Cerbo GX Manual

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1. Safety instructions

! **SAVE THESE INSTRUCTIONS – This manual contains important instructions that shall be followed during installation, setup, operation and maintenance.**

- Please read this manual carefully before the product is installed and put into use

- Make sure you have the latest version of the manual. The most recent version can be downloaded from the product page.

- Install the product in a heatproof environment. Ensure therefore that there are no chemicals, plastic parts, curtains or other textiles, etc. in the immediate vicinity of the equipment.

- Ensure that the equipment is used under the correct operating conditions. Never operate it in a wet environment.

- Never use the product at sites where gas or dust explosions could occur

- This device is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.

2. Introduction

2.1. What is the Cerbo GX?

The Cerbo GX is a powerful member of the GX product family with extensive communication ports and the option to add a touchscreen display (GX Touch 50 & GX Touch 70) for extended functionality.

GX products are Victron's state-of-the-art monitoring and control solution that run our Venus OS operating system. It 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 Cerbo GX ensures that they all work in harmony.

To monitor and control your system, you can simply access it remotely via our Victron Remote Management (VRM) portal from anywhere in the world using an internet connection. Or access it directly, using the optional GX Touch screen, a web browser, a Multi-Functional Display (MFD) [87] or our VictronConnect app.

The Remote Console [42] serves as the primary control center for monitoring, controlling and managing your system.

The Cerbo GX also provides VRM: Remote firmware updates and allows settings to be changed remotely.

Note that all the information in this manual refers to the latest software. You can check your device has the latest version in the firmware menu (see the Firmware updates [62] chapter) when the GX device is connected to the internet. For installations without internet, you can find the latest version in Victron Professional.

2.2. What's in the box?
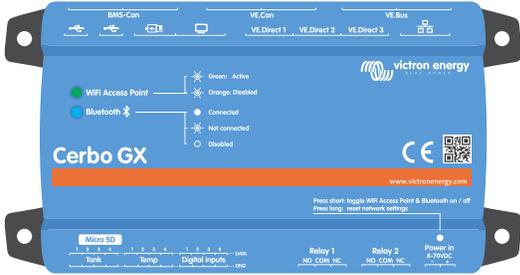
Cerbo GX	
Power cable with inline fuse and M8 terminal eyes for battery or DC busbar-attachment.	
VE.Can terminators (2 pcs)	
Terminal blocks for all the connectors on each side: 3x 4-pin, 2x 3-pin, 1x 2-pin	
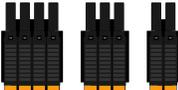
Please also watch this video for an unboxing and overview of the interfaces:

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3. Installation

3.1. Cerbo GX Overview of connections

Supported 3rd party Batteries:
Freedom Won
Pylontech
BYD
Cegasa
and more...

USB Products:
GX LTE 4G
RS485 to USB Interface
Zigbee to USB Interface
USB Bluetooth Adapter
USB WiFi Adapter

VE.Direct Products:
Solar Chargers
BMV Battery Monitor
SmartShunt
Phoenix Smart Charger IP43
Phoenix Inverter VE.Direct

VE.Can Products:
MPPT RS, Multi RS, Inverter RS
Lynx Smart BMS
Lynx Shunt
MPPT VE.Can
Skylla-i, Skylla-IP65

VE.Bus Products:
MultiPlus / Quattro
VE.Bus Phoenix Inverter
VE.Bus BMS
VE.Bus BMS V2
Digital Multi Control

Networking:
Ethernet
WiFi
Modbus TCP
Node-RED
VRM-Remote Management
Remote Support

RV-C in/out support

Supported Bluetooth Products:
VictronConnect
RuuviTag Temperature Sensor
Mopeka Pro Check LPG & Water
USB Bluetooth Adapters

Marine MFD integration by NMEA 2000

Marine Integration by App:
Raymarine
Garmin
Navico
Furuno

I/O Ports:
Resistive Tank Sensors
Temperature Sensors
Digital Inputs

WiFi Products:
Remote Console
VictronConnect
EV Charging Station

Communication ports	IO	Other
3x VE.Direct	4x Digital Inputs	MicroSD Card Slot (max. 32GB)
1x VE.Can (non-isolated) and 1x BMS-Can	4x Resistive Tank Level Inputs	Power in port (8 - 70VDC)
1x VE.Bus	4x Temperature Sense Inputs	HDMI port
Ethernet	2x Programmable Relay (NO, COM, NC - current limit: DC up to 30VDC: 6A / DC up to 70VDC: 1A / AC: 6A, 125VAC)	
WiFi 2.4GHz (802.11 b/g/n) incl. WiFi Access Point		
Bluetooth Smart		
2x USB Host ports + 1x USB Power only port		

3.2. Mounting options and accessories

The following mounting options and accessories are available for purchase:

- GX Touch 50 & GX Touch 70 displays

- GX Touch wall mount available in 5" and 7"

- GX Touch 50 adapter for CCGX cut-out

- DIN35 rail mount adapter

- Temperature sensor Quattro, MultiPlus and GX Device

Please watch this video for all mounting options:

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3.3. Powering the Cerbo GX

The device is powered by using the *Power in V+* connector. It accepts 8 to 70V DC. The device will not power itself from any of the other connections (eg network). The supplied DC power cable includes an inline 3.15A slow blow fuse.

If the DC voltage exceeds 60V, the Cerbo GX is classified as a "built-in product". Installation should be in such a way the user cannot touch the terminals.

When the Cerbo GX is used in an installation with a VE.Bus BMS, connect the *Power in V+* on the Cerbo GX 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 Cerbo GX 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 Cerbo GX has power …but the Cerbo GX will not boot-up until *it* has power. This deadlock can be rectified by briefly unplugging the Cerbo GX 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 Q20 [132] for more information about this.

Note that both with or without above modification, powering the monitoring equipment with the AC-out of an inverter/charger (of course) has the disadvantage that all monitoring is shut down when there is a problem that causes the inverter/charger to shut down. Examples are inverter overload, high temperature or low battery voltage. It is therefore recommended to power the GX device from the battery.

Isolation

Because the Cerbo GX 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.

• VE.Bus ports are isolated

• VE.Direct ports are isolated

• VE.Can ports are not isolated.

• USB ports are not isolated. Connecting a WiFi 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.

3.4. GX Touch 50 & GX Touch 70
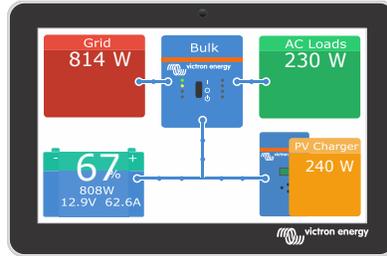
The GX Touch 50 & GX Touch 70 are display accessories for our Cerbo GX. The five inch and seven inch touchscreen displays give an instant overview of your system and allow to adjust settings in the blink of an eye. Their super-slim waterproof design, top-mountable setup and simple installation bring a lot of flexibility when creating a crisp and clean dashboard.

No configuration is required. When the screen is connected, the device will automatically display the GX overview and menu controls.

Display options are available in the Settings → Display & Language menu. You can set a time before the display turns off, or enable adaptive brightness.

The screen is controlled by a finger tip. You can swipe to scroll up and down through the menus, and tap to make selections. Text and number input is entered via an onscreen keyboard.

Mounting options

It is possible to mount the GX Touch in several different ways:

- using the included bracket frames

- using the optional GX Touch Wall Mount

- or the optional GX Touch 50 adapter for CCGX cut-out (GX Touch 50 only)

- The supplied (from serial number HQ2242, can be ordered separately - see the datasheet for details) protection cover prevents damage from UV light during prolonged exposure to the sun

Connecting the GX Touch 50 or GX Touch 70

> ❗ Note that the GX Touch must be connected to the Cerbo GX **before** powering it on. The best way to do this is to unplug the power connector from the Cerbo GX prior to installation.

The touchscreen is connected to the device with a single cable, which has an HDMI connector and a USB connector at one end.

1. Mount the touchscreen in a convenient location

2. Connect the HDMI connector into the HDMI port of the Cerbo GX.

3. Connect the USB connector to the USB port that is right next to the HDMI port (this USB port is only used for the power supply of the touchscreen and has no other function)

4. Plug the power cable into the Power in port via its 2-pin connector block and power the Cerbo up. After the Cerbo boots up, the Remote Console appears on the touchscreen. Familiarise yourself with the operation of the touch display and then configure the touchscreen settings.

+VDC
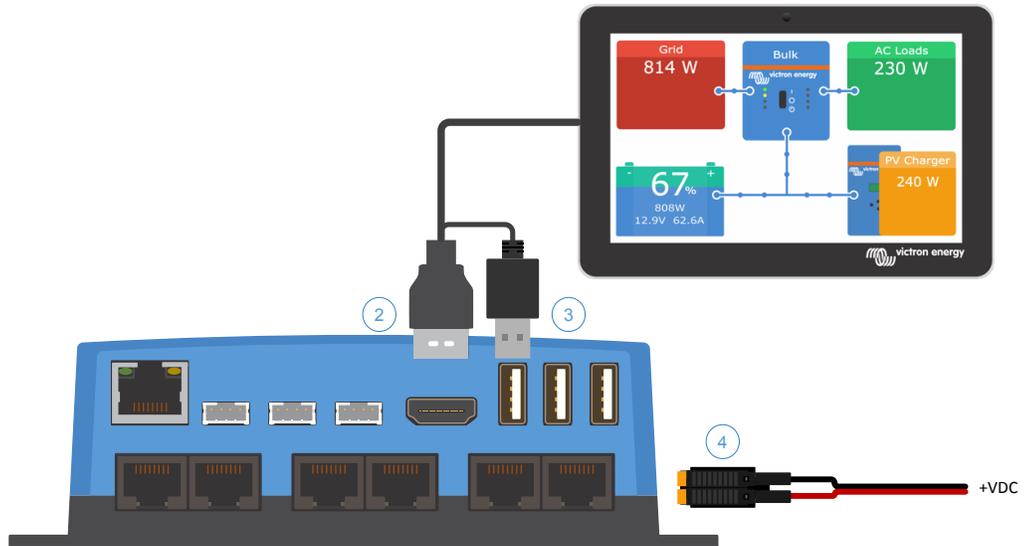
3.5. Deactivating touch input control

In order to restrict access to the GX system, it is possible to disable touch input control for the attached GX Touch 50 or 70 touchscreen. This allows mounting the GX Touch where it is visible by the operator of the system; and at the same time prevent them from using that to elevate their access level.

Note that this feature only disables touch/mouse control. On the Remote Console you are still able to control the device with keyboard input.

There are two ways to disable the touch function of the display:

1. Using a momentary-push button wired to one of the digital inputs

2. By using an external USB keyboard connected to the Cerbo GX; The touch function can then be toggled on and off by pressing the Pause/Break key.

    If you want to use this function, make sure that the USB ports and the USB keyboard are not accessible.

Deactivating touch input control using a momentary-push button

1. Go to Settings → IO → Digital inputs → Digital input [number of the digital input]

2. Scroll down the submenu until you see the Touch input control option

3. Press the spacebar or click/tap to enable Touch input control

4. Wire a momentary-push button between the appropriate top and bottom pins of the associated digital input

    Pushing the button once will activate (disable) touch. Touch entries are no longer possible. The display switches off after the time set under Display off time (see menu Display & Language). Touching the screen activates the last page set. Pushing the button again will deactivate (enable) touch. Note that this pulls the gpio pin to ground. Do not apply voltage to the gpio pins.

Deactivating touch input control using an external USB keyboard

1. Connect an external USB keyboard to one of the USB ports on the Cerbo GX

2. Press the Pause/Break key to toggle touch input control on/off.

    For keyboards without Pause/Break key use one of the substitute key combinations mentioned in this Wikipedia article.

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3.6. Relay connections

The Cerbo GX has potential-free Normally Open (NO) and Normally Closed (NC) relay functionality. The function of the relays can be set via the GX menu, Settings → Relay → Function.

Relay 1 is of particular importance because, in addition to manual and temperature [60]-related triggering (also applies to relay 2), it can also be used as an alarm [48], generator start/stop [118] or tank pump [48] relay.
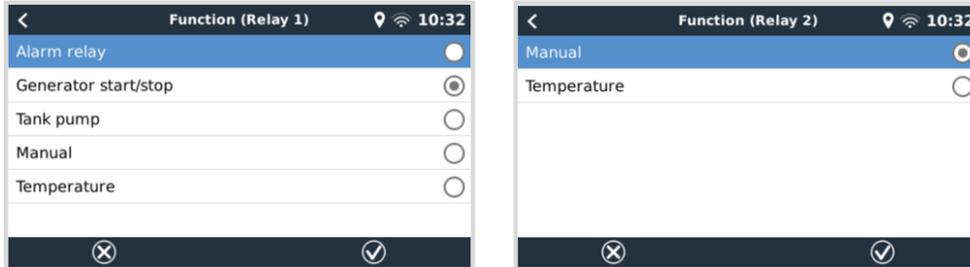
If the relay function is configured as an Alarm relay, it is possible to reverse the polarity of the relay via an additional menu. The default setting is Normally open. Please note that reversing the polarity to Normally closed will result in a slightly higher current consumption of the GX device.
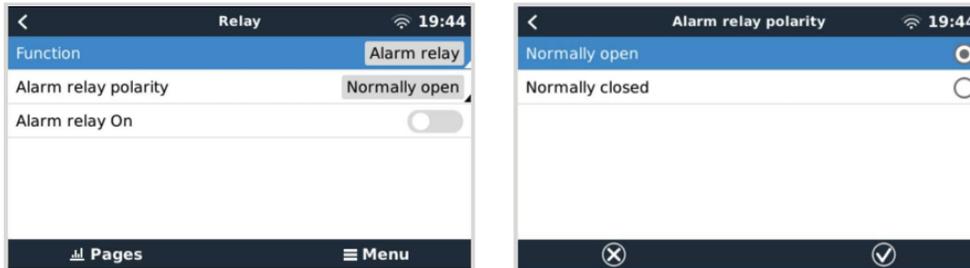
Observe the voltage and current limits of the relays, which are: DC up to 30VDC: 6A - DC up to 70VDC: 1A - AC: 6A, 125VAC

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4. Connecting Victron products

4.1. VE.Bus Multis/Quattros/Inverters

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 VE.Bus devices that can be connected using the Products: Product_Acronym is 19xx111, where the first 2 digits represent the microprocessor and the last 3 digits represent the VE.Bus firmware version.

VE.Bus device microprocessor	GX device support
18xxxxxx	No
19xx111	Yes
20xx111	Yes
26xxxxx	Yes
27xxxxx	Yes

Note that for Multis, Quattros and EasySolars, it is not possible to use the Remote On/Off (header on the VE.Bus control PCB) in combination with a Cerbo GX. There should be a 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 instead.

This limitation does not apply to the next generation of VE.Bus inverter/chargers: when using a MultiPlus-II, Quattro-II or EasySolar-II, the Remote on/off terminal header *can* be used in combination with Cerbo GX.

> ⚠️ **Before connecting any VE.Bus product, be very careful not to confuse the GX device VE.Bus ports with the Ethernet or VE.Can/BMS-Can port!**

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 Cerbo GX. 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 Cerbo GX. Use a standard RJ45 UTP cable, see our pricelist.

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

- The following only applies to the VE.Bus BMS v1, not to be confused with its successor VE.Bus BMS V2.

- Connect the Cerbo GX 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 Cerbo GX 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 Cerbo GX in case of a low battery, make sure the Cerbo GX is powered via the VE.Bus BMS: connect *Power in V+* on the Cerbo GX to *Load disconnect* on the VE.Bus BMS. And connect both negative leads to the negative stub of a common Battery.

Combining the Cerbo GX with a Digital Multi Control

It is possible to connect both a Cerbo GX 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 Cerbo GX 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 Cerbo GX will not be possible.

Connecting multiple VE.Bus systems to a single Cerbo GX

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

If you do require to connect more than one system to the same Cerbo GX, 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.

• Only the Multi/Quattro (which can be a single device, or multiple together configured for three-/split-phase as well as parallel) connected to the VE.Bus port will be controlled via DVCC. Additional systems, connected to the GX device using an MK3-USB, are not controlled by DVCC and will charge and discharge according to the configuration made in those units.

• 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.

Additional features provided by a GX device to VE.Bus products

An internet connected GX device allows for remote configuration via the VRM Portal. Please read the Remote VE.Configure manual for more information, system requirements and specific steps to access this feature.

The internet connected GX device also allows remotely updating the firmware of VE.Bus products. For details see the Remote VE.Bus firmware updates manual.

4.2. AC load monitoring
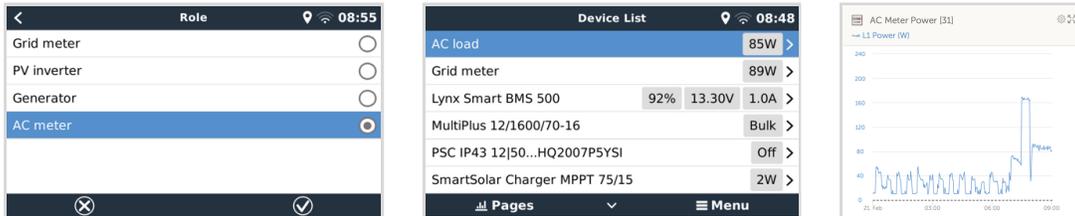
All energy meter types can be assigned the AC meter role. This is done in Settings → Energy meters → [your_energy_meter] → Role menu where you choose between Grid, PV Inverter, Generator and AC meter. With AC meter selected, the load will be shown in the Device list and on VRM in the advanced widgets.

> Please note that such metered loads are not used in any calculations, just monitoring.

4.3. Battery Monitor SmartShunt, BMV-700 series; and MPPTs with a VE.Direct port

Direct connection via a VE.Direct cable is limited to the number of VE.Direct ports on the device (see Overview of Connections [3]). There are two types of VE.Direct cables available:

1. Straight VE.Direct cables, ASS030530xxx

2. VE.Direct cables with an angled connector on one end. These are designed to minimise 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 a VE.Direct to USB interface with an active USB extension cable.

It is also possible to use the VE.Direct to VE.Can interface, but note that this only works for BMV-700 and BMV-702. Not for the BMV-712, MPPT solar chargers and Inverters with a VE.Direct port. See next paragraph for more information on that VE.Can interface.

Connecting more VE.Direct devices to your Cerbo GX than number of VE.Direct Ports

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First of all, note that the maximum of VE.Direct devices that can be connected is GX device specific, and constrained by the CPU power. It may also be reduced for very complex systems, such as many AC PV inverters or synchronised inverter chargers, etc. So always allow some additional headroom in the design. How they are connected, whether via VE.Direct, via USB or USB hub, does not change this maximum. See the Victron GX product range for the maximum limit on all GX devices.

For the Cerbo GX, this limit is 15.

Options to connect more VE.Direct products than available VE.Direct ports:

1. Use the VE.Direct to USB interface. The Cerbo GX has built-in USB ports. Use a USB-hub when additional USB ports are required.

