



SK48V100 Owner & Operator's Manual



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About this Manual

Use of this Manual

This manual is not a substitution for proper training. The intended use of this manual is to provide guidance and reference for the use of products sold by and associated with SOK Battery NZ, LLC. All materials mentioned in this Training Manual range in technicality and require varying competency levels and expertise. Therefore it is recommended to seek proper training before using products seen and mentioned in the training manual.

Reading and understanding all safety guidelines and instructions is essential before use, connection, installation, or maintenance. Failure to comply with the policies and instructions can lead to property damage, injury, and/or death. Remember that past performance is not indicative of future results. The many variables in the materials listed in these training documents can be unpredictable if not managed and maintained correctly.

This manual does not cover all details or variations in the equipment. It does not claim to provide every possible contingency met in connection, installation, operation, and maintenance. Please contact the SOK Battery NZ, LLC. Support Team if further information is desired or problems arise. SOK Battery NZ, LLC. will not be held liable for damages or injuries sustained from improper use of the above-mentioned.

We thank you for the continued use of SOK Battery NZ, LLC. as your resource, and we hope this Training Manual will better assist you in understanding your project and enable you to meet your goals.

Printing

This manual is not intended to be printed on paper, as sections of this manual are interactive and will not function when printed on physical media. For the best user experience, you should refer to the web version of this page directly.

Introduction

Manufacturer's Background

SOK Battery is a dedicated LiFePO₄ manufacturer based out of Zhuhai, China. SOK has a long history of delivering both the highest quality battery and safest overall design at a value conscious price point. This trend continues with the release of the SK48V100, a true Grade A+ Lithium Iron Phosphate (LiFePO₄) battery pack designed to be easily installed into standard 19" EIA server-rack type battery enclosures or the custom-built SOK Server Rack.

A 16S (48v nominal) 5.12 kW-h LiFePO₄ battery bank is paired with a digital battery management system (BMS), to provide automated and maintenance free battery operation, with a typical lifespan of over 4000 cycles. The assembly features full CAN bus & RS485 protocols to pair with most common 48V inverters, as well as RS-232 control for PC configuration.

Use Applications

The SK48V100 battery is ideal for medium to large-scale off-grid and grid-interactive energy storage systems (ESS), telecom & server room backup, as well as mobile installations requiring a 48v battery.

Applications that require reliability, expandability, quality, safety, and serviceability are well-suited for this battery array. The SK48V100 can communicate with up to 15 modules per master battery, for a total system size of 76.8 kW-h per battery cluster. In special circumstances, multiple battery clusters may be interconnected for even larger centrally managed systems.

Advantages

The SOK engineers plan future serviceability into the initial design of all battery assemblies. On rare occasion, products in the real world can fail, depending on the usage, environment, and build quality. Failures can be caused by shipping damage, installer error, downstream equipment malfunction, natural aging, and unavoidable environmental factors such as lightning.



Competing batteries on the market are not designed for serviceability, being permanently assembled using techniques such as IR-Laser Welding of aluminum cell-interconnection busbars, plastic injection-molded cases, and permanent epoxy potting. These processes are great for single-use disposable products, but a poor choice for systems expected to last decades. When parts within these permanently assembled packs fail, the entire module is rendered useless and needs to be disposed of as E-waste and replaced as a complete unit. Any attempt to service would certainly void your warranty and the likelihood of a successful service is slim to none.

SOK Battery believes that these products are an investment and should not be thrown away if something goes wrong; products should withstand the test of time. The SOK Battery SK48V100 is engineered so that every single part within the battery pack can be field serviced and replaced by either an authorized service agent, or the end customer. This means less downtime and lower repair costs to the end-customer, as well as a decreased environmental impact.

SOK Battery is the leader in battery technology, paving the way for many battery manufacturers to follow.

Specifications

Electrical Properties	
Model	SK48v100
Nominal Voltage	51.2 (48v Range)
Nominal Capacity	100Ah
Run Time at 20A Load (~1000w)	300 Minutes
Energy	5120Wh
Self Discharge	< 3% per month (BMS Off) ~2% per day (BMS On)
Max Batteries in Series	1
Max Batteries in Parallel (with BMS communication)	15*
Maximum Terminal Feedthrough Current	350 Amps
Discharge Performance	
Max Continuous Discharge Current	100A (1C)
Peak Discharge Current	125A (3 Seconds, automatic shutdown)
Short Circuit Protection	300a, 200µs
BMS Low-Voltage Disconnect	46v
BMS Low-Voltage recover	48v
Charge Performance	
Recommended Charge Current	0~63A
Maximum Charge Current (Continuous)	100A
Recommended Charge (Absorption) Voltage	57.6
BMS Cell Protection Voltage	3.7v
BMS Pack Protection Voltage	>58.2v
Temperature Performance	
Discharge Temperature	-4°F - 140°F
Charge Temperature	32°F - 113°F
Storage Temperature	23°F - 95°F
Low Temperature Charge Protection	Yes
Internal Temperature Sensors	4 Cell Sensors, 1 BMS Sensor, 1 Ambient Air Sensor
Maximum Elevation	13000 Ft
Physical Properties	
Case Material	Powder-Coated Steel
Rack Mountable	Yes, 4U
Dimensions	
Width: 17.5in (Without ears - Fits standard 19" rack with ears installed)	
Height: 7in (4 rack units)	
Depth: 18in + 1 1/4" for handles / terminals	
Unit Weight	45 Kg
Weather Rating	IP20
Shipping Classification	UN3480, Class 9, MSDS

Listings & Certifications

UL 1973 (Battery) certification:

UL Standard 1973, Batteries for Use in Light Electric Rail (LER) and Stationary Applications (UL 1973), is a safety standard for stationary batteries for energy storage applications that is not specific to any one battery technology or chemistry, and can apply to Li-ion battery ESSs, as well as ESSs using other battery chemistry.

The SK48v100 has been tested by Intertek Laboratories and has been certified to conform to UL 1973 standards.

UL 9540 (ESS) certification:

UL 9540 is a safety standard for an energy storage system (ESS) and equipment intended for connection to a local utility grid or standalone application. It designates key issues associated with ESS. UL9540 certification is currently in progress. The time for completion is not currently set in stone, but is targeted for mid 2023.

UL 9540A (Fire) certification

UL 9540A is the Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, to help manufacturers have a means of proving compliance with the new regulations. UL9540A testing is complete and we are awaiting the final report. Check back in a few weeks for an update.

California "CEC" Approval

The SK48v100 is not currently listed by the California Energy Commission as approved for use within the state for on-grid installations. We cannot submit our application for this list until UL9540 testing has been completed, which is required for submittal for listing on the CEC database. Once we receive the UL9540 certification, we will have our application submitted. You can view the approved equipment list here: <https://solarequipment.energy.ca.gov/Home/BatteryList>

Why is UL listing important?

Local AHJ's (authority having jurisdiction) have begun adopting 2017 NEC that requires batteries and energy storage system to be listed. This excludes non-listed packs from being used in a system that is code-compliant (permitted). Since the SK48v100 is listed to UL 1973 standards, it can be used in most jurisdictions. Recent regulation has started requiring UL9540 testing in addition to UL1973 testing, however adoption has been slow, so be sure to confirm with your local AHJ.

Even if a system is not required to be permitted, insurance providers may deny a claim for damages to property or people if an unlisted system is involved in a claim, even if the unlisted system is not the cause of such claims.

Shipping & Receiving

Allowable Shipping Methods

Due to the nature of these batteries, they must be shipped by truck freight both to the customer as well as any returns to SOK Battery NZ. Each unit is over 100lbs, which excludes typical ground methods such as FedEx / UPS.

Hazmat Certifications

The SK48v100 server rack battery is a Lithium battery. Despite the inherent safety of LiFePO4 chemistry, Lithium batteries are considered class 9 hazardous materials and require appropriate UN3480 lithium battery handling & labeling. This means they cannot be transported on passenger aircraft or through the US Postal Service and must be packaged appropriately. If you need to ship your batteries for any reason, please contact SOK Battery NZ in advance for assistance with shipping.

