

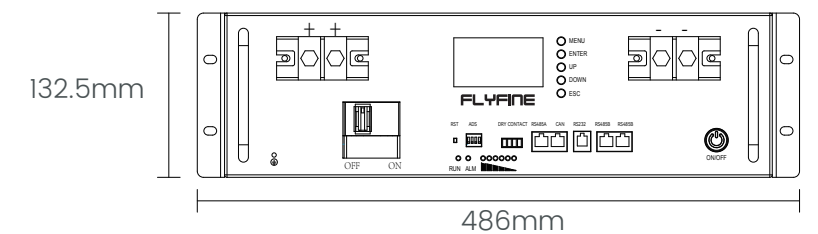
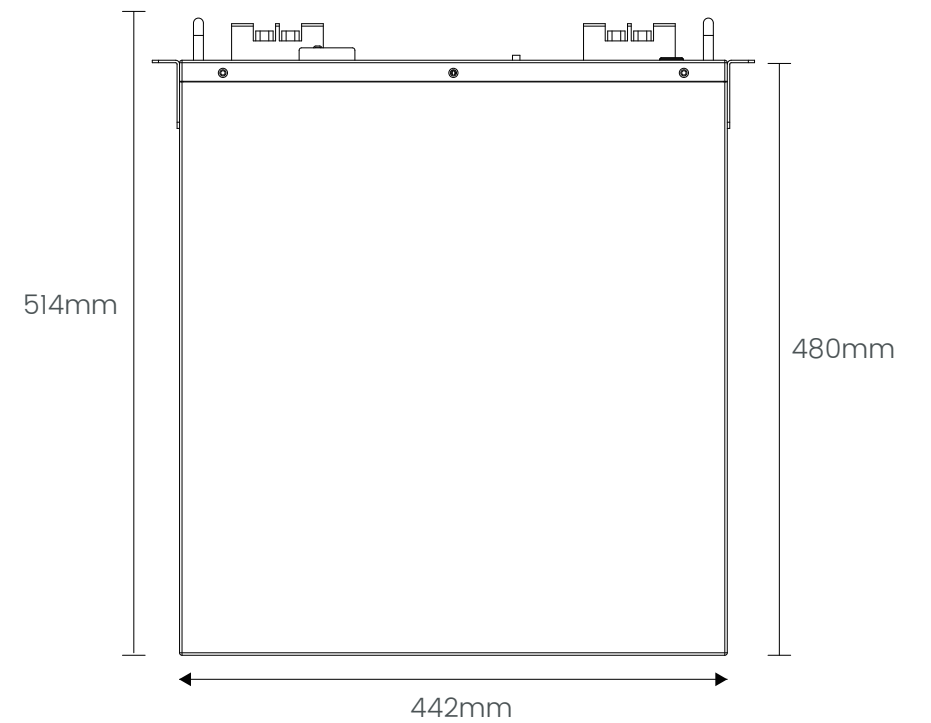
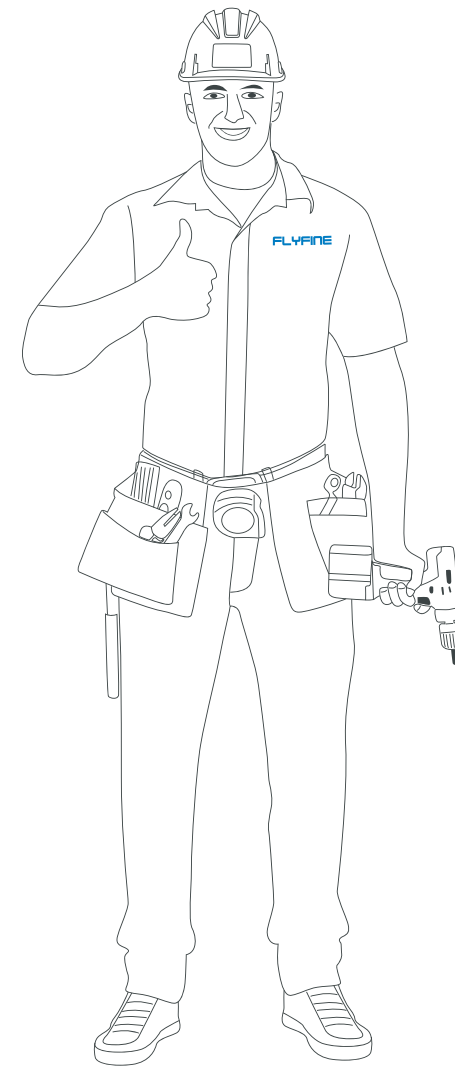
User Manual

Low Voltage Racked Battery Solution

FR5120



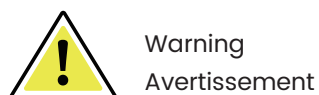
FLYFINE DIGITAL ENERGY CO.LTD
Battery Storage System Solution Expert Since 2008



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Note: please comply with all warnings and operating instructions in this manual strictly. Save this manual properly and read carefully the following instructions before installing the unit. Do not operate this unit before reading through all safety information and operating instructions carefully.



Warning
Avertissement



Recyclable.
Recyclable.



Read instruction before use.
Lire les instructions avant utilisation.



Do not dispose battery in household trash.
Ne jetez pas les piles dans les ordures ménagères.

1. Safety Instructions

The Energy storage pack is an essential component of the photovoltaic power generation system. It can provide electricity for the connected load, and it can also store photovoltaic solar modules, fuel generators, or wind energy generators by charging the remaining energy in case of emergency. When the sun goes down, energy demand is high, or there is a power outage, you can use the energy stored in the system to meet your energy needs at no additional cost. In addition, the energy storage Pack can help you achieve energy self-consumption and ultimately achieve the goal of energy independence.

