48V Lithium iron phosphate battery module GR-FC4850-1630J1

Version：V1.2

Date：2021-05-20

Version information

Version	Prepared	Checked	Approved	Date
V1.0				2020-02-23
V1.1				2021-01-14
V1.2				2021-05-20

Contents

Revised Record

No.	Date	Revised Contents	Revised	Revised version
1	2020.02.23	Updated	Zhangjinming	V1.0
2	2020.01.14	Modify the address Dial Switch function	Zhangjinming	V1.1
3	2020.05.20	Update protection parameters	Zhangjinming	V1.2
4				
5				
6				
7				

1. Summary

GR-FC4850-1630J1 is a lithium iron phosphate battery system produced by GARAYE Energy Technology (Shenzhen) Co., Ltd, which can be used to provide safe, reliable, and stable energy for various equipment. At the same time, the module supports expansion on both capacity and power by multiple parallel uses. It supports CAN, RS485, RS232 communication, and can meet the requirements of various PV inverter communication protocols.

GR-FC4850-1630J1 has the advantages of high safety performance, long life span, wide charging voltage range, simple installation, and standard modular design.

Products can be widely used in household energy storage, industrial and commercial energy storage and other fields.

2. Technical Specification

2.1. Battery Pack Specification

No.	Item	Unit	Value	Remark
01	Cell model	-	LFP 50Ah/3.2V	
02	Combination Mode	-	1P16S	
03	Nominal Capacity	Ah	50	
04	Rated energy	Wh	2560	
05	Initial Internal Resistance	mΩ	<80	AC 1KHz
06	Rated Voltage	V	51.2	
07	Charge Cut-off Voltage	V	57	Unit cell max. charge voltage not exceed 3.55V
08	Discharge Cut-off Voltage	V	47	Unit cell min. discharge voltage not lower than 2.93 V
09	Standard Charge Current	A	10	0.2C
10	Max. Charge Current	A	≤50	
11	Standard Discharge Current	A	25	
12	Max. Discharge Current	A	≤50	
13	Operating Temperature	℃	-0~+55℃	Charge
			-15~ +55℃	Discharge
14	Open Circuit Voltage	V	44~52.5	
15	Shell type	-	Painted metal	
16	Weight	kg	33±1	About

17	Dimension	mm	408(L)*440(W)*132(H) Exclude extended part, handle, wiring terminal, 446(L)*482.6(W)*132(H) Outer Maximal dimension	Standard 3U size

2.2. Protection Board Specification

No.	Item		Value	Remark
1	Cell Overcharge Protection	Overcharge alarm voltage	3450mV	
		Overcharge protection voltage	3550mV	
		Overcharge protection delay time	1.0S	
	Cell Over Voltage Protection Release Condition	Overcharge protection release voltage	3330mV	
		SOC release	SOC < 96%	
		Discharge release	Discharge Current>1A	
2	Cell over-discharge protection	Over Discharge alarm Voltage	3110mV	Over discharge 30 seconds, if it still can't recover, enter into low-power mode
		Over Discharge Protect Voltage	2930mV	
		Over Discharge Protect delay time	1.0S	
	Cell Over Discharge protection release	Over Discharge protection release voltage	3200mV	
		Charging release	Access charger	
3	Pack overcharge protection	Overcharge alarm voltage	55.0V	
		Overcharge protection voltage	57.0V	
		Overcharge protection delay time	1.0S	
	Pack over voltage protection Release Condition	Overcharge protection release voltage	53.0V	
		SOC release	SOC < 96%	
		Discharging release	Discharge	
4	Pack over-discharge protection	Over Discharge alarm Voltage	47.0V	Over discharge 30 seconds, if it still can't recover, enter into low-power mode
		Over Discharge Protect Voltage	44.0V	
		Over Discharge protect delay time	1.0S	
	Pack over Discharge protection release	Over Discharge protection release voltage	51.2V	
		Charging release	Access charger	
6	Charge over-current protection	Charge Over-current alarm	≥55A	If it appears 10 times, will lock the status, and won't release automatically
		Charge Over-current protection	≥60A	
		Charge Over-current protection delay time	1.0S	
	Charge	Automatic release	1min	

