

# MANUAL EXPLANATION

## ● COTENT EXPLANATION

V-LFP51.2V series back-up lithium iron phosphate battery system is developed for backup of Telecom equipments. Under normal condition, grid AC power supply to rectifier module and the Telecom loads (the load of figure showed below) and charge battery pack; When the AC power fail, rectifier module stop power supply, the battery serves for Telecom equipment, to ensure the Telecom equipment runs normally; This manual contains working principle , structure ,operating parameters and installation of V-LFP51.2 system.

Chapters	Contents
1. Overview	Background, Applications and Advantages
2. Structure and principle	Structure and operating principle
3. Parameters	All parameters of V-LFP51.2
4. Installation	Installation and operation
5. Shipping, Storage, and Disposal	Shipping, Storage, Maintenance And Disposal





## ● BEFORE YOU START

Read all the safety information provided in this document prior to installing and/or operating the equipment. Contact VISION Customer Support immediately for a free consultation, if you have any questions about the handling, operation and safe use of the battery.

To handle or operate with V-LFP51.2 Power System:

- You must be qualified for electrical work;
- Remove any possible metallic shorting risk of Jewel, Watches, Pens. Metal bars and frames
- All tools must be insulated

## ● SAFETY SYMBOLS

Symbol	Definition
	Important safety information will follow.
	DO NOT dispose of battery in a fire.
	Recycle or dispose of Lithium batteries in accordance with local Laws/regulations.
	DO NOT dispose of battery in the trash.

## CAUTIONS

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### What Not To Do

Please read and comply with the following conditions of installation and use of the battery, incorrect installation using the battery may cause personal injury or damage to the product.

1. DO NOT throw the battery into water. Store batteries in a cool and dry environment when not in use.
2. DO NOT put the battery into fire or heat the battery, so as to avoid explosion or other dangerous events.
3. When charge the battery, please choose specialized charging equipment, and follow the correct procedures, do not use unqualified chargers.
4. DO NOT reverse positive and negative terminals, do not connect the battery directly to AC power, avoid battery short circuit.
5. DO NOT using batteries from different manufacturers or different kinds, types together, and do not mixed use old batteries and new batteries.
6. DO NOT use the battery when it become hot, bulges, deforms or leaks.
7. DO NOT puncture the battery by nail or other sharp objects; Do not throw, stamp on, impact or hit the battery.
8. DO NOT open or try to repair the battery when it is defective. Warranty invalid if the battery repaired or disassembled.



### Precautions

9. Batteries are half charged before shipment, Don't use the battery if it's hot, bulge, or smell abnormal and so on, and report to VISION after-sale dept. immediately.
10. If you need storage the battery for a long time, please charge and discharge the battery every three months to ensure the best performance, and the best state of charge for storage is between 50%~60%.
11. Please use the battery in the temperature range which defined in the manual.
12. The state of charge of batteries is 50% before shipment, please charge the battery before use or test.

# 1 OVERVIEW

## 1.1 BACKGROUND AND APPLICATIONS

In recent years, with the rapid development of lithium ion battery technology , the pace of lithium ion batteries to replace the traditional lead-acid batteries are also gradually accelerate in various power fields. Compared with the traditional lead-acid batteries, lithium ion batteries boast with high energy density, small volume, light weight, long life, wide applicable temperature range and other advantages, particularly the advantages of lithium iron phosphate (LiFePO<sub>4</sub>) battery are comprehensive more prominent. At present, the lithium iron phosphate battery technology is becoming mature, with the cost is gradually lowered, it's gradually used in the mainstream, high-end back-up power solutions.

Shenzhen Center Power Technologies Inc. closely follows the market demand, in accordance with the national Telecom back-up power standard, it's V-LFP51.2Series are the first Lithium Battery systems for Telecom equipment applications. The V-LFP51.2 system combines high energy lithium iron phosphate cells and intelligent management system, to achieve a high degree of integration and intelligent management, and can be widely applied in various conditions for Telecom equipments, mobile phone base equipments and other communication equipments.

## 1.2 ADVANTAGES

1. Using the high performance lithium iron phosphate ( LiFePO<sub>4</sub>) as positive materials, the cycle life is more than 2000 times, floating life up to 10 years, prolongs the service life of backup power supply system.
2. Using the intelligent management system, realize the monitoring and control of battery system under charge, discharge, floating and standby, make sure the system is always in under ideal state of health.
3. Built with comprehensive monitoring system, the battery voltage, current, temperature, volume, state of health is under monitoring. Communicating with PC to realize the real-time

monitoring and control through the core CPU.

