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MDT Quick Guide

MDT-400 | MDT-800 | MDT-1200 | MDT-1600 Trailer Range

For Cameras, Communications, and Lighting

Vorp Energy

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11/22/2022

MDT Quick Guide

Breakers

Turn on in assending order/off in decending order

1 - ***Battery***: connects charger to battery bank
2 - ***Solar***: connect charger to solar panel array
3 - ***Load***: enables 24VDC available through green terminals
4 - ***Inverter***: enables 120VAC through one NEMA 5-15 3 prong receptacle

DC Phoenix Terminals

2 Negative contacts on left side of terminals
2 Positive contacts on right side of terminals

Load - straight through connecton to battery bank

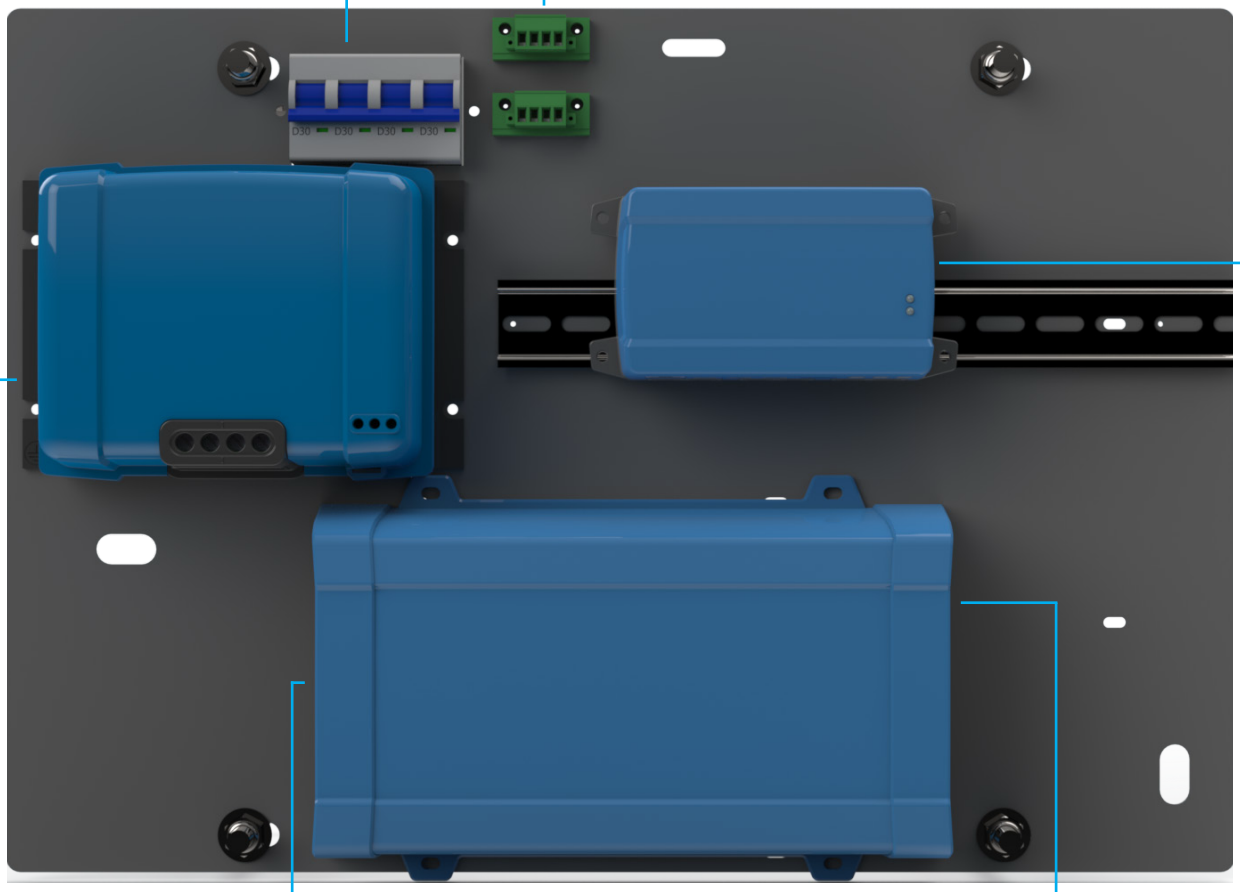
Relay - programmable relay controlled through the Remote-M device

Remote-M

Connects to online portal allowing viewing of key system parameters to ensure a healthy system

Can be connected to the communication device by use of WiFi, however a hardline is recommended to prevent interference by trailer body if the communication device is located outside of the PA cabinet

Portal allows control of the other systems connected to this device which acts as the “brain” of the system



MPPT Solar Charger

LED Indicators (*color coded*):
Bulk - charges the battery bank to 80% as quickly as possible; 1 to 2 hours
Absorption - charges the battery bank from 80% to 100% at a reduced rate charge; may take up to 6 hours, usually less than 4 hours
Float - will keep the battery bank on a trickle charge until the battery bank drops below a specified voltage; below 27.4VDC

Inverter Output

This side of the inverter has, 1 NEMA 5-15, 3 prong plug

The output voltage is 120VAC with a Watt capacity of 375W

Inverter manual switch

Has three positions:
On - provides full voltage and current, all of the time
Off - turns the inverter of regardless of breaker 4 position, usual cause of no output for the inverter
Eco - if the current draw drops below 0.2A the inverter will cut the output off, will check every 30 seconds for an increase in draw

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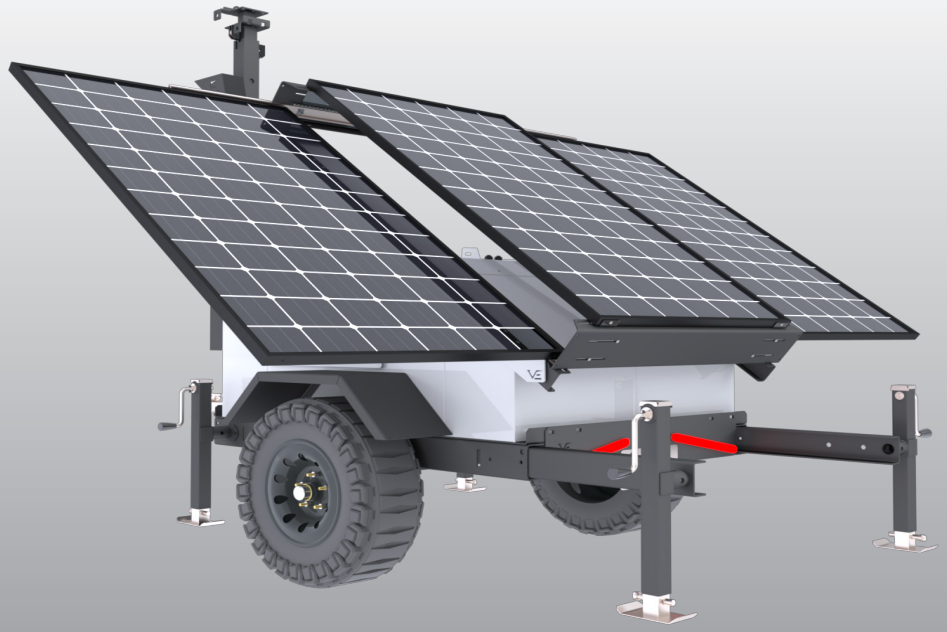
MDT User Manual



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MDT User Manual

1. IMPORTANT SAFETY INSTRUCTIONS – SAVE THESE INSTRUCTIONS!

In general

Please read the documentation supplied with this product first, so that you are familiar with the safety signs in directions before using the product

This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.

WARNING: SPEED LIMIT

The recommended speed limit for this unit is 55 MPH. Do not exceed this limit.

WARNING: HEIGHT CONSTRAINT

The unit measures 8'8" when in towing mode. This could be a hazard in some areas. Be aware of height constraints while driving. Do not pull trailer through a drive-through.

WARNING: RISK OF FALLING OBJECTS

The mast has two set extension levels. These are indicated by the slot cut into the pole extension following the outer part of the mast. The final slot is followed by a red mark indicating the end. The mast is designed in a manner in which it will not over extend, however excess cranking on the winch could cause the unit to fail. Sever injury can occur. The mast has a maximum lifting capacity of 65lbs; do not exceed this weight. The mast could collapse on itself and injury anyone underneath. Unsure all anchors are used when attaching the top of pole extension to the fixed mast. Loose anchors can cause the extension to fall over if they become undone or broken from wear caused by the two metals rubbing each other weakening the anchor. Ensure every item attached to the top of pole extension is secured properly and will not fall off injuring someone below.

WARNING: ELECTRIC SHOCK HAZARD

The product is used in conjunction with a permanent energy source (battery). Input and/or output terminals may still be dangerously energized, even when the equipment is switched off. Always disconnect the battery before carrying out maintenance or servicing the product.

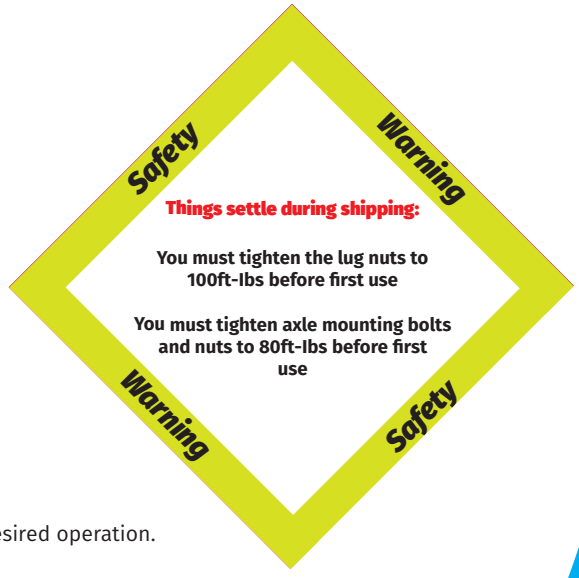
The product has no internal user-serviceable components. Do not remove the front plate or operate the product if any panels have been removed. All servicing must be undertaken by qualified personnel.

The AC output is isolated from the DC input and the chassis. Local regulations may require a true neutral. In this case one of the AC output wires must be connected to the chassis, and the chassis must be connected to a reliable ground.

Ensure that the equipment is used under the correct ambient conditions.

Never operate the product in a wet or dusty environment.

Never use the product where there is a risk of gas or dust explosions.



1.1. General safety precautions

• Read this manual carefully. It contains important instructions that need to be followed during installation, operation and maintenance.

1.2. FCC Compliance

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

• Save these instructions for future reference on operation and maintenance
• Danger of battery explosion from sparking
• Danger of electric shock
• This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

This device contains a transmitter with FCC ID: SH6MDBT42Q.

