

ESSENTIAL Off-Grid Installation Manual



Dependable Power Anywhere | DPA

- Full system overview
- Historical data
- Remote support



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Wiring Rules & Safety Considerations

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The wiring diagrams and guides for connectivity act as a guide, always ensure the standards below are followed, and the ESSential is installed by a licenced electrician at all times.

Associated Standards

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

Contact Us

If you have any questions or are unsure about any part of the installation, never hesitate to call DPA Energy for technical assistance.



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ESsential Startup Procedure

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ITEM	ACTION	LOCATION
1	Turn ON Battery ON/OFF SWITCH	Front of Batteries (if present)
2	Turn ON all BATTERY CIRCUIT BREAKERS	Front of Batteries
3	Turn ON all BATTERY SYSTEM DC ISOLATORS	D.C SWITCHBOARD
4	Turn ON all MPPT BATTERY DC ISOLATORS	D.C SWITCHBOARD
5	Turn ON all MPPT SWITCHES	Bottom right of Victron MPPT
6	Turn ON all INVERTER SWITCHES	Bottom Right of Victron Inverters
7	Turn ON all PV Array D.C ISOLATORS	D.C SWITCHBOARD
8	Press RED Battery SW Button on Pylontech (Start button on other batteries)	Front of Battery Number 1
9	Turn ON the MAIN SWITCH GENERATOR SUPPLY + Set Generator into AUTO MODE	A.C SWITCHBOARD
10	Turn ON the MAIN SWITCH PV INVERTER SUPPLY	A.C SWITCHBOARD (if present)
11	Turn ON the MAIN SWITCH STANDALONE SUPPLY	A.C SWITCHBOARD
12	Turn CHANGEOVER SWITCH to Standalone + Generator	A.C SWITCHBOARD



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ESsential Shutdown Procedure

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ITEM	ACTION	LOCATION
1	Turn OFF the MAIN SWITCH STANDALONE SUPPLY	A.C SWITCHBOARD
2	Turn OFF the MAIN SWITCH PV INVERTER SUPPLY	A.C SWITCHBOARD (if present)
3	Turn OFF the MAIN SWITCH GENERATOR SUPPLY and Disable Auto Start at Generator	A.C SWITCHBOARD
4	Turn OFF all PV Array D.C ISOLATORS	D.C SWITCHBOARD
5	Turn OFF all MPPT BATTERY DC ISOLATORS	D.C SWITCHBOARD
6	Turn OFF all INVERTER SWITCHES	Bottom Right of Victron Inverters
7	Turn OFF all BATTERY SYSTEM DC ISOLATORS	D.C SWITCHBOARD
8	Turn OFF all BATTERY CIRCUIT BREAKERS	Front of Batteries (if present)
9	Turn OFF Battery ON/OFF SWITCH	Front of Batteries (if present)

Which Communications Go Where In The Ekrano Complete Power Partners

VE Direct For SmartShunt,
And 150V Or 250V MPPT's

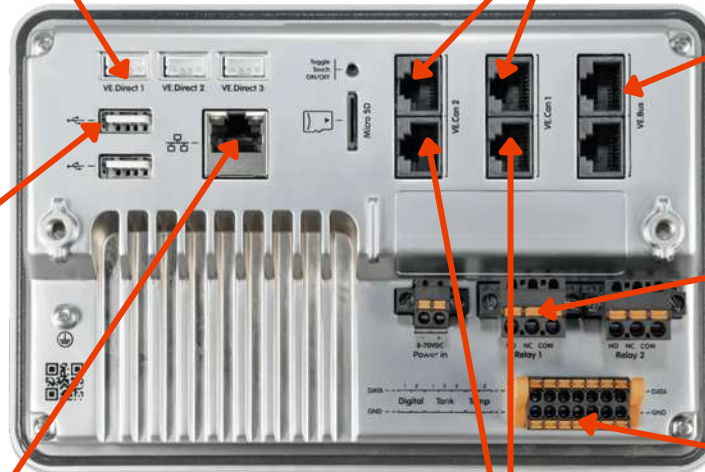
RJ45 From 450/100 Or
450/200 To VE Can

RJ45 From Inverter
To VE Bus

RS485 To USB
For Energy
Meter

Relay 1 For
Generator 2
Wire Auto

Relay For Fuel
Tank Input



Ethernet Port For
Hardwired Data
Connection
(Recommended)

