



RACK MOUNTED LITHIUM IRON PHOSPHATE BATTERY

SILVERBRICK SERIES

USER MANUAL

SHENZHEN BAK POWER BATTERY CO., LTD



Integrated Lithium-ion Battery Pack User Manual

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FOREWORD

Overview

This manual describes the installation, history recording, and parameter settings of the battery and provides safety and general information.



Readers



This document provides technical details regarding the tools and infrastructure for the following users:

- Sales engineer
- Technical support engineer
- Installation engineer
- Application engineer
- Maintenance engineer

Symbol convention

The following symbols may appear in this article and they are represented as follows:

Symbol	Indication
 dangerous	Used as warning in an emergency, if not avoided, it will result in death or serious personal injury.
 warning	Used as a warning of a medium or low potential hazards, if not avoided, it may cause minor or mild injury.

 caution	Used as a warning of potential dangers, if this information is ignored, it may result in equipment damage, data loss, equipment performance decrease and other unpredictable results.
 INTRO	represents supplementary information.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in previous issues.

Version: V1.4 (2020-07-23)

This version is the third official release including the 24V series batteries.

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1 OVERVIEW

1.1 Product specification

The model number of the integrated lithium ion battery (hereafter referred to as lithium battery or PACK) is shown in figure 1-1. It is currently available in a 50Ah (BTESF48V50-R), 100Ah (BTESF48V100-R), 150Ah (BTESF48V150-R), as well as 24V 100Ah (BTESF24V100-R) and 24V 200Ah (BTESF24V200-R).

Figure1-1 The explanation of the product model number

B T E S F 4 8 V 1 0 0 – R

— ——— — ——— ——— —

1 2 3 4 5 6

- 1 Trademark of BAK
- 2 Application: Standby and Solar
- 3 Cell material: LFP
- 4 Nominal voltage (actually 51.2V)
- 5 Capacity: 100Ah
- 6 Mounting: Rack

1.2 Product profiles

The lithium battery group is developed by SHENZHEN BAK POWER BATTERY CO., LTD. Belonging to one of the series of 48V and 24V back-up lithium battery products, the system uses international advanced lithium iron phosphate battery application technology and BMS control technology. Due to its long lifecycle, small size, light weight, stable performance, safety and environmental protection, as well as a strong ability to adapt, it can be used in harsh outdoor environments.

The system integrates advanced battery management system (BMS), including charge and discharge management, thermal management, communication management, balance management, data management, and realize remote centralized monitoring, remote management and maintenance of the battery. It has outstanding advantages in specific applications such as backup power supply as widely used in remote access network equipment, exchanges, mobile communication equipment, transmission equipment, satellite and microwave communication equipment and communication.

With the operating voltage programmed in the BMS to 44V to 55.2V and 22V to 27.6V respectively, the battery can also be used in cyclic applications such as PV power systems.

2 ILLUSTRATION

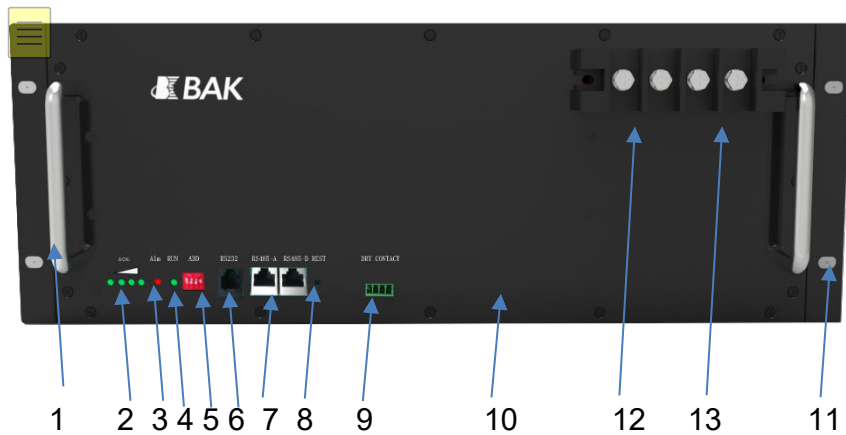
2.1 Panel description

The BTESF series lithium battery front panel is shown in Figure 2-1 below.
Figure 2-1 Module front panel



For detailed descriptions of each location, see the following figure 2-2.

Figure 2-2 Front Panel Definition



1 Handle	2 SOC (capacity light)	3 ALM (alarm)	4 RUN
5 ADD	6 RS232	7 RS485	8 RESET
9 Dry Contact (not used)	10 Main panel	11 Mounting holes	12 Output-
13 Output +			

Handle

Made of galvanized steel for lifting.

SOC

The meaning of SOC indication light shown in table 2-1.

Table 2-1 The relationship between the capacity of the battery and the SOC light

●	●	●	●	Capacity
☒	☒	☒	☒	75%-100%
☒	☒	☒	○	50%-75%
☒	☒	○	○	25%-50%
☒	○	○	○	0%-25%

INTRO ☒ Indicates ON, ○ Indicates OFF.

ALM

When the battery has a fault condition, the "ALM" light is red.

RUN

During charging, the "RUN" light will be green.

During discharging, the "RUN" light will be flashing.

"RUN" and "ALM" can display the battery status, as shown in table 2-2.

Table 2-2 The explanation of "RUN" and "ALM"

Function	Mark	Color	Flashing frequency	Indication
Running	RUN	Green	No light	Not working
			Slow Flash (about 3 secs)	Standby state
			Fast flash	Working state
Alarm	ALM	Red	No light	Normal
			Stable light	Alarm

ADD

When batteries are used in parallel, the four dip switches are used to set the batteries' addresses in the system. The address settings are shown in table 2-3.