2. Electrical Components

The following components are housed in the smaller cabinet compartment located on the side of the trailer. Two wing nobs are located along the top of the door. One knob is keyed and the other is not. When opening the door use caution as the door is held together in a compression fashion which removes the need of using hinges. The door comes off completely giving full access to the compartment.

The front of the trailer has a similar door of a much larger size that provides access to the battery compartment. Use caution with this door as it uses the same method of locking as the smaller door, but is much heavier. The batteries have been prewired prior to shipping. The solar arrays connection cable is also located in this space. This too has already been wired in the optimal manner to provide the best solar production.

The space behind the batteries can be used as a storage area for smaller equipment. This is also a great place to put the removable parts of the trailer and mast during transport and deployment. When placing metallic items in this compartment ensure nothing comes into contact with the termination posts of the batteries. Ensure no sharp objects can move around, and puncture the batteries. Prevent heavy items from crushing the batteries as this could damage them.

1. Description: Solar Charger

The SmartSolar charge controller is an ultra-fast Maximum Power Point Tracking (MPPT) solar charger with outstanding conversion efficiency and is suitable for a wide range of battery and PV voltages. When coupled with the Remote-M device you can monitor and control your SmartSolar charge controller and system locally (LAN) or remotely via the internet from anywhere in the world, using the free VictronConnect App through Bluetooth and the internet via the free VRM portal website. Access can be from a phone, tablet, laptop or PC for multiple operating systems.

1.1. Battery voltage, PV voltage and current rating

The solar charger can charge a lower nominal-voltage battery from a higher nominal voltage PV array. The controller will automatically adjust to the battery voltage and will charge the battery with a current up to its rated current.

The product name of the solar charger incorporates the maximum PV voltage and the maximum battery charge current.

For example: A 150/35 model has a maximum PV voltage of 150V and can charge the battery with a maximum of 35A.

1.2. Outstanding MPPT algorithm

Ultra-fast MPP tracking

The solar charger contains an ultra-fast MPPT controller. This is especially beneficial when the solar light intensity is constantly changing, as is the case during cloudy weather. Because of the ultra-fast MPPT controller, 30% more energy is harvested compared to solar chargers with a PWM controller and up to 10% more compared to slower MPPT controllers.
Optimal solar yield

The solar charger has an innovative tracking algorithm. It will always maximize energy harvest by locking to the optimum MPP (Maximum Power Point). If partial shading occurs, two or more maximum power points may be present on the power-voltage curve. Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.

1.3. Outstanding conversion efficiency

The solar charger has outstanding conversion efficiency. The maximum efficiency exceeds 98%. One of the benefits of the high efficiency is that the solar charger does not have a cooling fan and the maximum output current is guaranteed up to an ambient temperature of 40°C (104°F).

1.4. Extensive electronic protection

The solar charger is protected against over-temperature. The output is fully rated up to an ambient temperature of 40°C (104°F). Should the temperature further increase, the output current will be derated.

The solar charger is equipped with PV reverse polarity protection and PV reverse current protection.

1.5 Operation

1.5.1. Startup of Solar Charger

The solar charger will power up as soon as it has been connected to a battery and to a solar array by turning breakers “1” and “2” on. As soon as the solar charger has been powered up, it can communicate via the Remote-M device and Bluetooth. The solar charger’s data can be read out and setting configurations can be made using the Remote-M device’s online portal or VictronConnect App.

The solar charger will commence battery charging as soon as the PV voltage is 5V higher than the battery voltage. For charging to continue, the PV voltage must remain at least 1V higher than the battery voltage.

1.6. Battery charging

The charge controller will start a new charge cycle every morning, when the sun starts shining and when the PV voltage is 5V higher than the battery voltage.
1.6.1. Adaptive 3-stage battery charging

The solar charger is a 3-stage charger. The charge stages are: Bulk – Absorption – Float.

Bulk

During the bulk stage the solar charger delivers the maximum charge current, to rapidly charge the batteries. During this stage the battery voltage will slowly increase. Once the battery voltage has reached the set absorption voltage, the bulk stage stops and the absorption stage will commence.

Absorption

During the absorption stage the solar charger has switched to constant voltage mode. The current flowing to the battery will gradually decrease. Once the current has dropped below 2A (tail current), the absorption stage stops and the float stage will commence. When only shallow discharges occur the absorption time is kept short. This to prevent overcharging of the battery. But if the battery was deeply discharged, the absorption time is automatically increased, to make sure that the battery is fully recharged.

Float

During the float stage the voltage is reduced and the batteries fully charged state is maintained.

**A storage stage is not needed for a solar charger, unlike is the case for an AC charger, since at night there is no solar power, so battery charging will stop. The battery is almost full*

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The battery is almost full

The solar charger will reduce its charge current when the battery is almost full.

If the state of charge of the battery is unknown, and the current is reducing while the sun is still shining, it can mistakenly be interpreted as the solar charger being faulty.

The first current reduction takes place at the end of the absorption stage, when the battery is approximately 80% charged.

The current will continue to reduce during the float stage, when the battery is approximately 80 and 100% charged.

The float stage starts when the batteries are 100% full. During the float stage the charge current is very low.

To find out what the state of charge (SoC) of the battery is, check the battery monitor (if present), or alternatively check the charge stage the solar charger is in.

• **Bulk**: 0-80% SoC

• **Absorption:** 80-100% SoC

• **Float storage:** 100% SoC

Default method to determine length and end of absorption for Lead-acid batteries

The charging algorithm behavior of solar chargers differs from AC connected battery chargers. Please read this section of the manual carefully to understand the solar charging behavior, and always follow the recommendations of your battery manufacturer.

**The voltage values mentioned in this chapter are for 12V systems, for 24V systems multiply by 2.*

By default, the absorption time is determined on idle battery voltage at the start of each day based on the following table:

Battery voltage at start up	Multiplier	Maximum absorption time
< 11.9V	X 1	6h
11.9V-12.2V	X 0.66	4h
12.2V-12.6V	X 0.33	2h
> 12.6V	X 0.16	1h

The default absorption voltage is 14.4V and the default float voltage is 13.8V.

The absorption time counter starts once switched from bulk to absorption.

The MPPT solar chargers will also end absorption and switch to float when the battery current drops below a low current threshold limit, the “tail current”. The default tail current value is 2A.

The default settings (voltages, absorption time multiplier and tail current) can be modified with the VictronConnect App locally or the VRM portal through the Remote-M device.

Variations to the expected charging behavior

• Pausing of the absorption time counter:

The absorption time counter starts when the configured absorption voltage is reached and pauses when the output voltage is below the configured absorption voltage. An example of when this voltage drop could occur is when PV power (due to clouds, trees, buildings) is insufficient to charge the battery and to power the loads.

• Restarting the charge process:

The charging algorithm will reset if charging has stopped for an hour. This may occur when the PV voltage drops below the battery voltage due to bad weather, shade or similar.

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• Battery being charged or discharged before solar charging begins:

The automatic absorption time is based on the start-up battery voltage (see table). This absorption time estimation can be incorrect if there is an additional charge source (e.g., AC Charge Source) or load on the batteries. This is an inherent issue in the default algorithm. However, in most cases it is still better than a fixed absorption time regardless of other charge sources or battery state. It is possible to override the default absorption time algorithm by setting a fixed absorption time when programming the solar charge controller. Be aware this can result in overcharging your batteries. Please see your battery manufacturer for recommended settings.

• Absorption time determined by tail current:

In some applications it may be preferable to terminate absorption time based on tail current only. This can be achieved by increasing the default absorption time multiplier (warning: the tail current of lead-acid batteries does not decrease to zero when the batteries are fully charged, and this “remaining” tail current can increase substantially when the batteries age).

1.6.2. Lithium batteries

Lithium Iron Phosphate (LiFePo4) batteries do not need to be fully charged to prevent premature failure. The default lithium (and recommended) settings are:

Setting	12V system	24V system
Absorption voltage	14.2V	28.4V
Absorption time	2h	2h
Float voltage	13.2V	26.4V

Default settings for LiFePO4 batteries

The default absorption voltage is 14.2V (28.4V) and the absorption time is fixed and set to 2 hours. The float voltage is set at 13.5V (27V). Equalization is disabled. The tail current is set to 0A, this is so that the full absorption time is available for cell balancing. The temperature compensation is disabled and the low temperature cut off is set to 5. These settings are the recommended settings for LiFePO4 batteries, but they can be adjusted if the battery manufacturer specifications advise otherwise.

1.6.4. Shutdown and restart procedure

The solar charger is always active when the PV and/or the battery terminals are powered. The solar charger does not have an on/off switch.

To shut down the solar charger, perform these steps in the prescribed order:

1. Disconnect the PV supply to the solar charger by switching the PV supply off using breaker “2”

2. Disconnect the battery supply to the solar charger by switching the battery supply off using breaker “1”

To restart the solar charger after it was shutdown, perform these steps in the prescribed order:

1. Connect the battery supply to the solar charger by switching the battery supply on using breaker “1”

2. Reconnect the PV supply to the solar charger by switching the PV supply on using breaker “2”

2. Description: Load

The Load consists of a Low Voltage Disconnect system in the form of a BatteryProtect.

The BatteryProtect disconnects the battery from non-essential loads before it is completely discharged

To prevent damage to sensitive loads due to over voltage, the load is disconnected whenever the DC voltage exceeds 16V respectively 32V.

The BatteryProtect can be set to engage / disengage at several different voltages. The default is set to 10V / 12V respectively 20V / 24V.

2.1 Operation

By turning breaker 3 “on” enables power to become available on the green terminal labeled “LOAD”. This provides constant power by the BatteryProtect, this would be the terminal used to power mission critical components like your cellular gateway. The green terminal labeled “Relay 1” is wired to allow the Remote-M turn the devices connect to this terminal on and off remotely through the web portal. The ideal use of this would be to power cycle PoE switches and injectors in case of a hard reboot to these components. A second Relay is available on the Remote-M to enable the start/stop functions (disabled by default) on a generator (sold separately).

2.1.1. Shutdown and restart procedure

The BatteryProtect is always active when the battery terminals are connected. The BatteryProtect does not have an on/off switch.

To shut down the Load, perform this step in the prescribed order:

1. Disconnect the battery supply to the green terminal by switching the battery supply off using breaker “3”

To restart the BatteryProtect after it was shutdown, perform this step in the prescribed order:

1. Connect the battery supply to the solar charger by switching the battery supply on using breaker “3”

To perform a hard reset of the BatteryProtect, perform these steps in the prescribed order:

1. Disconnect the battery supply from the Load by turning breaker “3” off.

2. Disconnect the Positive cable from the battery bank by removing the bolt securing the cable.

3. Wait 30 seconds, connect the Positive cable to the battery bank by tightening the bolt back in place.

4. Connect the battery supply to the Load by turning breaker “3” on.

3. Description: Inverter

It is a powerful true sine wave inverter. It provides 1 120V NEMA 5-15R output socket. When coupled with the Remote-M device you can monitor and control your Inverter and system locally (LAN) or remotely via the internet from anywhere in the world, using the free VictronConnect App through Bluetooth and the internet via the free VRM portal website. Access can be from a phone, tablet, laptop or PC for multiple operating systems.