	over-current protection release	Discharging release	Discharge Current>1A	
7	Discharge Over Current Protect_1st	Discharge Over-Current alarm	≥55A	If it appears 10 times, will lock the status, and won't release automatically
		Discharge Over-Current Protect	≥60A	
		Over-current protection delay time_1st	1.0S	
	Discharge Over Current Protect Release Condition_1st	Automatic release	1min	
		Charging release	Charge Current>1A	
8	Discharge Over Current _2nd	Discharge Over-Current Protect	≥70A	If it appears 10 times, will lock the status, and won't release automatically
		Discharge Over-current protection delay time_2nd	100±50mS	
	Discharge Over Current Release Condition_2nd	Automatic release	1min	
		Charging release	Charge Current>1A	
9	Short Circuit Protect	Short protection current	≥350A	
		Short Circuit Protect Delay Time	300μS	
		Short Circuit Protect Release	Charging, short circuit protection release	
			After removing load, will release automatically	
10	MOS Over-Temperature protection	MOS Over-Temperature alarm	90℃	
		MOS Over-Temperature protection	110℃	
		MOS Over-Temperature release	85℃	
11	Cell Over-Temperature protection	Charge Low Temperature alarm	5℃	
		Charge Low Temperature Protect	0℃	
		Charge Low Temperature Protection Release Condition	5℃	
		Charge High Temperature alarm	50℃	
		Charge High Temperature Protect	55℃	
		Charge High Temperature Protection Release Condition	50℃	
		Discharge Low Temperature alarm	-15℃	
		Discharge Low Temperature Protect	-20℃	
		Discharge Low Temperature Protect Release Condition	-15℃	
		Discharge High Temperature alarm	55℃	
		Discharge High Temperature Protect	60℃	
		Discharge High Temperature Protect Release Condition	55℃	

12	Ambient Over-Temperature protection	Low Temperature alarm	-20℃	
		Low Temperature Protect	-25℃	
		Low Temperature Protect Release Condition	-20℃	
		High Temperature alarm	65℃	
		High Temperature Protect	70℃	
		High Temperature Protect Release Condition	65℃	
13	Consumable current	Consume current while working	≤20mA(without display)	
		Low-power mode current	≤100μA	
14	Balance	Balance threshold voltage	3400mV	
		Bleed Voltage	30mV	
15	Capacity default setting	Low capacity Alarm	SOC < 10%	No alarm while charging
		rated capacity setting	50AH	
16	sleep mode	Voltage	3150mV	
		Delay Time	5min	

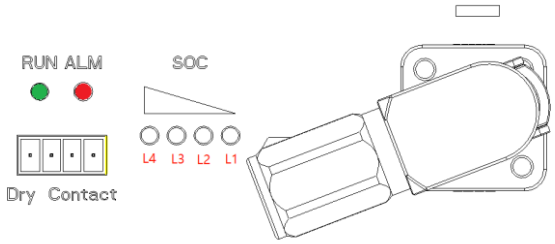
2.3. Electrical performance test

Test Item	Test Method	Technical Requirement
Discharge capacity	Under standard charging mode, charge the battery pack. Then discharge with 0.2C, record the discharge capacity.	≥100% Minimum capacity
-20℃ Low Temperature Discharge Capacity	Standardly charge the batter pack, then put it into the constant temperature and humidity oven with -15±2℃ for 8H, then discharge with 0.1C to cut-off voltage, record the discharge capacity.	≥65% Nominal Capacity(Without BMS)
55℃ High Temperature Discharge Capacity	Standardly charge the batter pack, then put it into the constant temperature and humidity oven with 55±2℃ for 4H, then discharge with 0.1C to cut-off voltage, record the discharge capacity.	≥97% nominal capacity
Charge Retention(Residual Capacity) and Capacity Restoration Ability	Standardly charge the battery pack, record initial capacity. Under 15℃~30℃, place it for 28 days, then discharge and record the residual capacity. Then standardly charge, record the restoration capacity.	Residual capacity(Charge Retention) ≥95% Restoration capacity ≥97%
Cycle life	Standardly charge the battery pack, then discharge with 0.3C. When discharge capacity is less than 80% of initial capacity, ending cycle test	≥8000 times