4. The built-in intelligent balance module, to ensure that the consistency of battery capacity , to extend the service life.
5. Intelligence-design, meet the national standard requirements, remote-measurement, remote-communication, remote-control and remote-adjustment.
6. Working state and alarm display directly on control panel.
7. System with intelligent thermal management devices, which insure the system work in a wide range of temperature,  $-20\text{ }^{\circ}\text{C}\sim+60\text{ }^{\circ}\text{C}$ .
8. With good electromagnetic compatibility and can be matched with standard communication equipment compatibility.
9. Standard and universal sizes.

### 3.3 BATTERY MANAGEMENT SYSTEM (BMS)

**Table 3.4 Assignments of ID address**

Code				Address	Assign	Remarks
ON	ON	ON	ON	0	Model 0	
ON	ON	ON	OFF	1	Model1	
ON	ON	OFF	ON	2	Model 2	
ON	ON	OFF	OFF	3	Model 3	
ON	OFF	ON	ON	4	Model 4	
ON	OFF	ON	OFF	5	Model 5	
ON	OFF	OFF	ON	6	Model 6	
ON	OFF	OFF	OFF	7	Model 7	

**Note:** In the table 3.4, code bits are in accordance with the control panel ID code corresponding to the binary digit, dial up stands for "OFF ", dial down stand for " ON ", the left dial is low digit, the right dial is high digit, encoding in the range of 0~15, which can support up to 16 modules cascade. All coded according to the table, followed by analogy. If you need more modules in parallel, please tell us, we will design it to meet your requirement.

#### 3.3.1 Battery Status

If bms starts,the BMS will output the battery status according to the condition.As shown in table 3.6

**Table 3.6 battery status description**

Status display	Setting Value
Battery FULL	-800mA<Current<800mA
Charging	Current>800mA
Discharging	Current<-800mA
Protected	Trigger protection condition

#### 3.3.2 VOLTAGE PROTECTION

##### ● Over Charge Protection

During charging, if the voltage of any cell exceeds the setting for cell protection or total

voltage of the system is greater than the setting for the system, the BMS stop charging. And when all voltage of each cell and total voltage of the battery drop to the recovering-set values, the protection removes automatically. The voltage settings are shown in table 3.7.

- **Over Discharge Protection**

During discharge, if the voltage of any one cell or total voltage of the battery is lower than the protection settings, the BMS stops discharge. And when all cell voltage and total voltage go up to recovering-setting, the protection remove automatically. The settings are shown in table 3.7.

### 3.3.3 CURRENT PROTECTION

- **Charging Current limitation**

During charging, if the charging current is greater than the setting value, the BMS will limit the charging current to less than the setting value, this is charging current limitation.

The settings are shown in table 3.7.

#### ● Discharging Over Current Protection

During discharge, if the discharging current is bigger than the setting value, the BMS will stop discharging, this is discharging over current protection. Remove the load or charge the battery, it will recover. The settings are shown in table 3.7.

### 3.3.4 TEMPERATURE PROTECTION

#### ● Cell Temperature Protection

There are several thermal sensors to monitor the cell temperature, if the temperature of any cell is higher than 60°C or lower than -20°C, the BMS will stop charging, this is charge temp. protection; If the temperature of any cell is higher than 70°C or lower than -30°C, BMS will stop the discharge. This is the discharging protection. The settings are shown in table 3.7.

#### ● PCB over-heat Protection

There is a thermal sensor to monitor the PCB temperature, if the PCB temperature is higher than 95°C, it will trigger the PCB protection and stop charging or discharge until the temperature drop to normal range. The settings are shown in table 3.7.

### 3.3.5 CELL BALANCE

#### ● Smart Cell Balance

During charging, If all cell voltages are greater than 3.40V and the voltage difference between cells  $\Delta U > 40\text{mV}$ , BMS will trigger the balancing process, the balance current is designed base on the capacity of battery pack.