Table 2-3 Dip switches address code

Address Code				ADD	PACK Definition	Explanation
1	2	3	4			
OFF	OFF	OFF	OFF	0	PACK0	Use as Single Pack
ON	OFF	OFF	OFF	1	PACK1	Use as MasterPack (When more than one used in parallel)
OFF	ON	OFF	OFF	2	PACK2	Use as SlavePack2
ON	ON	OFF	OFF	3	PACK3	Use as SlavePack3
OFF	OFF	ON	OFF	4	PACK4	Use as SlavePack4
ON	OFF	ON	OFF	5	PACK5	Use as SlavePack5
OFF	ON	ON	OFF	6	PACK6	Use as SlavePack6
ON	ON	ON	OFF	7	PACK7	Use as SlavePack7
OFF	OFF	OFF	ON	8	PACK8	Use as SlavePack8

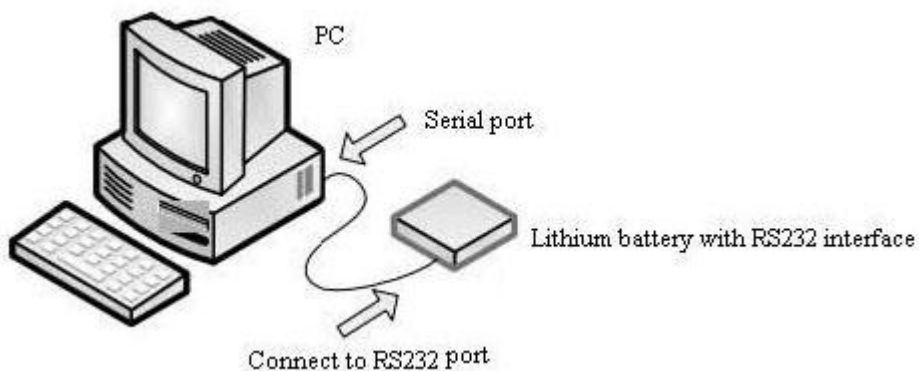
Address Code				ADD	PACK Definition	Explanation
1	2	3	4			
ON	OFF	OFF	ON	9	PACK9	Use as SlavePack9
OFF	ON	OFF	ON	10	PACK10	Use as SlavePack10
ON	ON	OFF	ON	11	PACK11	Use as SlavePack11
OFF	OFF	ON	ON	12	PACK12	Use as SlavePack12
ON	OFF	ON	ON	13	PACK13	Use as SlavePack13
OFF	ON	ON	ON	14	PACK14	Use as SlavePack14
ON	ON	ON	ON	15	PACK15	Use as SlavePack15

RS232

The system uses RS-232 series communications to load data and transfer data including: system parameters, system status and alarm information.

RS-232 generally uses 9600bps. The RS-232 port on the battery is only active when the dip switch is set to Single Pack mode (ON,OFF,OFF,OFF). Connection is as shown in figure 2-3.

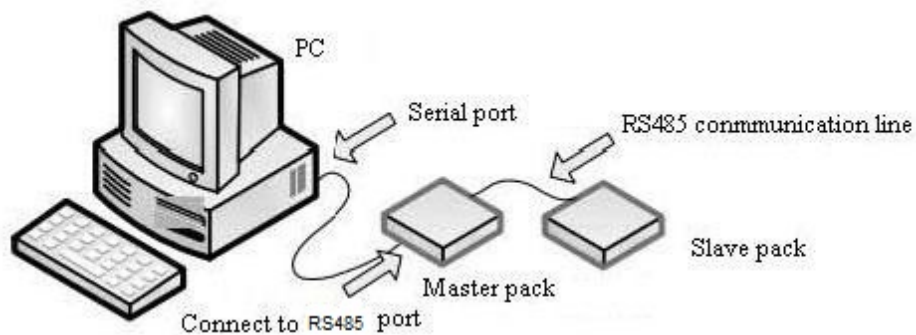
Figure 2-3 RS-232 connection schematic diagram



RS485

When the system is in parallel mode, it uses the RS-485 serial port for data transfer. The main system (Charger/Inverter controller or PC) connects through the Master Pack to get the data for each Slave Pack. Connection as shown in figure 2-4.

Figure 2-4 RS-485 connection schematic diagram



RESET

Press RST key for 3 seconds to start the device, or press the RST key for 3 seconds again to shut down the device. When the system is running, should there be an exception (alarm), press this button for 6 seconds to reset the system (press / release) to ensure the stability of the system.

Dry contact

The two dry contacts can be used as control inputs to an inverter/charger to stop charging when the battery is at 100% SOC, stop discharging at 80% DOD or stop when there is an alarm or fault condition.

Dry 1	Closed: Normal	Open: Stop charging
Dry 2	Closed: Normal	Open: Stop discharging

Output

A terminal of 4 connections, 2 for positive, 2 for negative, each connection is for a M6 ring-lug.

LCD display (optional)

LCD display can read Battery status, cell status, firmware version, protection/alarm, etc.

2.2 The working principle

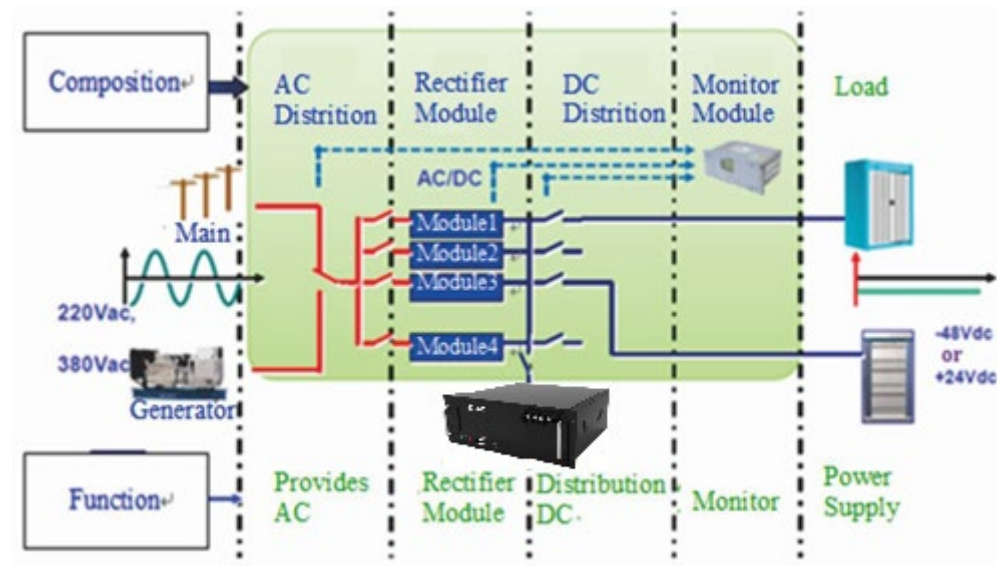
BTESF series lithium battery pack is equipped with charging and discharging management module and monitoring module.

