New Generation 12.8V / 25.6V Li-ion Battery

User's Guide

End User Documentation

Rev 1.0

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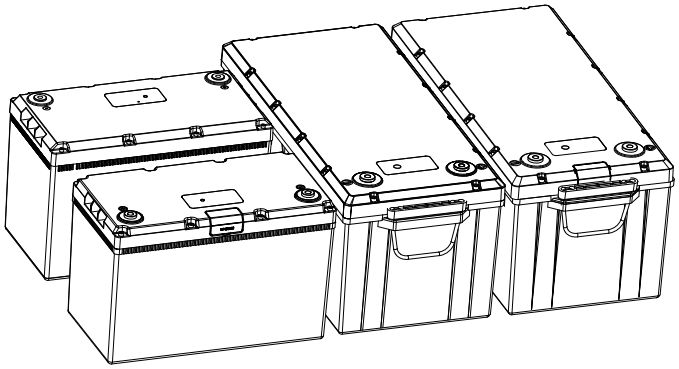

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New Generation 12.8V / 25.6V Li-ion Battery

Ritar new generation 12.8V/25.6V Li-ion battery is intended as a replacement for the common 12V lead acid battery and traditional case Li-ion battery. The new generation Li-ion battery adopt removable enclosure and modular design which support to assembly in local.

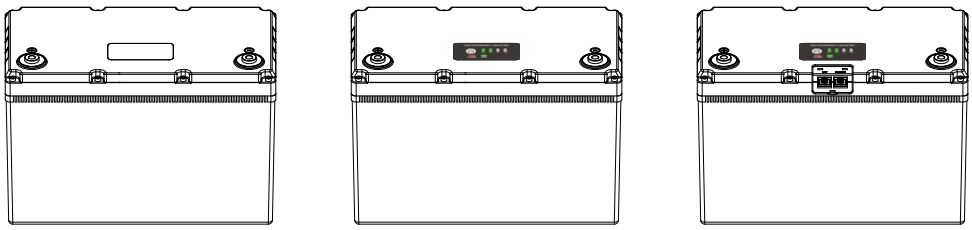
The new generation Li-ion battery adopt Iron Phosphate (LiFePO4) cells and unique BMS to provide safety, high current and prominent long life performance, with 20 times longer cyclic life than SLA battery to save cost and energy, up to 70% lighter than SLA battery to save logistic cost. Diverse accessories which include Bluetooth modules, heater components, LED display units and communication ports.

This document is intended for use by anyone required to install and operate new generation 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.

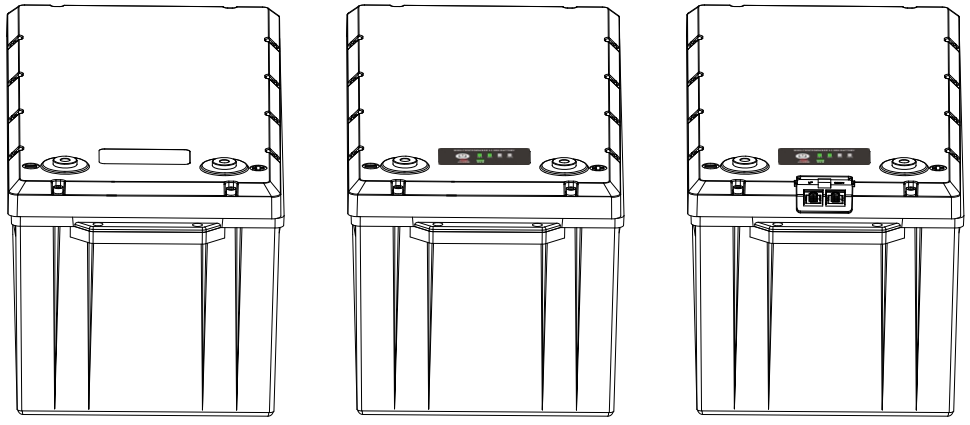
Failure to install or use this product as instructed can result in damage to the product that may not be covered under the limited warranty.