2. (Only!) the BMV-700 and BMV-702 can also be connected using the VE.Direct to VE.Can interface (deprecated). Note that the BMV-712, MPPTs and VE.Direct Inverters cannot be connected using this CAN-bus interface as it does not translate their data into CAN-bus 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. Lastly, note that this CAN-bus interface is deprecated.

Notes about older VE.Direct MPPTs

- An MPPT 70/15 needs to be from year/week 1308 or later. Earlier 70/15s are not compatible with the Cerbo GX , 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.

4.3.1. DC load monitor mode

If you wish to use a SmartShunt or BMV-712 to monitor individual DC circuits, rather than as a whole-of-system battery monitor, you can change the Monitor mode setting from Battery Monitor to DC Energy Meter in VictronConnect.

If DC meter is selected, you can then select the following types (also in VictronConnect):

Solar charger, Wind charger, Shaft generator, Alternator, Fuel cell, Water generator, DC-DC charger, AC charger, Generic source, Generic load, Electric drive, Fridge, Water pump, Bilge pump, DC system, Inverter, Water heater

Once connected to the Cerbo GX, the type and the amps and power of the DC load is shown in the user interfaces and available on the VRM Portal.

When configured as type "DC System", the Cerbo GX does more than just recording and visualisation:

1. The power shown in the DC system box is the sum of power reported by all SmartShunts configured as such. Allowing multiple meters is done to accommodate for example a catamaran, so you can measure the DC Systems on Port hull and on Starboard hull.

2. The DC system current is being compensated for when setting DVCC charge current limits to Multis, Quattros and Solar Chargers. For example when a load of 50A is being measured, and CCL by the battery is 25A, the limit given to the Multis & Solar Chargers is 75A. An improvement for systems with significant DC loads such as Yachts, Coaches and RVs.

Notes and limitations:

- This feature is available for SmartShunts and BMV-712. Not for BMV-700 or BMV-702.

- Setting the meter mode is done with VictronConnect, in the BMV/SmartShunt itself. For details see the BMV-712 or SmartShunt product manual on the Battery Monitor product page.

- The NMEA2000-out feature does not support these new types, for example when using a SmartShunt to measure output of an alternator, that data is not made available on NMEA 2000.

4.4. VE.Can Devices

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 Cerbo GX, an MPPT 150/70 must be running firmware v2.00 or newer.

2. You can combine a Skylla-i control panel with a Cerbo GX.

3. You can combine a Ion Control panel with a Cerbo GX.

4. All VE.Can devices 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.

The following VE.Can products also support VictronConnect-Remote (VC-R) – Configuration and monitoring via VRM. Please read the VictronConnect manual for further details.

VE.Can product	VC-R	Remarks
Lynx Shunt VE.Can	Yes	-
Lynx Smart BMS	Yes	-
Inverter RS, Multi RS and MPPT RS	Yes	They also have VE.Direct but must be connected via VE.Can for VC-R
Blue/Smart Solar VE.Can MPPTs [1]	Yes	Tr and MC4 models
Skylla-i and Skylla-IP44/-IP65	Yes	Requires firmware v1.11

[1] All VE.Can solar chargers except the very old (big rectangular case with display) BlueSolar MPPT VE.Can 150/70 and 150/85

4.5. VE.Can and BMS-Can Interfaces

The Cerbo GX has two CANbus interfaces. They are **independent** from a data and connected device perspective. They are not electrically isolated. One is labelled VE.Can, the other is labeled BMS-Can, with a screen print on the top side of the unit when it is facing towards you. These each correspond to the VE.Can port and BMS-Can port listed in the services menu of the GX remote console.

VE.Can is intended to be used for Victron (and Victron compatible) VE.Can products, such as the VE.Can MPPTs, Skylla-IP65, Lynx Shunt VE.Can and Lynx Smart BMS. You can string these VE.Can 250 kbit/s devices together along this bus. It must be terminated at both ends with the included VE.Can terminators.

BMS-Can is intended to be used with compatible managed battery systems, such as Pylontech, BYD, Freedomwon and many more. These must be terminated at the Victron end (on the Cerbo GX) with the included terminator (same one as used with VE.Can). It may or may not be necessary to terminate at the managed battery, BMS or BMU - this will be documented in the specific Victron Compatible managed battery instructions for that battery. Some batteries automatically terminate.

VE.Can and BMS-Can cannot be combined on the same bus. If you wish to use both, they require a GX device with two separate buses, each with 2 RJ45 ports - 4 CANbus ports in total.

It is not possible to set the BMS-Can port to anything other than 500 kbit/s or disabled.

You can set the VE.Can port from 250 kbit/s to be 500 kbit/s (or one of several other CANbus speeds for other CANbus applications).

By default; VE.Can is set to 250 kbit/s & BMS-Can (if present) to 500 kbit/s.

Other types of Batteries and BMS may claim compatibility with BMS-Can or VE.Can, but if they are not on the battery compatibility list, then they have not been tested and confirmed to work by Victron.

One extra element of possible confusion is that there are some BMS products on the market that use a CANbus-BMS profile at 250 kbit/s. These BMS products can only be connected to the VE.Can port, and it must also be set to match this (VE.Can & CAN-bus BMS (250 kbit/s)) in the services menu for the VE.Can port. They can be used in the same cable daisy chain as other Victron VE.Can devices.

4.6. Inverter RS, Multi RS and MPPT RS

The Inverter RS, Inverter RS Solar and Multi RS have both VE.Direct and VE.Can interfaces. For these specific products, it is only possible to connect a GX device via the VE.Can interface. It is not possible to connect a GX device via the VE.Direct interface.

The VE.Direct interface on these specific products is only used for connection of a VE.Direct to USB adapter for programming.

This restriction does not apply to the MPPT RS, which can be connected to a GX device via either VE.Direct or VE.Can.

4.7. BMV-600 series

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

4.8. DC Link Box

• Connect the DC Link Box with the supplied RJ12 cable. Then connect the BMV-700 to the Cerbo GX.

4.9. VE.Can Resistive Tank Sender Adapter

See the VE.Can resistive tank sender adapter product page 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 CAN-bus is powered, see the Power chapter in the Tank Sender Adapter manual for details.

4.10. Connecting a GX Tank 140

The GX Tank 140 is an accessory for our range of GX system monitoring products.

It takes readings from up to four tank level sensors.

Tank levels can be read-out locally in the system, as well remotely through our VRM Portal.
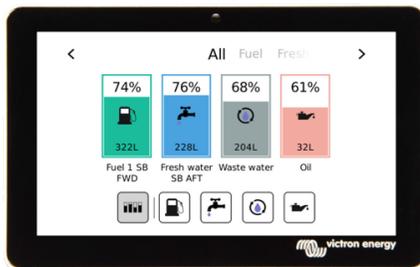
The GX Tank 140 is compatible with current senders (4 to 20mA) as well as voltage senders (0 to 10V). The connection to the GX device is via USB, which is also how the GX Tank is powered: no additional power wires required.

To make wiring the tank sender as simple as possible, two of the four inputs provide a 24V power supply, to power the sender. Using the other two channels requires an external power supply, and there is a power in terminal together with fused outputs to facilitate that.

Upper and lower limits are configurable, to allow using senders that provide only part of the scale, for example 0 to 5V.

For marine applications, the GX device can transmit these tank levels on the NMEA 2000 network to be picked up by other displays such as an MFD.

The GX Tank 140 product page links to the complete documentation of this product.

4.11. Connecting hardwired Victron temperature sensors

See the Connection Overview [3] for the location and number of temperature sensor inputs.

They can be used to measure & monitor all kinds of temperature inputs. The measuring temperature range of the temperature inputs is -40°C to +70°C.

Temperature senders are not included. The required sensor is ASS000001000 - Temperature sensor Quattro, MultiPlus and GX Device. Note that this is different from the BMV temperature accessory. The BMV temperature sensor accessory cannot be used on the temperature inputs.

They are not required to be connected to the battery (though they appear like a battery lug).

To physically attach the temperature probes requires a ferrule or exposed copper end of at least 10 mm+ to be inserted into the removable terminal block connector. Once correctly attached, you must push in the orange tab if you wish to remove the secured wire. Sensors are connected with the red wire to the top of the connector, and the black wire to the bottom.

Termin block   ASS000001000 - Temperature sensor Quattro,
                      MultiPlus and GX Device
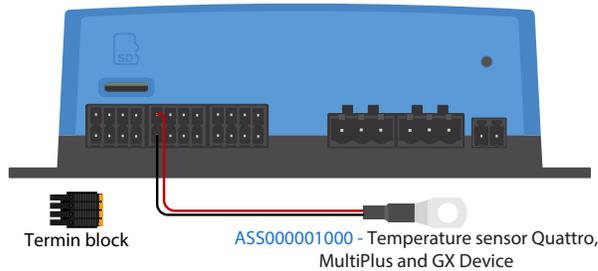
Sensors are enabled (and disabled) in the Settings → I/O → Analog inputs menu of the GX device settings.
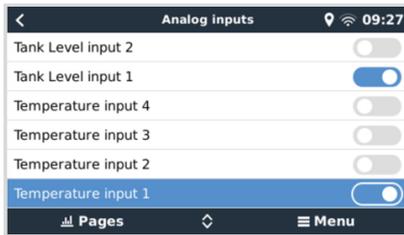
Once enabled, temperature sensor data is visible in the device list, and also logged to VRM.

Selecting the temperature sensor from the device list menu then allows you to set the temperature type setting to either Battery, Fridge or Generic. It is also possible to set a custom name in the Device menu.

It is possible to adjust the temperature offset and scale, however for now this feature is limited to users with 'superuser' permission level.

5. Connecting supported non-Victron products

5.1. 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 or limited feed-in feature.

Direct connections

Type	Zero feed-in	Details
Fronius	Yes	LAN Connection, see GX - GX - Fronius manual
SMA	No	LAN Connection, see GX - 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. Energy Meter
Energy Meter	No	Wired to the Cerbo GX, or connected wirelessly using our Zigbee to USB/RS485 converters. See the Energy Meters start page
Wireless AC sensors	No	See the Wireless AC Sensor manual - Discontinued product

5.2. Connecting a USB GPS

Use a GPS to remotely, on the VRM Portal, track vehicles or boats. Also its possible to configure a Geofence, which will automatically send an alarm when the system leaves a designated area. And gps-tracks.kml files can be downloaded to open them e.g. in Navlink and Google Earth.

Victron does not sell USB-GPS modules, but the Cerbo GX 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 USB sockets. Connection may take a few minutes, but the Cerbo GX will automatically recognize the GPS. The unit's location will automatically be sent to the VRM online portal and its position is shown on the map.

The Cerbo GX 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

5.3. Connecting a NMEA 2000 GPS

Instead of a USB GPS, a NMEA 2000 GPS can be used for remote vehicle or boat tracking in the VRM portal.

The third party NMEA 2000 GPS sender must meet the following requirements:

• The NMEA 2000 device class must be 60, Navigation.

• The NMEA 2000 device function must be 145, Ownship Position (GNSS).

• Position (latitude, longtitude) must be transmitted in PGN 129025.

• Height, which is optional, must be transmitted in PGN 129029.

• Course and speed (both optional), must be transmitted in PGN 129026.

Most NMEA 2000 GPS-es are expected to work. Compatibility has been tested with:

• Garmin GPS 19X NMEA 2000

To connect a NMEA 2000 network to the VE.Can port on the GX device, which both have a different style connector, there are two solutions:

1. The VE.Can to NMEA 2000 cable. Which by either inserting or leaving out the fuse allows to either power the NMEA 2000 network with Victron equipment, or not. Take note of below warning.

2. The 3802 VE.Can Adapter by OSUKL. Its advantage is that it lends itself well to connecting a single NMEA 2000 device such as a tank sender into a VE.Can network. It's also able to power a lower voltage NMEA 2000 network directly from a 48V Victron system.

Warning and solution for 24V and 48V systems

Whilst all Victron components accept up to 70V input on their CAN-bus connections, some NMEA 2000 equipment does not. They require a 12V powered NMEA 2000 connection, and sometimes work up to 30 or 36V. Make sure to check the datasheet of all used NMEA 2000 equipment. In case the system contains NMEA 2000 that requires a network voltage below the battery voltage, then either see above 3802 VE.Can Adapter by OSUKL, or alternatively install the VE.Can to NMEA 2000 cable without it's fuse, and provide suitable power to the NMEA 2000 network using for example a NMEA 2000 power adapter cable – which is not supplied by Victron. The VE.Can port on the GX device does not need external power to operate.

5.4. Connecting a Fischer Panda Generator

See GX - Fischer Panda generators.

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5.5. Connecting Tank Level Sensors to the GX Tank Inputs

The tank level inputs are resistive and should be connected to a resistive tank sender. Victron does not supply tank senders. The built-in tank sensor connections do not support mA or 0-5V type sensors, this type will require additional accessories or replacement with a resistive type sensor.
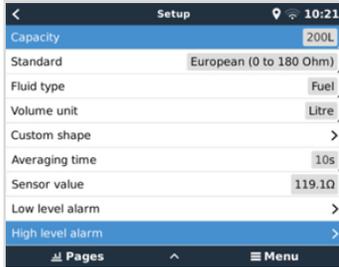
Sensors are enabled (and disabled) in the I/O menu (Settings → I/O → Analog input) of the GX device settings. Once enabled, the tank will appear in the Device List with options to customise the setup to suit your specific installation.
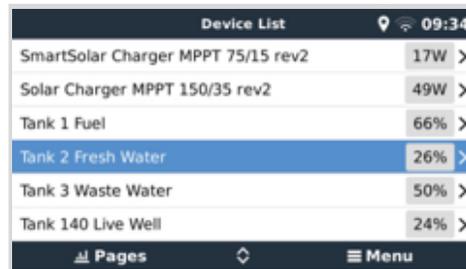
Set the tank volume unit (Cubic meter, litre, imperial or U.S gallon), and capacity. It is also possible to configure custom shapes for non-linear tanks, with up to 10 variations e.g 50% of sensor is equal to 25% of volume & 75% of sensor is equal to 90% of volume.
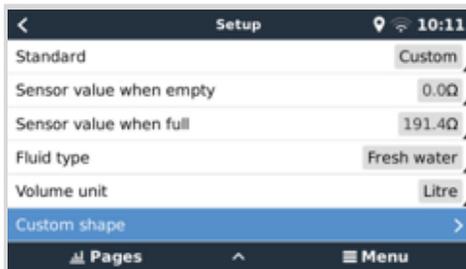
The tank level ports can each be configured to work with either European (0 - 180 Ohm); or US tank senders (240 - 30 Ohm) standards; or to configure a custom Ohm resistance range between 0 Ohm and 300 Ohm (requires firmware v2.80 or higher).

You can set tank fluid type to Fuel, Fresh water, Waste water, Live well, Oil, Black water (sewage), Gasoline, Diesel LPG, LNG, Hydraulic oil and Raw water and also set a custom name.
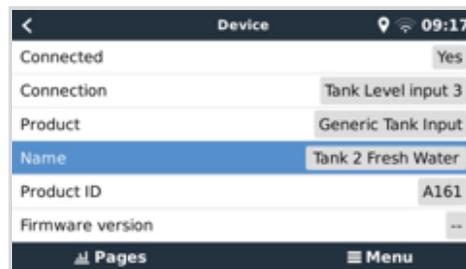
A separate low or high level alarm can be set and activated for each tank sensor.

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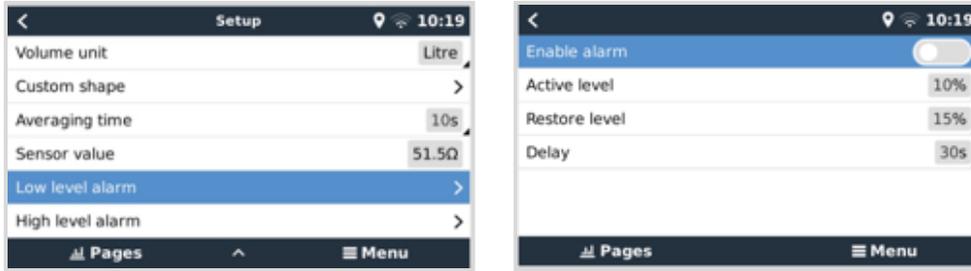
Tank level data is sent to the VRM Portal, shown on the boat and motorhome overview display (if connected and enabled), and can be used as a trigger for the relay when it is set to 'Tank pump'. Tank levels can also be monitored at various other locations within the GX environment:

• Device List of the GX device

• Sensor overview menu of the GX device

• Graphical overview of the GX device

• VRM Dashboard

• VRM advanced menu widgets

• VRM App widgets

To physically attach the tank probes requires a ferrule or exposed copper end of at least 10 mm+ to be inserted into the removable terminal block connector. Once correctly attached, you must use the orange tab if you wish to remove the secured wire.

5.6. Increasing the number of tank inputs by using multiple GX devices

5.6.1. Introduction

The number of tank inputs on a GX device, such as the Cerbo GX and Venus GX, can be expanded by connecting multiple GX devices together in a VE.Can network. To do this, one GX device must be designated to be the "main" and the others(s) to be the "secondary" one(s). How this is done in practice is explained below.

There is no practical limit on how many GX devices can be used - except for the number of source addresses available in a VE.Can network, which is 252 addresses. For example, a Cerbo GX with 4 tank inputs uses up to 5 addresses: one for itself and one for each tank input.

5.6.2. Requirements

1. Only enable the MQTT settings (part of MFD App integration [87]) on one of the GX devices, not multiple.

2. Only connect the main GX device to the Ethernet network - do not connect the others. The MFD App on Marine MFDs is not designed to work with multiple GX devices on one Ethernet network.

3. In case you are using the ModbusTCP protocol: Enable ModbusTCP on only one of the GX devices.

4. Only connect the main GX device to VRM; it will also transmit tank levels received from the secondary units.

5. We recommend connecting all VE.Bus and VE.Direct products to the main GX device. Connecting through a secondary device works, but has limitations. For example, remote configuration doesn't work, DVCC control will not work, and remote firmware updates don't work either. Extending the VE.Direct ports via USB provides full functionality, which is therefore the recommended method. You can find more information on this in chapter Powering the Cerbo GX [5].

5.6.3. Configuration step-by-step

1. First, on all GX devices, configure all tank inputs in Settings → I/O → Analog input, only enable the inputs in use, disable the others.

2. In Device List → Tank input → Device → Name, give each tank input its own unique proper name, ie Fresh water 1, Gray water SB, Diesel Port, and so forth.

    This is the only way to make sure they are distinguishable once all connected together.

3. Connect each GX device together on its VE.Can port and make sure to terminate on both ends.

    There is no need to power the VE.Can network externally: while the GX devices don't power the VE.Can network, they do power their own internal CAN circuitry.