Charge and discharge management module protects battery charge and discharge functioning, prevents overcharging, discharge over-current by adapting the DC input as required for the charging process, and disconnecting the battery when fully discharged.

The monitoring module provides the cell balance function and power, temperature and SOC. The monitoring module transmits the real-time information collected in the operation of the product through the protocol network to the monitoring platform, and the user can observe the operation status of the battery in each group through the display screen.

A single 48V module is 51.2V, 50Ah, 100Ah or 150Ah and a 24V module is 25.6V 100Ah and 200Ah. It can be used in standby applications such as telecom power as shown in figure 2-6, or in Solar/Wind applications with solar/wind charge controller/inverter instead of the rectifier.

Figure 2-6 Telecom standby application example



2.3 The product features

BTESF series integrated lithium battery pack has the following remarkable characteristics:

- The lithium iron phosphate cathode material has a long cycle life and its safety is extremely good.
- The operating temperature range is: 0 ~ 45 °C.
- It has strong charge and discharge capacity: charge and discharge rate can support 1.0C.
- It can support up to 15 batteries in parallel for expansion.
- During storage and transport, the battery is set to sleep mode (Off), in order to reduce the loss of capacity and disconnect active power from the output terminals for enhanced safety.
- The Port design is convenient; all wire harness connected to the plug, convenient connection.
- Lightweight, small size, easy to install and maintain, meets the requirements of the standard cabinet, is able to be wall mounted, or mounted on a pole.
- Built-in Battery status monitoring system (BMS) for real-time monitoring of current and voltage, temperature, alarm and protection function.
- The function of "four remote" (telemetry, remote signaling, remote regulating and remote control), can be connected by computer with remote control center.
- It is environmentally friendly.

INTRO

- 1) Telemetry: voltage, current, temperature, SOC, SOH (optional), etc.
- 2) Tele-signal state of charge and discharge, overcharge / overcurrent, under voltage

overcurrent alarm / alarm, environment / battery /PCBA/ battery temperature alarm, low environmental temperature alarm, battery capacity is too low, the battery temperature / voltage / current sensor failure alarm, battery failure alarm (just not cut off the monomer pressure high limit alarm) (optional), battery failure alarm (optional).

- 3) Remote control: charge / discharge (optional), alarm sound off, intelligent intermittent charging mode, current limiting charging mode, etc.
- 4) Optional: Battery charge / discharge management parameters and the output parameters of the switching power supply system.

3 INSTALLATION GUIDE

3.1 Installation precaution notes

Comply with local laws and regulations

When operating the equipment, make certain to comply with local laws and regulations.

Personnel requirements

Technicians who are responsible for installation and maintenance are required to undertake strict training on the BAK batteries first. Master the correct methods for operation and safety, only then the installation, operation and maintenance can be carried out.

In order to maximize the efficiency of the equipment, to obtain best possible operating results, and ensure maximum lifespan, please pay careful attention to the correct installation and usage requirements.

Personal safety

- Insulated tools and gloves should be used and worn at all times – During the installation process, watches, bracelets, rings and other metal products should be removed.
- 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.
- Should be operated and supervised by engineer who have experience and can take preventive measures for potential hazards of battery.

Field and environment

- Site requirements
 - 1) Cleanliness

Lithium battery packs cannot be placed in or near garbage disposals, or accidentally dropped or placed in smaller disposal units, as their interaction with metals is likely to cause short circuits and endanger the system and personal safety.

- 2) Fire protection

The battery storage or installation room must not contain flammable, explosive and other dangerous goods, and it should be equipped with effective fire equipment (such as CO2 fire extinguishers).

3) Ventilation and heat dissipation

For optimum operation and maintenance access the equipment should be installed with 30cm – 50cm clearance all round, with preferably 50cm clearance above it. If installed in a cabinet or cramped area, an exhaust fan should be installed to maintain good indoor ventilation.

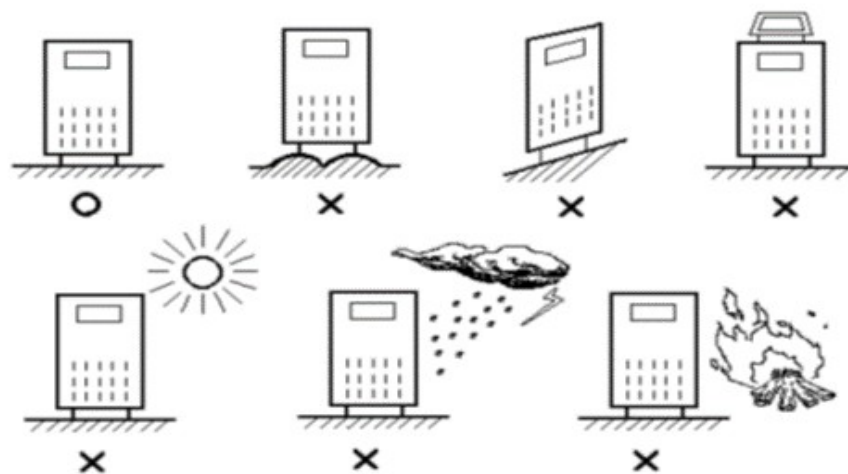
4) Installation requirements

Installation should be carried out as shown in figure 3-1 in order to avoid possible risks.

Put the lithium battery on the ground (to avoid tilt, uneven ground).

Avoid placing in the sunlight, rain or wet surfaces.

Figure 3-1 Requirements for installation scenarios



● Environmental requirements

Ambient temperature: (-10~+40) °C.

Relative humidity level: 0%RH~95%RH, no condensation.

Cooling method: air cooler.

Height above sea level: match to the standard requirement of GB3859.2-93.

Verticality: no vibration and the vertical inclination does not exceed 5°.

Pollution level: Level ii .