VE. Direct communication port

The VE. Direct port can be connected to:

• A computer (VE. Direct to Remote-M device via the VRM online portal)

• Apple and Android smartphones, tablets and other devices (VE. Direct to Bluetooth Smart dongle needed or VE. Direct to Remote-M device using the VictronConnect App)

Fully configurable

• Low battery voltage alarm trip and reset levels

• Low battery voltage cut-off and restart levels

• Output voltage 120VAC +/- 3%

• Frequency 50 Hz or 60 Hz +/- 0.1%

• ECO mode on/off and ECO mode sense level

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Monitoring

Battery voltage, AC Output voltage, load indicator, alarms

Proven reliability

The full bridge with toroidal transformer topology has proven its reliability over many years. The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, filament lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value. It will switch on and check every few seconds, adjustable, if the load has increased again.

LED diagnosis

A red and a green LED indicate inverter operation and status of the different protections.

The inverters are fitted with an internal DC fuse.

Reverse polarity connection of the battery wires will blow the internal fuse and can damage the inverter. The internal fuse is not replaceable.

Note that also the front switch needs to be set to either “On” or “ECO” for the inverter to start.

3.1 Operation

3.1.1. Startup of Inverter

The Inverter will power up as soon as it has been connected to a battery by turning the breaker “4” on. The front face of the Inverter has a 3-position switch with “On”, “Off”, and “Eco”.

3.1.2 On Mode

When switched to “on”, the unit is fully functional. The inverter will come into operation and the green LED “Power” will light up. The unit can deliver 300 Watts at 25° C, 260 Watts at 40° C; 700 Watts Peak power for 30 seconds. The unit will run in “on” until the low battery voltage is reached.

*The Inverter is turned to this setting as default.

3.1.3 ECO Mode

Set the front switch to ECO mode to reduce the power consumption in no-load operation. The inverter will automatically switch off as soon as it detects that there is no load connected. It then switches on, briefly, every 2.5 seconds to detect a load. If the output power exceeds the set level, the inverter will continue to operate.

The default ECO mode wake-up minimum power is 15 Watt.

The default ECO mode search interval is 2.5 seconds

**Note that the required ECO mode settings are heavily dependent on the type of load: inductive, capacitive, non-linear. Adjustment may be needed.*

3.1.4 Protections and automatic restarts Overload

Some loads like motors or pumps draw large inrush currents in a start-up situation. In such circumstances, it is possible that the start-up current exceeds the over current trip level of the inverter. In this case the output voltage will quickly decrease to limit the output current of the inverter. If the over current trip level is continuously exceeded, the inverter will shut down: wait 30 seconds and then restart.

After three restarts followed by another overload within 30 seconds of restarting, the inverter will shut down and remain off. The LEDs will signal shutdown due to overload. To restart the inverter, switch it Off, then On.

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Low battery voltage (adjustable)

The inverter will shut down when the DC input voltage drops below the low battery shutdown level. After a minimum delay of 30 seconds, the inverter will restart if the voltage rises above the low battery restart level.

After three restarts followed by a low battery shutdown within 30 seconds of restarting, the inverter will shut down and stop retrying. The LEDs will signal low battery shutdown. To restart the inverter, switch it Off, and then On, or recharge the battery: as soon as the battery has risen and then stays above the Charge detect level for 30 seconds, it will switch on.

High battery voltage

Reduce DC input voltage and/or check for a faulty battery- or solar-charger in the system. After shutting down due to a high battery voltage, the inverter will first wait 30 seconds and then retry operation as soon as the battery voltage has dropped to acceptable level. The inverter will not stay off after multiple retries.

High temperature

A high ambient temperature or enduring high load may result in shut down to over temperature. The inverter will restart after 30 seconds. The inverter will not stay off after multiple retries. Reduce load to correct issue.

3.1.5 Connection to the load

Never connect the output of the inverter to another AC source, such as a household AC wall outlet or a generator.

The inverter does not have a fuse in the AC output. The AC cabling is protected by a fast-acting current limiter in case of a short circuit and an overload detection mechanism which mimics the characteristics of a fuse (i.e., faster shutdown with larger overload). It is important to size your wiring properly based on the inverters' power rating.

3.1.6. Shutdown and restart procedure

The inverter is active when breaker "4" is powered on. The inverter does have an on/off switch which can also be used to power on or off.

To shut down the inverter, perform the following step:

1. Disconnect the battery supply to the inverter by switching the battery supply off using breaker "4"

To restart the solar charger after it was shutdown, perform these steps in the prescribed order:

1. Connect the battery supply to the inverter by switching the battery supply on using breaker "4"

**There is no need to change the on/off switch setting on the inverter when using the breakers this will make redeployment easier and faster.*

4. Description: Remote-M

This all-new communication center allows you to always have perfect control over your system from wherever you are and maximizes its performance. Simply connect through the VRM portal, or access directly, using the VictronConnect App thanks to its added Bluetooth capability.

Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements (some components sold separately and do not come standard). Easily control the (auto)start/stop generator(s) or change any setting to optimize the system. Follow up on alerts, perform diagnostic checks and resolve challenges remotely.

4.1 Operation

The Remote-M is wired directly to the batteries and will be powered on as you receive the unit. An ethernet connection will be required to connect the device to VRM portal via internet; through the cellular gateway or other internet communication used in the project. This will require the use of a computer connected to the internet to access the VRM.

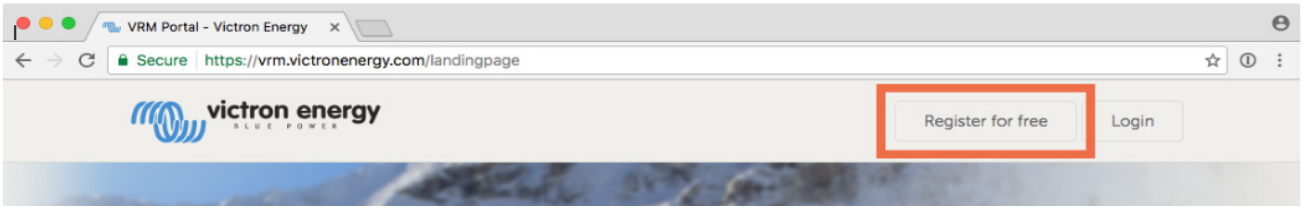
An independent LTE dongle is available for purchase separately which will require the use of a data plan provided by the customer.

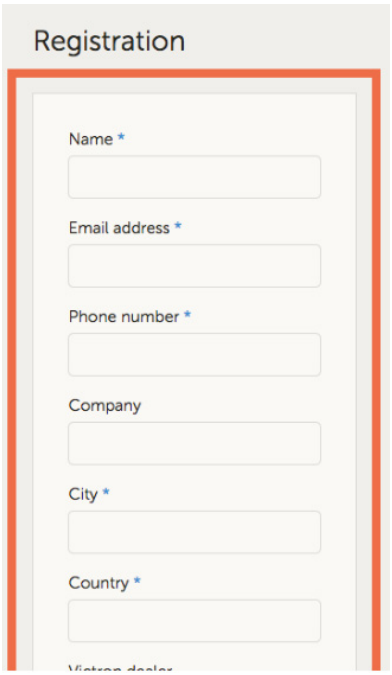
The Remote-M can be connected to a "USB to GPS dongle" as well in order to enable satellite tracking and Geofencing capabilities (a list of compatible devices can be provided upon request).

4.1.1 Registration

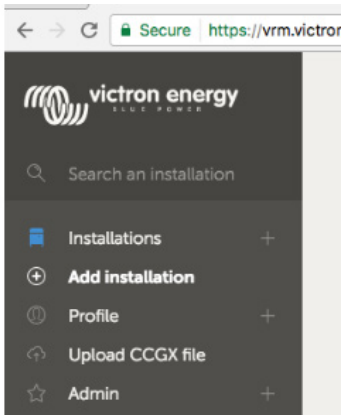
The Remote-M monitoring will require a subscription to the VRM portal https://vrm.victronenergy.com/login

The service is free to use and completing the registration is very easy. To begin click “Register for free”, complete the questionnaire, when asked “Victron Distributor” enter ‘Vorp Energy”.





Once registration is complete you will need to add your “installation”, unit, to your account. Make sure the Remote-M is connected to the internet with a good connection. On the Remote-M the VRM Portal ID is printed on a label on the side which is needed to request access. This is the unit’s unique identification code.



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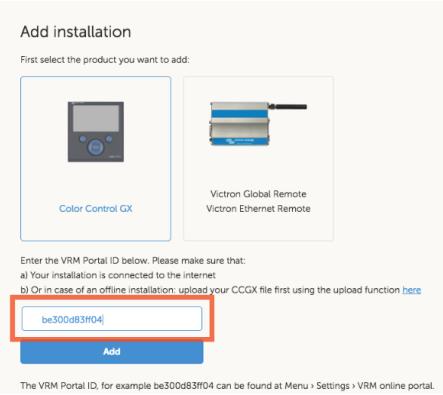
4.1.2 Adding Installation

Select “Add Installation” and choose the device you want to add. The Remote-M is called “Cerbo GX” in this portal. Enter the VRM ID in the box and click “Add”, if the connection is good the device will send a request to our support team. From here the team will add you to the unit as an administrator user within 24hrs of the request. When adding additional users anyone with administrator level can approve the request.



** The support team will defer additional user access to the customer. We will not approve additional users unless specifically requested to do so. To do so contact your sales rep who will direct the request to the tech team. **

4.1.3 Setup

In the Settings tab, only visible for installations at which you have admin rights, go through the following settings:

General

- GSM Number: Not applicable to our design
- Description: Name / description of the installation. This field will be filled with the PO number for your order by the production team. The customer can change it to the designation they wish to use to identify the units.

Tags

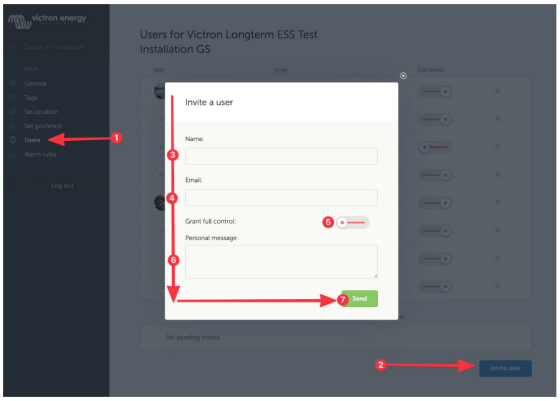
- Useful for accounts that have many installations. An example being a hybrid generator rental company with four depots: North, South, East and West. Add the tag of the right depot to all installations. Then in the installation overview you can filter on these tags.