VE Can To BMS From
Battery For Managed
Battery Comms



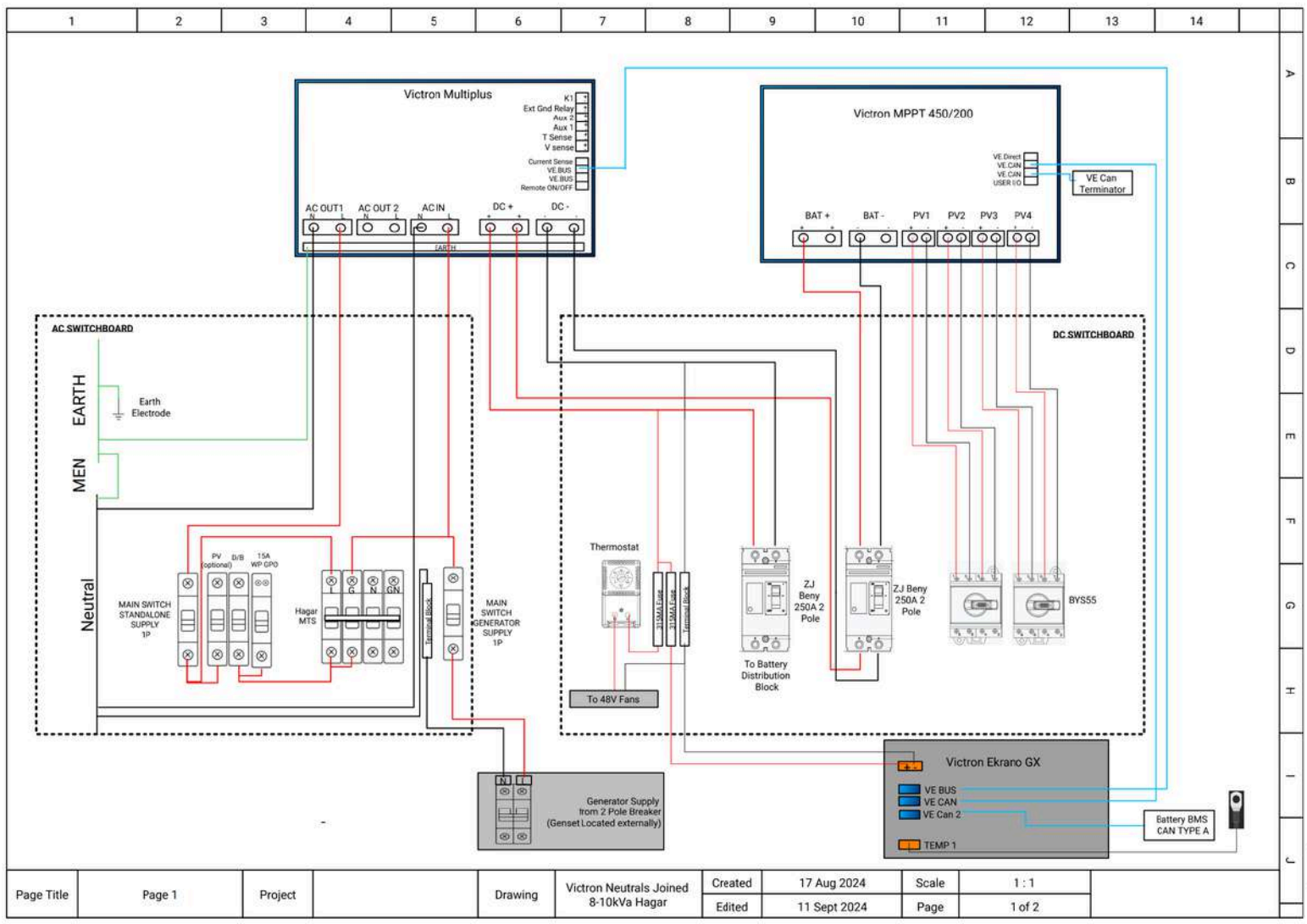
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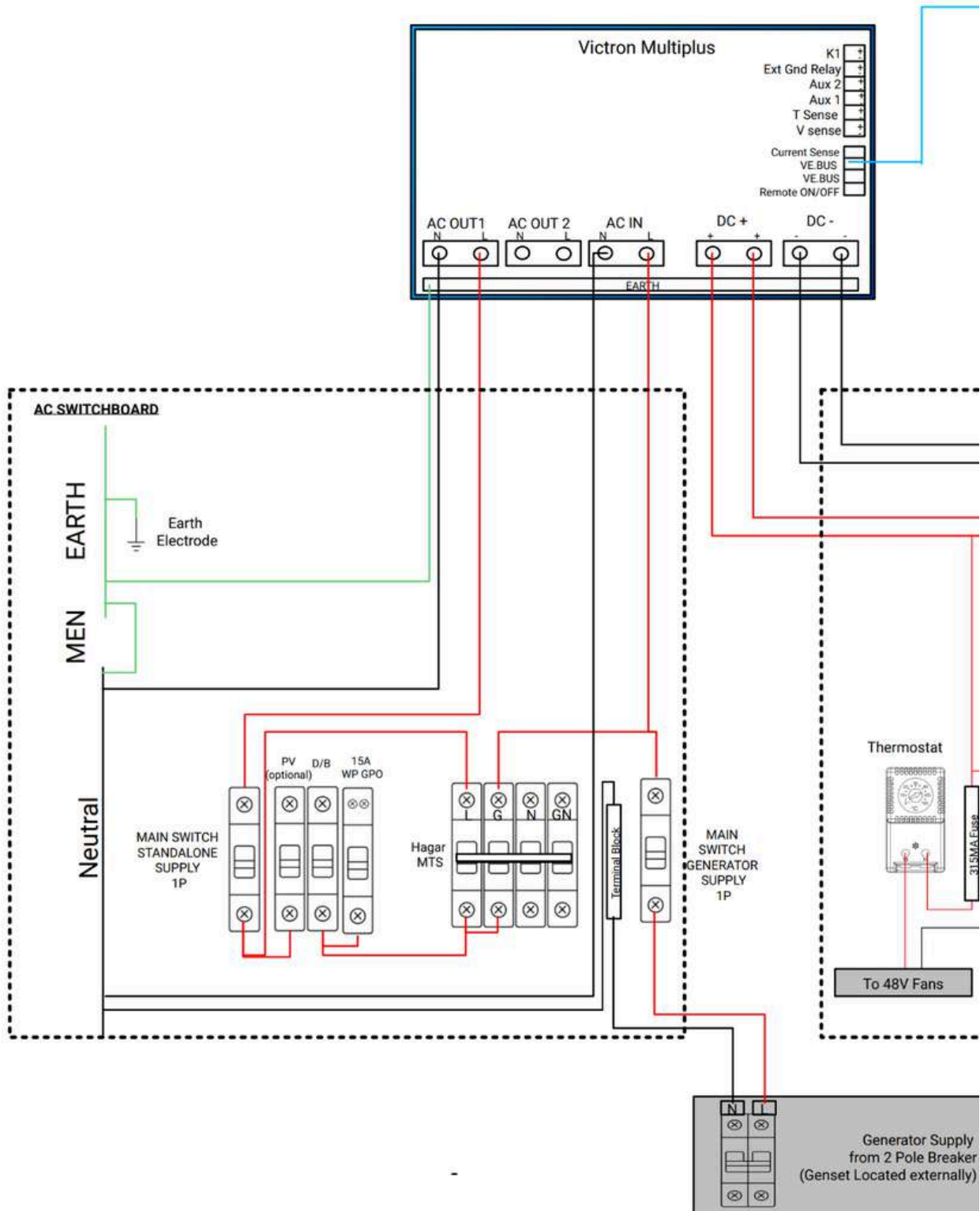
SLD For ESsential Off-Grid Single Phase