Recommended operating temperature : (20~25) °C , humidity level control within 50%.



caution

- Do not install in a working environment with metal conduction type dust.
 - Do not install in an area containing corrosive gases.
 - Do not install in high dust concentrated areas.
 - Do not place any items on the top of lithium-ion battery pack. People must not sit on the battery.
-
-

Power check

Before installation, please confirm that the load capability of inlet wire meets the requirements of the new equipment. Check to see if the power supply corresponds to the equipment nameplate of the voltage and frequency and if the current capacity has decreased due to the aging of the wire.

If in doubt, please check with your local power supply Consultation Department.

- Ground wire
Earthing terminal is available; zero voltage with reference to main earth cannot exceed 5V.

- DC output voltage and load capacity

Lithium-ion battery pack of nominal DC output 48V:

50Ah/50A DC, 100Ah/100A DC, 150Ah/150A DC.

And nominal DC output 24V: 100Ah/100A DC, 200Ah/200A DC.



caution

- When installing the lithium-ion battery pack, the user should check the lithium-ion battery pack in advance to make sure that the contacts and connectors are safely in place to avoid an open circuit or short circuit fault.
 - During installation, do not connect the lithium batteries polarity in reverse or in any way incorrectly, to avoid causing a short circuit.
 - Please do not connect the terminals with no security or insulation protection, so as to avoid the risk of electric shock.
-
-

3.2 Installation preparation

3.2.1 Unpacking and inspection

BTESF series lithium batteries and accessories use packaging of cardboard boxes or wooden boxes. When unpacking, be careful when dismantling. Inspect the device and accessories according to the package list, to ensure it's complete and make certain nothing was damaged during shipping.

Before clearing the packaging, make sure that all parts are included. If equipment or accessories are damaged in transit, or incomplete or incompatible, the equipment,

accessories and order contracts should be recorded and immediately contact the local branch or office of BAK company.

The site needs to be reviewed inspected once again to make sure the audit documents are in order for the audit. Before inspection, the site should be clean.

3.2.2 Installation tools

Potential commonly used tools as shown in table 3-1~3-4.

Table 3-1 General purpose tools








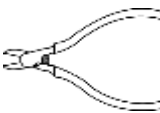

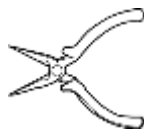



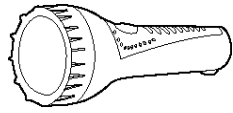


The appearance of the tools, parameters, and names			
Adjustable wrenches	Phillips screwdriver	Slotted screwdriver	Socket wrench
			
Torque wrench	Open-end wrenches	Double offset ring spanner	Diagonal cutting pliers
			
Wire cutters	Needlenosed pliers	Marking pen	Working gloves
			
Ladder (2m)	Flashlight	Tape measure	Impact drill
			

Table 3-2 Tools for delivery and unpacking

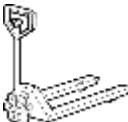

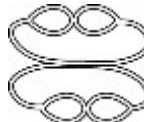

The appearance of the tools, parameters, and names			
Manual forklifts	Electric forklift	Sling (weight≥400kg)	Leverage (weight≥400kg)
			

Table 3-3 Electrical installation tools


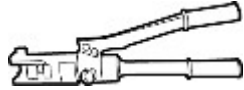
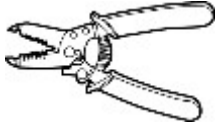
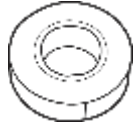

The appearance of the tools, parameters, and names			
Insulated gloves	Power cable crimping plier	Wire stripping pliers	Electrical tape
			

Table 3-4 Measuring Tools

The appearance of the tools, parameters, and names			
Current Clamp meter			-
			-

3.3 Installation and wiring



caution

- Before installing, make sure that the switching power supply system is off and that the battery's system switch is off.
- The installer should ensure that all wiring terminals have been wiped clean of dust. After installation designate a person to check that all bolts have been correctly tightened/torqued.
- Check the battery voltage before installation and if required top-up charge the battery before connecting it to the switching power supply and switching on the mains. At least two or more people should be present on the construction site.

3.3.1 Standard cabinet installation

Mounting fixed

The standard cabinet installation is to place the product on a shelf in a 19-inch standard cabinet, then push it into the cabinet, and secure with m6*15 bolts through the front panel mounting holes, into M6 cage nuts.

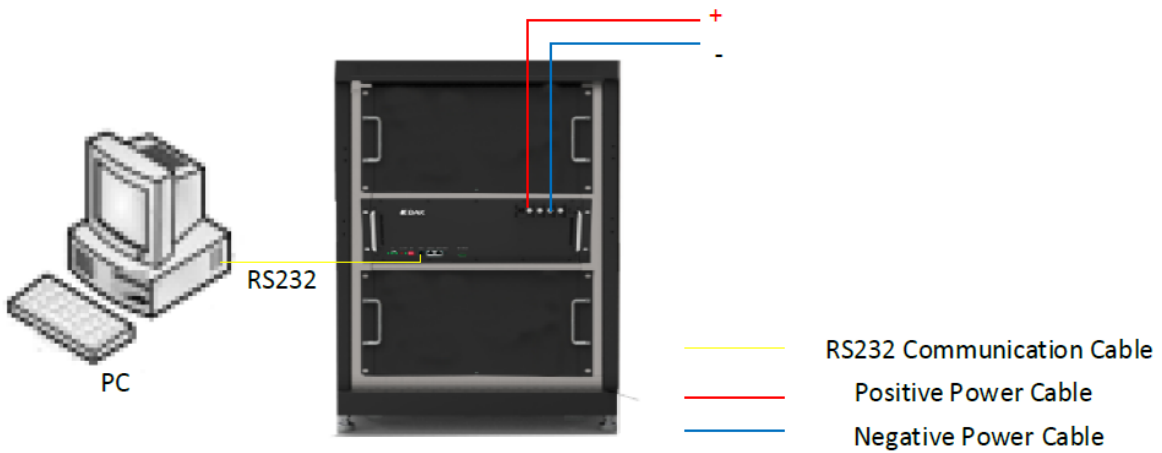
Figure 3-2 Schematic diagram of standard cabinet installation



Battery Output Connection

The positive and negative polarity of the battery output terminals on the lithium-ion battery system chassis are connected with the positive and negative polarity of the DC switching Power module battery terminals by using the attached red and black cables respectively.

