



# Lithium Iron Phosphate Battery Module

## Application Manual



**LITHIUM BATTERY**

48V Series

***Read this manual carefully before starting to install the battery.  
Keep these instructions for future reference.***

This document contains information that is the property of Shandong Sacred Sun Power Sources Co.,Ltd, and provides for the sole purpose of the installation, operation, and maintenance of products of Shandong Sacred Sun Power Sources Co.,Ltd. No part of this publication is to be used for any other purpose, and it is not to be reproduced, copied, disclosed, transmitted, stored in a retrieval system, or translated into any human or computer language, in any form, by any means, in whole or in part, without prior written consent of Shandong Sacred Sun Power Sources Co.,Ltd.

Although every possible effort has been made to ensure the accuracy of this document, Shandong Sacred Sun Power Sources Co.,Ltd assumes no responsibility for errors that may appear herein. The information is subject to change without notice.

Read and follow these instructions!

The following precautions are intended to ensure your safety and prevent property damage. Before installing this product, be sure to read all safety instructions in this document for proper installation.

	<b>⚠ DANGER</b>
	Failure to comply with the instructions with this symbol may result in a serious accident, causing death or a severe injury.
	<b>⚠ WARNING</b>
	Failure to comply with the instructions with this symbol may result in a serious accident, causing a severe injury.
	<b>⚠ CAUTION</b>
	Failure to comply with the instructions with this symbol may result in minor or moderate injury.
	<b>NOTICE</b>
	Provides information considered important but not hazard-related. The information relates to property damage.
	<b>IMPORTANT</b>
	Indicates valuable tips for optimal installation and operation of the product

This product is designed to an integrated system, which must be performed by a qualified person trained in electrical engineering and familiar with the characteristics and safety requirements of lithium batteries. Do not use this product if you are unsure if you possess the necessary skills to complete this integration.

## Table of Contents

1. Precautions .....	8
1.1 General Safety Precautions .....	8
2. Installation Precautions .....	8
2. Product Introduction .....	9
2.1. Front Panel Function Introduction .....	9
2.2 Product Specifications .....	11
2.3 State Indicator .....	11
2.4 Protective Functions .....	12
3. Unpack the Battery .....	13
3.1 Parts List .....	13
3.2 Visual Inspection of the Modules .....	15
4. Battery Installation .....	15
4.1 Battery Module Installation .....	16
5. Cable Connection .....	18
5.1 Single Battery Connection .....	18
5.2 Connect Cables of the Multiple Batteries in Parallel .....	21
5.3 Visual Inspection of the Connection .....	23
6. Activate the Product .....	23
6.1 Start the Battery .....	23
6.2 Monitoring the Battery .....	23
6.3 Monitoring Software Function Introduction .....	26
7. Inspection, Cleaning and Maintenance .....	30
7.1 General Information .....	30
7.2 Inspection .....	31
7.3 Cleaning .....	31
7.4 Maintenance .....	31
7.5 Storage .....	31
8. Troubleshooting .....	33
9. Transportation Requirements .....	34

## Figures

Figure 2-1: Front Panel Function Introduction

Figure 4-1: Battery Module Installation

Figure 5-1: Single Battery Connection

Figure 5-2: Removing the Protecting Cover

Figure 5-3: Communication Cable Connections between Battery and Computer

Figure 5-4: Multiple Batteries Connections

Figure 5-5: Communication Cable Connections among Multiple Batteries

Figure 6-1: Communication Port Set

Figure 6-2: Language Set

Figure 6-3: System Monitoring Program

Figure 6-4: Introduction of Monitoring Interface

Figure 6-5: Multipacks Interface

Figure 6-6: Record

Figure 6-8: Data Record Interface

Figure 9-1: Class 9 Miscellaneous Dangerous Goods and UN Identification Label

## Tables

Table 2-1: Product Specifications

Table 2-2: State Indicator

Table 2-3: Protective Functions Parameter Setting

Table 3-1: Parts Lists

Table 3-2: Recommended Tools and Instruments

Table 5-1: The Dialing Address Configuration of Each Battery

Table 8-1: Troubleshooting

## About this Manual

To make sure that you understand the proper procedures for safe operation, this section briefly describes the purpose, audience, organization, revision history, and acronyms and abbreviations.

## Purpose

The purpose of this manual is to provide information for the safe and successful installation of the product. The instructions in this manual are based general battery installation. Other configurations are possible and theses instructions can be reduced or expanded to accommodate installation of those systems.

## Target Audience

This installation manual is intended for system administrators and operators who install and configure the product.

## Organization

This manual is composed of the following chapters:

- Chapter 1, “Precautions,” list the considerations.
- Chapter 2, “Product Introduction,” explains the function of the product.
- Chapter 3, “Unpack the Battery,” explains how to unpack the battery.
- Chapter 4, “Battery Installation,” explains how to install the product.
- Chapter 5, “Battery System Connection,” explains how to connect the product.
- Chapter 6, “Activate the Product,” explains how to activate and monitor the battery.
- Chapter 7, “Inspection, Cleaning and Maintenance,” explains how to carry out the maintenance and store the battery.
- Chapter 8, “Troubleshooting,” explains some troubleshooting when some fault phenomenon occur.
- Chapter 9, “Transportation Requirements,” explains transportation requirements.

## Revision History

Rev.	Description	Author	Date
0.1	First Release		2019.5

## Acronyms and Abbreviations

The following acronyms and abbreviations are used in this manual

Abbreviations	Full Name
BMS	Battery Management System
SOC	State Of Charge
SOH	State Of Health

# 1. Precautions

## 1.1 General Safety Precautions

The product provides a safe source of electrical energy when operated as intended and as designed. Potentially hazardous circumstances such as excessive heat or electrolyte mist may occur under improper operating conditions, damage, misuse and/or abuse. The following safety precautions and the warning messages described in this part must be observed.

If any of the following precautions are not fully understood, or if you have any questions, contact us for guidance.

### Risks of explosion

- Do not subject the battery to strong impacts.
- Do not crush or puncture the battery.
- Do not dispose of the battery in a fire.

### Risks of fire

- Do not expose the battery to temperatures in excess of 60°C.
- Do not place the battery near a heat source such as a fireplace.
- Do not expose the battery to direct sunlight.
- Do not allow the battery connectors to touch conductive objects such as wires.

### Risks of electric shock

- Do not disassemble the battery.
- Do not touch the battery with wet hands.
- Do not expose the battery to moisture or liquids.
- Keep the battery away from children and animals.

### Risks of damage to the battery

- Do not allow the battery to come into contact with liquids.
- Do not subject the battery to high pressures.

## 2. Installation Precautions

Please be aware that a battery presents a risk of electrical shock including high short-circuit current.

Follow all safety precautions while operating the batteries.

- Remove watches, rings, and other metallic accessories.
- Use tools with insulated handles in order to avoid inadvertent short circuits.

- Wear rubber gloves and safety boots.
- Do not put tools or any metal parts on the top of the batteries.
- Disconnect charging source and load before connecting or disconnecting terminals.
- When moving batteries and wear all appropriate safety clothing and equipment.
- Do not open or mutilate the batteries.