4. Now, on each GX device go to Settings → Services → VE.Can and there:

    1. Verify that the chosen profile is VE.Can & Lynx Ion BMS (250 kbit/s) or VE.Can & CAN-bus BMS (250 kbit/s)

    2. Enable the NMEA2000-out feature on all GX devices

    3. Assign each GX device its own unique number

    4. Use the Check Unique id numbers test feature when to make sure all went well

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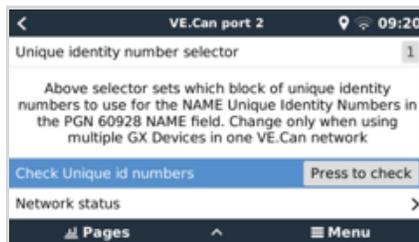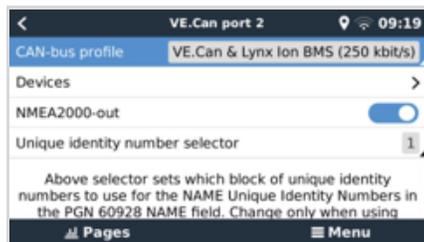
5. Lastly, on the main GX device, check if all sensors show up in the Device List and work well.

Device List	🔘 📶 09:34	
SmartSolar Charger MPPT 75/15 rev2	17W	>
Solar Charger MPPT 150/35 rev2	49W	>
Tank 1 Fuel	66%	>
Tank 2 Fresh Water	26%	>
Tank 3 Waste Water	50%	>
Tank 140 Live Well	24%	>
⊿ Pages	◇	☰ Menu

5.7. Connecting third-party NMEA 2000 tank senders

A third-party NMEA 2000 tank sender must meet the following requirements to be visible on the GX device:

• Transmit the NMEA 2000 Fluid Level PGN, 127505

• The NMEA 2000 device class needs to either General (80) in combination with function code Transducer (190), or Sensor (170). Or, the NMEA 2000 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 menus - for example the Maretron TLA100. This facility may be available with other senders made by other manufacturers - it's well-worth trying.

Tested compatible NMEA 2000 tank senders:

• Maretron TLA100

• Maretron TLM100

• Navico Fluid Level Sensor Fuel-0 PK, partno. 000-11518-001. Note that you need a Navico display to configure the Capacity, Fluid type, and other parameters of the sensor. **See voltage warning below.**

• Oceanic Systems (UK) Ltd (OSUKL) - 3271 Volumetric Tank Sender. In case it doesn't work, it needs a firmware update. Contact OSUKL for that. **See voltage warning below.**

• Oceanic Systems UK Ltd (OSUKL) - 3281 Water Level Sender. **See voltage warning below**

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

To connect an NMEA 2000 network to the VE.Can port on the GX device, which both have different type connectors, there are two solutions:

1. The VE.Can to NMEA2000 cable. Which by either inserting or leaving out the fuse allows to either power the NMEA 2000 network with Victron equipment, or not. Take note of below warning.

2. The 3802 VE.Can Adapter by OSUKL. Its advantage is that it lends itself well to connecting a single NMEA 2000 device such as a tank sender into a VE.Can network. It's also able to power a lower voltage NMEA 2000 network directly from a 48V Victron system.

Warning and solution for 24V and 48V systems

Whilst all Victron components accept up to 70V input on their CAN-bus connections, some NMEA 2000 equipment does not. They require a 12V powered NMEA 2000 connection, and sometimes work up to 30 or 36V. Make sure to check the datasheet of all used NMEA 2000 equipment. In case the system contains NMEA 2000 that requires a network voltage below the battery voltage, then either see above 3802 VE.Can Adapter by OSUKL. Or alternatively install the VE.Can to NMEA2000 cable without it's fuse, and provide suitable power to the NMEA 2000 network using for example a NMEA 2000 power adapter cable – which is not supplied by Victron. The VE.Can port on the GX device does not need external power to operate.

5.8. Mopeka Pro Check LPG and Water Bluetooth Sensors

Mopeka Pro Check-Water and Pro Check-Sensor LPG support has been added to VenusOS. These ultrasonic sensors use BLE (Bluetooth Low Energy), a wireless technology that allows devices to be networked within a range of about 10 meters, while consuming significantly less power compared to ordinary Bluetooth technology.

The Mopeka Pro sensors feature ultrasonic sensing for water and LPG tanks in horizontal or vertical cylinders and mount to the bottom of those tanks by magnets. The liquid level, temperature and sensor battery voltage is streamed wirelessly to the GX device.

> Only Mopeka Pro Check-Water and Pro Check-Sensor LPG sensors are supported. Other Mopeka sensors, even if they have Bluetooth, are not supported.

To connect the Mopeka Pro sensors to the GX device via Bluetooth, the GX device needs Bluetooth functionality. Some GX products already have built-in Bluetooth, all others can easily be retrofitted using a standard USB Bluetooth adapter (see the Victron GX product range overview for GX products that have built-in Bluetooth).

However, an additional USB Bluetooth adapter, also for GX devices with built-in Bluetooth, allows for limited relocation of the Bluetooth radio (via a USB cable extension) close to other supported Bluetooth devices that might not otherwise be reachable.

Note for Cerbo GX units built up to and including serial number HQ2207; The built-in Bluetooth connection is disabled when the internal CPU temperature exceeds 53 degrees C (influenced by load and/or ambient temperature). **For reliable operation it is necessary to use a USB Bluetooth adapter**. Devices manufactured later (HQ2208 and later) do not require an additional USB Bluetooth adapter. Note that this limitation does not apply to the Cerbo-S GX.

USB Bluetooth adapters that have been tested and known to work:

USB Bluetooth adapter				
Insignia (NS-PCY5BMA2)	Logilink BT0037	TP-Link UB400(UN)	Kinivo BTD-400	Ideapro USB bluetooth adapter 4.0
Ewent EW1085R4	Laird BT820	Laird BT851	-	-

A list of additional adapters that are also being tested, as well as adapters that have been tested and are known not to work, is available here: Victron Community.

5.8.1. Installation
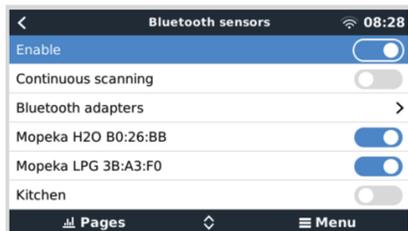
The installation of the Mopeka Pro sensor is very simple. First, however, the sensor must be installed according to Mopeka's installation instructions and configured via the Mopeka Tank app (available in Google Play and Apple App Store). Then the installation and configuration is done in the GX device as described below.

1. Make sure Bluetooth is enabled in the Bluetooth sensors menu (enabled by default).

2. Go to Settings → I/O → Bluetooth sensors menu.

3. Move the Enable slider to the right to enable Bluetooth sensors.

4. To find your Mopeka Pro sensor, scroll down until you see them.

5. To activate the sensor, move the slider to the right. It should now appear on the Device List.

6. Repeat steps 1..5 for more than one sensor.

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5.8.2. Configuration

1. Go to the Device List menu.

2. Scroll up or down and select the appropriate sensor.

3. Press the right arrow key or space bar on that sensor to open up the sensor Setup menu.

4. Scroll down to Setup and right arrow key or space bar again to open up the sensors Setup menu.

5. In the Setup menu you can change the tank capacity, select the liquid type and volume unit, set up calibration values for empty and full tank levels and read the actual sensor value.

6. After setup, go back to the Sensor overview menu.

7. Scroll down, select Device and press the right arrow key or space bar again to open up the device settings menu.

8. In the Device menu you can assign a custom name to the sensor and read out some additional device information.

9. Repeat steps 1..8 if you want to set up additional sensors.

Mopeka Pro H2O ⌕ 08:32		Setup ⌕ 08:29		Fluid type ⌕ 08:30	
Status	Ok	Capacity	0.020m³	Fuel	●
Level	55%	Sensor value when empty	0.0cm	Fresh water	⦿
Remaining	0.010m³	Sensor value when full	33.0cm	Waste water	○
Temperature	23°C	Fluid type	Fresh water	Live well	○
Sensor battery	2.97V	Volume unit	Cubic metre	Oil	○
Setup	›	Sensor value	18.6cm	Black water (sewage)	○
⊯ Pages ⌄	☰ Menu	⊯ Pages	☰ Menu	⊗ ⌄	✓

Fluid type ⌕ 08:30		Volume unit ⌕ 08:31		Device ⌕ 08:32	
Gasoline	○	Cubic metre	⦿	Connection	Bluetooth LE
Diesel	○	Litre	○	Product	Mopeka sensor
LPG	○	Imperial gallon	○	Name	Mopeka Pro H2O
LNG	○	U.S. gallon	○	Select position Select character Add space	
Hydraulic oil	○				
Raw water	●			Product ID	C02A
⊗ ⌃	✓	⊗	✓	⊗ ⌄	✓

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5.8.3. Tank level monitoring
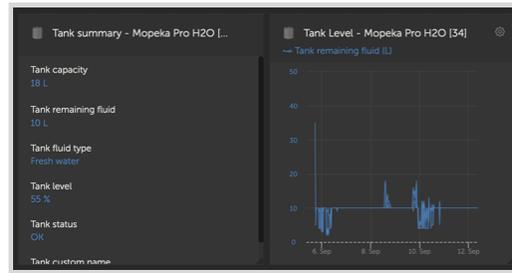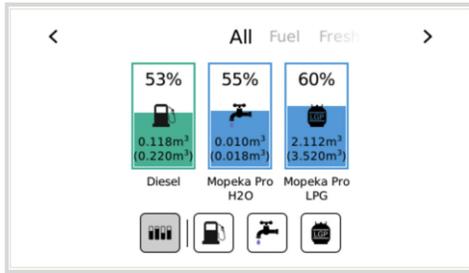
Tank levels can be monitored at various locations within the GX environment:

• Device List of the GX device

• Sensor overview menu of the GX device

• Graphical overview of the GX device

• VRM Dashboard

• VRM advanced menu widgets

• VRM App widgets
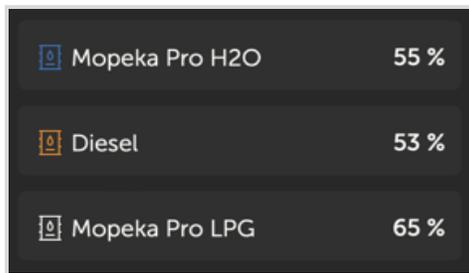
5.9. Wakespeed WS500 alternator regulator support

5.9.1. Introduction

The WS500 is an external smart alternator regulator with CAN-bus and NMEA 2000 communication, which is especially applicable in Marine and RV applications. The Wakespeed WS500 is supported by Venus OS and offers the possibility to monitor the performance of your alternators via a GX device.

5.9.2. Requirements

Necessary requirements for the integration of the WS500 are:

1. VenusOS firmware v2.90 or higher installed on your GX device

2. Wakespeed WS500 firmware 2.5.0 or higher installed on the WS500 controller

3. The WS500 must connect to the VE.Can port of the GX device. It is not possible to monitor the WS500 when connected to the BMS-Can port of a Cerbo GX.

5.9.3. Wiring the WS500 to VE.Can

Both, the WS500 and VE.Can, use RJ45 connectors for their CAN ports.

However, both have different pin outs. This means that a normal (straight UTP cable) network cable cannot be used. A crossover cable is required. This crossover cable must be made by yourself. The following diagram reflect the pin out of the two devices.

Victron VE.Can pin# and signal	WS500 CAN pin# and signal
1 NC	1 CAN-H
2 NC	2 CAN-L
3 NET-C (V-)	3 CAN-GND
4 NC	4 (SFTY-STOP)
5 NC	5 -
6 NET-S (V+)	6 (CAN-SHLD)
7 CAN-H	7 (GND)
8 CAN-L	8 (CAN-V+)
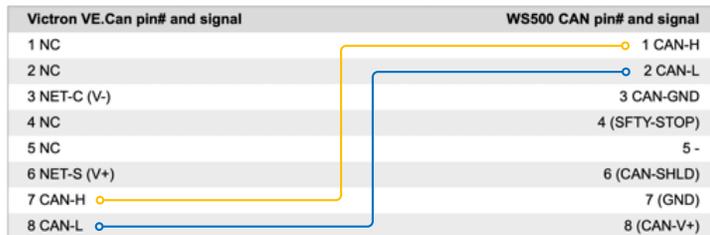
The important pins to look at are pin 7 and pin 8 for CAN-H and CAN-L on the VE.Can side and pin 1 and 2 for Can-H and CAN-L on the WS500 side.

Therefore a cable is needed where pin 1 and 2 on one side are connected to pin 7 and pin 8 on the other side. Pin 7 goes to pin 1 and pin 8 to pin 2.

The RJ45 connector with pin 7 and 8 on one end connects to the VE.Can port of the GX device. The other end of the cable with pin 1 and 2 connects to the WS500 controller. Both sides must be terminated.

The cable colors do not matter for the do-it-yourself cable. Wakespeed also offers a ready-configured cable with a blue RJ45 connector on one end that must be connected to the VE.Can port.

> Please note that the black terminators supplied by Wakespeed and the blue terminators supplied by Victron are not interchangeable. Therefore: insert the Victron terminator on the Victron side of the network, and insert the Wakespeed terminator into the Wakespeed.

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5.9.4. Wiring Example

The example below shows an overview of the recommended wiring based on an installation with a Lynx Smart BMS, Lynx Distributors and a Cerbo GX.

The correct placement of the alternator shunt (not to be confused with the shunt of the BMV or SmartShunt) is important here for the correct connection of the current sense wire.

For complete wiring between the WS500 and alternator, see the WS500 and the alternator manual.
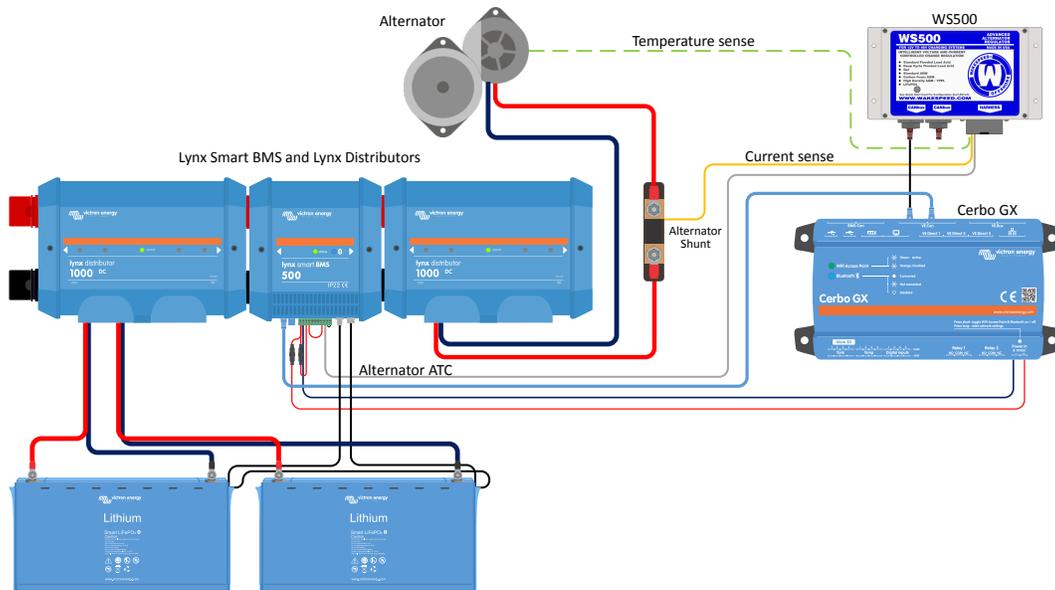
5.9.5. GX device user interface for WS500

Once the WS500 is connected to the GX device, the Device list contains an entry for the regulator.

The WS500 menu then provides the following information and data:

- **Output**: voltage, current and power as reported from the alternator regulator

- **Temperature**: the alternator temperature as measured by the WS500 temperature sensor

- **State**: the charging state of the WS500
  - Off when not charging

  - Bulk, Absorption or Float when the WS500 is using its own charging algorithm

  - External Control when controlled by a BMS such as Lynx Smart BMS

- **Network Status**:
  - Standalone, if the regulator is working on its own

  - Group Master, when it is supplying charging targets to another WS500 device

  - Slave, when it is taking charging directions from another device such as a WS500 or a BMS

- **Error**: reflects any error state the WS500 might be in. The details of all error codes and messages can be found in the Wakespeed Configuration and Communications guide. See also the appendix for error #91 and error #92

- **Field Drive**: report on the % of field drive being sent by the WS500 to the alternator on the field connection

- **Speed**: the speed in RPM at which the alternator is spinning. This is as reported by the stator feed and if this is wrong can be adjusted by setting the Alt Poles option within the Wakespeed SCT configuration line

- **Engine Speed**: reported in RPM. This is reported by either
  - calculation based on the alternator speed and the Eng/Alt drive ratio as set by the SCT configuration line

  - NMEA 2000, if the WS500 is receiving engine RPM from PGN127488

  - J1939, if the WS500 is receiving engine RPM from PGN61444

It is also possible to create a custom name for the WS500 in the Device menu. This triggers the WS500 to update the $SCN configuration line of the regulator.
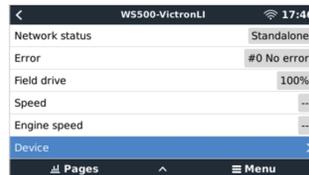
5.9.6. WS500 data on the VRM Portal

WS500 data that can be displayed on our VRM portal is current, voltage and temperature.

Currently 3 widgets are available on VRM
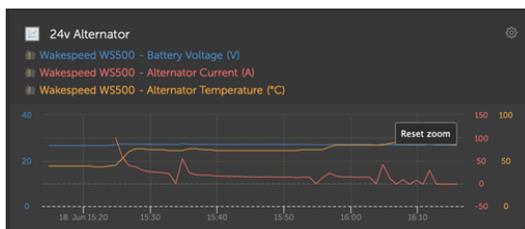
VRM custom widget showing WS500 voltage, current and temperature

5.9.7. Troubleshooting & FAQ

For further assistance and troubleshooting please contact Wakespeed support directly.

Error code #91 and #92

Venus OS will report all errors that can be generated by the WS500 as defined within the Wakespeed Communications and Configuration guide. In systems with integrated BMS, the following errors are critical as long as the events are active and require special attention.

- **#91: Lost connection with BMS**

   The WS500 has lost communication with the BMS and will drop into the configured get home mode. As soon as communication is restored with the BMS, it will revert to following the charging goals as set by the BMS.

- **#92: ATC disabled through feature IN**

   The BMS has signalled a charge disconnect event through the feature in wire and the WS500 has therefore reverted to an Off status.

Current and power data are not displayed in the WS500 device menu

This does not constitute a problem and simply relates to how the system is installed and intended to be.

- No alternator shunt[1] installed

- Alternator shunt installed but not properly configured. Check the ShuntAtBat setting and the Ignore Sensor setting using the Wakespeed configuration tools.

[1] The alternator shunt is a shunt that can be installed in series with the alternator to provide readout of alternator output current and power. Its sense wiring connects directly to the WS500. This is an optional feature that is only for display purposes. If the shunt is not installed, the GX device will show other alternator data, such as field % and output voltage etc., but not the alternator output current and power.

FAQ

Q1: Is the alternator output current (if actually measured) used for anything other than just display purposes?