According to different power conditions, the energy storage PACK can output power during peak power consumption, and can also store energy during low power consumption. Therefore, when connecting the matching photovoltaic modules or inverter arrays, external equipment is required to match the energy storage the working parameters of the pack to achieve the highest operating efficiency. For a simple diagram of a typical energy storage system.

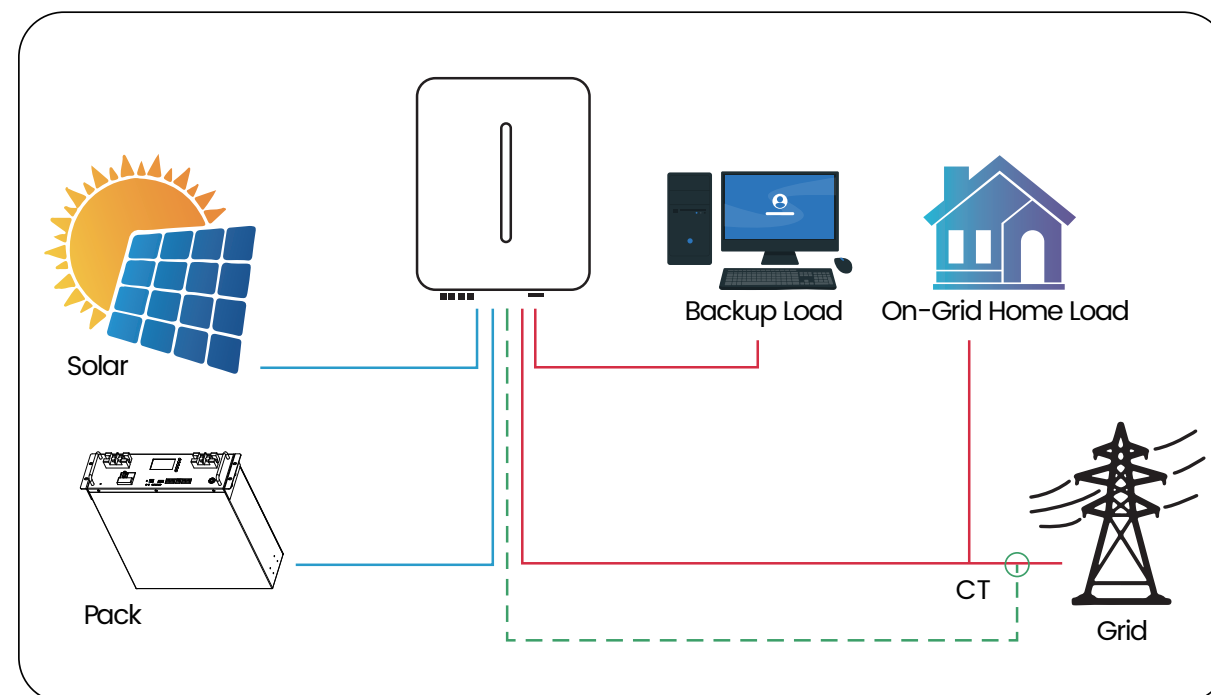


Figure 1 Energy storage System Overview

It is very important and necessary to read the user manual carefully before installing or using the battery. Failure to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, death, or may damage the battery and the whole system.

- If the battery is stored for a long time, it is required that they are charged every three to six months, and the SOC should be no less than 80%, after fully discharging, the battery needs to be recharged within 12 hours.
- Do not expose cable outside; Do not use cleaning solvents to clean the battery.
- All battery terminals must be disconnected before maintenance.

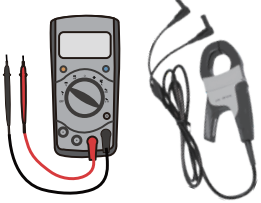


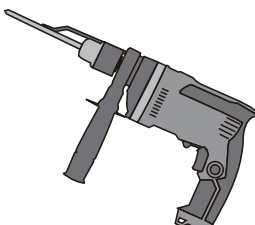

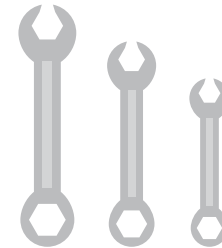


2. Important Safety Warning

- Do not expose the battery to flammable or harsh chemicals or vapors.
- Do not paint any part of the battery, include any internal or external components.
- Do not connect battery with PV solar wiring directly.
- Any foreign object is prohibited to be inserted into any part of the battery.
- Our company will not bear any warranty claims for direct or indirect damage caused by violation of the above items.

2.1 Before connecting

- After unpacking, please check the battery and pack list first, if the battery is damaged or spare parts are missing, Please contact the dealer.
- Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode;
- Wiring must be correct, do not mix-connect the positive and negative cables, and ensure no short circuit with the external device;
- It is prohibited to connect the battery with AC power directly;
- The BMS in the battery is designed for 24VDC/48VDC, DO NOT connect battery in series;
- It is prohibited to connect the battery with different type of battery;
- Please ensure the electrical parameters of battery system are compatible to inverter. Keep the battery away from fire or water.

2.2 Necessary installation Tools.

 Multimeter + v	 Screw Driver Set	 Allen Key Set	 Drill + Hammer
 Electrician Scissors	 Wrench set	 Lifting strap + mechanical lifter	 RS 232/USB+screw terminal (insulated)

2.3 Personal protective equipment

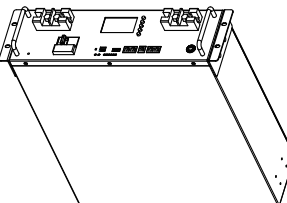



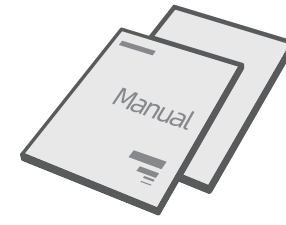

2.4 During operation

- If the battery system needs to be moved or repaired, the power must be cut off first and the battery is completely shutdown;
- It is prohibited to connect the battery with different type of battery;
- It is prohibited to put the batteries working with faulty or incompatible inverter;
- In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited;
- Please do not open, repair or disassemble the battery. We do not undertake any consequences or related responsibility due to violation of safety operation or violating of design, production and equipment safety standards.