	
	<ul style="list-style-type: none"><li>▪ Verify polarity at all connections before energizing the system. Reverse polarity at the battery terminals will void the Warranty and destroy the batteries. Do not short circuit the batteries.</li><li>▪ Do not combine SACRED SUN Lithium Batteries with other brands or chemistries; Do not mix Lithium Batteries from different installations, clients, or job sites.</li><li>▪ Do not disassemble or modify the battery. If the battery housing is damaged, do not touch exposed contents.</li></ul>

## 2. Product Introduction

48 V series lithium iron phosphate battery system has been designed to provide power backup for remote or outside telecom plants like Access Terminals, Base Transceiver Stations, and Base Station Controllers. This system has the characteristics of high system integration, well reliability, long service life, and wide operating temperature range.

### 2.1. Front Panel Function Introduction

In order to operate the product correctly, please carefully view the function of the front panel of the battery.

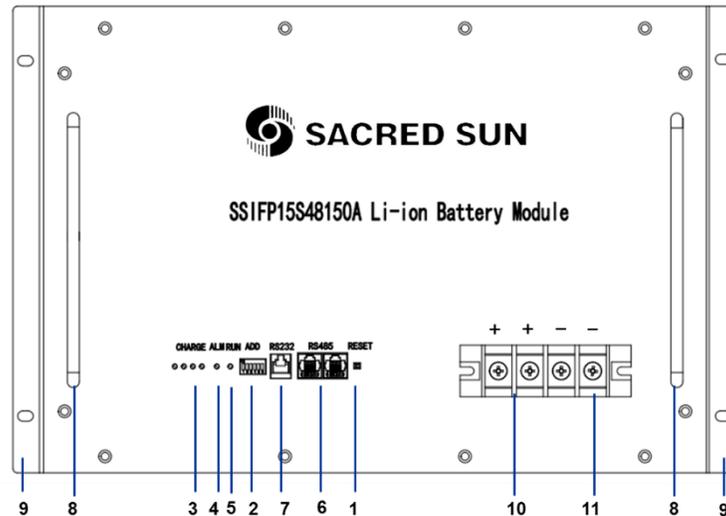


Figure 2-2: Front Panel Function Introduction

1. Reset: When the BMS is in the dormant state, press the button for 1S to activate the BMS. Meanwhile, the LED indicator will be lit to show SOC of the battery. When the BMS is in the active state, press the button for 3S to cause battery dormant. Then the LED indicator light will be lit from "RUN" for 0.5 seconds.
2. ADD: DIP switch, used for setting the product communication address when communication cascade;
3. SOC: These 4 LEDs are used to display the pack SOC. The lighting of these LEDs indicates the SOC of 25%, 50%, 75%, and 100%. For example, when SOC >75%, all 4 LEDs will be light up. If SOC > 50% and <75%, 3 LEDs will be light up. Etc.
4. ALM: Warning light;
5. RUN: Indicate the alarm or the run status of the battery.
6. RS485: Communication interface: Used for RS485 communication;
7. RS232: Connect with upper computer for battery system debugging and software upgrade.
8. Handle: It was used to carry/move the battery.
9. Used for fixing with cabinet.
10. Positive output terminal.
11. Negative output terminal.

Note: The front panel will vary somewhat depending on battery specifications and performance. For example, some battery positive and negative output terminals are distributed separately at the ends of the battery panel.

## 2.2 Product Specifications

Table 2-1: Product Specifications

Electrical Characteristics	
Typical Voltage	48V
Voltage Range	40.5~54.0V
Max. Permanent Discharge Current	1 C <sub>10</sub> A
Max. Permanent Charge Current	1 C <sub>10</sub> A
Communication Interface	RS485 / RS232
Operation Environment	
Charge Temperature	0°C to +55°C
Discharge Temperature	-20°C to +60°C
Storage Temperature	-20°C to +60°C
Protection Class	IP20

## 2.3 State Indicator

Table 2-2: State Indicator

System Mode	Abnormal event	RUN	ALM	Capacity LED			
							
De-energized/ shutdown Mode		No lit	No lit	All no lit			
Stand-by Mode	Normal	Flush 1	No lit	Indicate the SOC			
	Alarm	Flush 1	Flush 2	Indicate the SOC			
Charging	Normal	Lit	No lit	Indicate the SOC, the higher LED flush 2			
	Alarm	Lit	Flush 2	Indicate the SOC, the higher LED flush 2			

	Over charge protection	Lit	No lit	All lit
	Temp protection	Flush 1	Flush 2	Indicate the SOC
	Overcurrent, fail protection	No lit	Lit	All no lit
Discharging	Normal	Flush 3	No lit	Indicate the SOC
	Alarm	Flush 3	Flush 2	Indicate the SOC
	Low voltage protection	Flush 3	No lit	All no lit
	Overcurrent, Short Circuit protection	No lit	Lit	All no lit
Failure		No lit	Lit	All no lit
Flush 1: Lit 0.25s and no lit 3.75s; Flush 2: Lit 0.50s and no lit 0.50s; Flush 3: Lit 0.50s and no lit 1.50s				

## 2.4 Protective Functions

Table 2-3: Protective Functions Parameter Setting

No.	Items	Set Condition	Time (Sec)	Release Condition
1	Over voltage Protection-Cell	Max Cell $\geq 3750$ mV	1s	Max Cell < 3340 mV
2	Under voltage Protection-Cell	Min Cell $\leq 2700$ mV	1s	Min Cell > 3000 mV
3	Over voltage Protection-Battery Module	Max Cell $\geq 55$ V	1s	Max Cell < 51.0 V
4	Under voltage Protection-Battery Module	Min Cell $\leq 40.5$ V	1s	Min Cell > 45 V
5	Over temperature Protection (Discharge)	Max Temp $\geq 65$ °C	4s	Max Temp < 60 °C

	Over temperature Protection (Charge)	Max Temp $\geq 60$ °C	4s	Max Temp $< 55$ °C
6	Under temperature Protection (Discharge)	Min Temp $\leq -20$ °C	4s	Min Temp $> -15$ °C
7	Under temperature Protection (Charge)	Min Temp $\leq 0$ °C	4s	Min Temp $> 5$ °C
8	Overcurrent Protection (Charge)	Level 2 Current $\geq 1.6 C_{10}A$	300ms	Self-recovery after 15 mins
		Level1 Current $\geq 1 C_{10}A$	4s	
9	Overcurrent Protection (Discharge)	Level 2 Current $\geq 1.8 C_{10}A$	500mS	
		Level1 Current $\geq 1.2 C_{10}A$	5s	

### 3. Unpack the Battery

The battery and the related accessories are packed in the carton box and steel belt wooden box. Use tools to open the packing box. After open the packing box, confirm the product components according to the parts list.

	
	<p>Violent unpacking is strictly prohibited. If the battery system is found to be broken, deformed or other abnormal conditions, the user shall immediately stop using the battery and contact us.</p>

#### 3.1 Parts List

Check the parts during unpacking.