A1: For the time being it's just for display purposes. Perhaps sometime in the future there will be DVCC integration, where the GX device controls the amount of current you want the WS500 to generate, and then the GX device splits the desired charge current between the WS500 and, for example, MPPTs.

Q2: What is the battery output current used for and can it be read over the canbus by a Lynx Smart BMS, other battery monitors or even a GX device?

A2: Yes, the current can be read out via canbus and Lynx Smart BMS.

In this case the WS500 shunt can be configured for the alternator and thus report the amount of current the alternator is producing. The Lynx Smart BMS current is used by the WS500 to ensure that no more than what the battery needs goes into the battery. So if the battery calls for 100A and the WS500 reports 200A at the alternator, 100A will be used to support the loads. It offers a greatly improved calculation for the DC load.

Q3: If the system includes a Lynx Smart BMS, are there any wiring recommendations?

A3: Yes. We have created extensive system examples that show the complete wiring and have been supplemented with important additional information. For example a catamaran system with two WS500 or a system equipped with an additional alternator controlled by one WS500. These examples can be used as a basis for your own system.

These system examples can be downloaded from the product page of the Lynx Smart BMS.

Q4: If the system does not include a Lynx Smart BMS, how do you recommend wiring?

A4: Wakespeed provides a quick start guide showing how to configure the regulator via DIP switches and an overview of all wiring connections on the wiring harness that comes with the unit.

The WS500 product manual contains additional wiring diagrams that show in detail how the wiring harness is wired.

Note that the shunt should be connected to the battery and the WS500 configured with the shunt on the battery.

5.10. Wireless Bluetooth Ruuvi temperature sensors

The Ruuvi sensor features temperature, humidity and atmospheric pressure streamed wirelessly to the GX device via Bluetooth.

To connect the Ruuvi sensors to the GX device via Bluetooth, the GX device needs Bluetooth functionality. Some GX products already have built-in Bluetooth, all others can easily be retrofitted using a standard USB Bluetooth adapter (see the Victron GX product range overview for GX products that have built-in Bluetooth).

However, an additional USB Bluetooth adapter, also for GX devices with built-in Bluetooth, allows for limited relocation of the Bluetooth radio (via a USB cable extension) close to other supported Bluetooth devices that might not otherwise be reachable.

Note for Cerbo GX units built up to and including serial number HQ2207: The built-in Bluetooth connection is disabled when the internal CPU temperature exceeds 53 degrees C (influenced by load and/or ambient temperature). **For reliable operation it is necessary to use a USB Bluetooth adapter**. Devices manufactured later (HQ2208 and later) do not require an additional USB Bluetooth adapter. Note that this limitation does not apply to the Cerbo-S GX.

External USB Bluetooth adapters that have been tested and known to work:

USB Bluetooth adapter				
Insignia (NS-PCY5BMA2)	Logilink BT0037	TP-Link UB400(UN)	Kinivo BTD-400	Ideapro USB Bluetooth adapter 4.0
Ewent EW1085R4	Laird BT820	Laird BT851	-	-

A list of additional adapters that are also being tested, as well as adapters that have been tested and are known not to work, is available in this community thread.

Installation procedure

Make sure that Bluetooth is enabled in the Bluetooth menu (enabled by default).

Go to the Settings → I/O → Bluetooth sensors menu and then click Enable to enable Bluetooth temperature sensors.

The Ruuvi sensors come supplied with a removable plastic pull tab. This prevents it from discharging while on the shelf. Pull out the plastic tab and the unit will start transmitting its temperature information.

The sensor should appear in the menu, "Ruuvi ####" - with a 4 hexidecimal device ID, enable the specific Ruuvi sensor.
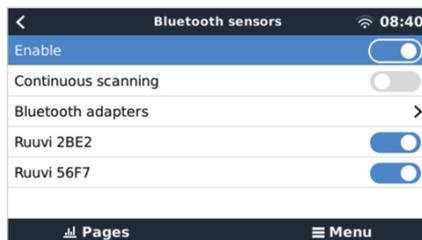
The Bluetooth adapters submenu displays a list of available Bluetooth adapters. The menu option Continuous scanning permanently scans for new Bluetooth sensors. Note that this option affects the WiFi performance of the GX device. Only enable this option if you need to search for new Bluetooth sensors. Otherwise, leave this option disabled.

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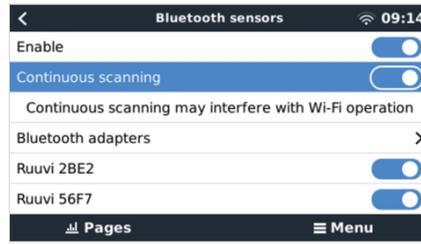
If you have multiple sensors, you may wish to physically write this device ID on the sensor case itself to help keep track.

The sensor should now be visible in the main menu - by default it is labelled 'Generic temperature sensor (##)'
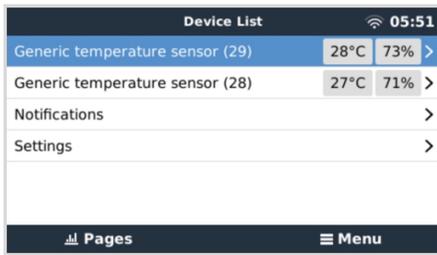
It is possible inside the temperature sensor menu to adjust the type, and also to set a custom name.

The Ruuvi sensors are estimated to last more than 12 months on a single replaceable CR2477 3V Li coin battery. Both the internal battery voltage and the battery status are displayed in the menu of the respective sensor. Status 'Ok' = battery voltage ≤2.50V. Status 'Sensor battery low' = battery voltage ≥2.50V.

It is possible to update the firmware for the Ruuvi with Ruuvi's own separate phone app, though this is not necessary unless you are experiencing issues.

5.11. Connecting IMT Solar Irradiance, Temperature and Wind Speed Sensors

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.

Compatibility

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.

Operation

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

The Victron GX device must be running version 2.40 or later.

The IMT sensor needs to be firmware version 1.52 minimum - for more information about this please contact IMT.

Physical connection to the Victron 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.

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

Wire connections

Si-Sensor	Victron RS485 to USB interface	Signal
Brown	Orange	RS485 Data A +
Orange	Yellow	RS485 Data B -
Red	-	Power Pos - 12 to 28VDC
Black		Power Neg/Gnd - 0VDC
Black (thick)	-	Ground / Cable Shield / PE
-	Red	Power Pos - 5VDC (not used)

Si-Sensor	Victron RS485 to USB interface	Signal
-	Black	Power Neg/Gnd - 0VDC (not used)
	Brown	Terminator 1 - 120R (not used)
	Green	Terminator 2 - 120R (not used)

Installation Notes

The maximum DC power supply voltage permitted for the IMT Si-RS485 series solar irradiance sensor range is 28.0VDC - accordingly for 24V and 48V 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 12V 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 10.5V (as measured at the sensor, account for voltage drop in the cable).

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)

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).

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).

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.

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.

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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.

5.11.1. Data Visualisation - VRM

To review logged historical data on the VRM portal, expand the 'Meteorological Sensor' widget list and select the 'Meteorological Sensor' widget.
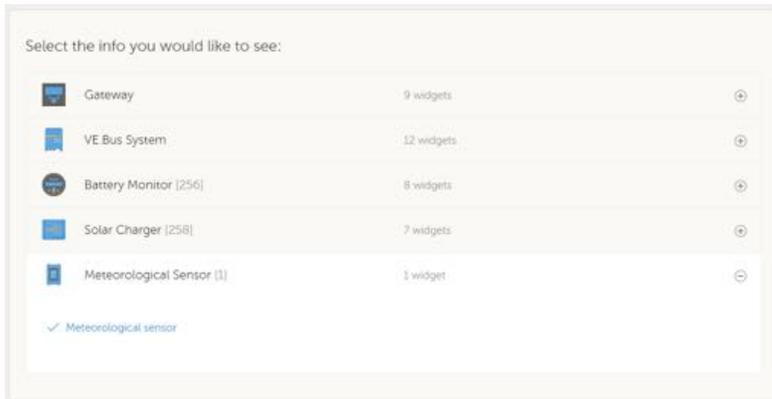
Data from all available sensor types will be automatically displayed in the graph. Individual sensors/parameters can also be disabled/enabled by clicking on the sensor name/legend.

5.12. Connecting a ComAp CM-Ethernet module

5.12.1. Introduction
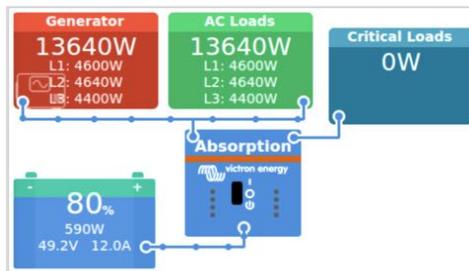
The ComAp CM-Ethernet communication module enables remote monitoring and control for ComAp genset controllers such as the InteliLite 4. By integrating with a GX device, it is possible to read out AC data, oil pressure, coolant temperature, and further status readings and data, including digital start/stop signalling from the GX device.

The GX device and the VRM Portal display data such as voltage, power, and energy values from the genset.

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How does it work?

The CM-Ethernet module contains data from the InteliLite 4 panel that the GX device can read via Modbus. The default Modbus mapping of the CM-Ethernet module is used.

In the appendix you will find an overview of all Modbus registers used and their mappings: Modbus holding registers for the ComAp CM-Ethernet module [146].

5.12.2. Installation & Configuration

Installation and configuration takes place in just a few steps. You only need to enable the Modbus Server in your CM-Ethernet module. This can be done from the control panel or using the software for the controller, InteliConfig, which can be downloaded from the ComAp website.

No further configuration of the ComAp CM-Ethernet module is required, provided that the standard mapping in the CM-Ethernet module has not been changed. Note that the GX device register mapping is static; it cannot be configured.

ComAp CM-Ethernet configuration

The following procedure describes the steps using InteliConfig:

1. Open the InteliConfig app.

2. Select the Setpoint tab.

3. In the following menu, select the CM-Ethernet module.

4. Enable the Modbus server.
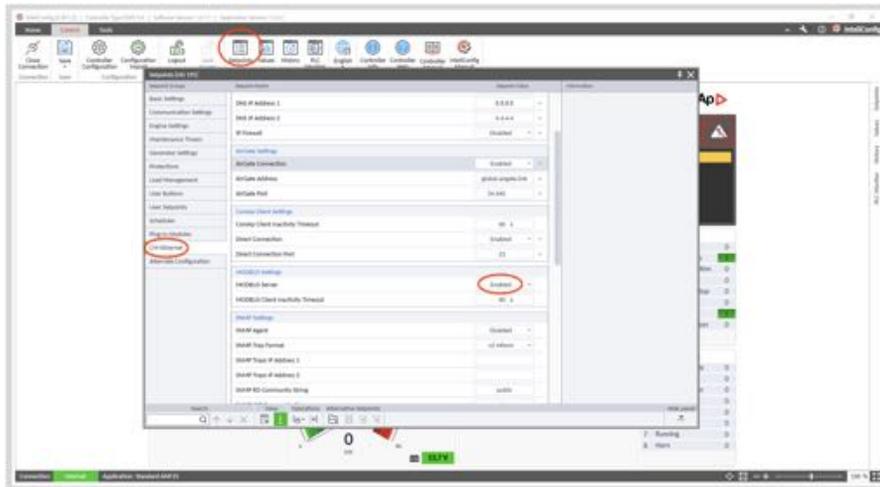
GX device configuration

Once the GX device and the CM-Ethernet module are connected to the same network, it will automatically appear in the Device List.

If not, check the Modbus settings on the GX device, Settings → Modbus TCP Devices, and ensure Automatic scanning is enabled (default setting) or scan for it; it should be automatically detected. For this to work reliably, automatic scanning must remain switched on. The network is scanned every ten minutes. If the IP address changes, the device will be found again.

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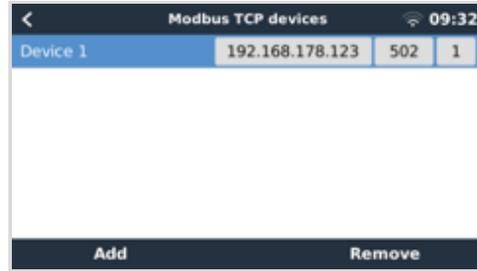
6. Internet connectivity

Connect the Cerbo GX to the internet to get all the advantages of the VRM Portal. The Cerbo GX 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 Cerbo GX to regularly check for a new firmware versions - which (depending on the setting) will be automatically downloaded and installed.

There are several ways to connect a Cerbo GX to the internet:

• Run a network cable between a router and the Cerbo GX Ethernet LAN port

• Connect to the router wirelessly using WiFi

• Via a mobile (cellular) network, using the GX LTE 4G - a cellular USB modem or, with a 3G or 4G router

• USB Tethering via a mobile phone

This video explains how to connect LAN, WiFi and a GX GSM (also applies to GX LTE 4G):

6.1. Ethernet LAN port

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

> ⚠ **Before connecting the ethernet cable, be very careful not to confuse the GX device Ethernet port with the VE.Bus or VE.Can/BMS-Can ports!**

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6.2. WiFi

The Cerbo GX includes built-in WiFi. Using WiFi it is possible to connect to WEP, WPA and WPA2 secured networks. It is also possible to connect a supported external USB WiFi dongle (to increase wireless range outside of a cabinet for example).

There are several supported USB WiFi 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.

• Partno. BPP900200400 - WiFi module long range (Netgear AC1200) - higher cost and also better reception than the Nano USB. Wireless AC, Wireless G and Wireless N; 2.4 Ghz and 5 Ghz.

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.

• Partno. BPP900200400 - Netgear A6210-100PES.

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

The WiFi 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 (WiFi Protected Setup) is not supported.

When the Cerbo GX finds multiple WiFi 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.

> WiFi is an inherently less reliable connection than a hardwired ethernet cable. It should always be a preference to connect via ethernet when possible. Signal strength should always be at least 50%.

internet	16:11
State	Connected
Name	internet
Forget network?	
Signal strength	73 %
MAC address	00:0F:00:4F:05:96
IP configuration	Automatic
⊪ Pages ∨	≡ Menu
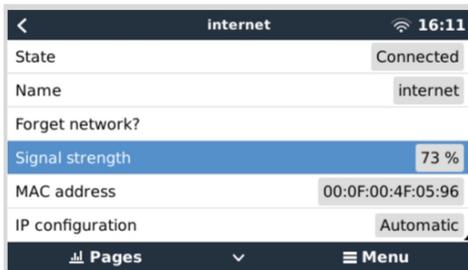
6.3. GX LTE 4G

The GX LTE 4G is a cellular modem for our GX range of monitoring products and provides a mobile internet connection for the system and a connection to the VRM Portal. It works on 2G, 3G and 4G networks.

Please see the GX LTE 4G Manual

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

> The GX LTE 4G provides only an internet connection for the GX device. Sharing the internet with laptops, phones, or other devices is not possible.

For installations where more devices require internet, as is often the case on a yacht or RV, or where a reliable failover/backup solution is needed, consider installing a mobile router with this functionality instead.

A mobile router can share cellular data with multiple devices such as smartphones, tablets, laptops and other devices via its Ethernet port or WiFi and is able to switch to a previously configured WiFi connection in the event of an Ethernet connection failure or vice versa.

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

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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 reset. Examples of such professional routers are the H685 4G LTE from Proroute and the Industrial 4G router range from Pepwave.

More information is in this blog post.

Note that the Cerbo GX does not support USB 3G/4G dongles, other than the GX GSM and GX LTE 4G accessories available from Victron.

6.5. 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

6.6. Manual 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 Cerbo GX default setting. If you do need to configure the address manually, select the following template:
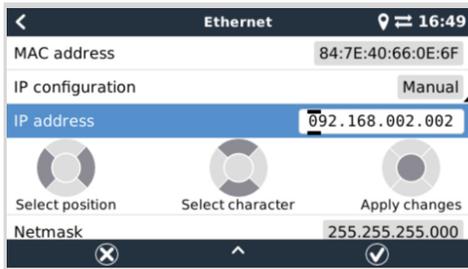
Complete details of IP requirements, as well as used port numbers will be found in the VRM FAQ - ports and connections used by the [131] Cerbo GX.

6.7. Multiple connections (failover)

It is possible to connect the Cerbo GX to multiple networks simultaneously, Ethernet, WiFi and LTE (via a GX LTE 4G). In this case, the GX device uses Ethernet or WiFi whenever available and falls back to LTE if the Ethernet connection is lost and WiFi access isn't available.

The priority of which connection the GX device uses is based on the following order:

1. Ethernet, regardless of whether there is a WiFi or LTE connection.

2. WiFi when there is no Ethernet connection and regardless of whether there is an LTE connection.

3. LTE when there is no Ethernet and WiFi connection.

> ❗ Please note that the GX device does not check whether any network devices mentioned have an active internet connection. This mechanism only considers the active network connection.

6.8. Minimise internet traffic

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

• Disable auto firmware updates [62]

• Do not enable remote support [132]

• Reduce the Log interval (Settings → VRM online portal → Log 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

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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 Cerbo GX 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.

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 GX device 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.

6.9. More information about setting up an internet connection and VRM

- Setting up a VRM account

- VRM Portal alarms and monitoring

- VRM Portal - Frequently asked questions

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7. Accessing the GX device

It is possible to access the GX device via a smartphone, tablet or computer. This access is called Remote Console. The Remote Console is the central element for making or changing settings on the GX device.

In GX devices with a display this Remote Console feature may be disabled by default and need to be enabled. GX devices without a display have Remote Console enabled by default.

There are several ways to get access:

Access type	Color Control GX	Venus GX	Cerbo GX / Cerbo-S GX	Ekrano GX
VictronConnect via Bluetooth[4]	-[1]	-[1]	Yes	Yes
Built-in WiFi Access Point [44]	-[2]	Yes	Yes	Yes
Local LAN/WiFi network [45]	Yes	Yes	Yes	Yes
VRM Portal [3]	Yes	Yes	Yes	Yes

[1] Both CCGX and VGX do not have built-in Bluetooth. This feature can be easily added by connecting a USB Bluetooth dongle.

[2] The CCGX does not have built-in WiFi. This feature can be easily added by attaching a USB WiFi dongle.

[3] Requires the GX device connected to the internet.

[4] GX device Bluetooth functionality is limited to assist with initial connection and networking configuration. You cannot use Bluetooth to connect to the Remote Console or other Victron products (e.g. SmartSolar charge controllers). For more information about how to connect other Victron products, please see Connecting Victron products [10].

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7.1. Using VictronConnect via Bluetooth

If you are just getting started for the first time with VictronConnect, you may wish to begin with the VictronConnect manual.

1. Download the latest version of the VictronConnect app onto your Bluetooth compatible device (phone or laptop), and make sure that Bluetooth is enabled.

2. Make sure the Cerbo GX is powered on and the Bluetooth LED is blinking.

3. Open the VictronConnect app within 10 meters of the Cerbo GX and wait for nearby devices to be discovered.

4. Once discovered, click or tap on the Cerbo GX.

5. On first connection you will be asked to enter a Bluetooth PIN code.

    For GX devices with a serial number less than HQ2242, the default PIN code is 000000. GX devices with a serial number equal to or greater than HQ2242 have a random 6-digit PIN code printed on the label (on the back of the GX device).