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AC Switchboard Connection Guide For Solar Core Single Phase

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Battery Communications With Managed Battery

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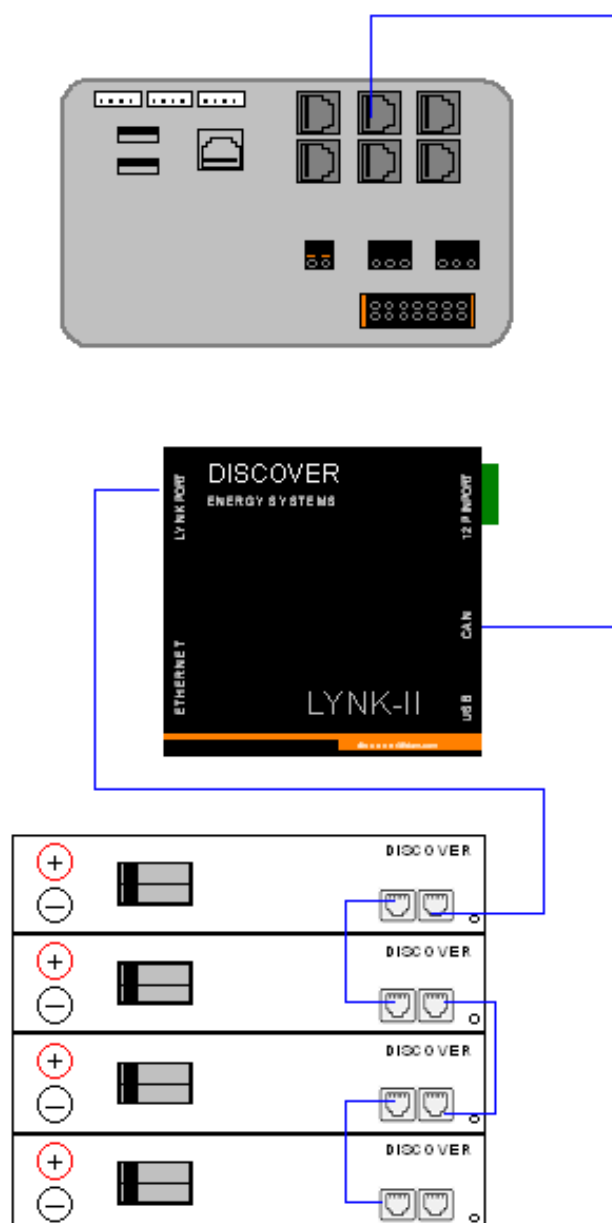
Data Connections:

From The Victron Ekrano: CANBus To LYNK-II gateway CANBus Port

From the Discover Battery: LYNK Port (on battery) to LYNK Port (on LYNK-II gateway)

Key Point:

- CANBus cable from LYNK-II to Ekrano must be plugged into a VE.Can Port, not the VE.Bus port.



ESSential Air-Conditioner Installation

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If Ordered With ESSential

The air-conditioner is pre-wired and programmed when ordered with an ESSential, no further wiring will be required on site. The 500W DC model is connected to a 10A breaker ready to turn on upon powering up the system

Retrofitting An ESSential Air-Conditioner

1. On the inverter side, remove 6 x bolts holding the side panel, and fit the ESSential Air-Conditioner mount in place of it. The ESSential comes with a custom side panel with the Air-Conditioner pre-fitted
2. Using the supplied cable, run to a 10A DC breaker which is powered from the inverter DC bus as per the SLD attached

Note: The 500W ESSential Air-Conditioner is 48VDC. Specifications on page 10



**Add 2 Pole
10A Breaker wired
to Inverter DC
terminals**

ESsential Air-Conditioner Specifications

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Enclosure Protection	
IP Rating	IP55
Physical	
Colour	Grey
Material	Galvainsed Steel
Mounting	Door mounted
Dimensions	353mm x 165mm x 585mm (W x D x H)
Weight	16kg
Noise Level	55dB
Cooling Performance	
Capacity (Watts)	500
Refrigerant	R134a
Electrical Data	
Voltage	48VDC
Power Consumption	215W
Rated Current	4.4A
Electrical Data	
Warranty	1 Year



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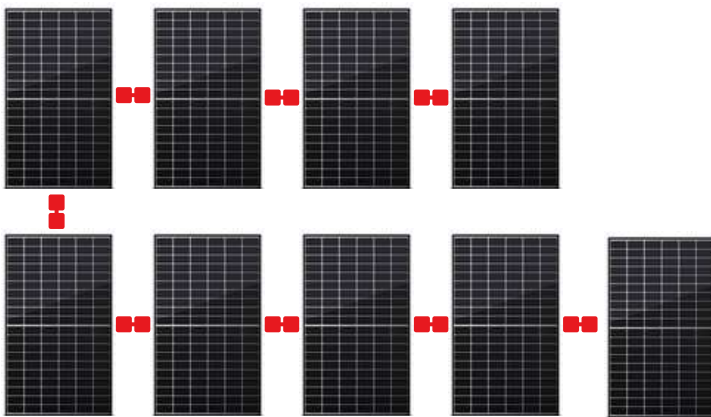


Solar Array Installation With Victron MPPT's

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Rules To Remember

1. The string voltage must never exceed the maximum rated input voltage by the manufacturer. Our most commonly used solar regulators are the 450V/100 or 200A SmartSolar controllers by Victron Energy. Their maximum input voltage is 450V, however you don't want to edge too close otherwise you run the risk of complete product failure with over-voltage.
2. CPP recommends total PV to not exceed 45% of the rated input current to maximise system efficiency