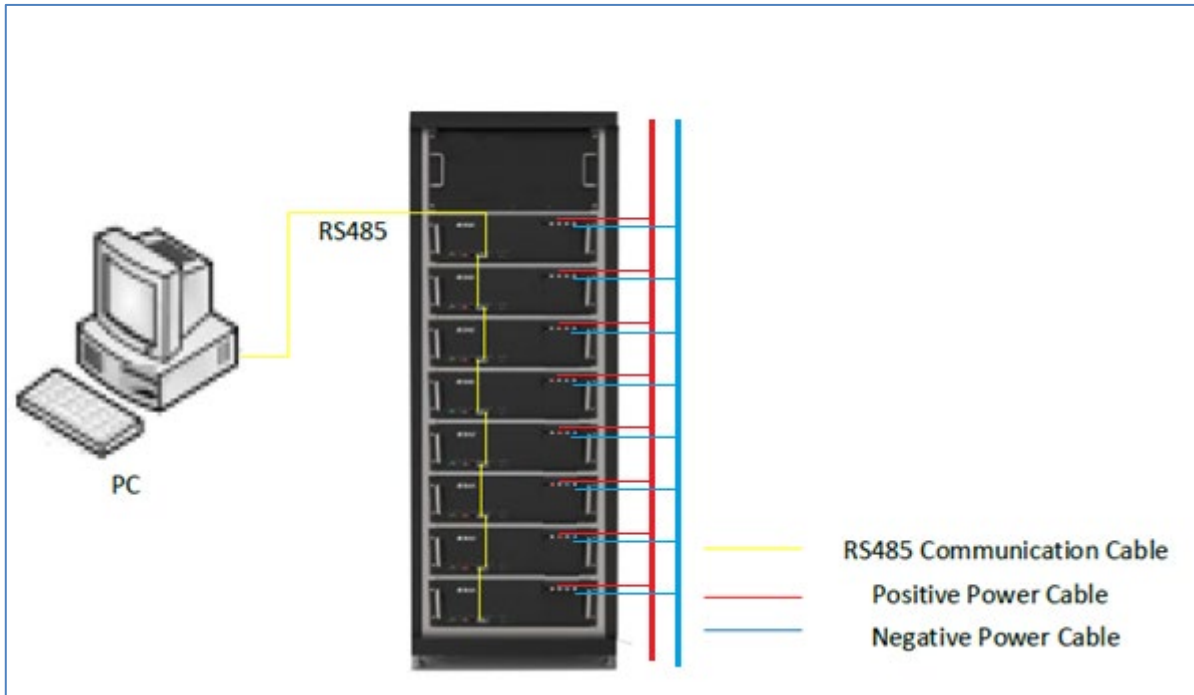
Figure 3-3 Connection diagram



Multi-group Parallel use

If multiple systems are required in parallel, the positive terminals of several lithium-ion batteries are connected together, and the negative terminals connected together. The RS485 communication cables should also be fitted and the dip switches address codes setup (Table 2-3). Please refer to the figure below.

Figure 3-4 Parallel use



Switch power supply parameter setting

After installation, test for short-circuits. If not, you can switch on the electricity. Switching power supply module parameters should be set according to the following table:

Table 3-5 Switch power supply parameter setting

Item	Parameters: Cyclic use 24V	Parameters: Cyclic use 48V	Notes
Charge voltage (CV)	27.6V	55.2V	When the charging current is less than 0.01C, The battery will be stopped to charge.
Low voltage disconnect	≥22V (23V)	≥44.0V (45-46V)	
Charge current	≤0.2C/Module	≤0.2C/Module	If the current exceeds 0.2C/Module please contact our technical

INTRO

- 1) The BMS is factory set for limited charging current when used in parallel operation with the RS485 cables connected. If comms cables are not connected, the maximum charge current for each battery pack must be programmed to 0.2C. For detailed operations, please refer to Integrated Lithium-ion Battery Pack PC Software User Manual.
- 2) Always start the power supply module first, then connect the load.

4 MAINTENANCE

In order to ensure the lithium-ion battery pack achieves the longest life cycle, the maintenance technician should carry out regular inspections and maintenance care.

The maintenance records should be complete and routine, so that subsequent verification of management parameters of the battery pack can be tracked.

4.1 Electrical maintenance

Maintenance of the electrical parts may refer to table 4-1.

Table 4-1 Table of contents for maintenance

Items	The checking Points	Methods	Repair conditions	Repair solution
Electrical	Check if the Output of the voltage is normal	Multimeter	Battery voltage out of range set	See the following troubleshooting section
Fault inspection	Check if lights are normal	Visual inspection	Alarm	
Cable	Insulation, Terminal	Visual inspection	<ul style="list-style-type: none"> ● Insulation cracks, aging ● Exfoliated, corrosion of the terminals 	<ul style="list-style-type: none"> ● Replace the cable ● Replace the terminal block

4.2 Battery maintenance

Table 4-2 Contents of battery maintenance

Frequency	Items	Solutions
Monthly	Operating environment	Stay away from heat source and avoid direct sunlight.
	Visual inspection	If there is any breakage, leakage or deformation, Isolate the problematic battery pack, take a photograph and replace the battery.
Quarterly	Visual inspection	Use cotton cloth to clean the appearance. Be careful during cleaning because the voltage is high.
	Connection status	<ul style="list-style-type: none"> ● Check each terminal, check the bolt, if it's loose, and tighten it again. ● Check the reason if the cable temperature exceeds 40°C.
Every 6 months	Measure and record the voltage	<ul style="list-style-type: none"> ● At the final stage of charging, record the voltage; make sure the positive and negative voltage of the battery are the same. Otherwise, should check and repair the corresponding connection cable. ● Collect the discharging data at least once every six months for the first year. ● In the second year, capacity is determined by every three months. Through the RS232 interface to view history, which shows frequent overcharge of a battery in the alarm message, indicating that the batteries have reached the charging and discharging protection point. This may result in time for preparing electricity is not enough and suggest changing the battery immediately.



