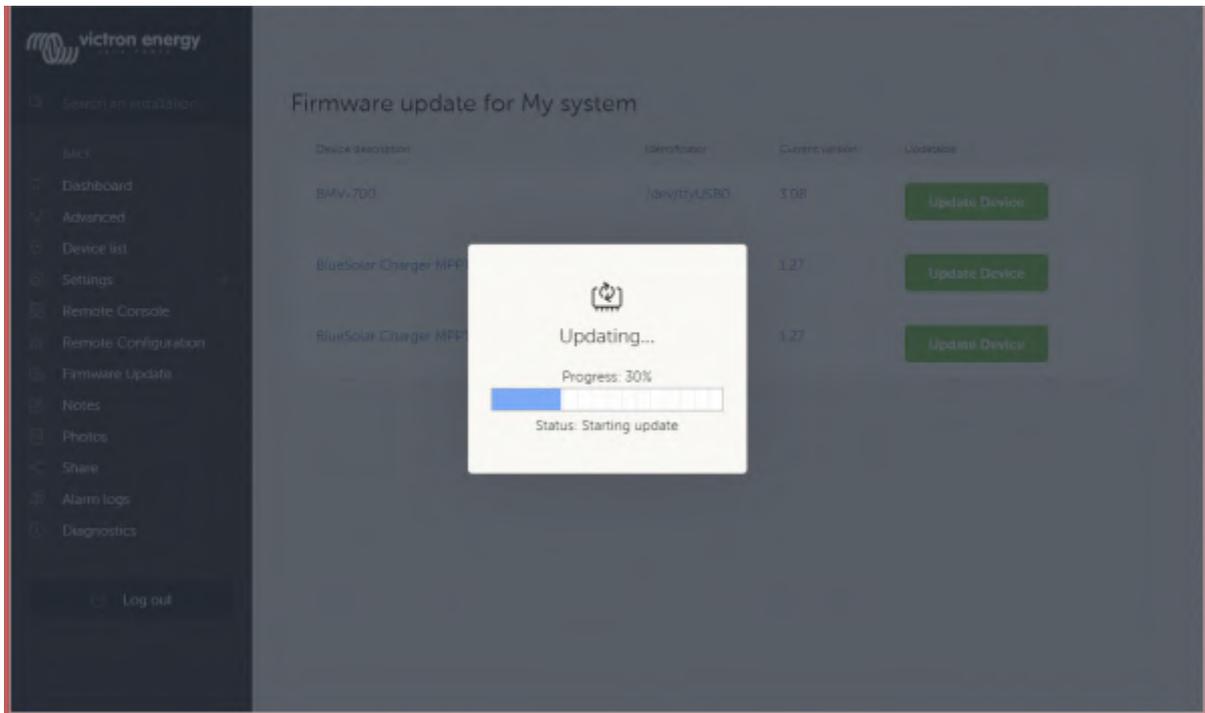
3. Step by step instructions

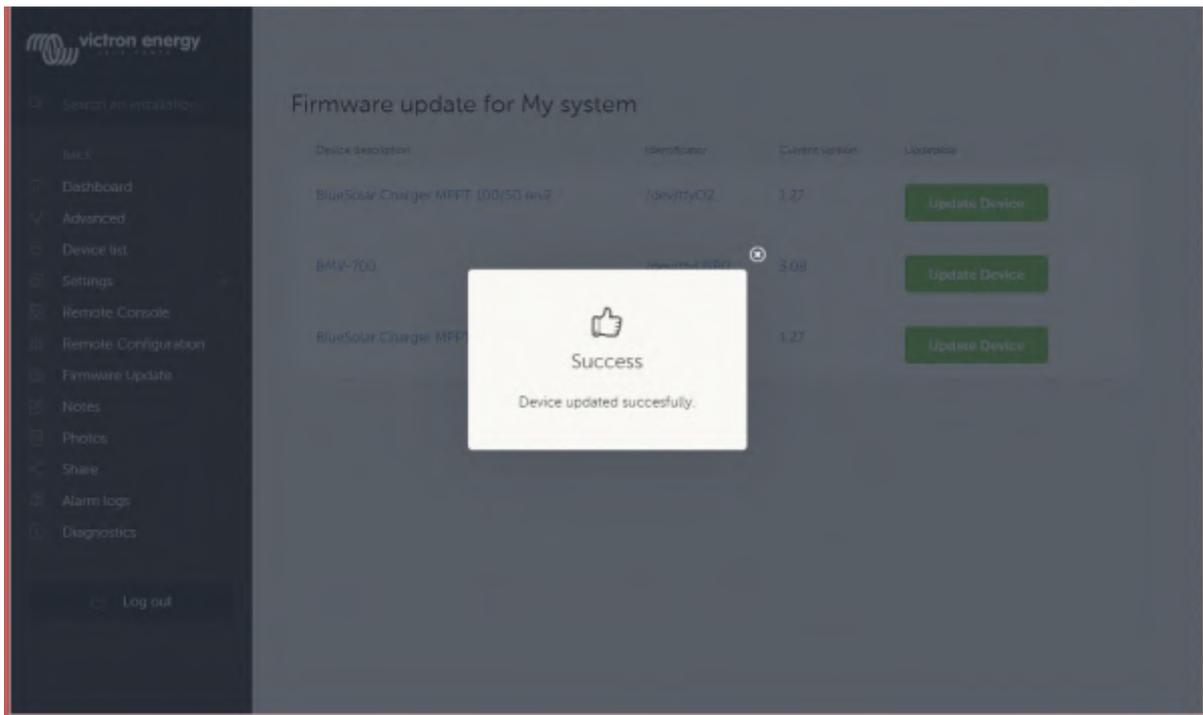**Step 1. Go to Firmware updates on the VRM Portal**
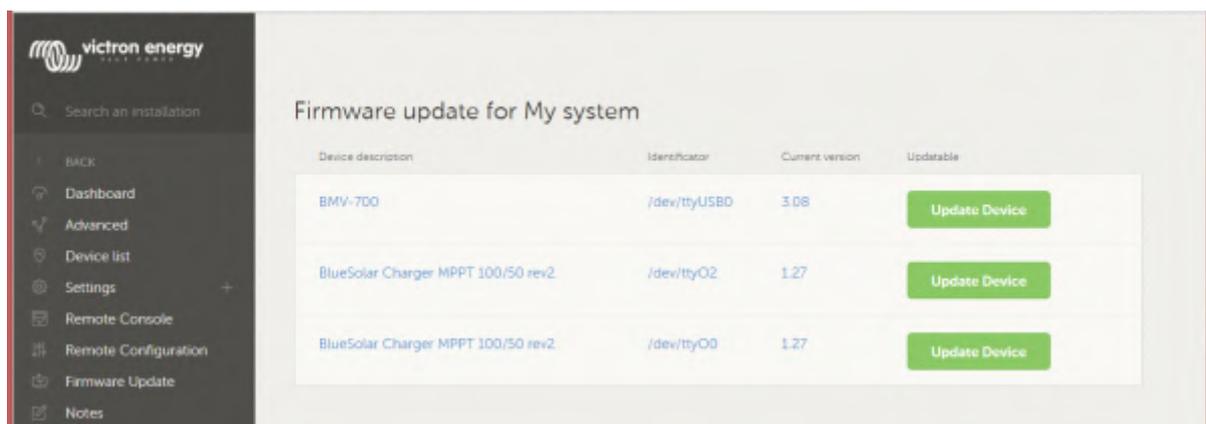
There, any device for which a new firmware version is available will show a green Update button. Press that button to initiate the update.

Step 2. Update process

Step 3. Finished

4. Uploading a firmware file

In most situations the system will already have a firmware file available; no need to upload anything yourself. Sometimes however it is necessary to upload a file from your computer; and this chapter explains how that's done.

First start with having the system list the updatable devices; the result will look like this:

Click the three dots on the right of a line; the upload file button will show.

Click that, select the file on your computer; and the rest of the procedure will continue as explained above.

5. Trouble shooting

Error 1341 Not updatable

Typically shows when it is not a Victron product.

Error 1343 Not updatable: Blacklisted

See limitations chapter above. The product you are trying to update cannot be updated remotely.

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ESS - Start page

An Energy Storage System (ESS) is a specific type of power system that integrates a power grid connection with a Victron Inverter/Charger, GX device and battery system. It stores solar energy into your battery during the day, for use later on when the sun stops shining.

- ESS Quick Installation Guide
- ESS Design & installation manual
- External control (ESS mode 2 and 3)

VRM Portal documentation

- Getting started with VRM
- Alarms and monitoring
- Frequently asked questions
- VRM: Remote firmware update
- Advanced VRM Widgets
- VRM: Remote VEConfigure
- VRM World
- Two-step verification
- VRM Portal change log
- VRM JSON API v2
- Linking to a dealer in VRM

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