3. Unpacking & Overview

3.1 Packing List

You will receive the following parts (Not a full set), sample as follow picture. For customized requirements, please place an order with the manufacturer.

Battery pack 	Inverter common cable(RJ45) 	Power out positive cable 
Power out Negative cable 	Manual *1 	Parallel common cable(RJ45) 

*NOTE :Types of communication tools need extra order

3.2 Product Overview

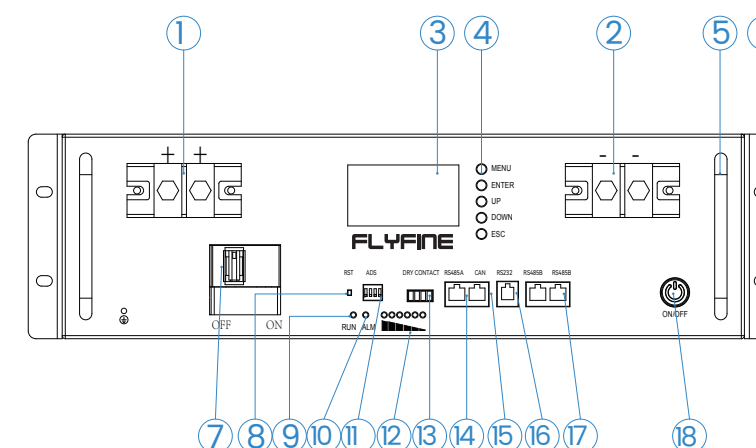


Figure 4

No.	Description	Silk-screen	Remark
1	Pack positive pole	P+	Output terminal
2	Pack negative pole	P-	Output terminal
3	LCD		
4	LCD key		
5	handle		
6	Fixed bracket		
7	reset	RST	
8	Run LED indication	RUN	
9	ALARM LED indication	ALM	Lift heavy objects
10	Capacity LED indication		
11	DRY connect port	DRY CONTACT	
12	485A communication port	RS485A	Connect to inverter
13	CAN communication port	CAN	Connect to inverter
14	RS232 communication port	RS232	Host software
15	RS485B communication port	RS485B	Parallel use
16	ADS Coder	ADS	Set Battery address code
17	Air switch	ON/OFF	
18	Power switch	ON/OFF	

4.Installation

4.1 Selecting Mounting Location

Consider the following points to install the energy storage Pack:

- Do not mount the Pack on flammable construction materials. Mount on a solid surface.
- Install this Pack module at eye level in order to allow the readability of LCD display at all times.
- For proper air circulation to dissipate heat, please leave a gap of about >0.3 meter from the ground,30 cm from the side of the device.
- The ambient temperature should be between 0°C and 40°C and relative humidity should be between 25% and 85% to ensure optimal operation.
- The recommended installation is flat wise adherence.
- Install the battery module in a dry, protected area with no excessive dust and sufficient air circulation. Do not operate in locations where the temperature and humidity are outside the specified range.

4.2 Mounting The PACK



WARNING!! Remember that this Pack is heavy so please be careful when removing it from the package, or install it

When installing the Pack bracket, use appropriate screws to fix it. After that, the equipment should be firmly bolted. The pack can be run indoors or outdoors, However, only professional personnel can enter this area for installation or maintenance.

Step 1:

- When receiving the product, first check whether all parts are complete, if not, please report to the Dealer.

Step 2:

- Ensure that the Pack is installed on the Rack. Choose a suitable installation location and require the battery pack to be placed at a safe.
- The first load-bearing plate should be at least 15cm away from the ground. The distance between the load-bearing plates is about 160mm.
- We recommend that the installation distance be 160mm.

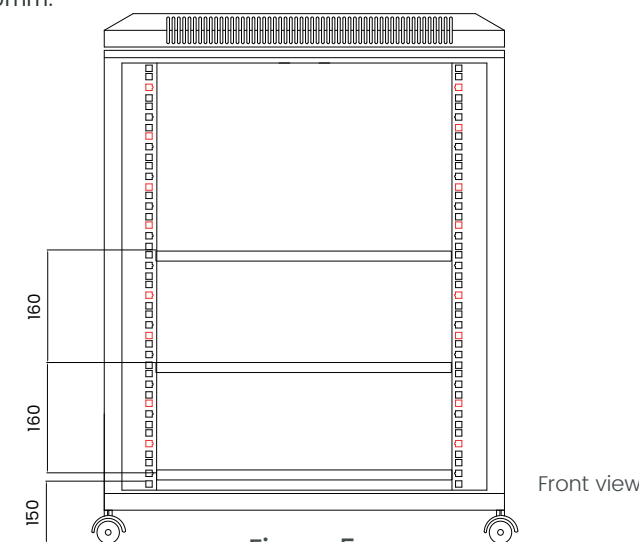


Figure 5

Step 3:

- Mark the position of the nut on the cabinet with the mounting bracket, and clamp the nut into the cabinet. See Figure 6.