12.8V100Ah, 25.6V50Ah



G1 G2 G3

12.8V200Ah, 12.8V300Ah, 25.6V100Ah, 25.6V200Ah



G1 G2 G3

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.
- 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 ames.
- Do not connect over 4 sets 12.8V or 2 sets 25.6VLi-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.

Storage

The 12.8V/25.6V 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 3 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 12.8V Li-ion battery that you can connect in a series is four.

The maximum number of 25.6V Li-ion battery that you can connect in a series is two.

Below figure 2 illustrates four 12.8V Li-ion batteries connected in series, for a 4S1P configuration.

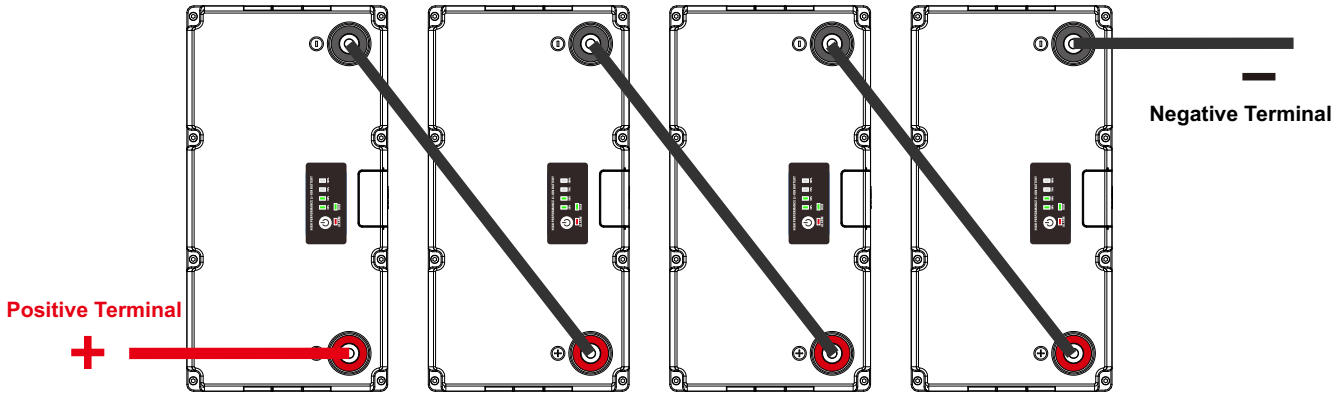


Figure 2. Connecting Batteries in Series (4S1P Configuration)

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

Three batteries in series: 3 x 12.8V = 38.4V (nominal) for 36V applications

Four batteries in series: 4 x 12.8V = 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 cause some batteries 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 12.8V Li-ion batteries connected in parallel.