Table 3-1: Parts Lists

No.	Items	Appearance	Usage	Qty	Remarks
1	Battery		Provide power	/	

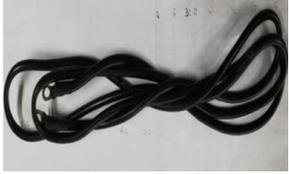
2	Positive output cable		Connect the battery and rectifier	Each battery configures one positive output cable	
3	Negative output cable		Connect the battery and rectifier	Each battery configures one negative output cable	
4	RS485 communication line		Apply to Modbus protocol. Connect the battery and the computer.		Optional
5	RS485 communication line		Battery cascade line. Connect the RS485 communication interface between the adjacent battery		Optional
6	Cabinet bolt		Fix the battery on the rack or cabinet	4 sets for each battery (including nuts)	

Table 3-2: Recommended Tools and Instruments

No.	Items	Usage	Appearance
1	Phillips Screwdriver or Bit	To fasten battery and assemblies	
2	Box Cutter	Opening boxes	

3	Insulated Torque Wrench	Installing cables and busbars	
4	Insulated Sockets	Installing cables and busbars	
5	Battery Tester	Measure battery module's voltage	

### 3.2 Visual Inspection of the Modules

After transporting the modules to the installation location, check for:

- Physical damage to the exterior
- Damaged or protruding screws
- Proper voltage of the battery modules using the battery tester. The range of the battery voltage is 48.0~50.0V. (when the battery is activated).

## 4. Battery Installation

This system must be installed by qualified, trained workers familiar with the required instruments.

	<div style="background-color: #ff9900; color: black; padding: 5px; text-align: center;"><b>⚠ WARNING</b></div>
	<ul style="list-style-type: none"> <li>▪ Be sure to use insulated tools (torque wrench, extension, socket, etc.).</li> <li>▪ All the instruments must be insulated and no metal articles (e.g. watch, ring) should be present in the installation area.</li> <li>▪ All power switches must be turned off in advance.</li> <li>▪ Prepare a CO<sub>2</sub> fire extinguisher, a first aid kit, and an AED (automated external defibrillator) before installation.</li> </ul>

	<div style="background-color: #ff9900; color: black; padding: 5px; text-align: center;"><b>⚠ WARNING</b></div>
	<p>Arc Flash and Shock Hazard</p> <p>Insulated tools are required for any work on this energized equipment.</p>

	<b>⚠ WARNING</b>
	Sharp Edges Wear gloves and other protective gear to prevent injury.
	<b>⚠ WARNING</b>
	Pinch Point Use caution when working in the enclosure to prevent injury.
	<b>⚠ CAUTION</b>
	Heavy Object Can cause muscle strain or back injury. Use lifting aids and proper lifting techniques when moving trays, batteries and other heavy objects.

#### 4.1 Battery Module Installation

1. Transport battery modules to the installation location.
3. Place the battery modules on the rack frame or cabinet.
4. Fix the battery on the rack. Using the cabinet bolt to fix the battery into the hole on the rack.
5. After installation, tighten all bolts.

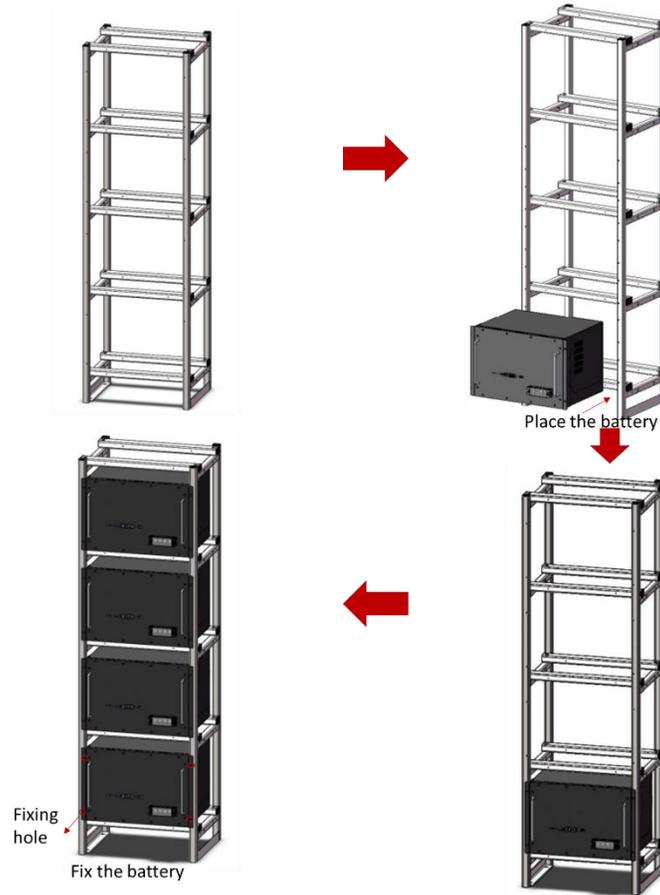


Figure 4-1: Battery Module Installation (A possible battery install procedure)

	<b>IMPORTANT</b>
	<ul style="list-style-type: none"> <li>▪ We recommends installing battery modules in the upper shelves first and proceeding to the bottom.</li> <li>▪ The battery can be mounted on a standard 19 inches cabinet or rack.</li> <li>▪ Battery modules can be inserted into a rack frame according to the customer battery configuration scheme.</li> </ul>

## 5. Cable Connection

### 5.1 Single Battery Connection

	<b>NOTICE</b>
	<ul style="list-style-type: none"> <li>▪ Before connect the cable with the rectifier, the worker must confirm the output switch of the rectifier has been turn off, to prevent the risk of fire or electric shock.</li> </ul>

	<b>⚠ CAUTION</b>
	<ul style="list-style-type: none"> <li>▪ Before connection, make sure to close the battery.</li> <li>▪ Please follow the instructions to protect the module BMS against damage.</li> <li>▪ DO NOT deviate from the sequence of steps below.</li> <li>▪ Exercise extreme caution prevent the terminals from contacting anything except their intended mounting points.</li> <li>▪ Terminals and their connected wires have either positive or negative polarity (Positive: +; Negative-). The polarity of a terminal or a wire connected to the terminal is on the front of each module. Exercise extreme caution to prevent the terminals and/or wires with opposite polarity from contacting with each other.</li> <li>▪ In telecom and battery, it is typically designed that positive is grounded. Therefore, it is necessary to avoid any non-insulating contact between the negative terminal and the positive terminal of the battery or the rack during the connection process. This can effectively avoid issues such as sparking or short circuit.</li> <li>▪ The maximum voltage of the battery is no more than 56V, which is higher than the safe voltage of 36V. Therefore, we still recommend that the battery terminals or other exposed parts should not be directly touched during the installation.</li> </ul>

	<b>NOTICE</b>
	<ul style="list-style-type: none"><li>▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside.</li><li>▪ Assemble the screws using a Phillips-head within the fastening torque of less than 8.0 Nm (79.88 kgf/cm).</li></ul>

	<b>IMPORTANT</b>
	<ul style="list-style-type: none"><li>▪ The power terminals, such as “+,” “-,” of the module are covered with the protecting cover to guard against a short circuit (Shown in Figure 5-1).</li><li>▪ You must remove the insulation cover prior to connecting and reattach the insulation cover immediately after connecting.</li></ul>



Figure 5-1: Removing the Protecting Cover

1. Remove the protecting cover.
2. Take-down positive fixing bolt by the Phillips Screwdriver and connect the positive output cable between the battery positive terminal of the battery and the rectifier. After connecting the battery, fastening bolt immediately to avoid dropping.



Figure 5-2: Single Battery Connection

3. Take-down negative fixing bolt by the Phillips Screwdriver and connect the negative output cable between the battery negative terminal of the battery and the rectifier. After connecting the battery, fastening bolt immediately to avoid dropping.
4. Install the protecting cover.
5. Sort the cables and fasten the battery cables to the perforated bracket with cable ties.
6. Communication Line Connection

As shown in Figure 5-3, when monitoring the battery by the computer, connect the 'USB convert to RS485' communication line between battery and computer.



