COMMODORE
OFF GRID & SOLAR PUMPING SPECIALISTS

POWERHUB
COMMODORE

POWERBOARD
COMMODORE

Installation & User Manual

Power Skid

TO ENSURE YOUR PERSONAL AND PROPERTY SAFETY, PLEASE READ THE MANUAL CAREFULLY BEFORE USE OF YOUR OFF-GRID SOLAR SYSTEM

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Safety Definition

The installation of an off-grid system should only be carried out by qualified electricians. It is imperative to emphasise that electricians are the sole tradespersons deemed suitable for this task, given their specialised knowledge and expertise in adhering to electrical safety regulations. This ensures the proper implementation of the off-grid system in compliance with established standards, contributing to the overall safety and reliability of the installation.

The provided wiring diagrams and installation instructions serve as guidance, and it is the responsibility of the installer to ensure compliance with the appropriate standards. Below are the relevant standards:

Relevant Standards	
AS/NZS 3000:2018	Wiring Rules
AS/NZS 5033:2021 (and 1&2)	Installation and safety requirements for photovoltaic (PV) arrays
AS/NZS 4509.2:2012	Stand-alone power systems-Design
AS/NZS 1170.2:2011	Structural design actions-Wind actions
AS/NZS1768:2007	Lightning protection
AS/NZS 3008.1.1:2017	Electrical installations – Selection of cables
AS/NZS 5139:2019	Electrical installations-Safety of battery systems for use with power conversion equipment

In the event of any equipment damage upon arrival, it is crucial to promptly notify Commodore Australia for timely assistance. Please reach out to our support team via email at support@commodoreaustralia.com.au or contact us directly by calling 1300 669 256. Your cooperation in reporting damaged items is essential to facilitate swift resolution and ensure that you receive the necessary support and replacements to ensure both safety and performance.

Electricians and system owners must exercise extreme caution and adhere to established safety procedures when working with electrical systems. Prior to any maintenance, troubleshooting, or modifications, it is crucial to de-energise the system and ensure that all relevant safety measures are in place. Always follow industry best practices and utilise appropriate personal protective equipment (PPE) to minimise the risk of electrical accidents.

Power Hub 3-10 Dimensions & Parts

Electricians and system owners must exercise extreme caution and adhere to established safety procedures when working with electrical systems. Prior to any maintenance, troubleshooting, or modifications, it is crucial to de-energise the system and ensure that all relevant safety measures are taken.

External Components

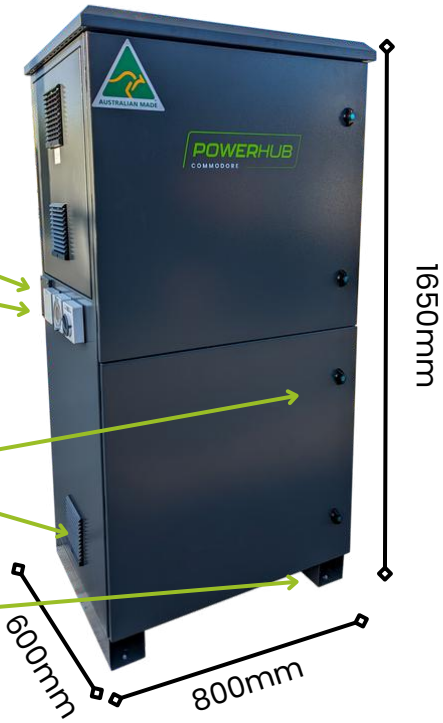
Gland Plate (One Each Side)

15A Outlet

Fans/ Vents For Temperature Control (Newer models these are placed in the roof)

Lockable Latches

Forklift Points, If Tynes Are Too Wide, Lift In The Middle Section



Weight: 330kg + 40kg per battery

Internal Components

Inverter Charger

MPPT Solar Charge Controller

GX Touch System Monitoring

PV Solar DC Isolator

MPPT Battery DC Isolator

Battery System DC Isolator

AC Switchboard

48V Batteries

Power Hub Internal Part Explanation

Inverter - The inverter charger has two functions, it converts 48Vdc power from the batteries to 240Vac to power appliances. It also can convert 240Vac (from a generator or grid) to 48Vdc to charge the batteries.

MPPT Solar Charge Controller - This brings in the Solar power from your Solar panels and converts that power to 48Vdc. This 48Vdc power will either first be used by the inverter if it needs to power loads and then an excess will charge the batteries.

GX Touch System Monitoring Screen - This screen allows you to view how your system is working and also to access settings.

AC Switchboard - This box is where the electrician wires 240Vac circuits either to another switchboard as a sub board or can run circuits directly to loads from here. The AC Switchboard also contains a manual changeover switch for the generator in the case of inverter failure.

DC Switchboard - This is where the DC breakers are held which usually are for the Solar panels.

Battery System DC Isolator - This isolator disconnects the battery from all system components and provides current protection to the inverter.

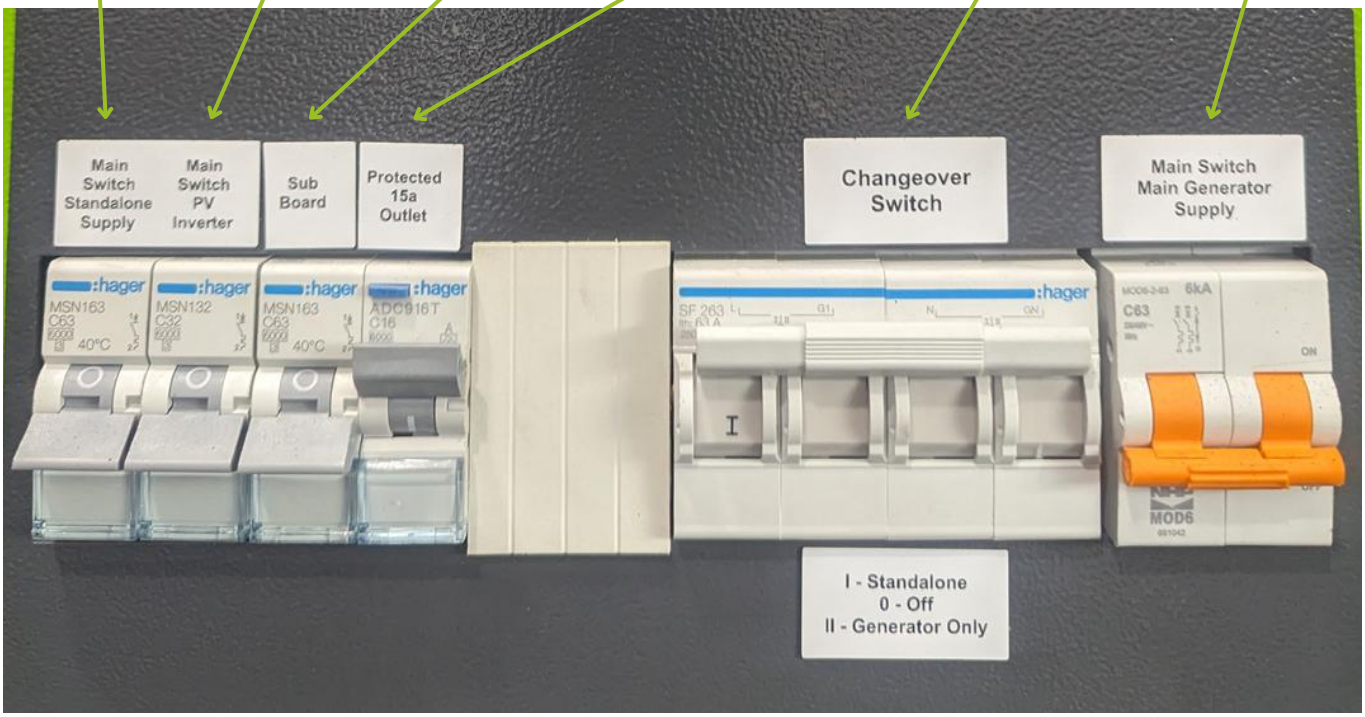
MPPT Battery DC Isolator - This isolator disconnect the MPPT from the batteries provides current protection to the MPPT's.

