

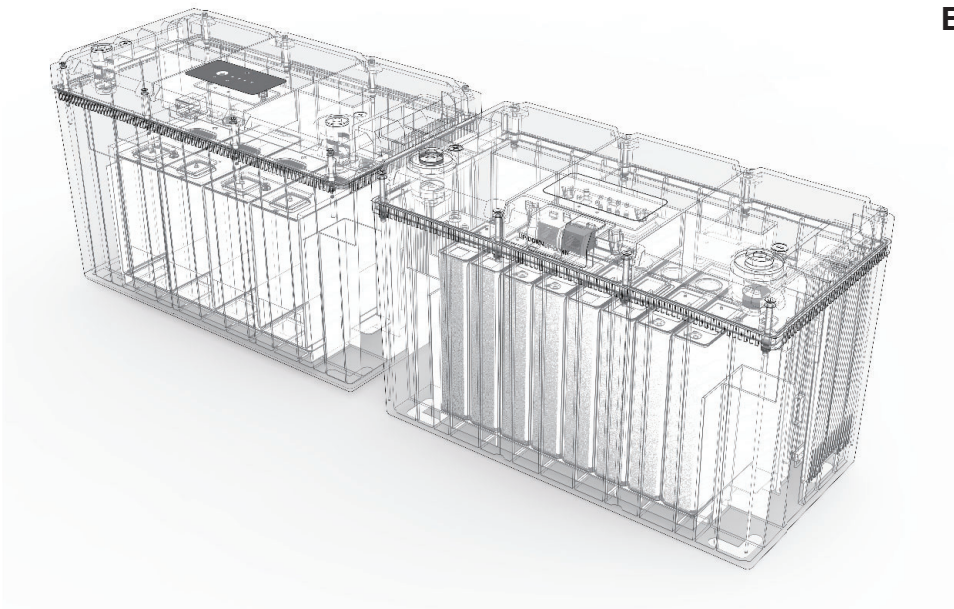
LI100A24PRO 25.6V 100AH Li-ionn Battery

User's Guide

Ended User Documentation

Rev 1.0

2023-Aug-30



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It is the further responsibility of each user to ensure that all applications of this products are appropriate and safe based on conditions anticipated or encountered during use.

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WARNING:

Explosion, Electrocution, Or Fire Hazard

- A battery can present a risk of electric shock, burns from high short circuit current, fire, or explosion. Observe proper precautions.
- Ensure the cables are properly sized.
- Ensure clearance requirements are strictly enforced around the batteries.
- Ensure the area around the batteries is well ventilated and clean of debris.
- Ensure no heat source near the battery.
- Ensure the battery terminal screws are tightened, (M8 screw torque: 18 N.m).
- Always use insulated tools. Avoid dropping tools onto batteries or other electrical parts.
- Never charge a frozen battery unless optional heater parts inside.
- If a battery must be removed, always remove the grounded terminal from the battery first. Make sure all devices are disconnected.



IMPORTANT

- When installing batteries, leave adequate clearance between batteries.
- When replacing batteries, use the same number and type of batteries.
- Avoid any fall or collision during the installation process.
- Do not remove the battery components. The maintenance of the battery should be carried out by a professional engineer.
- Do not expose the Li-ion battery to heat in excess of 58°C during operation, 60°C in storage.
- Do not incinerate or expose to open flames.
- Do not connect over 2 sets Li-ion batteries in series. Wrong operation will damage the BMS.
- Before series connection, it's better to make sure fully charge or discharge single battery. The different SOC between batteries may cause the whole group to fail to charge and discharge normally (Reduce the usable capacity of the battery group).
- Before parallel connection, it's better to make sure the voltage difference less than 0.1V to avoid large current impact .
- Do not connect in series at the same time connect in parallel.

LI100A24PRO Li-ion battery is intended as a replacement for the common 24V100Ah lead acid battery and traditional case Li-ion battery. The new generation 25.6V100Ah Li-ion battery adopt removable enclosure and modular design which support to assembly in local. The new generation 25.6V100Ah Li-ion battery adopt Iron Phosphate (LiFePO₄) cells and unique BMS to provide safety, high current and prominent long life performance, with 20 times longer cyclic life than SLA battery to save cost and energy, up to 70% lighter than SLA battery to save logistic cost. Diverse accessories which include LED display units and communication ports.

This document is intended for use by anyone required to install and operate LI100A24PRO Li-ion batteries. Be sure to review this manual carefully to identify any potential safety risks before proceeding.

The owner must be familiar with all the features of this product before proceeding.

Failure to install or use this product as instructed can result in damage to the product that may not be covered under the limited warranty.