Figure 5-3: Communication Cable Connections between Battery and Computer

## 5.2 Connect Cables of the Multiple Batteries in Parallel

When multiple batteries in parallel, the cable connecting procedures are follows.

1. As shown in Figure 5-4, following the cable connection method of the single battery, connect the positive and negative cables between the Battery 1 and the Rectifier, Battery 2 and the Rectifier, and Battery N and the Rectifier respectively.

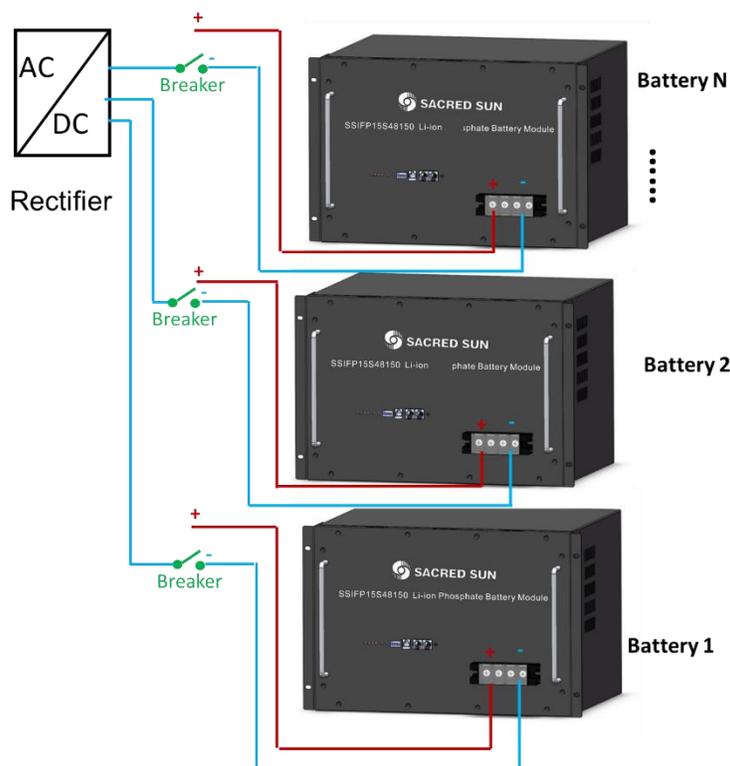
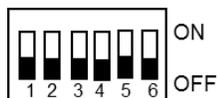


Figure 5-4: Multiple Batteries Connections

2. As shown in Figure 5-5, connect the communication line (a standard RJ45 network cable) between the adjacent batteries.
3. When performing multi-machine parallel communication operation, it need to configure the dialing address of each battery. The dialing code is in BCD format, and the address 0 is defined as



. The dialing address configuration of each battery is shown in Table 5-1.

According to the number of the battery in parallel, set the dialing address of the corresponding battery.

Table 5-1: The Dialing Address Configuration of Each Battery

No.	Module Address	Battery Module ID	Picture	No.	Module Address	Battery Module ID	Picture
1	0x01	1	ON OFF	9	0x09	9	ON OFF
2	0x02	2	ON OFF	10	0x0a	10	ON OFF
3	0x03	3	ON OFF	11	0x0b	11	ON OFF
4	0x04	4	ON OFF	12	0x0c	12	ON OFF
5	0x05	5	ON OFF	13	0x0d	13	ON OFF
6	0x06	6	ON OFF	14	0x0e	14	ON OFF
7	0x07	7	ON OFF	15	0x0f	15	ON OFF
8	0x08	8	ON OFF				

4. Connect the communication line between battery and computer

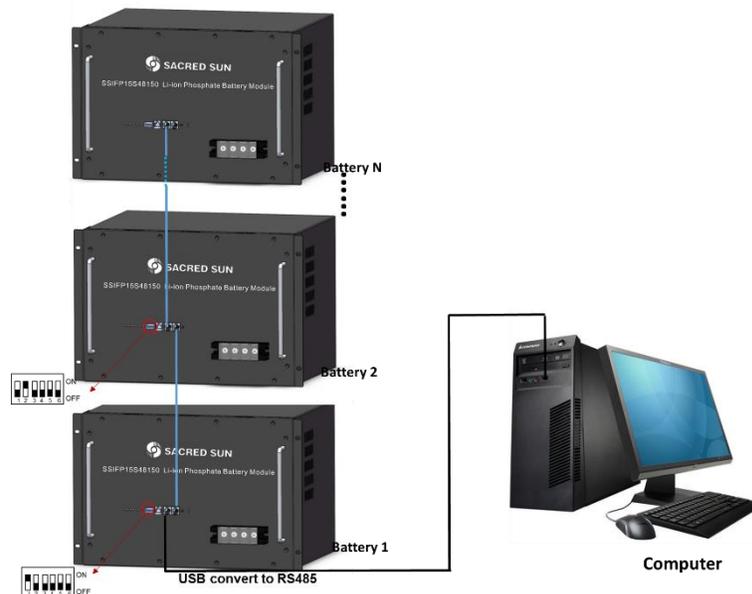


Figure 5-5: Communication Cable Connections among Multiple Batteries

## 5.3 Visual Inspection of the Connection

After connecting the battery, check for:

- Usage of positive and negative cables.
- Connection of the positive and negative terminals.
- All the bolts are tightened.
- Cables fixation and the appearance.
- The setting of the dialing address.
- The installation of the protecting cover.

## 6. Activate the Product

### 6.1 Start the Battery

After installation, wiring, and configuration are completed, you must check all the connection. When the connections are correctly, and then press reset button to activate the battery. The green working light on the front panel of the battery flashes, indicating that the battery system is normal.

### 6.2 Monitoring the Battery

After start the battery, connect the communication line (USB convert to RS485) between the battery and the monitor device. It can check the status of the battery through the monitor device. The method of monitoring the battery is as follows.

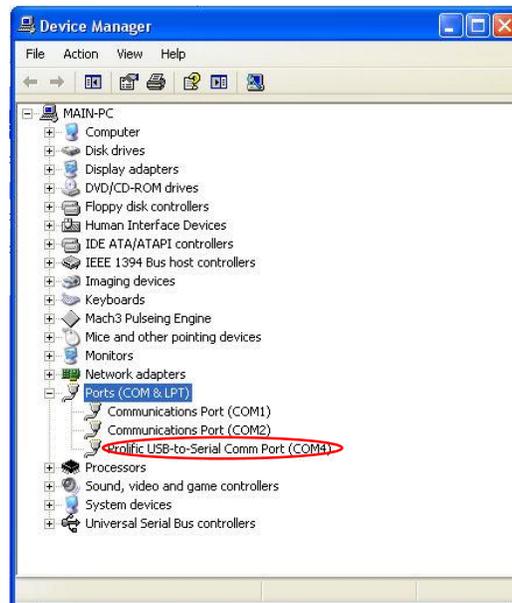


Figure 6-1: Communication Port Set

1. Install the USB-to-Serial driver. When you are first to use the RS485 USB-to-Serial communication line, it need to install the USB-to-Serial driver. The driver is stored on a CD. As shown in Figure 6-1, after the connect the communication line (USB convert to RS485) between the battery and the monitor device, a new “Comm Port” (such as COM4) can be seen in the Device Manager, indicating the successful installation of the driver.