6. For GX devices that use the default PIN code, you will then be asked to change this insecure default PIN code to a more secure unique code. Please set your unique code, and then put it in a safe place for passwords in case you forget.
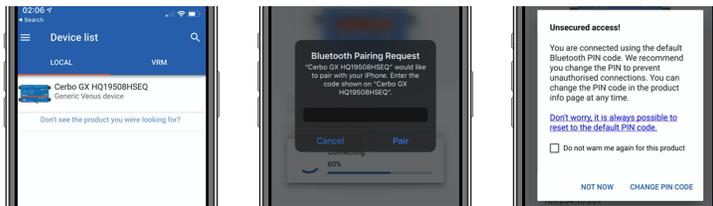
From the main device screen it is possible to change the network and ethernet settings, enable or disable the built-in WiFi Access Point, view the system on VRM, or open the Remote Console (requires a WiFi connection to a local network or the access point of your GX device).

For the network settings, tap or click the cog wheel icon.
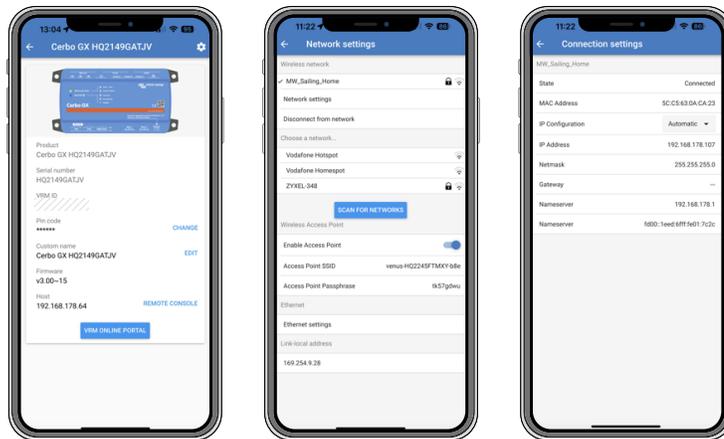
Bluetooth can only be used for initial connection and networking configuration, and cannot connect to other Victron products such as SmartSolar charge controllers. If you need to connect other Victron products, please refer to the Connecting Victron products [10] chapter.

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7.2. Accessing via built-in WiFi Access Point

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

Steps to connect automatically via the QR Code:

1. Locate the QR code sticker on the side of the Cerbo GX

2. Scan the QR code using your phone's camera function, or a QR code scanning app

3. If supported by your phone, this will prompt you to connect you to the WiFi Access point

4. Once connected, open VictronConnect

5. Select the GX device from the list

6. Open the Remote Console

Steps to manually connect:

1. Stand as close as possible from the Cerbo GX, and no further than a few meters away.

2. Go to the WiFi settings on your phone, tablet or laptop.

3. After searching, the Cerbo 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 http://172.24.24.1 or http://venus.local

• For added security it is possible to disable the WiFi Access Point. See Settings → Wi-Fi → Create access point in the Remote Console.

Instruction video

Watch the step-by-step instruction video on how to connect to a GX device using the VictronConnect app:

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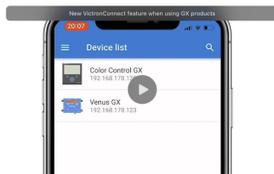
7.3. Accessing the Remote Console via local LAN/WiFi Network

This section explains how to connect to Remote Console when the Cerbo 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 it will need to be connected to the same computer network as the Cerbo GX.

This video shows how it is done.

7.3.1. Alternative methods to find the IP address for Remote Console

In case VictronConnect can't be used, here are a few other methods to find the Cerbo GX, ie. its IP address.

Link Local Address - Venus.local

When the Remote Console on LAN setting is enabled, a direct connection (via network cable without a router or DHCP server) is possible. You can access the GX device by typing venus.local or http://venus.local into a web browser, or in VictronConnect when connected to the same network. Only enable this function on trusted networks or direct connections. Make sure you have disabled the password check, or set a password first.
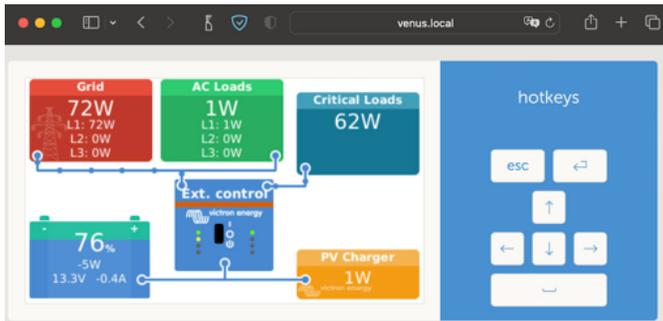
IP Address on VRM

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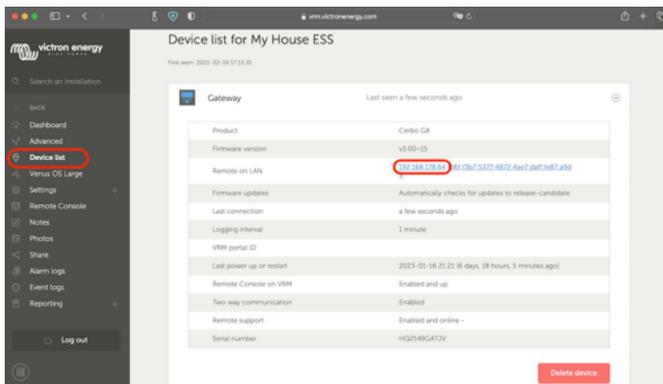
Network (on Microsoft Windows)

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In a local network, for example at home, you can also find the Cerbo GX in the Windows 'Network' overview (this uses Universal Plug-and-Play (UPnP) broadcast technology):
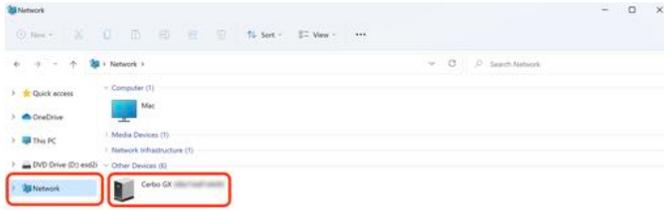
Double-clicking the icon will open up Remote Console on LAN.
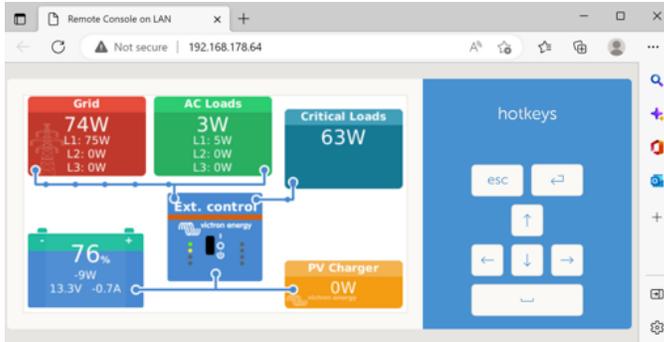
Open the 'Properties' window by right-clicking the icon to see the IP address.
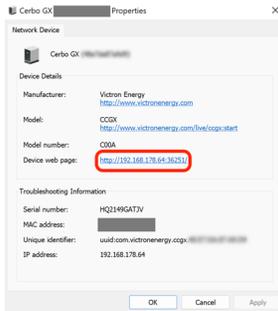
7.4. Accessing via VRM
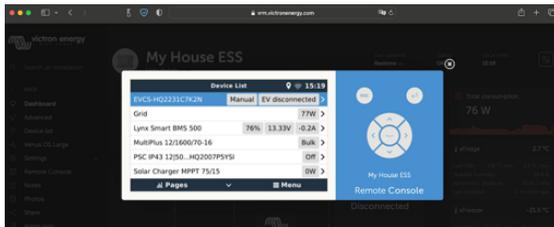
This method requires a working internet connection, both on your phone, tablet or laptop as well as for the Cerbo GX. For a new install, this means that it needs to be connected by Ethernet cable.

Step-by-step instructions:

1. First, connect the Cerbo 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 Cerbo GX will immediately connect to VRM.

2. Now go to the VRM Portal, https://vrm.victronenergy.com/, and follow the instructions to add the device.

3. Then, once visible on VRM, click on the Remote Console link in the left-hand menu.

   The result looks similar to the image above.

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More technical information in the related troubleshooting chapter: Remote Console on VRM - Troubleshooting [85].

7.5. The Remote Console menu
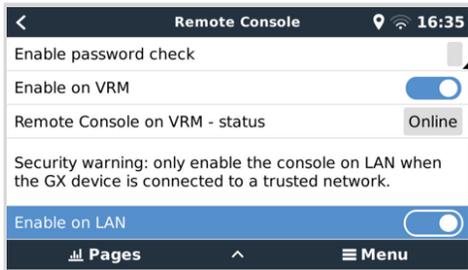
The Remote Console menu (Settings → Remote Console) contains options for controlling access to the Remote Console via LAN/WiFi and VRM and shows the online status of the Remote Console on VRM.

The options in detail:

1. **Disable password check:**

   If this option is disabled, there is no password check when accessing the Remote Console.

2. **Enable password check:**

   To enable password check, a password must first be assigned. Use this password when accessing the Remote Console. Keep it in a safe place.

3. **Enable on VRM:**

   If enabled, the Remote Console can be used via the VRM portal from anywhere in the world. The password check (recommended) also applies if it is activated.

4. **Remote Console on VRM - status:**

   Displays the online status of the Remote Console on VRM.

5. **Enable on LAN:**

   If enabled, the Remote Console can be used via local LAN/WiFi. Mind the security warning.

Note that you need to manually reboot (Settings → General → Reboot) the GX device after changing any of these settings.

8. Configuration

8.1. Menu structure and 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 Cerbo GX:

Item	Default	Description
General		
Access level	User and installer	Set this to 'User' to prevent accidental and unwanted changes to the configuration. Installer has additional privileges and once changed from default requires a password. Password is available from your dealer.
Remote support	No	No / Yes - Enable this to allow Victron engineers to access your system in case there is a problem.
Reboot?		Reboots the GX device
Audible alarm	Yes	When there is an alarm on the Cerbo GX or a connected product, the Cerbo GX will beep - unless this setting is set to 'Off'.
Demo mode	Disabled	Demonstrates product and installation features to a client or at an exhibition. This simulation mode will allow better understanding without (yet) changing any settings. Note that this will add simulated devices to a VRM installation. Demos for ESS, Boat and Motorhome are available.
Firmware - Read full feature description [62]		
Firmware Version	x.xx	Displays the currently installed firmware version.
Build date/time	xxx	Displays the build number.

> Note that for most system applications our advise is to keep automatic updates disabled; as is also the default factory setting.
>
> Instead, update the system at a convenient moment; when people are on location and ready to revert to a previous system and/or troubleshoot in case of issues.

Item	Default	Description
Online updates: Auto update	Check only	If this is Enabled, the GX device will check with the server to see if there is a new version available. It is possible to set to disable, or update automatically
Online updates: Update feed	Latest release	Use the default setting unless you want to participate in test versions. End-user systems should certainly be set to 'Latest release'.
Online updates: Image type	Normal	Choice between Normal and Large image. The large image adds Node-RED and the Signal K-Server functionality to the image.
Online updates: Check for updates	Press to check	Click or press the spacebar to check if a new firmware update is available.
Install firmware from SD/USB		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 UTC	Automatic from internet	-
Date/Time local	Automatic from internet	When connected to the internet, time will be automatically synchronised regardless of this setting. Toggle this setting to manually input the time where no internet connection is present.
Time zone		Select the correct local time zone.
Remote Console - Read full feature description [42]		
Disable password check		Password authentication not required for Remote Console access.

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Item	Default	Description
Enable password check		Choose password to allow Remote Console access.
Enable on VRM	No	No / Yes - Enabling on VRM will allow connection to the Cerbo GX from anywhere via the VRM portal. See also Troubleshooting Remote Console on VRM [85]
Remote Console on VRM - status	-	Displays the connection state of the VRM Remote Console Feature: Online, Offline, Disabled.
Enable on LAN	No	No / Yes - Enabling will allow direct connection to the Cerbo GX 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		
System name	Automatic	Select the system name - presets or user defined
AC input 1	Generator	Select Not available, Generator, Grid or Shore power. Note: additional configuration is required for complete setup of these options.
AC input 2	Grid	Same choices as above.
Monitor for grid failure	Disabled	Monitors for loss of AC-input and triggers an alarm if detected. Alarm is cleared when the AC-input is reconnected.
Battery monitor	Automatic	Select the SoC source. This function is useful where there is more than one BMV. Options: Automatic, No battery monitor and available battery monitor sources. For more details see Battery state of charge (SoC) [56].
Has DC system	Disabled	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. |
| Battery Measurements | Not set | Use this menu to define which battery measurement to see on the VRM portal and the MFD HTML5 app. |
| System status | On/Off | The following parameters are diagnostic flags only. See The System Status Menu [58] chapter for details

Synchronise VE.Bus SoC with battery

Use solar charger current to improve VE.Bus SoC

Solar charger voltage control

Solar charger current control

BMS control |
DVCC - Read full feature description [71]		
DVCC	Disabled	Enabling DVCC changes a GX device from a passive monitor into an active controller. Default setting is No, unless a compatible BMS-Can managed battery is connected, then setting is set and locked to manufacturers specification.
Limit charge current	Disabled	User-configurable system wide maximum charge current setting in Amps.
Limit managed battery charge voltage	Disabled	Only use this option for 15s Pylontech batteries on initial balancing. Using it for other purposes may have undesirable side effects.
SVS - Shared voltage sense	Disabled	The GX device automatically selects the best available voltage measurement and shares it with other connected devices.

Item	Default	Description
STS - Shared temperature sense	Disabled	The GX device will send the measured battery temperature to the inverter/charger system as well as all connected solar chargers.
Temperature sensor	Automatic	Select the temperature sensor to use for shared temperature sense measurement.
SCS - Shared current sense	No	Forwards the battery current, as measured by a battery monitor connected to the GX device, to all connected solar chargers.
Controlling BMS	Automatic	Select the BMS that controls the battery.
SCS status	-	Describes if SCS is enabled, or why it is disabled
Display & language		
Adaptive brightness	Yes	Use the ambient light sensor to adjust screen brightness (only available when a GX Touch is connected)
Brightness		Configure the brightness between 0 and 100%
Display off time	-	Set time-to-off between 10s / 30s - 1m / 10m /30m - or never
Show boat & motorhome overview	Disabled	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, Czech, Dansk, Polish, Russin and Arabic.
Units	°C	The available options are Celsius and Fahrenheit. Please note that this setting does not affect the temperature unit in the VRM portal.
VRM online portal - Read full feature description [79]		
Logging enabled	Enabled	Enable or disable logging
VRM Portal ID	-	Use this value when registering the GX device onto the VRM 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.
Use secure connection (HTTPS)	Yes	This encrypts the communication between the GX device and the VRM server
Last contact	-	Time since the VRM server was last contacted
Connection error	No error	Displayed if there is an error in VRM communications. See here for more details on troubleshooting VRM errors. [81]
VRM two-way communication	Disabled	Enable for VRM: Remote VEConfigure and VRM: Remote firmware update
Reboot device when no contact	Disabled	The GX device will reset itself to attempt to correct a potential networking issue if the internet connection is lost for the set delay period
No contact reset delay (hh:mm)	01:00	How long the unit must be offline before restarting itself
Storage location	Internal storage	Displays if an external storage device (eg USB drive or microSD card) is mounted, or the internal storage is in use
Free disk space	-	Amount of bytes available on the storage device
microSD/USB	-	Select to safely eject an external microSD or USB storage (if one is connected) before physically removing it. Failure to do so can cause data loss.
Stored records	-	How many records are stored locally when no internet connection is available. The GX device will store as many records as it can locally, then upload them when internet is available again.

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Item	Default	Description
Oldest record age	-	If internet/VRM is not available, then this will display the oldest record stored on the GX device.
ESS - 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. Read full feature description.		
Mode	Optimized (with BatteryLife)	Optimized (with BatteryLife) and Optimized (without BatteryLife), Keep batteries charged, External control
Grid metering	-	Leave at default when there is no external Victron grid meter installed.
Inverter AC output in use	Enabled	Setting this to 'No' hides the AC-out graphic in the overview pane.
Self-consumption from battery	All system loads	This setting allows for ESS to only use battery power for essential loads. Options are 'All system loads' or 'Only critical loads'. 'Inverter AC output in use' must be enabled for this option to appear.
Multiphase regulation	-	Use the Phase compensation setting in systems with a three-phase connection to the utility grid.
Minimum SOC (unless grid fails)	10%	Configurable minimum SoC limit. ESS will supply loads from the grid once the SoC has fallen to the configured setting - except when the utility grid has failed and the system is in Inverter mode.
Active SOC limit	10%	Use this setting to see the current BatteryLife SoC level.
Peak shaving	Above minimum SoC only	Above minimum SoC only, Always
BatteryLife state	Self-Consumption	Self-consumption, Discharge disabled, Slow charge, Sustain, Recharge
Limit inverter power	Disabled	Limit the power drawn by the Multi: ie. limit the power being inverted from DC to AC.
Grid setpoint	50W	With a higher grid setpoint, you can give the system some "leeway" so as not to feed too much energy into the grid in the event of sudden load changes.
Grid feed-in	-	Set and limit grid feed-in: AC-coupled PV feed in excess, DC-coupled PV feed in excess, Limit system feed-in
Scheduled charge levels	Inactive	Allows you to set up to five scheduled periods, during which the system will take power from the grid to charge the battery.
Energy meters - Read full feature description		
Role	Grid meter	Grid meter, PV inverter, Generator, AC meter
Phase type	Single phase	Either multi- or single-phase
PV inverters - Read full feature description		
Inverters:	-	Shows connected AC PV inverters
Inv: Position	AC Input 1	AC input 1, AC input 2, AC Output
Inv: Phase	L1	
Inv: Show	Yes	
Find PV inverters	-	Scan for available PV inverters
Detected IP addresses	-	Shows the IP address of PV inverters that have been discovered
Add IP address manually	-	If an inverter has a manually assigned IP address, you can add it directly here.
Automatic scanning	Enabled	This setting will continue to look for PV inverters, this can be useful if using a DHCP assigned IP address that might change.
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.		
Modbus TCP devices		
Automatic scanning	Enabled	Scans automatically for Modbus TCP devices
Scan for devices	-	Manually trigger a scan for Modbus TCP devices

Item	Default	Description
Devices	-	Displays a list of found Modbus TCP devices and their IP address
Ethernet - read full feature description [37]		
State	Unplugged	The state is either unplugged, connecting or connected
MAC address	-	
IP configuration	Automatic	Options: Automatic (DHCP) and manual IP address allocation
IP address	-	
Netmask	-	
Gateway	-	
DNS server	-	
Link-local IP address	-	
WiFi - Read full feature description [38]		
Create access point	Enabled	Disables the internal WiFi access point
Wi-Fi networks	-	Displays a list of available WiFi networks and/or the network to which the GX device is connected
Name	-	SSID of the Wifi network
State	Connected	
Forget network	-	Press to "forget" the network if you want to connect to a different network or troubleshoot
Signal strength	%	
MAC address	-	
IP configuration	Automatic	Options: Automatic (DHCP) and manual IP address allocation
IP address	-	
Netmask	-	
Gateway	-	
DNS server	-	
GSM modem - Read full feature description		
Bluetooth		
Enabled	Yes	
Pincode	000000 (or a unique PIN code supplied with the device or set manually)	
GPS - Read full feature description [16]		
GPS information	-	Status, Latitude, Longitude, Speed, Course, Altitude, Number of satellites
Device	-	Displays device related information for diagnostic
Format	DDD.DDDDD°	Choose between decimal degrees, degrees and decimal minutes or degrees, minutes and seconds display
Speed unit	km/h	Choose between km/h, meters per second, miles per hour, or knots.
Generator start/stop - Read full feature description [118]		
State	Stopped	Shows the state of the generator.
		Possible state messages:
		Stopped, Warm-up, Manually started, Running by condition, Cool-down, Stopping
Error	No error	Displays if there is an error (e.g. generator is supposed to be running but no AC input is detected)
Run time	hh:mm	The time the generator has been running since start.
Total run time	hh:mm	Total time the generator has been running since reset.