LI100A24PRO

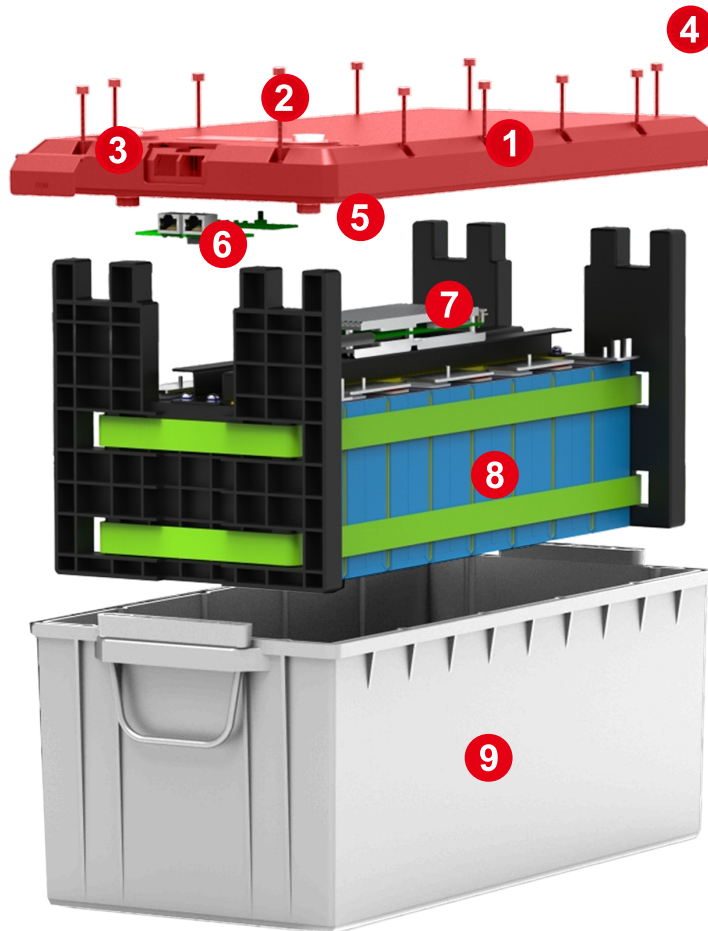
25.6V100Ah : LED indicator (SOC, RUN, ALARM) and ON/OFF button.
Communication port (RS485, CAN).

External display module (RS485)



Explode Diagram

INTERNAL STRUCTURE DIAGRAM



- ① Detachable cover-ABS+PC
- ② ON/OFF button and LEDs
- ③ Communication port cove
- ④ Hexagon socket screws
- ⑤ PC Film

- ⑥ Communication board
- ⑦ BMS (RD-RJ8S100A)
- ⑧ Cells, 1P8S
- ⑨ Case : ABS+PC

Specification

Model	LI100A24PRO	
Nominal Voltage [V]	25.6	
Nominal Capacity [Ah]	100	
Total Energy [Wh]	2560	
Max. Charging Current [A]	100	
Recommended Charging Current [A]	50	
Charging Voltage [V]	28.4~29.2	
Max. Discharging Current [A]	100	
End of Discharge Voltage [V]	22.4	
Operating Temperature Range ⁽¹⁾	Charge: 0 ~ +50°C; Discharge: -20 ~ +55°C With optional heater parts: Charge/Discharge -20~+55°C	
Protection	Over charge Over discharge, Over temperature, Low Temperature, Over Current, Short circuit	
Cycle Life ⁽²⁾	>3500 cycles	
Designed Calendar Life	10 Years	
Dimension (W*D*H, mm)	522*240*219	
Weight [Kg]	21.6	
Operation Humidity	0~95% RH (No condensing)	
Communication Port	RS485; CAN	
LED Indicator and Button	SOC, ALM, RUN, ON/OFF	
IP Class	IP30	
Parallel Support ⁽³⁾	Yes, Max, 4Sets	
Series Support	Yes, Max. 2 Sets	
Certification-Cell	UN38.3; ROHS; IEC62619; UL1973;	
Certification-Battery	UN38.3; MSDS; CE	

Note:

(1) Normally the Li-ion battery operation temperature range is : discharge -20~+55°C, charge 0~+55°C, If the optional heater is stalled, it will automatic start to work once the cell temperature is below 5°C and the heater can help to increase cell temperature 4~8°C/hour. With Optional Heater: Charge / Discharge: -20 ~ +55°C , the charger power should be above than heater parts power consumption.

(2) 25°C ,0.5C/0.5C, 100%DOD and 80% EOL

(3) For parallel and series power cable connection, refer to user manual.

