victron energy
BLUE POWER

Troubleshooting System

Issues and warranty

Topics

1. System diagnostics
2. Visual check and history
3. Batteries and cables
4. AC sources and AC loads
5. Inverters and inverter/chargers
6. Battery chargers
7. MPPT solar chargers
8. DC products
9. Lithium batteries
10. Monitoring and control
11. Technical support
12. Warranty and repairs
13. Training and more information

Safety warning and disclaimer

- Electricity is dangerous, it can cause harm to persons or property
- Electrical work should always be carried out by a qualified electrician or licensed electrician
- Local safety guidelines and requirements need to be adhered to
- The sole purpose of this training is to aid in the understanding of basic principles behind certain electrical concepts and is intended as a guide only

IMPORTANT:

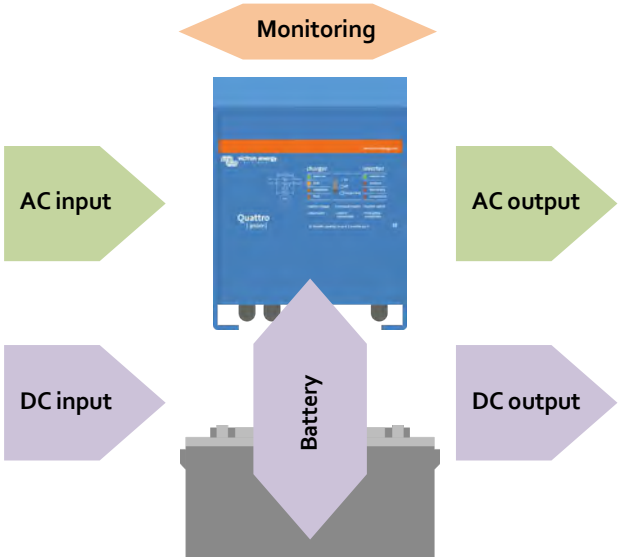
- AC and DC voltages are dangerous and harmful and can cause injury or death
- Always use insulated tools when working with electricity and batteries
- Do not short-circuit batteries this can cause fire or explosion
- Battery charging can create explosive gasses
- Undersized wiring or bad electrical contact can cause fire
-

1. System diagnostics

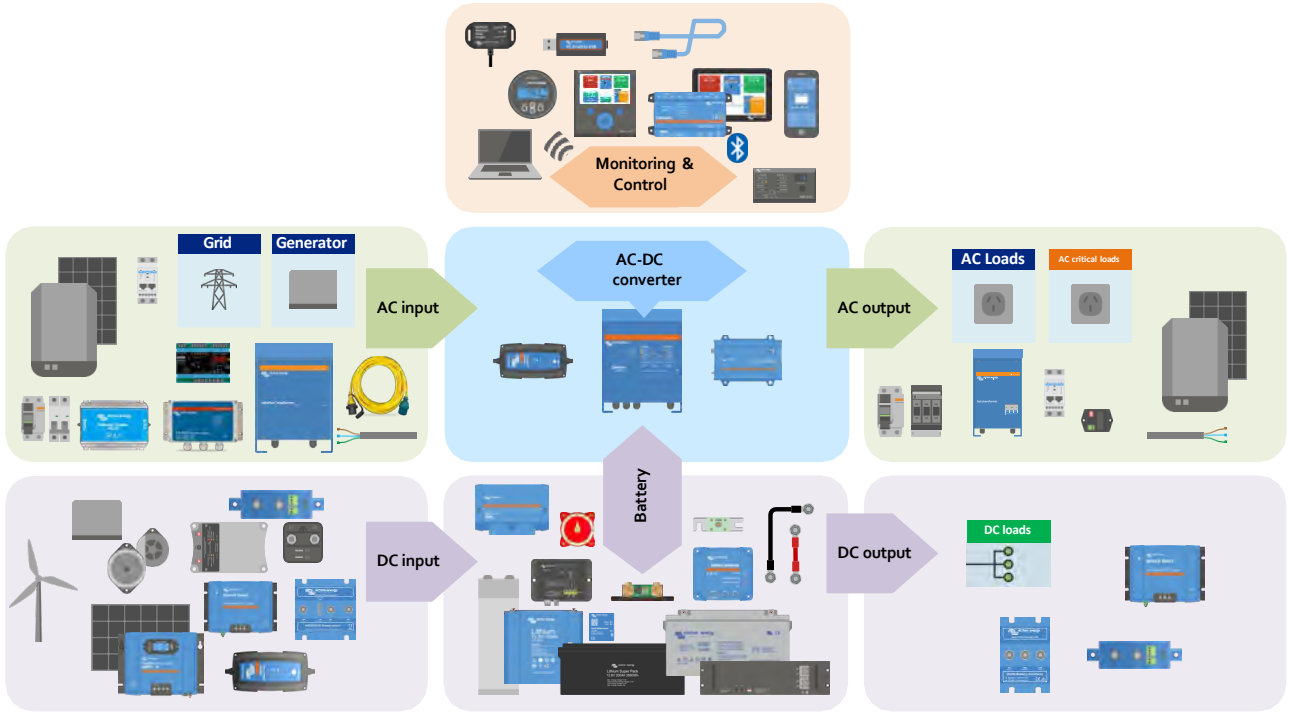
A Multi always sits at the heart of a system

- A problem with one of the inputs or outputs will affect the performance the Multi

- Often the Multi gets the blame
- But in reality one of its inputs is not functioning and is causing the Multi to malfunction



And the same can be said for other Victron products



Steps to diagnose a system

Visual check and history	Look at system and listen to system user
Batteries and cables	Check batteries and the DC path
AC input and output	Check grid, generator, CBs, RCDs and the AC loads
Check inverter/charger	Check operation of the inverter/charger
DC inputs and outputs	Check DC charge sources and DC loads
Monitoring and control	Check monitoring devices and communication

2. Visual check and system history

Talk to the end user

- Talk to the end user, get their side of the story
- Be pro-active, ask questions about the fault and the history of the system

Example questions:

- Describe the fault?
- When did the fault first occur?
- Are there blinking LEDs or alarm notifications?
- Is the system on VRM?
- Was there recent lightning?
- Were there recent changes made to the system?
- Have large loads been added or other changes made after the system was installed?

Visual check

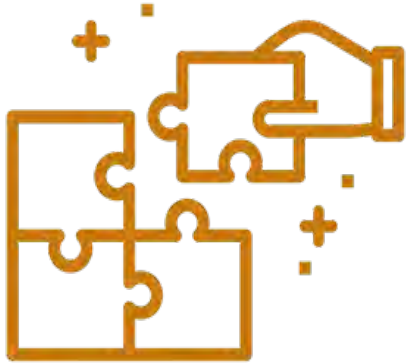
- Are the batteries gassing, leaking or swollen? - be aware that this can be dangerous and there is a risk of fire, explosion or acid burns
- Do you see burn or smoke marks or is there a burn smell?
- Is there potential water damage, do you see dried water marks or is there actual water present?
- Can you see mechanical damage?
- Check the wiring , is there loose wiring or can you see damaged conductors?
- Are there blown or tripped AC and DC fuses?

Tip: Take photos of the system and the wiring, these can be used for reference or for a future support case

Is the system fit for purpose?

Some pointers:

- Does the system suit the product(s) used?
- Does the system match the customers expectation?
- Is the inverter large enough to power the loads?
- Is the battery bank big enough to power the loads?
- Is the generator or solar array powerful enough?
- Do not use an ESS for Marine, automotive off grid or when the grid is bad



3. Diagnosing Batteries and DC cabling issues

Measure the DC voltages

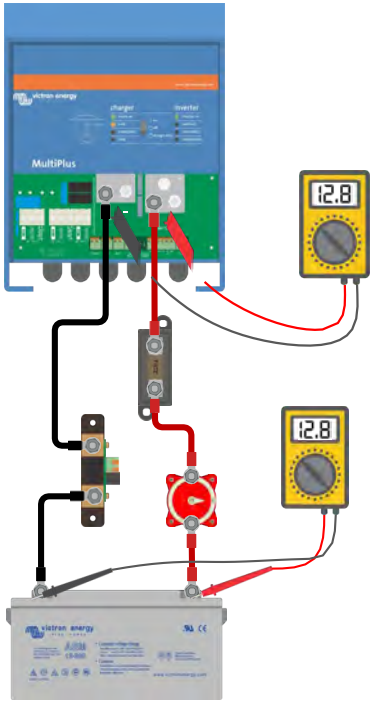
The first step in diagnosing a system is to check the battery voltages

- Is the battery voltage ok?

➡ Measure the battery terminal voltage

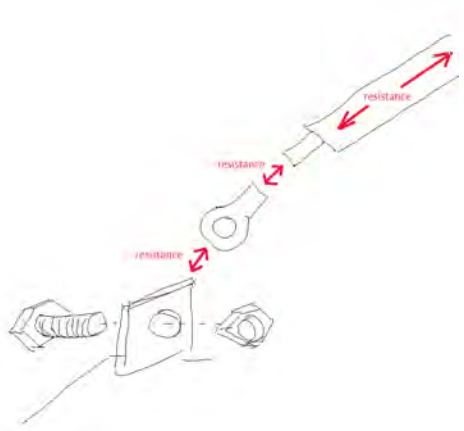
- Does all DC equipment receive this voltage?

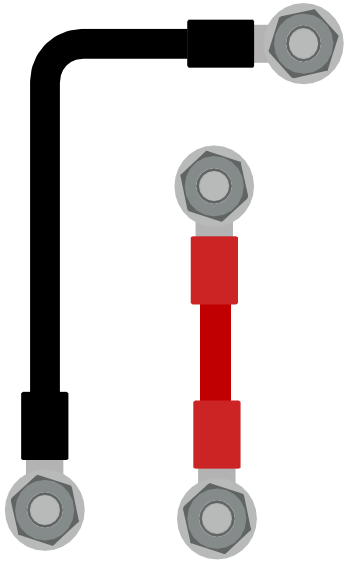
➡ Measure the voltage at the DC terminals of the equipment



Check DC cables and connections

- Do the battery cables have the required cross sectional area?
- Can you see damaged insulation?
- Are all connections tight, but not too tight (use correct torque)
- Are the cable lugs correctly crimped?
- Do the cables heat up when under load?
- Are the cables loose?
- Is there a voltage drop over the cables?

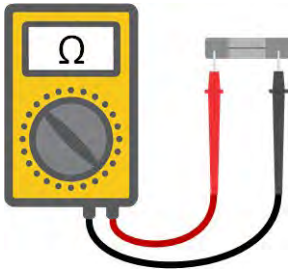


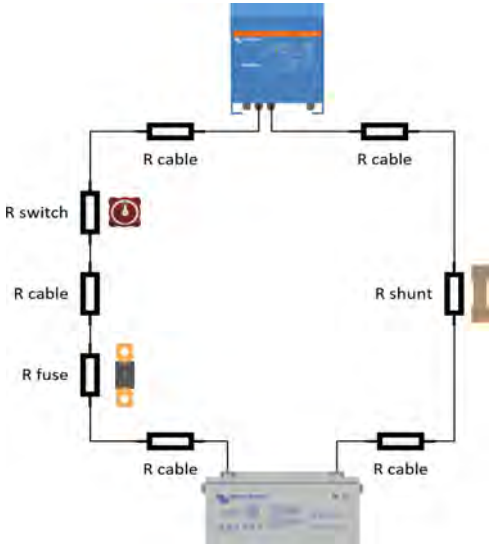


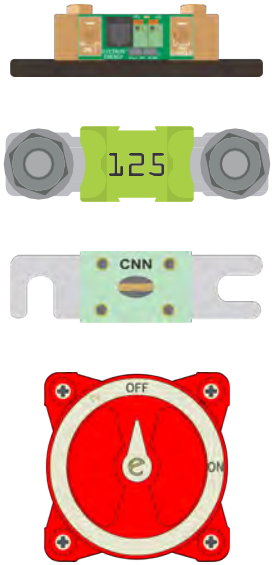
Check all components in the DC path

What is located between the battery and the DC equipment connection?

