

# Manual on Rack Mounted Li-ion Battery

Product model:LFR24100



# **Operation Manual for LFR Series Rack-Mounted Battery**

**Product Model: LFR24100**

**File version: V1.0**

**Revision record**

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1	V1.0	first edition	2024/04/11	

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# 1. Safety instructions



Danger: If there is no standardized operation, it may lead to accidents such as fire, serious personal injury, and even death.



Attention: If there is no standardized operation, it may cause moderate or minor personal injury, as well as system failure or damage. When installing, using, and repairing this system, please read this manual carefully and be sure to follow the safety precautions required in this chapter! Any injury or loss caused by illegal operations is not related to our company!

## Usefulness



### Danger

◆ This series of battery packs must be used together with the compatible inverter, otherwise it may cause system damage.




◆ This series of battery packs is used for energy storage and cannot be used for other purposes, as it may cause system malfunctions or fires.




## Arrival inspection





### Attention

◆ If system components are found to be damaged, they cannot be installed. Please communicate and confirm with the manufacturer in a timely manner, otherwise it may affect the project application.

	<p>◆ If it is found that the packing list does not match the physical name, communicate and confirm with the manufacturer in a timely manner, otherwise it may affect the project application.</p>
Install	<p> Attention</p>
	<p>◆ when handling and installing, please handle with care, otherwise it may cause system damage.</p> <p>◆ This system should be kept away from flammable and explosive materials and heat sources.</p>
Assembly wiring	<p> Danger</p>
	<p>◆ Installation must be guided by qualified electrical engineering personnel who are familiar with the system, otherwise there is a risk of electric shock or damage to the system.</p> <p>◆ Before wiring, it is necessary to ensure that the power supply is disconnected, otherwise there is a risk of electric shock or fire.</p>
	<p> Attention</p> <p>◆ Confirm if the communication wiring is correct, otherwise it may cause abnormal operation</p>

	<p>◆ Confirm whether the positive and negative pole connections of the power supply are correct, otherwise it may cause system damage.</p>
Running	<p> Danger</p>
	<p>◆ Only after proper connection can the power be turned on. It is strictly prohibited to plug and unplug the wiring harness when the power is on, otherwise there is a risk of electric shock.</p> <p>◆ Non system familiar professionals are not allowed to change the parameters of the upper computer settings page without authorization, otherwise it may cause system malfunctions or even accidents.</p>
	<p> Attention</p>
	<p>◆ Before running, please confirm whether this system is within the allowable range of use, otherwise it may cause damage to the system.</p> <p>◆ Before operation, please confirm that the positive and negative wiring screws are tightened, otherwise it may cause system damage</p>
Maintenance	<p> Danger</p>
	<p>◆ If you want to disassemble the casing,</p>

Inspection	<p>please make sure to turn off the power, otherwise there is a risk of electric shock.</p> <p>◆ Please designate qualified electrical engineering personnel for maintenance, inspection, or replacement of components, otherwise accidents may occur.</p>
Others	<p> Danger</p>
	<p>◆ Do not squeeze, puncture, drop, vibrate, heat or short-circuit, and keep away from corrosive substances.</p> <p>◆ Do not disassemble the battery by yourself. Incorrect disassembly can cause short circuits and other problems such as fire, gas, and even explosion;</p> <p>◆ Do not place the battery in a fire. Otherwise, it may cause very dangerous situations such as fire and explosion.</p>
	<p> Attention</p>
	<p>◆ If deformation, swelling, leakage or other issues are found, please do not use.</p> <p>◆ Do not place the battery in substances such as water or liquids.</p>

## 2. Introduction to Basic Functions of Rack mounted Battery

This product is a rack mounted lithium battery pack that can be combined with an adaptive inverter to form a household energy storage system. AC mains electricity (or solar energy generated through photovoltaic panels) is converted into appropriate voltage range DC electricity through an inverter to charge the battery pack and store electrical energy for use when needed. When battery storage is needed, the electricity from the lithium battery pack is converted into alternating current (grid connected or off grid, depending on user needs and inverter functions) through an inverter to supply power to the user's electrical equipment.