BMS Information

Over-Charge Alarm & Protection	
Over-Charge Alarm	3.55V (For cell) 28.4V (For pack)
Over-Charge Protection	3.7V (For cell) 29.6V (For pack)
Over-Charge Protection Delay	1000 ms
Over-Charge Release	3.45V (For cell) 27.6V (For pack)
Over-Discharge Alarm & Protection	
Over-Discharge Alarm	2.8V (For cell) 22.4V (For pack)
Over-Discharge Protection	2.5V (For cell) 20V (For pack)
Over-Discharge Protection Delay	1000 ms
Over-Discharge Release	2.8V (For cell) 22.4V (For pack)
Over Current Alarm & Protection	
Charge Over Current Alarm	105A
Charge Over Current Protection	110A
Charge Over-Current Protection Delay	15S
Charge Over Current Protection Release	Automatic release after 1min and up to 3 times or Discharge
Discharge Over Current Alarm	110A
Discharge Over Current Protection-1	120A
Discharge Over Current Protection-1 Delay	15S
Discharge Over Current Protection-2	180A
Discharge Over Current Protection-2 Delay	200ms
Discharge Over Current Protection Release	Automatic release after 1min and up to 3 times or Charge
Over Temperature Alarm & Protection	
Charge Low Temperature Alarm	7°C
Charge Low Temperature Protection	0°C
Charge Low Temperature Protection Release	5°C
Charge High Temperature Alarm	50°C
Charge High Temperature Protection	55°C
Charge High Temperature Protection Release	45°C
Discharge Low Temperature Alarm	-10°C
Discharge Low Temperature Protection	-20°C
Discharge Low Temperature Protection Release	-17°C
Discharge High Temperature Alarm	55°C
Discharge High Temperature Protection	60°C
Discharge High Temperature Protection Release	50°C
Short Circuit Protection	
Short Current Protection Delay Time	1500 uS
Short Current Release Method	Release load
Heater Control (for optional heater parts)	
Heater ON	Cell temperature ≤ 0°C and charger is connected
Heater OFF	Cell temperature > 10°C

Storage

The LI100A24PRO Li-ion battery can be stored in an environment with temperatures between -20°C and +55°C and between 10% and 90% relative humidity, non-condensing. For long storage periods at 25°C, charge the battery every half years. For temperatures above 40°C, charge the battery quarterly. Do not store the Li-ion battery at temperatures above 60°C.

Relationship Between Charge Limits and Temperature

Due to the chemistry of Lithium Ion cells, the cells cannot accept as much charge current at lower temperatures without risking permanent loss of capacity. As the cells' temperature rises during the charging process, they can gradually accept higher currents. To maintain optimum performance and durability of Li-ion battery, the following charge limits based on ambient temperature is recommended.

Temperature (°C)	Max Charge Current
-20	Prohibit charging
-10	Prohibit charging
0	0.1C
10	Recommended charge current
20	Max continuous charge current
35	Recommended charge current
45	0.2C
>55	Prohibit charging

Table 1 Charge rate by temperature

Series Strings

The batteries can be combined together in series strings to achieve higher operating voltages by connecting the positive terminal of one battery to the negative terminal of the next battery. The maximum number of 25.6V Li-ion battery that you can connect in a series is two(2). Below figure 2 illustrates four 12.8V Li-ion batteries connected in series, for a 4S1P configuration.



4pcs 12.8v100ah in series

Figure 2. Connecting Batteries in Series (4S1P 12.8V Configuration)

Two batteries 12.8V in series: $2 \times 12.8V = 25.6V$ (nominal) for 24V applications

Two batteries 25.6V in series: $2 \times 25.6V = 51.2V$ (nominal) for 48V applications



CAUTION

- Failure to follow the following safety instructions may result in personal injuries or damage to the equipment!
- Do not connect more than four batteries in series. Connecting more than four batteries in series exceeds the voltage limit of the BMS.
- Do not short circuit the Li-ion battery
- Do not connect different batches, different types, old and new batteries in series.
- Ensure the batteries consistency before connecting in series.
- For series connection, if one of batteries is charged fully (100% SOC), the other batteries will not be charged anymore, this may casue some batteris SOC won't show 100%, it don't effect the performance of battery.

Parallel Strings

You can combine batteries together in parallel strings to achieve higher operating energy by connecting like-polarity terminals of adjacent batteries. To combine batteries in parallel strings, connect all like-polarity wires on adjacent batteries to an appropriately sized terminal block for your application.

Refer to Figure 3 for an example of four 25.6V Li-ion batteries connected together in a 4P configuration. The maximum number of 25.6V series strings that you can connect in parallel is two.