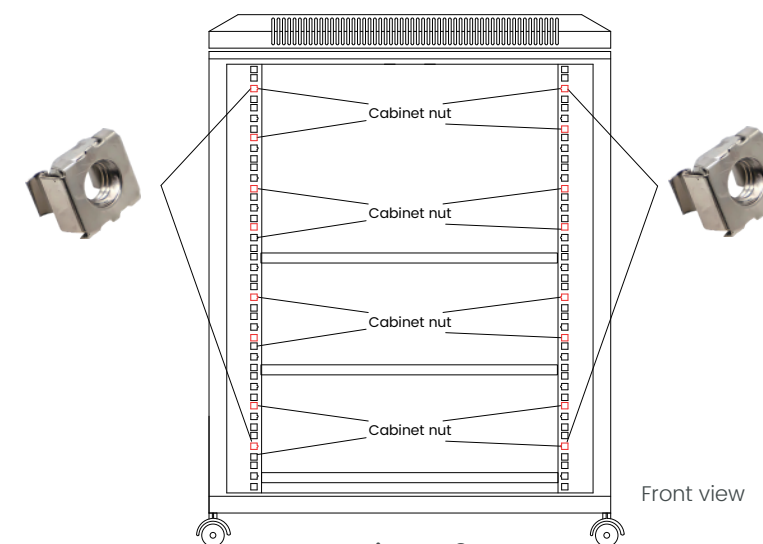


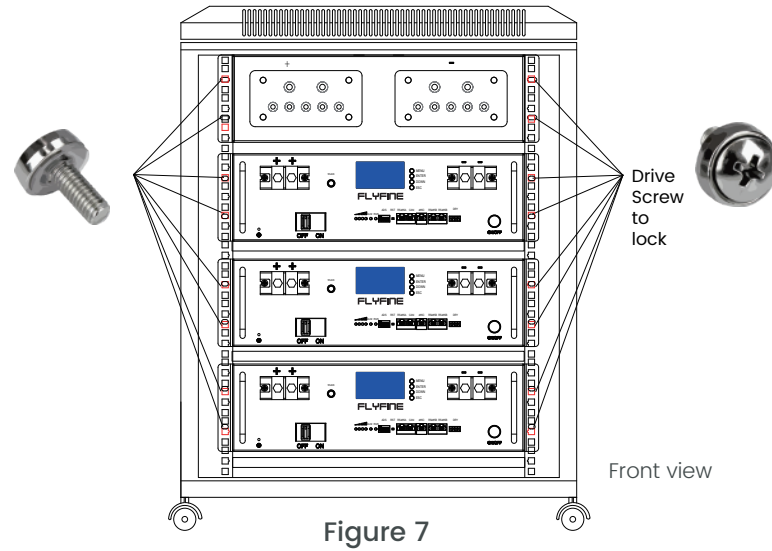
Figure 6

Step 4:

- As shown in the below, install the battery pack. The pack is too heavy, please use a special lifting device to lift the pack for operation and safety protection. Put the battery module into the cabinet and screw it, as shown in Figure 7.

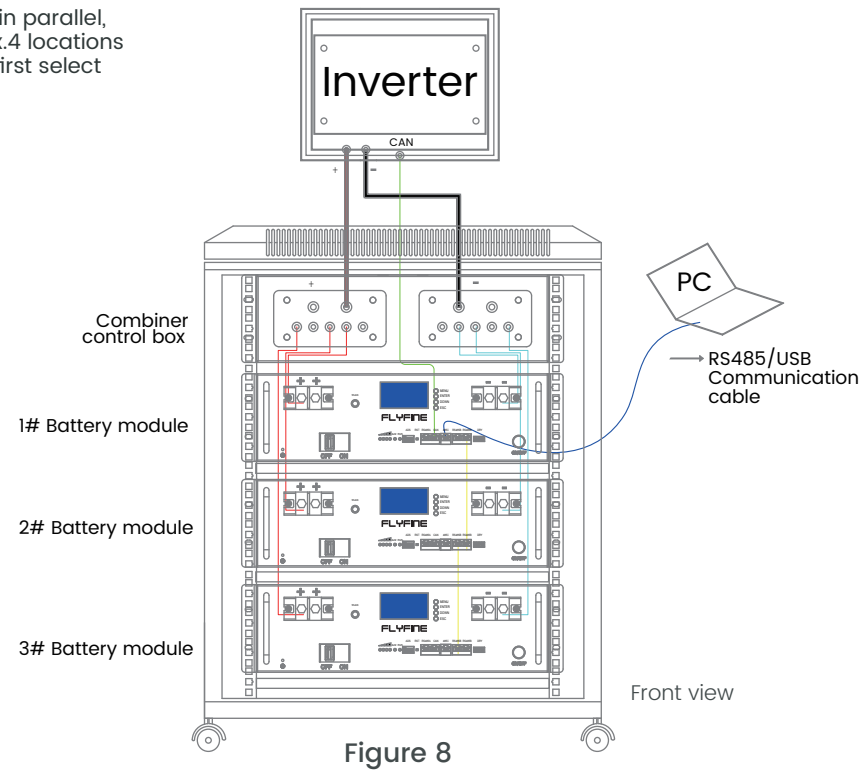
Step 4:

- As shown in the below, install the battery pack. The pack is too heavy, Please use a special lifting device to lift the pack for operation and safety protection. Put the battery module into the cabinet and screw it, as shown in Figure 7.



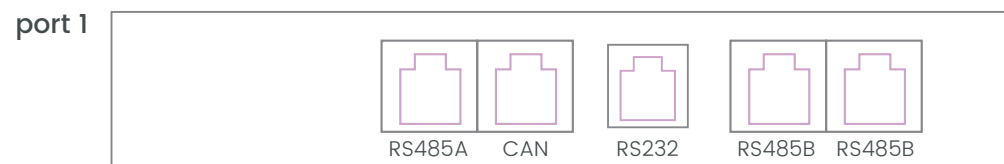
Step 5:

- When more than 3 PCS packs are connected in parallel, then we recommend you install combiner box. 4 locations we recommend you install the combiner box, first select location is Top and Bottom see figure 8.