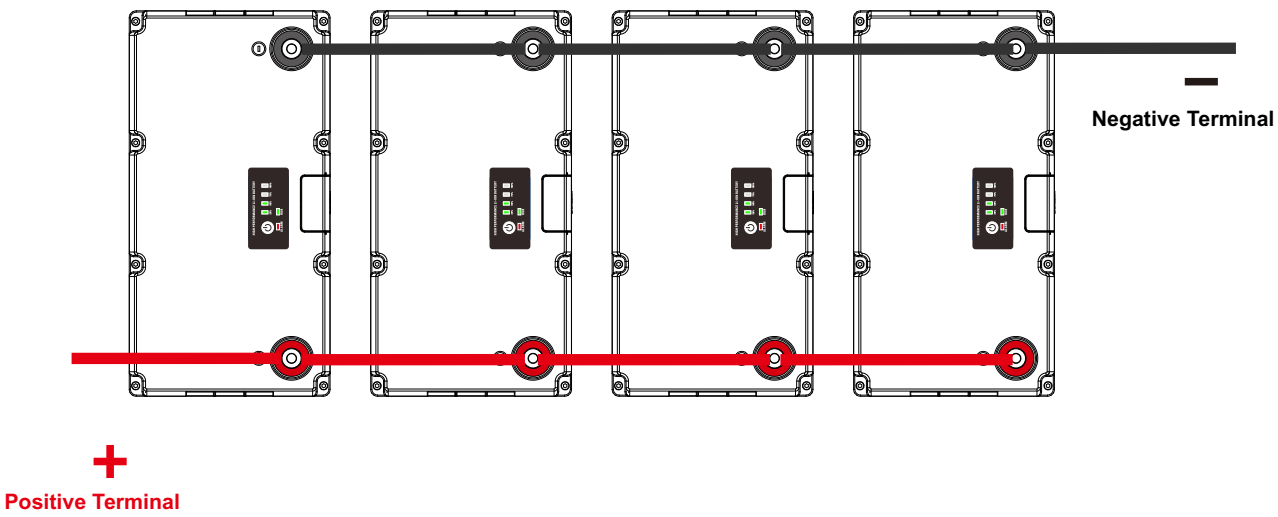


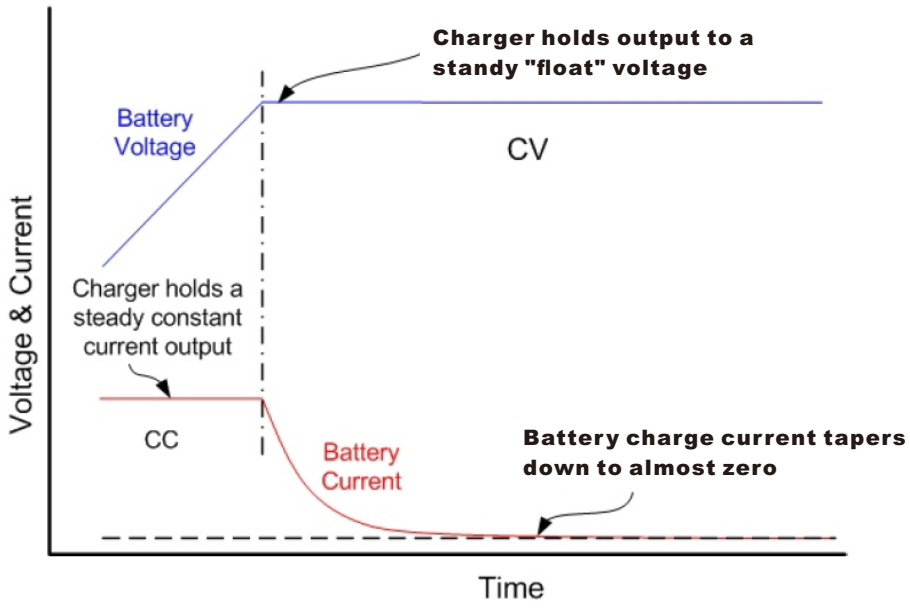
Figure 3 Example of a 4P1S Configuration

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

The 12.8V Li-ion is compatible with common 12V Lead-acid battery chargers.
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 12.8V battery, the maximum charge voltage is 14.6V 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 Charge

Note:

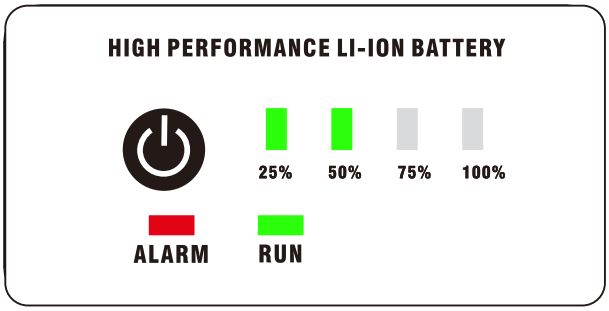
For 12.8V Li-ion battery, the minimum charging voltage is 13.7V, otherwise the battery will not be fully charged.

ON/OFF Button and LED Indicators for G2, G3

For new generatation 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 (>10V), 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 G2 and G3 series. it can also support to press ON/OFF button 6 seconds to active or switch off a battery.