4pcs x 25.6V 100ah in Parallel



CAUTION

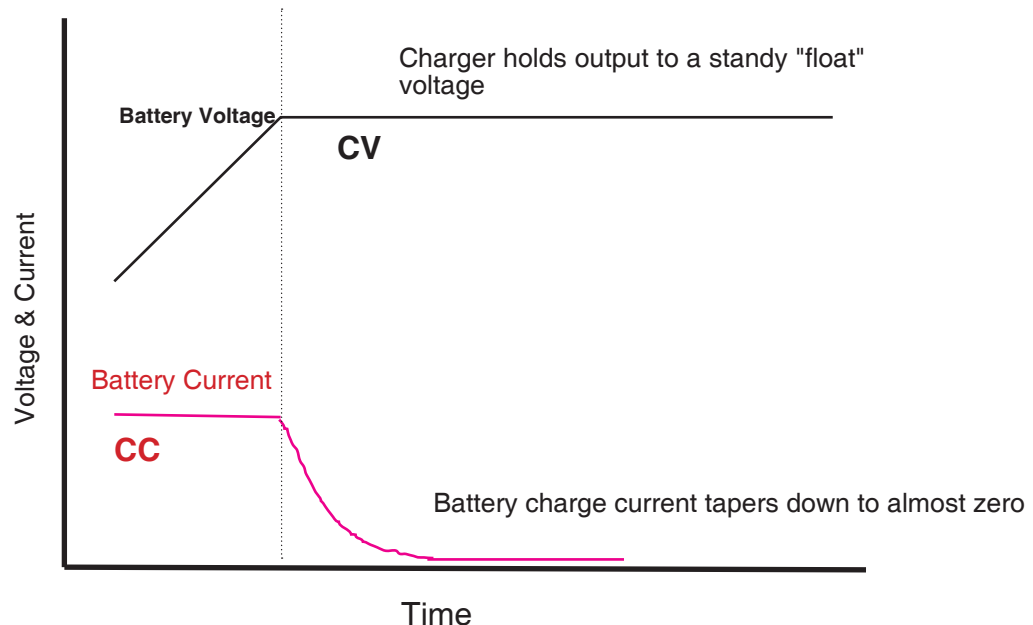
- Do not connect different batches, different types, old and new batteries in parallel.
- Ensure the battery voltage difference is below 100mV before parallel connection to avoid high pulse current.
- Ensure every battery have 3A charge/discharge current.
- **The parallel application can only extend the working time, and cannot increase the charging or discharging current.**

Charging Batteries

Chargers that require the detection of voltage at the battery terminals to charge may fail to wake the Li-ion battery from a state of under-voltage protection. Constant Voltage (CV) chargers may result in an inrush of current due to the low impedance of the cells, interrupting the charge. Reset the charger and continue charging normally if the charger trips. The constant current (CC) chargers is recommended strongly.

To charge a single 25.6V battery, the maximum charge voltage is 29.2V and the maximum charge current is refer to Table 1. Any inrush current may cause over current or short circuit protection.

Once you reach end-of-charge voltage, apply a constant voltage hold at this voltage until the current decays to almost zero. This charges the cells to 100% state of charge (SOC). Refer to below figure for an illustration.



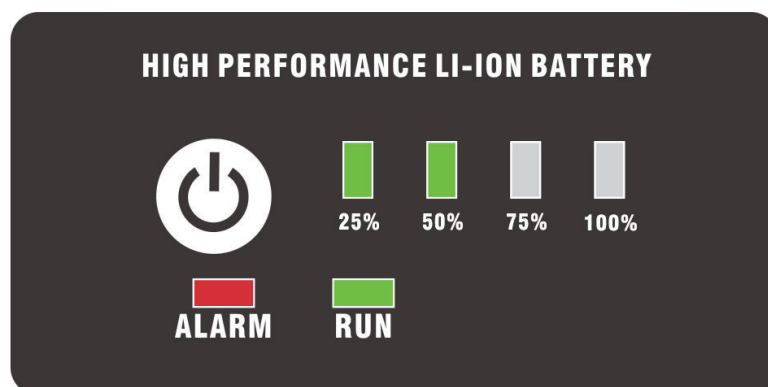
Battery voltage and current during recharge

Week up or Switch Off

For 25.6V100Ah Li-ion battery, if there are no charge or discharge for 24 hours, the battery will enter into sleep mode to save energy and it can still be measured a OCV, any charge or discharge operation will active the battery.

If the battery was over-dicharged protection, the BMS will enter into sleep mode after 5 min. there are no OCV at this status. only charge operation can active the battery.

For 25.6V100Ah Li-ion battery, it can also support to press ON/OFF button 6 seconds to active or switch off a battery.