48V Batteries - This is the where the excess energy is stored and pulled from for the system. Note, This is how the batteries should be installed, and commissioned in your Power Hub. While documentation from Pylontech may suggest the batteries should be installed horizontally, Pylontech's engineers have also confirmed via email to Commodore that this mounting position is suitable. If you'd like to see a copy of this please don't hesitate to ask.

AC Breakers Explained

AC Switchboard Components & Descriptions

Main Switch Standalone Supply	Main Switch PV Inverter	Sub Board	Protected 15A Outlet	Changeover Switch	Main Switch Generator Supply
The main isolation point and current protection from the inverter output to the switchboard.	The main isolation point for the PV Inverter. Only if you have a Fronius or an equivalent Inverter installed.	Is where you pull power back to an existing switchboard on site.	The 15A outlet located on the left side of the Power Hub	When in normal operating conditions, leave this on Standalone, in the event of system failure and you need to rely on generator, switch to generator only	The point where your generator is hardwired into. This wires to the input of the inverter and connects to the changeover switch to the left.



AC Switchboard

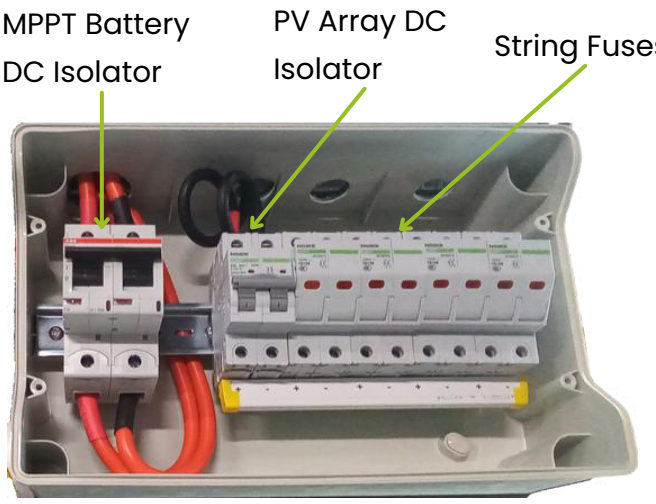
DC Switchboard Explained

Your solar system will have one or more DC switchboards for the solar charge controllers. Below are the components within the DC Switchboard.

MPPT-Battery DC Isolator, this will be present with every installation and depending on the size of the installation will be larger, similar size to the Battery System DC Isolator. This is pre wired and isolates the batteries from the MPPT when Shutdown is required.

PV Array DC Isolator & String Fuses
All pre wired systems have at least one PV array DC Isolator. The PV array DC isolator isolates the Solar from the MPPT. This is where your solar from the roof wires into unless string fusing is present.

Depending on model of MPPT & amount of strings required in parallel you may also have string fusing. If these are present the individual strings from the roof wire straight into the top of these string fuses.
The PV Array DC isolator will be prewired with a busbar in this instance.



In the process of shutdown only the PV Array DC Isolator needs to be switched off. The string fusing doesnt need to be touched.

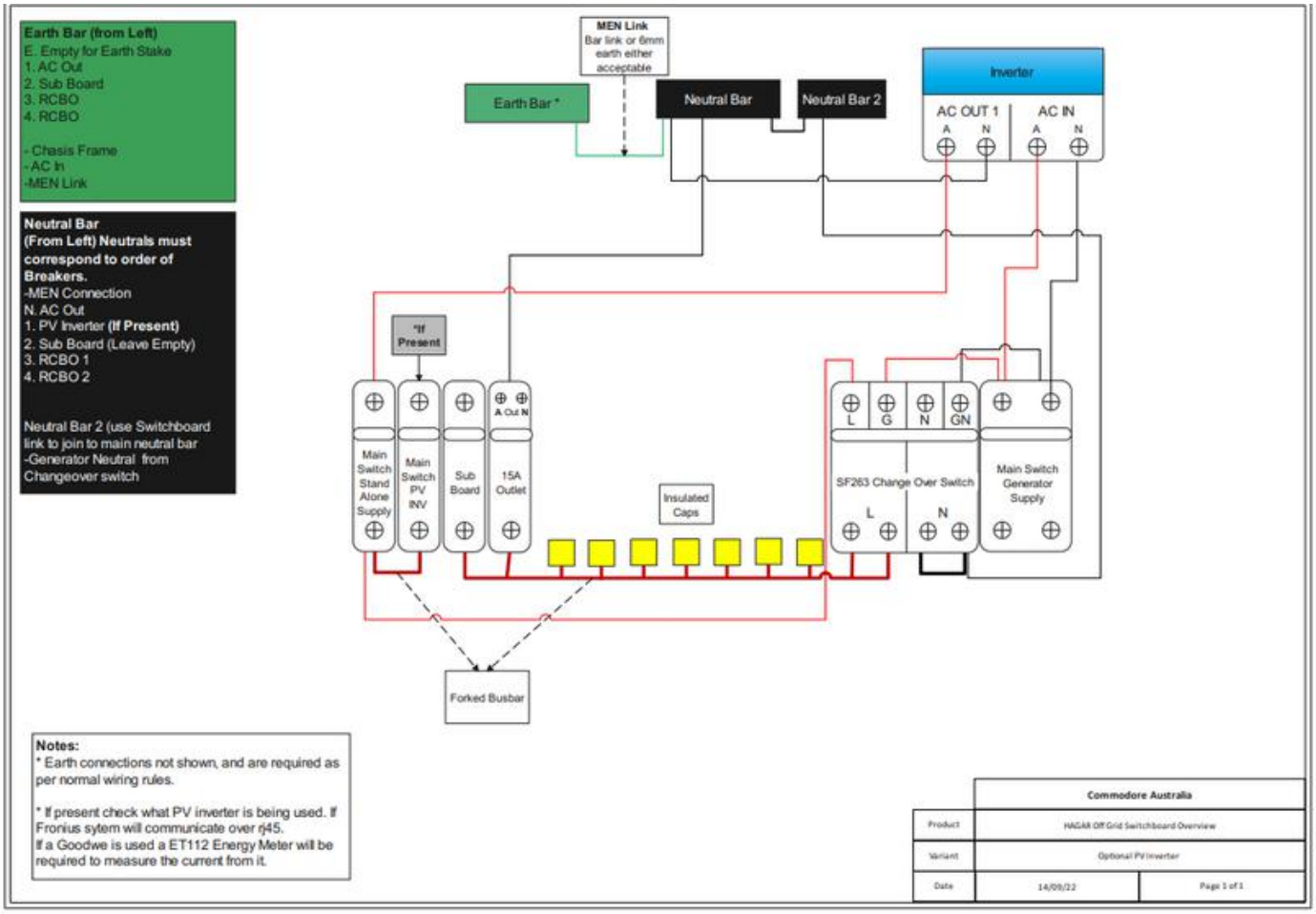
Isolator Indicators
These isolators are connected or ON when in the "1" or "RED" position.
They are disconnected or OFF when in the "0" or "GREEN" position.