Step 6:

- Connect the wiring of the Pack as shown below, see figure 11 inverter need CAN BUS port / RS485 port. Please insert communication cable (RJ45) to CAN port or RS485A, RS485B only be used for battery packs parallel mode.



RS485A---Communicate with external devices, sample as inverter ,EPS
 CAN
 RS232---Communication with host computer
 RS485B---Communication with host computer or parallel communication with battery pack

Figure 9

1pack---1 Inverter. Single mode.

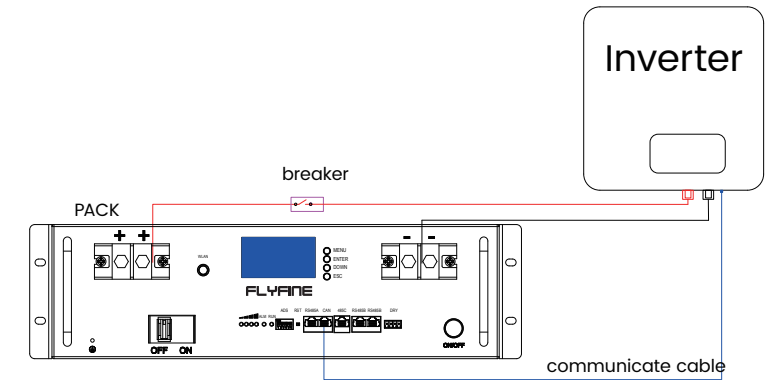


Figure 10

2 pack---1 Inverter. Pack 1 is slave ; pack 2 is master, Negative and Positive power cable has the same length. Figure 11.

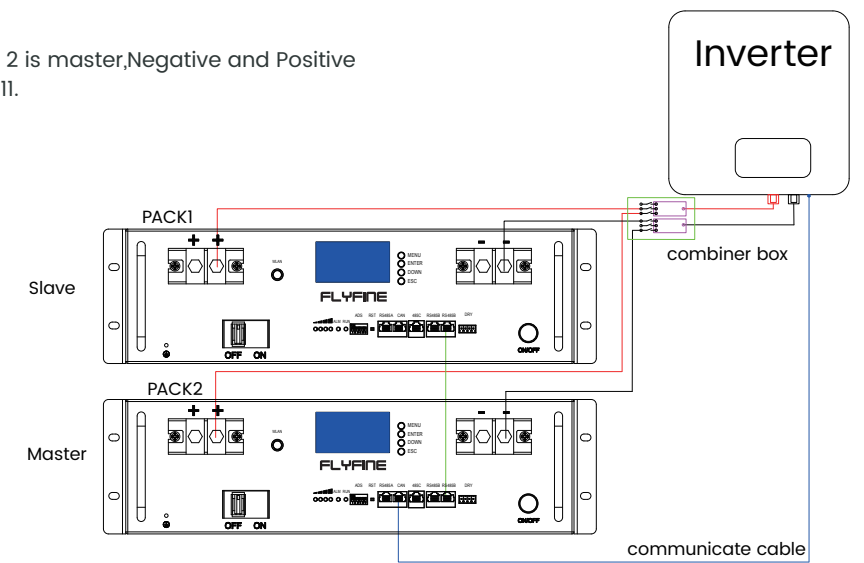


Figure 11

3 pack---1 Inverter. Pack 1, 2 is slave; pack 3 is master. more pack are parallel, one pack is master, other are slave. Negative and Positive power cable has the same. Figure 12.

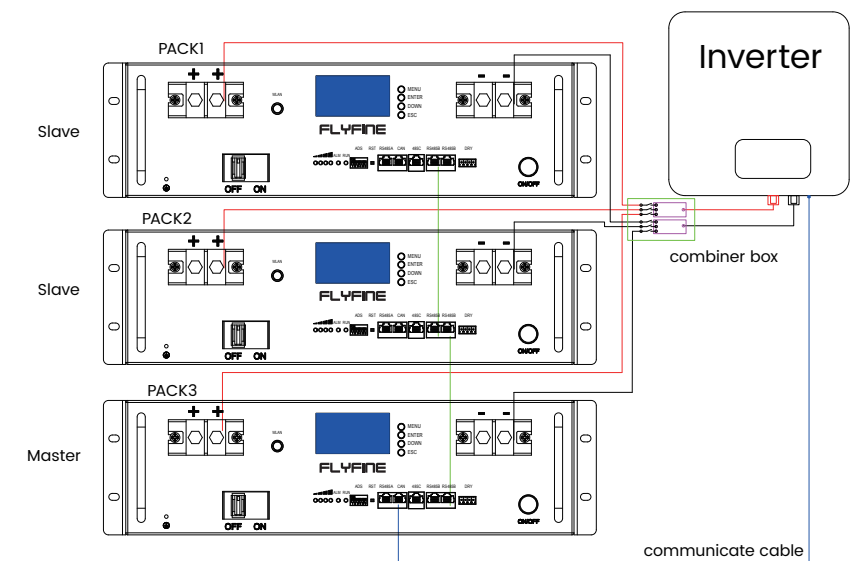
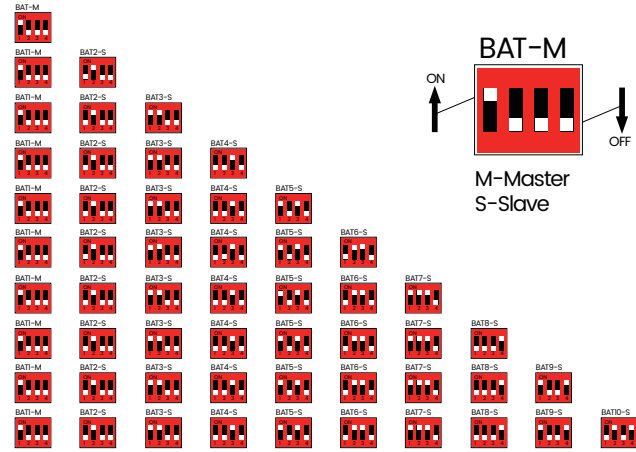