The product shapes of LFR24100 rack battery are shown in figure 1:

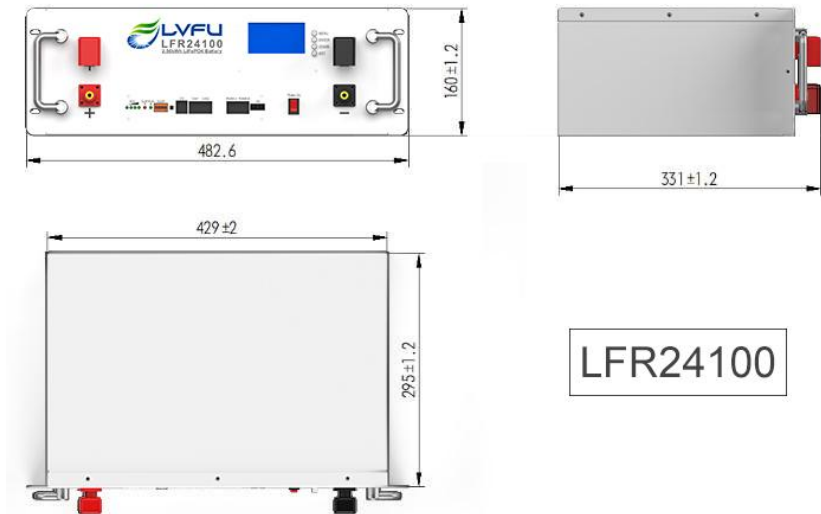
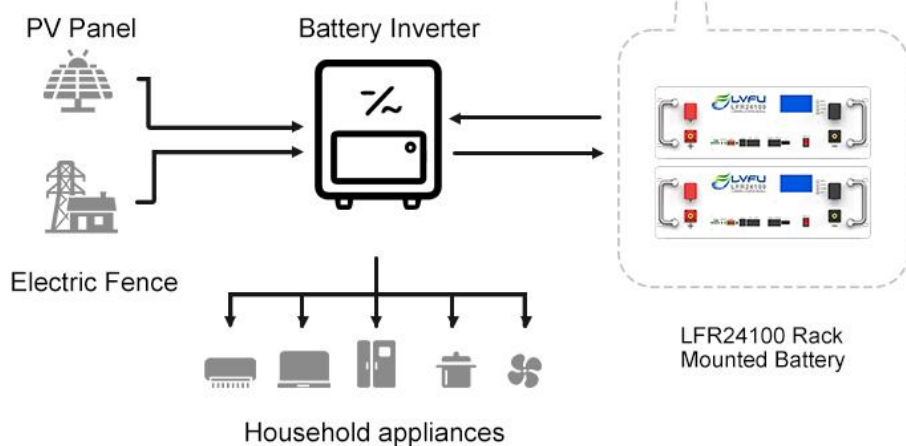


Figure 1. External view of LFR24100

The application scenario is shown in the figure:



**Figure 2. Application scenario diagram**

The technical parameters of the battery are shown in the table below

**Table 1. Technical parameters of rack battery LFR24100**

Model		LFR24100
Specifications		24V100Ah
Battery Parameters	Battery type	LFP(LiFePO4)
	Nominal voltage (V)	25.6
	Range of operating voltage (V)	21.6-29

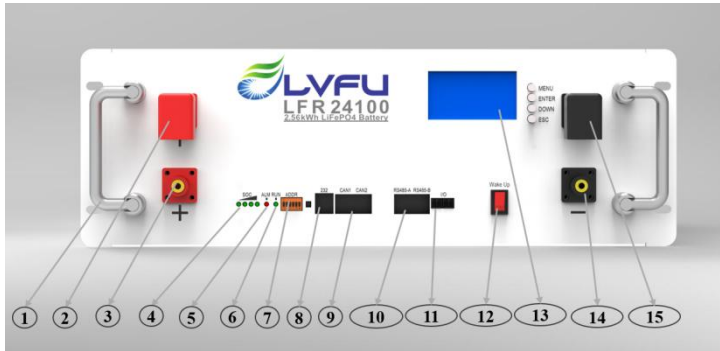
	Floating charge voltage (V)	27
	Equalized charging voltage (V)	28
	Conditions for opening step-up charging (V)	Total voltage $\geq 28$
	Trickle charge current	25
	Max. charge voltage (V)	29.04
		or unit $\geq 3.63$
	Max. charge / discharge current (A)	50/100
	Discharge cut-off conditions	SOC $\leq 5\%$ , or
		Total voltage $\leq 23.2$
		or unit $\leq 2.9$
General Characteristics	Rated capacity *(Ah)	100AH
	Rated energy (kWh)	2.56
	Dimensions (W*D*H)	482.6*331*160 ( $\pm 1.2$ )
	Weight of battery pack (Kg)	29

\* The rated capacity refers to the current released by charging at 0.5C to the cut-off state at  $25 \pm 5^\circ\text{C}$ , and then discharging at 0.5C to the cut-off state after standing for 30min.