- Check fuses
- Check shunt connections
- Check isolator switches

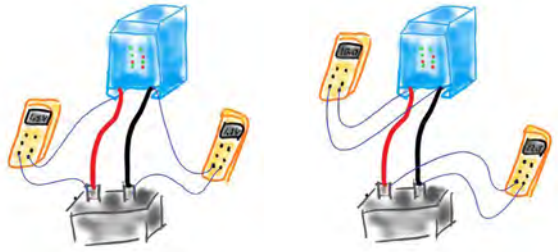


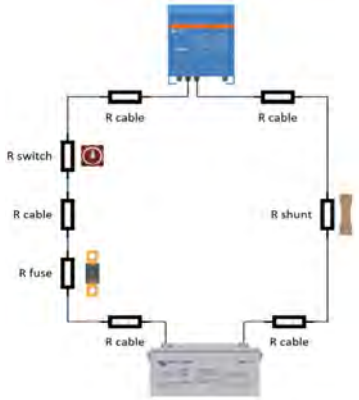




Are cabling issues causing a voltage drop?

- Voltage drop occurs when the system is under load
- Voltage drop is caused by
  - too thin cables,
  - bad or loose cable connections
  - bad cable eye crimps
  - bad fuses
  - bad isolator switches
  - bad batteries
- Voltage drop will cause low voltage alarms, ripple alarms and can even cause overload alarms



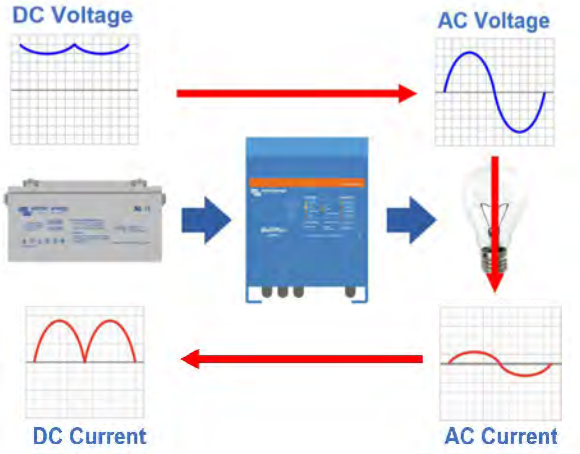


What is ripple

- When a battery powers an AC load via an inverter the voltage drop will cause a ripple in the DC voltage

- This ripple will cause batteries and electronic equipment
- to age quicker

- Measure ripple via VEConfigure or measure AC on the DC connections



Are the batteries fit for purpose?

- Does the battery type used match the application?
- Is the battery capacity big enough for the application?
- In case of lead acid, only half the capacity should be used, do not go below 50%
- Can the battery handle the system charge and discharge currents?
- Are deep-cycle batteries used? (Do not use car batteries)
- Do not mix old and new or batteries or use different battery brand or types in one battery bank
- Don’t use second hand batteries

Are the batteries broken or empty?

- Empty
- Almost empty
- Capacity too small
- Too old
- Do they still have full capacity?
- Bad quality
- Damaged because of too many deep discharges
- Too hot or too cold
- Are they swollen, cracked or are leaking acid?
- Are the battery terminals corroded?

Why is the battery capacity less than expected?

- Battery ageing - the maximum cycle number has been reached
- Too high temperatures - this will greatly reduce battery cycle life
- Sulphation - battery has been left in a discharged state over time

- Battery misuse:
  - Too often too deeply discharged
  - Incorrect charge voltages
  - Discharge current too high, customer has added too many loads to the system
  - Batteries not regularly or not long enough recharged, not enough solar, or not running generator long enough
  - Ripple voltage issues

Age or damage will reduce battery capacity

An old battery or a misused battery will have a reduced capacity

Signs that there is an issue with battery capacity:

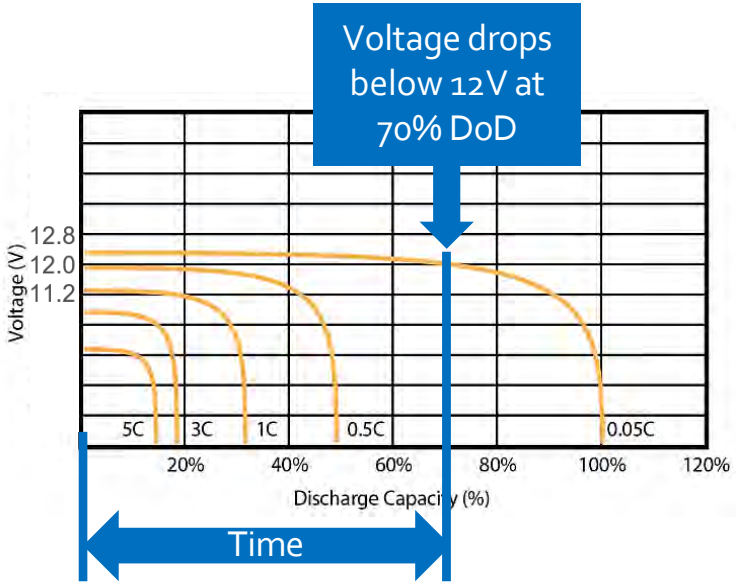
- Does the battery seem to discharge much faster than they used to?
- Does the battery charge much quicker than before?
- Do the voltages go up too quick when charging?
- Does the battery voltage drop suddenly under load

To test the battery capacity:

- Handheld testers cannot be used for deep cycle batteries
- The only way to measure battery capacity is by discharging the battery and to measure the time it took to discharge the battery

Testing battery capacity

- Fully charge the battery until the battery charger goes into float
- Mark the time and discharge the battery with a constant load at C20 rate (=20 hour rate = 0.05C)
- C20 is capacity/20. For a 220Ah battery this is 220/20=11A
- Stop discharge when the battery voltage drops below 12V and mark the time
- In this example this will happened at about 70% DoD



- The batter capacity can now be calculated:

Capacity = time x current x (1/0.7)

Battery history and warranty

The battery monitor history will give you a lot of information

- How many cycles (equal cycles and synchronisations is ideal)
- How much total energy has been draw from battery
- Deepest and average discharge (max 50% discharge for lead acid)
- Min and Max voltage and number of full discharges

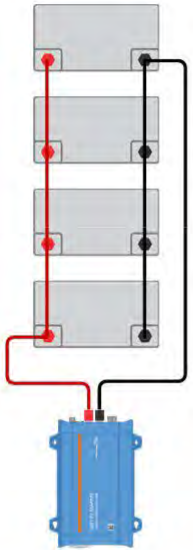
- User abuse is not warranty
- We would prefer only to warrant our batteries if also a BMV is used
- Our battery warranty is 2 years

Battery bank issues

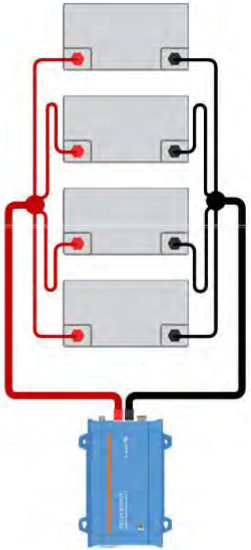
- Do not mix batteries of different types, brands or chemistries
- Do not mix batteries with different capacities
- Do not mix of old and new batteries
- Check for incorrect battery bank wiring
- Do not connect too many 6 or 12V AGM or GEL batteries in series/parallel (use 2V cells or lithium batteries instead)
- There might be a battery unbalance in a series string
- The batteries are too close together so heat can't escape

Is the battery bank wired correctly?

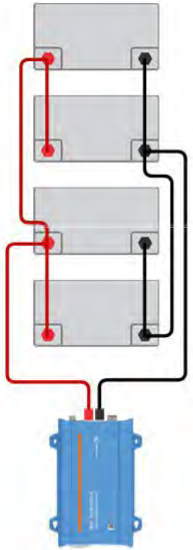
The correct way:



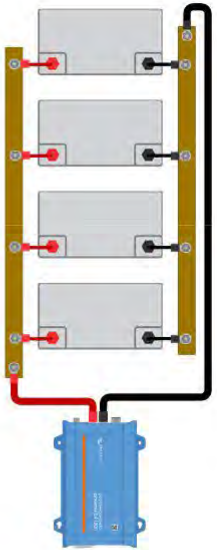
Diagonally



Posts



Halfway

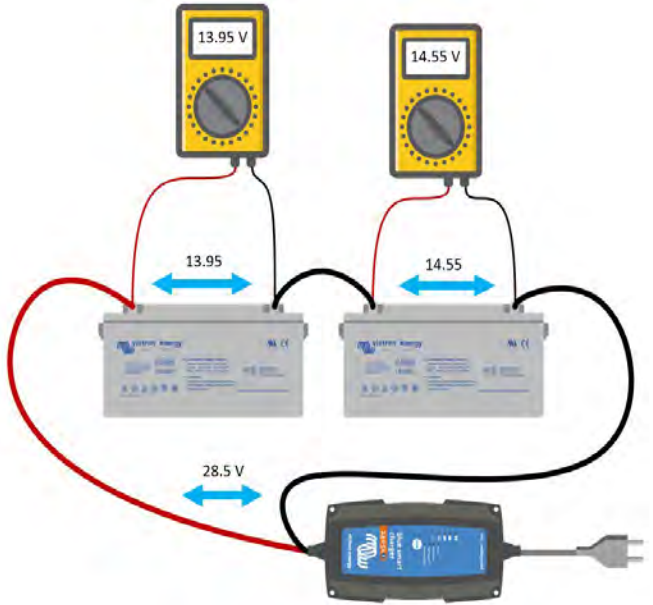


Busbars

Battery unbalance and midpoint monitoring

- If batteries are connected in series they will, over time, have different voltages
- This unbalance is created because of slight differences in internal resistance of each battery

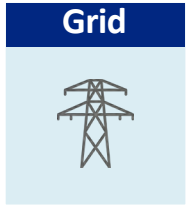
- The difference will occur during charging
- It can be prevented with a battery balancer
- It can be monitored with a battery balancer, BMV7x2 or a SmartShunt

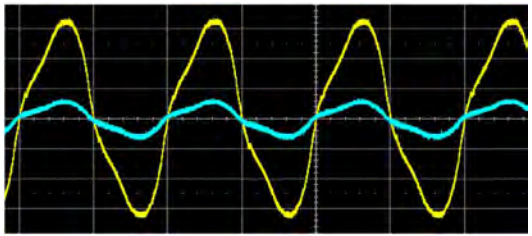


4. AC sources and AC loads

Check the AC supply

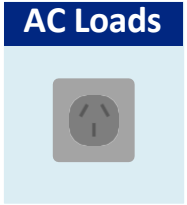
- Is the grid or generator capable of producing the required current? - check AC input current limit in the Multi
- Is the grid or generator output voltage too high or too low? - does it fall in the AC input voltage window Multi settings
- Is the generator waveform acceptable? - disable UPS setting in Multi
- Have the neutral and live conductors been swapped?
- Is the grid or generator output voltage of good quality?
- End of line grid system ESS issues? - adjust LOM in Multi)
- Are the correct AC cables used and are they in good condition?
- Is there a bypass or transfer switch accidentally activated?