Set location

- Set the location of the installation by dragging the cursor to the right place. This automatically sets the time zone that is used for all x-axes on the graphs as well.

Users

- Configure which users are admins and which not. Admins can change settings on all installations for which they have admin rights.
- Invite new users to this installation.



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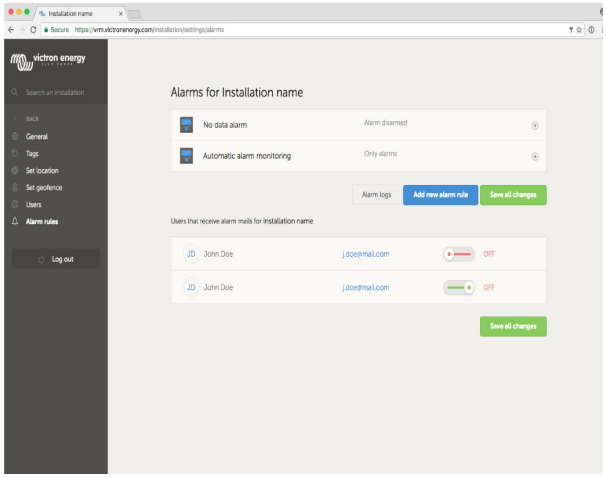
Alarm rules

- Set specific alarms you want reported on and who will receive the notifications

These include:

- MPPT measurements: Charger fault, Charge state, Equalization pending, Alarm condition, Low voltage alarm, High voltage alarm, Error code
- Inverter measurements: similar to MPPT
- Temperature: sensor must be installed (sold separately)
- Generator: requires configuration
- Shunt: not included in all modes; similar to MPPT
- Remote-M: loss of connection, geofencing, errors, warnings, etc.



The VRM portal provides an online guide which can be used to learn further features available to the Remote-M. This is located in the options column on the left of the screen.

**If not first available click "back" several times and the option will become available.*

5. Description: AC Charger

The unit is fitted with an AC 115V charger which provides a means for indoor charging when the unit is being stored, or as a Hybrid, solar and grid power unit.

The charger uses a 3-stage charging algorithm similar to the MPPT solar charge controller.

5.1 Operation

The connection point is found outside of the trailer body behind a weather proof cover. This allows the unit to be charged using an extension cord with NEMA 5-15 connectors.

The charger comes prewired and configured to 115VAC so there is no need to enable any switches. The charger is separated from the solar charge controller. This means the breakers do not need to be on in order to charge the batteries.

5.1.1. Shutdown and restart procedure

The AC charger is always active when the unit is powered on by the mains. The AC charger does not have an on/off switch which can be accessed from the power cabinet.

To shut down the AC charger:

1. Disconnect the extension cord from the AC charger by unplugging from the NEMA 5-15 plug.

To restart AC charger after it was shut down:

1. Connect the AC charger to the mains by inserting the extension cord back into the NEMA 5-15 plug.

6. Solar Panels

The solar panels fitted to the trailer are prewired, fixed to a pivot point on the trailer, and are incredibly durable. The panels come in a single, double stack, triple stack, and side by side double stack configuration. This design allows easy deployment through the use of a slider rail system for the multiple panel systems. The is no need to connect wires as this was done before the unit left the factory. The pivot point allows the panels to be adjusted to two fixed positions, a flat position recommended as the towing position, and a tilted position which is the deployed position. To accomplish this the mounting rails have anchor slots at both ends. There is a pin that slides through and secures the desired position. There are pins on both sides for stability. The panels are very resilient from head on impact, but are weak to side impacts on their frame.

6.1 Deployment

Using the provided pins, lock the array in the deployed position (tilted). For units with multiple panels the sliding rails that both ends of the array have red tabs that are pressed down to release the lock keeping the panel closed. Both ends need to be pressed at the same time to disengage the lock. Others have used a foot to help reach both tabs at once. This is fine, however by applying a gentle pulling force on the panel when moving from one tab to the other a single person is able to release the panels. This gentle pull prevents the lock from becoming engaged once you move to the other tab. Pull the panel out completely until both locks click into place. It may be necessary to tug on one end of the panel slightly to engage the lock. If this occurs pull gently straight out while directly in front of the slide rail. Do not attempt to pull from the opposite end as this could bend the panel at an awkward angle and cause the panel to fracture.

For the 1200W version it is recommended to open the panels in order from top to bottom. This prevents the risk of a cable becoming entangled somewhere it is not supposed to be.

6.1.1 Orientation

The orientation of the solar panels is crucial for optimal solar power production. The panels need to be facing South. This will allow the panels to absorb the Sun's rays throughout the whole day. It is ideal to place the back end of the trailer facing South prior to unhitching and extension of the solar panels. Ensure the area surrounding the trailer is clear of objects that could prevent a correct deployment. Ensure the unit is placed far enough to prevent shading from trees, buildings, vehicles, and any other tall objects in the area. Excessive shading leads to poor charging of the batteries causing the system to perform below expectations.

6.2 Damages and Repairs

Do not attempt to do repairs without first contacting support for instruction on what to do.

A solar panel that has cracked will still perform at 70%+ of its total efficiency. A panel that has a puncture through the glass and backing will require replacement. Again, do not attempt repairs without first contacting support for help.

Maintenace that is encouraged includes wiping the panels periodically, lubricating slide rails, and removing any foreign objects that could be stuck to the panel.

6.3 Tear Down:

Ensure the panels are clean before packing begins. Check for chips or cracks to ensure the unit is good for your next project. The release the panel use the tabs by pressing down. This will disengage the lock and the panel will be free to slide back and forth.

If the unit has been in extremely windy and dusty areas, it is recommended to spray the slide rails with lubricant to help with closing. It may be needed to spray the rail multiple times and slide the panel in and out repeatedly.

For units with multiple panels start by sliding the bottom panel back first and working your way up. Work on any tough panels individually with lubricant when needed. There should be no need to use excessive force when closing the panels.

Once the panels have been locked back into the closed position, remove the locking pins from the mounting rails and gently lift the bottom of the panels. With the panels back in a flat position, lock the pins back into place. Always check that there is no excessive wiggle of the panels when locked in flat. Excess wiggle can cause serious damage to the solar array.

When the panels are locked in flat you are now able to tow the trailer to your next project location.

7. Mast deployment:

The mast comes with a few options to mount equipment on top. Currently we have a straight round 3ft extension piece which can fit a T-Bar, optional extra. The extension is anchored using bolts and a custom hook and slot design to ensure maximum security. The mast can extend to two different heights, with a safety pin for locking. It has a coiled cable for power and/or communication running along side it. It has guy wires for stability, and is operated using a hand crank winch.

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The straight bar allows the equipment to be mounted in any direction, and stack equipment the full length of the extension. The piece is made of strong high carbon steel and can be drilled into to create secure connections. The exterior is covered in zinc galvanizing which allows for a great grip when strapping equipment to it and perfect protection from the weather.

The T-Bar provides a flat surface to mount the equipment. It is made from high carbon steel with a galvanized finish or from 10 gauge aluminum.

7.1 Description

The first step will always be the same regardless if you are using the straight extension or the T-Bar. It is key to assemble the equipment that will be elevated using the mast to be fastened to this extension piece before mounting it to the top section of the mast. Using a ladder, raise the extension to the top anchor plate of the mast and line the upward hooks with the slots. This will require the extension to be on its side at a 90° angle from the rest of the mast.

Slide the hooks through the slots all the way to allow the extension to be righted; the anchor plates on both sections will line up their respective bolt slots. Proper alignment occurs when a bolt can be inserted through both slots. Using the provided hardware ensures you have securely fixed the extension when the nuts and bolts are tightened down. Tighten the bolt farthest away from the hooks in order to help keep the extension from falling over in cases of heavy equipment being used.

With the extension firmly secured connect any wires that may be needed. This includes the cables provided by the coiled cable. The common versions of the cable provided are: an 18/3, or 18/4, 2 or 4 Cat5e/Cat6 combined cable. The ends of the cable will not be terminated it is up to the user to pick conductors and which Ethernet cables they will be using. Once properly terminated for the given application, the unused cable(s) can be trimmed flat to the protective sheath the cable is covered in. The equipment can now be wired in and this would be the best time to make sure everything is powering up correctly.

Attach the guy wires to the mast using the carabiner hooks, three are provided, through the eyelets provided on the anchor plate for the extension. The width of the holes allows for two carabiners to be hooked. Spread the guy wires out in the direction you intend to secure them. This prevents tangling of the wire when cranking up the mast.

The mast is raised and lowered using a hand cranking winch. There are two positions at which the mast can be extended to. The first is at around 14ft and the second position is full extension which is at around 21ft. There is a slot in which a safety pin can be inserted. There are two winged bolts that can be tightened on the first section of the mast for stability.

7.2 Operation

Turn the handle clockwise to lift the load, a loud clicking sound will be heard. If no clicking sound is heard, inspect the piece for broken or damaged parts that need to be replaced, and do not use the winch further. The winch is designed to lock in place as the handle turns clock wise this will lock the load in at that spot when turning stops.

Raise the mast to the desired height. A red stripe will appear on the top of the bottom section of the mast to indicate the maximum height capable. Be aware of the cable as it is brought into the winch. Make sure the wire is being spooled in properly and no kinks occur. Also make sure the coiled cable is stretching evenly as the mast is extended. Make sure the guy wires do not tangle as the load is raised. Make sure the winged bolts are loosened, if the bolts are still tight they will prevent the mast from extending and could damage the cable pulley system of the mast.

Use the safety pin located on the right side of the mast to lock the mast in place. It is attached using a link chain to prevent losing the pin. Remove the cotter pin at the bottom of the safety pin to pull it out of the carry slot.

Once the height is reached lower the mast by a half turn, drive the stakes into the ground on the ends of the guy wires. Once the stakes are locked in the ground raise the mast by the half turn it was lowered, doing so will apply tension evenly on the guy wires.

Pass the safety pin through both sections of the mast, and reinsert the cotter pin to lock the safety pin in place.

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7.3 Tear Down

Inspect the cable for any signs of wear; such as kinks, knots, and fraying. Remove the cotter pin from the safety pin, slide it out, and place it the carry hook. Insert the cotter pin once more to prevent the safety pin from become lost.