Freight Forwarder Documents

If you choose to utilize a freight forwarder, you will need the MSDS and the Dangerous Goods Certificate. SOK Battery NZ will only ship and provide transportation to addresses located within the Contiguous US. Customers may choose to utilize a Freight forwarders address for the delivery address on their order located within the Contiguous US. Once SOK Battery NZ has delivered the product to the address provided by the customer, all liability and responsibility shifts from SOK Battery NZ to the customer. Freight Forwarding is not a service we offer assistance, recommendations, or will fill out any additional documents pertaining to HAZMAT other than what is already provided. The customer and Freight forwarder will be responsible for any other items, documents, or information regarding the forwarding of your order. The customer and Freight Forwarder will be responsible for communicating, and arranging any and all other necessary information to successfully forward your order. The MSDS and Dangerous Good Certificate are included within this section for your convenience. Often times, Freight forwarders will require other HAZMAT information and documents to be completed depending on if the shipment is going via Air (IATA) or Boat (IMDG), these HAZMAT requirements are not something we specialize in or can help with. We are specialized in Ground (49CFR) but cannot provide additional information or fill out additional documents pertaining to forwarded shipments. These documents will need to be executed between the forwarder and customer directly. Most Freight Forwarders will have correct HAZMAT templates depending on the mode of transportation, and evaluate the shipment to provide the correct HAZMAT documents for transit. Often times, there is an additional fee for this so please plan your shipment accordingly and make sure to communicate with your forwarder. SOK Battery NZ cannot guarantee the different modes of transportation a Freight Forwarder utilizes, or the various HAZMAT regulations required for each individual shipment that need to be properly documented and followed, and if the forwarder follows these regulations. This is why we do not offer any assistance, recommendations, and will not fill out any additional documents pertaining to HAZMAT, as these rules and regulations are very strict. All Forwarding will be at the sole responsibility and liability of the customer, handled completely between the customer and the Freight Forwarder.

Packaging

Your new lithium battery is packaged using special materials to meet transportation standards. Please retain a set of this material should you need to pack and send your battery in the future e.g. for relocation or warranty claims. If the original packaging is not available, please contact your place of purchase or SOK Battery NZ to order a replacement set.

Each box is conveniently built with 2 hand-holes on each side because each box must be lifted by two people to relocate into the unboxing location. To protect the product, keep it in the original box until the time of permanent installation.

- **Batteries are heavy! Team lift ONLY.**
- **If any strong smells are present, it could indicate internal damage. Stop and contact your place of purchase immediately**
- **Use a multimeter and measure from each terminal to the case to ensure that no internal damage has occurred in shipping**

Inspecting for damage

Carefully inspect the boxes inside and out for any dents, crushed cardboard/foam or strange odors. If any of these are observed, stop and contact your place of purchase

Removing batteries from boxes

The safest way to remove the battery from the box is to open the top of the box, remove the accessories & foam inserts, then carefully cut along the 4 vertical edges with a box cutter making sure not to cut/scratch any of the product inside. Fold down the 4 sides to create access space for two people to safely pick up the battery. The battery can then be carried by the two handles on the front. It can be moved in any orientation except for upside-down (top lid facing toward the ground).

Testing

After unboxing, we highly recommend that you power on the BMS per the power-up procedure covered later in this manual to make sure your battery is fully functional at the time of receipt. If you have a product that is dead-on-arrival (DOA) then contact your place of purchase to start a warranty claim.

Notice: We have isolated a situation in which internal damage has caused DC voltage to be present on the case of the batteries leading to difficult-to-trace faults. When unboxing, use a multimeter and measure from each terminal to one of the case screws to ensure that no internal damage has occurred. If you intend to use rack ears, install them before performing this test. If voltage is present, STOP IMMEDIATELY and contact SOK Battery NZ before continuing.

Installation: Planning your location

Protected From Damage

Batteries and solar components (Inverters) should be located in secure locations not subject to physical damage. Batteries installed in garages must be protected with bollards or similar to prevent damage caused by a vehicle collision.

Moisture / Humidity

As for most electronics, extreme humidity & condensation is not good for long term performance or integrity. Avoid environments that have condensing humidity and be especially cautious in locations near the ocean where salt spray may be present, as this can cause accelerated degradation that wouldn't be covered by warranty. If a high humidity application is expected, install the batteries in a sealed / outdoor rated enclosure.

Proximity to Equipment

When compared to AC wiring, Low-voltage DC systems are very susceptible to voltage drop. Long cable runs between batteries and inverters can lead to premature low-voltage shutdown when heavy loads are turned on. For optimal performance, keep your batteries as close to your inverter/charge controllers as possible.

Temperature

LiFePO4 batteries generally have a very strong tolerance to varying temperatures. However, if you install these batteries in extreme environments their performance and operation may be internally limited. Additional environmental consideration should be taken based on your climate.

Extreme Cold Charging

The SK48v100 battery is equipped with 6 temperature sensors – 4 of them measure the temperature of the cells, 1 measures the temperature of the high-power section of the BMS, and the final sensor is an environmental temperature sensor. These sensors are important for controlling the operation of the BMS, since charging in extreme cold is bad for the longevity of the cells. If any of the 6 sensors detect a temperature below -5°C (23°F), then the BMS will stop allowing charge to enter the battery, while simultaneously still allowing discharge to occur, if demands require discharging.

Extreme Cold Discharging

Contrary to charging, discharging in extreme cold does not present a risk to the cells quite like charging does. The battery can safely discharge down to -20°C (-4°F), although you may notice a reduced capacity (as much as 40% below its rating) and discharging at a voltage lower than normal. Once the battery returns to a normal temperature, this capacity will be restored and the voltage will cycle as expected. As strange as it may seem, if discharging in temperatures below 32°F , you may observe the voltage increasing as the battery is emptied. This is caused by the small amount of heat inside of the cells freeing up the flow of ions through the electrolyte inside the cells. Here is a very in-depth study in case you are interested: https://mdpi-res.com/d_attachmen...

Heat

This product is not a notable source of heat. It can operate without active cooling in most environments. The battery can charge in ambient temperatures up to 113°F and discharge in temperatures up to 140°F. The built-in BMS will automatically prevent charging / discharging in environments not suited for operation. Never exceed an ambient temperature of 150°F.

Installation: Mounting Batteries

Mounting without racks

This battery is very versatile, and can be used in many applications aside from the typical server rack use. Should you choose not to use the rack, there are many different orientations you can use the battery. When determining a location for installation, you must pay special attention to make sure the battery cannot fall, bounce, or slide, or otherwise move.

Battery Orientation – Stationary

In a stationary application, the SOK 48v battery can be installed in any orientation with the exception of upside down, as viewed from the front panel. This means installation on-end, sideways or even face down would be perfectly acceptable.

Battery Orientation – Mobile Application

In a mobile application, vibration and jarring is a much bigger concern. For this reason, we recommend installing the battery flat. When we say flat, we mean exactly how it would be oriented when installed into a server-rack.

Stacking

The batteries may be stacked without a rack up to 3 units high. Further stacking poses a crush hazard to the battery on the bottom. When stacking without a rack, it is essential that the batteries be secured in such a fashion that they do not slide off of each other.

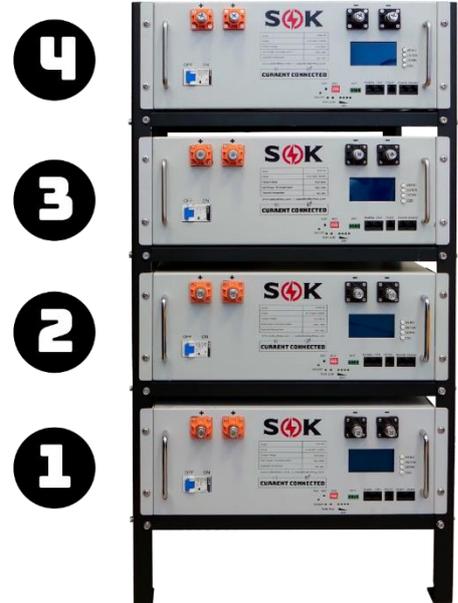
Author's Note: Design changes are being implemented to future production of this battery that will allow for significantly improved use without a rack. Until these changes have been finalized, this will remain as a placeholder for direction regarding the new design implementations.

Installing in Racks

Rack Stability

To prevent a tip over hazard, racks of all types should always be loaded from bottom to top, as illustrated in the diagram. Battery racks & server racks containing batteries must be anchored to the floor and have added earthquake brackets to prevent being tipped over. Not all manufacturers include outriggers or other means of appropriate tip-prevention, but they must be added for safe installation.

Since the SOK Battery can fit into a wide variety of standard EIA racks, we cannot predict the implications of every possible installation. Common sense must be exercised by the installer to ensure safe practice, such as keeping the center of gravity low and remaining within the weight rating of the rack the batteries are installed in.



SOK Battery Racks

SOK Battery currently offers a 5-slot open-frame rack. This 5-slot rack has its own documentation available: [SOK 5 Slot Rack Assembly & Installation Manual](#)

19" EIA Server Racks

When using a third-party EIA server rack for your batteries, you must use rails at minimum (full metal rack shelf is preferred) to support the full weight of the battery. The front rack ears are only meant for preventing the battery from sliding out of the front of the rack. Damage caused by opting out of using rack rails is not covered by warranty.