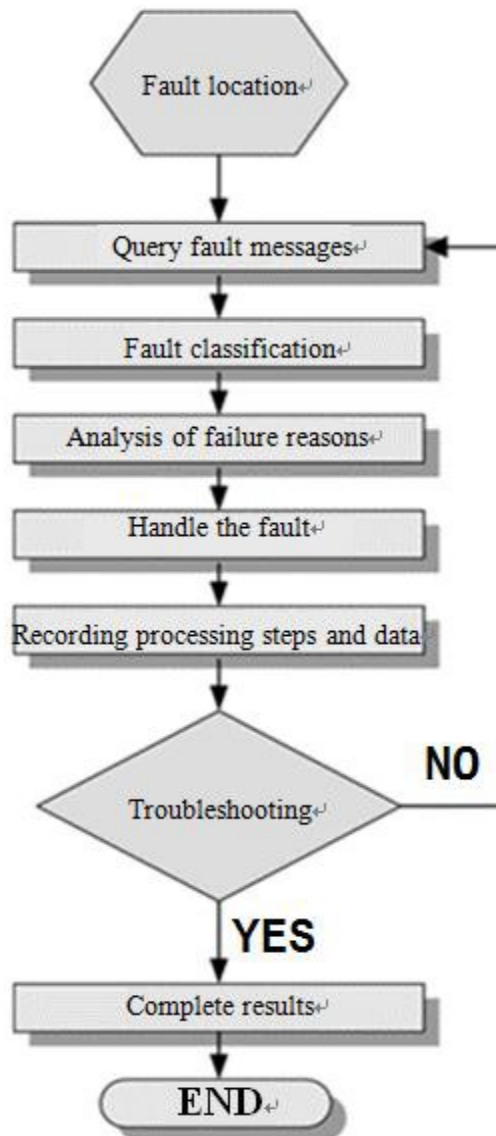
- 1) Charge and discharge status at the final stage can determined from the four capacity lights. Please refer to 2.2 for the definition of capacity lights.

4.3 Treatment for malfunctions

Solutions

Follow figure 4-1 to process the malfunction.

Figure 4-1 Table of Battery maintenance



- Step 1** Check the LED lights to determine which part may be faulty.
- Step 2** Check the information about the failure in the monitor module.
- Step 3** Classify the information (DC, AC, modules, batteries, control, etc.).
- Step 4** Find the problem according to the information.
- Step 5** Debugging the failure.
- Step 6** Record the data while processing.
- Step 7** Confirm all malfunction removed.
- Step 8** Fill in the report.
- Step 9** Repeat these steps if any more malfunction.

Faulty reasons and handling methods

Table 4-3 lists of most frequently failures and solutions.

Table 4-3 Checklist

Failure modes	Possible reasons	Solutions
Over voltage	<ul style="list-style-type: none"> ● DC over-voltage alarm set Unreasonable. ● In manual control mode, the power supply voltage is set too high. ● Rectifier module failure. 	<ul style="list-style-type: none"> ● Check if the DC over-voltage alarm point (default value is 29.2/58.5V) is reasonable. If it is unreasonable, adjust according to the actual situation. ● Check whether the manual control increases the system voltage. If yes, confirm the cause and return to the normal value when the operation is completed. ● Pull out the rectifier module one by one to check whether the alarm disappears. If the alarm still exists, insert the rectifier module into the home position. If the alarm disappears, replace the module.
Under voltage	<ul style="list-style-type: none"> ● No AC power. ● Monitoring module DC undervoltage alarm point set unreasonable. ● System configuration is unreasonable. ● In manual control mode, the power supply voltage is set too low. ● Check whether the exchange of power outage and restore AC power supply. 	<ul style="list-style-type: none"> ● Check the DC under voltage alarm point (default value is 23/45V). If it is not reasonable, adjust it according to the actual situation. ● Check that the power system current value is greater than the current power system capacity and, if so, increase capacity configuration or reduce the power system load. ● Check whether the manual control to reduce the system voltage, if so, should confirm the reason, to be restored to normal after the completion of the action. ● Check whether the rectifier module is faulty and the system capacity does not meet the load demand. If yes, replace the rectifier module.
Charge over current	<ul style="list-style-type: none"> ● Module communication interruption. ● Loose contact for monitor module. ● Monitoring failures. 	<ul style="list-style-type: none"> ● If there is a commutation module communication interruption alarm, if yes, plug and unplug the commutation module of communication interruption to confirm whether the alarm is cleared. If the alarm continues, replace the rectifier module. ● Reinstall the monitoring module, if still alarm, replace the module.

Failure modes	Possible reasons	Solutions
Ambient temperature is too high	<ul style="list-style-type: none"> ● Temperature alarm parameter setting is unreasonable. ● The temperature control system of the cabinet where the temperature sensor is located is faulty. ● The temperature sensor is faulty. 	<ul style="list-style-type: none"> ● Check if the ambient temperature alarm value (default 50 °C) is reasonable. If not, adjust it according to the actual situation. ● Check whether the temperature control system of the cabinet is faulty. If so, handle the fault of the temperature control system. When the temperature in the system cabinet returns to the normal range, the alarm will be cleared automatically. ● Check the temperature sensor is faulty, if so, replace the temperature sensor.
Ambient temperature is too low	<ul style="list-style-type: none"> ● Low temperature alarm parameter setting is unreasonable. ● Temperature sensor system cabinet where the temperature control system failure. ● The temperature sensor is faulty. 	<ul style="list-style-type: none"> ● Check if the ambient temperature alarm value (default 0°C) is reasonable. If not, adjust it according to the actual situation. ● Check the system cabinet temperature control system is faulty, if it is, then deal with temperature control system failure. After the temperature in the system cabinet returns to the normal range, the alarm will be cleared automatically. ● Check that the ambient temperature sensor is faulty and, if so, replace the ambient temperature sensor.
Battery temperature is too high	<ul style="list-style-type: none"> ● The battery temperature is too high alarm point set unreasonable. ● Battery compartment cooling system failure. ● The temperature sensor is faulty. 	<ul style="list-style-type: none"> ● Check the battery temperature is too high alarm value (default 53 °C) is reasonable, if unreasonable, according to the actual situation adjustment. ● Check the battery compartment temperature control system is faulty, and if so, then deal with temperature control system failure. When the battery temperature returns to normal, the alarm will be cleared automatically. ● Check the temperature sensor is faulty, and if so, replace the temperature sensor.