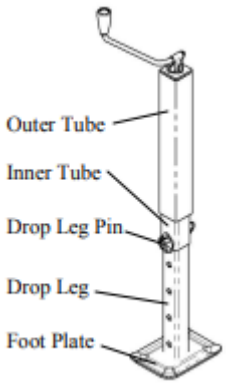
Turn the handle counter-clock wise to lower, the piece will not make a clicking sound; the brake system is working. Make sure all parts of the mast are coming down properly. If a section becomes jammed, use the guy wires to pull straight down. The sections could become stuck when the tension is not evenly distributed among the guy wires as the section is being pulled harder in that direction. In rare occasions striking the mast with a rubber malt has been required. The only time masts have been reported to be come stuck is after extended deployment of the units. Make sure the coiled cable is retracting, and returning to its storage tube properly when lowering the load on the mast.

Remove the stakes from the ground to help with guy wire storage. Once fully lowered, using a ladder, climb up to the equipment on the extension pole and disconnect any necessary cables in preparation to remove the extension. Remove the guy wires from the hooks, proper way of storing them it to roll the wires up in a loose hoop. Be cautious of tangling up the wires as this could cause the wire to deform leading to potentially unsuccessful future deployments. Use tape or string to keep each wire separate and tangle free.

Remove the nuts and bolts from the anchor plates. Always remove the one closest to the hooks in order to prevent the extension from being violently flung out of your hands. This could cause injury to yourself, others, or damage to the equipment. Slowly unscrew the bolt opposite the hooks as the extension will want to fall in the direction away from the bolt. Firmly grasp the extension and lower it so it is 90° from the starting point. Slide the hooks out of their slots and lower the extension and equipment to the ground. Remove the handle from the crank, and store the equipment for transport.

8. Jack deployment:

The jacks equipped to each trailer are there to provide stability and the option to level the trailer and equipment in rough terrain. They consist of a three-part construction. There is an outer tube, inner tube, and a drop leg tube welded to a foot plate. The inner tube when fully compressed rests inside the outer tube. The drop leg rests inside the inner tube, and is held in place with a “Drop Leg Pin”. This design allows the jack to be very compact when not in use. The outer tube has a round jack mount welded on so that the jack can be mounted in a horizontal or vertical manner or taken off entirely.



When attaching the jacks to the trailer, use the locking pin with chain to mount it securely on the round jack mount. This way the jacks have the ability to swivel from a horizontal position to a vertical position. The two rear jacks are attached to an outrigger style bracket that can be extended when deploying the unit and retracted during travel from one site to another.

The unit can be towed with the jacks mounted in place, and the jacks be turned to the horizontal position. It is recommended that the “Drop Leg Pin” be inserted from the top down. This will ensure the drop leg will not come loose and fall out during travel. The advised method of towing is to remove the jacks entirely when the trailer is on the road. The inside of the trailer main body has enough room to accommodate the jacks for storage while driving.

8.1 Operation

Before detaching the trailer from the vehicle, lower the jacks into a position where they can support the weight of the unit, and ensure all bolts are as tight as possible. They can become loose during travel and may need tightening. Remove the drop leg pin to extend the drop leg and foot plate as far as it will allow.

Place the Pin back in the next available slot. Insert the drop leg back in to the inner tube if the next slot is too far up. Make sure the pin is through both sides of the jack.

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Once all four jacks have been extended, detach the trailer from the vehicle. The unit can then be leveled out by raising and lowering the jacks. The trailer can be lifted off of the wheels when raising the jacks, but do not exceed a height of six inches. The foot plate is designed with a wide base, however in areas of loose ground it is recommended to place some form of outrigger "pad" before raising the trailer.

**Note: The Inner Tube does not need to be fully extended when deploying the trailer.*

8.2 Tear Down

Lower the jacks until the wheels are back firmly on the ground. Attach the trailer back to the vehicle to prevent lifting of heavy loads. Retract the jacks back until inner tube is back fully inside the outer tube. Remove the drop leg pin, insert the drop leg and foot plate back into the inner tube. Replace the drop leg pin in the lowest slot possible.

When all jacks have been raised, inspect the area for possible interference while towing. Always tow the trailer with the jacks positioned in a way that allows for maximum ground clearance. If it is determined that the jacks interfere with road way safeties, remove the jacks by undoing them from the round jack mount, and storing them inside the unit or in your vehicle.

9. Towing Tongue & Hitch Coupler

The trailer is equipped with a detachable tongue, towing chain, and a 2" hitch ball coupler. The tongue is constructed of a 36" long, 4" square tube with reinforced ¼" plates at the connection point. The second half of the tongue consists of a 4" tube running the whole length of the main trailer body. It is firmly secured with welds and bolts where this tube meets the base. The connection point for both halves is reinforced using the layered ¼" plates.

9.1 Operation

Attach the removable section of the tongue by lining up the holes on both parts and lock them in place using hitch pins with their removable cotter pins. Always make sure the hitch coupler is placed correctly with the receiver downwards. The coupler cannot be removed and switched to the opposite side. The tongue is constructed to be assembled in one manner only. The part of the tongue that is fixed to the main trailer body is wider than the removable part. The removable part is designed to go "into" the fixed part. It is recommended to tug on the removable part to test that the pin is inserted properly and is secure for towing. Always tow the trailer with hitch pin fitted with their cotter pins safely in place. It is recommended to use a cotter pin on the lever that releases the ball from the coupler. Always attach your towing chains to the hooks on your vehicle.

9.2 Tear Down

Detach the trailer from the vehicle by releasing the ball, remove the chains, and detach the tail light connector from the vehicle. Gently pull the tail light extension cord out of the removable half. You can tuck the extra cable back into the fixed section of the tongue for storage, or fully remove it. Once the cord is out of the way, remove the cotter pin from the hitch pin and pull the pin out. Placing the hitch pin back in their hole on the removable tongue half is a good place to store them. Replace the cotter pin on the hitch pin to prevent losing them as well. Removing the chain is not advised as it is highly recommended to not tow the trailer without it.

10. Tail Light Bar

The trailer has a detachable tail light bar. Always tow the trailer with the light bar in place. Check that the lights are working properly before setting off on the road. The trailer may need to be registered in your area at the DMV. The light bar has a license plate holder for use in mounting the plate provided for the trailer. The system for the lights consists of a 12' extension cord that connects to vehicle, the light bar with mounting holes, a wiring junction box, and a connector for the extension cord. The extension cord has the same connector at both ends so you can be safe knowing you will not connect something incorrectly.

10.1 Operation

Make sure the bar is properly secured to the body of the trailer with the bolts provided. With the extension inserted through the tongue of the trailer, connect the flat 4 pin terminal. This connector has a sleeve around it when fully inserted. This helps with preventing foreign objects from causing an electrical short. Attach the other end of the cord to your vehicle and test the lights to make sure they are operational.

10.2 Tear Down

Disconnect the extension cord from your vehicle, then disconnect the extension from the light bar. Do not allow the extension to support the weight of the light bar by itself. This could damage the cable and cause the light bar to perform poorly resulting in possible road way violations and fines. Remove the bolts from the light bar and the main body of the trailer. The holes on the light bar are a good place to leave the bolts in when the light bar is stored and not in use. With the light bar off inspect the device for cracks, leaks, or holes. Broken light fixtures may result in road way violations and fines in some area. If the lights are not operating correctly do not use the trailer.

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11. Conclusion

Always practice good common sense when operating the trailer. The trailer has a top speed of 55 MPH, do not exceed this limit. For longer trips remember to leave early to accommodate for the slower rate of travel. Inspect the trailer regularly for any signs of damage that could cause the unit to under perform. Before every trip perform your pre-trip inspections and at the conclusion perform a post-trip inspection. If there is need for any support in an area not covered in this manual, please contact your sales team representative who can help answer any questions. Never operate this unit if you know of a problem that has occurred. If damaged or missing parts are needed feel free to contact the support team who can help with obtaining the parts for those repairs when necessary.

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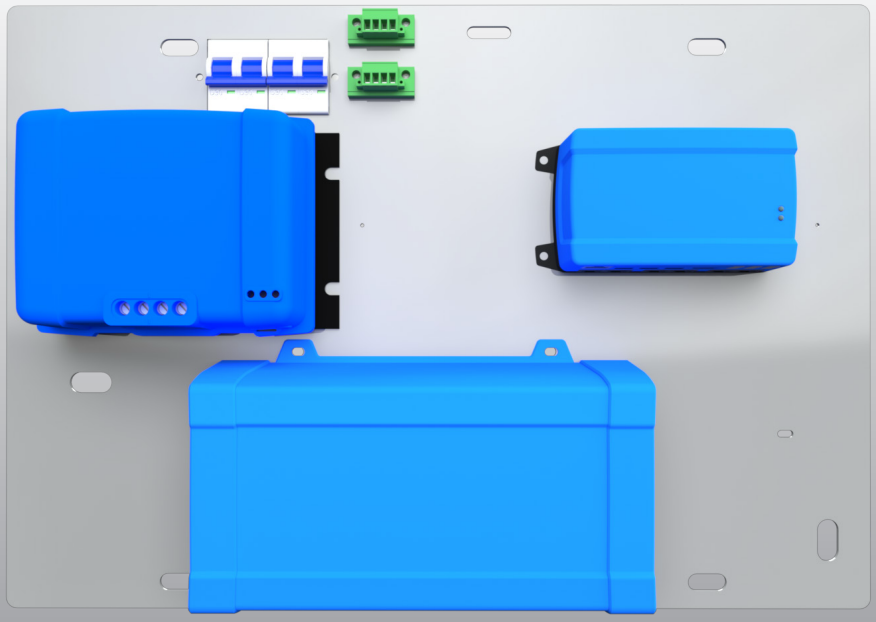
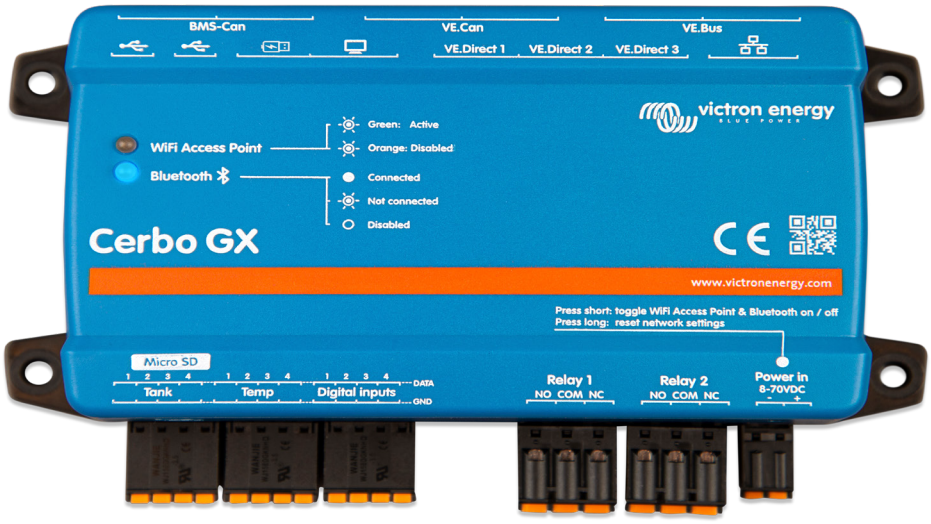
Remote M User Manual



Remote-M for use in the Vorp Energy Product Range

For Cameras, Communications, and Lighting



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Remote M User Manual

Description: Remote-M

This all-new communication center allows you to always have perfect control over your system from wherever you are and maximizes its performance. Simply connect through the VRM portal, or access directly, using the VictronConnect App thanks to its added Bluetooth capability.

Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements (some components sold separately and do not come standard). Easily control the (auto)start/stop generator(s) or change any setting to optimize the system. Follow up on alerts, perform diagnostic checks and resolve challenges remotely.

Operation

The Remote-M is wired directly to the batteries and will be powered on as you receive the unit. An ethernet connection will be required to connect the device to VRM portal via internet; through the cellular gateway or other internet communication used in the project. This will require the use of a computer connected to the internet to access the VRM.

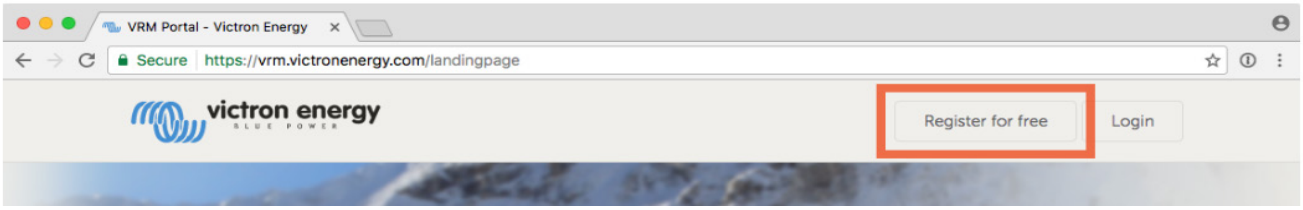
An independent LTE dongle is available for purchase separately which will require the use of a data plan provided by the customer.

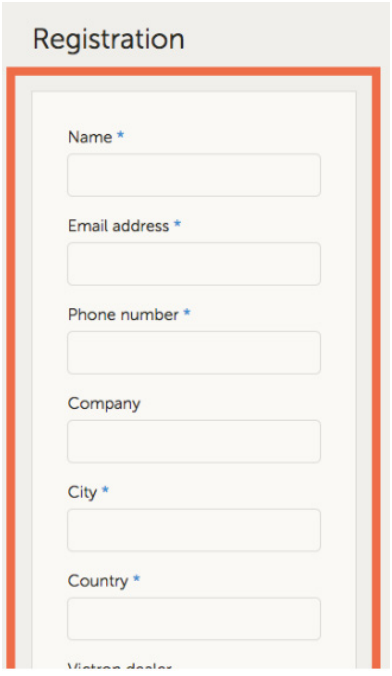
The Remote-M can be connected to a “USB to GPS dongle” as well in order to enable satellite tracking and Geofencing capabilities (a list of compatible devices can be provided upon request).

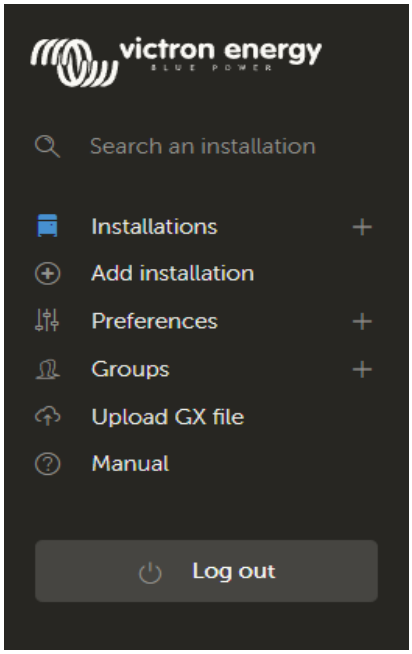
1.1 Registration

The Remote-M monitoring will require a subscription to the VRM portal https://vrm.victronenergy.com/login

The service is free to use and completing the registration is very easy. To begin click “Register for free”, complete the questionnaire, when asked “Victron Distributor” enter ‘Vorp Energy”.







Once registration is complete you will need to add your “installation”, to your account. Make sure the Remote-M is connected to the internet with a good signal. On the Remote-M device the “VRM Portal ID” is printed on a label on the side which is needed to request access. This is the unit’s unique identification code.

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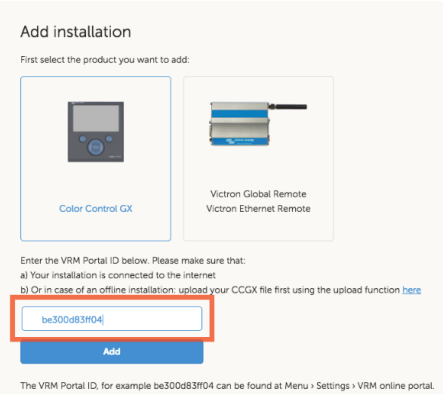
Remote M User Manual

1.2 Adding Installations

Select “Add Installation” and choose the device you want to add. The Remote-M is called “Cerbo GX” in this portal. Enter the VRM ID in the box and click “Add”, if the connection is good the device will send a request to our support team. From here the team will add you to the unit as an administrator user within 24hrs of the request. When adding additional users anyone with administrator level can approve the request.



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In the Settings tab, only visible for installations at which you have admin rights, go through the following settings:

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- GSM Number: Not applicable to our design
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Tags

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Set location

- Set the location of the installation by dragging the cursor to the right place. This automatically sets the time zone that is used for all x-axes on the graphs as well.

Users

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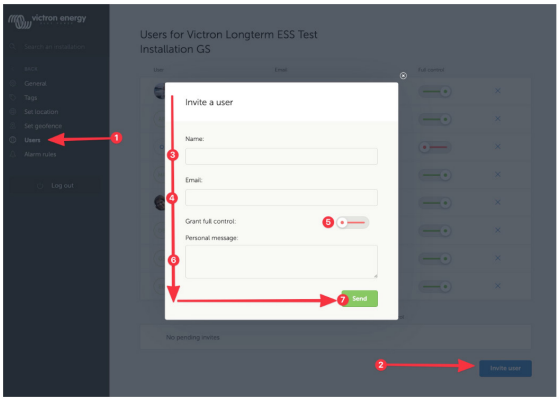
- Invite new users to this installation.



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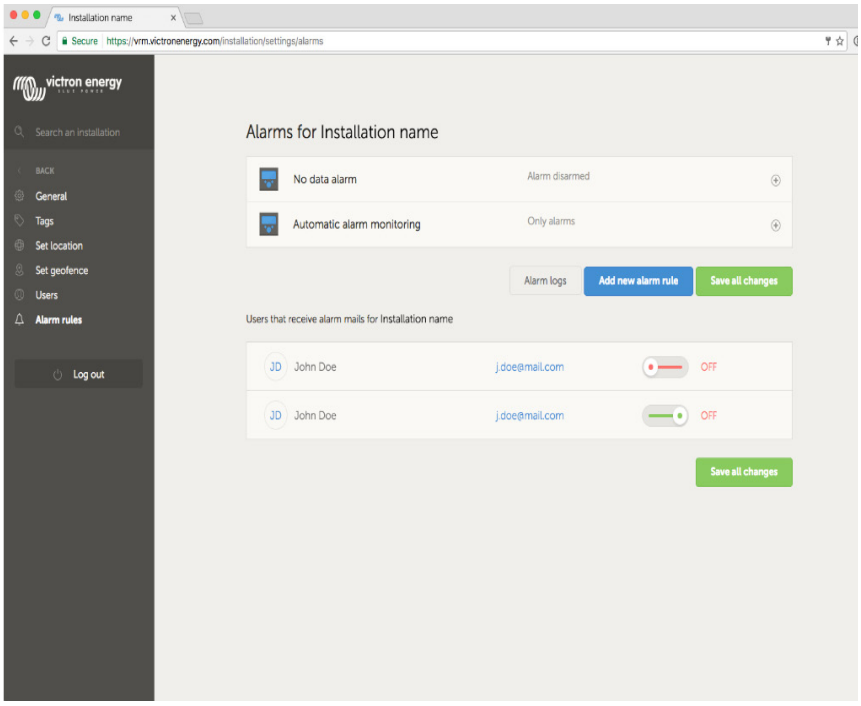
1.4 Alarm rules

The VRM uses alarm rules to notify “Installation” owners of any issues that may be happening with the system. An email is sent to the email address listed to receive the alerts. The type, “error” or “error cleared”, and frequency can be adjusted from the portal at any time. There is a large category of rules that can be monitored specific to each individual component connected to the GX device, or brain of the system. The easiest method to receive notifications would be to enable the “Automatic Alarm Monitoring” option. This allows the user to request notification of the default alarms preprogrammed to the components that make up the system without having to worry about creating specific rules for each device. These defaults can provide an overview of the system that covers 99% of all potential issues.

The default parameters this option is monitoring for are:

Solar charger

- Charger fault
- Charge state
- Equalization pending
- Alarm condition
- Low voltage alarm
- High voltage alarm
- Error code



Inverter

- Inverter state
- Temperature alarm (if sensor is present)
- Low battery alarm
- Overload alarm

Smart Shunt

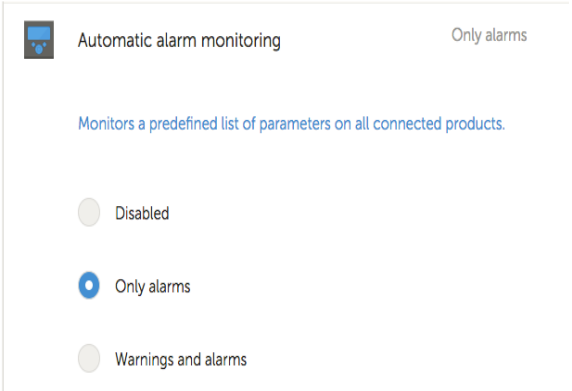
- High voltage alarm
- Low voltage alarm
- High starter-voltage alarm
- Low state-of-charge alarm
- Low battery temperature alarm (if sensor is present)
- High battery temperature alarm (if sensor is present)
- High internal-temperature alarm (if sensor is present)
- Low starter-voltage alarm
- High charge current alarm
- High discharge current alarm
- Cell Imbalance alarm
- Internal error alarm

Some of the alarms listed will be of no importance or not functioning as a component may be missing, or the specific conditions needed to have the alarm function are not present. In the case of installations that have the Vorp Energy Hybrid configuration AC current will not be monitored as the devices are unable to communicate with each other. Determining if the AC power is present when you are expecting it to be, will have to be determined by reviewing the data reports provided in the “Advanced” section of the installation page. If the system is charging when no solar power is available, in the case of AC power being available after dark, it would indicate the system is working as intended. The AC power is coming on and charging the batteries.