Router Power Supply
This is a prewired 48v to 12v converter which is used to power the router on the board when a fronius is sold with the system.

Communication Cables

VE Direct Cable	RJ45	VE Can To BMS Type A	RS485 To USB	2 Core 1mm Sensor Cable
Used For: • MPPT Charge Controller (on older pre wired systems) • Smartshunt or BMV (if using non managed batteries such as Aeson, Sun Torque or Powerplus)	**Used For:** • Inverter Charger • Providing internet from your router or switch • Used for MPPT charge controllers (plugged into the VE Can port)	**Used For:** • Communicating from your battery bank to the remainder of the system	**Used For:** • Energy Meters (Only used when a PV Inverter is installed) • Or a grid energy meter for grid connected systems	**Used For:** • Triggering the automatic start of your generator if you have a two wire generator • Controlling fronius shut down when generator is turned on
Wiring: From the bottom of the MPPT or shunt to any of the VE direct ports in the VE Can area of your Cerbo. The VE Direct is also available in USB if more than 3 x VE Direct devices are	**Wiring:** From the bottom of your inverter, into the VE Bus port in your Cerbo	**Wiring:** From the A/Can port of the "Master Battery"/first battery to the BMS Can port in the Cerbo. Ensure the Victron tag is connected to the Cerbo and the BMS Can tag is connected to the batteries	**Wiring:** From the bottom of the Energy Meter, into any of the USB ports on the Cerbo. * 2 left USB ports (one next to HDMI only Power for Touch screen) New MK2 version has all 3 x USB	**Wiring:** From the generator to Relay 1: No & Com Port's, polarity is irrelevant. Located at the bottom right side of the Cerbo GX. From the Fronius WSD port to inverter K1 contact.

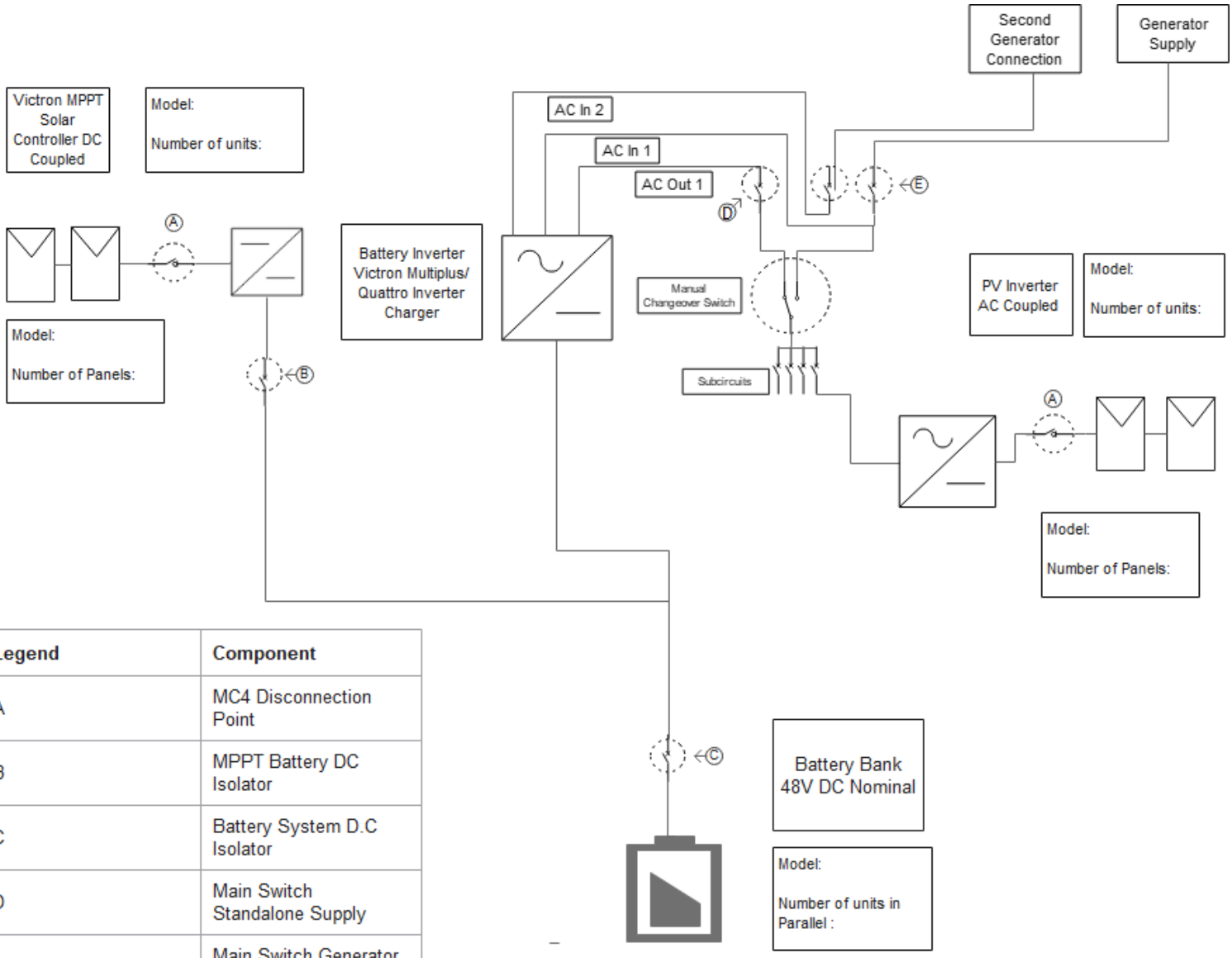
AC Switchboard Wiring



Relevant Information:
For the AC Switchboard we use the HAGAR circuit breakers, changeover switch and their forked bus bar system, this makes it easy to add additional breakers straight onto the bus bar system as long as the HAGAR brand is used. Other brands can also be installed beside the bus bar if required.

A Main Switch Standalone Supply, PV Inverter Main Switch (if present) Change over switch, Generator Supply Switch, RCBO for the 15A outlet and a Sub Board Breaker are all pre installed.

System SLD



Legend	Component
A	MC4 Disconnection Point
B	MPPT Battery DC Isolator
C	Battery System D.C Isolator
D	Main Switch Standalone Supply
E	Main Switch Generator Supply

Why A Generator Must Be Hardwired

As per 9.4.2 located in AS/NZS 4509:2:2012, Stand Alone Power Systems, the governing standard for off-grid solar installations in Australia and New Zealand, a caravan style inlet plug cannot be installed on an off-grid solar system, the standard reads as per the below:

9.4.2 Connecting a generating set in parallel with an interactive inverter

The electrical output of a generating set shall only be connected with an interactive inverter using fixed wiring.

Note: The use of plug connecting generating sets is not permitted due to the possibility that the pins on the connection cord may come live due to “back feeding” from the inverter.

AC, DC & Data Cable Entries

Using seperate conduits AC & Data (if not using a 4G router), enter either through the left of the Power Hub in the middle section, glands are provided inside the Power Hub for connection of 25mm conduits.