Failure modes	Possible reasons	Solutions
Battery temperature is too low	<ul style="list-style-type: none"> ● Battery temperature is too low alarm set unreasonable. ● Battery compartment heating system failure. ● The temperature sensor is faulty. 	<ul style="list-style-type: none"> ● Check if the battery temperature is too low (default: 0 °C). If it is not reasonable, adjust the battery temperature according to the actual situation. ● Check the battery compartment temperature control system is faulty, and if so, then deal with temperature control system failure. When the battery temperature returns to normal, the alarm will be cleared automatically. ● Check the temperature sensor is faulty, and if so, replace the temperature sensor.



- 1) Only when the power system is configured with a battery temperature sensor there should be a temperature alarm.

5 SPECIFICATIONS

5.1 Technical specifications

For the BTESF series Lithium batteries, the main technical parameters for a single module are shown in table 5-1, 5-2. When installing multiple sets in parallel, the charge and discharge parameters are shown in table 5-3, table 5-4.

Table 5-1 Technical data of single module charging

Model	Voltage (V)	Capacity (Ah)	charging voltage(V) Cyclic	charging voltage(V) Telecom	Charging current (A)	
					Standard value	Largest value
BTESF48V100-R	51.2	100	55.2	57.6	20	100
BTESF48V50-R	51.2	50	55.2	57.6	10	50
BTESF24V100-R	25.6	100	27.6	28.8	10	20
BTESF24V200-R	25.6	200	27.6	28.8	10	20

Table 5-2 A single module discharging parameters

Model	Voltage (V)	Capacity (Ah)	limited discharge voltage(V) Cyclic	limited discharge voltage(V) Telecom	Discharging current (A)	
					Standard value	Biggest value
BTESF48V100-R	51.2	100	44.0	43.2	20	100
BTESF48V50-R	51.2	50	44.0	43.2	10	50
BTESF24V100-R	25.6	100	22.0	21.6	20	50
BTESF24V200-R	25.6	200	22.0	21.6	40	100

Table 5-3 Multi group of BTESF48V100-R lithium batteries parallel charging parameters:

Voltage (V)	Capacity (Ah)	Charging voltage(V)		largest current (A)	Notes
		Cyclic	Standby		
51.2	100	55.2	57.6	20	1
51.2	200	55.2	57.6	40	2 parallel
51.2	300	55.2	57.6	60	3 parallel
51.2	400	55.2	57.6	80	4 parallel
51.2	500	55.2	57.6	100	5 parallel

Table 5-4 Multi group of BTESF48V100-R lithium batteries parallel discharging parameters

Voltage (V)	Capacity (Ah)	Discharge voltage(V)		The largest current (A)	Notes
		Cyclic	Standby		
51.2	100	44.0	43.2	30	1
51.2	200	44.0	43.2	60	2 parallel
51.2	300	44.0	43.2	90	3 parallel
51.2	400	44.0	43.2	120	4 parallel
51.2	500	44.0	43.2	150	5 parallel

Table 5-5 Multi group of BTESF48V50-R lithium batteries parallel charging parameters

Voltage (V)	Capacity (Ah)	Limited charging voltage(V)		largest current (A)	Notes
		Cyclic	Standby		
51.2	50	55.2	57.6	10	1
51.2	100	55.2	57.6	20	2 parallel
51.2	150	55.2	57.6	30	3 parallel
51.2	200	55.2	57.6	40	4 parallel
51.2	250	55.2	57.6	50	5 parallel

Table 5-6 Multi group of BTESF48V50-R lithium batteries parallel discharging parameters

Voltage (V)	Capacity (Ah)	Limited discharge voltage(V)		The largest current (A)	Notes
		Cyclic	Standby		
51.2	50	44.0	43.2	15	1
51.2	100	44.0	43.2	30	2 parallel
51.2	150	44.0	43.2	45	3 parallel
51.2	200	44.0	43.2	60	4 parallel
51.2	250	44.0	43.2	75	5 parallel

Table 5-7 Multi group of BTESF24V100-R lithium batteries parallel charging parameters:

Voltage (V)	Capacity (Ah)	Charging voltage(V)		largest current (A)	Notes
		Cyclic	Standby		
25.6	200	27.6	28.8	20	2 parallel
25.6	300	27.6	28.8	30	3 parallel
25.6	400	27.6	28.8	40	4 parallel
25.6	500	27.6	28.8	50	5 parallel

Table 5-8 Multi group of BTESF24V100-R lithium batteries parallel discharging parameters

Voltage (V)	Capacity (Ah)	Discharge voltage(V)		The largest current (A)	Notes
		Cyclic	Standby		
25.6	200	22.0	21.6	40	2 parallel
25.6	300	22.0	21.6	60	3 parallel
25.6	400	22.0	21.6	80	4 parallel
25.6	500	22.0	21.6	100	5 parallel

Table 5-9 Multi group of BTESF24V200-R lithium batteries parallel charging parameters

Voltage (V)	Capacity (Ah)	Limited charging voltage(V)		largest current (A)	Notes
		Cyclic	Standby		
25.6	400	27.6	28.8	80	2 parallel
25.6	600	27.6	28.8	120	3 parallel
25.6	800	27.6	28.8	160	4 parallel
25.6	1000	27.6	28.8	200	5 parallel

Table 5-10 Multi group of BTESF24V200-R lithium batteries parallel discharging parameters

Voltage (V)	Capacity (Ah)	Limited discharge voltage(V)		The largest current (A)	Notes
		Cyclic	Standby		
25.6	400	22.0	21.6	80	2 parallel
25.6	600	22.0	21.6	120	3 parallel
25.6	800	22.0	21.6	160	4 parallel
25.6	1000	22.0	21.6	200	5 parallel

5.2 The main performance index of the battery

For lithium battery of BTESF series module, the electrical performance as shown in table 5-11. [48V spec/24V spec]