LED Indicator for LI100A24PRO

Status	Nominal Warning Protection	RUN 	ALM 	SOC    				Description
Shut down	Dormancy	OFF	OFF	OFF	OFF	OFF	OFF	
Standby	Nominal	Flash 1	OFF	Follow module capacity				Standby
	Warning	Flash 1	Flash 3					Module at low voltage
Charge	Nominal	ON	OFF	Follow module capacity				
	Warning	ON	Flash 3					
	Over-charge Protection	ON	OFF	ON	ON	ON	ON	LED turn to standby if no power supply
	Temperature, over-current, Failure protection	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging
Discharge	Nominal	ON	OFF	Follow module capacity				
	Warning	ON	Flash 3					
	Under voltage Protection	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
	Temperature, over-current, short circuit, failure protection	OFF	ON	OFF	OFF	OFF	OFF	Stop discharging
Failure		OFF	ON	OFF	OFF	OFF	OFF	Stop charging and discharging

Note:

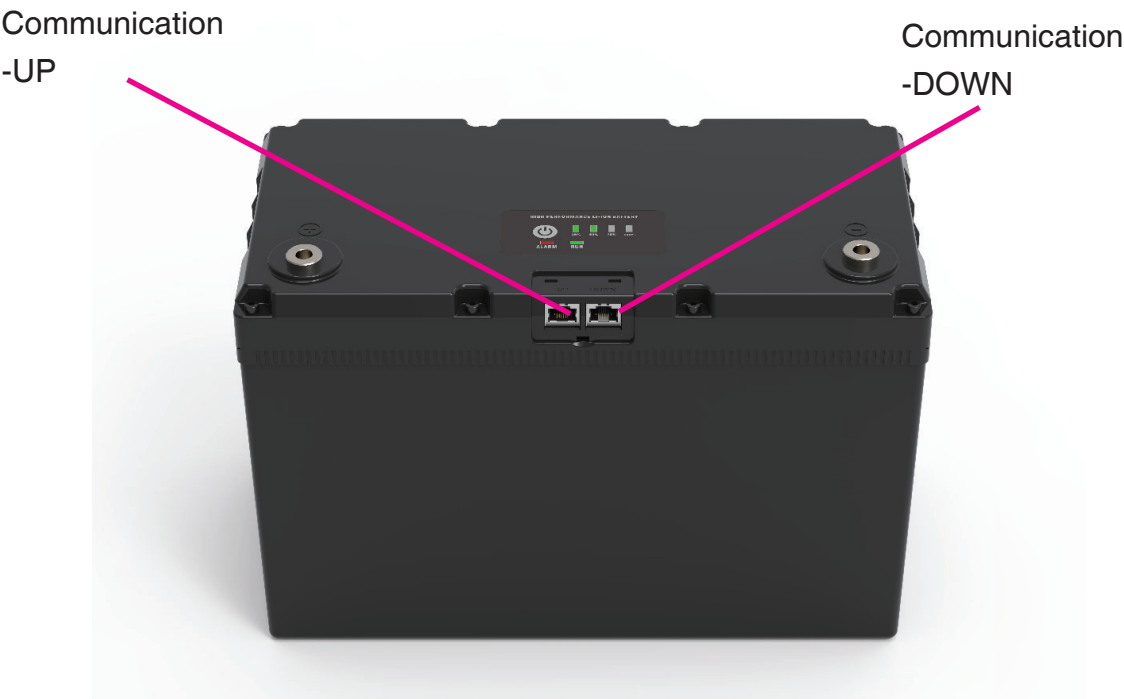
Flash 1: light 0.25s/off 3.75s

Flash 2: light 0.5s/ off 0.5s

Flash 3: light 0.5s / off 1.5s

Communication for LI100A24PRO

This chapter mainly introduce the communication function for LI100A24PRO



UP	
PIN	Description
1	LED -
2	O/F/LED+
3	O/F
4	CAN H
5	CAN L
6	COMG
7	RS485-A
8	RS485-B

DOWN	
PIN	Description
1	/
2	SWB
3	SWA
4	CAN H
5	CAN L
6	COMG
7	RS485-A
8	RS485-B

the battery BMS default ADD is 0, if there are 2 or more batteries connect in series or parallel.

It needs change BMS ADD by following steps:

Step 1: Ensure all batteries are on sleep mode. Measure every battery open circuit voltage

Step 2: Connect power cable for series or parallel.

Step 3: Connect communication cable between batteries.

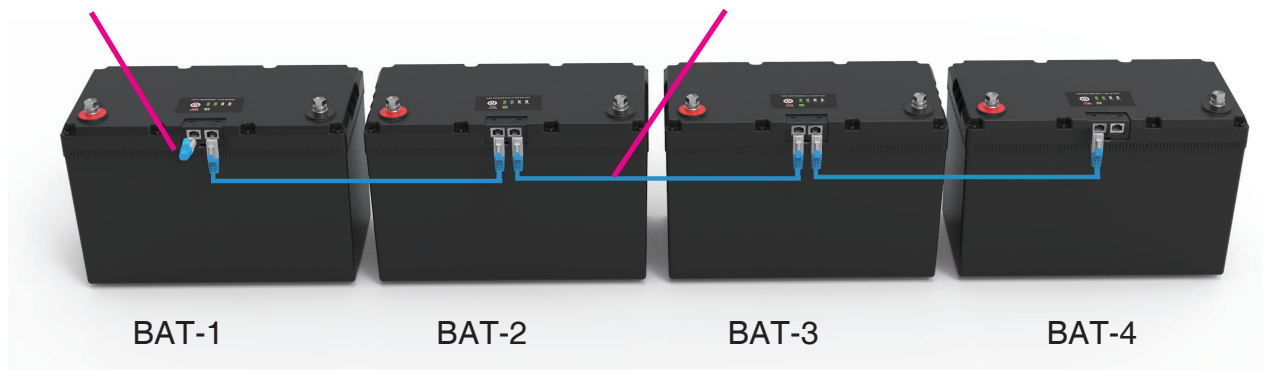
Step 4: Active all batteries by press ON/OFF button 6s, the battery SOC indicator will on. Setp