Batteries can be installed with one battery directly above another without a rack space between them (no cooling requirement).

Caution

The front rack ears are only meant for preventing the battery from sliding out the front of the rack.

Rack is to be securely bolted to the floor using concrete bolts or through bolts. It is also possible to supplement the bottom bolt by securing the rack at the top to the wall.

Powerup, Inverter Pre-Charge & Shutdown

Inrush Current Risk

Common in Inverters, battery chargers, and solar controllers is a sizable bank of capacitors on their DC bus to smooth out any ripple that may cause interference with normal operation.

When you apply a voltage across a capacitor it initially appears to be a short-circuit, that is, the voltage across the capacitor is zero and the ability to pass current is infinite. If there is very little resistance in the circuit, such as the instant action closing of a circuit breaker, then the current will be extremely high for a brief instant while the capacitors charge. LiFePO4 Batteries in general have a very low internal resistance, especially when compared to lead-acid batteries. This means that it is easy for very large currents to be delivered instantaneously.

The sudden high current (known as an inrush current) can cause damage to various components such as circuit breakers, fuses, BMS units, and the capacitors themselves. Unrestricted, this inrush current will certainly exceed the current ratings of the equipment involved.

How to limit inrush current

High inrush currents can be prevented using a pre-charge resistor. The pre-charge resistor allows the capacitors in the controller to slowly charge BEFORE the low-resistance circuit is in place. This means that the powering-up of inverters and chargers is regulated and graceful, rather than abrupt and volatile. A pre-charge resistor can be built into an automatic circuit or used manually.

Built In Automatic Pre-Charge Circuit

The SK48v100 contains an internal, automatic pre-charge Circuit that can safely startup most systems. In order to properly utilize the pre-charge circuit, you must take special care to follow the power-up steps below in the correct order, otherwise the benefits of having a pre-charge circuit are negated.

Since very large capacitor banks and short circuits look identical, the automatic pre-charge circuit in the SK48v100 battery has a limitation in terms of how big of an inverter can be pre-charged before the battery considers the system to have a short-circuit fault. Most inverters 10,000w and smaller are no problem for the built-in precharge circuit, however, systems with larger inverters and/or stacked inverters (parallel) are above the limit of the built-in pre-charge circuit and must be manually pre-charged. NOTE: Systems using a single Sol-Ark 12k or 15k as well as the EG4-18k are within the capability of the built-in circuit.

Warning: The automatic pre-charge circuit only works during the power-up procedure of the BMS. If you shut off any 48v DC switches, trip any 48v DC breakers, or blow a fuse during operation, the system must be fully shut down and the pre-charge

process must be repeated, otherwise damage from inrush current will occur. Inrush damage is not covered under warranty.

Power-Up procedure (using automatic pre-charge)

Whenever working with electrical systems, proper PPE must be worn, including safety glasses, insulating gloves, closed toe-shoes, etc. otherwise personal injury may occur if your system is miswired.

1. Thoroughly inspect the system for any miswiring (loose connections, short circuits, reverse polarity) and correct any issues before proceeding
2. Confirm all DC circuit breakers and switches in the system are in the “OFF” (open) position – Typically they should already be off during the wiring process.
3. Ensure the BMS(s) in all batteries have been de-activated – this means none of the LED lights on the front panel are illuminated.
 - a. If the BMS is active, you can turn it off by pressing and holding the “RST” button with a small screwdriver or similar object for approximately 3 seconds, releasing the button when the SOC% lights begin to flash. A few seconds after releasing, all lights and the display will turn off, which indicates the battery has shut down.
4. Turn on (close) all DC breakers and switches in the battery system. This includes turning on the DC breaker located on the front panel of all the SK48v100 unit(s).
5. Briefly press the “RST” button of any battery. This will immediately engage the pre-charge circuit of that battery, which will charge any capacitors in the system. After pre-charging is complete, the pre-charge circuit will be automatically disengaged and the main power circuit will be enabled.
6. If additional batteries in the system have not turned on automatically when the first battery was turned on, turn them on now by briefly pressing their “RST” button.
7. If none of the red “ALM” lights have illuminated, the system is now ready for use.

If however, you follow the process and it triggers the “ALM” light, this means you have triggered short-circuit protection. You will need to turn off the DC breaker on the battery, wait 60 seconds for the protection to automatically clear, power down the BMS as mentioned in step 2, and then repeat this process. If after two tries you continue to trigger short-circuit protection, your inverter is beyond the circuit’s capability and must be manually pre-charged as described in the next section.

Power-Up procedure (manually pre-charging)

For the manual pre-charge procedure, you will need approximately a resistor between 10 and 30 ohms, rated at 10 watts or greater. These are readily available: [Amazon.com](https://www.amazon.com) [Mouser.com](https://www.mouser.com)

You will also want to use insulated tools during this process.

1. Thoroughly inspect the system for any miswiring (loose connections, short circuits, reverse polarity) and correct any issues before proceeding.
2. Assuming all cables have already been installed, you will need to disconnect one of the main negative cables leading to your battery bank.
3. Switch all 48v DC circuit breakers and/or disconnect to the "ON" position, EXCEPT the breakers located on the front plate of the SK48v100 batteries. Do not turn on the on/off toggle switches on your system.
4. Press the "RST" button on one of the SK48v100 batteries to power on the BMS, making sure to keep the DC breaker on this battery in the off position.
5. Hold your pre-charge resistor with one side making connection to the main negative cable you removed in step 2, and the other side touching the negative terminal the cable would normally connect to
6. Turn on the DC breaker on the front of the the SK48v100 and wait for 15 seconds.
7. With the breaker still on, quickly remove the pre-charge resistor and make the final connection, torque to spec (15 ft·lbs).
8. Now, you may turn on the DC breakers and BMSs in the rest of the batteries as described previously. You may now use your system.

Manual Shutdown Procedure

Other Equipment:

Most solar controllers require the PV source be disconnected prior to shutting down or disconnecting batteries. Similarly, best practice is to turn off all loads on an inverter prior to turning it off. Since every installation is different, we can't anticipate which auxiliary items you may have, and which devices must be powered off before disconnecting your batteries. We expect you to use good judgement and turn these devices off prior to starting this shutdown process.

Procedure:

Remove all loads from the system. Shut down any inverters, charge controllers, etc.

Turn off the DC breakers on the front of the SK48v100 batteries.

To turn off the BMS, press and hold the "RST" button until the LED lights on the front of the battery being to blink. Release the "RST" button when this blinking is observed. After a few seconds, all lights will turn off indicating the BMS has turned off.

Note: the BMS will automatically turn off after a period of inactivity, however, it is a good idea to manually turn the BMS off to conserve battery power.

Automatic Shutdown

The SK48v100 battery will automatically turn the BMS off after 24 hours if no current (less than .7A) has been drawn from battery. If the battery is kept on charge, or the BMS detects there has been "activity" (current flowing in or out), then the 24 hour timer is reset.

Note: if the battery is heavily depleted (cells < 3.15v), the automatic timeout is reduced to prevent an excessive-discharge scenario. Simply apply a charge to the battery to reactivate it from this sleep state.

First Time Use Automatic Functions

Automatic Charge Equalization

Most batteries require equalizing packs to a similar state-of-charge (SOC%) when connecting for the first time. This is often accomplished by fully charging all batteries that will be used in a system before hooking them up. With the SK48v100, this is not required and a complete waste of your time. The BMS has an innovative, built-in charge limiting circuit.

Automatic Charge Current Limiter

The built in charge limiting circuit is a part of the battery management system (BMS). The charge limiting circuit prevents excessive charge current from causing a complete shutdown of the battery module, by using active electronics to reduce the incoming charge current to a safe level. The charge limiting circuit is automatically activated when charge current exceeds 100A. When active, the charge limiting circuit reduces the charge current to 20 amps and stays active until the current falls below 20A, at which point the limiter automatically deactivates.

The charge limiting circuit is truly revolutionary, as most competing batteries will block all charging when the over-current threshold has been reached, causing a battery connected to a charger to appear as full, however, it is a false reading and the battery is actually depleted.

Let's use a practical example of how this would come into play; let's say your batteries were nearly empty and you removed one from service at a low state of charge for some reason. Later that day, solar charged the rest of the batteries in your system and now they are nearly full. Now, you are ready to add the new battery to service, but the SOC% is very different. Now, instead of manually equalizing the pack with the rest, you can safely re-rack the battery, turn it on and everything will return to normal operation without any user intervention.