55℃ 7 days storage	Standardly charge the battery pack, record initial capacity. Under 55±2℃,place it for 7 days, then discharge and record the residual capacity. Then standardly charge, record the restoration capacity.	Residual capacity≥90% Restoration capacity≥95%

3. Battery Pack Function Description

3.1 LED indicators Description LED



3.2 SOC Indicators Tablets SOC

Status		Charge				Discharge			
Capacity Indicators		L4●	L3●	L2●	L1●	L4●	L3●	L2●	L1●
Capacity (%)	0～25%	Off	Off	Off	Blink 2	Off	Off	Off	On
	25～50%	Off	Off	Blink2	On	Off	Off	On	On
	50～75%	Off	Blink2	On	On	Off	On	On	On
	75～100%	Blink 2	On	On	On	On	On	On	On
Running Indicators●		On				Blink 3			

3.2.1 Status Indicator Description

Status	Normal/ Warning/ Protection	RUN	ALM	LED Capacity Indicator				Instruction
		●	●	●	●	●	●	
Power off	Sleep	off	off	off	Off	Off	Off	All off
Standby	Normal	Blink1	Off	According to capacity				Standby
	Warning	Blink1	Blink3					Low voltage Module
Charge	Normal	on	off	According to Capacity Indicator (Capacity Indicate Max. LED blinks 2 times)				Maximum Capacity LED blinks (blink 2 times), overcharge alarm ALM not blink
	Warning	On	Blink3					
	Overcharge protection	on	Off	On	On	On	On	Indicator Status without AC input

	Temperature, Over current and Failure Protection	Off	On	Off	Off	Off	Off	Stop charging
Discharge	Normal	Blink3	Off	According to capacity				
	Warning	Blink3	Blink3					
	Under voltage Protection	Off	Off	Off	Off	Off	Off	Stop discharge
	Temperature, Over current, Short Circuit, Reverse Connection, Failure Protection	Off	on	off	Off	Off	Off	Stop discharge
Failure		Off	on	Off	Off	Off	Off	Stop charge and discharge

3.2.2 Indicator Blink Description

Blink pattern	on	off
Blink 1 times	0.25S	3.75S
Blink 2 times	0.5S	0.5S
Blink 3 times	0.5S	1.5S

3.3 Standby Function

When the battery pack is not charged or discharged and communicated after boot-strap, the battery is in standby mode.

3.4 Dormancy Function

When any of the following conditions is met, the battery enters the low-power mode:

1) Under voltage protection is not released within 30 seconds.

2) Press the reset button for 3 seconds and then release the button.

NOTE: ●If there are other batteries in the output state in parallel application scenario, the current battery cannot be set to sleep through the reset button at this time, because it will be charged and awakened by other batteries with normal output.

3) The lowest cell voltage is lower than the sleep voltage, and the duration reaches the sleep delay time (while meeting the requirements of no communication, no protection, no equilibrium, and no current).

4) Standby mode lasts for more than 24 hours (no communication, no charge and discharge, no mains power, minimum cell is less than 3.2V).

5) Forced shutdown from the Ems Tools. Before entering sleep, make sure no charger is connected; otherwise it will not be able to enter Low-power mode.

3.5 Buzzer function

In case of failure, the buzz lasts 0.25S for every S;

In the case of protection, the buzz lasts for 0.25S every 2S (except overvoltage protection);

In case of failure, the buzz lasts 0.25S for every S;

In the case of protection, the buzz lasts for 0.25S every 2S (except overvoltage protection);

In the case of warning, the buzz lasts for 0.25S for every 3S (except overpressure warning);

The buzzer function can be enabled or prohibited by the host computer, factory default is prohibited.

