NetSure 731 CC2、NetSure 731 C62 系列电源系统

用户手册

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NetSure 731 CC2, NetSure 731 C62 Series Power Supply System User Manual

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维谛技术有限公司

地址：深圳市南山区学苑大道 1001 号南山智园 B2 栋

邮编：518055

公司网址：www.vertivco.com

客户服务热线：4008876510

E-mail: vertivc.service@vertivco.com

Vertiv Tech Co., Ltd.

Address: Block B2, Nanshan I Park, No.1001 Xueyuan Road, Nanshan District, Shenzhen, 518055, P.R.China

Homepage: www.vertivco.com

E-mail: overseas.support@vertivco.com

Declaration

This is a Class A UPS product. In a residential environment, this product may nevertheless cause radio interference, in which case, the user is required to take additional measures to reduce the interference.

Safety Precautions

To reduce the chance of accident, please read the safety precautions very carefully before operation. The 'Caution, Note, Warning, Danger' in this book and on the product do not represent all the safety points to be observed, and are only supplement to various safety points. Therefore, the installation and operation personnel must receive strict training and master the correct operations and all the safety points before operation.

When operating Vertiv products, the operation personnel must observe the safety rules in the industry, the general safety points and special safety instructions provided by Vertiv.

Electrical Safety

I. Hazardous voltage

Danger	Some components of the power system carry hazardous voltage in operation. Direct contact or indirect contact through moist objects with these components will result in fatal injury.

Observe safety rules in the industry when installing the power system. The installation personnel must be licensed to operate high voltage and AC power.

In operation, the installation personnel are not allowed to wear conductive objects, such as watches, bracelets, bangles and rings.

When you spot the cabinet with water or moisture, turn off the power immediately. In moist environment, precautions must be taken to keep moisture out of the power system.

'Prohibit' warning label must be attached to the switches and buttons that are not permitted to operate during installation.

Danger	High voltage operation may cause fire and electric shock. The connection and wiring of AC cables must be in compliance with the local rules and regulations. Only those who are licensed to operate high voltage and AC power can perform high voltage operations.

II. Tools

Warning	In high voltage and AC operation, specialized tools must be used.

III. Thunderstorm

Danger	Never operate on high voltage, AC, iron tower or mast in the thunderstorm.

In thunderstorms, a strong electromagnetic field will be generated in the air. Therefore the equipment should be well earthed in time to avoid damage by lightning strikes.

IV. ESD

Note	The static electricity generated by the human body will damage the static sensitive elements on PCBs, such as large-scale ICs. Before touching any plug-in board, PCB or IC chip, ESD wrist strap must be worn to prevent body static from damaging the sensitive components. The other end of the ESD wrist strap must be well earthed.

V. Short circuit

Danger	During operation, never short the positive and negative poles of the DC distribution unit of the power system or the non-grounding pole and the earth. The power system is a constant-voltage DC power device, short circuit will result in equipment burning and endanger human safety.

Check the polarity of the cable and connection terminal when performing DC live operations.

As the operation space in the DC distribution unit is very tight, please carefully select the operation space.

Never wear a watch, bracelet, bangle, ring, or other conductive objects during operation.

Use insulated tools.

In live operation, keep the arm, wrist and hand tense, so that when the tool in operation slips, the movement of the human body and tool is reduced to a minimum.

Battery

Danger	Before any operation on battery, read carefully the safety precautions for battery transportation and the correct battery connection method.

Note	If the power system does not connect with mains power for a long time, to prevent battery over-discharge, users should cut batteries off from the power system thoroughly, for example, pulling out battery fuses or switching off battery MCBs. Before putting the power system into operation, insert all the battery fuses or switch on all the battery MCBs.

Non-standard operation on the battery will cause danger. In operation, precautions should be taken to prevent battery short circuit and overflow of electrolyte. The overflow of electrolyte will erode the metal objects and PCBs, thus causing equipment damage and short circuit of PCBs.

Before any operation on battery, pay attention to the following points:

1. Remove the watch, bracelet, bangle, ring, and other metal objects on the wrist.
2. Use specialized insulated tools.
3. Use eye protection device, and take preventive measures.
4. Wear rubber gloves and apron to guard against electrolyte overflow.
5. In battery transportation, the electrode of the battery should always be kept facing upward. Never put the battery upside down or slanted.

LLVD And BLVD

The power system has battery low voltage disconnection (BLVD) function and load low voltage disconnection (LLVD) function. LLVD means that the mains fail and batteries supply power, the controller cuts the non-priority load off when the battery voltage drops down to below 44V. In this way, the battery remaining capacity can sustain the priority load longer. BLVD means that the controller cuts the load off when the battery voltage drops down to 43.2V to prevent over-discharge.

The factory setting is enabling LLVD and BLVD, which means that if power outage lasts for a long time or the power system fails, there might be LLVD and BLVD. Users should classify the loads and connect the non-priority loads to LLVD routes, and connect the priority loads to BLVD routes. For vital loads, users can disable BLVD of these loads to insure reliability of the power supply.

The method of disabling BLVD is:

1. Hardware disabling: unplug the signal cable in J10 interface of the controller. Tag the BLVD-disabled label. The position of the controller and the interface description are given in 2.4.2 Connecting Signal Cables.
2. Software disabling: set 'BLVD Enable' item of the controller to 'N'.