When Applying: $VOC_{cell\ eff} = VOC_{STC} [\gamma VOC \times (T_{cell\ eff} - T_{STC})]$

$$\begin{aligned} 0.25\% \times 42.54V &= 0.1065V/C \\ &= 0.1065V/C \times 25/C = 2.67V \\ &= 42.54 + 2.67V = 45.21V \end{aligned}$$

Max Voltage Of Solar Controller = 450V - Apply 5% safety margin

$$450 \times 0.95 = 427.5VOC\ max$$

$$427.5 / 45.21 = 9.46\ panels$$

Cannot exceed 427.5 hence round down to 9

Total String Voltage $45.21 \times 9 = 406.89V$

Calculations

Panel Model: JKM475N-60HL4-V

Max Number Of Panels: In Series: 9

Panel Specifications:

Module Type	JKM475N-60HL4 JKM475N-60HL4-V	
	STC	NOCT
Maximum Power (Pmax)	475Wp	357Wp
Maximum Power Voltage (Vmp)	35.21V	33.10V
Maximum Power Current (Imp)	13.49A	10.79A
Open-circuit Voltage (Voc)	42.54V	40.41V
Short-circuit Current (Isc)	14.23A	11.49A
Module Efficiency STC (%)	22.01%	
Operating Temperature (°C)	-40°C ~ +85°C	
Maximum system voltage	1000/1500VDC(IEC)	
Maximum series fuse rating	25A	
Power measurement tolerance	+/- 3%	
Temperature coefficients of Pmax	-0.30%/°C	
Temperature coefficients of Voc	-0.25%/°C	
Temperature coefficients of Isc	0.046%/°C	
Nominal operating cell temperature (T _n)	45±2°C	



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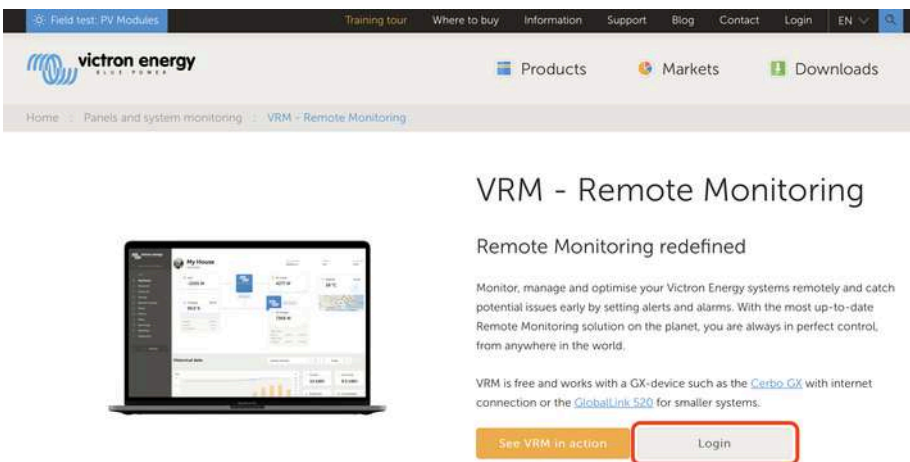
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New Users: Opening A VRM Account

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1. Open a browser window on your computer and go to <https://vrm.victronenergy.com>
2. Click on 'Login'.



3. On the next screen scroll down to 'Register for free' and click on it.
4. Complete all the requested information and then click on 'Register'.
5. You will now receive a confirmation email with a link to activate your account.
6. Once activated, account creation and registration is finished.

Accepting A VRM Installation From CPP

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1. Once you've registered an account, you can accept the Installation from CPP if you've purchased a pre-wired & programmed ESSential. An email titled "You have been invited" from no-reply@victronenergy.com will be sent to you by DPA Energy or CPP.

You have been invited to join CPP Team on VRM



VRM <no-reply@victronenergy.com>

To: Matt Miller

2. In the email, click the link below, it will redirect you to VRM and the installation will appear in your "Installations"

Please visit the following link to view the site:

<https://vrm.victronenergy.com/installation/230012/dashboard>



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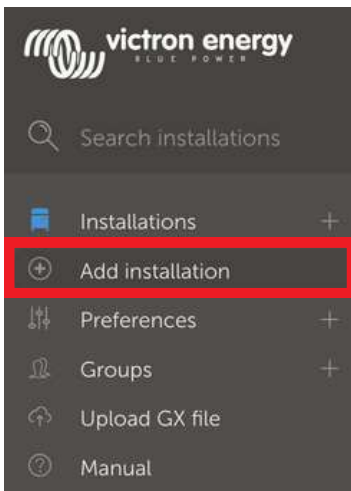
**Any Questions? Don't
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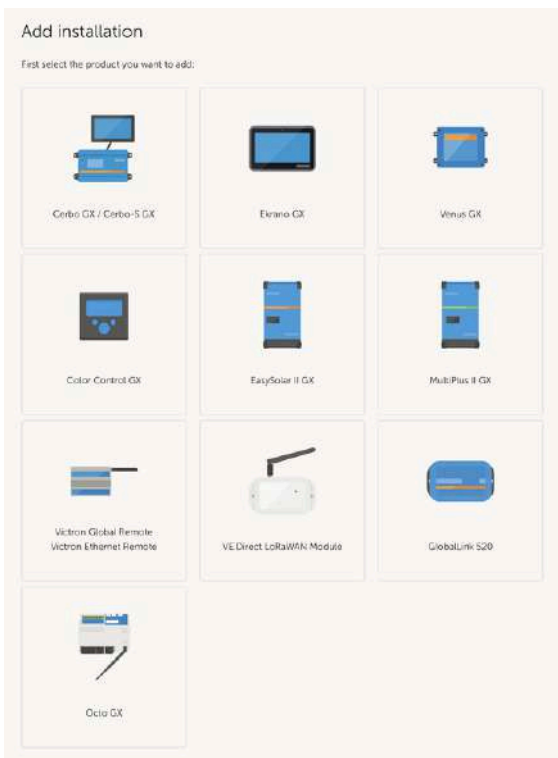
Manually Adding An Installation (If You Can't Find Our Email)