The VRM portal provides an online guide which can be used to learn further features available to the Remote-M. This is located in the options column on the left of the screen.

**If not first available click “back” several times and the option will become available.* https://www.victronenergy.com/live/vrm_portal:alarms

You can set the monitor to send an email alert for alarms only, for warnings and alarms, or disable it entirely. The default for new installations is “Only alarms”.



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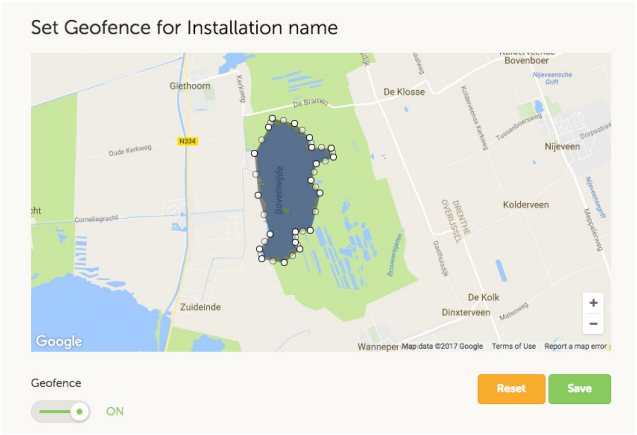
1.5 GPS Tracking

The VRM portal has the ability to set a Geo Fence to monitor the location of the installation using GPS satellite tracking. In the case of older installations of the
Solar trailer the USB to GPS dongle can be added to enable this feature. They can be connected to any of the USB ports on the Remote M device and setup is handled through the “Set geofence” page of the settings tab. The newer trailers have an antenna that is capable of data transmission and GPS location.

The image here shows an example of a geofence for a boat. When the boat leaves the lake an alarm will be created and emailed to the installation owner. The same applies to the trailers. When the geofence feature is used in combination with the “No Data” alarm, a field of full coverage is created.



1.6 Charging of the Batteries

The solar charger is the main source of charging for the system. The solar charger can charge a lower nominal-voltage battery from a higher nominal voltage solar array. The controller will automatically adjust to the battery voltage and will charge the battery with a current up to its rated current. The product name incorporates the maximum solar voltage and the maximum battery charge current for the given device. For example the MPPT 100/50 can accept a maximum of 100V of PV (solar) and can charge at a maximum of 50A to the batteries.

1.6.1 The battery is almost full

The solar charger will reduce its charge current when the battery is almost full.

If the state of charge of the battery is unknown, and the current is reducing while the sun is still shining, it can mistakenly be interpreted as the solar charger being faulty.

The first current reduction takes place at the end of the absorption stage, when the battery is approximately 80% charged.

The current will continue to reduce during the float stage, when the battery is approximately 80 and 100% charged.

The float stage starts when the batteries are 100% full. During the float stage the charge current is very low.

To find out what the state of charge (SoC) of the battery is, check the battery monitor (if present), or alternatively check the charge stage the solar charger is in.

- **Bulk**: 0-80% SoC
- **Absorption:** 80-100% SoC
- **Float storage:** 100% SoC

Default method to determine length and end of absorption for Lead-acid batteries

The charging algorithm behavior of solar chargers differs from AC connected battery chargers. Please read this section of the manual carefully to understand the solar charging behavior, and always follow the recommendations of your battery manufacturer.

**The voltage values mentioned in this chapter are for 12V systems, for 24V systems multiply by 2.*

By default, the absorption time is determined on idle battery voltage at the start of each day based on the following table:

Battery voltage at start up	Multiplier	Maximum absorption time
< 11.9V	X 1	6h
11.9V-12.2V	X 0.66	4h
12.2V-12.6V	X 0.33	2h
> 12.6V	X 0.16	1h

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The default absorption voltage is 14.4V and the default float voltage is 13.8V.

The absorption time counter starts once switched from bulk to absorption.

The MPPT solar chargers will also end absorption and switch to float when the battery current drops below a low current threshold limit, the “tail current”. The default tail current value is 2A.

The default settings (voltages, absorption time multiplier and tail current) can be modified with the VictronConnect App locally or the VRM portal through the Remote-M device.

Variations to the expected charging behavior

• Pausing of the absorption time counter:

The absorption time counter starts when the configured absorption voltage is reached and pauses when the output voltage is below the configured absorption voltage. An example of when this voltage drop could occur is when PV power (due to clouds, trees, buildings) is insufficient to charge the battery and to power the loads.

• Restarting the charge process:

The charging algorithm will reset if charging has stopped for an hour. This may occur when the PV voltage drops below the battery voltage due to bad weather, shade or similar.

• Battery being charged or discharged before solar charging begins:

The automatic absorption time is based on the start-up battery voltage (see table). This absorption time estimation can be incorrect if there is an additional charge source (e.g., AC Charge Source) or load on the batteries. This is an inherent issue in the default algorithm. However, in most cases it is still better than a fixed absorption time regardless of other charge sources or battery state. It is possible to override the default absorption time algorithm by setting a fixed absorption time when programming the solar charge controller. Be aware this can result in overcharging your batteries. Please see your battery manufacturer for recommended settings.

• Absorption time determined by tail current:

In some applications it may be preferable to terminate absorption time based on tail current only. This can be achieved by increasing the default absorption time multiplier (warning: the tail current of lead-acid batteries does not decrease to zero when the batteries are fully charged, and this “remaining” tail current can increase substantially when the batteries age).

1.6.2 Lithium batteries

Lithium Iron Phosphate (LiFePo4) batteries do not need to be fully charged to prevent premature failure. The default lithium (and recommended) settings are:

Setting	12V system	24V system
Absorption voltage	14.2V	28.4V
Absorption time	2h	2h
Float voltage	13.2V	26.4V

Default settings for LiFePO4 batteries

The default absorption voltage is 14.2V (28.4V) and the absorption time is fixed and set to 2 hours. The float voltage is set at 13.5V (27V). Equalization is disabled. The tail current is set to 0A, this is so that the full absorption time is available for cell balancing. The temperature compensation is disabled and the low temperature cut off is set to 5. These settings are the recommended settings for LiFePO4 batteries, but they can be adjusted if the battery manufacturer specifications advise otherwise.

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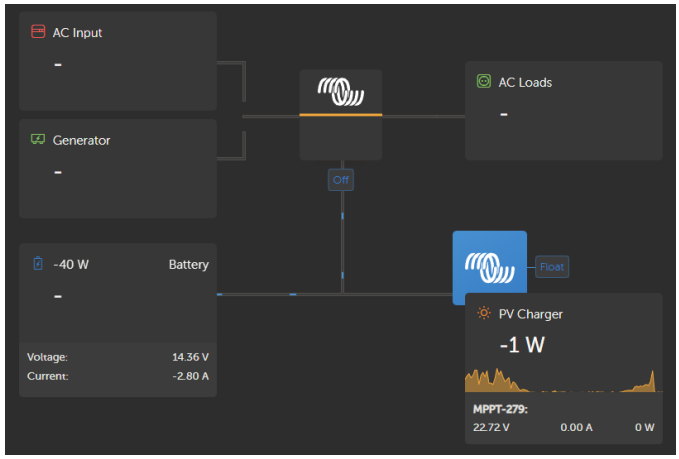
1.7 Understanding the data

The VRM presents the readings from each installation through graphs on the Dashboard and Advanced pages of the portal.

1.7.1 Dashboard

The dashboard is the main page. It shows all information on the installation at a glance. This includes the name given, the last update, status of the installation, and the local time if assigned properly.

Schematic visualization



The information shown adapts itself to the system installed. The solar charger, shunt, inverter, temperature, and DC load if the devices are available will be displayed here.

The system displays the flow of power using 'moving ants'.

Historical Data

Depending on available information, this block will either show a bar graph for kWh production and consumption, together with a blue line showing state of charge or, in case that information is not available, it will show a line diagram.

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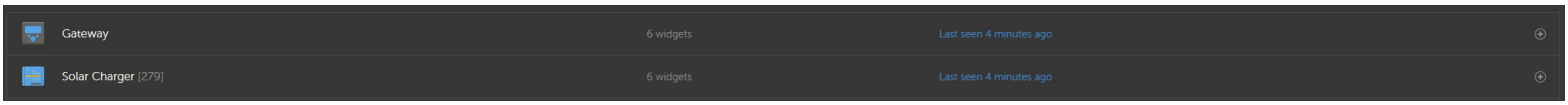
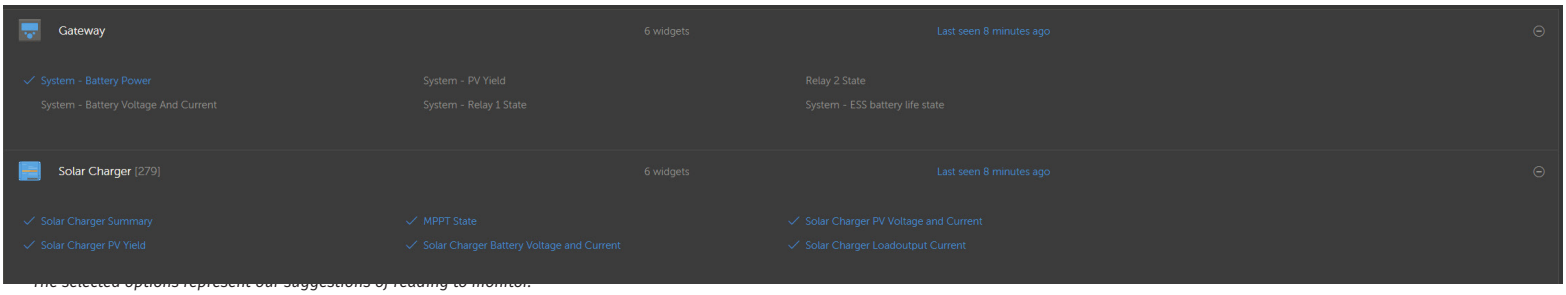
1.7.2 Advanced