Automatic Cell Balancer

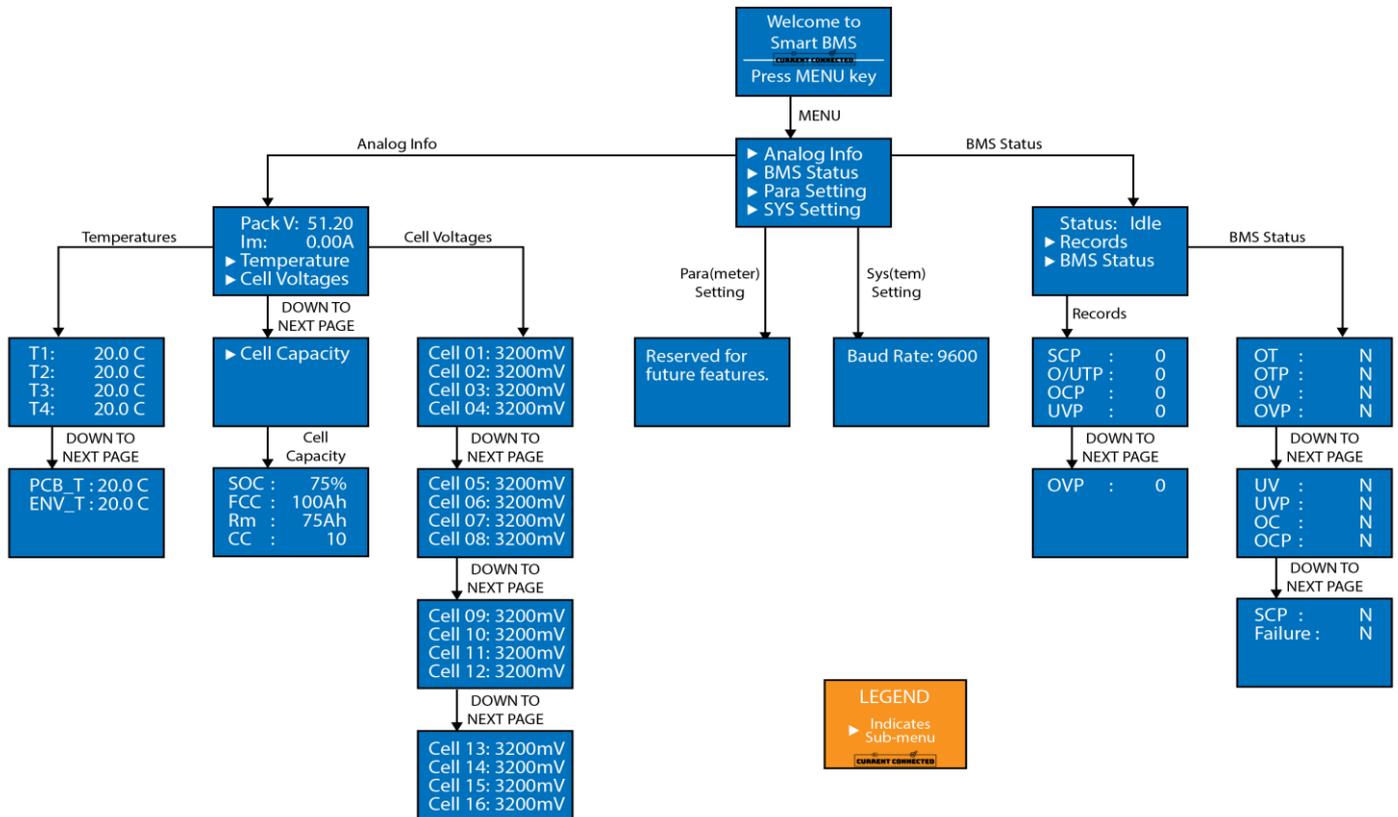
The BMS also features a cell balancer; when charging reaches nearly 100% full, the cell voltage rises rapidly. From the factory, the charge level within each cell differs slightly, this means that the entire pack can only charge until the fullest cell reaches its peak voltage. If it weren't for the automatic cell balancer, natural drift among cells would cause major capacity loss.

When you charge the battery up for the first time, it is normal for the BMS to trigger OVP (over-voltage protection). This OVP is triggered because the BMS monitored the level of each cell and stops charging if the voltage is too high. When OVP occurs, the cell balancer is simultaneously working, bleeding energy from only the completely full cells, so that all 16 cells can charge as a group.

The initial balancing process is slow and typically takes about 10 to 15 charge cycles before perfect cell balancing has occurred. Cells are considered perfectly balanced when the voltage deviation is within 30mv, as indicated on the cell voltages battery screen. Cell imbalances on brand new, fully charged batteries can reach as high as 250mv. This is normal and no cause

for concern. The only time to worry is if there is a large difference at a state of charge between 95% ~ 5%.

BMS Screen Display



Automatic Screen Timeout

The screen will automatically turn off after 30 seconds of inactivity. Press the “Menu” button to re-activate the screen.

Controls

Four buttons to the right of the screen exist to provide simple navigation.

- Menu – Returns to the main menu
- Enter – Selects the current option
- Down – Progress through options (and/or pages)
- ESC – Escape to previous screen

An arrow on the left side of the screen indicates which option is in queue for selection. Use the “Down” button to progress through options and then use the “Enter” button to progress with your selection. If you wish to go back a page, simply use the “ESC” button, or press the “Menu” button to return to the main menu.

Home / Welcome Screen

The default screen shown when BMS is powered on. The only option on this screen is to press the “Menu” button to view the main menu.

Main Menu

Four menu options exist on the main menu:

- Analog Info – Information such as voltages, state of charge, temperature, etc.
- BMS Status – Options to view current state of operation, protection status and number of times a protection has tripped.
- Parameter Settings – Reserved for future features
- System Settings – View communication baud rate

Analog Info

The analog info section displays analog information such as voltages, temperature, state of charge & battery capacity. Two readouts and three menu options exist on the Analog Info screen.

- Pack Voltage – The total voltage of the pack, as measured internally
- Im (Pack Current) – Display of amperage entering or exiting the pack
- Temperature – Displays a 2-page submenu displaying 6 temperature measurements within the pack. There are 4 cell temperature sensors, a temperature sensor on the circuit board of the BMS, as well as an ambient temperature sensor that can be viewed here.
- Cell Voltage – Displays a 4-page submenu displaying the individual voltages of each of the 16 cells. The “Down” button is used to scroll between each page of voltages.
- Cell Capacity – Displays a single-page submenu showing the current state of charge (SOC), Full-Charge-Capacity (FCC), remaining capacity (Rm) and total number of cycles (CC).

BMS Status

BMS Status refers to the current operation mode and any active protections. The menu contains 1 indicator and two submenus.

- Status – Displays 4 potential status – Charging, Discharging, Idle & Fault. A fault can be either of many scenarios, you can see which fault is active by viewing the second “BMS Status” submenu.
- Records – Displays a count of how many times a protection has triggered. Abbreviations as described below.
- BMS Status – Displays any active faults. Abbreviations as described below.

Meaning of “BMS Status” abbreviations

Two levels of statuses exist; Warning & Protection. When a warning setpoint is reached, the battery will continue to operate, so long as the protection setpoint is not reached.

- OT / OTP – Over Temperature. If the battery is too hot or too cold, at various setpoints the BMS will prevent charging or discharging to protect the cells from damage.
- OV / OVP – Over Voltage. This means the battery is either self-balancing (normal) or has been fed too high of a charge voltage to safely operate.
- UV / UVP – Under Voltage.

- OC / OCP – Over Current. OCP means that more than the rated 100A has been drawn from the battery. Since the battery / BMS is only rated to deliver 100A, the BMS protects the system from damage caused by too much load.
- SCP – Short Circuit Protection. SCP means that either the DC system has a short circuit, the pre-charge function was not used correctly, or an inverter / set of inverters with a capacitance exceeding the capability of the pre-charge circuit has been connected. This can always be reset by applying charge current to the battery, or can be reset up to 3 times by restarting the BMS (using the RST button). After 3 failed attempts to restart, the BMS will lock out to prevent damage to itself.
- Failure – Something has gone terribly wrong. Contact technical support for further analysis.

Para(meter) settings & System settings

These two menu options are reserved for future features, and do not offer any function at this time.

Inverter Setpoints / Open Loop Communication

The SK48v100 is compatible with select inverters in a closed-loop configuration where the battery programs the correct operating parameters to the inverter via CANBUS / RS485 communication. While this mode of operation is usually the most simple and precise control method, it is not a solution for everyone.