Figure 12

Step 7:

- Set the address of pack, this is an important step, you can see there is 4bit or 8bit coder in bottom of Pack, please set as bill 1 and 2. 4 bit CODER: this is Binary CODER, Calculated by 8 4 2 1 BCD code. PACK 1 set as Master (BCD 1 0 0 0), see bill 1. It supports 15 PCS pack (max) in parallel. Address "0" is only used for single mode.



ID地址	Position of the DIP switch 拨码开关位置			
	#1	#2	#3	#4
1	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

This is 4bits coder and communication port. CAN port and RS485A port can be selected as the same time.

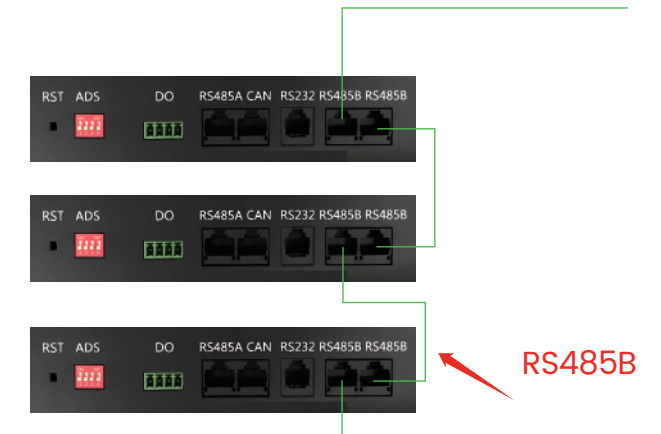


Parallel communication		RS485B-8P8C		RS485B-8P8C		
		RJ45		RJ45		
		1,8	RS485-B	9,16	RS485-B	
		2,7	RS485-A	10,15	RS485-A	
		3,6	GND	11,14	GND	
		4,5	NC	12,13	NC	
External communication		RS485A port		CAN port		
		RJ45		RJ45		
		1,8	RS485-B1	9,10,11,14,16		
		2,7	RS485-A1	12		CAN-L
		3,6	GND	13	CAN-H	
		4,5	NC	15	GND	
Communication with host computer		RS232		RJ11		
		RJ11		RJ11		
		1	NC	4		RX
		2	NC	5		GND
		3	TX	6		NC

NOTE: The output connected to the communication cable with a waterproof plug is listed according to the order requirements, which are customized products, and are not listed here.

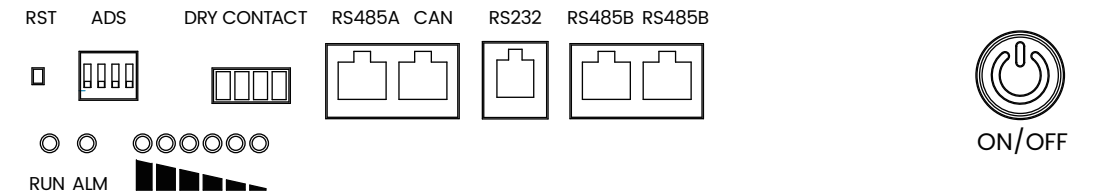
Step 8:

- Connect the parallel communication cable (yellow network line). Any Pack has 2 PCS RS485B port for parallel communication, 1 PCS RS485A and IPCs CAN port for inverter or other device. RS232 port only used for host software and update the firmware.



Step 9:

- Start and stop battery pack. Confirm that the operation is correct, and the battery function can be turned on after the wiring is correct, and you can press down power switch (ON/OFF) 3 seconds for start battery pack, then turn on switch in the combiner box, the battery starts working and output, it enters standby mode (if there is no power switch, please use a little pole and press down the RESET key 3-6 seconds, like as follow picture, LED indicate all running status and check it's self).



Note: You need to turn on the low side switch first (Discharge negative); then turn on high side (Discharge positive), if any of pack has mistake or alarm, you'd turn off the switch which connect to this pack, check and reset the pack, then turn on switch again. Turn off the pack, you must turn off the high side switch, then turn off low side switch.

Step 10:

- Running the device, set the external charger or inverter parameters, please set according to the corresponding operation manual. Can not exceed the rated parameter requirements.

4.3 Battery pack parameters:

No	Item	General Parameter		
1	Combination method	24V	48V	51.2V
2	Rated Capacity(Ah)(typical)	200	100	100
3	Factory Voltage(V)	26-27V	48-50V	51-53V
4	Rate power(Wh)	5120	4800	5120
5	Charging Voltage(V) recommend/max	28.8/29V	54/54.4V	57.6/58V
6	Charging Current(A) recommend/max	0.2C/0.5C	0.2C/0.5C	0.2C/0.5C
7	Float charge Voltage(V)	27.6V	53V	56V