5: Insert BMS coding accessories to BAT-1 UP port. the BAT-1 RUN & ALARM LED will start to flash, and then BAT-1 and BAT-2 RUN & ALARM LED will flash, fi nally, all LED indicator will become normal which means the BMS ADD coding process is complete.

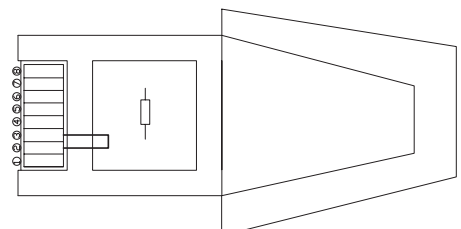
Setp 6: Remove BMS coding accessories and connect RS485-USB cable to PC, it can monitor every battery information by BMS PC software.

BMS coding accessories

Communication cable between batteries



BMS coding accessories



Communication cable

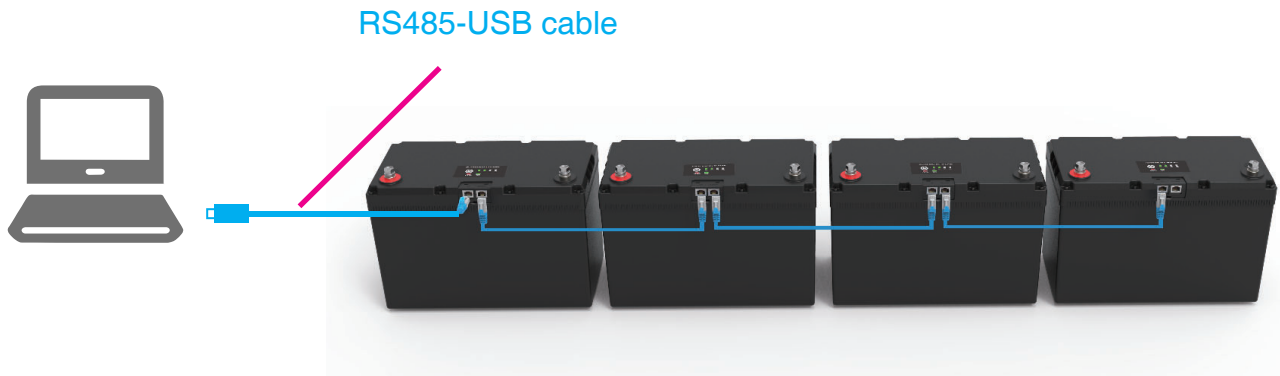
The communication cable between Battery and Victron inverter is Customization required ,

Cannot be used standard network cable.

BMS PC software operation

This chapter mainly introduce the BMS PC software operation for R-LFP25.6V100Ah.