For older inverters not featuring CANBUS / RS485 communication, or loads powered directly by DC, the batteries can still be used by programming some simple setpoints. The exact terminology and setpoints of each inverter will vary, but can easily be adapted to match the parameters listed below.

When to use closed loop communication

Closed loop communication is optimal for simple systems with few components. For example, simply connecting a few batteries to an all-in-one unit such as a Sol-Ark inverter is a great time to use communications. A more complex system with various inverters, charge controllers, dc loads, etc. is not a good application for closed loop communication unless all components support communication (e.g. Victron systems). Even if some components in the system do support communication, if non-communicating components are added, you should revert to open-loop (no communication) and set each device to the appropriate charge voltages, as listed below.

No-communication Equipment Setpoints & recommendations

- Charge Current for normal use: Up to 63A (Per Battery)
- Charge Current for fast charge: Up to 95A (Per Battery)
- Absorption Voltage: 57.6v recommended; up to 58.4v max
- Absorption Time: 15 Minutes
- Float Voltage: 55.2v
- Charging Target: 100% SOC
- Low Voltage Shutdown: 48v

Charge Currents:

There are two setpoints here for certain charge applications.

For example, if you are running a generator and have ample charging capacity, you are better off running a higher charge current to get the batteries topped off as quickly as possible. Fast charging will reduce the runtime of the generator, leading to decreased wear & tear as well as increased fuel efficiency. The increase of wear on the cells by using a higher current when generator charging is miniscule compared to the increased wear & maintenance on a generator from additional runtime, that your money is better spent fast charging.

If you are providing normal everyday charging with solar, that's when it would be better to reduce the charge current closer to the target of 63A or less. Areas having more than 4 hours of sun exposure can charge as low as a 25A (C/4) rate and still reach a full charge while experiencing minimal wear.

Absorption Voltage

Not every charger allows you to dial in the exact voltage you need. Some only allow for coarse adjustment via DIP switches, as an example.

57.6v is the most optimal absorption voltage, however if the charger doesn't let you program this voltage, anywhere from 57.6 up to 58.4v is still safe and within normal operating parameters for these batteries.

Absorption Time

If any cell within the pack reaches a full charge too quickly (due to being out of balance), the BMS will restrict charging to the entire pack to allow that cell to be discharged by the BMS (balanced), and when the cell is back within a normal range the BMS will stop restricting charging. The thing is, if absorption never takes place, then the other cells may not be fully charged because charging has ended by the time the BMS has corrected the cell balance issue.

By setting a 15 minute absorption duration, we allow some time for the BMS to provide balancing, but still have charge current available on demand the moment the BMS re-enables the charging circuit. Since absorption is a constant-voltage stage, absorption time need not be changed based on the number of batteries connected, as balancing happens simultaneously across all packs.

Float Voltage

The float voltage is not actually a charging voltage; it is a voltage that can be provided by a charger that matches the resting full-charge voltage of the battery. Some chargers allow float to be disabled, however we do not recommend doing so. By leaving float enabled and set at the recommended voltage, the charger (whether solar or grid) will provide the power to loads FIRST, and the battery will make up for any additional current demanded by the loads.

Floating in this manner will prevent discharging the battery while ample charge is available – whether coming from Solar, Grid or Generator. If floating was disabled or set to a lower voltage, then the battery could be significantly discharged when the

user thinks that it's been connected to a charger and should be full and ready to go. This is contrary to the float-charge of a lead acid battery, as a lead acid battery will self-discharge when sitting and must be continually be fed charge current to keep it topped off.

Note: when batteries are operating in closed-loop communication mode, there is no "float" mode – when loads require power they receive it from the source, and if discharging of the battery occurs, then the battery recharges to 100% and the charging process ends until recharging is required.

Charging SOC%

This is NOT a setting, rather, a guideline.

A common misconception about LiFePO4 (LFP) is that it is best to operate in the 30%~90% SOC region, however this applies heavily to every other lithium based chemistry except for LiFePO4. If you only charged these batteries to 90%, then the BMS would never have a chance to offer any cell balancing due to the stable nature of LFP's charge curve. Balance can only be checked when the cells reach 100% SOC.

If cells get out of balance, then the capacity of the entire pack is reduced to the capacity difference between the least full and least empty cell. If packs are not regularly balanced by the BMS, then the difference in balance can easily overcome what the BMS is able to correct, leading to quite poor performance of the system in general.

Common cells such as the NiCoAl (NCA) cells used in common EV's are subjected to increased stresses when above 90% SOC that due to their construction, LFP cells are not. Charge the battery to 100%.

Low Voltage Shutdown

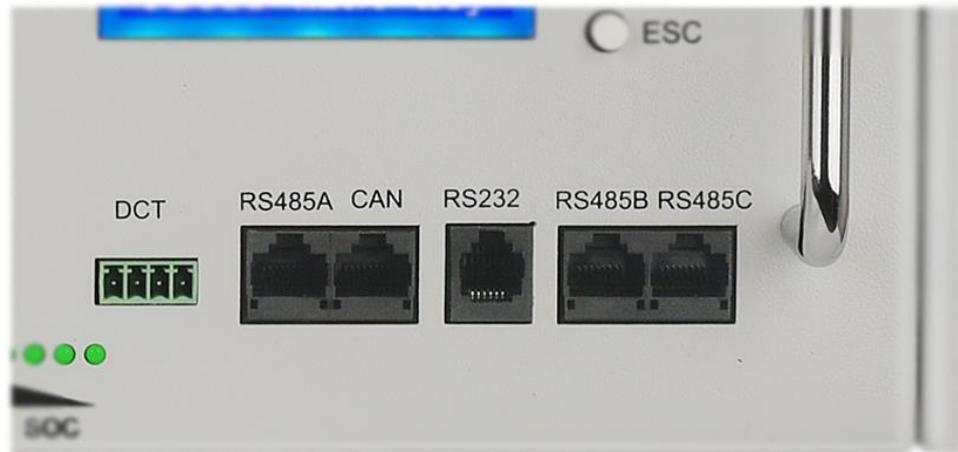
We suggest stopping discharge at 48v. The battery won't cut off until 46v, however if you set your low voltage shutdown at 46v, then there is a strong chance that the battery will shut down before the inverter/load, which can cause a situation where the battery is difficult to get restarted. Some chargers require presence of battery voltage on the terminals before they will turn on and begin charging.

Closed Loop Communication

Introduction to Communication

Communication between batteries (via BMS) and inverters and charge controllers has been a great advancement over simple voltage-based controls. All the parameters that control the charging/discharging behavior are calculated by the BMS and transmitted to the inverter / controller, reducing user-intervention and chances of mistakes due to misconfiguration.

For example, The BMS can command charging to be stopped when cells are too cold, and slowly ramp up charging as temperature increases. The BMS can slow down the charging as the charge level reaches full, and limit discharging as the pack approaches empty.



Communication Ports

Communications – A Practical Example:

Since the SK48v100 is internally constructed of 16 individual cells put into a series string, it is necessary to keep all cells at the same voltage so they can work in unison. This is called cell balancing and is handled by the BMS.

In a normal voltage-controlled configuration, the battery may near full charge, but the over-voltage limit of a few cells can be reached, meanwhile the remaining cells are still only partially charged. In order to protect the full cells from overcharge, the BMS must shut down the main charge MOSFET switches in order to stop the charging while simultaneously running the balance circuits to bleed down the charge from the full cells. Once the full cells have returned to a safe level, the BMS turns on the charge MOSFETs, until they meet the high voltage cutoff again, and the cycle repeats.

The downside is that when the BMS opens the MOSFET switches to protect the cells, some controllers will reduce the output to a float voltage since they detect that the battery is no longer accepting a charge (because they assume that a battery not accepting current is fully charged). As a result, balancing does not have time to be completed and capacity in the system is reduced due to cell imbalance.

With a fully communicating system, the battery can ramp-down the charger to as low as a fraction of an amp, while still maintaining at a charge voltage rather than a float voltage. This ramping allows the balancing circuit time to do its job without ever triggering a high-voltage shutdown situation. Properly charged and balanced cells will give the longest lifespan of a battery pack as a whole, hence why SOK chose to use a communicating BMS.

Additionally, if a pack in a fully communicating system experiences an error such as an internal short circuit or system overload, it can shut down all packs in a system in order to prevent further damage, cascade failure or in extreme cases, a fire.

Communication Between Packs

Batteries can be linked together to allow for communication between packs. This communication is established using an RJ45 (cat5e/cat6) cable between the RS485B and RS485C ports. Both ports are identical, so patch cables can be plugged into either port.