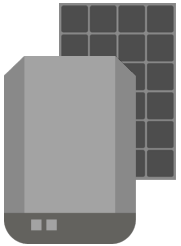




Check the AC loads

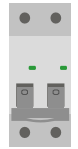
- Is the AC load too high?
- Are there too many loads running at the same time?
- Is there a short-circuit in one of the loads?
- Does the load have a very high start up current?
- Is the load power rating greater than the power the AC input or battery can supply
- Is a PV inverter connected to the AC output and has this been set up correctly? (VEConfigure PV assistant)
- Are the correct thickness AC cables used and are they in good condition?





AC breakers, fuses and RCDs

- Look for tripped AC breakers, fuses or RCDs

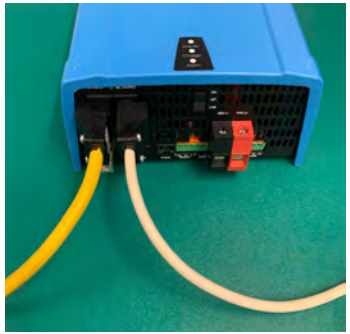


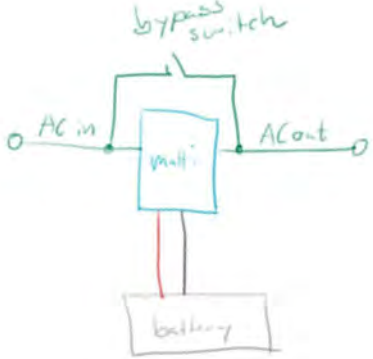
If there is nuisance tripping of RCDs:

- Is there is a double Earth-Neutral link in the system?
- Or is there another connection to a different earth?
- Is there a permanent MEN link in the switchboard together with the make and break link in the multi - more later on this
- Is there other equipment that can cause this? Surge protectors or "leaky" AC loads
- Is there moisture somewhere, or a link to plumbing?
- Live and Neutral have been swapped
- Ac in has been connected to AC out somewhere in the system
- There is an faulty RCD

AC issues? - Bypass the Multi

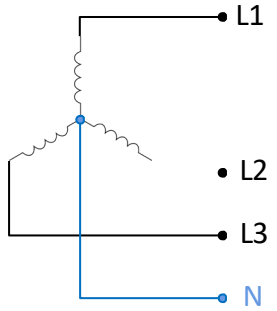
- Bypass the Multi and see if problem still persist
- Perhaps the system has a bypass switch?
- In small Multis this is easy, just remove the AC connectors and connect together
- If the problem is still exists after the bypass then it is not the Multi's fault



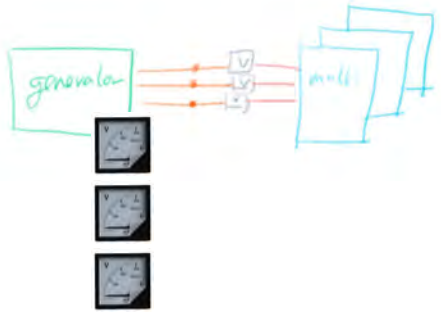


3 phase systems AC issues

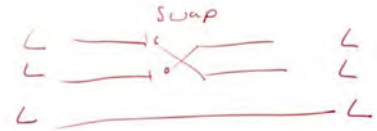
- Have the Multis or Quattros been programmed for 3 phase?
- The neutrals need to be connected, only star is possible - No delta



- Are all 3 phases present?
- Are all 3 phase supplying the correct voltage?
- Are the phases balanced?



- Is there perhaps a phase rotation issue? swap two of the phases. This will instantly fix the phase-rotation issue



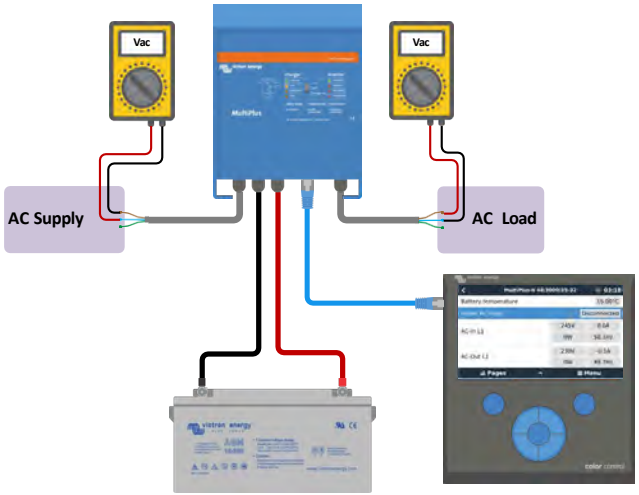
5. Inverter/charger

Inverter/charger common issues

- Reverse battery polarity - unit will get damaged and is not warrantable
- Battery voltage to low or missing - check battery cables and are the batteries still okay
- Incorrect AC input current setting - unit trips AC breakers or overloads generator
- Will not accept generator power - disable UPS setting
- AC output 2 appears to be broken - be aware that there is a 2 minute delay for AC out 2
- Mechanical, dust or water damage - not waterproof and not suitable for outdoor use
- Premature overload - the power rating is related to unit temperature and battery voltage
- Blinking overload and low battery - Ripple alarm - probably battery cable issue
- Blinking absorption and float - T sense error - + and - swapped or T and V sense swapped

Inverter/charger test procedure

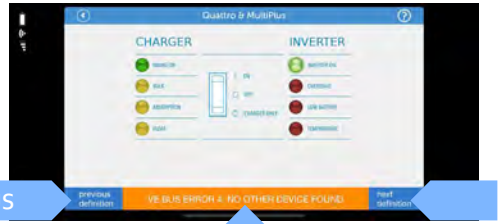
- Internal visual check, look for dirt or water damage, remove the front plate(s) and look inside the unit
- Check battery voltage at the battery terminals (not at the battery)
- Do you see red LEDs, blinking LEDs - this can indicate an error
- Or use a GX device and check error codes
- Disconnect AC in and AC out and all the Multi accessories
- Test if the inverter works
- Connect AC loads and check if inverter can power them
- Connect AC input, check if battery charging starts



LEDs and error codes

- Always make note of alarm LEDs or GX error codes
- Red LEDs or blinking LEDs can indicate an error
- In case of small Multis use the MultiControl panel or GX device

- look in the manual to find out the meaning of the error
- Or for a list of error codes see [VE.Bus error codes]
- Or use the toolkit app

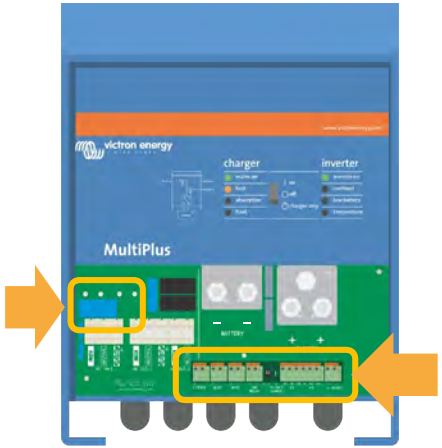


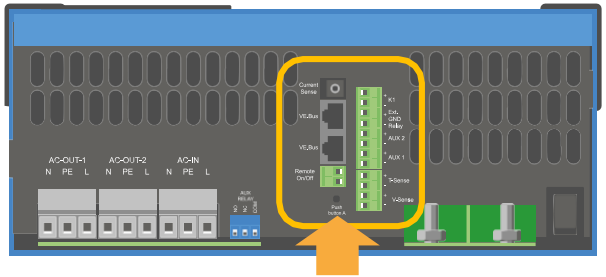
Click on blue to go to next or previous

Click on orange bar to get more info

Is a remote device controlling Multi

- It there a remote device connected?
- Is a Multi Control panel or a GX device connected that could be switching the Multi off?
- Disconnect it and check if the Multi now will turn on
- Is there another external source controlling the Multi, like a managed battery, a BMS or a signal from an external control system?
- Is there anything connected to the RJ45 or Aux ports?
- Are the V sense and T sense correctly wired?





Diagnosing Inverter Overload
Power rating & overload

Power rating inverter 3000VA

For example, the inverter power of a Multi 24/3000/70:

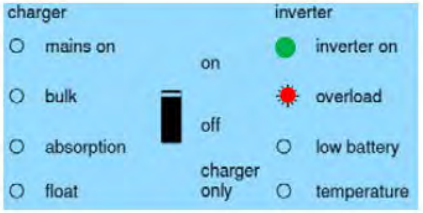
- Continuous power at 25°C is: 3000 VA = 2500W
- Continuous power at 40°C is: 2700VA = 2200W
- Peak power at 25°C is: 6000W

MultiPlus 12 Volt 24 Volt 48 Volt	C 12/800/35 C 24/ 800/16	C 12/1200/50 C 24/1200/25	C 12/1600/70 C 24/1600/40	C 12/2000/80 C 24/2000/50	12/3000/120 24/3000/70 48/3000/35	24/5000/120 48/5000/70
Cont. output power at 25 °C (VA) (3)	800	1200	1600	2000	3000	5000
Cont. output power at 25 °C (W)	700	1000	1300	1600	2500	4500
Cont. output power at 40 °C (W)	650	900	1200	1450	2200	4000
Peak power (W)	1600	2400	3000	4000	6000	10.000

Overload mechanism in Multi

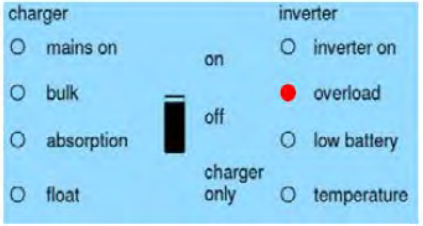
Pre-alarm (blinking LED)

- When the nominal power of the inverter has been exceeded.
- Depending on the size of the overload, this condition can remain for some time.



Alarm (LED is on)

- In case of a severe overload or short circuit the unit will attempt to power the overload 3 times, every 30 seconds.