If connecting multiple Power Skids, use cable tray to run DC cable across the Power Skid base, separating AC & DC cables, and connect DC into the right side of the Power Hub.

Pre wired plugs are sitting in the solar skid ready for connection,

Step 1 Earth Stake Connection

1. A licensed electrician needs to make the main Earth Electrode Connection, there is an earth cable tail pre connected and stored in the cable tray ready for connection to the earth electrode.

Step 2: Startup Procedure (inside Powerhub)

1. Turn on all **Battery Switches** if present (in battery cabinet)

2. Turn on all **Battery Circuit Breakers** located on the front of batteries (if present)

3. Turn on all **"BATTERY SYSTEM D.C ISOLATORS"**

4. Turn on all **Victron Inverter switches** (located on Victron Inverters below)

5. Turn on all **"MPPT BATTERY DC ISOLATORS"** located In **"DC Switchboard"**

6. Turn on all **"PV ARRAY D.C ISOLATORS"** located in **"DC Switchboard"** and below PV Inverter- if present

7. (For Pylontech Batteries) Press and hold red SW Button on the first battery for 3 seconds.

8. Turn on the "**MAIN SWITCH GENERATOR SUPPLY**" circuit breaker located in **"AC Switchboard"** and disable generator auto start at generator control panel –if present

9. Turn on the **"MAIN SWITCH PV INVERTER SUPPLY"** circuit breaker located in **"AC Switchboard"** -if present

10. Turn on the **"MAIN SWITCH STANDALONE SUPPLY"** circuit breaker located in **"AC Switchboard"**

11. Shutdown Procedure is the reverse of the Startup Procedure

Quattro **Multiplus**

On/Off Button

Shutdown Procedure - if required

1. Turn off the **"MAIN SWITCH STANDALONE SUPPLY "** circuit breaker located in "AC Switchboard"

2. Turn off the **"MAIN SWITCH PV INVERTER SUPPLY "** circuit breaker located in **"AC Switchboard"** if present

3. Turn off the **"MAIN SWITCH GENERATOR SUPPLY"** circuit breaker located in **"AC Switchboard"** and disable generator auto start at generator control panel –if present

4. Turn off all **"PV ARRAY D.C ISOLATORS"** located in **"DC Switchboard"** and below PV Inverter-if present

5. Turn off all **"MPPT BATTERY DC ISOLATORS"** located beside Battery System DC Isolator

6. Turn off all **Victron Inverter switches** (located on Victron Inverters)

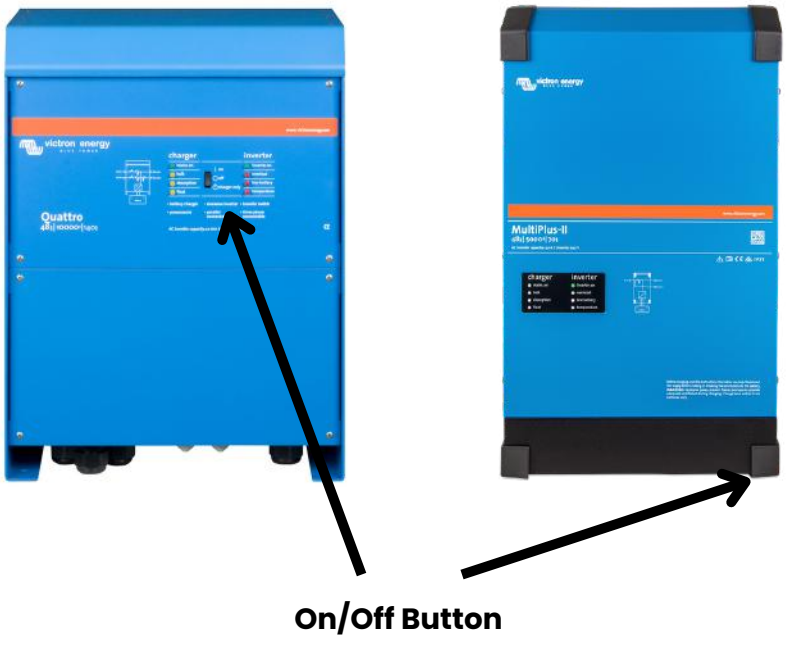
7. Turn off all **"BATTERY SYSTEM D.C ISOLATORS"**

8.Turn off all **Battery Circuit Breakers** located on front of batteries if present

9.Turn On/Off Switch **to OFF on Lithium batteries**

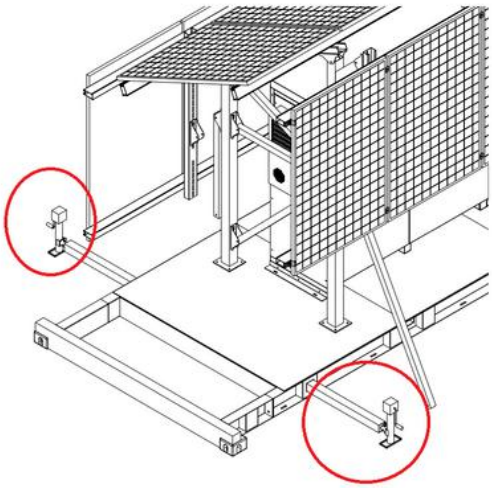
10.Startup Procedure is the reverse of the Shutdown Procedure

Quattro **Multiplus**



Set up Skid Panels + Bracing

1. Install the 4 x Outrigger Legs and wind support arm down to maintain pressure on the ground



2. Disconnect travel stabilizer arms x 6

3. Fit Stabilizing arms to end of solar array onto the C section with 8mm nut and bolt as provided, this is best done in the closed position so that the panel ends can be easily reached. Take note of the colour code used for each section

Attachment point

Set up Skid Panels + Bracing

4. Turn on Circuit breakers in Control box ocated on the end of the Solar Skid, and then Raise Solar Frames using control buttons in cabinet

5. Secure ends of bracing to main upright pole via 8mm bolt provided

Support Bracing highlighted in Green

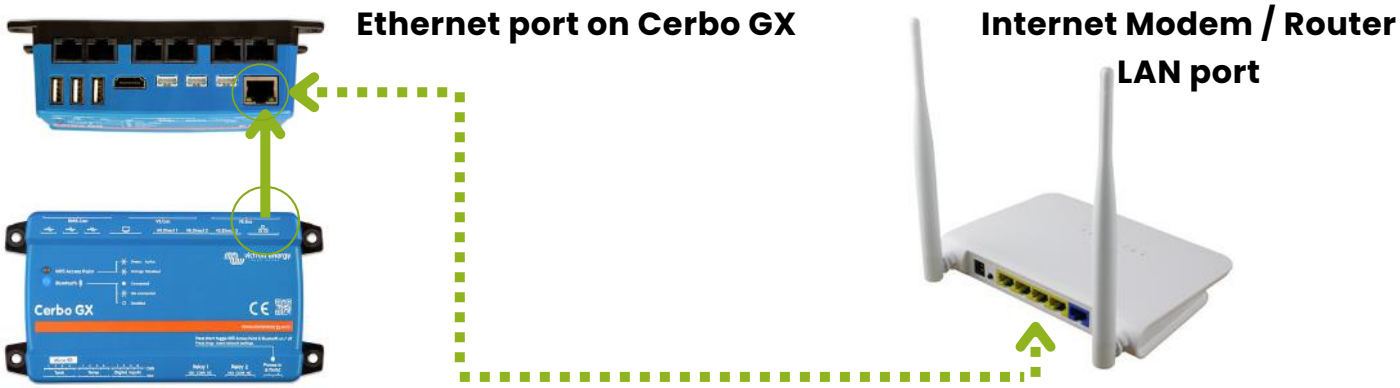
Step 3: Getting Your System Online

Getting your system online or connected to your home network is advantageous in many ways. You can check how much power you're using, how your Solar and batteries are holding up or even manually start your generator. From our perspective the best thing about a customer being connected to Victron's Remote Monitoring portal (the VRM portal) before you call us is that it is so much easier for us to assist you.