DIP Switch Addressing

DIP switches in the “UP” position are “ON”. The switches are numbered left to right, #1 – 4. The DIP switches assign the RS485 address of the pack – each pack must have a unique address otherwise you will have multiple packs with overlapping transmissions that will cause a complete loss of communication. The battery set with ID=1 is the battery that concentrates all information sent by batteries ID=2 through ID=16, so this battery with ID=1 must be the battery that has the data uplink to the rest of the system, I.E. the “Master”.

The following table depicts the DIP switch settings for all packs communicating together:

Battery	Switch 1	Switch 2	Switch 3	Switch 4
1 (Master)	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Victron Communication

Communication changes a GX device from a passive monitor into an active controller. Victron inverter/chargers and MPPT Solar Chargers use their own internal charge algorithm and settings when in stand-alone mode. This means that they determine how long to remain in Absorption, when to switch to Float, when to switch back to Bulk, or Storage.

When using closed-loop communication, the GX device can receive information such as pack voltage, cell voltage, current, temperature, state of charge (SOC) as well as any errors that may be present, and display most of these parameters on the GX-touch. For systems utilizing 15 batteries or less, the battery communication takes place of a shunt within the system, so no additional shunt is needed.

If parameters detected by the battery are outside of safe operating range, the battery will instruct the GX device to call on all devices in the system to reduce (or stop) charging, shut down / stop discharging, along with other measures required in order to protect the batteries.

Cables:

Pre-Made Cables:

To establish communication with a Victron device, a special cable must be used. This cable uses RJ45 connectors but has a special pinout in order to get the proper data on the correct pins. Cables that have been made ready to work out of the box are available from SOK Battery NZ. We highly recommend identifying these cables upon receipt by their label "Victron-CAN", since they may look very similar to other communication cables included in your order.

Firmware:

For charging to work properly, changes by Victron were required to be implemented into the firmware used by the GX device. Without these changes, charging stopped when the batteries reached 52.4v, which correlates to around 30% full. The first firmware version to support these changes was version 3.0.0~15 which is a candidate release. Despite many release candidates past this, the latest release is only 2.9x. This means, you must enter the menu of your Cerbo-GX, select “Firmware”, and change the release stream setting to “latest release candidate” prior to checking and installing the latest update.

If old firmware compatibility is required, we have a full page detailing the manual patching process is available [here](#).

Communication Cable Connections:

The communication cable plugs into the CAN-BMS port of the Cerbo-GX, and a terminator provided with the Cerbo-GX must be plugged into the empty port.

Verify the communication cables between master and slave batteries are properly connected, and that DIP switches of the master battery are set to address #1, as described in the previous section.

Ensure all batteries are in the “BMS-OFF” state prior to installing the cable(s) as explained in the shutdown procedure. After the cable(s) have been installed, power up the system per the proper pre-charge procedure.

If the battery is not detected by the Cerbo:

- Ensure the cable is plugged in properly, and that a CANBUS terminator is inserted in the unused port
- Enter main menu and select “Settings”. Scroll down to the “Services” selection.
- Under BMS-CAN port, ensure CAN-bus BMS (500 kbit/s) is the selected protocol.

High-Voltage Alarms:

The following is quoted from Victron’s documentation:

The ‘high voltage’ warning or alarm is not unusual on new batteries that are not yet balanced. To help the batteries balance quickly, keep the batteries fully charged until the errors go away. In an ESS system, set it to ‘keep batteries charged’, in an off-grid system the fastest way is to either charge / balance the battery before installation, or to fully charge with a generator if not enough solar is available to keep the batteries fully charged.

If you are unable to maintain the target voltage to balance the batteries without the ‘high voltage’ alarm occurring, you may need to enable and set the “Limit managed battery charge voltage” setting in the DVCC menu of the GX device. Reduce this voltage as necessary until the alarm stops. After sufficient time to balance the batteries, try increasing this value until it can be disabled again for normal operation.

Fallback Settings:

In the event of a CANBUS communication failure, the parameters set within various devices such as inverter/chargers and solar controllers will be utilized in an open-

loop configuration. It is highly recommended to set these devices to appropriate LiFePO4 settings as described here to prevent over/undercharging.

Sol-Ark Communication

Communication with the Sol-Ark Inverter is by far, the easiest to setup among all inverters. Communication works with all 4 current Sol-Ark models, the 5k, 8k, 12k and 15k. Communication is approved by Sol-Ark and SOK Battery is listed in their integration guide on page 28.

With communication established, the Sol-Ark Inverter can re-configure its charging voltage, current, and battery discharge cut-off voltage according to the battery's parameters. If parameters are outside of a safe range, the inverter can start charging, discharging, slow down and stop in order to protect the batteries from exceeding their safe operating range.

Cables:

To establish communication with a Sol-Ark Inverter, a standard CAT-5e or CAT-6 Ethernet cable with RJ-45 ends can be utilized. Simply plug one end of the cable into the "CAN" port of the master battery, and the other end into the "BMS-CAN" port of the Sol-Ark Inverter.

Verify the communication cables between master and slave batteries are properly connected, and that DIP switches of the master battery are set to address #1, as described in the previous section.

Ensure all batteries are in the "BMS-OFF" state prior to installing the cable(s) as explained in the shutdown procedure. After the cable(s) have been installed, power up the system per the proper pre-charge procedure.

Settings:

1. Enter the main menu by pressing the "gear" button in the top right corner of the display.
2. Select "Battery Setup", then in the first "Battery" tab, enable "Lithium Battery [00]" and ensure the screen displays a value of "[00]". Adjust if needed.
3. Confirm communication is working by re-entering the menu – you will see a new button that says "Li-Batt Info". Click this button to view the information reported by the battery.
4. Each battery will add 95A to the charge and discharge current. In other words, if 5 batteries are connected, you would expect to see 475A in either field.

Note: if the batteries have been fully charged, you would expect the menu in step 4 to eventually show 0A for charge current, but the full 475A for discharging current. This is to be expected.

Warning triangle on home screen:

If the battery is commanding the inverter to limit charging / discharging, then a notice icon will display on the home screen of the inverter. This is only to notify you that the battery is the limiting source of charge, not the inverter. Say you were troubleshooting a charging issue, this icon would serve to let you know that the source of reduced charge current is the battery, not a setting within the inverter.

Voltronic Inverter Communication (EG4/MPP Solar/Sungold Power)

When communication has been established, the Voltronic Inverter can re-configure its charging voltage, current, and battery discharge cut-off voltage according to the battery's parameters. If parameters are outside of a safe range, the inverter can start or stop in order to protect the batteries.

Firmware:

Voltronic inverters will require an update to firmware version 112.19 or newer which supports communication. Version 112.14 is known to have issues, so if you have purchased your inverter from another dealer, a firmware update may be needed. This would be covered by the inverter manufacturer's documentation.

Cables:

To establish communication with a Voltronic inverter, a special cable must be used. This cable can either be purchased pre-made or can be field-assembled by following the pinout table below. If you purchase pre-assembled cables, you must identify them based on their label as "Voltronic", since your order may contain multiple similar cables. An incorrect cable can lead to no communication and error F61. The following table depicts the pinouts used on the Voltronic Inverter, as well as the RS485A port of the SK48v100. When hand-making cables, we highly recommend confirming the pin configurations, as mistakes can lead to very difficult-to-troubleshoot problems.

Voltronic / SK48v100 Pinout Table

Function	Voltronic	SK48v100
GND	Pin 8	Pin 6
RS485A	Pin 5	Pin 7
RS485B	Pin 3	Pin 8

If you wish to use your own cable, do so with caution; the following pinout table creates a cable that is unidirectional, so only the end labeled "SK48v100" must be plugged into the battery, and the end labeled "Voltronic" must be plugged into the inverter. If this is reversed, then communication cannot be established.