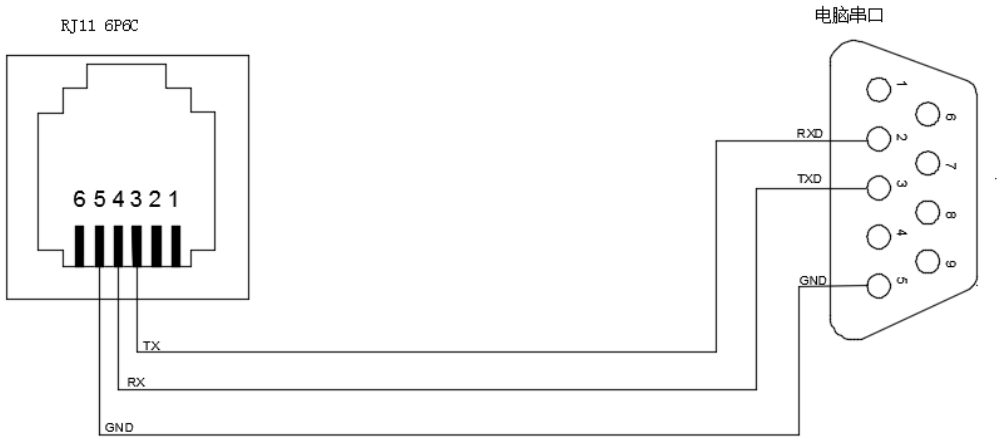
3.6 Reset Key Function

When BMS is in a dormant state, press the key (3-6S) to release, the protective board is activated, and the LED indicator lights "RUN" are lit for 0.5 seconds successively.

When BMS is activated, press the button (3-6S) to release, the protective board is dormant, and the LED indicator lights up 0.5 seconds in turn from the lowest power lamp. Press the button (6 ~ 10S) to release, the protective board is reset, and all the LED lights are lit for 1.5 seconds at the same time.

3.7 Communication function

- The battery pack has RS232 and RS485 communication functions. RS232 communication wiring is used to communicate with the host computer, so as to monitor battery information through the host computer.



- RS485 communication wiring is used for communication between master Pack and slave Pack in parallel connection of battery packs.

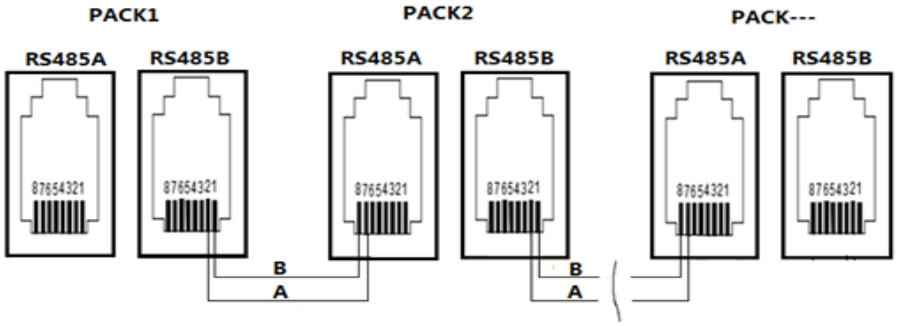
RS485--Using 8P8C Vertical RJ45 Socket	
RJ45 Pin	Definition
1、8	RS485-B
2、7	RS485-A
3、6	GND
4、5	NC

- Inverter communication: the isolated CAN and RS485 communication interface CAN be used to communicate with SMA, Schneider，Victron, Studer, Goodwe, Growatt, Solis, Sofar and other mainstream inverters in the market

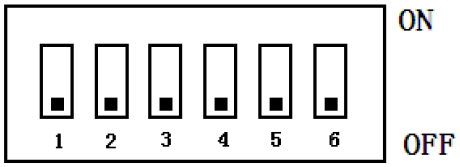
CAN/RS485--Using 8P8C Vertical RJ45 Socket	
RJ45 Pin	Definition
1	RS485-B
2	RS485-A
3	RS485-RL+
4	CAN-RL
5	RS485-GND\CAN-GND
6	RS485-RL-
7	CANH
8	CANL

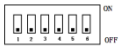
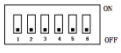
3.8 Multi-device parallel connection definition

BMS batteries can communicate with devices with RS485 bus in parallel, and RS232 interface can communicate with PC or other intelligent terminals. Human-computer interaction RS485 bus can communicate with any battery package information in parallel. The multi-computer parallel bus interface is shown in the following figure.



3.9 Address Dial Switch



In the operation of multi-machine parallel communication, it is necessary to configure the dial address of each PACK first. Dialing is in BCD code format. Address 0 is defined as  (black dot is O FF state, blank is ON state, the same below), Address 1  , Address 2  , please refer to the table below for details.