Table 5-11 Multiple group parallel discharge technology parameters


Items for test	Testing methods	Requirements
0.1C discharge performance	Standard battery charge, 1h within 1h with 0.1C discharge current to 40.5V/20.25V, Record the discharge time.	Discharge time \geq 600min
0.5C discharge performance	Standard battery pack, 1h within 0.5C discharge current to 40.5V/20.25V, record the discharge time.	Discharge time \geq 115min
High temperature performance	After the battery pack is charged in the standard (60 ± 2) °C high temperature box for 4 hours and then discharged to 40.5V/20.25V at 0.1C, record the discharge time.	Discharge time \geq 600min
Low temperature performance (-10 °C)	After charging, the battery pack is put in the low temperature box of (-10 ± 2) °C for 6 hours, then discharged to 40.5V/20.25V at 0.2C at this temperature, record the discharging time.	Discharge time \geq 180min
Low temperature performance (-20 °C)	After charging, the battery pack is allowed to stand for 6 hours at (-20 ± 2) °C, then discharged to 40.5V/20.25V at 0.2C at this temperature. Record discharge time.	Discharge time \geq 120min

6 ENVIRONMENT PROTECTION

6.1 Environmental Label

The product described in this manual does not contain toxic and hazardous substances or elements. It is a green product. It can be recycled after being discarded and should not be discarded at will. The environmental label shown in Table 6-1.

Table 6-1 Environmental label

Specification	Mark
48V or 24V	

6.2 Recycle



■ This mark indicates that the product can not be classified with other waste. In order to prevent potentially hazardous substances from hazardous waste disposal hazards to the environment and human health, please refer to the classification of waste recycling in order to promote the sustainable use of material resources.



In order to recycle the used equipment, please use the recycling system or contact the manufacturer or seller of the product or the local authority to manage the waste products.

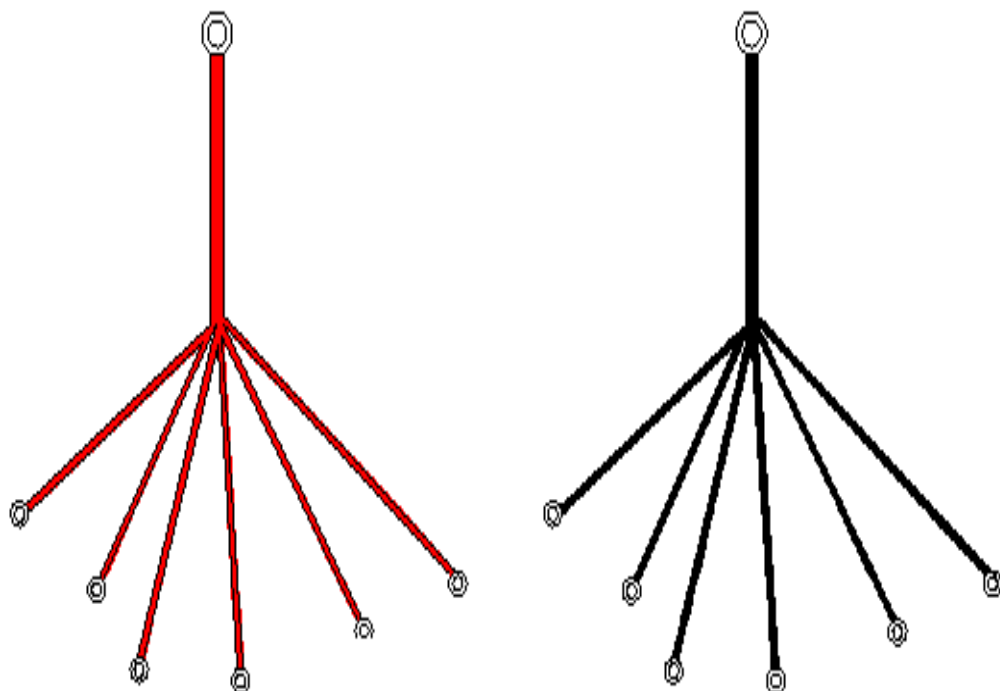
7 APPENDIX

7.1 Connection cable

If groups (4~10) of parallel sets of lithium batteries are not supplied by BAK battery racks, you can choose the customized wiring cables to replace. Relevant technical requirements are the feeder cable number and the number of parallel battery pack is consistent, and the specifications of each extension cable (length, diameter, and material) are the same.

For example, a customized six parallel wiring cable diagram as shown in figure 7-1.

Figure 7-1 Customized wiring cable diagram



According to the customer requirements, selecting the appropriate connector, cables, extension cable specifications, refer to relevant cable specifications given in table 7-1.

Table 7-1 Corresponds to AWG line number table

AWG	Diameter		cross-sectional area (mm ²)	Resistance (Ω/km)	Rated current (A)	Maximum current (A)
	mm	inches				
0000	11.68	0.4600	107.22	0.17	423.2	482.6
000	10.40	0.4096	85.01	0.21	335.5	382.6
00	9.27	0.3648	67.43	0.26	266.2	303.5
0	8.25	0.3249	53.49	0.33	211.1	240.7
1	7.35	0.2893	42.41	0.42	167.4	190.9
2	6.54	0.2576	33.62	0.53	132.7	151.3
3	5.83	0.2294	26.67	0.66	105.2	120.0
4	5.19	0.2043	21.15	0.84	83.5	95.2
5	4.62	0.1819	16.77	1.06	66.2	75.5
6	4.11	0.1620	13.30	1.33	52.5	59.9
7	3.67	0.1443	10.55	1.68	41.6	47.5
8	3.26	0.1285	8.37	2.11	33.0	37.7
9	2.91	0.1144	6.63	2.67	26.2	29.8
10	2.59	0.1019	5.26	3.36	20.8	23.7
11	2.30	0.0907	4.17	4.24	16.5	18.8
12	2.05	0.0808	3.332	5.31	13.1	14.9
13	1.82	0.0720	2.627	6.69	10.4	11.8
14	1.63	0.0641	2.075	8.45	8.2	9.4


Installation steps are shown below:

- 1) Preparation before installing: insulation metal mounting tool (such as a cross screwdriver, wrench), insulation tape and customized wiring cables.
- 2) Lithium-ion battery pack should be installed in a suitable location.
- 3) Connect each connector in turn with each of the output end of the lithium-ion battery pack. First, connect all lithium-ion battery packs with to the positive terminals (“+”), and then all the negative terminals of lithium-ion battery packs.

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