### 3. Structure and Function Description of Rack Battery Products

#### 3.1. Product Interface

The interface and its definition of LFR24100 rack battery is as follows:



**Fig. 3 Rack Battery Interface and Components Diagram**

**Table 2. Definition details of rack battery interface**

No.	Components of Interface	Silk Screen and Identification	Functions
1	Handle	/	Battery transfer handle
2	Positive terminal cover	/	Positive terminal insulation protection
3	Positive terminal	+	Positive battery output terminal
4	Power indicator	SOC	Display the status of battery capacity
5	Alarm indicator	ALM	Display the alarm status
6	Running indicator	RUN	Display the running status
7	DIP switch	ADDR	Set RS485 communication address
8	RJ45 interface	232	Output electrical signal (reserved)
9	RJ45 interface	CAN1, CAN2	Inverter communication interface
10	RJ45 interface	RS485A, RS485B	RS485 parallel interface
11	Dry contact	I/O	Output electrical signal (reserved)
12	Rocker switch	Wake Up	Control the on / off of BMS



<b>13</b>	Display screen	/	Display battery running, alarm and other information
<b>14</b>	Negative terminal	—	Negative battery output terminal
<b>15</b>	Negative terminal cover	/	Negative terminal insulation protection

## 4. Installation and usage instructions for rack batteries

### 4.1. Unpacking and Inspection

After unpacking, check if the goods are complete according to the packing list in the document, and check the battery pack for appearance, the device for integrity and correctness, and the battery case for deformation and corrosion.

#### **LFR24100 battery packing list:**

**LFR24100 battery pack** × 1 unit

**Wires** × 1 set (including:

25 square 0.3m positive electrode wires × 1;

25 square 0.3m negative electrode wire × 1;

0.4m grounding wire × 1;

0.3m Ethernet cable × 1)

**Instruction** × 1 book (this product)

### 4.2. Precautions before installation

(1) Before installing the battery module, it is necessary to carefully check whether the open circuit voltage of the battery is normal, and whether there is any damage to the shell, leakage, or other phenomena;

(2) During the installation process, insulated tools and gloves should be used. Metal containing conductors such as watch bracelets should be removed from the wrist to prevent electric shock or short circuits between the positive and negative poles;

(3) The installation location of the battery should be far away from heat sources or areas prone to metal sparks, with a safe distance of more than 0.5m;

(4) Cannot connect batteries of different models, performance, and manufacturers together for use;

(5) The connection wires for battery pack installation should be as short as possible to prevent excessive line losses.

(6) Batteries should be kept away from direct sunlight and should not be placed in environments with a large amount of radioactivity, infrared radiation, organic solvent gases, and corrosive gases. They should be kept away from windows, air conditioning, exhaust fans, etc.

#### **4.3. Installation steps:**

##### **4.3.1 Single machine use**

(1) Before installing the battery, please ensure that the system end battery switch is in the OFF state to prevent ignition during installation and wiring.

(2) Keep the battery in a non working state (indicator light not on)

(3) Connect the negative terminal (P-) of the battery to the negative terminal of the system using a wire

(4) Connect the battery positive pole (P+) to the system positive pole using a wire.