$$\Delta U = \text{max. Cell voltage} - \text{min. Cell voltage}$$



**Table 3.7 Protection Settings**

NO.	Type		Function	Setting value	Remarks
1	Voltage	Charge	Cell Voltage Protection	3.90V Protection	Recover at 3.6V
2			Total Voltage Protection	57.0V Protection	Recover at 54.0V
3		Discharge	Cell Voltage Protection	2.0V Protection	Recover at 3.1V
4			Total Voltage Protection	42.0V Protection	Recover at 46.5V
5	Current	charge	Normal	$\leq 20A$	
6			Limit	$> 50A$	
7		Discharge	Normal	$\leq 50A$	
8			Over current protection 1	$55A < \text{current} < 100A$	Delay 30s
9			Over current protection 2	$100A < \text{current} < 200A$	Delay 3s
10	Temp	Cell	Temperature protection	Charging Range $-20^{\circ}C \sim 60^{\circ}C$ Discharging Range $-30^{\circ}C \sim 70^{\circ}C$	Charging recover: $> -15^{\circ}C$ or $< 55^{\circ}C$
11		Environment		Charging Range $-20^{\circ}C \sim 60^{\circ}C$ Discharging Range $-30^{\circ}C \sim 70^{\circ}C$	Discharge recover: $> -25^{\circ}C$ or $< 65^{\circ}C$
12		PCB		$\leq 95^{\circ}C$	
13	SOC	Discharge	Warning	Warning signal appear when $SOC < 5\%$ and battery in discharge state	ALM led、RUN led Flash 0.6s

## 4 INSTALLATION AND TESTING

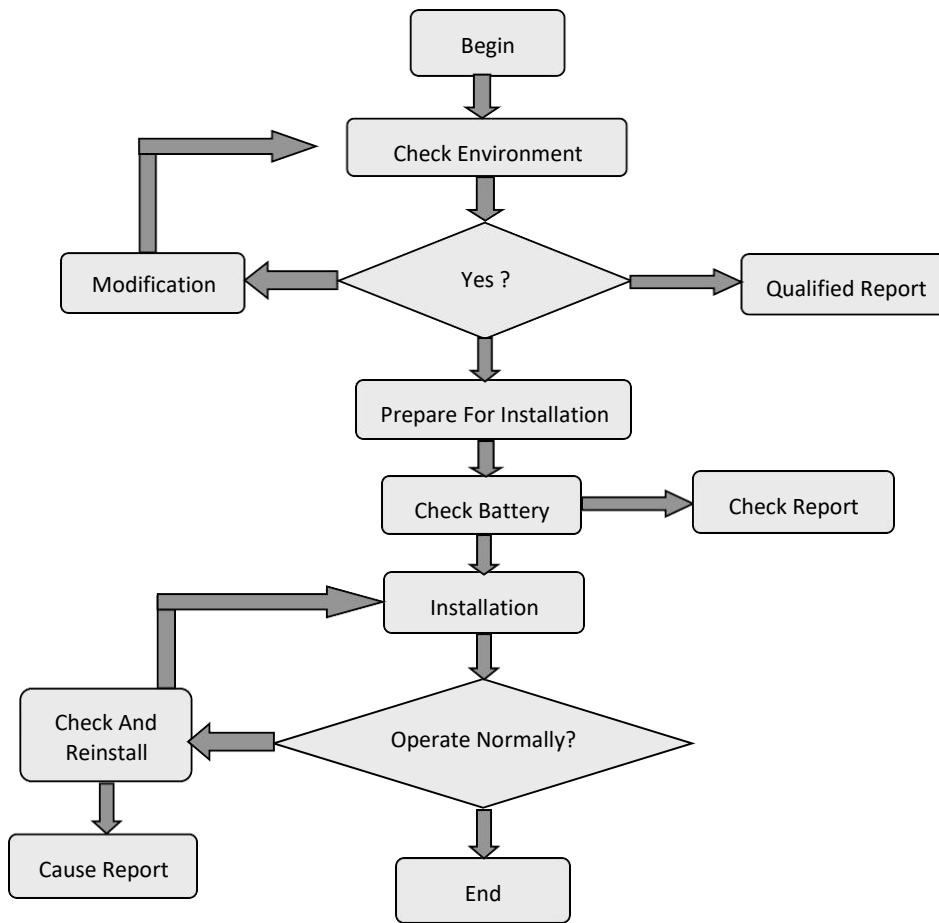
### 4.1 PREPARE TO INSTALL

#### ● Rules Of Safe

The installation, operation and maintenance of V-LFP51.2lithium iron phosphate battery system must be performed by trained and qualified professional personnel. Before installation and use, please carefully read the product safety precautions and related operating rules. Strictly abide by the following safety rules and local safety regulations, otherwise may cause personal injury or damage to the product.