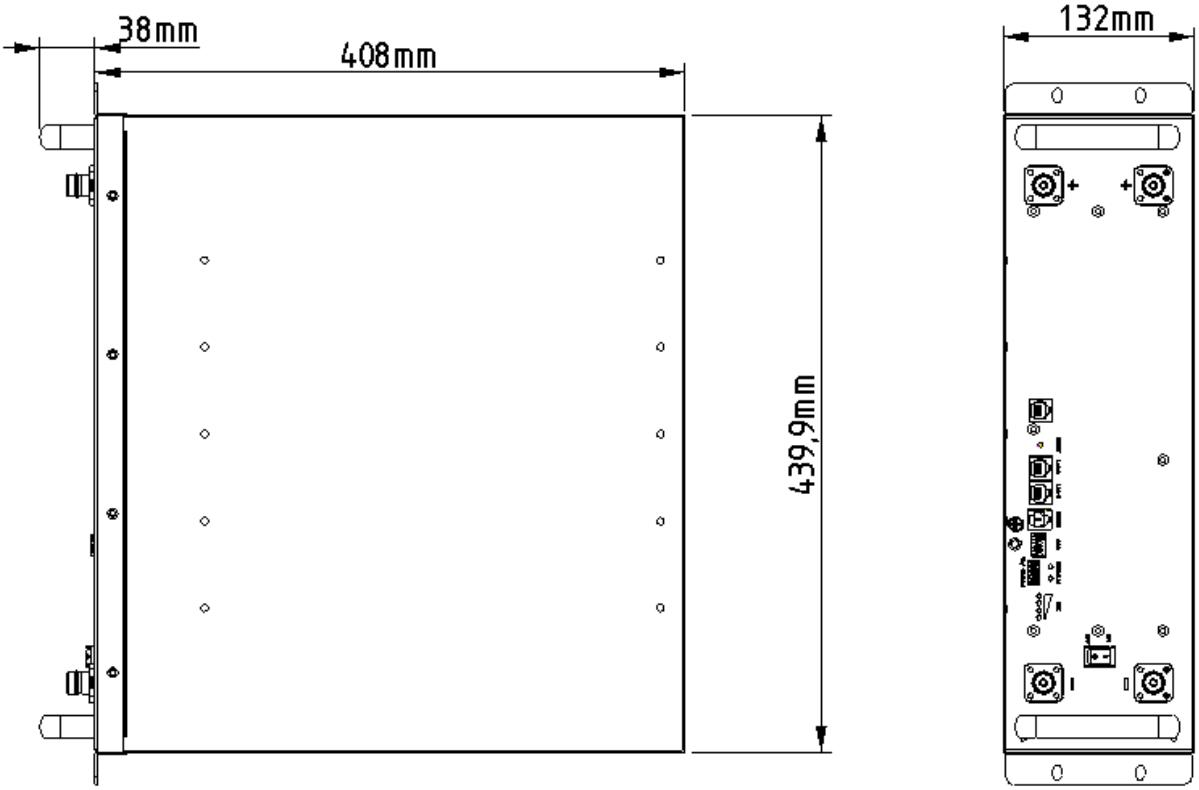
Address	Dial Switch Position						Instruction
•	#1	#2	#3	#4	#5	#6	
1	ON	OFF	OFF	OFF	OFF	OFF	Use lonely (Main)
2	OFF	ON	OFF	OFF	OFF	OFF	Set as Pack1
3	ON	ON	OFF	OFF	OFF	OFF	Set as Pack2
4	OFF	OFF	ON	OFF	OFF	OFF	Set as Pack3
5	ON	OFF	ON	OFF	OFF	OFF	Set as Pack4
6	OFF	ON	ON	OFF	OFF	OFF	Set as Pack5
7	ON	ON	ON	OFF	OFF	OFF	Set as Pack6
8	OFF	OFF	OFF	ON	OFF	OFF	Set as Pack7
9	ON	OFF	OFF	ON	OFF	OFF	Set as Pack8
10	OFF	ON	OFF	ON	OFF	OFF	Set as Pack9
11	ON	ON	OFF	ON	OFF	OFF	Set as Pack10
12	OFF	OFF	ON	ON	OFF	OFF	Set as Pack11
13	ON	OFF	ON	ON	OFF	OFF	Set as Pack 12
14	OFF	ON	ON	ON	OFF	OFF	Set as Pack13
15	ON	ON	ON	ON	OFF	OFF	Set as Pack14