Internet Connection Options

Network cable connected to your internet modem

This is by far the best method of connecting your system to a network and the internet as it provides the most stable connection. Simply connect an Ethernet cable to the Ethernet port on your Cerbo GX to a LAN port on your internet modem, no further setup is necessary:



Sometimes running a network cable all the way to your modem is not practical due to long or awkward distances. It may be possible to extend your wired network through your house power cables using a 'Powerline Ethernet' set. This is generally still preferred instead of wifi where possible. Most computer and electronics retailers have these available.

If the system comes with a TP-Link router which is typically when there is a Fronius Solar inverter, instead of the ethernet cable plugging into the Cerbo it will plug into the TP-Link WAN port.

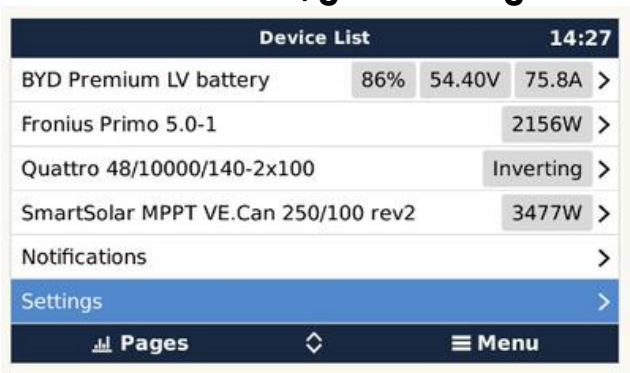
Step 3: Getting Your System Online

WiFi wireless network

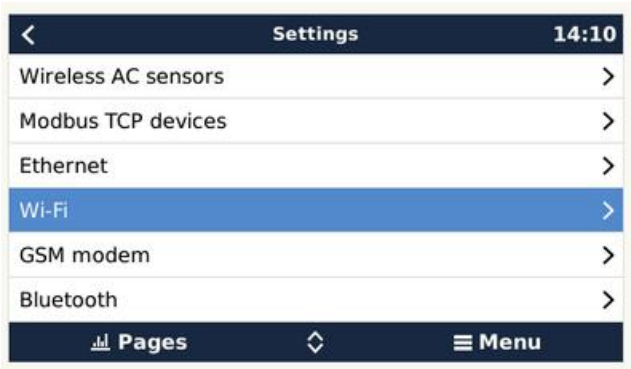
Where a network cable or Powerline Ethernet setup is not practical, a WiFi connection to your modem is the next best solution. WiFi extenders can be used if necessary to get a stronger signal.

On your touch screen, follow these steps to connect to your WiFi network:

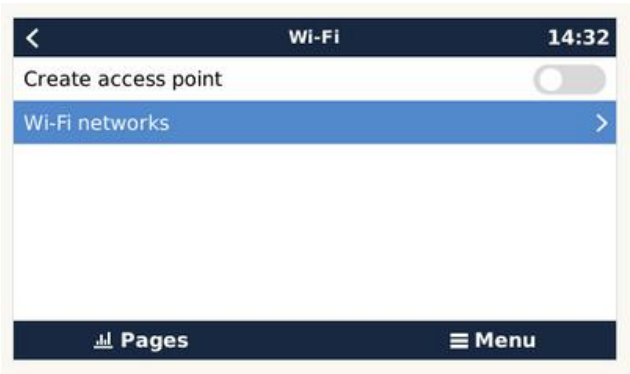
1. In the Device List, go to Settings:



2. Go down to Wi-Fi:



3. Select Wi-Fi networks:



4. Select your Wi-Fi network:

5. Select Password

use the on screen touch keyboard to enter your password, then press the tick at the bottom right of the screen

6. Success

you can now return to the settings list using the Back arrow at the top left of the screen

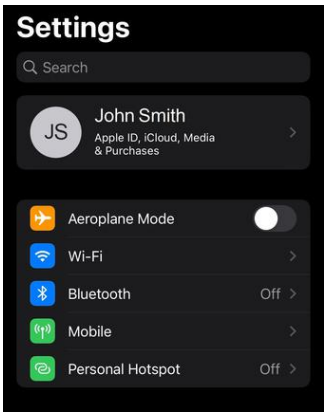
Step 3: Getting Your System Online

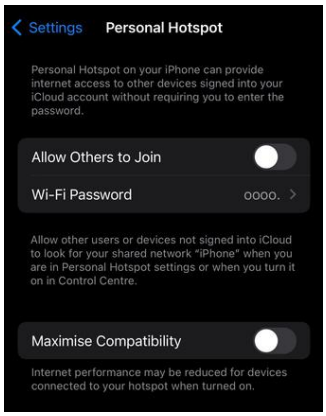
Mobile Phone 'HotSpot' Connection

Where no other means of an internet connection is possible, your system can connect to the internet using your mobile phone 'HotSpot'. This shares your phone internet connection over WiFi to your system.

Most phones list the Personal Hotspot menu in the Network or Internet settings where you can enable the Hotspot and see the password to connect:

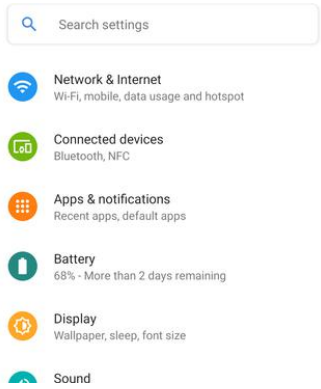
For iPhones:

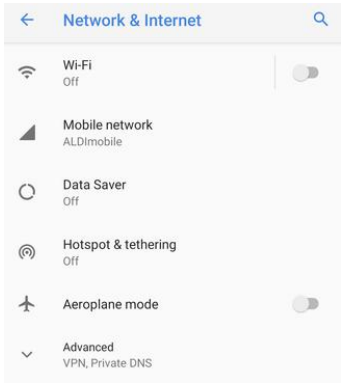


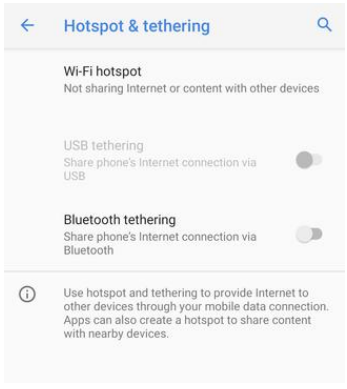


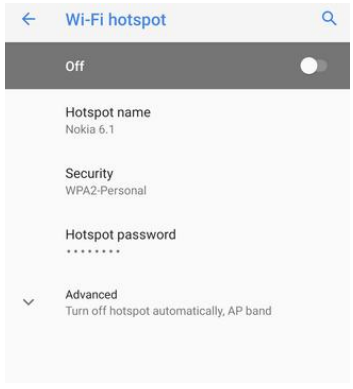
- Select 'Allow Others to Join'
- Sometimes it is necessary to enable 'Maximise Compatibility'
- The password you need to connect to the Hotspot is shown in 'Wi-Fi Password'