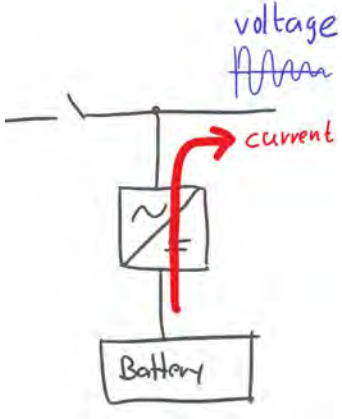
Switch off

- If, at the 3th attempt, the overload or short circuit still persists, the unit will turn off while the overload led will remain lit.
- A manual turning unit off and on is required to restart

What determines overload

Overload is initiated when:

- The current through the inverter is too high
- Or when the inverter output voltage drops



When determining loading, always look at the AC output current:

- Use a true RMS current clamp
- Current = power / voltage
- For a 8000 VA unit at 240V the current rating is 8000/240 = 33.33 A
- This is the half hour current
- The peak current is twice that, so 2 x 33.33 = 66.66A
- Remember inverter power rating is related to inverter temperature
- For more info watch the Diagnosing inverter overload video

Webinar: Diagnosing inverter overload - by Johannes Boonstra

Overload, how long

This guide can be used, provided:

- The battery voltage remains stable
- The unit is not over-heated due to earlier overload attempts

Overload	Time
130% of nominal power	30 minutes
Overload where the output voltage remains stable	2 minutes
150% of nominal power where the output voltage remains stable	5 seconds
Peak power of 200% of the nominal power (short-circuit)	0.5 seconds = 30 cycles

Start up current of loads:

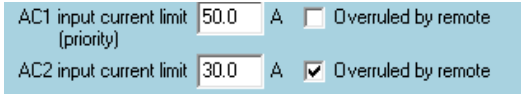
- Single phase motor: 6 x nominal current
- 3 Phase motor: 3 x nominal current
- For inductive or capacitive loads (0.7 power factor): double inverter size is needed

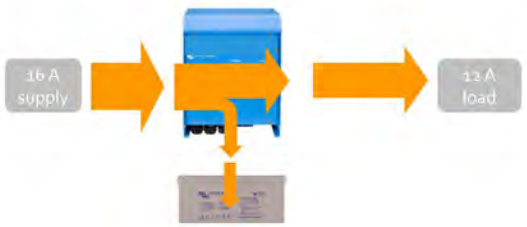
Soft start devices:

- Use frequency drive devices,
- Don't use devices that chop the sine wave

Power control current limit

- The Multi needs to know how much current is allowed to take from grid or generator
- You need to set the current limit with the Multi Control panel, GX device or via the VEConfigure software!





Start up current of Loads

Rule of thumb:

- Single phase motor: 6 x nominal current
- 3 Phase motor: 3 x nominal current
- For inductive or capacitive loads (0.7 power factor): double inverter size is needed

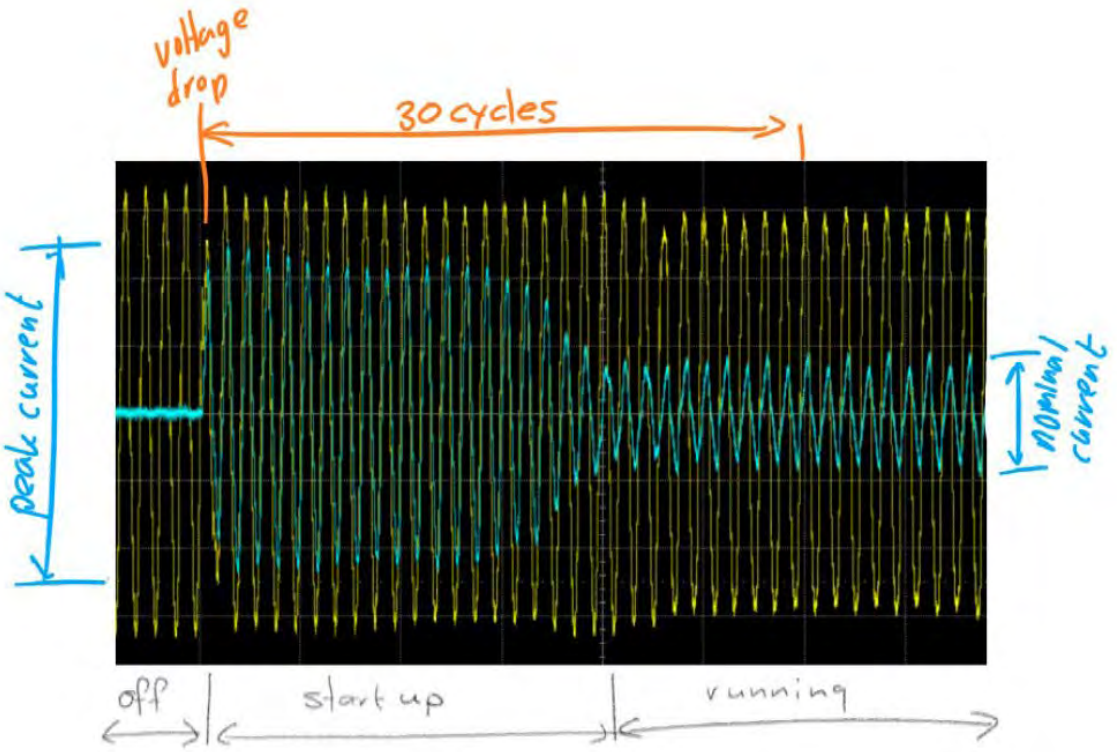
Soft start devices:

- Use frequency drive devices,
- Don't use devices that chop the sinewave

Current and voltage during an overload

Starting a compressor

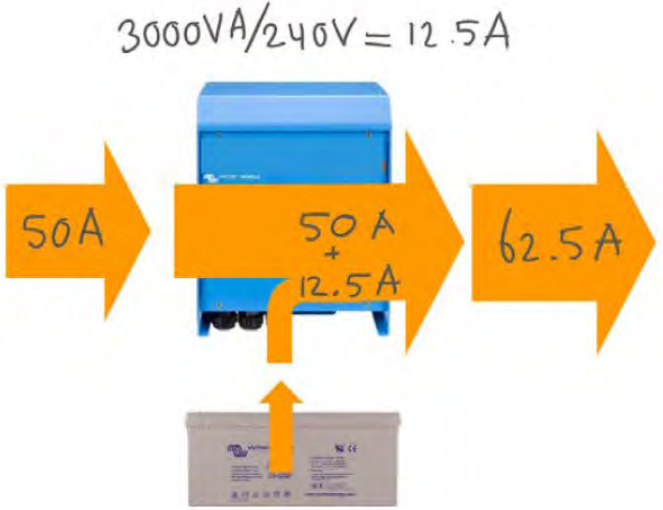
- Yellow is voltage
- Blue is current



Power rating together with power assist

For example a 48/3000/16 - 50A unit:

\With its PowerAssist active the Multi can add up to 3 kVA to the output during periods of peak power requirement

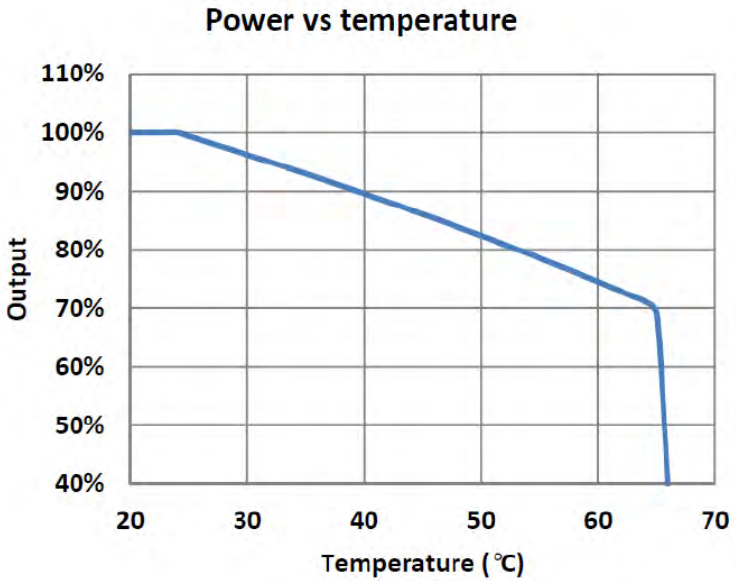


Temperature deration

- When the internal temperature of the Multi or Quattro increases the output power decreases.

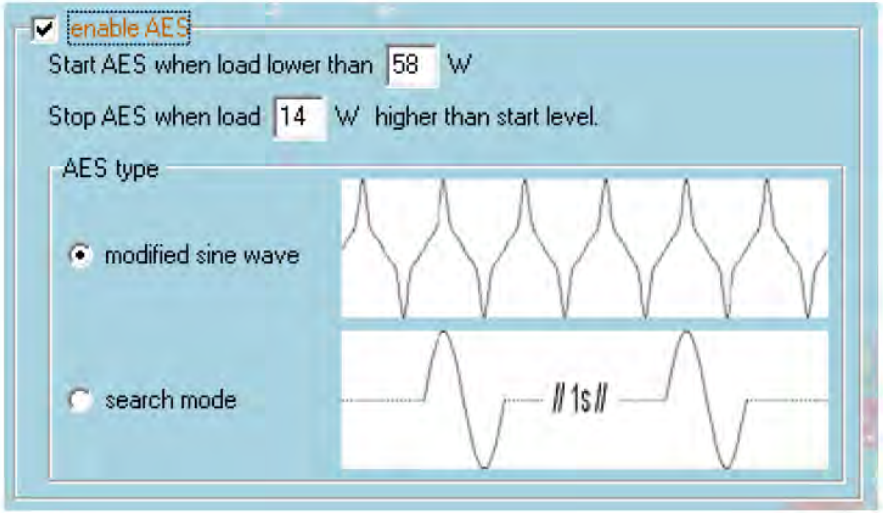
Excessively high ambient temperature will result in the following:

- Reduced peak capacity, or shutdown of the inverter
- Reduced charging current



AES – Auto Economy Setting = Standby mode

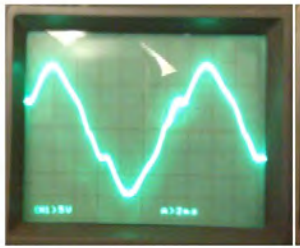
Inverter tab



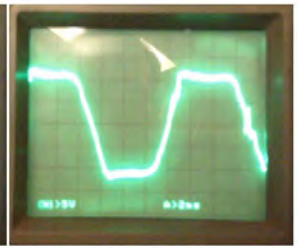
MultiPlus	12 Volt 24 Volt 48 Volt	12/3000/120 24/3000/70 48/3000/35
Zero load power (W)		20 / 20 / 25
Zero load power in AES mode (W)		15 / 15 / 20
Zero load power in Search mode (W)		8 / 10 / 12

Trouble shooting generator issues

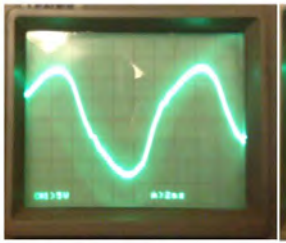
- Some generators have ill-shaped sine waves, in particular during sudden load changes. In these situations, the Multi will disconnect frequently or not connect at all. Untick the UPS setting
- It could be that the generator is undersized, generator needs to be same or bigger than the Multi
- It could be that the AC current limit is set too high, set it to 80% of maximum generator rating
- For more information see: MultiPlus generator FAQ