(5) After the installation of the battery system, pay attention to the insulation treatment of the battery poles and cover the insulation cover

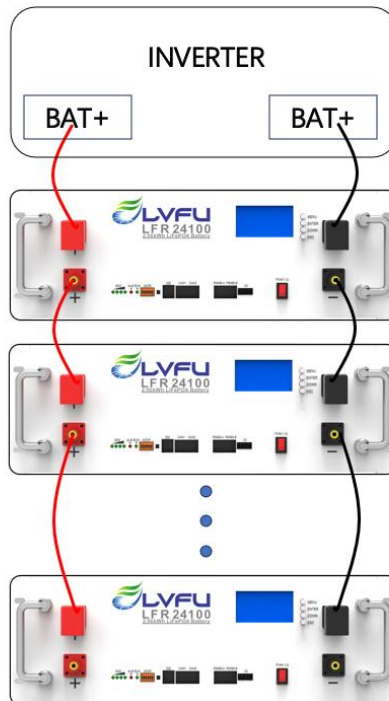
##### **4.3.2 Parallel use**

(1) If parallel connection is required, before conducting parallel connection, please check the voltage of each battery module. The voltage difference between battery modules should be less than 0.5 V. If it is greater

than this value, please adjust the voltage through charging and discharging and let it stand for at least 15 minutes before proceeding with the operation.

(2) The parallel connection method is as follows:

Parallel connection of power lines: Use wires to connect the positive pole of the battery to another positive pole, and the negative pole to another negative pole. It is prohibited to connect batteries in series;



**Figure 4. Parallel Connection Diagram**

(3) After the installation of the battery system, pay attention to the insulation treatment of the battery poles and cover the insulation cover.

## **4.4. Switching on and running**

### **4.4.1 Power on/start up**

If the BMS is in hibernation status, pressing ON of the rocker switch,

BMS is started and switched to normal operating status after LED indicators light up in turn.





#### 4.4.2 ShutDOWN/Hibernation

If the BMS is in standby or discharge status, pressing OFF of the rocker switch, BMS is switched to hibernation status after LED indicators light up in turn. No power consumption of BMS after hibernation.










#### 4.4.3 Status display

When the battery is in different operating modes, the LED lights on the panel will emit different indications

(1) LED: 4 green capacity indicators, 1 red warning indicator, and 1 green running indicator

SOC1	SOC2	SOC3	SOC4	ALM	RUN
					
					

(2) Capacity Indicator:

Status	Charge				Discharge			
Capacity Indicator	SOC1	SOC2	SOC3	SOC4	SOC1	SOC2	SOC3	SOC4
								
0-25%	Flash2	Off	Off	Off	On	Off	Off	Off
25-50%	On	Flash2	Off	Off	On	On	Off	Off
50-75%	On	On	Flash2	Off	On	On	On	Off
75-100 %	On	On	On	Flash2	On	On	On	On
Running Indicator	On				Flash 3			
								

Running status indicator :

Status Indicator: System Status	Abnormalities	Power LED				ALM	RUN	Description
		●	●	●	●	●	●	
ShutDOWN	ShutDOWN	All off						
Standby	Normal	Based on power indication				Off	Flash 1	The standby status only appears as normal or alarm, and protection and fault are reported in charge /discharge status. Alarms include high dropout voltage alarm, low capacity alarm, high / low unit voltage alarm, high / low overall voltage, and all temperature alarms (high / low cell temperature, high / low ambient temperature, high MOS temperature)
	Alarm					Flash 2	Flash 1	
Charge	Normal	Based on the power indication				Off	On	
	Alarm					Flash 2	On	Alarms include high dropout

		(when power indication is maximum, the LED flashes 2)			voltage alarm, low capacity alarm, low unit voltage alarm, low overall voltage, and all temperature alarms (high / low cell temperature, high / low ambient temperature, high MOS temperature, overcurrent alarm)
	Unit / overall overvoltage protection / full charge protection	Based on power indication	Off	On	
	Overcurrent protection (current-limiting charge)	Based on the power indication (when there is charging current, the power indication is maximum, and the LED flashes 2)	Off	On	After charging overcurrent protection, it enters current-limiting charge mode with charging current, displayed in normal status. After charging overcurrent protection, it enters current-limiting

					charge mode without charging current, displayed in fault status, ALM On, and others off
	Temperature protection	All off	On	Off	Cell, MOS, environment
Discharge	Normal	Based on power indication	Off	Flash 3	
	Alarm	Based on power indication	Flash 2	Flash 3	Alarms include high dropout voltage alarm, low capacity alarm, high / low unit voltage alarm, high / low overall voltage, and all temperature alarms (high / low cell temperature, high / low ambient temperature, high MOS temperature, overcurrent alarm)
	Unit / overall undervoltage protection	Based on power indication	Flash 2	Off	
	Overcurrent	All off	On	Off	

	protection, short circuit protection				
	Temperature protection	All off	On	Off	Cell, MOS, environment
Fault	NTC fault, MOS fault, reverse connection, dropout voltage protection, ultra-low voltage protection	All off	On	Off	

(3) Flash description:

Flash mode	On	Off
Flash 1	0.25s	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

## 5. Screen operation instructions

### 5.1. Keys

This product is equipped with 4 keys, the functional order of which from top to bottom is as follows: MENU, ENTER, DOWN, ESC. " » ": a SUBMENU exists, press ENTER to enter the submenu.