For Android phones:









- Select 'Network & Internet', then 'Hotspot & tethering', then 'Wi-Fi hotspot'
- Turn on the Hotspot
- The password you need to connect to the Hotspot is shown in 'Hotspot password'

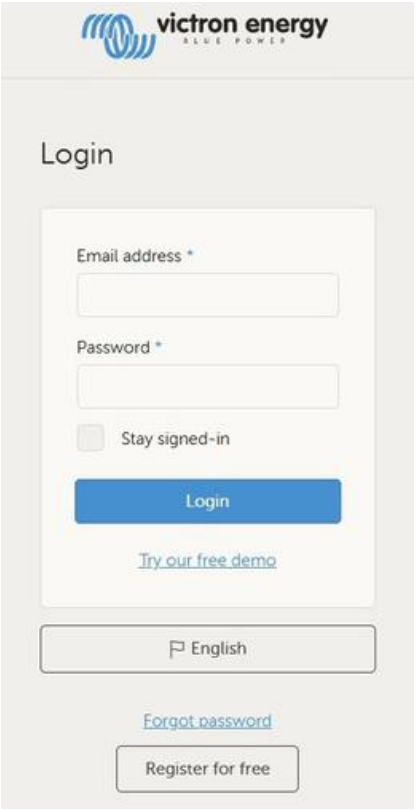
Once the HotSpot feature is activated on your phone, see the instructions on the previous page to connect your system to your phone HotSpot WiFi network.

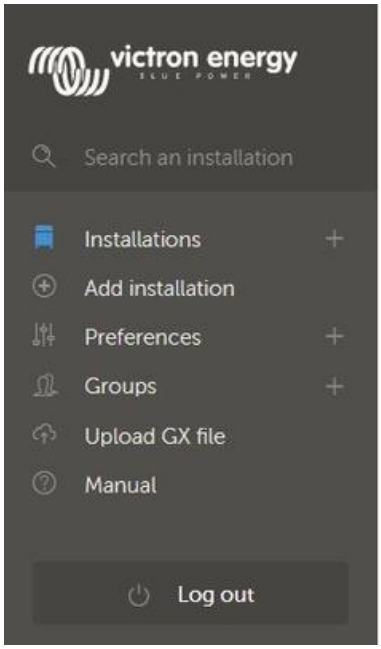
**** If the internet disconnects from the Cerbo follow these steps to reboot the Cerbo, this won't turn off your power. From the Home Screen click Settings > General > Reboot. When click Reboot this will reconnect the internet.**

Step 3: Getting Your System Online

Once your system is connected to the internet, you can view your system online using the Victron Remote Monitoring portal from anywhere you can get an internet connection. A free VRM account is required for you to login and check your system, simply go to vrm.victronenergy.com using a smartphone or PC and click 'Register for Free'.

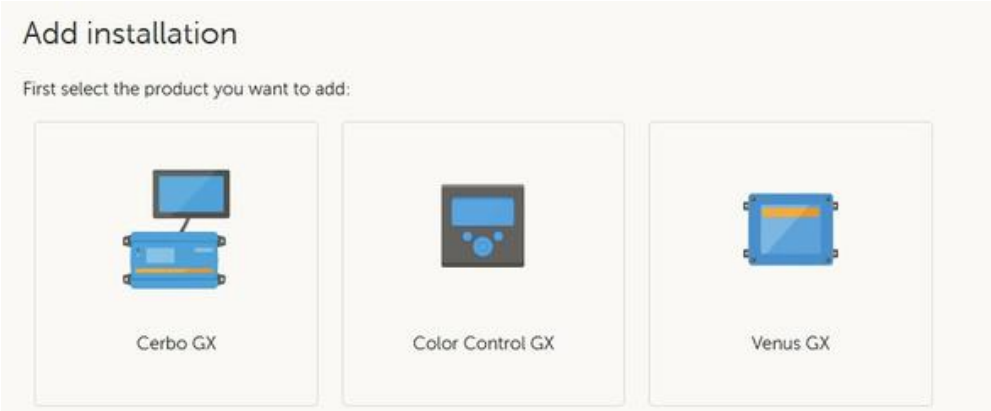
The VRM Portal Login & Register Page





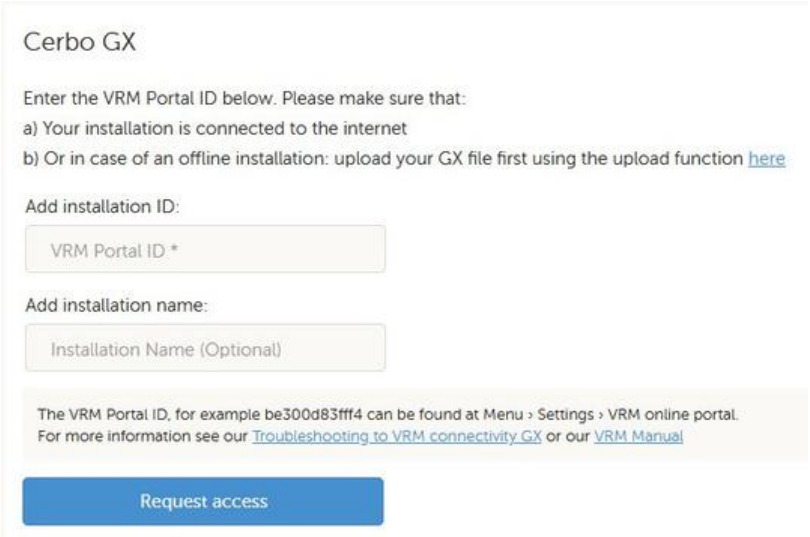
After you login the the VRM portal, this menu is shown on the left side of the screen.
Select 'Add Installation' which takes you to the screen shown below.
Note: Systems from Commodore will already be registered on the VRM portal using the customers email address.
Go to 'Add Installation' will send us an email asking us to grant you access.

Click on the type of Display installed on your system.
Typically this will be the 'Cerbo GX' option:



Step 3: Getting Your System Online

Here you can enter the 'VRM Portal ID'. How to get your VRM Portal ID from your system Display is shown further down this page.

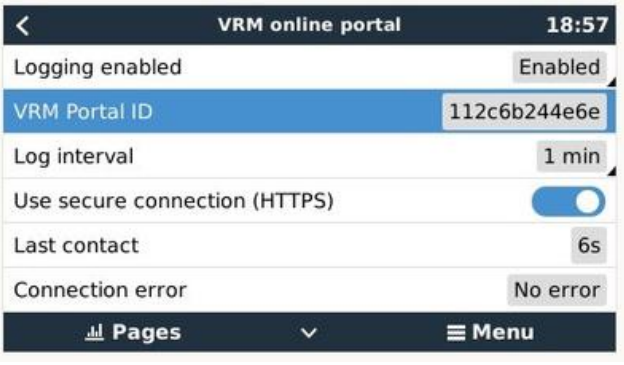


To retrieve your 'VRM Portal ID' from your system Display, follow the following steps:

1. In the Device List, go to Settings:

2. Go down to 'VRM online portal':

3. Your VRM Portal ID is shown:



Enter your Portal ID in the 'Add Installation' page of the VRM portal as shown above and click 'Request access'. A Commodore Support member will then receive an email asking to approve access.