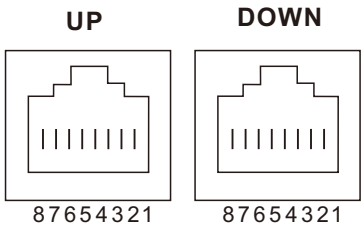


ON/OFF button and LED indicators for G2 and G3

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 Port for G3



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

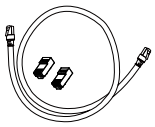
DOWN	
PIN	Description
1	/
2	SWB
3	SWA
4	CAN H
5	CAN L
6	COMG
7	RS485-A
8	RS485-B

Note :

1. For parallel connection, it supports to do communication between batteries.

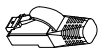
Communication connection

the battery BMS default ADD is 0, if the battery needs to do communication with inverter or there are 2 or more batteries connect in parallel. it needs set ADD.
The below accessories is necessary for communication setting and connection.

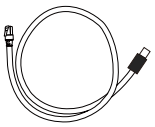


Communication cable-586B,CAT5e, 1m

CAN terminal resistor for parallel communication
(Blue color, PIN4-PIN5 120 Ohm resistor)

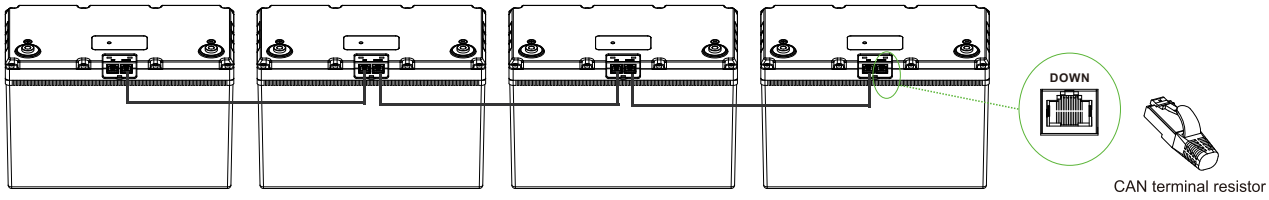


Automatic coding parts for parallel batteries ADD automatic coding
(Gray color, PIN2-PIN3 short together)

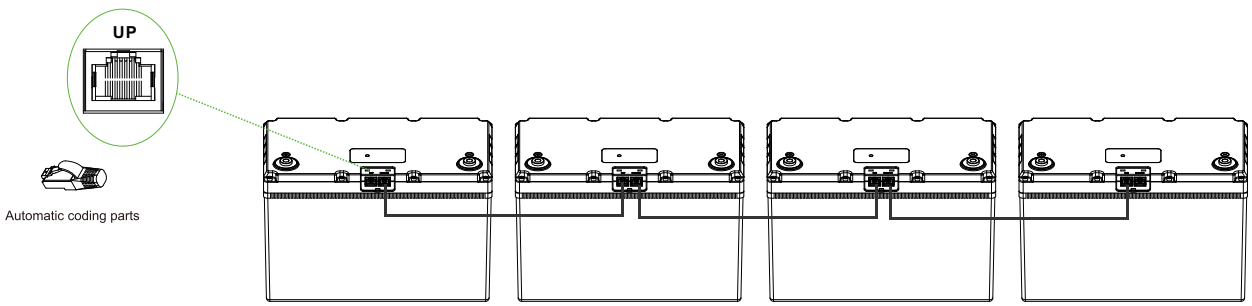


Optional Part
RS485-USB device
Only for install engineer and after-sale engineer.

Step 1. Connect the power cable between batteries. Make sure the screws are tight.
Step 2. Connect communication cable batteries and CAN terminal resistor.