8	Discharge Cut-off Voltage(V)	≤22V	≤41V	≤44V
9	Max Discharging current(A)	90A		
10	Charging Current limits(A)	10A /20A		
11	Charge over Current protect(A)	110A/Adjustable		
12	Discharge over Current protect(A)	110A		
13	Internal Impedance	≤20mΩ		
14	Communication protocol	CAN/485	CAN/485	CAN/485
15	Host software and Communication protocol	RS232/485	RS232/485	RS232/485
16	Operation Temperature Range	Charge:0~55℃		
		Discharge: -20~55℃		
17	Storage Temperature Range(recommend)	-20~50℃		
18	Combination method	24V	48V	51.2V
19	Rated Capacity(Ah)*Parallel	PACK*Parallel	PACK*Parallel	PACK*Parallel
20	Factory Voltage(V)	25.6-26.4V	48-50V	51-53V
21	Charging Voltage(V)recommend/max	28.8/29V	54/54.4V	57.6/58V
22	Charging Current(A)recommend/max	0.1C/0.2C(total)	0.1C/0.2C(total)	0.1C/0.2C(total)
23	Float charge Voltage(V)	27.6V	53V	56V
24	Discharge Cut-off Voltage(V)	≤24V	≤48V	≤50V
25	Max Discharging current(A)	90A*Parallel		
26	Charging Current limits(A)	10A/20A*Parallel		
27	Charge over Current protect(A)	110/Adjustable*Parallel		
28	Discharge over Current protect(A) Adjustable	110/Adjustable*Parallel		
29	Internal Impedance	≤20mΩ	≤20mΩ	≤20mΩ
30	Communication protocol	CAN or 485	CAN or 485	CAN or 485
31	Host software and Communication protocol	RS232/485	RS232/485	RS232/485
32	Operation Temperature Range	Charge:0~50℃		
		Discharge: -20~55℃		
33	Storage Temperature Range(recommend)	-20~50℃		

Step 11:

- Monitor all running status, and record all parameters, if there has any mistake, please record it .After start the system, every pack is on, and led indicate these status.

Step 12:

- Stop running battery pack.

When it is necessary to stop the charging and discharging of the battery or troubleshooting, please stop the external equipment first, cut off the input and output circuits, and then press the power switch off each battery pack.

Appendix 1

SOC Indicator & Status Indicator Guides

Chart 1: Battery Status

Status	Normal/Warning/Protection	RUN	ALM	Capacity LED						Description
		●	●	●	●	●	●	●		
Shut Down	Shut down	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	Flash	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Standby
Charge	Normal	ON	OFF	Based on capacity						
	Warning	ON	Flash							
	Protection	ON	ON							
Discharge	Normal	ON	OFF	Based on capacity						
	Warning	ON	Flash							
	Protection	OFF	ON							
Fault	Protection	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging or discharging

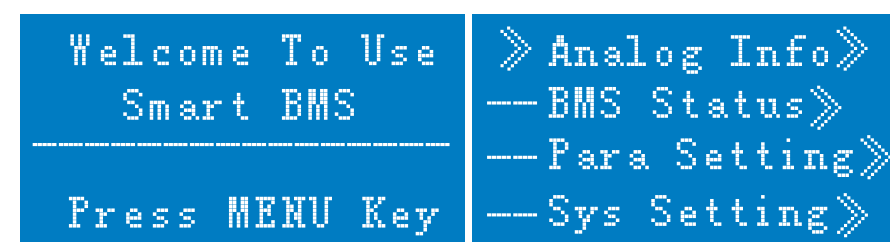
Chart2: LCD screen display

1. Display rendering



2. Main menu page

After BMS is activated, will show the welcome screen, press the "MENU" button to enter the main menu page. As shown in the figure below:



3. Battery parameters page

When the cursor "》" is point to "Battery Parameters Acquisition", press "ENTER" key will enter the page of "Battery Parameters Acquisition", As shown in the figure below:

》PackV: 53.22 V	--T1: 26.1°C	--PCB_T: 27.4°C
--Im: 0.00 A	--T2: 26.2°C	--ENV_T: 27.4°C
--Temperature》	--T3: 26.6°C	
--Cell Voltage》	--T4: 26.2°C	
--Cell101: 3333 mV	》CellCapacity》	SOC: 0.00 %
--Cell102: 3333 mV		FCC: 50.0AH
--Cell103: 3331 mV		Rm : 0.0AH
--Cell104: 3329 mV		CC : 0

When the cursor "》" is point to "Battery Status", press "ENTER" key will enter the page of "Battery Status", As shown in the figure below:

》Status: Idle	》OVP: 0	》UV : N
--Record》		--UVP: N
--BMS Status》		--OC: N
		--OCP: N
》SCP: 0	》SCP: N	》OT : N
--O/UTP: 0	--Failure: N	--OTP: N
--OCP: 0		--OV: N
--UVP: 7		--OVP: N

4.Parameter Settings

Screen can not set parameters Baud Rate: 9600, Can not be set.

--Non-production manufacturer can not use.	--Baud rate:9600
--	------------------

5.Key description

- SW1----MENU, SW2----ENTER, SW3----UP, SW4----DOWN, SW5--- ESC
- Each item is "》" or "--" as a beginning, among them "》" shows the current cursor position, press "UP" or "DOWN" key can move the cursor position; with "》" end of the project, the content of the said project hasnot shown, press "ENTER" key can enter the corresponding page.
- Press "ESC" key can be returned at the next higher level directory; In any position, press "MENU" key canreturn to the main menu page.
- When BMS inter sleep mode, press any key, can activate the screen.
- Inter standby mode , with no keystrokes 1 minutes later, LCD will enter Shutdown mode press any key,screen can be activated.

Appendix 2

• A Host soft operation:

When the equipment manufacturer confirms that it is necessary, it can authorize to provide the customer withthe host software and operating instructions.