DPA Energy

1. Login To VRM
2. Select "Add Installation"



3. Select the product you want to add




Manually Adding An Installation (If You Can't Find Our Email)

DPA Energy


4. Enter the VRM Portal ID of the device. The VRM ID can be found on a sticker of the respective device, and also in the VRM Online Portal menu in the GX Device which can be found by selecting Menu > Settings > VRM Online Portal

Add installation


First select the product you want to add:



Cerbo GX



Color Control GX



Venus GX

Cerbo GX

Enter the VRM Portal ID below. Please make sure that:

- a) Your installation is connected to the internet
- b) Or in case of an offline installation: upload your GX file first using the upload function [here](#)

Add installation ID:

VRM Portal ID *

Add installation name:

Installation Name (Optional)

The VRM Portal ID, for example be300d83ff14 can be found at Menu > Settings > VRM online portal. For more information see our [Troubleshooting to VRM connectivity GX](#) or our [VRM Manual](#)

Request access



5. Click Request access and your device is now paired with your VRM user account.



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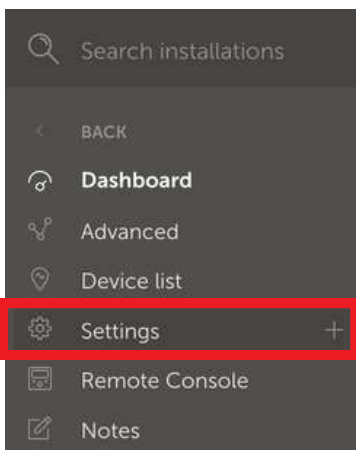


Adding Your Customer To The Installation

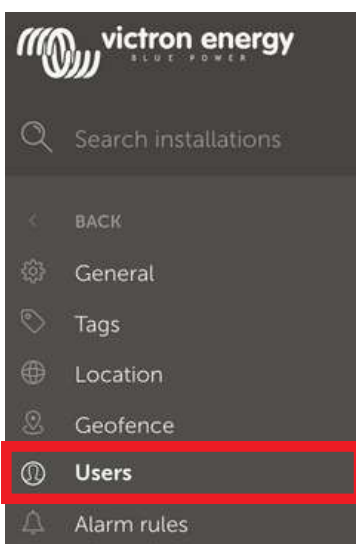
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To Allow Your Customer To View Their Systems Performance On Their Phone/Desktop

1. Under the installation in VRM, select Settings



2. Select Users



Adding Your Customer To The Installation

Complete Power Partners

3. Scroll to Pending Inviations and Invite User (blue button bottom right side)

Pending invitations

Pending invitation	Email	Access level ⓘ
No pending invites were found for this installation. You can invite a new user by clicking on the "Invite user" button.		

[Invite user](#)

4. Enter your customer's details, **ensuring the email they are invited with has a registered VRM account**, for view only, add them as a user (standard), to be able to make full configuration, add them as technician or admin

Invite a user

Name: *

Email: *

Access level:

User

Personal message:

[Send](#)



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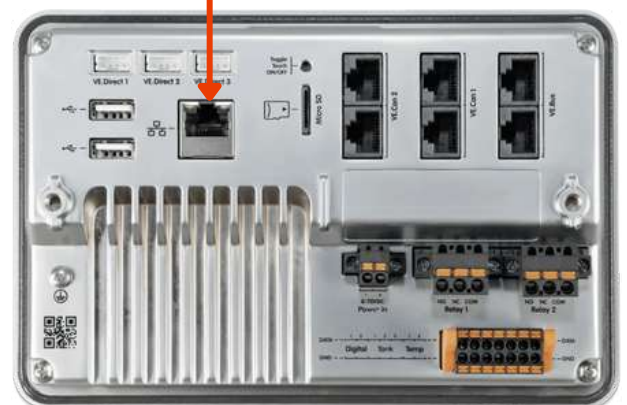
Internet Connection Via Ethernet (Preferred)

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Connection From Router Into GX Device

1. Run an RJ45 cable from the LAN port of your Router, to the Ethernet Port on your GX Device. **It's critical to not connect into the VE Can or VE Bus ports**
2. To check the success of your connection: Click anywhere on the touch screen > select menu > settings > scroll down to Ethernet - if you can see the state as Connected just like the image below, your connection is successful

Ethernet		23:39
State	Connected	
MAC address	90:59:AF:6A:16:EB	
IP configuration	Automatic	
IP address	192.168.003.167	
Netmask	255.255.255.000	
Gateway	192.168.003.001	



✓ WAN/LAN

✓ LAN

✗ WAN

Internet Connection Via Wifi

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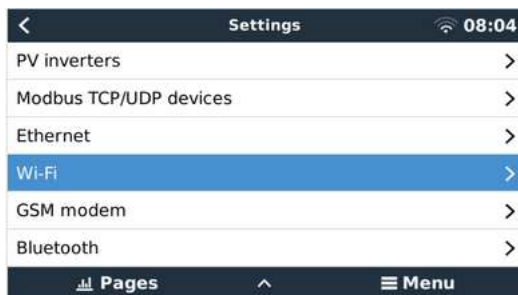
A Note From Victron Head Office

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%.

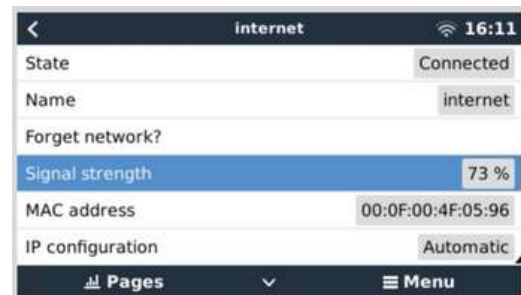
Wifi Connection

1. Touch anywhere on the screen > select Menu bottom right > Settings > scroll down to Wifi
2. Ensure “Create Access Point” is enabled.
3. Select your network, enter the network password (third line down), if successful, the State will show as Connected. Signal strength should always be at least 50% too.