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Item	Default	Description
Time to service	hh	Remaining hours until the next service.
Time to next test run	hh:mm	If a periodic run is programmed, this counter will display in days, and hours how long before that will occur.
Auto start functionality	Disabled	Enable or disable the Autostart functions, this can be further configured in the Generator → Settings → Conditions menu
Manual start	-	Start generator, Run for hh:mm
Daily run time	-	Submenu shows the history of time the generator has been running (minutes) each day for the previous 30 days.
Generator start/stop → Settings		
Generator start/stop → Settings → Conditions		
On loss of communication	Stop generator	Stop, Start, Keep generator running
Stop generator when AC input is available	Disabled	This option is ideal for backup systems where a Quattro has mains power connected to one AC input and a generator connected to the other AC input. If this option is activated, the generator will stop as soon as mains is available again.
Battery SOC	No	Use Battery SOC value to start/stop - No / Yes
		Start when SOC is lower than - %
		Start value during quiet hours - % (to override programmed quiet hours when absolutely necessary)
		Stop when Battery SOC is higher than - %
		Stop value during quiet hours - % (allows for less runtime during quiet hours, once system is recovered)
Battery current	No	Use value to start/stop - No / Yess
Battery voltage		Start when value is higher than - Amps / Voltage / Watts
AC output		Start value during quiet hours - Amps / Voltage / Watts (to override programmed quiet hours when absolutely necessary)
		Start after condition is reached for - seconds (to allow for momentary spikes to pass without triggering start)
		Stop when value is lower than - Amps / Voltage / Watts
		Stop value during quiet hours - Amps / Voltage / Watts (allows for less runtime during quiet hours, once system is recovered)
		Stop after the condition is reached for - seconds (to allow for momentary dips without stopping the running generator)
Inverter high temperature	No	Start on value warning - No / Yes
Inverter overload		Start when warning is active for - seconds (to allow for momentary spikes to pass without triggering start)
		When warning is cleared stop after - seconds (to allow for momentary dips without stopping the running generator)
Generator start/stop → Settings → Conditions → Periodic run		
Periodic run	No	Enable - No / Yes
		Run interval
		Skip run if has been running for
		Run interval start date
		Start time
		Run duration (hh:mm)
		Run until battery is fully charged
Generator start/stop → Settings		
Minimum run time	0	The minimum number of minutes the generator will run for any time that it is started, even after stop conditions.
Warm-up time	0	Allows a configurable time to be set for the generator to warm up or cool down via relay control while the AC input relay is open and the inverter/charger is not connected to it.
Cool-down time	0	

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Item	Default	Description
Detect generator at AC input	No	No / Yes - An alarm will be triggered when no power from the generator is detected at the inverter AC input. Make sure that the correct AC input is set to generator on the system setup page.
Alarm when generator is not in autostart mode	Disabled	If enabled, an alarm will be triggered when the autostart function is left disabled for more than 10 minutes.
Quiet hours	0	Quiet hours will prevent normal generator run conditions from starting the generator. It is possible for some settings to specify override values to the quiet hours (an extremely low battery voltage trigger to prevent a system shutdown for example)
Run time and service	Submenu	This is the service menu where the daily run time counter and service timer can be reset and the service interval hours can be defined.
Reset daily run time counters		An option to reset generator run time counters, for example if these are used for service, or if the generator is replaced or majorly repaired.
Generator total run time (hours)		The total time the generator has been running since the counter was reset.
Generator service interval (hours)		Enter the service interval in hours here.
Reset service timer		Press to reset the service timer after the service is complete.
Tank pump - Configure automatic starting and stopping of pump based on tank level(sender) information. Pump auto start/ stop with Color Control GX		
Pump state	-	Displays if the pump is running or not
Mode	Auto	Options are Auto, On and Off. This is the manual override to the start and stop level triggers when a tank sensor is connected.
Tank Sensor	Automatic	Select the tank sensor that is used for the tank pump trigger. 'No tank sensor' will be displayed if no tank sensor is connected or detected,
Start level	50%	The trigger point of the tank level to start the tank pump (close the relay).
Stop level	80%	The trigger point of the tank level to stop the tank pump (open the relay).
Relay		
Function	Alarm relay	Select the relay function. Possible functions are 'Alarm relay', 'Generator start/stop', 'Tank pump', 'Temperature', and 'Manual'.
Polarity	Normally open	Select the polarity of the relay on the back of the Cerbo GX. 'Normally open' or 'Normally closed'. Note that setting it to Normally closed increases the Cerbo GX power draw. This option is only available when configured as an alarm relay.
Services		
ModbusTCP	Off	This setting enables the ModbusTCP service. More information about ModbusTCP in this document and in the communications white paper https://www.victronenergy.com/upload/documents/Whitepaper-Data-communication-with-Victron-Energy-products_EN.pdf
MQTT on LAN (SSL)	On	Enables MQTT on LAN - More information on MQTT is available on Victron Community.
MQTT on LAN (Plaintext)	Off	This setting is required to be enabled when connecting a Marine MFD
VE.Can port	VE.Can	CAN-bus profile (Disabled, VE.Can & Lynx Ion BMS 250 kbit/s, VE.Can & Can-bus BMS 250 kbit/s, CAN-bus BMS 500 kbit/s, Oceanvolt 250 kbit/s, RV-C 250 kbit/s). Additional options: Devices, NMEA2000-out, Unique identity number selector, Check unique ID numbers, Network status
BMS-Can port	-	CAN-bus BMS (500 kbit/s) or disabled and Network status

Item	Default	Description
CAN-bus		CAN-bus profile, Send data to VE.Can, Unique device number for VE.Can, Check unique numbers
I/O		
Analog inputs	On	Available tank level sensors On/Off, Available Temperature sensors On/Off
Digital inputs	Off	Available Digital inputs Off, Door alarm, Bilge pump, Bilge alarm, Burglar alarm, Smoke alarm, Fire alarm, CO2 alarm, Generator
Bluetooth sensors	Disabled	Enable to scan for supported Bluetooth sensors (Ruuvi and Mopeka Pro). Other options: Enable or disable found Bluetooth sensors and see which Bluetooth adapters are currently connected

8.2. Battery state of charge (SoC)

8.2.1. Which device should I use for SoC calculation?

There are three products types that calculate state of charge (SoC). The Cerbo GX 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, SmartShunt, Lynx Shunt VE.Can, Lynx Smart BMS or the Lynx Ion BMS

2. Multi and Quattro inverter/chargers

3. Batteries with built-in battery monitor and a (mostly BMS-Can) connection to the Cerbo GX.

When to use what?

If you have a battery with built-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 monitor 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 RV with DC lights and other DC loads, a dedicated battery monitor will be required.

8.2.2. The different solutions explained in detail

1. **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 Cerbo GX, in Settings → System setup, verify the selected battery monitor. It should be set to the Multi or Quattro.

2. **Battery with Multi or Quattro and MPPT Solar Chargers or a EasySolar with GX device built-in**

   No battery monitor is required as long as all MPPT solar chargers are Victron products and are connected to the Cerbo GX. The Cerbo GX 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 Cerbo GX, in Settings → System setup, verify the selected battery monitor. It should be the Multi or Quattro.

   3. In the System status menu, verify that the option 'Use solar charger current to improve VE.Bus SOC' is set to On. 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 Cerbo GX (v2.06 minimum).

3. **Battery 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 Cerbo GX according to the instructions.

   2. In the Cerbo GX, in Settings → System setup, verify that the selected battery monitor is the battery.

   > Note that the battery monitor setting in VEConfigure 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.

4. **Other system types**

   When there are more chargers or loads than just the Multi or MPPT solar chargers connected to the battery, a dedicated battery monitor is required. Examples are:

- House loads in Marine or Vehicle system.

- PWM solar chargers

- AC chargers, such as Skylla-is, Phoenix Smart IP43 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 (3), then that is the dedicated battery monitor. Refer to section (3). Otherwise install a BMV, SmartShunt or Lynx Shunt VE.Can.

Configuration:

1. Configure the battery monitor as per its documentation.

2. In the Cerbo GX, in Settings → System setup, verify the selected battery monitor.

3. It should be the BMV, SmartShunt, Lynx Smart BMS or Lynx Shunt battery monitor.

4. Finished.

> Note that the battery monitor setting in VEConfigure 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.

8.2.3. Notes on SoC

- 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.

More information:

VRM Portal FAQ - difference between BMV SOC and VE.Bus SOC

See Configurable Parameters Section [48] on Battery monitor selection and Has DC system.

8.2.4. Selecting SoC source

(Settings → System Setup → Battery monitor)

In the image above 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 Cerbo GX.

In the same image we have chosen the Automatic setting. When automatic is selected, the System setup screen will be as shown in the image below.

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The 'Automatic' function uses the following logic:

1. When available, it will use a dedicated battery monitor, such as the BMV, SmartShunt, Lynx Smart BMS or a Lynx Shunt VE.Can, 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 Cerbo GX.

A short explanation: The VE.Bus SoC determined by the Multi or Quattro is incorrect in the above situation as it does not take into account the discharge and charge currents by those other DC loads and also unmonitored chargers.

8.2.5. Details on VE.Bus SOC

• While the Inverter/Charger is in bulk, the SoC will not rise above the value as set in VEConfigure 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 recognise 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%.

8.2.6. The System Status menu
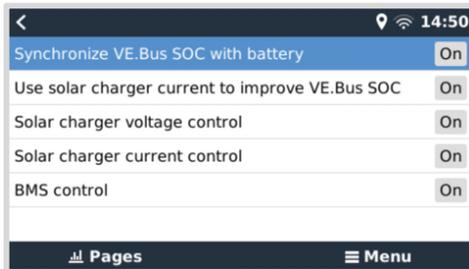
The System Status menu (Settings → System setup → System Status) contains diagnostic flags that can be useful in diagnosing problems with the system. Note that nothing can be configured here. The on/off flag depends on how a system is set up and what devices it contains.

Their meaning in detail are:

1. **Synchronise VE.Bus SoC with battery:**
   • If On, it indicates that the activated battery monitor in the Multi/Quattro is synchronising its SoC with that of a better source (a BMV or BMS in the system). The system does that automatically.

2. **Use solar charger current to improve VE.Bus SoC:**
   • In a VE.Bus system with no other battery monitor (no BMS, no SmartShunt, no managed battery) but with solar chargers, the solar charge current is taken into account and helps improve the SoC calculation of the internal Multi/Quattro battery monitor. The system does this automatically and indicates that it is active by displaying On.

3. **Solar charger voltage control:**
   • If on, this indicates that the solar chargers are not following their own internal charge algorithm. They're getting a voltage setpoint from somewhere else. Either
      • a managed battery or
      • in an ESS system, they get it from the Multi/Quattro.

4. **Solar charger current control:**
   • This indicates that the solar chargers are current limited by the system. In most cases the limiting device is a managed battery or a user-defined Maximum charge current in the DVCC menu.

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5. **BMS control:**

   • It indicates that the BMS is controlling the charge voltage setpoint (and not using the value set for absorption and float in the Multi/Quattro or solar charger).

8.3. Customise the logo on the Boat & Motorhome page

It is possible to use a custom logo on 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: http://venus.local/logo.php or http://[ip-here]/logo.php (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. Reboot the GX device.

8.4. LEDs and Push-button

8.4.1. LEDs

On the side of the Cerbo GX there are two LEDs. During power-up it it goes through these states:

Boot-up

The behavior of the LEDs during the boot-up process depends on whether the Wifi Access Point and Bluetooth were activated before booting or not.

• Stage 1: Both LEDs are off for approximately 4 seconds.

• Stage 2: The Wifi Access Point LED starts blinking red for approximately 40 seconds.

• Stage 3: The Wifi Access Point LED starts blinking green for approximately 10 seconds (or stays off in case the Access Point was disabled before booting up).

• Stage 4: The Bluetooth LED starts blinking blue (or stays off in case Bluetooth was disabled before booting up).

During operation

• Wifi Access Point LED blinks red: built-in WiFi Access Point disabled

• Wifi Access Point blinks green: built-in WiFi access point enabled (default)

• Bluetooth LED off: Bluetooth disabled

• Bluetooth LED blinks blue: Bluetooth enabled

• Bluetooth LED solid blue: Bluetooth connection to VictronConnect app established

8.4.2. Small recessed button above the Power in terminal block

Short press: Turns WiFi Access point and Bluetooth on/off

A single short press toggles the internal WiFi Access Point and Bluetooth on and off. The LED indicates its state: when the Wifi Access Point LED blinks red and the Bluetooth LED is off, then the built-in Access Point and Bluetooth is disabled. When the Wifi Access Point LED blinks green and the Bluetooth LED blinks blue, then both, built-in WiFi Access Point and Bluetooth is enabled.

Long press: Reset all network settings to factory defaults

Press and hold the small button for a minimum of four seconds. The LEDs will stay on for 2 seconds to indicate that the long press has been recognised; then release the button as soon as the Wifi Access Point LED blinks green quickly.

All network settings will be reset to their defaults:

• 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

> Note that after resetting to factory defaults a power cycle of the Cerbo (ie. by removing the Power in connector for a couple of seconds) is required to re-enable Bluetooth and the Wifi Access Point in order to get access to the GX device as described in the Accessing the GX device [42] chapter.

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8.5. Temperature relay configuration

It is possible to configure the built in Relay 1, and Relay 2 (if applicable), to activate and deactivate based on temperature.

See Connecting Temperature Sensors section [15] for compatibility and connection instructions. Confirm the temperature sensors are correctly connected and reporting temperature in the Device List.

Device List		📍 🔌 13:27
xAC load		55W >
xFreezer	-21°C	61% >
xFridge	2°C	70% >
xLiving	23°C	45% >
Notifications		>
Settings		>
📊 Pages	∧	☰ Menu

The temperature relay is controlled from Settings Menu → Relay → Function (Relay 1/2) → Temperature. Once enabled, the Temperature control rules menu will appear in the Relay menu, and inside the temperature sensors that have been detected.

<	Relay	📍 🔌 13:22
Function (Relay 1)		Generator start/stop
Function (Relay 2)		Temperature
Temperature control rules		>
📊 Pages		☰ Menu

Each temperature sensor can be used to control the relay. Select the temperature sensor you wish to use to control the relay. The temperature sensors that aren't used will display "No actions". It is possible to enable or disable the temperature relay control for each temperature sensor within this menu.

<	Temperature control rules	📍 🔌 13:28
xFridge		No actions >
xLiving		C1: 19°C, 18°C >
xFreezer		No actions >
📊 Pages		☰ Menu

In GX products where two relays are available (Cerbo GX & Cerbo-S GX, Ekrano GX), it is possible to have a single temperature sensor control both relays. It is also possible to have a single relay controlled by multiple different temperature sensors. For example, a Cerbo GX with 2 lithium battery heat pads, and only using both simultaneously when necessary.

1. In the Relay → Temperature control rules → Temperature sensor menu

2. Enable Relay activation on temperature

3. Assign the relay control to Relay 1

4. Set the Activation value to 5 degrees

5. Set the Deactivation value to 10 degrees

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If that is insufficient to maintain the battery temperature above 5 degrees, you may wish to connect a second heat pad contactor to Relay 2 as well.

1. Move down menu to Condition 2

2. Assign the relay control to Relay 2

3. Set the Activation value to 4 degrees

4. Set the Deactivation value to 6 degrees

This will mean that Relay 1 will be active if the battery temperature falls to 5 degrees. If the temperature continues to fall below 5 degrees to 4 degrees, then the second heat pad will be engaged via Relay 2. If that is sufficient to raise the temperature back to 6 degrees, Relay 2 will deactivate, and then Relay 1 will remain active until battery temperature returns to 10 degrees.

Note that the physical wiring contacts are available for both Relay 1 and Relay 2 in Normally Open and Normally Closed configurations.

> ⚠️ Note specifications for the power limits of the relays. It may be necessary to connect appliances via an additional contactor if power requirements exceed the relay power limit specification.

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9. Firmware updates

9.1. Changelog

The changelog is available on Victron Professional in the Firmware → Venus OS directory. To access Victron Professional, you need to sign up (free).

9.2. 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.

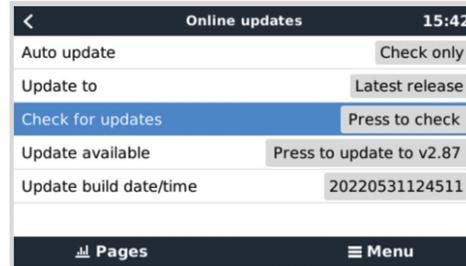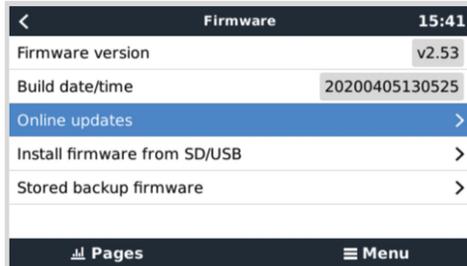2. Update it from a microSD-card or USB-stick.

9.2.1. Direct download from the internet

On GX devices without a display (ie. a Venus GX or Cerbo GX without GX Touch), use Remote Console to get to below menus.

1. To update from the internet, navigate to: **Settings → Firmware → Online updates.**

2. Press 'Check for updates'.

3. If there is a newer firmware version, it will be shown under 'Update available'. Press to update to the new firmware version.

4. After the GX device has been updated to the new firmware version, make sure to check the settings of your installation.

> Note that for most system applications our advise is to keep automatic updates disabled; as is also the default factory setting. Instead, update the system at a convenient moment; when people are on location and ready to revert to a previous system and/or troubleshoot in case of issues.