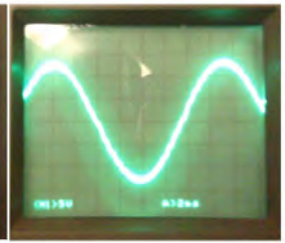
Generator output no load



Generator output large load



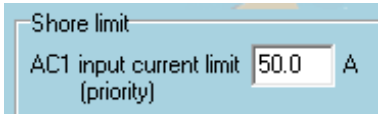
Generator output mid-size load



Quattro output

Grid tab

General tab

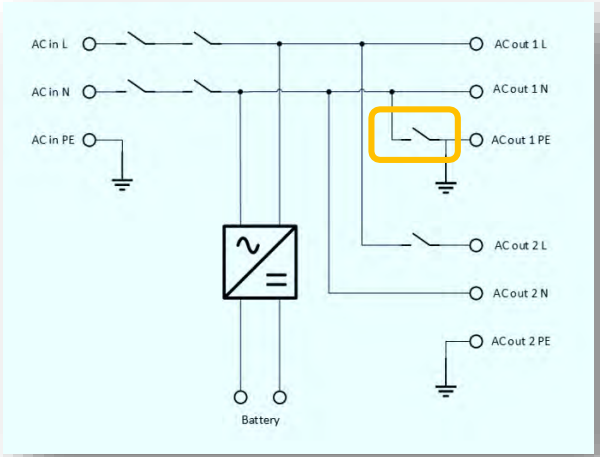


Charger tab

Error 11 - MultiPlus-II

- When grid feed has been enabled the MultiPlus-II performs an earth relay test before connecting to the grid
- When the relay test has failed, the unit shuts down and error 11 is generated

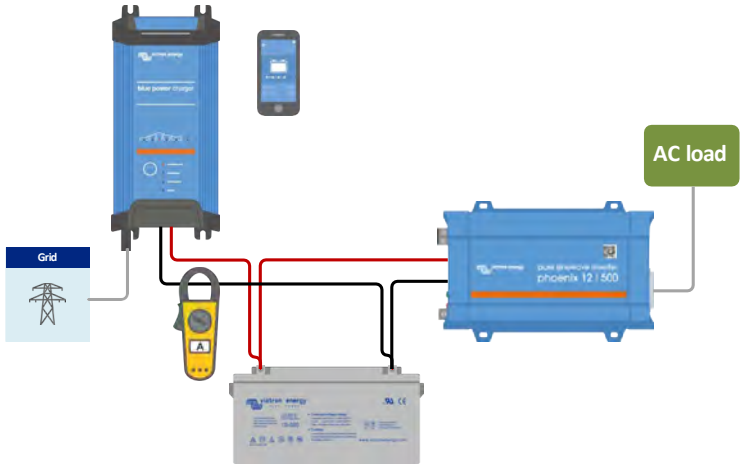
- Error 11 can mean that there is relay failure, but it can also indicate an installation error
- The most common reason being that there is an external connection between Neutral and Ground
- Or the input and output neutral is linked somehow (other than through the Multi) without the correct grid code selected



6. Battery chargers

Basic charger test

- Visual check
- Is the remote on/off connector wire loop present (if applicable)
- Connect to AC power
- Do you measure an output voltage?
- Repeat this for each output (if applicable)
- Load the charger (connect it to an empty battery or a battery with DC load such as an inverter running a large AC load)
- Is full current flowing? Use Victron Connect, look at LEDs, look at dial or or use current clamp
- Check the charge current and voltage settings - see manual or Victron Connect



7. MPPT solar chargers

MPPT common issues

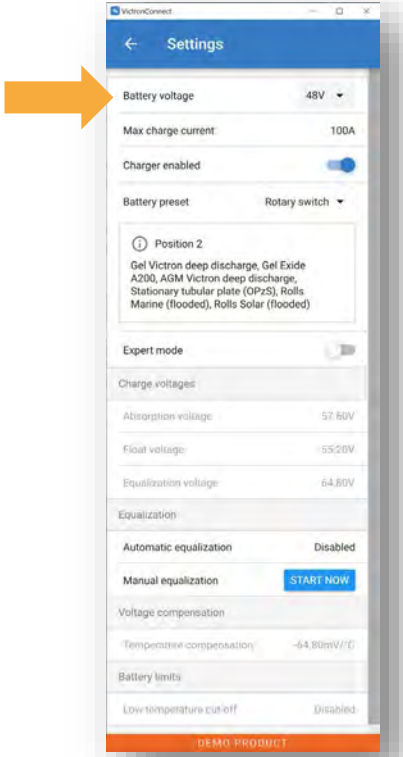
- Reverse battery polarity - MPPT will blow internal (not serviceable) fuse
- Battery overcharging - Incorrect system voltage settings, or wrong charge voltages
- PV undervoltage - MPPT will not initiate charging
- PV overvoltage - MPPT will be damaged
- PV overcurrent during reverse PV polarity - MPPT will be damaged
- PV overcurrent during correct PV polarity - MPPT will limit PV current to its rated current
- Mechanical damage
- Bad PV cable MC4 connector crimping - Molten MC 4 connectors on both cable and MC4 side
- MC4 connector overcurrent - Molten MC 4 connectors on both cable and MC4 side
- Wiring issues like incorrect PV cable or bad contacts - Will cause burned contacts
- Water damage - MPPT is not waterproof and mounting orientation matters

Battery voltage

- The MPPT automatically detects the battery voltage on first install
- After that the self detection is turned off
- If an MPPT that came out of a 24V system and is now used in an 12V system, it will overcharge a battery
- In the very early days the MPPT s would always automatically detect, but this was problematic in case the battery was disconnected often, by a BMS for example, so we now have turned this off

- Use VictronConnect to check the battery voltage settings

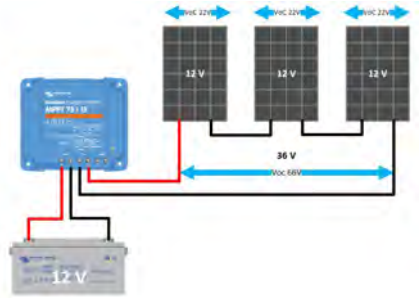
- Reverse battery polarity will damage the MPPT and is not warrantable

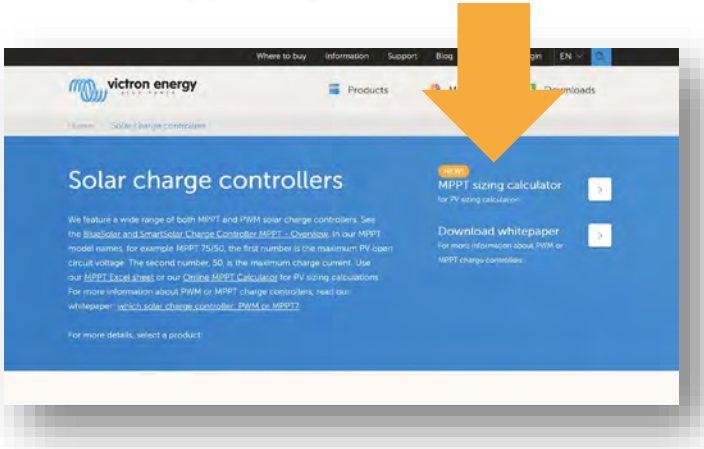


PV voltage too high

- The VoC is the solar panel open circuit voltage including temperature adjustment
- See the solar panel datasheet and the MPPT datasheet for the maximum VoC allowed for your system
- Exceeding this voltage **will** damage the MPPT
- Over voltage is not warrantable
- Take care in areas with cold early mornings, use a 10% safety margin

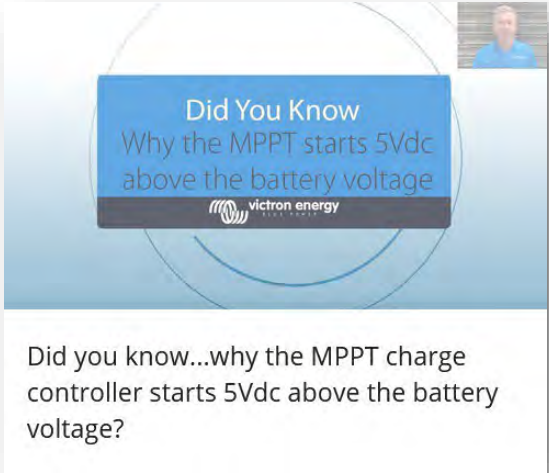
- Use the MPPT calculator on our website to find out if array is suitable for MPPT, the calculator can be found on MPPT product overview page





PV voltage too low

- The PV voltage must be 5V higher than the battery voltage for the MPPT to start charging
- Once started, the PV voltage needs to be at least 1V higher than the battery voltage
- In case of low PV voltage the charger might appear broken to the customer
- Watch the Why MPPT 5Vdc above battery video

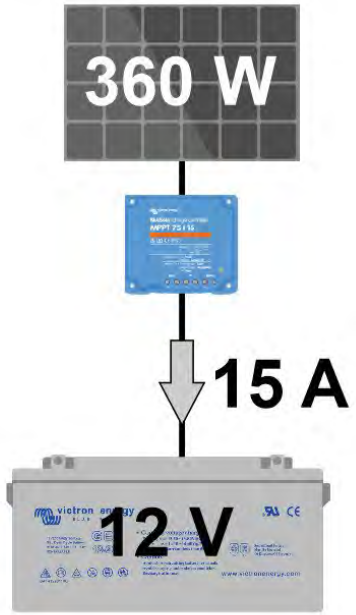


Charge current

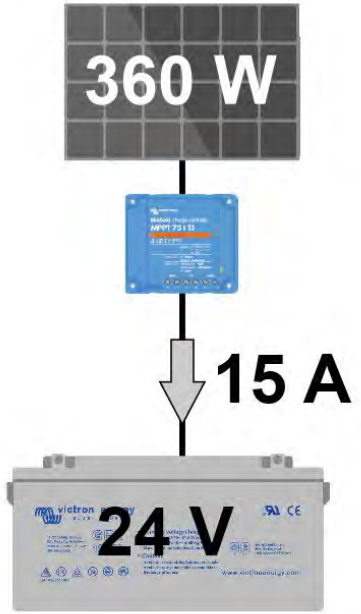
- Example:
- For a 75/15 MPPT the current rating is 15 A

- This is the current going into the battery

- This means that with a 12V battery you will get less power into your battery than with a 24V battery.