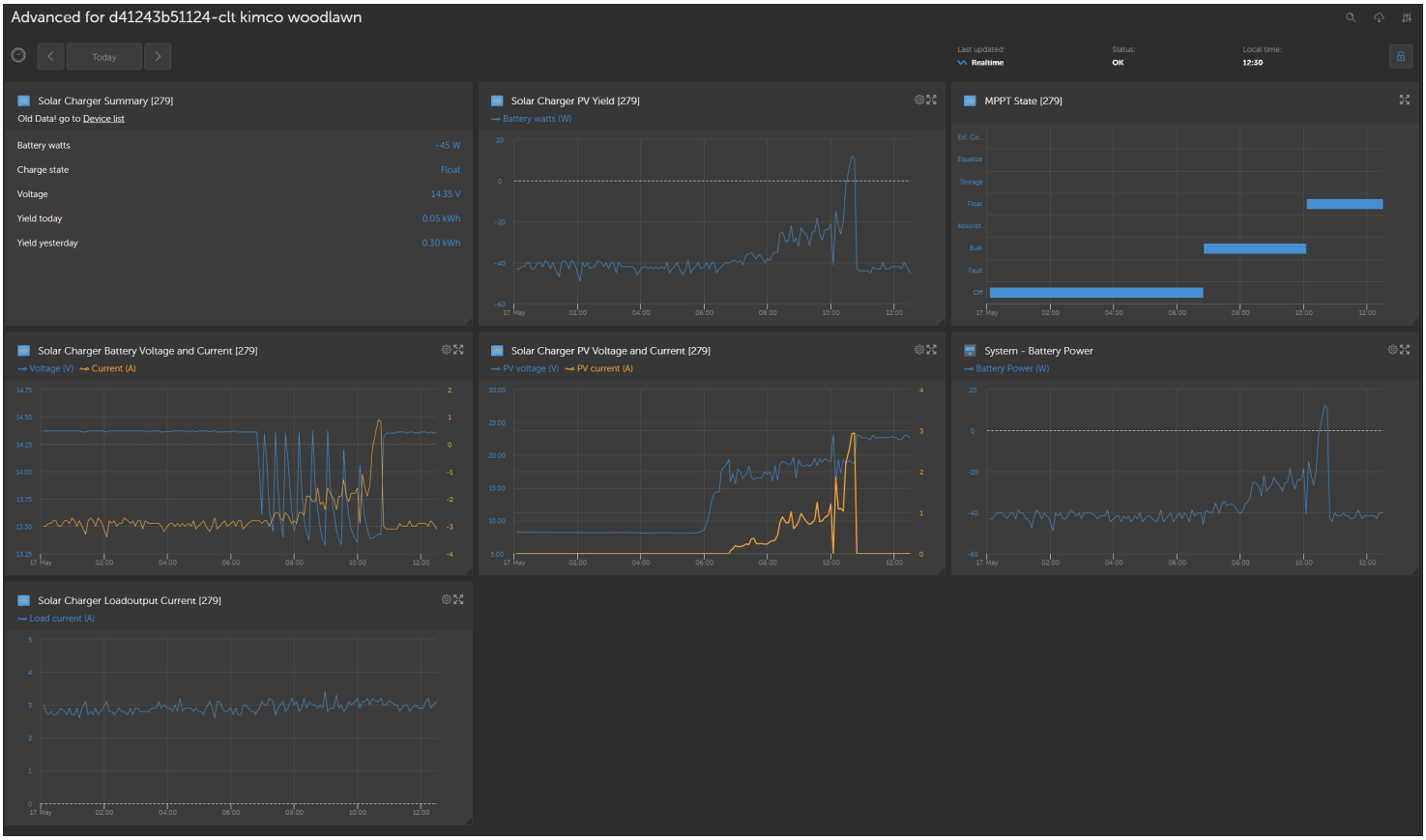
A new installation will show a bar displaying the devices available at the site. Click on the plus to open the options of graphs available to display readings for.



The selected options represent our suggestions of reading to monitor.

The selected graphs will display below this bar. After the initial selection this bar will become hidden and will need to be made visible using the “Widget” icon.

The page will show all of the graphs at once allowing the user the ability to compare the data of one graph with another by hovering over a point of interest.



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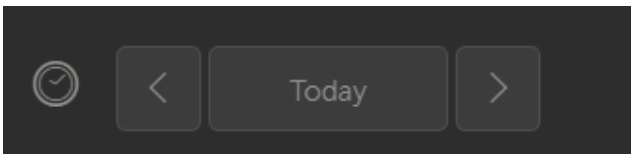
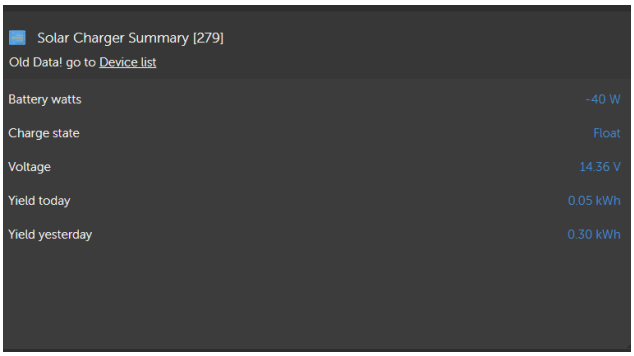
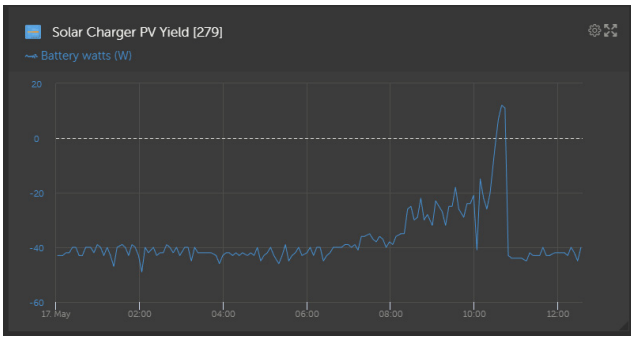


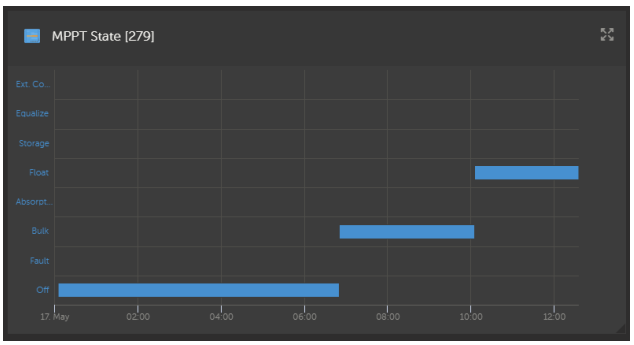
This tab allows you to view the data in these graphs in different ranges of time.



Status of the units production in the most current state - most general system summery



Solar Production over the time specified – refers to how much production was produced when being aided by a secondary source



Charge state the device has entered - Adaptive 3-stage battery charging The solar charger is a 3-stage charger. The charge stages are: Bulk – Absorption – Float

Bulk
During the bulk stage the solar charger delivers the maximum charge current, to rapidly charge the batteries. During this stage the battery voltage will slowly increase. Once the battery voltage has reached the set absorption voltage, the bulk stage stops and the absorption stage will commence.

Absorption
During the absorption stage the solar charger has switched to constant voltage mode. The current flowing to the battery will gradually decrease. Once the current has dropped below 1A (tail current), the absorption stage stops and the float stage will commence. When only shallow discharges occur the absorption time is kept short. This to prevent overcharging of the battery. But if the battery was deeply discharged, the absorption time is automatically increased, to make sure that the battery is fully recharged.

Float
During the float stage the voltage is reduced and batteries full charged state is maintained.

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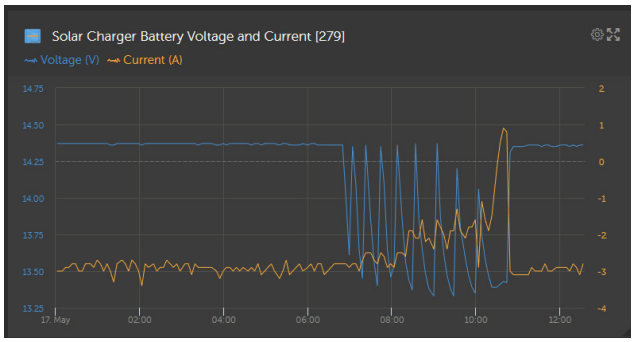
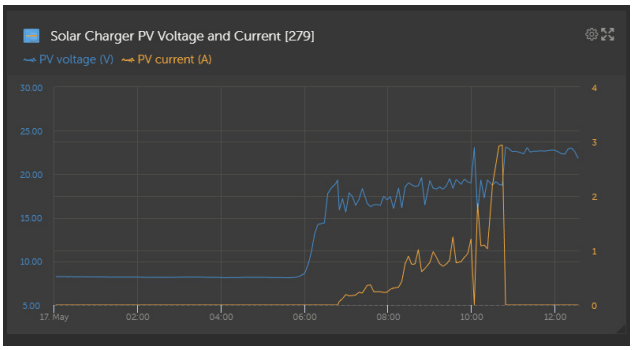
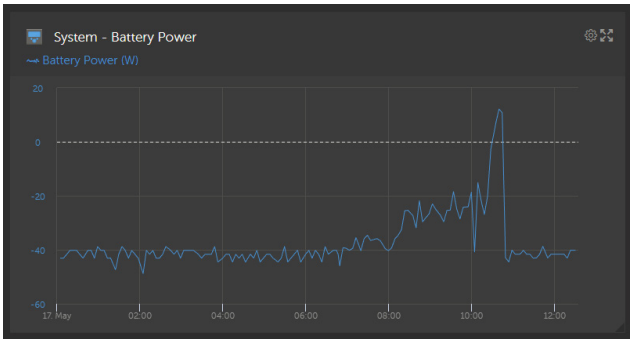


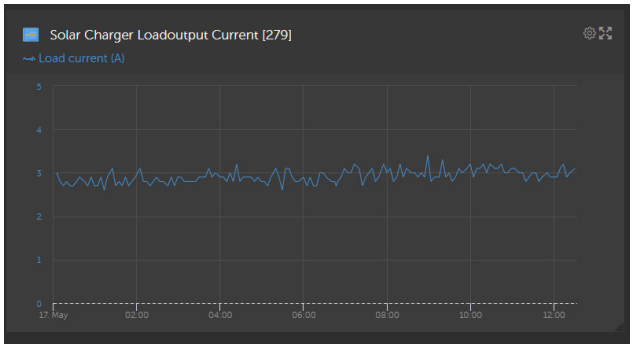
Chargers battery patterns – Voltage and current achieved by the device. Positive numbers represent the charger putting back into the batteries negative numbers are being taken out. *These numbers are in no way a direct correlation to what may be produced by the solar panel. MPPT (Maximum Power Point Tracking) chargers will take the available Voltage and convert it to Amperage in order to better charge the batteries. They are more efficient that PWM chargers in this regard.



Solar panels patterns – The charger takes the available power provided and uses it as best as it needs to in order to charge the batteries.
*In order to have the most accurate consumption figures find the range of the peaks (highest and lowest figures closest together) in these two graphs.



Summary of the Watts pulled from the battery – intended to be a rotuh figure for quick referencing.
*When excess power is being generated and the batteries are full the charger will send that extra power to the load. This in turn causes the Watts to be in the positive and negative range.



Displays the load output current of the installation.

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