## 2. Installation of the NET Framework

Battery monitoring software is development based on the Microsoft .NET Framework 4, which must run on Microsoft Windows 7 operating system or above version. Before installation the monitoring software, you should confirm the installation of the Microsoft .NET Framework 4 or the above versions. If the operating system is Windows 8 and above version, it do not need to install the relevant Microsoft .NET Framework due to its existence in the system. Otherwise you should download the corresponding version of the framework in Microsoft's official website. The download website is as follows:

<https://www.microsoft.com/en-us/download/details.aspx?displaylang=en&id=17851&ppud=4>

3. Click the network software “ 天邦达锂电池管理系统” to enter the program.

4. Modify the Language to English (Figure 6-2).

If the language displayed is Chinese, change the language to English.

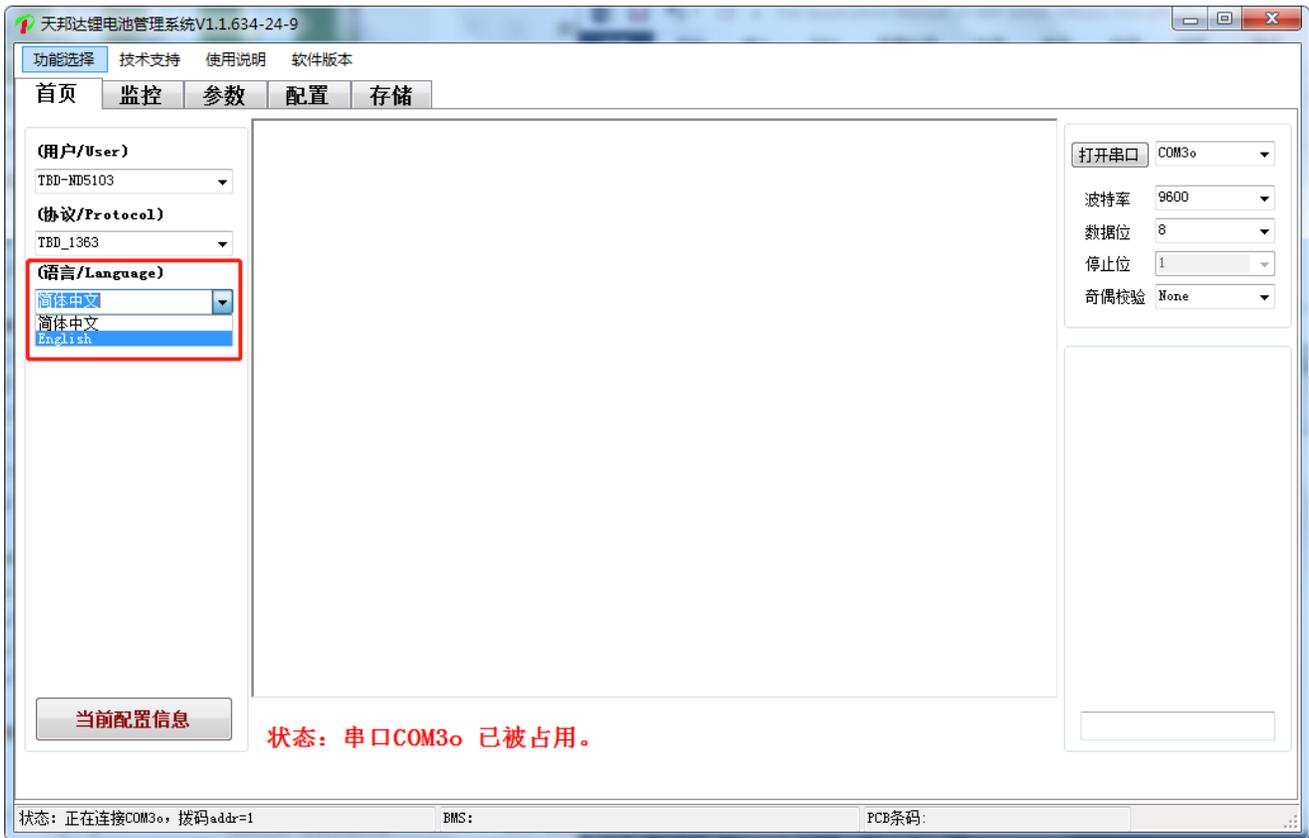


Figure 6-2: Language Set

5. As shown in Figure 6-3, click “Ports” to select the Comm Port (can be seen in Device Manager) . When the display interface of “INFO” shows voltage, SOC and etc., indicating that the communication is successful, as shown in Figure 6-4.

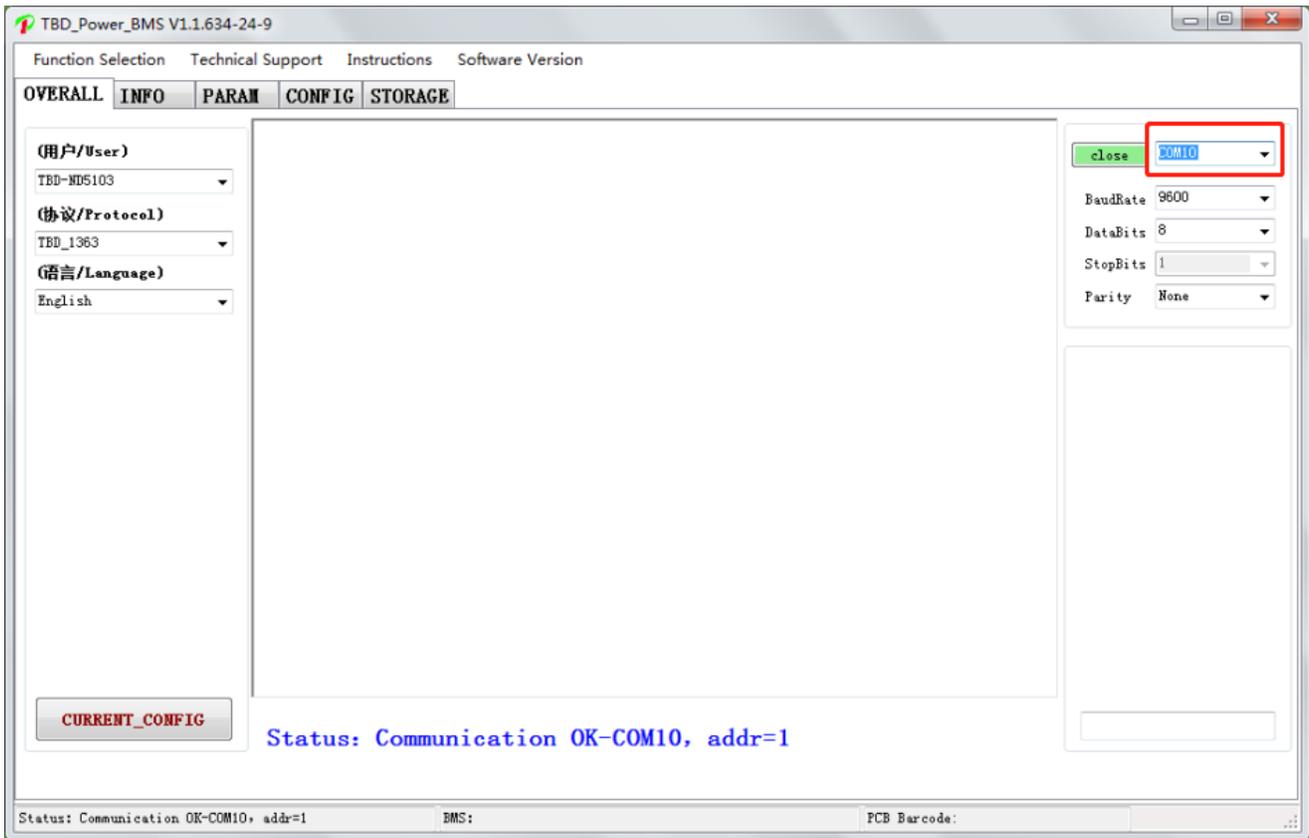


Figure 6-3: System Monitoring Program

### 6.3 Monitoring Software Function Introduction

As shown in Figure 6-4, the introductions of monitoring interface of the monitoring software are as follows:

- Area 1: Main Menu: Software Operation Commands region.
- Area 2: Submenu of “INFO”: In this area, you can choose which information to display.
- Area 3: Voltage: It shows the individual cell voltage, total voltage and voltage difference, etc.
- Area 4: Battery important information display: cycles, capacity, temperature, current, etc.
- Area 5: Real display of various state.
- Area 6: Alarm and protection status display.
- Area 7: Normal status: SOC, SOH, connection status, etc.
- Area 8: Other parameter selection. In this area, you can choose different battery pack.

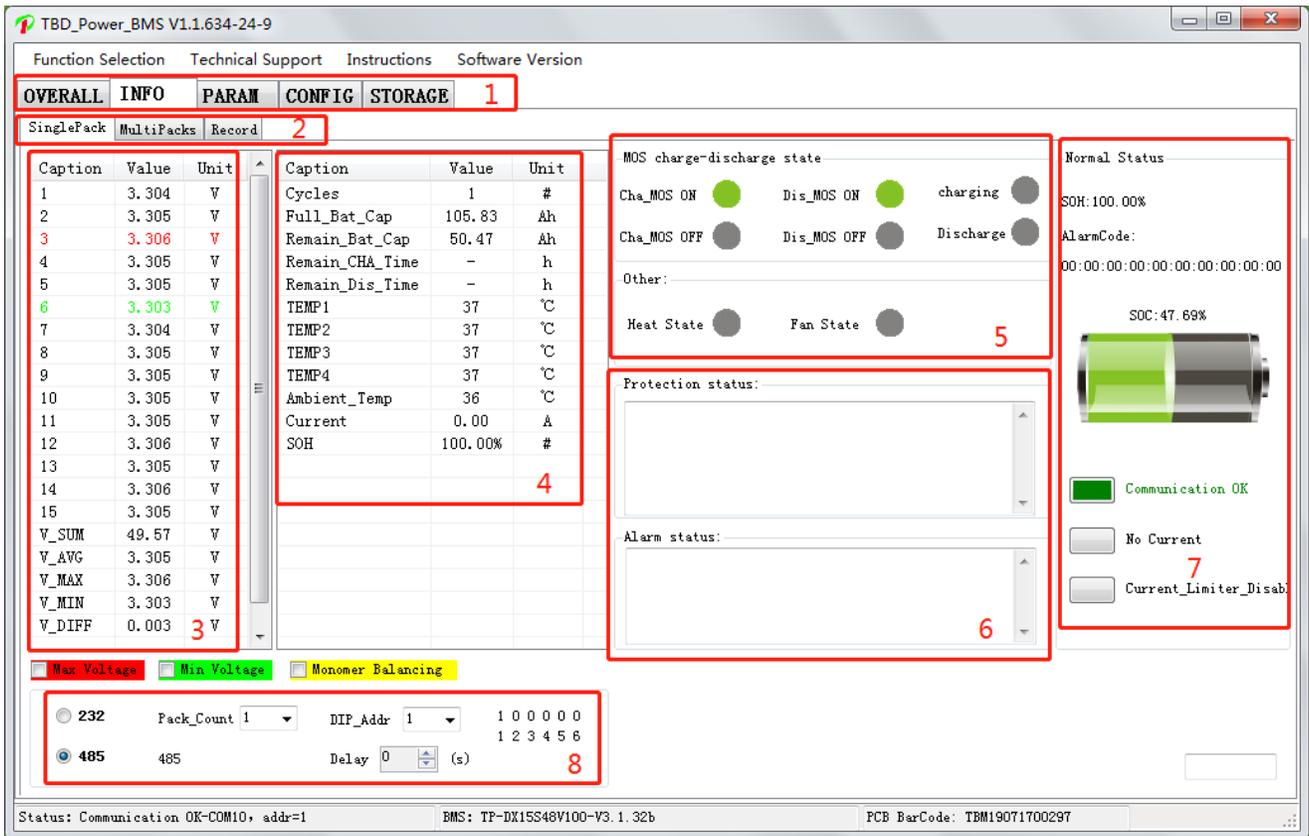


Figure 6-4: Introduction of Monitoring Interface

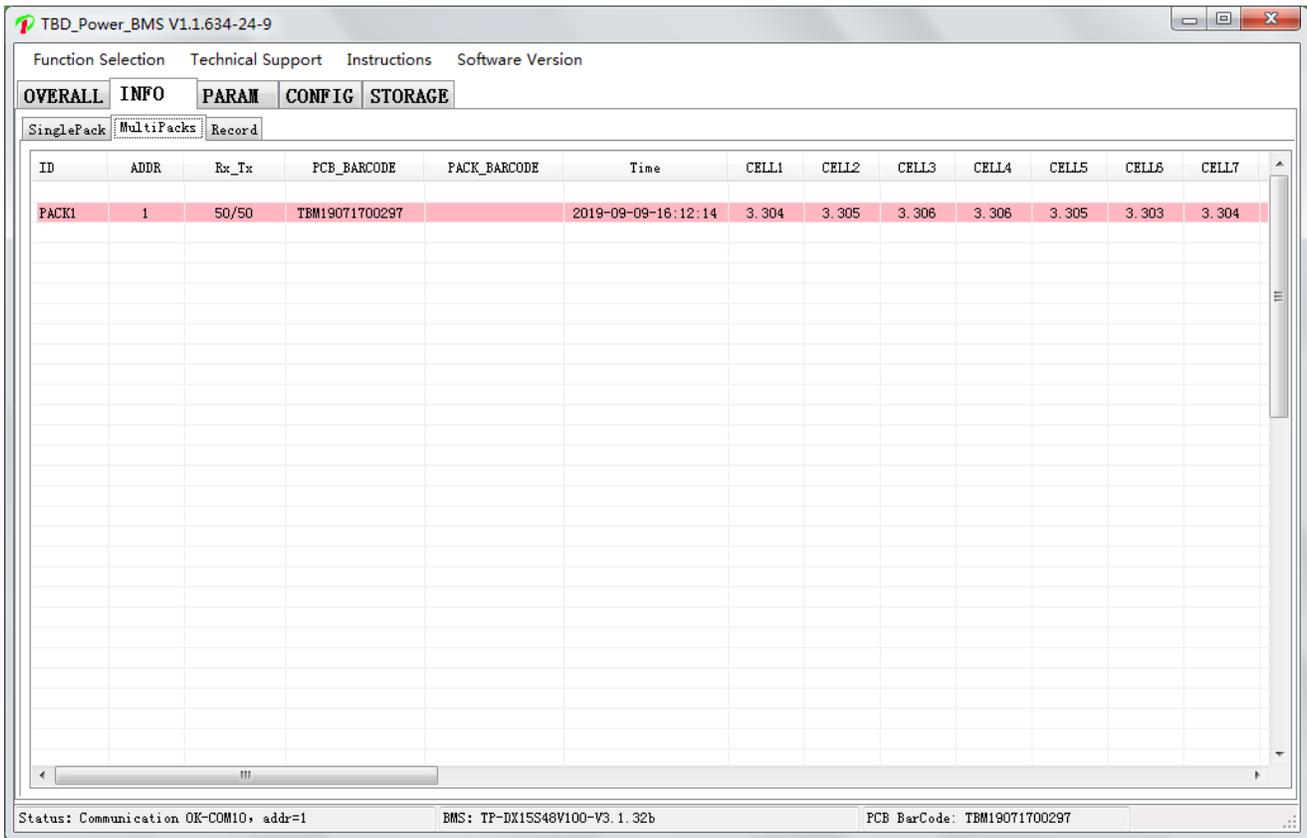
(1) “SinglePack” button

When you click the “SinglePack” button, it displays the content as shown in Figure 6-4. It can view the battery state according to the state indicator. As can be seen from area 5 and area 7, if the circle or rectangle turns green, it means that this function is running. Otherwise, it means the function is turned off.

If there are some warning and protection event, it will show event information in the area 6.

(2) “MultiPacks” button

When you click the “MultiPacks” button, it displays information for multiple battery packs as shown in Figure 6-5.