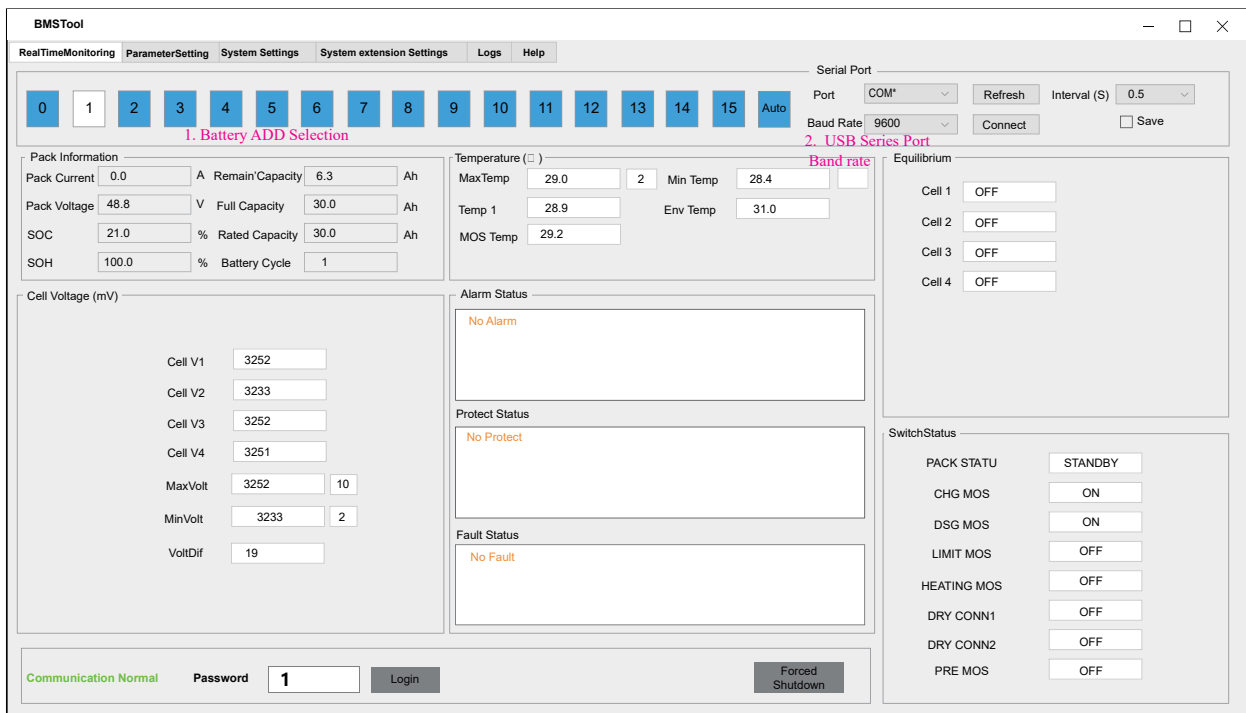
BMS PC software download: <https://www.gptess.com/list-download.html#md1>



Double click BMSTools.exe to open the software.

Check the battery ADD, USB series Port and band rate-9600, click “connect”.

If the communication is normal, the battery realtime information will be listed.



Click “ Read”, the BMS default parameter will be list. any modify about BMS parameters should be carried out by a professional engineer.

Wrong parameters setting will cause the damage about BMS or battery.

BMSTool

RealTimeMonitoring | **ParameterSetting** | System Settings | System extension Settings | Logs | Help

Clear | Deselect All | Write | Stop | Read | Clear | Restore

Pack OV Alarm Protect

- ☐ Pack OV Alarm (V) []
- ☐ Pack OV Protect (V) []
- ☐ Pack OVP Release (V) []
- ☐ Pack OVP Delay Time (mS) []

Cell OV Alarm Protect

- ☐ Cell OV Alarm (V) []
- ☐ Cell OV Protect (V) []
- ☐ Cell OVP Release (V) []
- ☐ Cell OVP Delay Time (mS) []

Pack UV Alarm Protect

- ☐ Pack UV Alarm (V) []
- ☐ Pack UV Protect (V) []
- ☐ Pack UVP Release (V) []
- ☐ Pack UVP Delay Time (mS) []

Cell UV Alarm Protect

- ☐ Cell UV Alarm (V) []
- ☐ Cell UV Protect (V) []
- ☐ Cell UVP Release (V) []
- ☐ Cell UP Delay Time (mS) []

CHG OC Alarm Protect

- ☐ CHG OC Alarm (A) []
- ☐ CHG OC Protect (A) []
- ☐ CHG OC Delay Time (mS) []

CHG OT Alarm Protect

- ☐ CHG OT Alarm () []
- ☐ CHG OT Protect () []
- ☐ CHG OTP Release () []

DSG OT Alarm Protect

- ☐ DSG OT Alarm () []
- ☐ DSG OT Protect () []
- ☐ DSG OTP Release () []

CHG UT Alarm Protect

- ☐ CHG UT Alarm () []
- ☐ CHG UT Protect () []
- ☐ CHG UTP Release () []

DSG OC Alarm Protect

- ☐ DSG OC Alarm (A) []
- ☐ DSG OC 1 Protect (A) []
- ☐ DSG OC 1 Delay Time (mS) []
- ☐ DSG OC 2 Protect (A) []
- ☐ DSG OC 2 Delay Time (mS) []

DHG UT Alarm Protect

- ☐ DHG UT Alarm () []
- ☐ DHG UT Protect () []
- ☐ DHG UTP Release () []

MOS OT Alarm Protect

- ☐ MOS OT Alarm () []
- ☐ MOS OT Protect () []
- ☐ MOS OTP Release () []

ENV OT Alarm Protect

- ☐ ENV OT Alarm () []
- ☐ ENV OT Protect () []
- ☐ ENV OTP Release () []

ENV UT Alarm Protect

- ☐ ENV UT Alarm () []
- ☐ ENV UT Protect () []
- ☐ ENV UTP Release () []

Balance Threshold (mV)

- ☐ Balance Threshold (mV) []
- ☐ Balance ΔV_{ocell} (mV) []

Sleep Vcell (V)

- ☐ Sleep Vcell (V) []
- ☐ Delay Time (s) []
- ☐ SCP Delay Time (uS) []
- ☐ SOC Low Alarm (%) []

BMS Version []
Model SN []
PACK SN []

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Communication with different inverter

LI100A24PRO li-ion battery BMS support to do communication with below inverters.