16	OFF	OFF	OFF	OFF	ON	OFF	Set as Pack15
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
62	OFF	ON	ON	ON	ON	ON	Set as Pack61
63	ON	ON	ON	ON	ON	ON	Set as Pack62

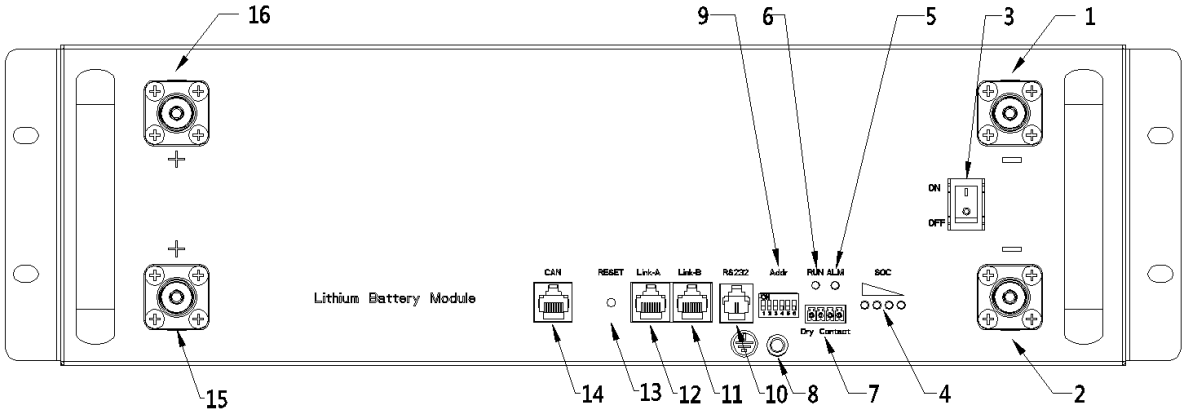
4 Appearance

4.1、 View

4.2、 dimensional drawing



4.3、 Interface View



No.	Instructions	NO.	Instructions
1	Battery cathode(same as the port 2)	9	Address Dial Switch
2	Battery cathode(same as the port 1)	10	RS232 communication port
3	Power Switch	11	Multi-device parallel connection 1
4	GND	12	Multi-device parallel connection 2
5	SOC indicator	13	Reset button
6	Alarm indicator	14	CAN/RS485 communication port
7	Run indicator	15	Battery anode (same as the port 16)
8	dry contact	16	Battery anode (same as the port 15)

5 Storage and Transportation

5.1 Storage

When the product is not in use for a long time, please put it in a dry and ventilated place to avoid inflammable and explosive articles; charge and maintain the battery pack regularly every three months to ensure that the battery is in the best performance state.

5.2 Transportation

Battery pack should be packed with outer packing before they can be transported. In the course of transportation, severe shock, shock or extrusion should be prevented, and sunshine and rain should be prevented.

6 Warning and Tips

6.1 Never put batteries in water or wet them。

6.2 It is forbidden to charge and use batteries outside the temperature range we prescribe. Do not store, charge and use this product near the source of fire or heat.

6.3 When the battery pack emits odor or leaks, it should stop using or charging immediately, and move to an open ventilated place, away from the source of fire, and contact us in time.

6.4 Do not connect the positive and negative poles in connection with the load.

6.5 Do not short-circuit the positive and negative poles of the battery pack with metal conductors

6.6 Do not put the battery pack into the fire or heat it.

6.7 It is strictly forbidden to dissect the battery pack artificially, to pierce the battery pack with nails or sharp objects, to strike the battery pack with hammers or other external forces, and to trample and drop the battery pack artificially.

6.8 It is strictly forbidden to put batteries in microwave ovens or pressure vessels.

6.9 If any abnormal phenomena occur during charging or using, please stop charging and using immediately.

6.10 The optimum operating temperature of the product is25±5℃. If the product is not in this temperature range in the course of using, the discharge capacity will be reduced.

6.11 If any malfunction occurs during the use of the product, please contact us in time. Do not disassemble the battery pack without permission.

6.12 The above test is for new batteries whose arrival time is not more than one month.