ID	ADDR	Rx_Tx	FCB_BARCODE	PACK_BARCODE	Time	CELL1	CELL2	CELL3	CELL4	CELL5	CELL6	CELL7
PACK1	1	50/50	TBM19071700297		2019-09-09-16:12:14	3.304	3.305	3.306	3.306	3.305	3.303	3.304

Figure 6-5: MultiPacks interface

(3) “Record” button

When you click the “Record” button, it displays the content as shown in Figure 6-6. Firstly, you need to check the “Display” option to display real-time records. You can choose the “Intervals” to display the time interval that you want. If you want to save the real-time data, click the “save” button as shown in Figure 6-6. You will save the real-time data into a .xls document, and can open it in excel. Please note the real-time data record shown here, if you want to view historical data records, please refer to the below section (4).

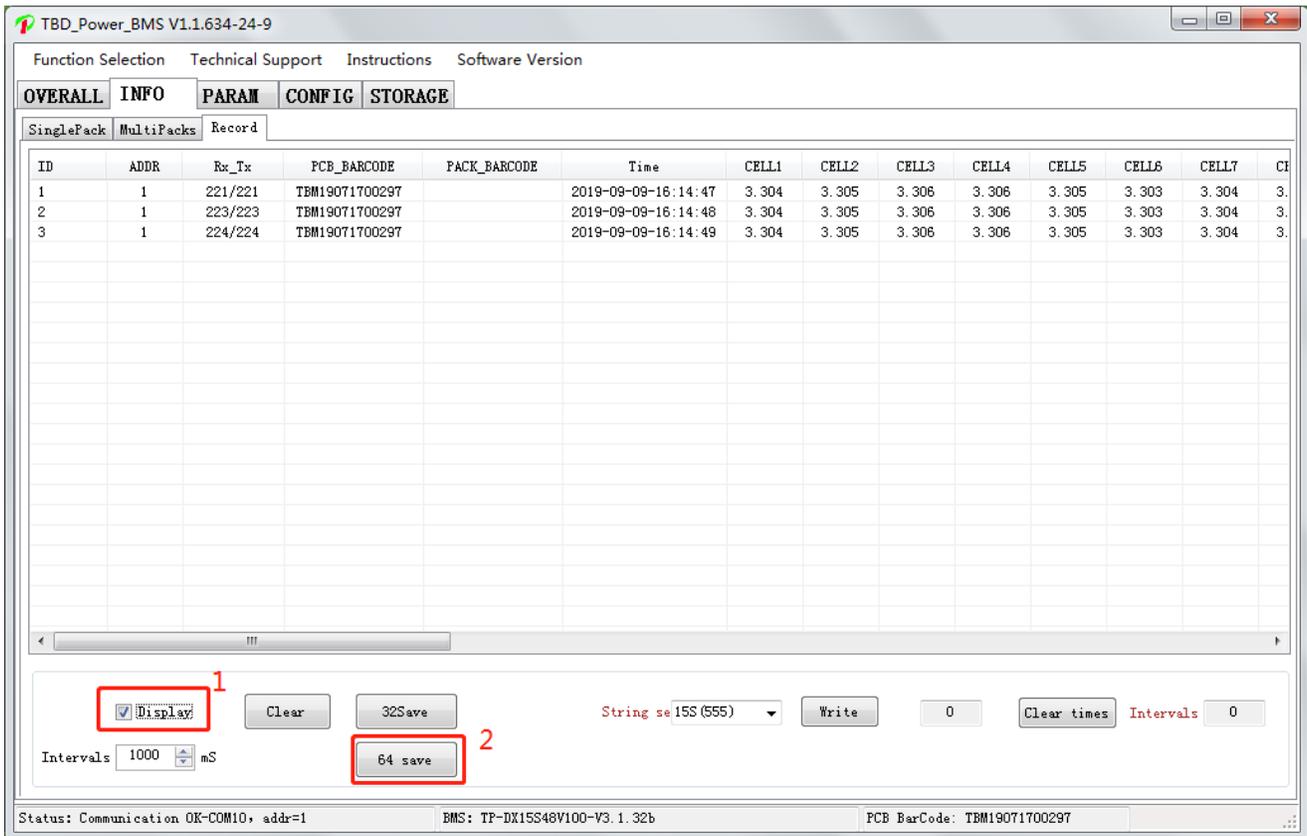


Figure 6-6: Record

#### (4) "STORAGE" main button

When you click the "STORAGE" button, it displays the content as shown in Figure 6-7. Firstly, you need to click the "Read Record" button to display historical records. If you want to save the historical records, click the "Save Record" button as shown in Figure 6-7. You will save the historical records into a .xls document, and can open it in excel.