Button functions:

MENU: press this key to enter the administration system

ENTER: press this key to enter the submenu

DOWN: press this key to move the cursor DOWN or page DOWN

ESC: press this key to return to the previous menu

## 5.2. Function Introduction

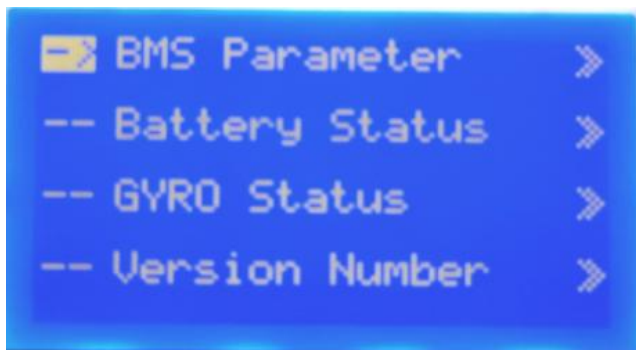
(1) The startup interface displays the following information:

System Date	SOH
Charge / discharge current	Ambient temperature
Total voltage	Maximum cell temperature
Remaining capacity	SOC
Maximum voltage of a single section	Minimum voltage of a single section



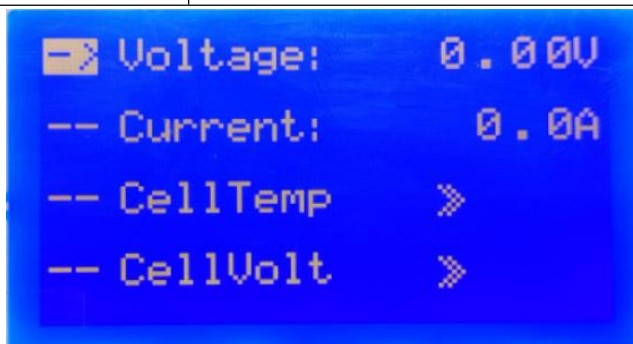
(2) Press MENU to enter the main menu

--BMS Parameter	»	-->	BMS parameters
**Battery Status	»	-->	Battery status
**GYRO Status	»	-->	Gyroscope status
**Version No.	»	-->	Version No.



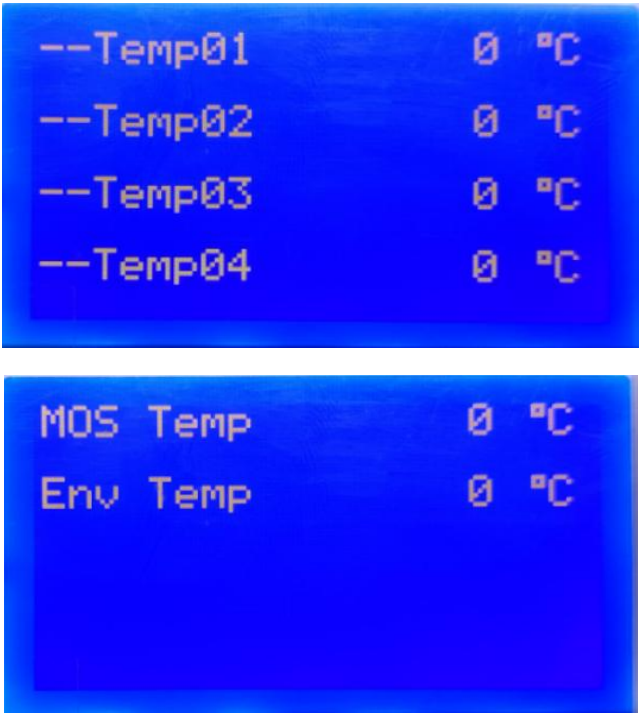
(3) Move the cursor on "BMS Parameter» " and press ENTER:

--Voltage:	--> Total voltage: XX V
**Current:	--> Current: 0.0A
**Cell Temp»	--> Battery temperature »
**Cell Vole»	--> Battery voltage»



(4) Move the cursor on "Cell Temp » " and press ENTER to enter the Battery Temperature Information interface, and press "DOWN" to page DOWN

--Temp01:xx°C	-->	Temperature 01
--Temp02:xx°C	-->	Temperature 02
--Temp03:xx°C	-->	Temperature 03
--Temp04:xx°C	-->	Temperature 04
--MOS Temp:xx°C	-->	MOS temperature
--Env Temp:xx°C	-->	Ambient temperature



(5) Move the cursor on "Cell Volt»" and press ENTER to enter the Battery Voltage Information interface, and press "DOWN" to page DOWN

--Cell01:	xxxxmV	-->	Voltage	01:
--Cell02:	xxxxmV	-->	Voltage	02:
--Cell03:	xxxxmV	-->	Voltage	03:
--Cell04:	xxxxmV	-->	Voltage	04:

--Cell05:	xxxxmV	-->	Voltage	05:
--Cell06:	xxxxmV	-->	Voltage	06:
--Cell07:	xxxxmV	-->	Voltage	07:
--Cell08:	xxxxmV	-->	Voltage	08:

```

--Cell101      --  mV
--Cell102      --  mV
--Cell103      --  mV
--Cell104      --  mV

```

```

--Cell105      --  mV
--Cell106      --  mV
--Cell107      --  mV
--Cell108      --  mV

```

```

--Cell109      --  mV
--Cell110      --  mV
--Cell111      --  mV
--Cell112      --  mV

```

```

--Cell113      -- mV
--Cell114      -- mV
--Cell115      -- mV
--Cell116      -- mV

```

--SOC:	--> SOC capacity
--Nominal:	--> Nominal capacity
--Remain:	--> Set residual capacity
--BMS Cycles:	--> BMS number of cycles

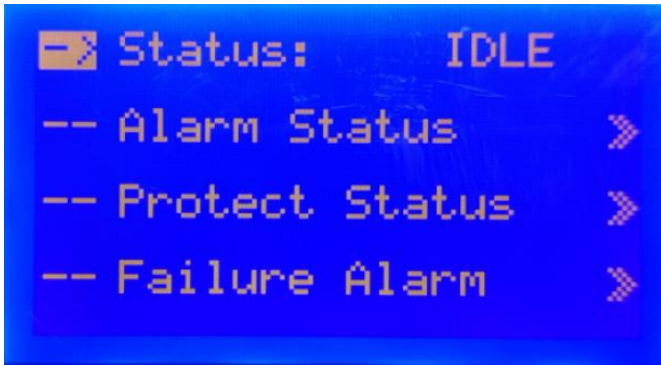
```

SOC      :      0 %
Nominal  :      0.0 AH
Remain   :      0.0 AH
BMS Cycles:      0

```

(6) Move the cursor on "Battery Status》" and press ENTER to enter the Battery Status Information interface, and press "DOWN" to page DOWN

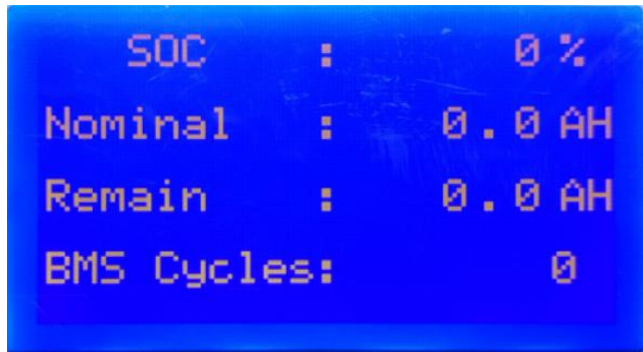
--Status:	--> Status (idle / charging / discharging / full charge)
--Alarm Status: 》	--> Alarm status
--Protect Status: 》	--> Protection status
--Failure Alarm: 》	--> Fault alarm



(7) Move the cursor on "Alarm Status» " and press ENTER to enter the Battery Alarm Information interface, and press "DOWN" to page DOWN