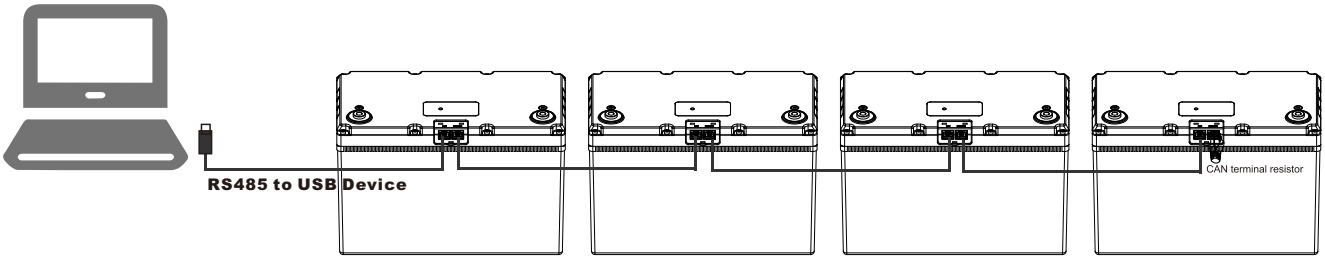
Step 3. Press ON/OFF button 6s to active all batteries. the battery SOC indicator will on.
Step 4. Insert automatic coding parts to BAT-1 UP port. the BAT-1 RUN & ALARM LED will start to flash at the same time which means the BMS start setting ADD automatically. Finally, all LED indicators will become normal which means the BMS ADD coding process is complete.
Setp 5: Remove automatic coding parts and connect RS485-USB cable to PC, it can monitor every battery information by BMS PC software. or connect BAT-1 UP port to inverter.



BMS PC software operation

This chapter mainly introduce the BMS PC software operation for G3 series.

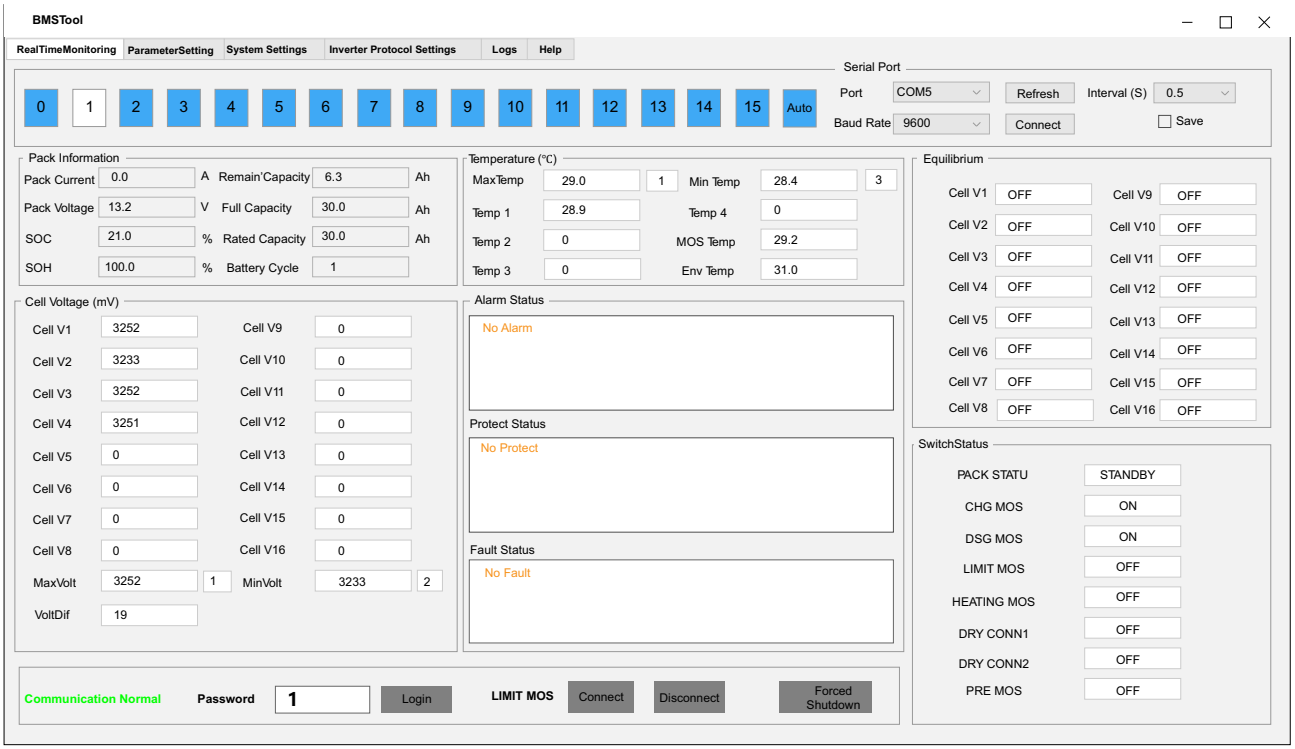
BMS PC software download: *http://120.27.63.138:8181/attach_files/vrla_case_12/112*



Double click BMSTools.exe to open the software.