Connector #1 (Voltronic)	Connector #2 (SK48v100)
Pin 1	Pin 1
Pin 2	Pin 2
Pin 3	Pin 3
Pin 4	Pin 4
Pin 5	Pin 5
Pin 6	Pin 6
Pin 7	Pin 7
Pin 8	Pin 8

Connection port & Procedure:

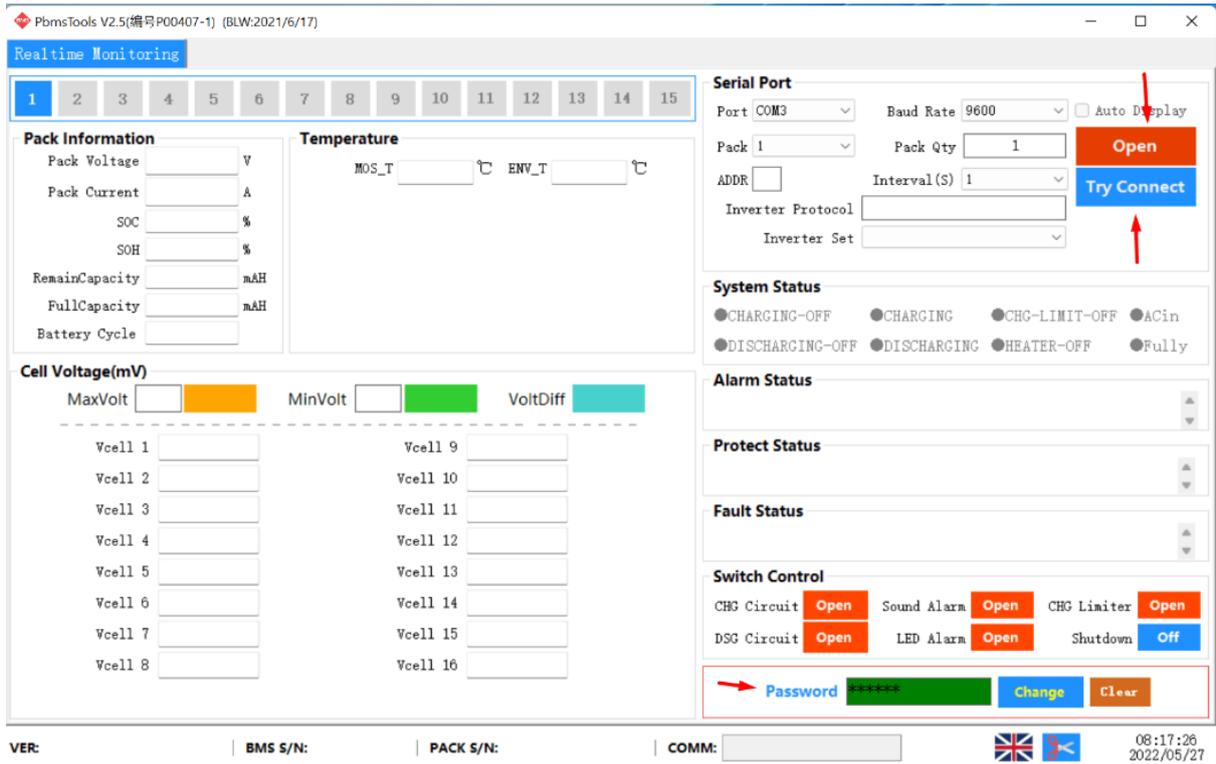
Ensure all batteries are in the “BMS-OFF” state prior to installing the cable(s) as explained in the shutdown procedure. We recommend keeping any AC and PV inputs to the Voltronic inverter OFF during this procedure.

The communication cable plug marked “SK48V100” plugs into the “RS485A” port of the master battery. Verify the communication cables between master and slave batteries are properly connected, and that DIP switches of the master battery are set to address #1, as described in the previous section. The remaining end of the cable marked “Voltronic” plugs into the “LI-ION” port of the Voltronic Inverter. After the cable(s) have been installed, power up the system per the proper pre-charge procedure.

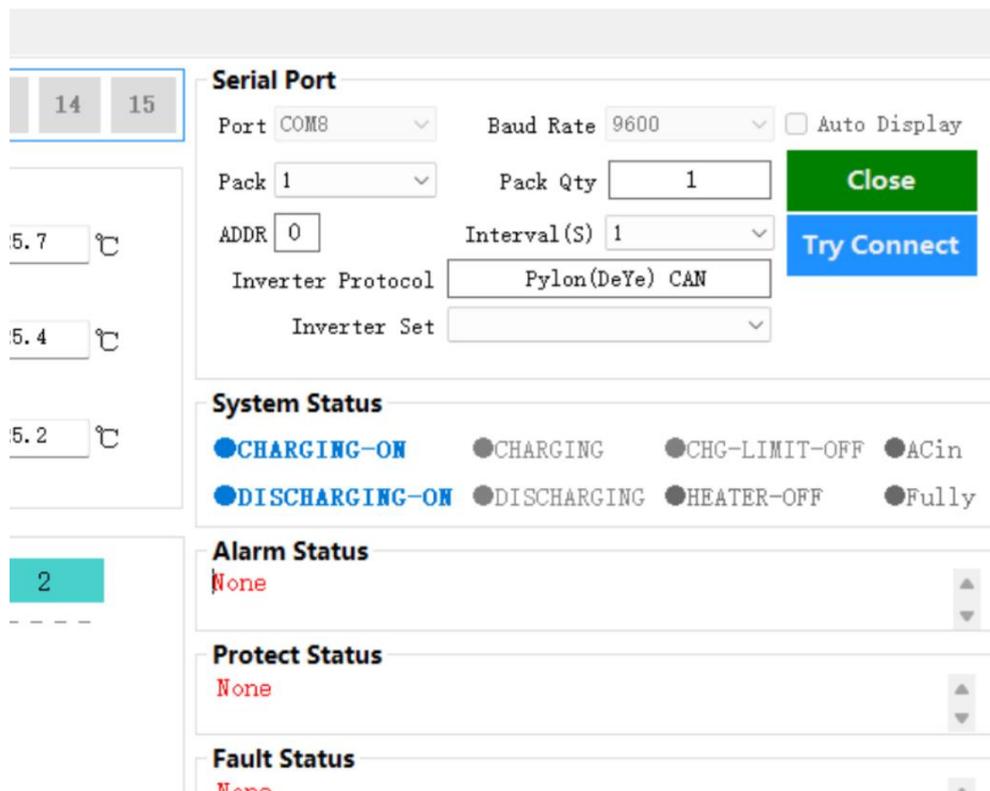
Battery Settings:

Batteries purchased prior to Jan. 1, 2023 require a change of the protocol of 1 battery (the “Master” battery) to utilize the proper protocol for communication. If you have purchased your batteries since then, skip this section.

1. Power on the BMS per the power-up procedure. The LED lights on the front panel should be illuminated.
2. Plug in the RS232 programming cable. Make certain that the cable is fully inserted into the RS232 port.
3. Open the Protocol Edit Software (PC) & Connect to battery. Click the red “OPEN” button in the top right corner. After clicking open click “TRY CONNECT”.



- If you have properly established the connection to the battery, the software should load the voltages and show statuses of the battery. In the top-right corner of the program there is a readout that shows the default protocol as "Pylon(DeYe) CAN".



- From the menu below the protocol indication, select the “Pylon 485” protocol.
- Now, the indicator for protocol should read as “Pylon 485”. You can now close the software and disconnect the RS232 cable.

Serial Port

Port: COM8 Baud Rate: 9600 Auto Display

Pack: 1 Pack Qty: 1

ADDR: 0 Interval (S): 1

Inverter Protocol: Pylon 485

Inverter Set: Pylon 485

System Status

● CHARGING-ON ● CHARGING ● CHG-LIMIT-OFF ● ACin

● DISCHARGING-ON ● DISCHARGING ● HEATER-OFF ● Fully

Alarm Status

None

Protect Status

None

MPP Solar Menu Settings:

Disclaimer: The following menu options described were determined based on the MPP Solar LVX 6048, and LV 6548. Different models and rebrands may have slightly different menu options. If you notice a discrepancy, please contact us so that we can provide an addendum to this section.

- Press & hold the “↵” key for approximately 3 seconds to enter the main menu.
- Using the up and down arrows, navigate to the battery type setting (#14 LVX 6048) (#5 LV 6548). Press the “↵” key to change the setting. Using the up and down arrows, adjust the setting parameter until “PYL” is shown. Press the “↵” key one more to save the setting.
- For systems using only 1 battery, navigate to setting 11 (Maximum charge current) and set this parameter to 95A. This is the maximum charge current one single battery allows with a touch of margin for error. For multi-battery systems, this setting can be set no greater than $95 \times (\text{number of batteries})$.
- Press the ESC button to exit the menu and save settings.