1. Make sure that the Telecom equipment to be connected with the battery system is in good condition and free from defects;
2. Before installation, make sure that the power supply system is under shut down state, while the battery system is also under shut down state;
3. All the electricity cables must have corresponding grade of insulation, Please ensure that no exposed cables;
4. Make sure that the battery and power system are reliable grounding.

**Figure 4.1 Process Of Installation**



### 4.1.1 Requirement Of Installation Environment

The requirement of installation environment is shown in table 4.2.

**Table 4.2 Requirement Of Environment**

Type	Requirement
Working Temperature	Working Range: -20°C ~+60°C
Storage Temperature	-20°C ~+45°C
Relative Humidity	<95%
Atmospheric Pressure	86kPa~106kPa
Site Requirements	No conductive dust and corrosive gas, no vibration. Keep away from heat and flame

## 4.1.2 Tools and Materials

May use the tools and information are shown in table 4.3.

**Table 4.3 Tools And Materials**

Name	Name
User manual	Oblique mouth clamp
Screw driver	multimeter
Wrench	Ammeter
Pincers	Insulating tape
Wire stripping pliers	Electrostatic prevention Bracelet
Wristband	Clamp band

## 4.1.3 Site Survey

### ● Equipment Inspection

1. Check that the equipments connected with batteries are right and in good conditions.
2. Check the DC interface position of the equipment. Check and confirm the output voltage is in the range showed in table 3.7.
3. Check DC device interface, make sure the maximum output current is matched with the selected battery.
4. Check the maximal working current of devices backed by the battery , make sure that the current is less than the maximum discharge current of the products showed in table 3.8 .

### ● Ground Check

Check and confirm the electrical grounding position of power system room.

#### 4.1.4 Battery Check

1. On the installation site, check the battery packaging to make sure it's intact;
2. Check battery box according to the packing list, make sure all the material is complete, if any damaged, please fill in the receipt;
3. Please be careful while handling batteries, avoid any damage.

## 4.2 INSTALLATION

### 4.2.1 CAUTIONS

When begin to install the battery system, you should pay attention to the following matters:

1. Installation space and load bearing. Make sure that there are sufficient fixed components to install the battery system, and to ensure that the battery mounting bracket or the cabinet be strong enough to bear the weight.
2. Cable specifications. To ensure that the use of the connection of the power supply line can meet the maximum current requirements of equipment operation.
3. Project layout. Ensure the whole construction process of power equipment, batteries and other reasonable layout.
4. Wiring layout. Ensure that the wiring reasonable, orderly; and consider the moisture-proof, corrosion prevention.
5. The whole installation process should wear anti-static wristband.
6. The installation site should be at least two or more peoples to operate.



**CAUTIONS:** Please ensure the installation site safe before installation.

## 4.2.2 INSTALLATION STEP

Battery installation steps are shown in table 4.4.

**Table 4.4 The installation steps**

Step NO.	Name	Definition
1	Turn off power supply	The system should be powered off, to ensure that there is no electric in installation process
2	Mechanical installation	1. Mounting lugs installation
		2. Battery fixed installation
3	Electrical installation	1. Grounding cable
		2. Power cable installation
		3. Connecting equipment installation
		4. Communication cable installation
4	Electrical commissioning	Power system commissioning

### ● Step 1. Interruption Of Power Supply

Before installation, please ensure the battery is powered off., at the same time, shutdown the equipment which need to connect to the battery.

### ● Step 2. Machinery Installation

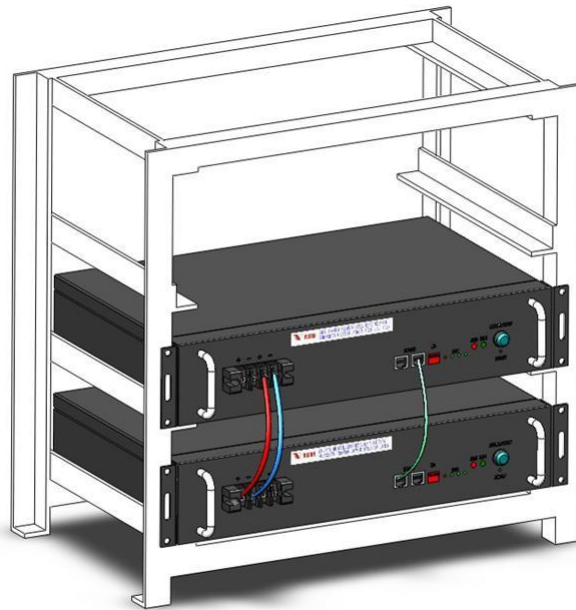
1. Mounting lugs installation. Equipment packaging with the chassis mounting lugs, before the installation of equipment, fix the mounting lugs on both sides of the battery box, ensure that the installation strong.