Step 1



Step 4



Step 2



Step 3



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Generator Trickle Charger Installation

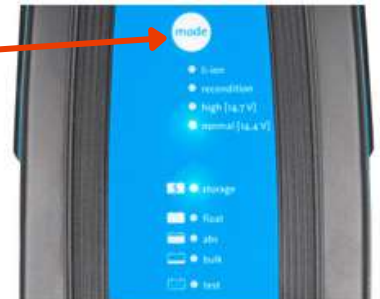
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Important Note

If using an automatic start generator, it's critical to have a trickle charger setup at all times. CPP recommends the Victron Energy 12V 4A charger for most applications, it comes with a 5m lead to 3 pin plug to plug into an AC source or can be hardwired.

Trickle Charger Connection

1. Connect the DC cables to the charger, then to the battery of the generator using the supplied clips
2. Connect the power cable to AC, this should light up the charger
3. Using the mode button on the charger, set the battery type as per the manufacturer specifications, the pre-available conditions are outlined below, however for custom charge voltages, enter Victron Connect and adjust the settings manually



Mode	Absorption	Float	Storage	Recondition
Normal	14.4V	13.8V	13.2V	16.2V
High	14.7V	13.8V	13.2V	16.5V
Li-ion	14.2V	13.5V	13.5V	N/A

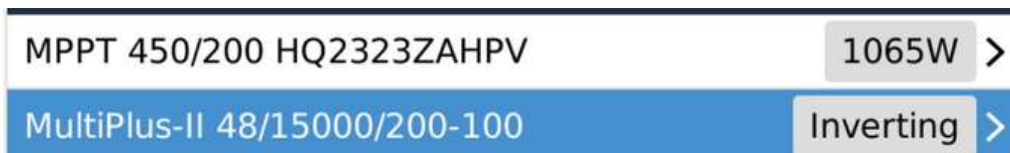
Configuring Generator Input Current Limit

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Adjusting Input Current Limit Via Remote Console

1. Touch anywhere on the screen > select Menu bottom right > in the Device List select the Inverter model (for example 48/10000 Multiplus II)
2. Scroll and select the input current limit
3. **Check with generator distributor/manufacturer if you're unsure**, however for most fuel fed generators, we recommend setting the input current limit to 70%-75% of it's continuous rated output, any higher and the generator will be running harder. Ensure you click save once finished

Step 1



Step 2



Step 3 & 4



Save Input Current Limit

If You Cannot View The Input Current Limit Adjustment In Remote Console

Call DPA Energy it's likely in the VE configuration settings, adjust input current limit has not been enable for Remote Console.



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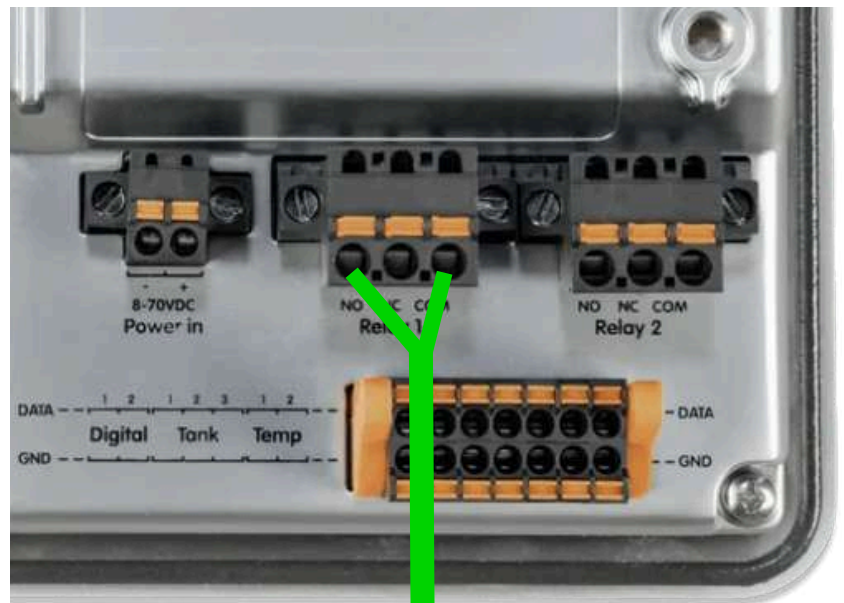
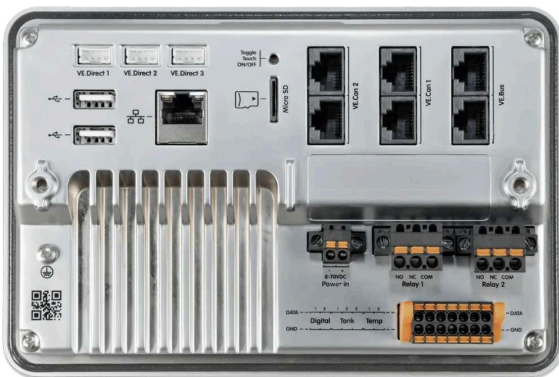
Any Questions? Don't
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Wiring For Generator Two Wire Automatic Start

DPA Energy

Run a twin core wire from the generator remote start terminals, to the normally open (NO) and common terminals in Relay 1 of the GX device (Ekran picture below). For the Ekran this will be founded behind the touch screen and for a Cerbo GX it will be found at the bottom of the small blue device (not the touch screen).