--	Over Volt YES/NO	-->	Over-voltage alarm	Yes / No
--	Low Volt YES/NO	-->	Under-voltage alarm	Yes / No
--	Over Temp YES/NO	-->	Over-temperature alarm	Yes / No
--	Low Temp YES/NO	-->	Under-temperature alarm	Yes / No
--	Low SOC YES/NO	-->	Capacity alarm	Yes / No
--	Diff Volt YES/NO	-->	Dropout voltage alarm	Yes / No
--	Over Curr YES/NO	-->	Over-current alarm	Yes / No
--	Reverse YES/NO	-->	Reverse connection alarm	Yes / No

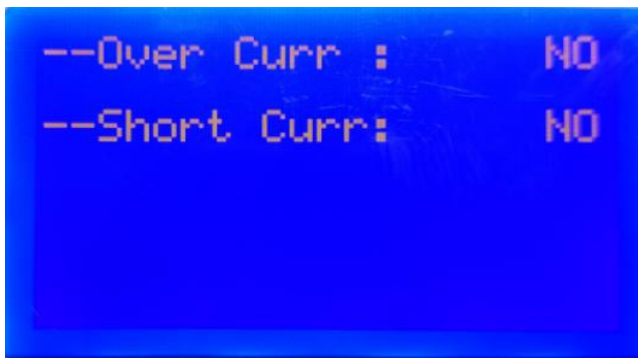




(8) Move the cursor on "Protect Status» " and press ENTER to enter the Battery Protection Information interface, and press "DOWN" to page DOWN

-- Over Volt YES/NO	--> Over-voltage protection Yes / No
-- Low Volt YES/NO	--> Under-voltage protection Yes / No
-- Over Temp YES/NO	--> Over-temperature protection Yes / No
-- Low Temp YES/NO	--> Under-temperature protection Yes / No
-- Over Cur YES/NO	--> Over-current protection Yes / No
-- Short Cur YES/NO	--> Short-circuit protection Yes / No





(9) Move the cursor on "Failure Alarm》" and press ENTER to enter the Battery Fault Information interface, and press "DOWN" to page DOWN

--Sample Line	--> Sampling line disconnected fault
--Charge MOS	--> Charging MOS fault
--Dis CHG MOS	--> Discharging MOS fault
--Sample Chip	--> AFE front end sample cell fault (ultra-high / low unit voltage)
--SCP Times	--> Short circuit protection frequency
--Over Temp CNT	--> Temperature protection frequency
--Over Cur CNT	--> Over-current protection frequency
--OVER Chg CNT	--> Over-voltage protection frequency
--Over Dchg CNT	--> Under-voltage protection frequency



```
--Sample Line:      N
--Charge MOS :      N
--DisCHG MOS :      N
--Sample Chip:      N
```

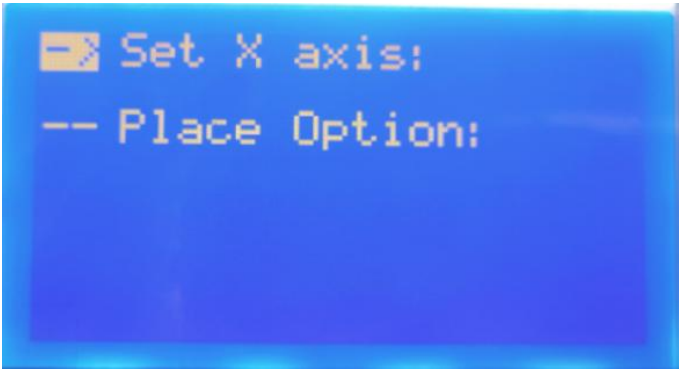
```
SC Times      :      0
OverTempCNT:      0
OverCurrCNT:      0
OverChgCNT :      0
```

```
OverDchgCNT:      0
```

(10) Move the cursor on "GYRO Status»" and press ENTER to enter the Gyroscope Information interface, and press "DOWN" to flip over

--Set X axis	--> Set X and Y axes
--------------	----------------------

--Place Option	-->Set horizontal and vertical
----------------	--------------------------------



Note: Gyroscope setting is optional

(11) Move the cursor on "More» " and press ENTER to enter the More interface, and press "DOWN" to flip over