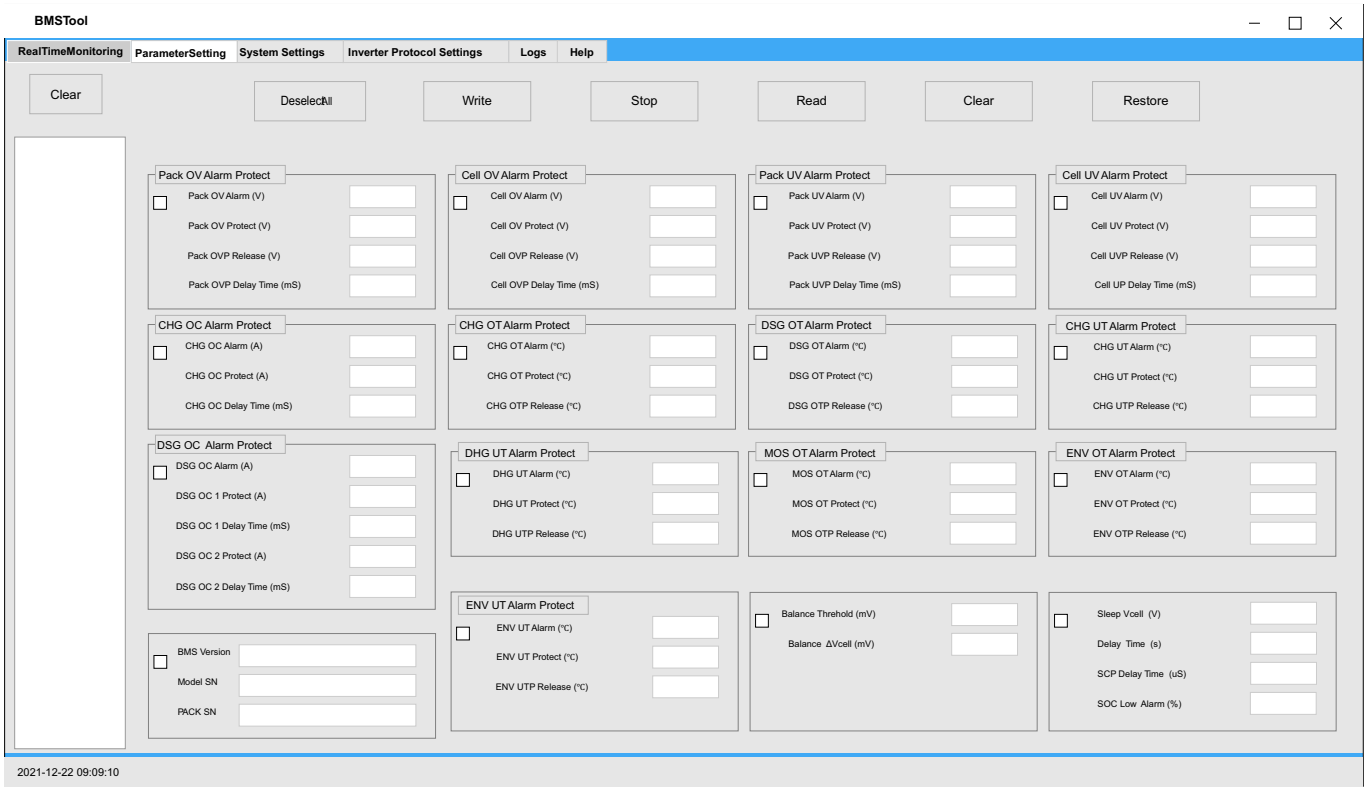
Check the battery ADD, USB series Port and band rate-9600, click "connect".

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.