**Generator remote
start terminals (2
wire)**

Configuring Generator Automatic Start

DPA Energy

1. Touch anywhere on the screen > select Menu bottom right > Settings > scroll down to Relay
2. If the twin wire has been wired into Normally Open & Common input in Relay 1, select Relay 1, a number of options will appear, select "Generator/Start Stop, this ensures Auto Start Functionality can be enabled in the Generator Start Stop function
3. Select the arrow top left to return to settings > scroll up to Generator Start Stop > scroll down to Auto Start Functionality and enable it (toggle will turn blue)
4. Scroll down and select Settings > select Detect Generator At AC Input
5. For most generators, we recommend setting the minimum run time to 10 minutes hence scroll up > set minimum run time to 10m
6. Above minimum run time, select Conditions where we want to ensure before setting SOC or Battery Voltage cut in, select On Loss Of Communication: Stop Generator
7. Scroll down and select Battery SOC, ensure Battery SOC value to start/stop is enabled, and set up the appropriate conditions for SOC start, for most LifePo4 batteries we recommend the SOC cut in to be set to 20% and cut out at 50%
8. If issues have been present with SOC, also enable Battery Voltage as per the manufacturers recommendations

Step by step visual walkthrough on next page



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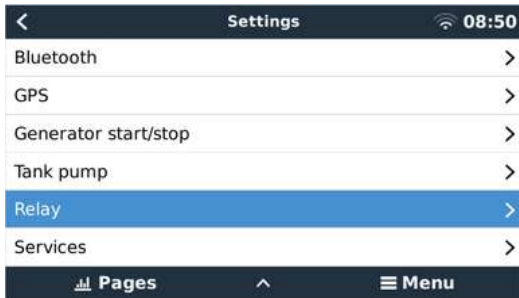
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Configuring Generator Automatic Start

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Step 1



Step 2



Step 3



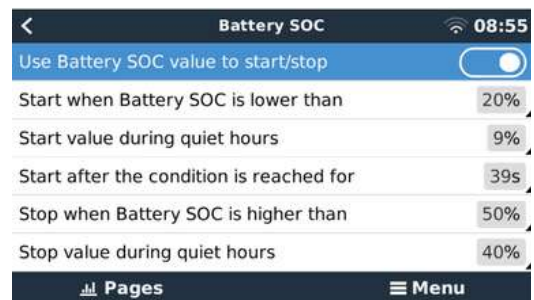
Step 4



Step 8 (Optional)



Step 7



Step 6



Step 5



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Fronius Gen 24 Wired Shutdown

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Data Connections:

From The Fronius: RJ45 from Lan port (right side)

To The Router: Into the "Lan" or "Lan/Wan" port of the router - do not plug into "Wan" port

To The Cerbo: Into the Ethernet port next to the VE Direct ports



- ✓ WAN/LAN
- ✓ LAN
- ✗ WAN



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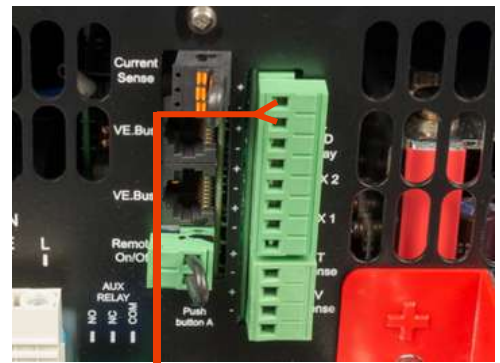
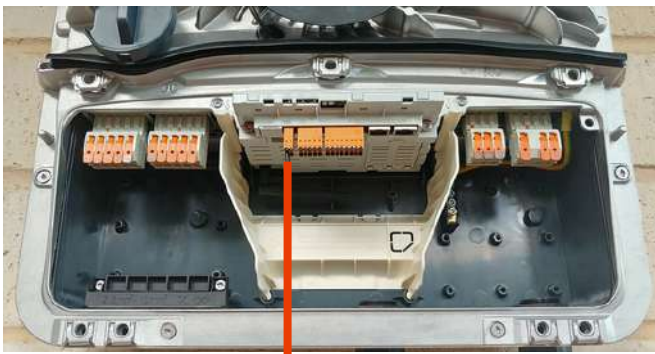
Fronius Gen 24 Wired Shutdown

DPA Energy

Wired Shutdown To Ensure The Fronius Does Not Clash With A Generator:

- 1. Wire from WSD a 2 core signal wire to Relay K1 in the Victron inverter. Positive & Negative terminals (or NC + COM if older inverter)

Next page includes programming information

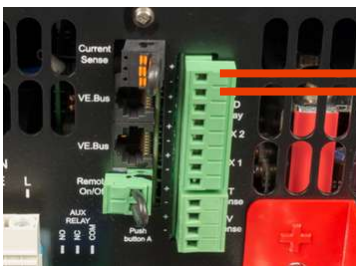


K1 = Top 2 Relay's (Not AUX)



Victron Side

Fronius Side



Positive Top, Negative Bottom

Positive Top, Negative Bottom



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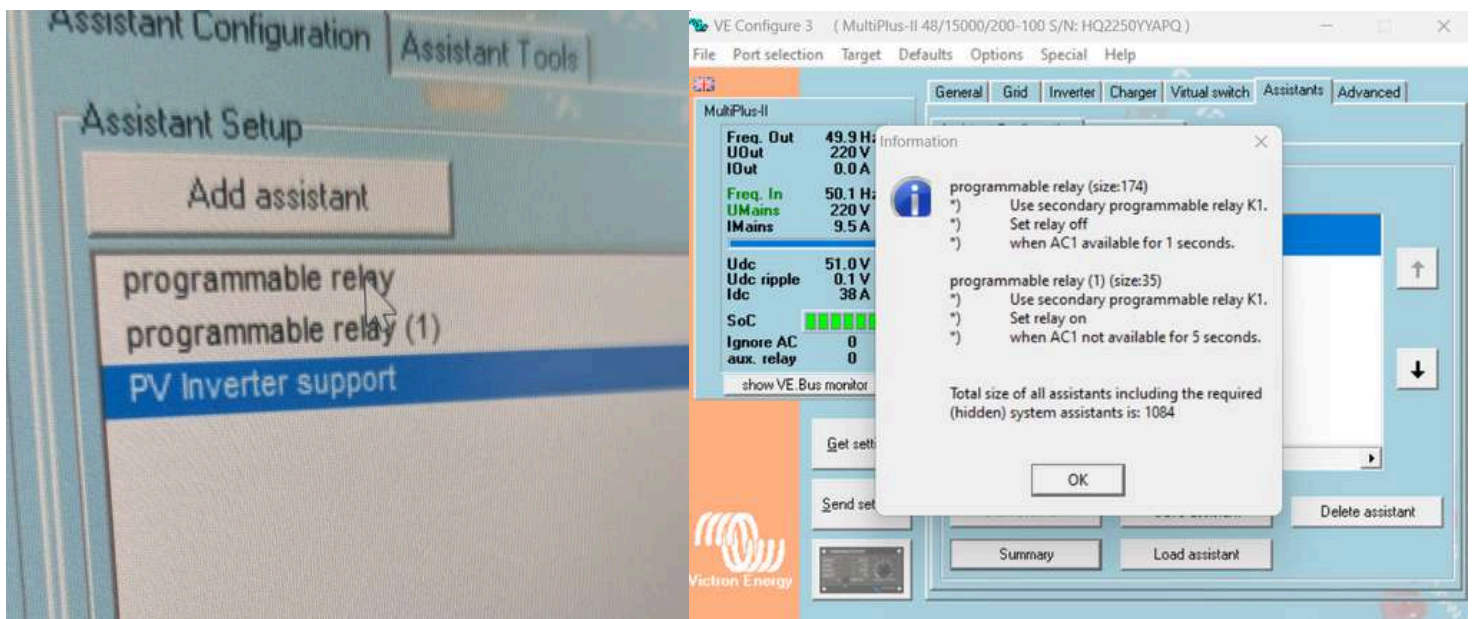
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Fronius Gen 24 Wired Shutdown