15A x 12V = 180W

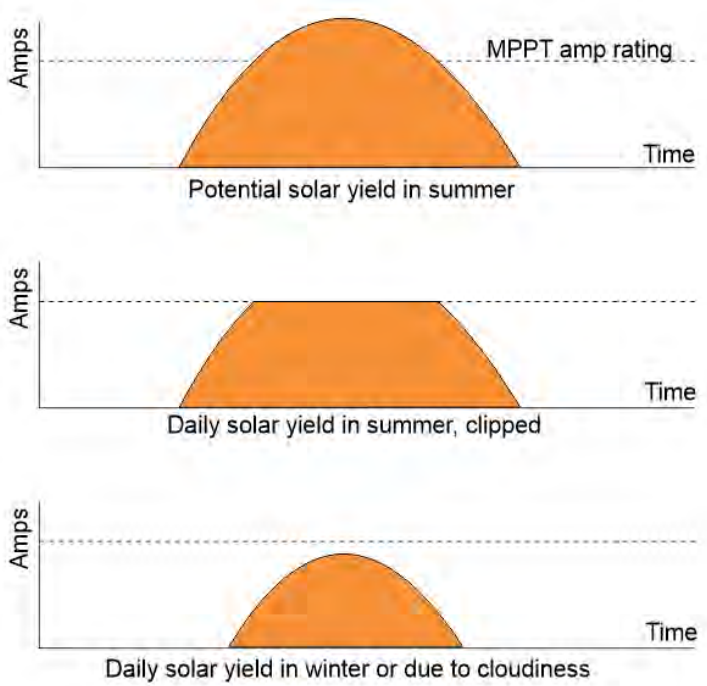


15A x 24V = 360W

Current rating

- The MPPT solar chargers are current limited
- Over current will not cause damage

- Reverse PV overcurrent will cause damage



MC4 connector problems

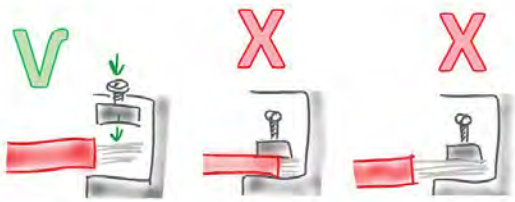
- Not crimped correctly
- Too much current
- Not dividing the current evenly over the 3 MC4 connector pairs
- Solar cable too thin - remember that the current will be higher when the PV voltage is lower
- Follow the datasheet recommendations
- Not warrantable

Burned connectors

Caused by:

- Not tightening screw
- Using wrong cable

•Inserting cable isolation in the connector Not warrantable

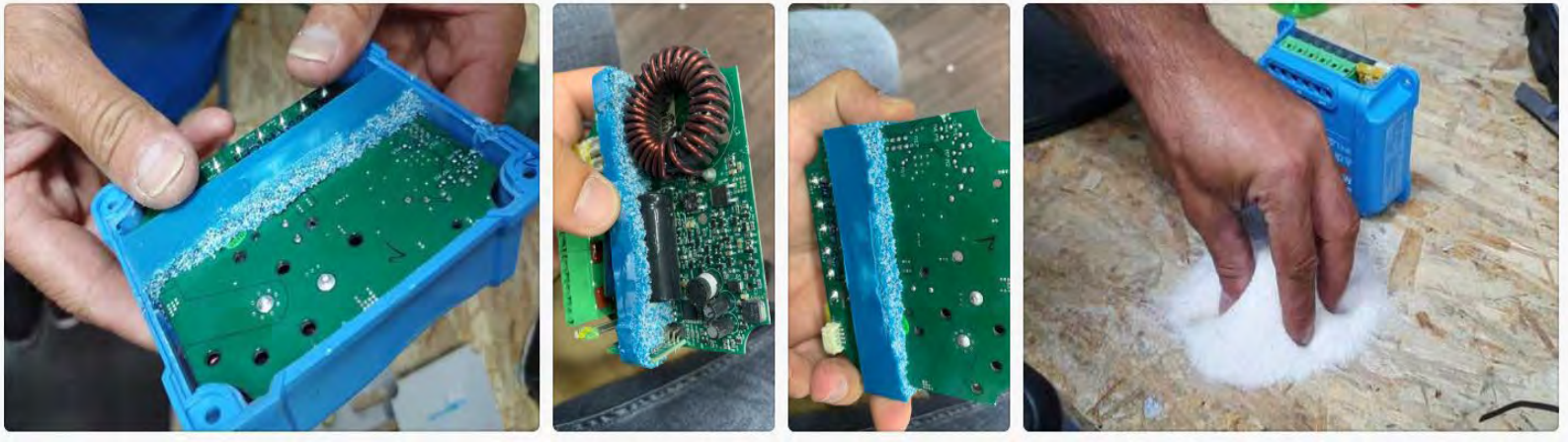


Mechanical damage

- Inspect unit for dents or other types of mechanical damage
- Not warranty

Sand in MPPT 15A

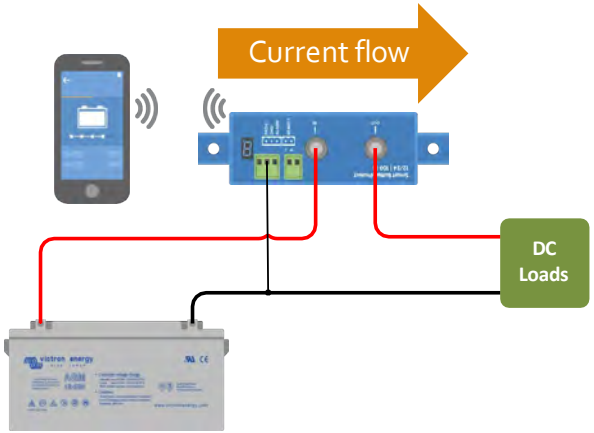
- If a 15A MPPT has been dropped on a concrete floor sand might come out
- Sand is used for cooling a 15A MPPT without sand is the 10A MPPT
- The sand can cause confusion.



8. DC products

Battery Protect

- Short circuit protected - shows E1
- Current limiting - should not get damaged due to overcurrent
- Unidirectional - current can only flow from in to out



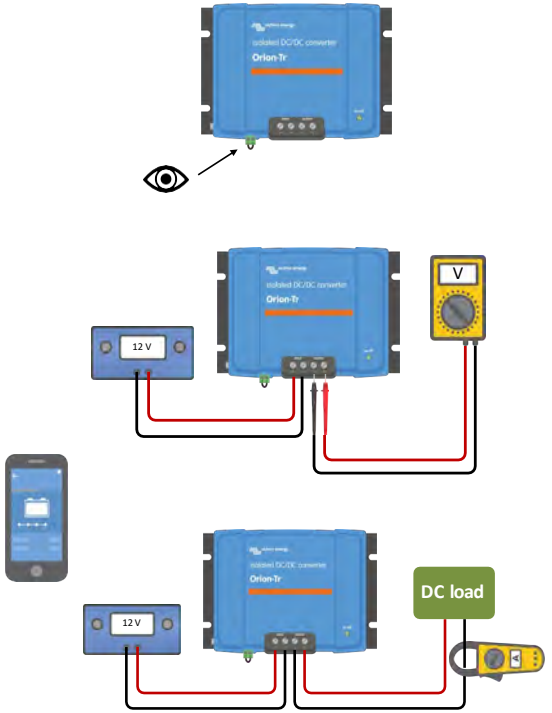
To test

- Connect a voltage to the input side
- Check if the same voltage is present on the output
- Reduce the input voltage and see if output will go to oV
- Does this match the settings?
- If unit does not work, check the remote on/off link
- For smart models, check settings via Victron Connect App

Basic test DC/DC converter

- Visual check
- Is the remote on/off wire placed? (if applicable)
- Power the input side and measure the output voltage
- Connect a DC load to the output and check current
- Connect with VictronConnect (if applicable) and check settings, has perhaps the voltage or current been changed?

- For the Buck Boost converter use it's special software, this is available from the downloads page
- Use a "type A to type B" USB cable

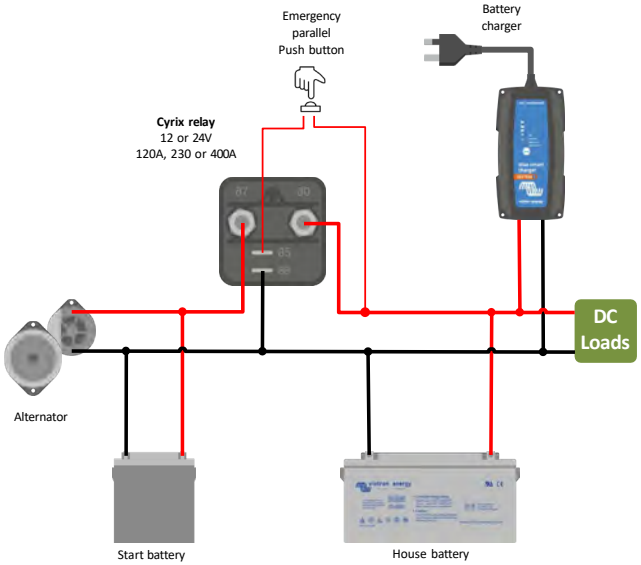


Cyrix

- Do not exceed current rating - check system to find out if this has been the case
- Negative needs to be connected for it to work
- Is perhaps the emergency parallel switch interfering with normal functionality?

To test:

- Connect voltage on one side
- Increase voltage
- See if relay will switch, you should hear a click
- Connect voltage on other side and repeat test



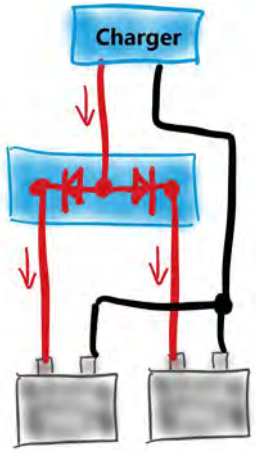
Argo isolator and Argo combiner

- Current ratings need to be adhered to
- Not suitable for 48V
- Dual alternators can cause issues, use two Cyrix instead
- Remember that these products are unidirectional

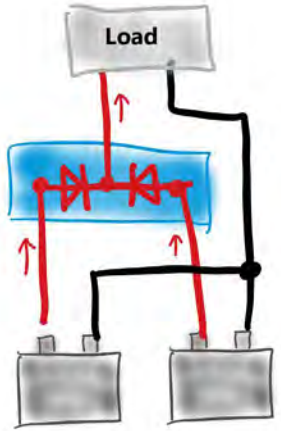
To test:

- Test each diode in both directions
- Then connect input to a DC source
- Check if all outputs work
- There will be a voltage drop over the diodes
  - Diode: 0.3V at low current 0.45V at higher currents
  - FET: 0.01 at low current 0.2V at higher currents

Splitter

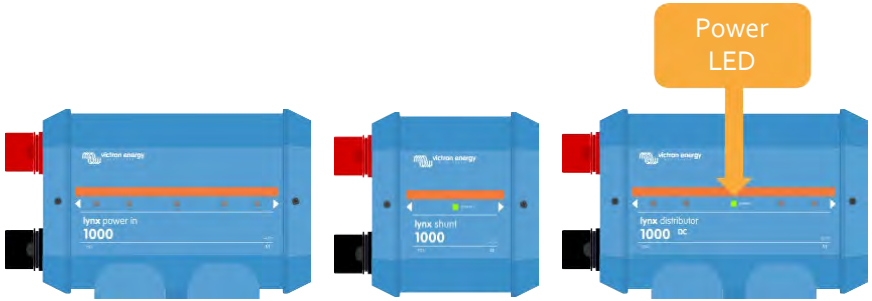


Combiner

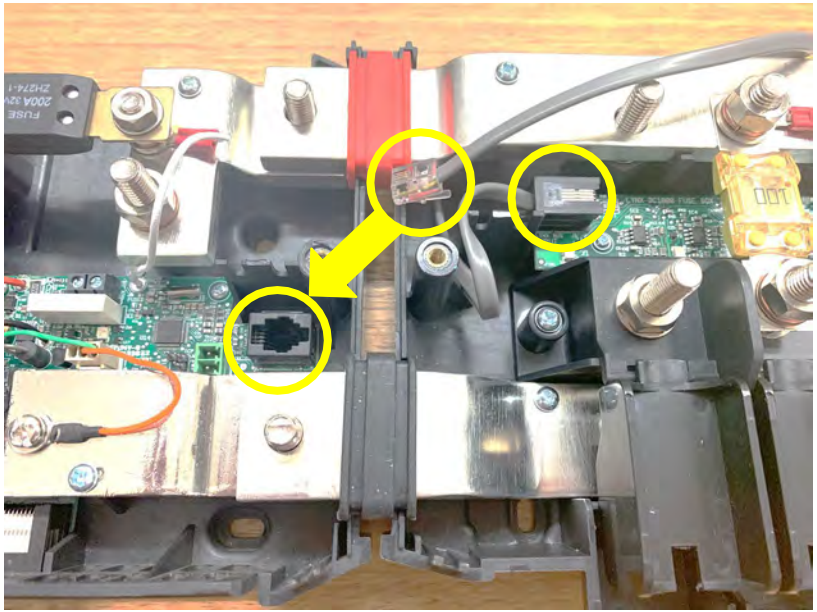


Lynx distributor

- The Lynx distributor needs to be powered from the lynx shunt for the fuse warning lights to work
- When powered the green power LED is on
- Any red LED means that the fuse has blown