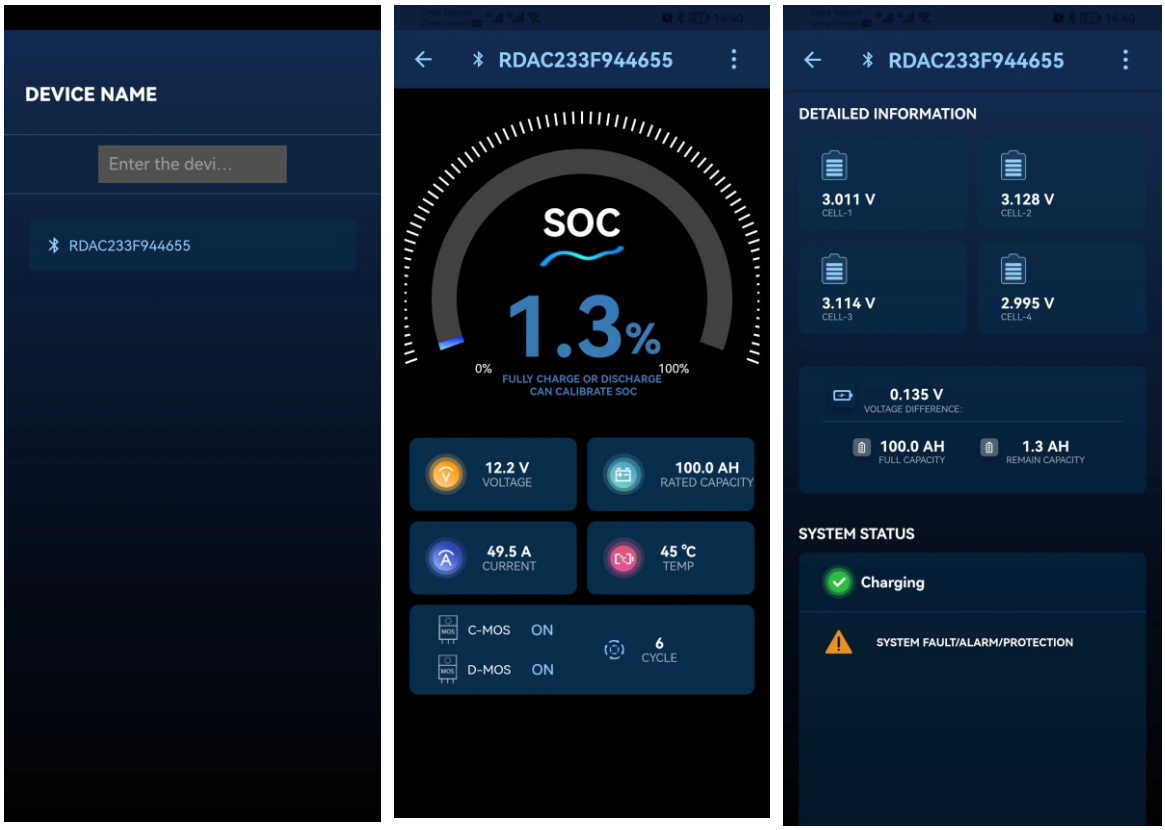
Bluetooth battery APP introduction

This chapter manily introduce the bluetooth battery APP

For IOS device, it can search Bluetooth Li at App Store.

For Android device, it can scan below QR code to download APP.

Android App



Note :

1. Bluetooth module is optional parts for new generation Li-ion battery.

Troubleshooting

The 12V / 24V Li-ion batteries are extremely reliable batteries that provide greater useful life than comparable 12V lead-acid batteries. Despite the high reliability of the 12V/24V 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 12V / 24V 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.

Possible causes for this problem are:

The voltage of a cell within the battery dropped below 2 V, causing the microprocessor to enable under-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, 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. Depending on the battery's voltage and state of balance it may take up to 48 hours to completely charge and balance the battery.

Battery Current Disappears when Charging

Problem :

Battery current disappears when charging. Possible causes for this problem are:

The battery overheated, enabling over-temperature protection.

The battery pack is out-of-balance.

Charger voltage is too high.

Solution:

To resolve situations where current disappears when charging:

1.Allow the battery to cool.

2.Apply a 14.0 V charge voltage for 48 hours to balance the battery pack‘s cells.

3.Reduce charger voltage to 14.4 V or less.