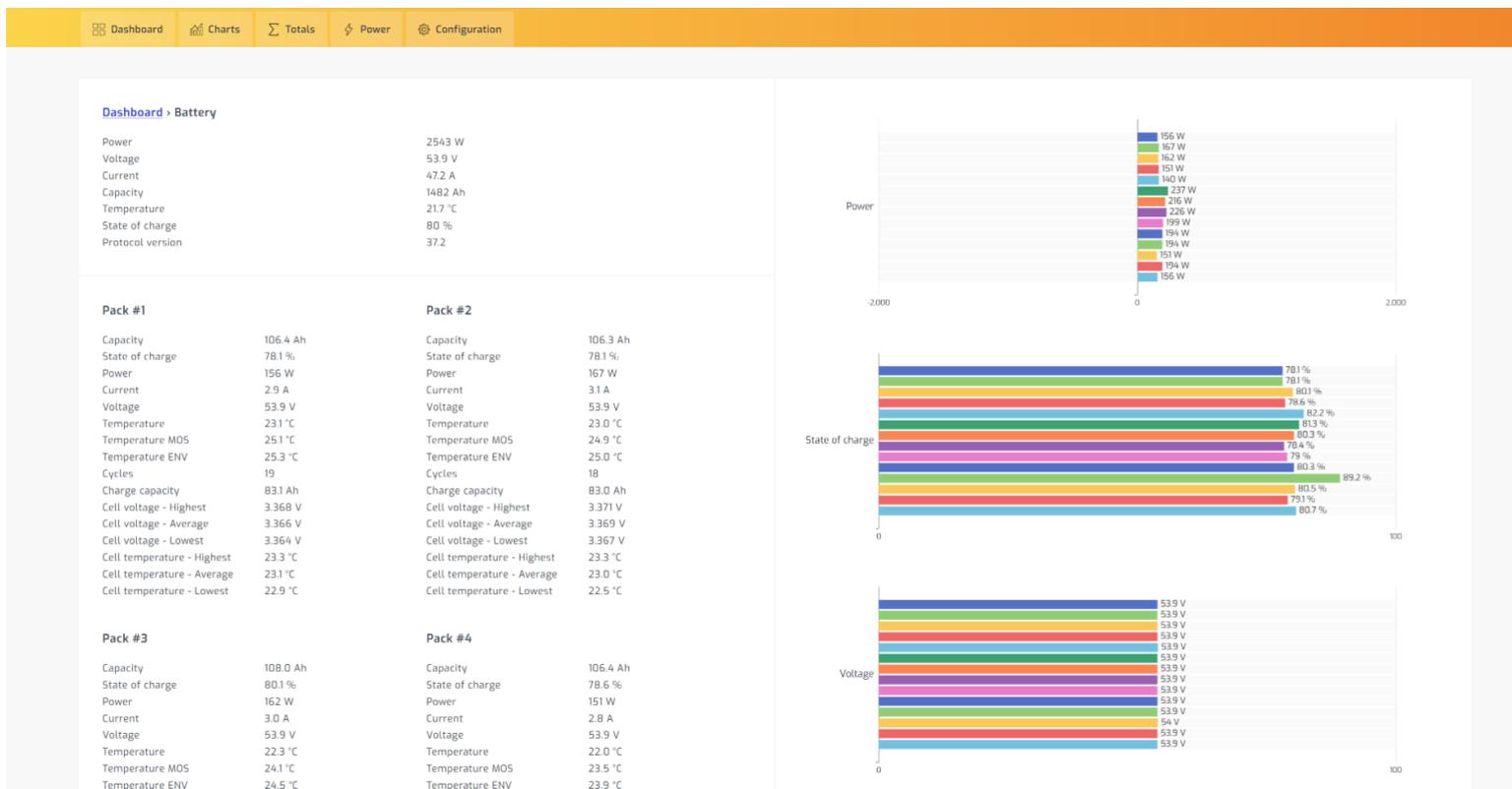
Solar Assistant Integration

What is SolarAssistant?

Solar assistant is a monitoring tool based the most powerful, low cost and globally available device on the planet: the Raspberry Pi. SolarAssistant provides metrics of your entire solar system live up to 2 seconds. SolarAssistant is a standalone system that can be used without the internet. However, when you are away from home, all features are available remotely via the internet.

What information is available with SolarAssistant?

Not only can you integrate data from your inverter at the same time as your batteries, you can also get all data from your batteries – way more information than you really need to know, displayed in a neat GUI. From individual pack capacities, voltage and amperage, to temperature and cell voltages, you can have the information you need to catch a problem before it happens.



How to setup SolarAssistant:

Please note that SolarAssistant also has a guide available here if you need further documentation.

Required Materials:

- An SOK SK48v100 battery
- A Raspberry Pi of any of the following models: Zero W, Zero 2W, 3A+, 3B, 3B+, 4B. We suggest the 3B+ (Amazon Link) due to the increased quantity of USB ports

- A Micro SD card (16GB recommended)
- MicroUSB adapter to provide power to the Pi. Alternatively you can use a 5v power supply. Refer to your Pi documentation for power requirements
- TIP: We use POE networking equipment at our facility, so we enjoy taking advantage of a POE hat for the Pi, because our network infrastructure has multiple backups in the event of a power outage.
- USB 2.0 to RS232 Cable for SOK Battery
- A software license for Solar Assistant, which you can purchase directly from SolarAssistant here: <https://solar-assistant.io/shop/products/software>

Setting up the Raspberry Pi:

1. Use a PC with Internet connection to access the licensed software by logging onto your SolarAssistant account. Select the “Sites” tab from the top menu, then proceed to select the blue “Download SD card image” button on the top-left side of the page. Save this file to your computer.
2. Flash the SD card, as described in the SolarAssistant documentation here: <https://solar-assistant.io/help/getting-started/prepare-device>
3. Safely eject the SD card from your computer and insert it MicroSD port on the underside of the Raspberry Pi.
4. Connect the Raspberry Pi to the local network by using one of the two following methods:
 - 4.1 Establish an Ethernet connection to the Raspberry Pi using the Ethernet port. Use the MicroUSB adapter to provide power to the Raspberry Pi.
 - 4.2 Establish a Wi-Fi Connection to the Raspberry Pi. Expand
5. Return to the “Sites” tab on the Solar Assistant homepage on the external device.
6. Select the site for the designated device. Solar Assistant will automatically detect the Raspberry Pi connected to the local network.
7. Activate your device through the “Configuration” tab to enable remote access. Select “Activate device” to activate and register the device simultaneously.

How to setup the connection to the batteries

1. If you haven’t already, activate the SOK 48v100Ah battery as described in the power-up procedure.
2. Connect the battery to the Raspberry Pi programmed with Solar Assistant using the SOK USB 2.0 to RS 232 adapter, by plugging the USB end into any available port on the Pi and the other end into the RS232 port of the battery.
3. Access the Raspberry Pi on the local network from the “Sites” tab through the Solar Assistant main website, or by simply typing “https://10.0.0.5” into your web browser.
4. Select the “Configuration” tab and locate the “Inverter” and “Battery” subcategories.
5. If an inverter is connected to the Raspberry Pi for Solar Assistant, select the appropriate compatible inverter from the Models drop-down menu (a list of compatible inverters is available on the Solar Assistant homepage). If no inverter is connected, feign the existence of an inverter by selecting the “Voltronic (Axpert, MPP, Infini, etc.)” option from the Models drop-down menu, since Solar Assistant will not recognize a battery if no inverter is selected. For the Interface drop-down menu, select “USB Direct”.
6. In the Battery drop-down menu, select “USB to Serial RS232/485”. In the USB port drop down menu, the only available option will be selected for you. If multiple batteries are connected, the sequence of batteries will appear in reverse order.
7. Select “Connect” button to establish the connection between the SOK 48v100Ah battery with Solar Assistant.

8. Success! You can now select the Dashboard, Charts, Totals, or Power menu tab to view real-time updates from your SOK 48v100Ah battery.

PC Monitoring & Diagnostics

PC Monitoring Software (SOK Tools)

Exporting Data Logs

The SK48v100 Battery has a unique function – the ability to export data logs of up to 2 months of operational history. This is particularly useful for intermittent issues, as the logs can give insight to every measurable data point with a correlating data/time stamp.

What's required:

In order to access the data logs, you need the following:

- SK48v100 Battery
- RS232-USB Adapter Harness
- PC Software, downloaded & installed as noted in the PC Communication Guide

Procedure:

1. Connect the battery to your computer, as noted in the PC Communication Guide.
2. Open the software. Typically the software will automatically connect to the battery. Refer to the PC communication guide if you have trouble.
3. Select the top tab, "Memory Info", then on the "Memory Setting" panel on the right, click the blue "Read" button.

After following this procedure, you will observe the data being read from the battery into the window on the left. You can read the info on this screen, although it is somewhat difficult. To read the data in an easier format, you can click on the "Save As" button on the right panel to export the data as a CSV file that can be opened in a spreadsheet program such as Excel.

Downloads:

SOK Monitoring Tools (PC Software) – 2022 Version

<https://www.currentconnected.com/soktools>

SOK Protocol Editor (PC Software) – 2022 Version <https://www.currentconnected.com/sok-pe>

SOK Tools 2023 version (Includes monitoring and protocol edit)

<https://www.currentconnected.com/wp-content/uploads/2023/01/SOKTools-2023-Edition.zip>