Scan this QR code to watch a video on how to connect VRM

Step 4: Generator Installation

Commodore Generator Installation

When installing a Commodore Generator into your Off Grid Solar System, please watch your relevant video (Air-Cooled or Water-Cooled) by scanning the QR Codes below.

Air-Cooled Commodore Diesel Generator Installation Video

Water-Cooled Commodore Diesel Generator Installation Video

Commodore Generator Current Limits

Commodore 5.7kVA Generator - current limit 15amps
Commodore 9kVA Generator - current limit 30amps
Commodore 13kVA Generator - current limit 40amps
Commodore 17.6kVA Generator - current limit 50amps

If Using An Alternative Generator

If you're using an alternative generator, please ensure the generator features:

Frequency: 45-55hZ

Waveform: <8%

Minimum Continuous Output: At least 60% of the rated inverter capacity

WE HIGHLY RECOMMEND:

- Servicing the generator before installing if it's a used generator to ensure the output is intended
- Using a generator with 2 wire automatic start to both charge your battery bank and run your loads automatically once programmed
- Fitting a trickle charger (240v or Solar powered) to the generators starting battery, to ensure the battery is charged when you need the generator to start.

Step 4: Generator Installation

Input Current Rules & Adjustments

Before you power up a generator connected to the system, please ensure the appropriate power limit is set for your generator by following the steps below.
This will ensure the generator is operated only within its ideal limits.
Please note if you are connecting a portable generator to the 15Amp connection point as detailed on the previous page, the maximum limit allowable is 15Amp. The power limit is set in 'Amps'.

Common Generator Current Limits

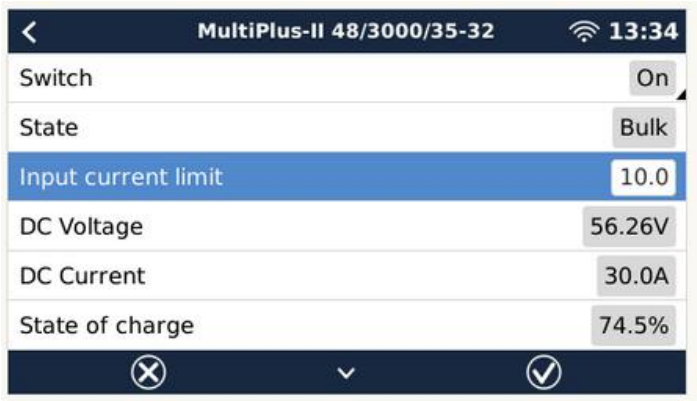
This table covers the most common generators and aims to keep the generator operating within the ideal limit of around 80%:

2kVA Generator - current limit 6amps
3kVA Generator - current limit 10amps
5kVA Generator - current limit 15amps
8kVA Generator - current limit 25amps
10kVA Generator - current limit 32amps
15kVA Generator - current limit 48amps
20kVA Generator - current limit 64amps
30kVA Generator - current limit 96amps

1. In the Device List, go to the MultiPlus or Quattro item:

2. Select 'Input current limit', Tap again to adjust the limit:

3. Press the tick at the bottom right of the screen once the limit is set:



4. Press the back arrow at the top left to return to the Device list.

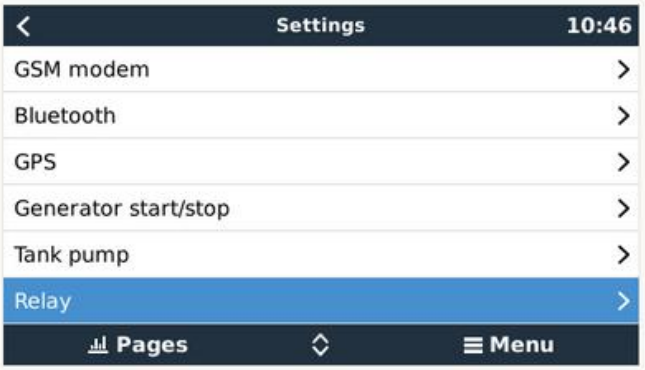
Perform a test run of the generator - preferably while the batteries are below 85%. If the generator power seems unstable, try reducing the current limit.

Step 4: Generator Installation

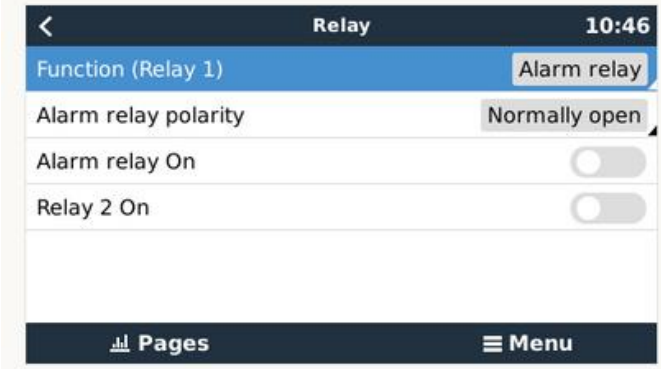
Relay Configuration To Enable Automatic Start

By configuring the relay, you are making the Cerbo GX available for use in starting the generator. This is not the default configuration hence is important to follow the steps below. If you ordered a system with an auto start generator, the auto start will be pre configured however it will still serve you well to familiarise yourself with this section.

Step 1: Select "Settings" from the Device List and then select "Relay":



Step 2: Select "Function (Relay 1) then tap again to change:



Step 3: Select Generator start/stop from the list:

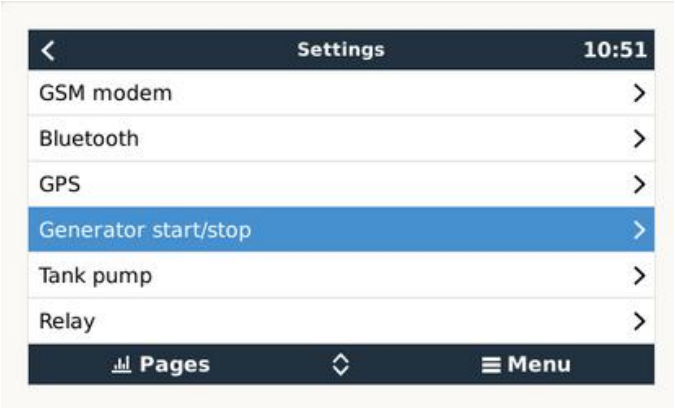
Step 4: Once done, press the back arrow at the top left to return to the Settings list:

Step 4: Generator Installation

Automatic Start Configuration

The following steps will guide you through the Generator Auto Start settings where the start and stop parameters can be adjusted to suit your system.