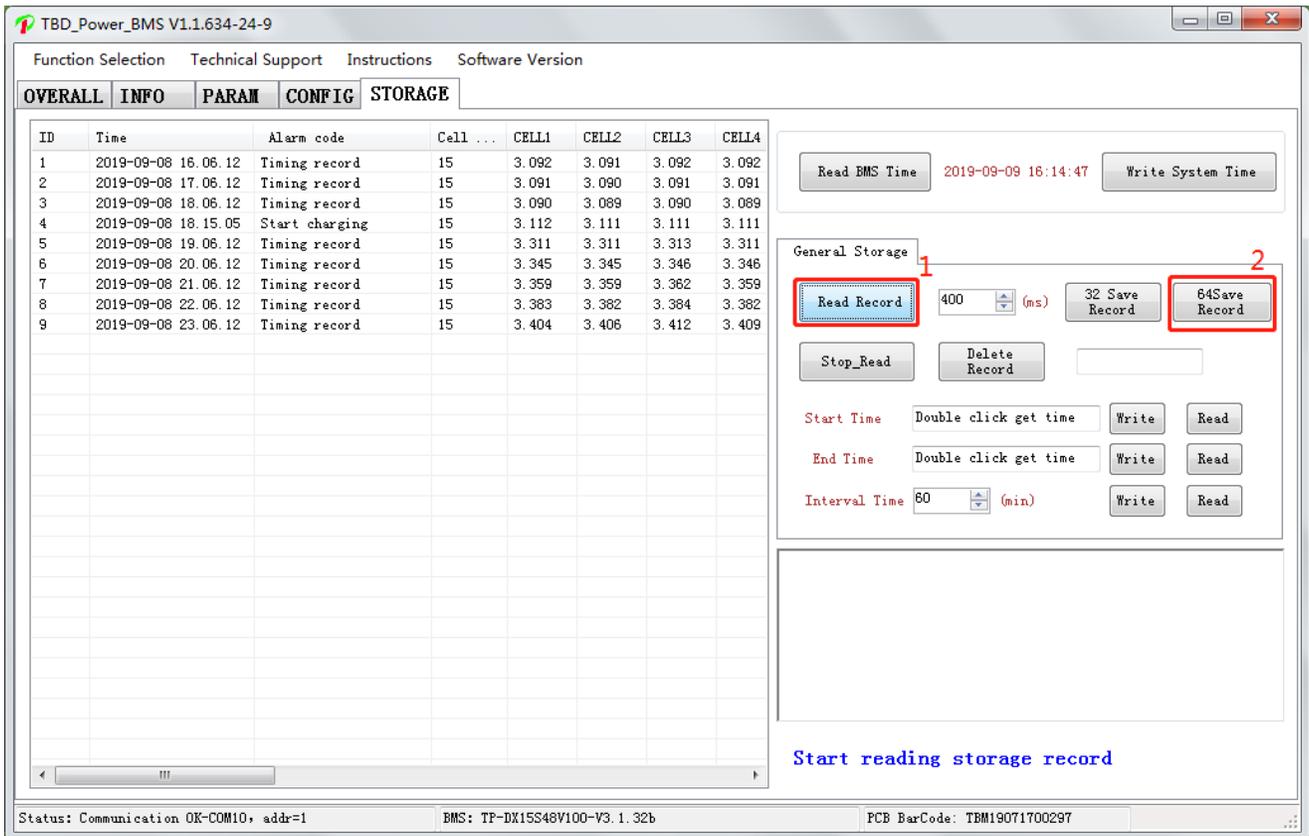


Figure 6-7: Data Record Interface

## 7. Inspection, Cleaning and Maintenance

### 7.1 General Information

- The battery product is not fully charged. It is recommended that the installation be completed within 3 months after arrival;
- During the maintenance process, do not re-install the battery in the battery product. Otherwise, the performance of the battery will be reduced;
- It is forbidden to dismantle any battery in the battery product, and it is forbidden to dissect the battery;
- After the battery product is over-discharged, it is recommended to charge the battery within 48 hours. The battery product can also be charged in parallel. After the battery product is connected in parallel, the charger only needs to connect the output port of any product battery.

- Never attempt to open or dismantle the battery! The inside of the battery does not contain serviceable parts.
- Disconnect the Li-Ion battery from all loads and charging devices before performing cleaning and maintenance activities
- Place the enclosed protective caps over the terminals before cleaning and maintenance activities to avoid the risk of contacting the terminals.

## 7.2 Inspection

- Inspect for loose and/or damaged wiring and contacts, cracks, deformations, leakage or damage of any other kind. If damage to the battery is found, it must be replaced. Do not attempt to charge or use a damaged battery. Do not touch the liquid from a ruptured battery.
- Regularly check the battery's state of charge. Lithium Iron Phosphate batteries will slowly self-discharge when not in use or whilst in storage.
- Consider replacing the battery with a new one if you note either of the following conditions:
  - The battery run time drops below 80% of the original run time.
  - The battery charge time increases significantly.

## 7.3 Cleaning

If necessary, clean the Li-Ion battery with a soft, dry cloth. Never use liquids, solvents, or abrasives to clean the Li-Ion battery.

## 7.4 Maintenance

The Li-Ion battery is maintenance free. Charge the battery to approximately > 80% of its capacity at least once every year to preserve the battery's capacity.

## 7.5 Storage

- The battery product should be stored in a dry, cool and cool environment;
- Generally, the maximum storage period at room temperature is 6 months. When the battery is stored over 6 months, it is recommended to check the battery voltage. If the voltage is higher than 45V, it can continue to store the battery. In addition, it is needed to check the voltage at least once a month until the voltage is lower than 45V. When the voltage of the battery is lower than 45V, it must to be charged according to the charging strategy.
- The charging strategy is as follows: discharge the battery to the cutoff voltage with 0.2C<sub>10</sub>A current, and then charge with 0.2C<sub>10</sub>A current for about 3 hours. Keep the SOC of the battery

at 40-70% when stored;

- When the battery product is stored, the source of ignition or high temperature should be avoided and it should be kept away from explosive and flammable areas

## 8. Troubleshooting

To determine the status of the battery system, users must use additional battery status monitoring software to examine the protection mode. Refer to the installation manual about using the monitoring software. Once the user knows the protection mode, refer to the following sections for solutions.

Table 8-1: Troubleshooting

NO.	Possible Problem	Cause Analysis	Solution
1	Battery products cannot be charged (according to the indicator light can understand some of the situation)	Defective wiring	<ul style="list-style-type: none"> <li>Check the positive and negative cable connection.</li> <li>Press the reset switch and see if it clears the protection.</li> </ul>
		Red LED is lit. Reset switch cannot release	Some Protection event triggered, you need to connect the battery using the Battery Studio to view the information from the battery. According to the protection event information, choose the right way to release the protection.  Or consult your reseller or Sacred Sun support. Reset the battery again
2	Battery products cannot be discharged (according to the indicator light can understand some of the situation)	Defective wiring	<ul style="list-style-type: none"> <li>Check the positive and negative cable connection.</li> <li>Press the reset switch and see if it clears the protection.</li> </ul>
		The cells within the batteries are not properly balanced, causing them to discharge at different rates.	Perform one full charge cycle to balance the cells. To replace the batteries.
		The state of Health of your battery has a low value.	The loss is probably caused by battery aging. This process cannot be reversed. To replace the batteries.

By checking the above data and sending the data to the service personnel of our company, the service personnel of our company will reply the corresponding solution after receiving the data.

## 9. Transportation Requirements

The battery products should be transported after packaging and during the transportation process, severe vibration, impact or extrusion should be prevented to prevent sun and rain. It can be transported using vehicles such as cars, trains and ships.

Always check all applicable local, national, and international regulations before transporting a Lithium Iron Phosphate battery.

Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specially limited or prohibited.

The transport of the Li-Ion battery falls under hazard class UN3480, class 9. For transport over water, air and land, the battery falls within packaging group PI965 Section I.

Use Class 9 Miscellaneous Dangerous Goods and UN Identification labels for transportation of lithium ion batteries which are assigned Class 9. Refer to relevant transportation documents. Lithium batteries and lithium ion cells are regulated in the U.S. in accordance with Part 49 of the Code of Federal Regulations, (49 CFR Sections 105-180) of the U.S. Hazardous Materials Regulations. Visit [www.iata.org](http://www.iata.org) for the complete transport regulations and packing instructions for this product. The relevant information for Lithium batteries can be found under “Programs” > “Cargo” > “Dangerous goods (HAZMAT)”.



Figure 9-1: Class 9 Miscellaneous Dangerous Goods and UN Identification Label

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

[www.sacredsun.com](http://www.sacredsun.com)