Lynx power in | Lynx shunt | Lynx distributor



9. Lithium batteries

New and old LFP batteries

Evolution of our LFP batteries:

Early models:

- LFP without BMS (passive balancing)
- LFP with BMS wires on either side (passive balancing)

2017 onwards:

- LFP Smart with BMS wires on either side (active balancing)
- LFP Smart with wires on one side (active balancing and pre-alarm)

Under and over voltage

Low voltage

- A LFP cell will fail if the voltage over the cell falls to less than 2.5V
- This can cause unrecoverable damage to the cell
- Loads will need to be turned off, or disconnected, in case of low voltage

High voltage

- A LFP cell will fail if the voltage over the cell increases to more than 4.2V
- The battery will melt or burn if the voltage is very high
- In case of high voltage charge sources will need to be turned off or disconnected

Temperatures

High temperatures

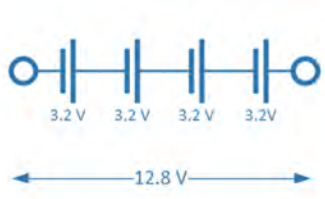
- Lithium batteries will get damaged if the battery is used at temperatures greater than 50°C
- Loads and charge sources need to be disconnected or turned off when the temperature exceeds 50°C

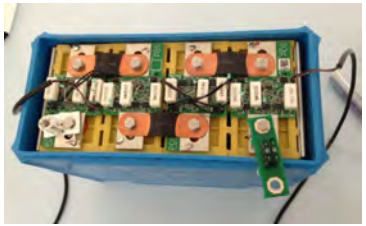
Low temperatures

- LFP batteries will get damaged if they are charged in below zero temperatures (discharge is allowed)
- Charge sources will need to be disconnected or turned off when the battery temperature is less than 5°C

Cell voltages

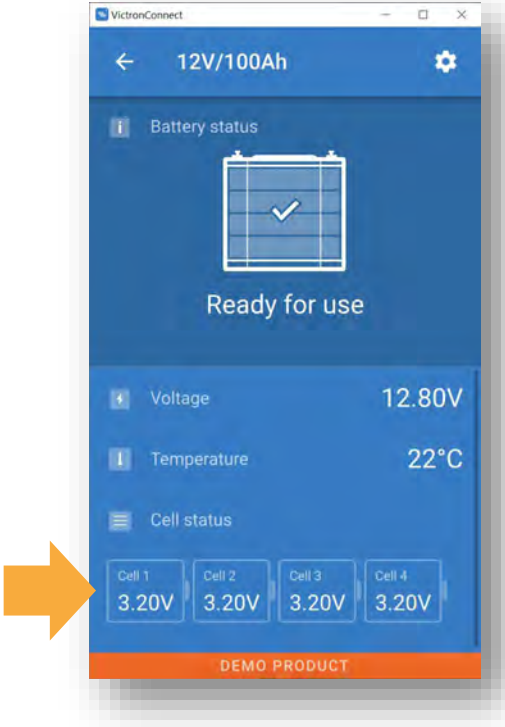
- 12.8V battery has 4 cells in series
- LFP Batteries are not serviceable
- Use VictronConnect to analyse the cell voltages
- A cell will fail if the voltage is less than 2.5V
- Always update firmware if asked to by VictronConnect, and repeat this for all batteries





Non-Smart

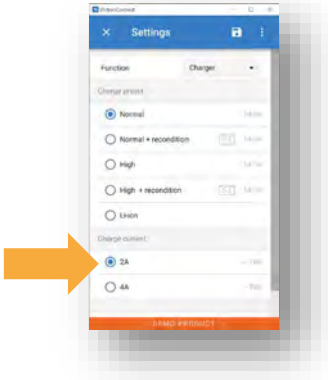
Smart



Recovery after very low battery

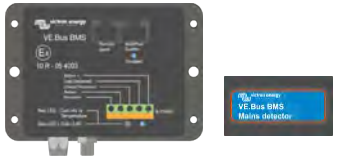
NOTE that this procedure might not always work and there is a realistic chance that the battery is unrecoverable:

- Connect a 12/4 BlueSmart charger and set it to lithium and set current to 2A
- Make note of the starting voltage
- Make note of the voltages at regular intervals
- Leave the charger connected and see if the voltage slowly increases
- Leave the charger connected for 24 hours
- Once the battery has reached 13.6 V disconnect the charger
- Let the battery sit for a few hours
- Check the voltage of the battery, it should comfortable sit above 12.8 V like 13.2V or higher
- If the voltage is below 12.8 wait 24 hours and measure again
- if voltage is even lower the battery is unrecoverable damaged



An external BMS is always needed

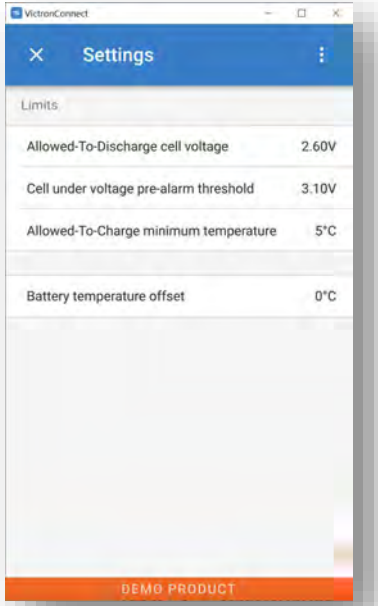
- VE.Bus BMS with mains detector
- Mini BMS
- BMS 12-200
- Smart BMS CL 12/100 with Bluetooth



How does the BMS work

- The battery takes care of active cell balancing during charging
- Each battery cell has a voltage and temperature sensor
- These are all connected in series to the BMS

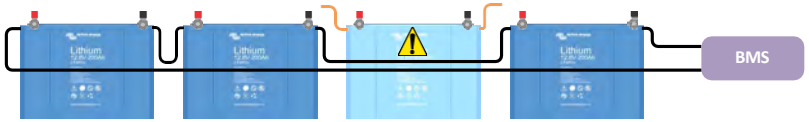
- An alarm signal will be send to the BMS when:
  - Cell voltage too low: 2.6V (can be increased with VC)
  - Cell Voltage pre-alarm signal (can be set to 2.8V and up with VC)
  - Cell voltage too high: 3.75V
  - Temperature too low : 5°C (can be changed with VC, less than 5°C will void warranty)
  - Temperature too high: 75°C



Trouble shooting BMS and batteries

- To test if the BMS is functional, disconnect the BMS communication cable and see if the BMS will go into alarm mode

- Non-smart battery: to rule out an issue with a individual battery, bypass the battery communication and see if the BMS alarm goes away



- Smart battery: use the VictronConnect
- In case of connection issues and the battery is not visible, try another device to see if the App is working
- Be aware that it could be that Bluetooth has been disabled, this is irreversible

Before lodging a warranty claim

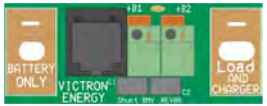
- It is hard to tell what happened to the battery
- If a battery monitor is in the system look at the history before deciding to lodge a RMA

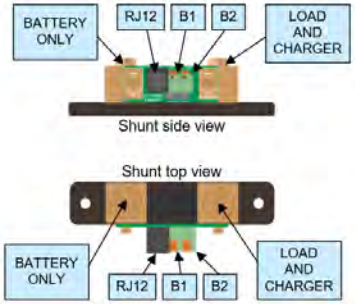
- No warranty if no BMS
- No warranty if batteries have been totally discharged or charged below 5°C
- How many cycles?
- Deepest and average discharge (should not be lower than 10% Soc)
- Max voltage, number of full discharges
- User abuse is not warranty
- Lithium battery warranty is 3 years

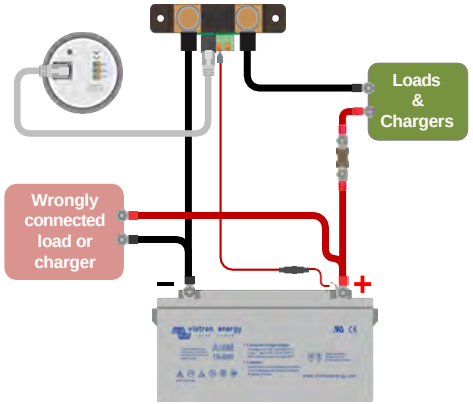
10. Monitoring and control

Common Battery monitor support issues

- Corroded shunt board
- Shunt connected the wrong way around
- DC loads or charge sources are bypassing the shunt
- The shunt board screws are used to connect DC loads or chargers to, rather than using the shunt bolts
- Fuse in one of the red cables blown
- B1 and B2 connection swapped
- Incorrect settings
- Broken or damaged UTP cable
- Bluetooth issues
- Display damaged, wet or too much UV exposure

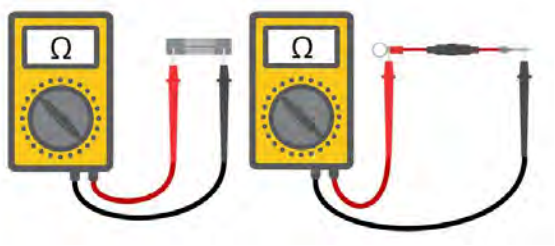


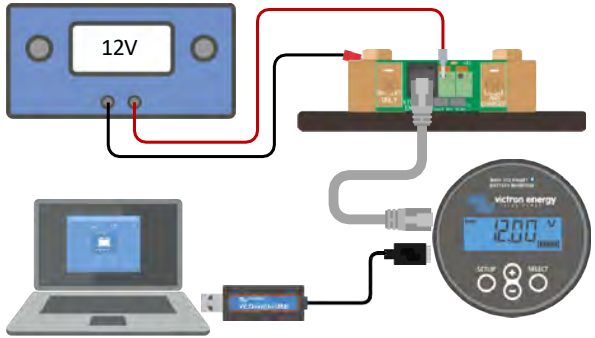




Battery monitor test procedure

- Visual check
- Check the fuse in the red power cable(s)
- Check the RJ12 cable with a cable tester
- Power up and check voltage and current reading
- Connect with VictronConnect
- Update firmware
- Check if settings are correct
- Display check (if applicable)
- Bluetooth check (if applicable)
- We will replace shunt boards or head units rather than the whole BMV kit