Step 1: From the Settings menu, select "Generator start/stop"

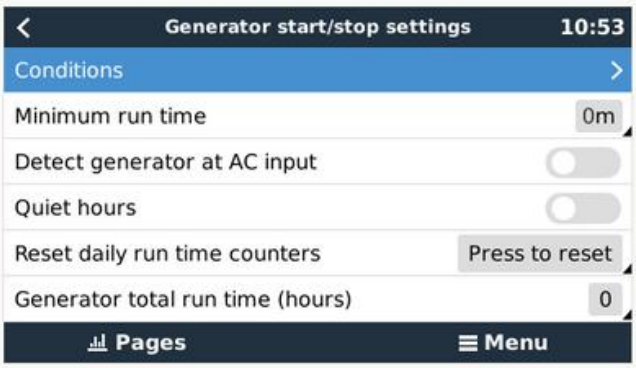


Step 2: To enable the Auto Start function, tap the switch as shown. It is recommended to switch this on after the auto-start paramaters have been set:

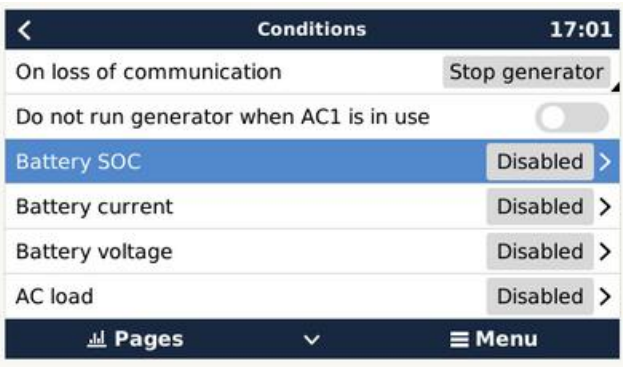
Step 3: Go down to Settings:

Step 4: Enabling 'Detect generator at AC input' causes an alarm to be triggered if the generator fails to start:

Step 5: Select "Conditions":



Step 6: Select Battery SOC (State of Charge)



Step 4: Generator Installation

Automatic Start Configuration (Continued)

Step 7: Switch on "Use Battery SOC value to start/stop":

*For AGM batteries the minimum Start Value is 50%. For Lithium batteries the recomended minimum Start Value is 20% however some types can go as low as 5%.
The Stop Value for either battery type should allow at least 30% charge into the battery above the Start value.

Other Start/Stop Conditions and Suggested values

The Conditions list has several options for starting and stopping the generator based on different events. It is recommended to activate only the necessary conditions to suit your system and needs.
Only the most commonly used options are detailed here.

Battery Voltage

This can be useful as a 'fail safe' to the State of Charge conditions, especially for AGM and other lead-acid type batteries. If the State of Charge reading for the batteries ever become out of sync, which can happen if the batteries haven't had a full charge for a few days in a row, the 'Battery voltage' start/stop conditions can prevent a system shut-down should the batteries be lower than the State of Charge reading suggests.

Setting a Start value of 47v and a Stop value of 55v would be appropriate for most lead-acid battery banks. The 'Start after the condition is reached for' setting allows a delay prior to starting the generator, set this to '120s'.

Step 4: Generator Installation

Inverter Overload

This option aims to start the generator to prevent a system shut-down when there is too much power being drawn from the inverter.
Once the generator is started, there can be a delay of up to 30 seconds before the inverter changes over to generator power. Therefore a short delay of around 3 seconds is recommended in the 'Start when warning is active for' setting. A longer delay of 60 seconds or more set in 'When warning is cleared stop after' keeps the generator running briefly in case another overload happens in this time.

Periodic run

If your generator is not likely to run for extended periods of time, during the sunnier months for example, the Periodic run is a great way to keep the generator healthy by starting it once in a while. You can select how often , what time of day, how long to run, etc from the menu.

Generator Quiet Hours

In some of the generator start/stop 'Conditions' menus there are separate values for “Quiet Hours”. Turning on 'Quiet hours' enables you to select a time - normally 9PM (21:00) until 6AM (6:00) where the generator will only be started based on these separate 'Quiet hours' values. This way, if you have neighbours or children sleeping you can make the generator run for a shorter time, wait until the battery is discharged lower or not run the generator at all. If your generator is in a situation where the noise is not a problem, you can safely leave this option disabled.

Enable "Quiet hours" in the Generator start/stop 'Settings' menu:

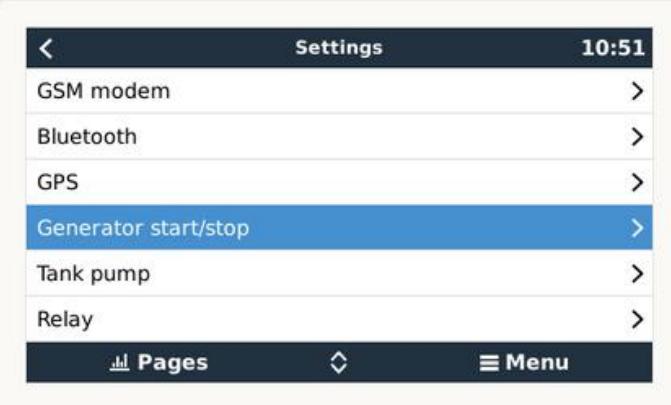
Example Battery State of Charge start and stop conditions for Quiet hours:

Step 4: Generator Installation

Manual Generator Start

Automatic start generators can also be manually started from the Generator start/stop menu as per the steps below.

Step 1: Select "Generator start/stop" in the main Settings list:



Step 2: Select 'Manual start':

Step 3: If you only want the generator to run for a set time, you can set a run duration in the 'Run for' section before selecting 'Start generator'.
Otherwise, you can simply select 'Start generator' and come back later to switch it off again.

Remember - if you don't set a run duration in 'Run for' the generator will keep running until it is switched off here - or until it runs out of fuel!

Step 5: Power Skid Fold Out

Power Skid Fold Out

Your Power Skid travels, and will arrive in the folded position just like the images attached. In order to expand the solar array,

Final Checks & System Completion

Final Checks

Before handover, please ensure:

- For off grid an earth stake is installed and wired to our prewired system earth bar. Note our AC Switchboard becomes the Main Switchboard on site. Any Pre existing switchboards become Sub Boards. We recommend removing previous earth stakes and wiring an earthing conductor between switchboards.
- All connections are tight.
- Solar polarity is correct.
- That the customers generator is hardwired and if it is a customer supplied generator that the MEN link is removed from the generator.
- Two wire automatic start is working as intended.
- Battery charger is connected to the generator starter battery if applicable.
- Both you, and the customer can access their system via the VRM phone app or online interface through their browser.
- The customer understands how to use the manual changeover switch to run from the generator if required in an emergency. Note this is only operated if something is wrong with the Victron system. In normal operation the switch will be left in standalone mode.
- The customer knows how to operate the system and the need to contact an electrician for any upgrades or changes.

Torque Settings

Inverters

- Quattro AC = 7Nm
- Quattro Batt DC = 14Nm
- Quattro Earth Bond(Down Bottom)= 14Nm
- Multiplus II AC = 1.6Nm
- Multiplus II Batt DC = 12Nm
- Multiplus II Earth Bond= 7Nm

MPPTs

- Standard MPPT Batt = 2.4Nm
- Standard MPPT Solar = 2.4Nm
- 450/100 & 200 Batt = 14Nm
- 450/100 & 200 Solar = 1.2Nm
- 450/100 & 200 Earth = 7Nm

Completion

At this point, if you're charging from solar and generator, discharging from the batteries, able to handle loads and are not showing any errors on the Cerbo GX Touch, you are finished the installation!

Contact Us With Any Questions

If you have any questions, please call our support team on 1300 669 256 or email support@commodoreaustralia.com.au