Firmware	15:41
Firmware version	v2.53
Build date/time	20200405130525
Online updates	>
Install firmware from SD/USB	>
Stored backup firmware	>
⊪ Pages	≡ Menu

Online updates	15:42
Auto update	Check only
Update to	Latest release
Check for updates	Press to check
Update available	Press to update to v2.87
Update build date/time	20220531124511
⊪ Pages	≡ Menu

9.2.2. 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.

1. **Download the latest swu file:**

    • Cerbo GX - venus-swu-einstein.swu

    Note that the same files and the changelog is available on Victron Professional. There is also a Dropbox connection to connect your Dropbox to our shared folder, so you always have the latest firmware files available on your laptop.

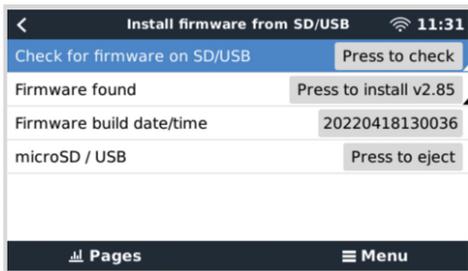2. **Install on a microSD-card or USB-stick**

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

3. **Insert the device**

    Note that you will see a warning "Attached storage contains a firmware image, not using for data logging.". That warning can safely be ignored.

4. **Initiate the update**

    • Navigate to **Settings → Firmware → Install firmware from SD/USB.**

    • Press 'Check for firmware on SD/USB'.

    • If the firmware in the microSD-card or USB-stick is newer than the running one, 'Firmware found' item will appear, press it to start the update process.

9.3. Revert to a previous firmware version

There are two ways to revert to a previous firmware version:

1. Using the Stored firmware backup feature or

2. by downloading a specific firmware file, saving it onto a microSD-card or USB-stick and install from SD/USB.

9.3.1. Stored firmware backup feature
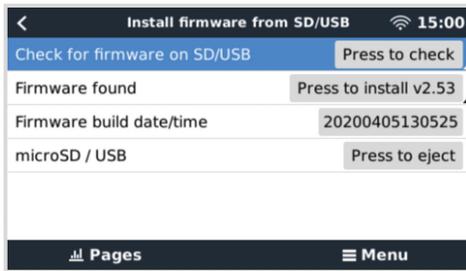
This option allows you to switch between the current and the previous firmware version. No internet or SD-card needed.

1. Go to **Settings → Firmware → Stored backup firmware**.

2. The following screen shows the firmware version currently running and the firmware version that can be booted.

3. Click on 'Press to boot' to boot into the stored firmware version.

4. The stored firmware version is now booted and the previous firmware version will be saved instead.

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9.3.2. Install a specific firmware version from SD/USB
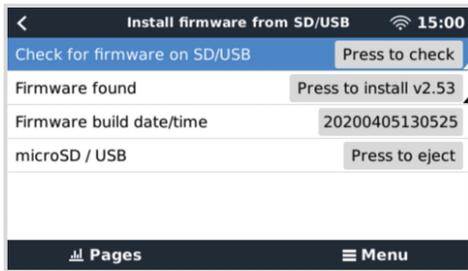
There may be reasons why it is necessary to manually download and install a specific firmware version (e.g. an older firmware version that is not stored under "Stored backup firmware" on the GX device). This chapter explains how to do that.

1. Old Venus OS firmware versions are available for download here: https://updates.victronenergy.com/feeds/venus/release/images/

2. For Cerbo GX use the einstein folder.

3. Download the .swu file of the version required.

4. Store the .swu file in the root folder of a USB-stick or MicroSD-card.

5. Insert the USB-stick or MicroSD-card into your GX device.

6. Note that you will see a warning "Attached storage contains a firmware image, not using for data logging.". The warning can safely be ignored.

7. Navigate to **Settings → Firmware → Install firmware from SD/USB**.

8. It should show the specific firmware version under 'Firmware found'. Click on it to install.

> Note that while backporting is no problem in general, it may be that some settings are reset to their default values. Be sure to check this.

9.4. Venus OS Large image

In addition to the normal Venus OS firmware, it is also possible to install Venus OS Large, an extended build of Venus OS that adds Node-RED and Signal K Server.

Among other features, Node-RED offers a fully customisable dashboard that can be viewed in a web browser - both locally and remotely, via the VRM Servers.

Signal K Server is designed for yachts and multiplexes data from NMEA 0183, NMEA 2000, Signal K and other sensor inputs. Data from all devices connected to the GX device is automatically available in SignalK for further processing.

Please note that there is and will be no official support on the extended functionalities included in the Venus OS Large image.

After installing the normal firmware version, there is an option 'Image type' in the 'Online updates' menu, which also allows to select 'Large' for the Venus OS Large image type and updating firmware like described in this chapter.

A detailed description of all functions and how to install can be found in our document Venus OS Large image: Signal K and Node-RED.

10. VE.Bus Inverter/charger monitoring

10.1. Input current-limiter setting

MultiPlus 12/1600/70-16	📍 📶 08:33
Switch	On
State	Bulk
Input current limit	16.0
DC Voltage	13.10V
DC Current	0.0A
State of charge	69.5%
⊪ Pages	≡ Menu
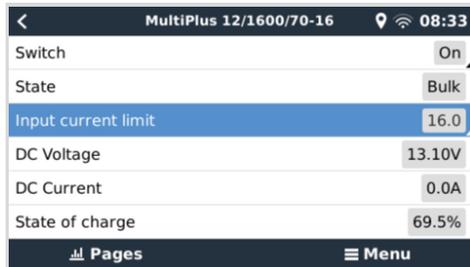
This chapter explains the implications of enabling or disabling user control of the input current-limiter setting, as seen in the above menu (Device List → [your inverter/charger].
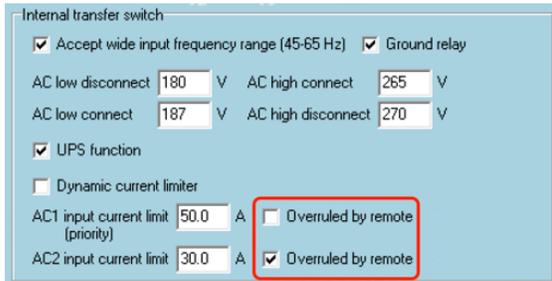
The limit as set by the user in the Cerbo GX will be applied to all inputs where the '**Overruled by remote**' setting in VEConfigure is enabled:

Internal transfer switch

☑ Accept wide input frequency range (45-65 Hz) ☑ Ground relay

AC low disconnect 180 V   AC high connect   265 V
AC low connect   187 V   AC high disconnect 270 V

☑ UPS function

☐ Dynamic current limiter

AC1 input current limit 50.0 A ☐ Overruled by remote
(priority)

AC2 input current limit 30.0 A ☑ Overruled by remote

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 Cerbo GX.

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

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 it 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.

10.2. 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.

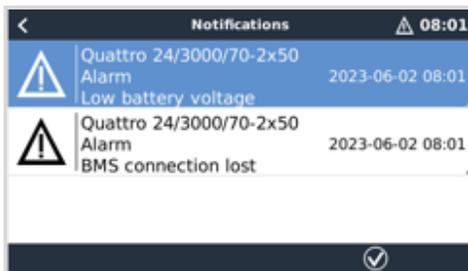On the GX device itself, the warning will popup as a notification on the GUI:

Also, it is visible in the menus:
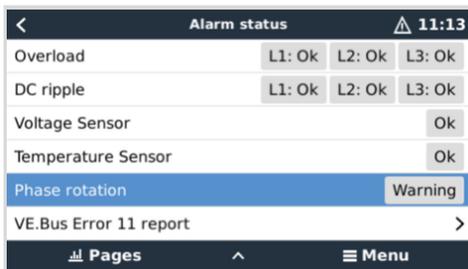
On the VRM Portal, it is visible in the VE.Bus Alarms & warnings widget on the Advanced page and will be listed in the Alarm Log on VRM. Furthermore, an email is sent; using the VRM Alarm Monitoring system.

10.3. BMS connection lost alarm

This alarm is triggered once the inverter/charger has received CVL/CCL or DCL data from a managed battery and will shut down if the battery is disconnected or communication with the battery get lost. The alarm is also raised when the inverter/charger has lost connection to a VE.Bus BMS.

Note that the system will also display a Low battery voltage alarm. However, the cause of this alarm is not a low battery voltage, but the lack of information from the battery due to lost communication.

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To resolve the alarm, restore the connection with the BMS or restart/power cycle the inverter/charger. A restart can be performed from the Advanced menu [68] of the VE.Bus device.

10.4. Grid failure monitoring
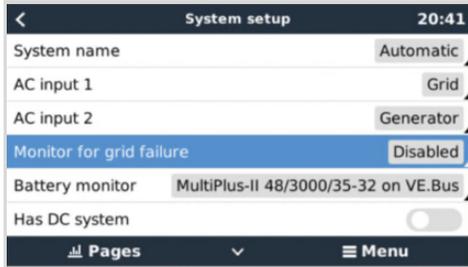
When this feature is enabled, an alarm is raised when the system hasn't been connected to the AC input configured to be Grid or Shore for more than 5 seconds.

• The alarm shows as a Notification in the GUI and as an alarm on the VRM Portal. It is also 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.

10.5. Advanced menu

The Advanced menu can be accessed from Device List → [Multi or Quattro] → Advanced and contains options for equalisation, redetect and restart VE.Bus system and shows the ESS relay test status.

• **Equalisation:** Starts equalisation. See Multi or Quattro documentation for details.

• **Redetect VE.Bus system:** Clears the cache on the Cerbo GX that has certain data of the VE.Bus system stored to keep the boot time as short as possible. Use this feature if, for example, a VE.Bus BMS used to be part of a system and is no longer used or replaced by a Lynx Smart BMS. When using Redetect VE.Bus system, the inverter/charger does not switch off for a couple of seconds like it would do when using Restart VE.Bus system.

• **Restart VE.Bus system:** Restarts the inverter/charger (just like switching it off and on again from the main rocker switch at the front) if it failed to restart automatically (after 3 attempts), for example, after a (very) heavy overload; or three overloads in a row. Any persistent errors such as a repeated and unrecoverable overload error, are deleted.

• **AC Input 1 ignored:** Status of the AC Input 1 flag

• **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.

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10.6. Alarm status monitoring
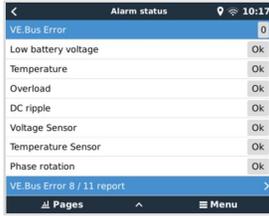
The Alarm status monitoring page can be accessed from Device List → [Multi or Quattro] → Alarm status. It displays diagnostic information on specific parameters to help with troubleshooting and provides additional information on the VE.Bus error 8/11.

10.7. VE.Bus alarm setup menu

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 Cerbo GX (and make it beep).

To change the VE.Bus alarm & warning notifications, proceed as follows:

1. On the Remote Console, go to Device List → [your VE.Bus product] → Alarm setup

2. Choose between the following notification settings for each alarm:

   • **Disabled**: The Cerbo GX will never beep or show a notification. Not recommended.

   • **Alarm only** (default): The Cerbo GX will only beep and show a notification when the VE.Bus system switched off in an alarm condition. Warnings are ignored.

   • **Alarm & warnings**: The Cerbo GX will beep and show a notification on all selected alarms and warnings.

3. Scroll to the bottom of the list and enable or disable VE.Bus error notification.

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

10.8. Device menu

The Device menu (Device List → [Multi or Quattro] → Device) offers device-related parameters such as custom name setting, firmware version, serial numbers (in the sub-menu) and more that can be used for diagnostic.

10.9. Solar & Wind Priority
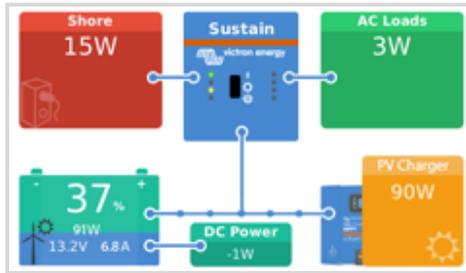
The solar and wind priority function ensures that solar and wind energy are used to charge the battery. At the same time, shore power is only used to prevent the battery from becoming too deeply discharged.

When activated, the system remains in this mode, called Sustain, for seven days; if there is not enough sun or wind, a full charge cycle will take place, charging the batteries to 100%. This ensures they remain in optimal condition and are ready for later use.

After these seven days, the system will not return to sustain mode. Instead, it will keep the batteries fully charged and prioritise solar power over shore power wherever possible during the day to run DC loads such as pumps and alarm systems.

For details and configuration, please see the Solar & Wind Priority manual.

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11. DVCC - Distributed Voltage and Current Control

11.1. 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. Two examples:

Managed CAN-bus batteries: In systems with a managed CAN-bus BMS battery connected, the GX device receives a Charge Voltage Limit (CVL), Charge Current Limit (CCL) and Discharge Current Limit (DCL) from that battery and relays that to the connected inverter/chargers and solar chargers. These then disable their internal charging algorithms and simply do what they're told by the battery.

Lead-acid batteries: For systems with lead-acid batteries, DVCC offers features such as a configurable system-wide charge current limit, where the GX device actively limits the inverter/charger if 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-acid	VE.Bus BMS V1 Lithium	VE.Bus BMS V2[1] Lithium	Supported 3rd party managed batteries[2]
Auto-config	No	No	No	[2]
System charge current	Yes	Yes	Yes	[2]
Should you enable SVS?	Yes	[3], [4]	[3], [4]	[2]
Should you enable STS?	Yes	No	No	[2]
Should you enable SCS	Yes	[3], [4]	[3], [4]	[2]
Charge control method	N/A	N/A	N/A	[2]
Wire ATC & ATD	N/A	Yes	[5]	[2]

[1] DVCC must be enabled for the GX device to control the solar chargers, Inverter RS or Multi RS in a system with a VE.Bus BMS V2.
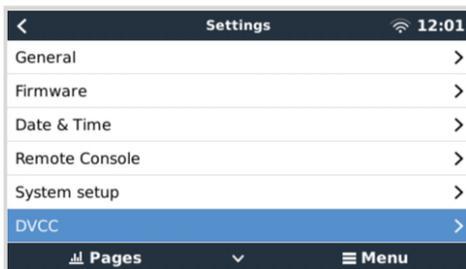
[2] Use the Battery Compatibility manual to see which parameters need to be set and which are set automatically.

[3] In an ESS system the VE.Bus device is already synced with the solar chargers, so we recommend leaving SVS and SCS off.

[4] For all other systems: If a BMV or SmartShunt is installed, we recommend enabling SVS and SCS. In all other cases, leave SVS and SCS disabled.

[5] Solar Chargers, Inverter/Chargers, Multi RS and Inverter RS do not require wiring. All other loads and chargers must be wired and controlled via ATC/ATD.

To enable or disable DVCC, go to Settings → DVCC on the GX device:

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11.2. DVCC Requirements

1. **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-acid batteries, DVCC can be used without any problem. The same is true for Victron Energy Lithium Battery Smart with the VE.Bus BMS, the Lynx Ion + Shunt BMS or the Lynx Ion BMS. DVCC is forced-enabled for the Lynx Smart BMS.

2. **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 proactively update firmware without reason. In case of difficulty, the first action is to update firmware.

   Required minimum firmware versions:

Victron product	Minimum firmware version
Multi/Quattro	422
MultiGrid	424
Multi RS, Inverter RS, MPPT RS	v1.08
GX device	v2.12
VE.Direct MPPTs	v1.46
VE.Can MPPTs with VE.Direct	v1.04
Older style VE.Can MPPT Solar Chargers (with the screen)	Cannot be used
Lynx Ion + Shunt	v2.04
Lynx Ion BMS	v1.09
Lynx Smart BMS	v1.02

   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. For more information about Error #48, see the Error codes chapter [127].

   In case of an ESS System, the ESS Assistant needs to be version 164 or later (released in November 2017).

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11.3. DVCC effects on the charge algorithm

In standalone mode, our inverter/chargers and MPPT solar chargers use their own internal charging algorithm. 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 ESS systems and systems with managed battery (see the Battery Compatibility manual), the internal charge algorithm is deactivated and the charger then works with an externally controlled charge voltage setpoint. This table explains the different possibilities:

Selection guide			Resulting charge algorithm	
System type	Battery type	DVCC	Inverter/charger	Solar charger
ESS Assistant[1]	Intelligent battery	On	Battery	Battery
		Off	Don't do this; better enable DVCC	
	Normal battery	On	Internal	Inverter/charger
		Off	Internal	Inverter/charger
Standard	Intelligent battery	On	Battery	Battery
		Off	Don't do this; better enable DVCC	
	Normal battery	On	Internal	Internal
		Off	Internal	Internal

[1] The ESS Assistant is only installed in a specific type of power system that integrates a grid connection with a Victron inverter/charger, GX device and battery system, not to be confused with an off-grid system such as is used in boats or RVs.

Details

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

  - MPPT solar charger indicated charge state: Ext. control (the LEDs continue to show bulk and absorption, never float).

11.3.1. DVCC effects when there is more than one Multi/Quattro connected

Only the Multi/Quattro (which can be a single device, or multiple together configured for three-/split-phase as well as parallel) connected to the VE.Bus port will be controlled via DVCC. Additional systems, connected to the GX device using an MK3-USB, are not controlled by DVCC and will charge and discharge according to the configuration made in those units.

This applies to all types of systems with DVCC enabled. For example a system that does not include a managed (CAN-Bus) battery, and uses only the DVCC charge current limit: that charge current limit is only applied to the Multi or Quattro connected to the VE.Bus port.

11.4. DVCC features for all systems

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

11.4.1. Limit charge current

Limit charge current is a user-configurable maximum charge current setting. It works across the whole system. MPPT solar chargers are automatically prioritised over the mains/generator.

This setting is available in the Settings → DVCC menu on the GX device.

Particulars:

1. If a CAN-bus 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 including Inverter RS, Multi RS and Solar chargers incl. MPPT RS. 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 MPPT solar chargers 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 may not be accounted for, unless a SmartShunt or BMV-712 is installed and correctly configured as a DC meter. For example, without the DC load monitor a configured maximum charge current of 50A and DC Loads drawing 20A, the battery will be charged with 30A, not with the full allowed 50A. With the SmartShunt configured as a DC meter, maximum charge current configured at 50A and DC system shunt reports a draw of 25A, then the chargers are set to charge with 50 + 25 = 75A.

   If you have one or more shunts configured for "DC system" (when more than one, they are added together), then the DVCC charge current limit compensates for both loads and chargers. It will add extra charge current if there is a load, and subtract it if there is another charger in the DC system. DC "loads" and "sources" are not compensated for in either direction.

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 set to 50A, the system will allow the MPPT solar chargers to charge with a maximum of 60A.

5. In all situations, the maximum charge limit configured in a device itself, i. e. the Charge current limit set with VictronConnect or VEConfigure for MPPT 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 or VictronConnect the charge current is configured to 50A. And on the GX device, a limit of 100A is configured, then the working limit will be 50A.

6. DVCC charge current limits are not applied to DC MPPTs when ESS is enabled with Allow DC MPPT to export. This is to get maximum output from the solar panels for export.