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1. Open VE Configure by either connecting your MK3-USB in your laptop, or open VE Configure via VRM, and complete the following.
2. Select “Assistants”
3. Select “Relay”
4. Select “Programmable Relay”
5. Use Secondary Programmable relay K1, set to OFF when AC IN 1 is available for 1 seconds
6. Use Secondary Programmable relay K1, set to ON relay off when AC IN 1 is not available for 5 seconds.
7. Add PV inverter support as per the image below customised to suit inverter size
8. Save, and re-upload the config file



Programming Fronius Gen 24

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Fronius Programming:

1. Open Fronius Solar Start, Web Interface
2. Connect To The Fronius Wifi
3. Upon Setup, enter system name and timezone. Ensure Country/Region is set to 50Hz, and Grid Code to Microgrid 50Hz
4. In the device configuration, add the Fronius inverter and the nominal power per MPPT, no smart meter
5. Do not select any Functions or I/O's
6. Export limitation set to Off and select Next
7. Select Modbus Data Export, set RTU Interface 1 & 0 to Master, Slave as Modbus TCP
8. Modbus Port 502
9. SunSpec Model Type int + SF
10. Meter Address 200
11. Enable Inverter Control via Modbus
12. Under "Communication" - "Solar API" - enable "Solar API Interface"
13. Ensure the Fronius firmware is current, can be downloaded from the Fronius Data Manager home page

The image shows two screenshots of the Fronius Solar Start web interface. The left screenshot is the 'SETUP' page, and the right screenshot is the 'Modbus Data Export' page.

SETUP Page:

- General:**
 - PV System Name *: Big Mob Electrical S138
 - Sep 5, 2024, 12:36:17 PM
 - Timezone: Australia
 - Timezone Location: Queensland
- Country Setup:**
 - Country / Region *: 50Hz
 - Grid Code *: Microgrid 50Hz
- Buttons: Back, Next
- Navigation: Device Configuration, Functions and I/Os, Export Limitation

Modbus Data Export Page:

- Modbus RTU Interface 0:** Master (selected), Slave, Disabled
- Modbus RTU Interface 1:** Master (selected), Slave, Disabled
- Slave as Modbus TCP:** Slave as Modbus TCP (selected)
- Modbus Port *:** 502
- SunSpec Model Type *:** int + SF
- Meter Address *:** 200
- Inverter Control via Modbus:** (selected)
- Restrict Control:** (unchecked)

Detecting Fronius On The Cerbo

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1. Enter the GX Touch, select “Menu” on the bottom right side, select “Settings” and select “PV Inverters”
2. Select “Press To Scan”
3. “Select “Automatic scanning” if not selected already
4. Upon completion of the Scan, select “Inverters”, you should then see the serial number of the inverter. Ensure AC-Out is selected, as the inverter should be wired on the output of the Victron inverter
5. Click the arrow top right until you’re back to the “Device List”, if you can see the Fronius, and can see power coming in,, the connection is successful however if you have any questions, contact DPA Energy

Step 1



Step 2



Step 3



Rebooting Victron Cerbo Via GX Touch Or Ekrano

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If Remote Console cannot be accessed on the VRM online portal, follow the steps below :

1. Select Settings > VRM Online Portal > Enable Two Way Communication
2. Select Settings > General > Remote Support > Enable Remote Support
3. Select Settings > Remote Console > Enable On VRM
4. In Remote Console > Disable Password Check
5. Then complete a Reboot of the GX Touch by selecting Settings > General > Reboot

Step 1



Step 2



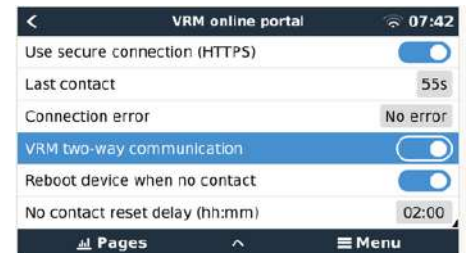
Getting Remote Console On VRM

DPA Energy

If Remote Console cannot be accessed on the VRM online portal, follow the steps below :

1. Select Settings > VRM Online Portal > Enable Two Way Communication
2. Select Settings > General > Remote Support > Enable Remote Support
3. Select Settings > Remote Console > Enable On VRM
4. In Remote Console > Disable Password Check
5. Then complete a Reboot of the GX Touch by selecting Settings > General > Reboot

Two Way Communication



Enable Remote Support



Enable On VRM & Disable Password Check



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