名称	修改日期	类型	大小
Config	2022/2/25 11:23	文件夹	
PbmsTools V2.5FN	2020/3/2 15:59	应用程序	669 KB
PbmsTools V2.5FN.exe.config	2021/12/17 16:31	CONFIG 文件	1 KB

• B Host soft operation:

The screenshot shows the PbmsTools V2.5FN software interface. It includes tabs for Realtime Monitoring, Multi Monitoring, Memory Info., Parameter Setting, System Config., and Export Datas. The main display area is divided into several sections: Pack Information (Pack Voltage: 51.363 V, Pack Current: 0.00 A, SOC: 48%, SOH, RemainCapacity: 96810 mAh, FullCapacity: 200000 mAh, Battery Cycle: 0), Cell Temperature (Tcell 1-4: 19.9-19.8°C, MOS_T: 21.7°C, ENV_T: 22.6°C), Cell Voltage (mV) (MaxVolt: 3206, MinVolt: 3204, VoltDiff: 2, Vcell 1-16: 3204-3205 mV), System Status (CHARGING-ON, DISCHARGING-ON, CHARGING, DISCHARGING, CHG-LIMIT-OFF, HEATER-OFF, ACin, Fully), Alarm Status (None), Protect Status (None), Fault Status (None), and Switch Control (CHG Circuit: Close, Sound Alarm: Open, CHG Limiter: Close, DSG Circuit: Close, LED Alarm: Close, Shutdown: Off). A Password field is also visible at the bottom right.

Appendix 3

Troubleshootin

1. Battery pack stop work.

- A: Turn on switch,be sure it is ON; If battery is low SOC.it need to charging in.
- B: Battery pack low volt or enter sleep mode,there you will press down "RST" button3-6 second,or charging in.



2. No communication ,inverter can not received any DATA from BMS.

- A: Check whether if communication cable is OK,check RJ45 PIN,
CAN: PIN4:CANH,485A-A
PIN5:CANL;485-B
RS485A: PIN2:485A-A
PIN1:485A-B;
- B: Replace the communication line.Please give feedback to the dealer and exchange it.
- C: Check inverter or other device which connect to BMS,update it is firmware.
- D: If the communication function needs to be upgraded, please consult the agent or manufacturer.
- E: Confirm your inverter and battery protocol is correct,Different protocol or different connection will make a mistake.

3. Battery pack report SOC is mistake.

A: Inverter received Data from Master BMS, but it is SOC<total SOC, sample as: 9PCS packs has 1800Ah, but inverter read DATA is 1600Ah. So you may check any one is disconnected.check RS485B communication cable(yellow), RS485 communication cable, replace the cable which is broken.RJ45 PIN:

CAN: PIN4:CANH,
PIN5:CANL;
RS485A: PIN2:485-A,
PIN1:485-B;

B: SOC DATA has Large tolerance.

Discharge empty the battery first, then charge it fully with a small current, and learn to discharge. Any pack is mistake, we advice you read the BMS Data(When we authorize the terminal to use) with host software.then we reset the BMS and calibration.

C: When multiple batteries are connected in parallel, the SOC is different.

We recommend that each pack has a small current discharged and it is emptied until the SOC alarm appears, and then recharged in parallel and fully charged.

4. How to turn on the Pack to discharge.

We recommend method is:

A: Reset the single pack's BMS, LED will flash and startwork

B: Turn on the power switch on the bottom/front panel;

C: Turn on power switch in the combiner box.



WARNING: The operating parameters of the equipment cannot exceed the rated working voltage and current of the Pack, exceed the rated volt and current, Can cause damage to the Pack or other failures.

5. Inverter or other external device can not connect the battery.

We recommend method is:

A: Check whether the working parameter's of the device and battery are appropriate, and improper parameters cannot be matched.

B: When the device is turned on, the current is too large, resulting in battery protection, At this time, you should be able to see the LED flashing from the battery panel.in this case, You can adjust your equipment parameters or contact the dealer to solve.

C: It is necessary to update BMS parameters and match the device,then Reset BMS and restart your device.

6. Replace bad Pack.

There is a bad battery pack, it is need to replace, please connect your supplier, need professional installers to operate it. We recommend replace all or make pack has same voltage and same specification batteries pack.

NOTE: When replacing the battery, the same module needs to be replaced at the same time, and the voltage should be the same.

7. Need to replace spare parts or emergency maintenance.

Some parts can be obtained from the sales or agency, and the excess parts need to be purchased separately.

Be careful, turn off the power switch before replacing parts.

8. Need to place some safety device for keep a safe environment.

You'd keep a safe case for Pack and external device, Please place safety device, as: fire-fighting sand, fire-fighting blankets, fire-fighting water pipes, Install Monitor sound, light, electricity, smoke and other equipment.

WARNING:**Emergency process:****1. The external device catches fire and explodes:**

A: Under the condition of ensuring safety, non-operating personnel immediately move to a safe location.

B: Under the condition of ensuring safety, the operator immediately cut off the external power supply of the equipment and the internal power supply.

C: Use fire-fighting equipment for fire-fighting treatment (the use of fire-fighting sand, fire-fighting blankets, fire-fighting water pipes)

D: If you cannot completely extinguish the fire, please call the local fire department for help.

E: Keep the accident site data so that the source of the accident can be traced.

Product Responsibilities and Consulting

We will not be liable for the accidents resulting from operation breaking this specification and user manual.

- We will not send separate notice, provided that the contents of this specification are changed due to improvement of product quality or technological upgrading, provided that you want to understand the latest information of this product, please contact us.

- The shelf life of this product after it is delivered; we will maintain the product, which is in the warranty period for service, provided that it has any product question.

- Quality problems within the specified operation range; we may replace the relevant parts, if we fail to maintain it, so as to achieve the purpose of sustainable use without performance reduction; our after-sales service personnel will propose the specific maintenance and troubleshooting methods.

In case of any questions, please contact us.

THANK YOU FOR CHOOSIN

END

FLYFINE DIGITAL ENERGY CO.LTD