This chapter mainly introduce the communication cable connection and BMS software configuration.

SN	Inverter Brand	Adaption Series	Communication
1	Victron	CCGX- VE-CAN	CAN
2	Voltronic		RS485
3	MUST		RS485
4	FIRMAN		RS485

Note: The BMS only integrate 1 inverter protocol inside, it needs to re-load different BMS software for different inverter.

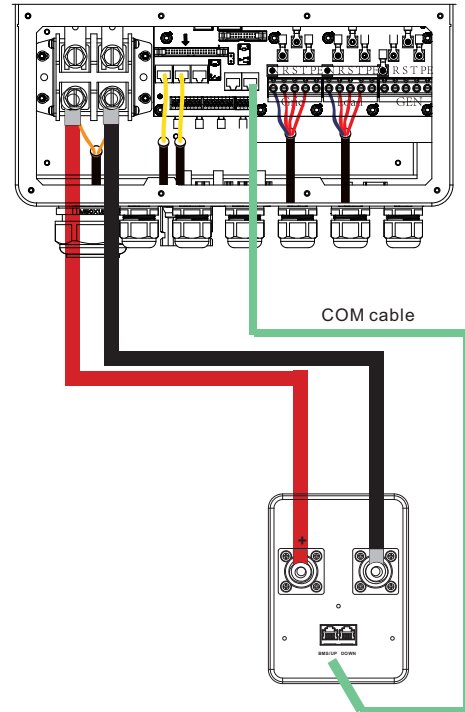
System cable connection

Single inverter with single battery

- Step 1. Make sure the battery breaker is in off condition. Connect the power cable to inverter. Make sure the screws are tight.
- Step 2. Connect the communication cable.
- Step 3. Set the battery module ID by ADD. **The master battery which do communication with inverter ADD must be 1.**
- Step 4. Make sure the inverter had be installed correctly.
- Step 5. Turn on battery breaker.
- Step 5. Press ON/OFF button to active the battery BMS and the inverter will be activated,
- Step7. Set inverter (Battery type and communication), If the communication between BMS and inverter is nominal, the SOC, temperature information will be send to inverter.
- Step8. **Charge the batteries fully in first use.**

Note:

- For 1pcs LI100A24PRO, the max. output current is 100A and it max support 2.5KVA inverter or the real load power consumption is less than 2.5KW.



Troubleshooting

The 25.6V Li-ion batteries are extremely reliable batteries that provide greater useful life than comparable 12V lead-acid batteries. Despite the high reliability of the 25.6V Li-ion batteries, you may encounter situations where the battery does not operate as expected. These situations are typically the result of misuse, abuse or a non-optimal operating or storage environment. This part details potential issues you may encounter with the 25.6V Li-ion batteries and the appropriate troubleshooting procedures.

Charger Trips using Constant Voltage

Problem:

CV charger trips when charging the batteries. This is due to the low impedance of the battery creating a current inrush.

Solution:

Reset the charger and try again.

Terminal Voltage Absent or Low

Problem:

Using a multimeter to check terminal voltage shows the terminal voltage is low ($<20V$).

Possible causes for this problem are:

The voltage of a cell within the battery dropped below 2.5 V, causing the microprocessor to enable low-voltage protection.

The battery's SOC dropped below 5% from either an extended idle period or heavy use, enabling under-voltage protection.

The battery overheated ($>60^{\circ}C$), causing the microprocessor to enable over-temperature protection.

Solution:

To resolve situations where terminal voltage is absent or low:

1. Allow the battery to cool and then recheck terminal voltage.
2. Connect the battery to a charger to wake the battery and recover terminal voltage.
($\leq 30V$ PV panel can be used to active a deep discharge battery.)
3. If the cells pack voltage is below 14V, the BMS will not be activated anymore. So it needs to be charged in time after deep discharge.

Battery Current Disappears when Charging

Problem:

Battery current disappears when charging. Possible causes for this problem are:
The battery overheated, enabling over-temperature protection.
Charger voltage is too high.

Solution:

To resolve situations where current disappears when charging:

- 1.Allow the battery to cool.
- 2.Reduce charger voltage to 28.4~29.2Vd.

Recommended setting for 25.6V battery:

Equalized charging voltage: 28.4~29.2Vd

Float charging voltage: 28Vdc

Charge current: 0.5C

End of discharge voltage: 24Vdc