11.4.2. Limit managed battery charge voltage
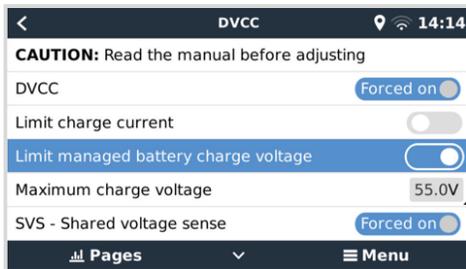
Some batteries (like BYD and Pylontech) that come from the factory will take some time to settle in, and you may need to run them at a **lower voltage** for the first two weeks or so to help them balance.

This is what Limit managed battery charge voltage is designed for. Enabling this makes it possible to lower the maximum charge voltage until cells have balanced.

Do not use it for any other purpose as it may have unwanted side effects, for example, balancing can fail or not start at all if the charge voltage is set too low, causing the battery cells to become severely imbalanced over time. It is also not possible to set the value above the charge voltage limit (CVL) sent by the battery.

11.4.3. Shared Voltage Sense (SVS)
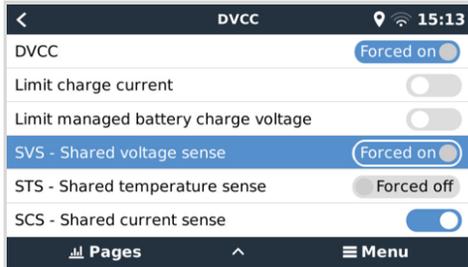
Works with VE.Bus devices, VE.Direct and VE.Can MPPT solar chargers as well as Inverter RS and Multi RS.

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 Settings → DVCC.

SVS (and DVCC) is force enabled for the Lynx Smart BMS and cannot be changed.

Note that SVS is force-disabled for some batteries. Please see the compatibility page for your battery.

### 11.4.4. Shared Temperature Sense (STS)
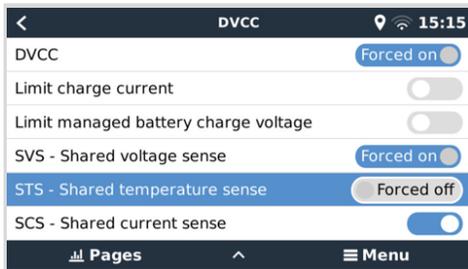
Select the temperature sensor to use; and the GX device will send the measured battery temperature to the inverter/charger system as well as all connected solar chargers.

Selectable sources for the battery temperature are:

• BMV-702 battery monitor

• BMV-712 battery monitor

• SmartShunt

• Lynx Shunt VE.Can battery monitors

• Temperature inputs on a Cerbo GX (and same for other GX devices that have a temperature input)

• Multi/Quattro inverter/charger

• Solar chargers (if fitted with a temperature sensor)

Note that STS is forced disabled for the Lynx Smart BMS and some batteries. Please see the compatibility page for your battery.

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11.4.5. Shared Current Sense (SCS)
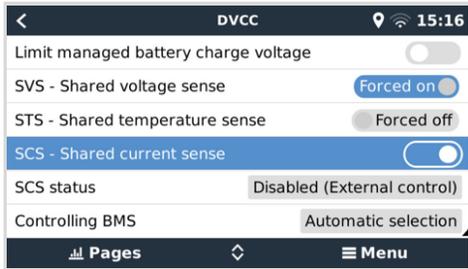
This feature forwards the battery current, as measured by a battery monitor connected to the GX device, to all connected solar chargers.

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.

11.4.6. Controlling BMS
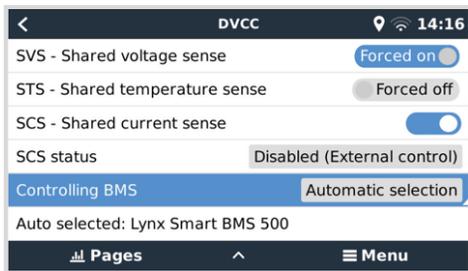
For systems with multiple BMSs connected, this allows selection of which BMS to use for DVCC. This also allows the use of a BMV or SmartShunt for SoC tracking by selecting a BMV as battery monitor (Settings → System setup) while the BMS is still used for DVCC.

This setting is available in the Settings → DVCC menu on the GX device.

11.5. 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 the following 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.

For such batteries there is no need to wire allow to charge (ATC) and allow to discharge (ATD) connections to the AUX inputs of a Multi or Quattro.

When inverting, i. e. 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 section Limit charge current [74], the user-configurable maximum charge current 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, Multi and Inverter RS and MPPT Solar Chargers will charge with the voltage as received via CAN-bus from the battery. This also applies to systems with a Lynx Smart BMS connected to a GX device.

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11.6. DVCC for systems with the ESS Assistant
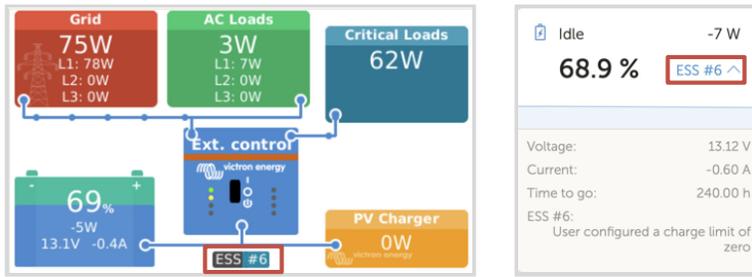
- The ESS Keep batteries charged mode will only work properly with DVCC enabled.

- A fixed solar offset of 0.4V (value for 48V system, divide by 4 for 12V) is applied when ESS-mode is set to Optimised in combination with the Feed-in excess solar charger power-setting enabled, or when ESS-mode is set to Keep batteries charged.

- For system with ESS mode Optimised and Optimised (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 status display in the graphic overview of the GX device and on VRM: In addition to the charge status (External Control or Bulk/Absorption/Float), the following status can be displayed:

ESS status	Meaning
#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

- Note: When DC-coupled PV feed-in excess is enabled with ESS, the DVCC system will not apply the DVCC charge current limit from PV to battery. This behaviour is necessary to allow the export. Charge voltage limits will still apply.

  Charge current limits set at the individual solar charger device settings level will also still apply.

- When the BMS is disconnected in an ESS system, solar chargers will stop and show error #67 – No BMS (see the MPPT Solar Charger Error Codes for additional info).

12. VRM Portal

12.1. 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 [84]: access and configure your system as if you were standing besides it

• Remote Firmware update: Update the firmware of connected Solar Chargers and other Victron products

• Remote VEConfigure: Download and upload Remote VEConfigure files from and to the Multi/Quattro connected to your GX device

• Remote Controls: Control devices such as the EV Charging Station, Inverter/charger, GX relay, Genset and ESS system remotely via VRM

• Use of the VRM App for iOS and Android including VRM APP Widgets on your mobile device's homescreen

See the Internet Connectivity chapter [37] for how to connect the device to the internet.

For a complete overview of all features and functions of the VRM Portal, see the VRM Portal documentation.

12.2. Registering on VRM

Detailed 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 as 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 data logging [81] and Remote Console on VRM - Troubleshooting [85] section.

12.3. Datalogging to VRM

Datalogs are transmitted to the VRM Portal over the Internet, if available. All related settings are available in the VRM Online Portal menu (Device List → Settings → VRM online portal).

The transmission of the datalogs has been designed to work also on bad internet connections. Connections with up to 70% permanent packet loss are still enough to get the data out, albeit partially delayed.

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 has a buffer to store a couple of days 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

- Supported file systems for MicroSD cards or USB flash drives are FAT (12, 16, 32), ext3, ext4 and exFAT.

- 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 an unsupported file system.

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 online 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. 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 navigate to the Installations menu:
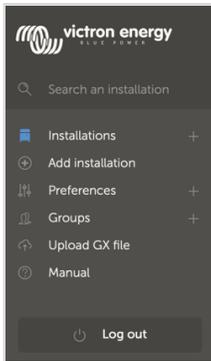
5. Click the 'Upload GX file' option and follow instructions:
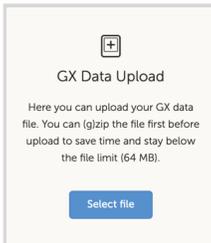
6. Remove the file from the storage device and re-insert it into the GX device. Note that uploading the same data twice does not cause any problems; but still it is better not to do that.

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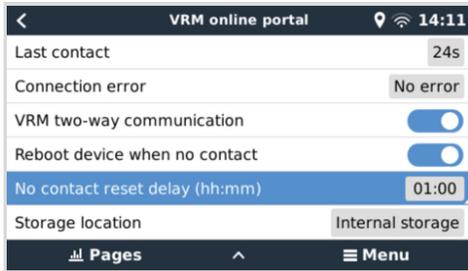
This feature, disabled by default, makes the GX device automatically reboot itself in case it has not been able to connect to the VRM Portal.

12.4. Troubleshooting data logging

This chapter guides you through the troubleshooting that needs to be done when the GX device cannot transmit data to the VRM portal.

Initial check

First, check whether there is a connection between the GX device and the VRM portal and whether data is being sent or not.

> Don't worry if the GX device has lost connection to the Internet for a short time. The data logs that were not transmitted during this time are temporarily stored in the GX device and will be transmitted once the Internet connection is restored.

1. Check the 'Last contact' entry in the menu of the VRM online portal (Settings → VRM online portal → Last contact).
   - If the displayed time is within the defined 'Log interval' setting in the same menu, this indicates that data is actively being sent to VRM, which means everything is working properly.
   - If it shows dashes, the GX device has been unable to contact the VRM Portal since it was powered up.
   - If it shows a time, but an error is shown, then the GX device has been able to send data, but has since lost contact.
   - If 'Logging enabled' is deactivated, then the GX device will not send any data to the VRM Portal.
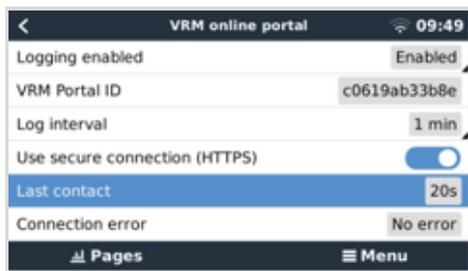
2. Check the 'Stored records' entry in the same menu.
   - The 'Stored records' indicates the number of logs that it has stored to send later.
   - If this number is 0, it means that the Cerbo GX has sent all its data to the VRM Portal, which in turn means that the connection is actually working.
   - If this is larger than 0, it means that the Cerbo GX can not connect to the VRM Portal.
     This is usually accompanied by an error message, which is described later in the chapter.

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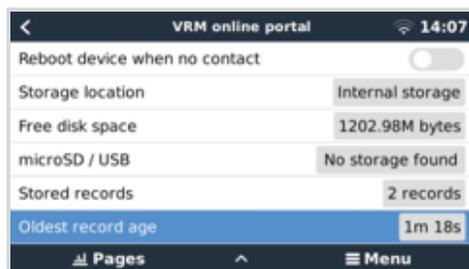
- If you continue to have issues with data logging, please read on.

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

1. **A good working internet connection** - Preferably use a wired connection via Ethernet cable. Tethered or hotspot connections, e.g. with a cell phone, are unreliable and often interrupted or they do not automatically restore the connection after it was lost.

2. **A proper IP address** - Normally the router takes care of this and assigns the IP address to connected devices/computers automatically via DHCP as soon as you connect to them. A manual configuration is not necessary.

3. **Outbound http(s) connection to http://ccgxlogging.victronenergy.com on port 80 and 443** - Note that should never be an issue, unless on very specialised company networks.

Note that the Cerbo GX does not support a proxy setup. For more details on the required networking, see the FAQ Q15: What type of networking is used by the Cerbo GX (TCP and UDP ports)? [131].

Troubleshooting steps

1. **Update the GX device to the latest available firmware**

   See the Firmware updates [62] chapter for details

2. **Verify the network and internet connection**
   - Check if the network router has automatically assigned an IP address to the GX device in the Ethernet or Wi-Fi menu (Settings → Ethernet → IP configuration → Automatic or Settings → Wi-Fi → Wi-Fi networks → [Your_connected_WiFi_network] → IP configuration → Automatic). This also applies to manually configured IP addresses. Make sure the following conditions are met:
   - State must be 'Connected'
     - There must be an IP address that does not start with 169.
     - There must be a Netmask
     - There must be a Gateway
     - There must be a DNS server

   For a GX GSM or GX LTE 4G , see the Troubleshooting guide in the GX LTE 4G manual.

   If 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/4G routers. If there is no DHCP server running, then configure the IP address manually as described in the Manual IP configuration [39] chapter.
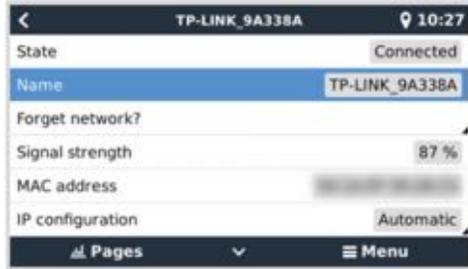   - **Ethernet**
     - When using Ethernet and 'State' shows 'Unplugged', verify that the Ethernet network cable is not faulty: try another one. The two lights at the back of the Cerbo GX, where the Ethernet RJ45 cable plugs in, should be lit or blinking. Two dead lights indicate a connection problem.
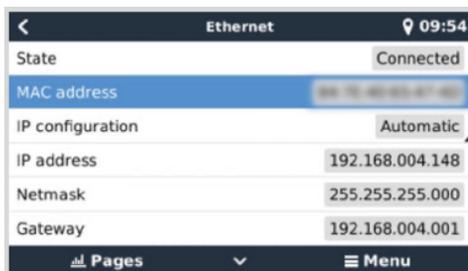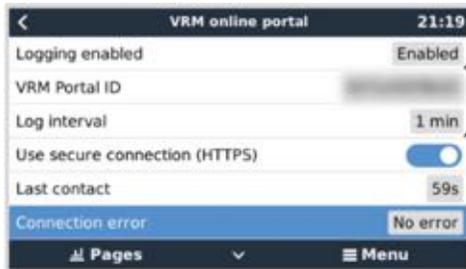
- **WiFi**
  - When using WiFi and the menu shows 'No WiFi adapter connected', check the USB connection to the WiFi dongle. Try to remove the dongle and insert it again.
  - When using WiFi and the 'State' shows 'Failure', it might be that the WiFi password is incorrect. Press 'Forget network' and try to connect again with the correct password.

TP-LINK_9A338A	🔵 10:27
State	Connected
Name	TP-LINK_9A338A
Forget network?	
Signal strength	87 %
MAC address	
IP configuration	Automatic
⊿ Pages	∨ ☰ Menu

3. **Check the Connection error status**
   - Navigate to Settings → VRM online portal and check the 'Connection error' status:

| VRM online portal	21:19
Logging enabled	Enabled
VRM Portal ID	
Log interval	1 min
Use secure connection (HTTPS)	🔵
Last contact	59s
Connection error	No error
⊿ Pages	∨ ☰ Menu

- If a Connection error is shown, the Cerbo GX 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:** The http/https call succeeded, but the response was incorrect. This indicates that there is a WiFi or network login page, sometimes called a "captive portal", occasionally seen in Airports, Hotels, Marinas or RV campgrounds. There is no solution to make the GX device work with a WiFi network that requires such a login page and/or accepting of terms of use.

  - **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:

VRM online portal	11:30
Connection error	#153 Connection error
Error message: <urllib3.connection.HTTPConnection object at ▩▩▩>: Failed to establish a new connection: [Errno 113] No route to host	
Reboot device when no contact	🔵
Storage location	Internal storage
Free disk space	10.47M bytes
⊿ Pages	↕ ☰ Menu

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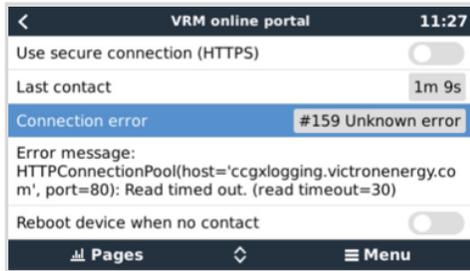
## 12.5. Analysing data offline, without VRM
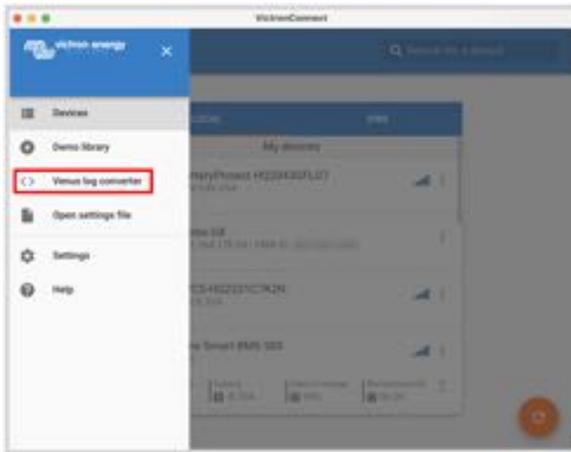
In certain cases, for example for very remote sites where there is no internet available, it can be useful to be able to analyse the data without first having to upload it to the VRM Portal.

1. Install VictronConnect on a Windows or Apple laptop

2. Insert the storage device containing the log file(s)

3. Open VictronConnect and use the Venus Log Converter feature to convert them to Excel sheets. Note that the Venus Log Converter is not available in the iOS and Android version of VictronConnect. See Importing and converting a GX Product Family database File for more details in the VictronConnect manual.

12.6. Remote Console on VRM - Setup

This feature allows full remote control of a GX device over the internet:

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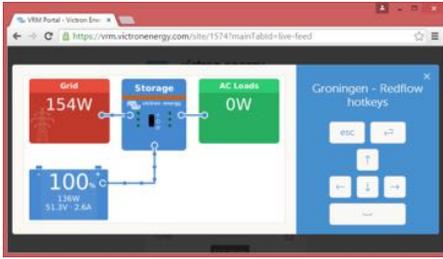
The Remote Console on VRM is disabled by default. Activate it by following these steps:

1. Enable the feature in the Settings → Remote Console menu.

   For details, see the The Remote Console menu [47] chapter.

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:

12.7. Remote Console on VRM - Troubleshooting

Follow these steps to troubleshoot Remote Console on VRM:

1. Make sure that logging to the VRM portal works, see chapter Datalogging to VRM [79] and Troubleshooting data logging [81]. Without this; Remote Console on VRM will not work.

2. After enabling the Remote Console feature, make sure to set (or disable) the password.

3. Also make sure to restart the Cerbo GX after setting (or disabling) the password.

4. Make sure to update the Cerbo GX 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 Cerbo GX 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 rule 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. https://vncrelay.victronenergy.com & https://vncrelay2.victronenergy.com/

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 multiple IP addresses (84.22.108.49, 84.22.107.120, 3.25.10.245, 13.244.154.199 or 35.165.124.40, depending on where you are), 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 at least one of them will be allowed by the local firewall.

Once connected to one of 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.

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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 [131].

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