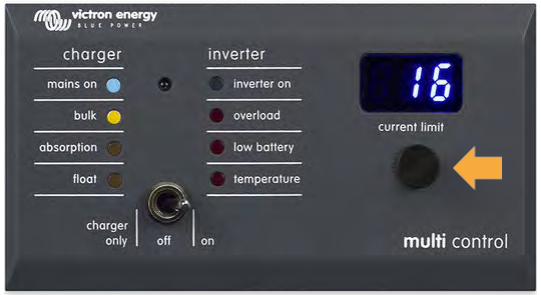


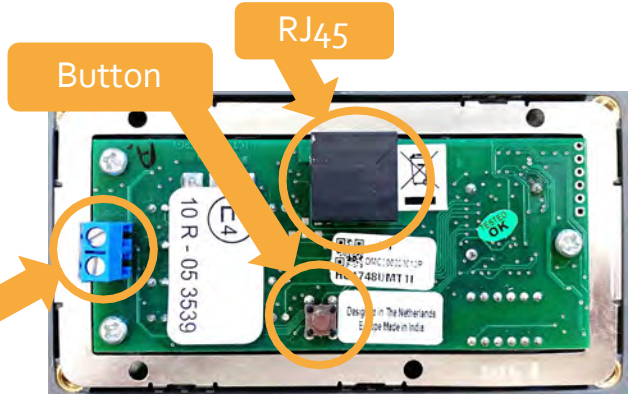
Multi control - common issues

- Damaged or missing current limit knob

- The UTP connector is a right angle connector
- It is not easy to get the RJ45 connector in and connector might get damaged when mistreated

- Button on the back is for manual programming
- Take care not to accidentally have it touching anything after the panel has been installed
- Do not forget that the MultiControl panel has a dedicated manual





Smart product with Bluetooth issues

- It is highly unlikely that the Bluetooth module is broken
- For connection issues see the VictronConnect Manual

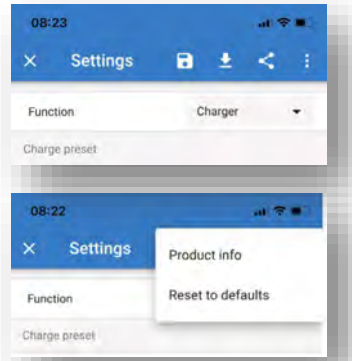
Some pointers:

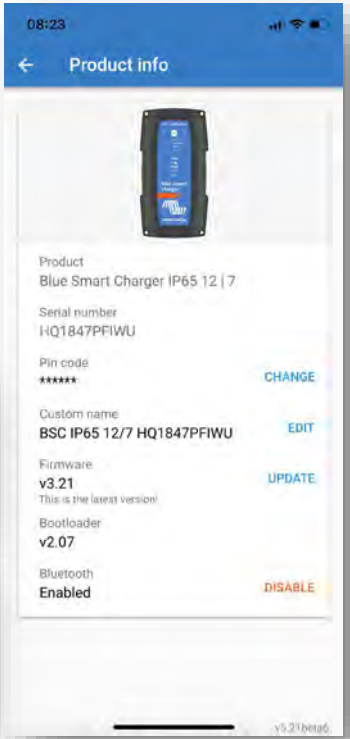
- Has Bluetooth been disabled by the customer?
- Is the PIN-code lost?
- Is there an issue with an Android phone?
- Windows Bluetooth is not supported
- Out of range or located inside a metal enclosure?
- If unable to connect with Bluetooth try to connect via USB

Updating firmware, save settings and reset settings

- Firmware needs to be updated prior to lodging a warranty claim
- This to rule out that the product fault is due to a firmware bug
- If you update firmware, write down the old version, then update and then write down the new version
- There are two firmwares in a Smart product, the Bluetooth interface firmware and the product firmware

- Bad settings could be a cause of a product fault
- Save existing file (so you have proof)
- Then set settings to default





GX device and VRM

- CCGX blue screen or logo screen, do a firmware update or manual one via SD card
- It is possible to revert to a previous firmware version
- Internet connection issues and VRM problems
- Screen issues, button issues or casing loose
- Does not power up
- Reverse polarity will normally not break a GX device, but it can cause problems if the reverse polarity exists for a long time.
- For more info and troubleshooting help see one of the GX devices manuals. Follow this link: [GX device start page]

Network, computer and communication issues

- These are out of our direct control
- It depends on the quality of the customer's computer and their network …
- … and on the customers computer and network skills

Examples of these are:

- Network issues
- Firewalls
- Bad Wi-Fi
- Older Android devices
- Company laptop limitations

11. Technical Support

Need support?

Level 1 Support - Self Help

1. Perform a system check
2. Update The Firmware
3. Read the manual
4. search on Victron community

Level 2 Support – Master Instruments Sales Desk

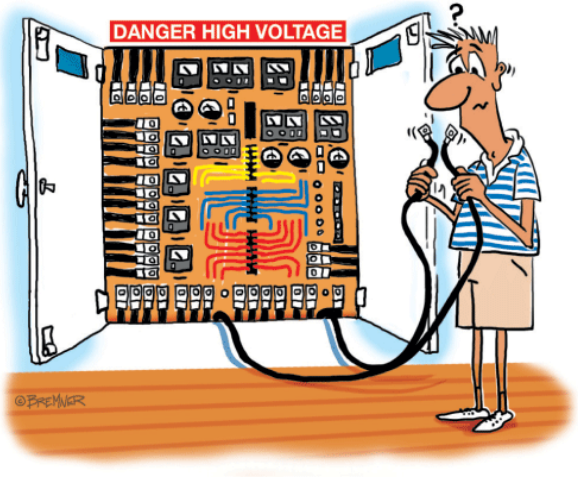
1. Download the MI RMA test & Diagnostic Procedures
   If a Warranty submit the completed RMA on the MI Link RGA Portal
   If unresolved go to Level3.

Level 3 Support – Master Instruments Technical support

Level 4 Support – Master Instruments Engineering Support

Level 5 Support – Master Instruments Engineers Request Victron Local Support

Level 6 Support – Master Instruments Engineers Request Victron Level 3 Head Office Support



Before seeking Level 3 support

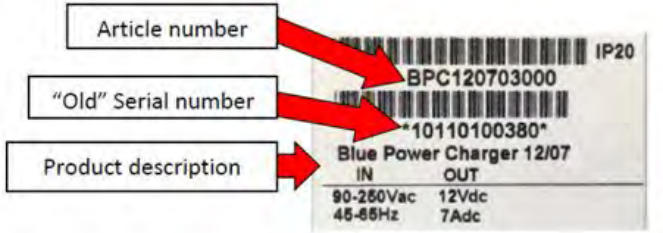
- Follow Level 1 & 2 Protocols
- Save a copy of all VEConfigure and VictronConnect settings
- Get the VRM site details
- Describe the system and list the system components
- Provide a system diagram
- Make photos of the system, batteries and the wiring
- Describe the fault and the exact steps to re-create the problem and the behaviour you are seeing
- Make note of alarm LEDs and/or GX device error codes
- Describe what you have already tried

12. MI Link RGA
Warranty and repairs

Warranty length and age of unit

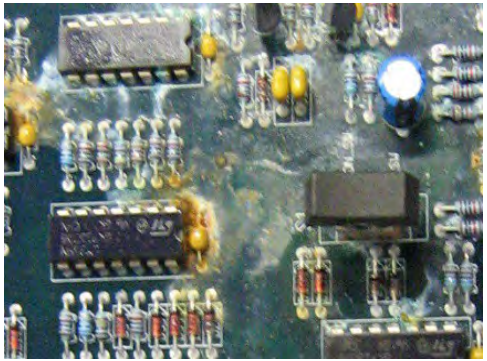
- Li-ion batteries - 3 year limited warranty
- Other batteries - 2 year limited warranty
- All other products - 5 year limited warranty
- All other products - For a 10% surcharge we can offer a 10 year warranty

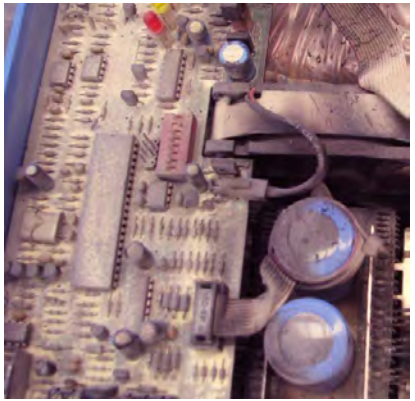
- To find age of unit look at the invoice date,
- Alternatively to get a rough idea of age , look at the serial number
- The first two numbers stand for the production year and the next two numbers stand for the production week



Non warrantable

- Older than 5 years
- Corrosion, dust, dirt or water ingress
- Damaged or incomplete wiring or burned connectors
- Broken or missing fuses
- Internal or external mechanical damage
- Vermin or pests entering unit
- Metallic objects inside unit, like bits of stripped wire, metal shavings or loose screw, bolts and so on
- Lightning strikes or power surges





Warranty claim fault description

Click HERE to lodge a MI RGA

- Attach the completed Victron RMA document
- Include the part number, the serial number and the firmware number
- Describe the fault & The Page in the RMA used to identify it
- Provide a photo if that will help you explain the fault
- If a GX device displays an error message include this in the fault description
- If the system is on VRM, include the VRM details

Packaging

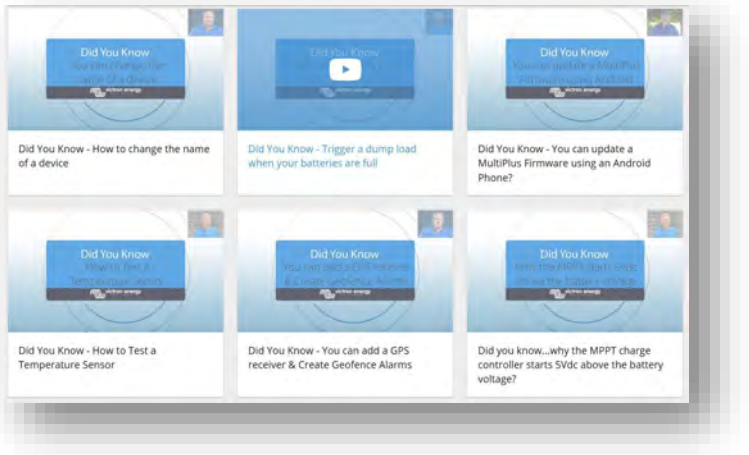
- Where possible, use the original box
- Do not add the manual, mounting accessories and not original cables
- Packages over 25 kg must be shipped on a pallet, with the back of the unit lying down

13. Training and more information

Useful links

Documents:

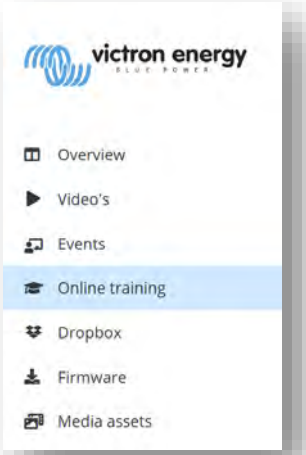
- Wiring unlimited book
- VE.Bus error codes
- Victron Community
- Victron support page
- Performing a system check



Videos:

- Diagnosing inverter overload
- Why MPPT 5Vdc above battery
- And many more videos on Victron professional

Victron Professional Training



Training is available in a variety of languages:

victron energy
BLUE POWER






Energy. Anytime. Anywhere.