--Protocol:	»	--> Protocol selection
--BMS Version:	»	-->BMS version information
--LCD Version:	»	-->LCD version information



(12) Move the cursor on "Protocol» " and press ENTER to enter the Serial Port interface, and press "DOWN" to flip over

--RS485A	»	--> Select serial port RS485A
--RS485B	»	--> Select serial port RS485B
--RS485C	»	--> Select serial port RS485C

--CAN1	》	--> Select serial port CAN1
--CAN2	》	--> Select serial port CAN2



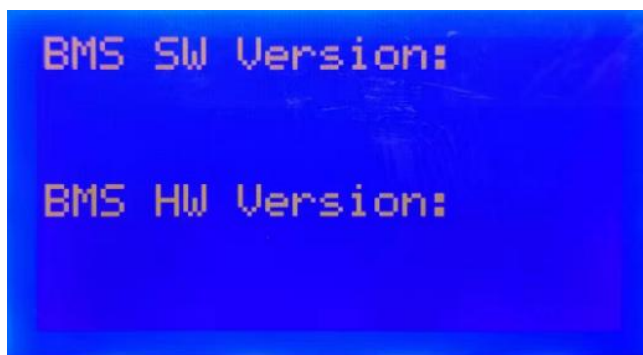
(Take the serial port RS485A as an example) Move the cursor on "RS485A》" and press ENTER to enter the Serial Port Selection interface, and press "DOWN" to flip over

Current Potocol:	--> The second line is the current protocol
9600 DR1363	--> 9600 refers to the baud rate, and OtherDR1363 is the protocol name
agreements》	--> Select other protocols

Press ENTER to enter Other Protocols (which includes all the protocols supported by the current serial port), then press "DOWN" to flip over, move the cursor to the corresponding protocol, and press ENTER to complete the selection.

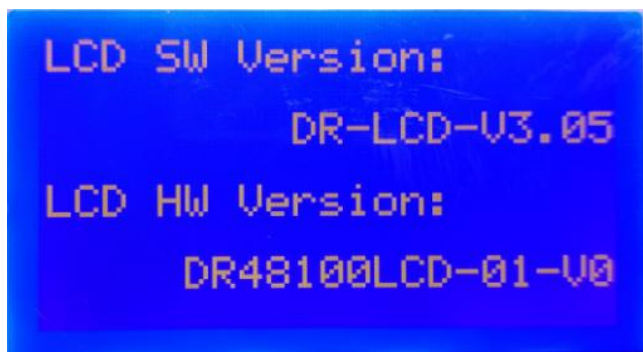
(13) Move the cursor on "BMS Version》" and press ENTER to enter the BMS Version Information interface

--BMS SW Version:	-->BMS software version
--BMS HW Version:	-->BMS hardware version



(14) Move the cursor on "LCD Version» " and press ENTER to enter the LCD Version Information interface

--LCD SW Version:	-->LCD software version
--LCD HW Version:	-->LCD hardware version



### 5.3. Hibernation and Activation

In normal operation status, after 1 minute of no key operation, the display system will be in an off screen status (only the backlight will be off). In an off screen status, pressing any keys can return the display screen to normal running.

## 6. Storage instructions

(1) When storing batteries, it is necessary to ensure that the SOC is  $\geq$

50%;

(2) The battery storage location should be dry and away from the source of goods;

(3) Do not store batteries at high temperatures ( $\geq 45\text{ }^{\circ}\text{C}$ );

(4) If the battery needs to be stored for a long time, it should be recharged at least once every three months

## **7. Declaration**

7.1 Due to product version upgrades or other reasons, the content of this document will be updated from time to time. Unless otherwise agreed, this document is for instructional purposes only. All statements, information, and advice in this document do not constitute any express or implied warranties.

7.2 Before installing the equipment, please read the user manual carefully to understand product information and safety precautions.

7.3 All installation operations of the equipment must be performed by trained and qualified electrical technicians. Operators must wear personal protective equipment.

7.4 Before installing the equipment, please check the delivery items according to the "Packing List" to ensure that all the items are complete and intact, without any obvious external damage. If anything is missing or damaged, please contact your dealer.

7.5 Equipment damage caused by failure to operate according to the document is not covered by the equipment warranty.

7.6 The cable colors mentioned in this document are for reference only, and the selection of cables should comply with local cable standards.



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