2. Battery installation. Battery module preference mounted in the rack 19 inch ( or cabinet ), when installed, portable handle arranged in parallel on the frame ( or cabinet ) supporting plate, push rack ( or cabinet ), ensure the mounting lugs and frame ( or cabinet ) edge fixing hole tightly, and then using a screwdriver with screw for fixation screwed into the rack to the mounting holes, to ensure that the battery pack mounted solid.

### ● Step 3. Electrical Installation

1. Grounding cable. The grounding cable end with screw press-fit fixation in the chassis rear grounding hole, the other end is connected to the frame ( or cabinet ) grounding copper bar. To ensure the stable connection.
2. Power line installation. When using a single battery, battery terminals directly connected to the device or switch power supply terminal, if there are multiple batteries in parallel when in use, please connect all batteries in parallel with the power line at first.

**Figure 4.5 Several model in parallel**



3. Communication cable installation. When the battery is used in a single, please skip this step. When a plurality of batteries used in parallel according to table 3.4, please dial settings for each cell address code ( to ensure that no duplicate address code ), and then connect the communication interface of RJ45-RS485 one by one. Connect the first or last battery module RS485 interface to the PC monitor or SMPS or UPS controller.
4. SP51.2V only support the parallel connection ( $\leq 8$ pcs) and not support the serial connection.

### ● Step 4. Electrical Commissioning

When these steps are completed, turn on air switch to start the battery one by one, then boot on the whole power system, complete the installation.



Caution: If you have any question about the installation, please stop and contact VISION technical support immediately. If the battery does not start or control panel ALM lights, please

disconnect the power line inspection and reinstall the start, if still cannot solve please contact VISION, avoid damage to equipment or cause accidents.

## 5 SHIPPING, STORAGE, AND DISPOSAL

### 5.1 SHIPPING AND STORAGE

#### ● Shipping

According to the provisions of the product can be used in general means of conveyance, but should avoid throwing, rain fall, strong radiation and corrosion erosion. during transportation, please prevent the collision and strong vibration.

#### ● Storage

Storage device in the indoor storage, the ambient air temperature is 0 °C to + 45°C, the average monthly relative humidity of not more than 90%, the ambient air without corrosive and flammable and explosive gas; storage warehouse should be ventilated, free of alkaline, acidic substances and other corrosive gases, without a strong mechanical vibration, shock, and without strong electromagnetic field and direct sunlight. Capacity was maintained at 50% to 60% stores, and charging the battery every 6 months.

### 5.2 WARNING AND DISPOSAL

When the ALM lights, battery has been alarmed or protected, please check fault reasons and take corresponding measures. Table 5.1 below is the main alarm condition.



**Table 5.1 The main alarm and protection**

State	Type	Indicator	Disposal
Charging	Over voltage protection	ALM	Stop charge, check module voltage and charger
	Over current protection	ALM	Stop charge, check the settings and limitation
	Temperature protection	ALM	Stop charge, wait for the temp recovery

Discharging	Low voltage protection	ALM	Stop discharge, turn to charging mode
	Over current protection	ALM	Stop discharge, check if there is an over load
	Temperature protection	ALM	Stop discharge, wait for the temp recovery

## 5.3 COMMON FAULTS AND SOLUTIONS

Common faults and solutions are shown in table 5.2.

**Table 5.2 Common faults and solutions**

NO.	Fault phenomenon	Analysis	Solution
1	No DC output	Low voltage protection	Charge the battery and try again
2	Power supply time is too short	Battery capacity lack or not full power	Maintenance or replacement
3	Battery can not be charged to full	Power system DC output voltage falls below the minimum charge voltage	Regulating DC output voltage of power supply to battery suitable charging voltage
4	ALM LED always lights	Power line connection short circuit	Disconnect the power cable and check all cables
5	The battery output voltage is unstable	Battery management system do not operate normally	Press the reset button to reset the system, then reboot the system
6	Communication lost or data fault	Communication settings fail	Check the communication settings and correct it



**Note:** If you have some special technical problems which not mentioned above, please contact VISION technical staff.

### Legal statement

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