⚠ **Note**	The advantage of enabling BLVD is protecting the batteries from over-discharge when the battery voltage is low. The disadvantage of enabling BLVD is that when the battery voltage drops down to a certain value, all the loads (including non-priority loads and priority loads) will be cut off due to battery disconnection. The advantage of software disabling BLVD is prolonging the power supply of priority loads. The disadvantage is that software disabling cannot prevent unwanted power failure due to misoperation or power system failure. The advantage of hardware disabling BLVD is preventing unwanted power failure due to misoperation or power system failure, and ensuring the continuity of vital loads' power supply.

Others

I. Sharp object

⚠ **Warning**	When moving equipment by hand, wear protective gloves to avoid injury by sharp object.

II. Power cable

⚠ **Note**	Please verify the cable labels before connection.

III. Signal cables

⚠ **Note**	The signal cables should be routed at least 150mm away from power cables.

Note

⚠ **Note**	To preserve the environment, the busbar of the power system may use tinning technique or passivation technique. The busbar may become dark due to long-term operation, which does not influence the performance or use of the power system.

Contents

Chapter 1 Overview

This chapter introduces the model description, composition and configuration, features, operating principle and functions of the NetSure 731 CC2 and NetSure 731 C62 series power system (power system for short).

1.1 Model Description

Taking NetSure 731 CC2 power system as an example, the model description is given in Figure1-1.

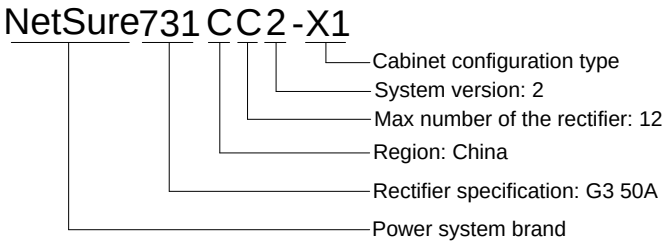


Figure 1-1 Model description

1.2 Composition And Configuration

Composition

The NetSure 731 CC2 power system has four models: NetSure 731 CC2-X1, NetSure 731 CC2-X2, NetSure 731 CC2-X3 and NetSure 731 CC2-X4. Figure 1-2 to Figure 1-5 illustrate the structure of the four models. NetSure 731 C62 has three models: NetSure 731 C62-X1, NetSure 731 C62-X2 and NetSure 731 C62-X3, the structure of this model are shown in Figure 1-6 and Figure1-8.

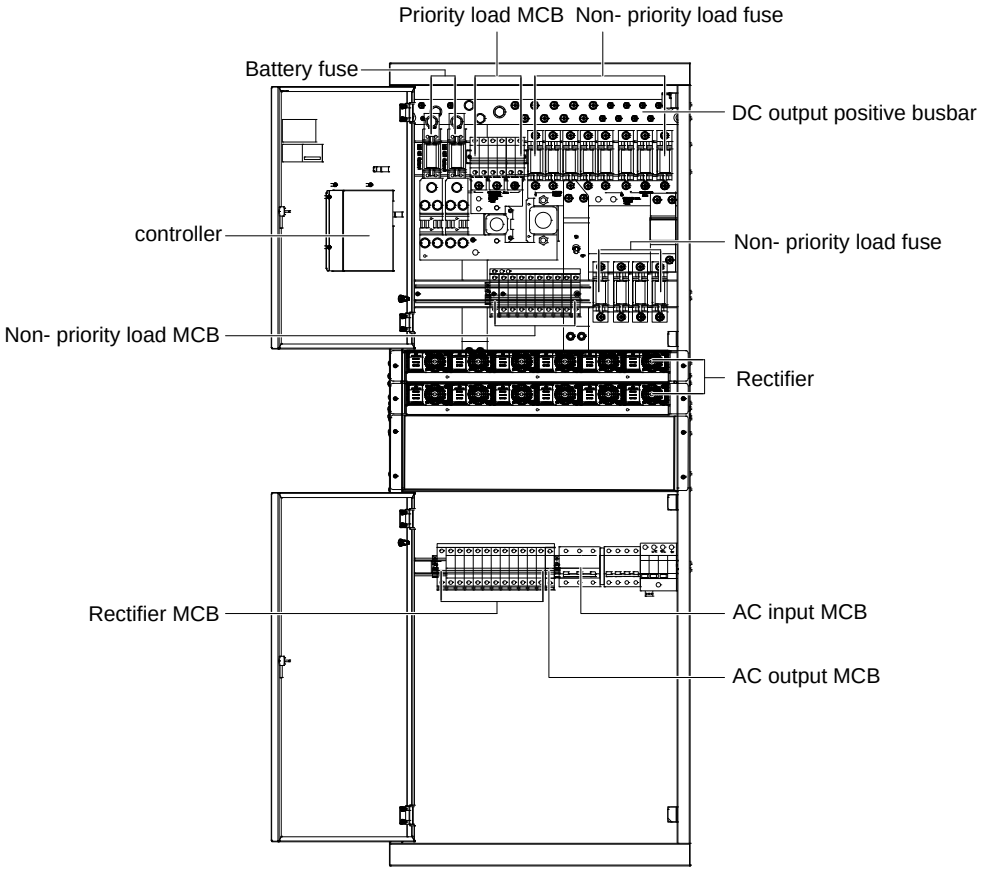


Figure 1-2 NetSure 731 CC2-X1 power system structure

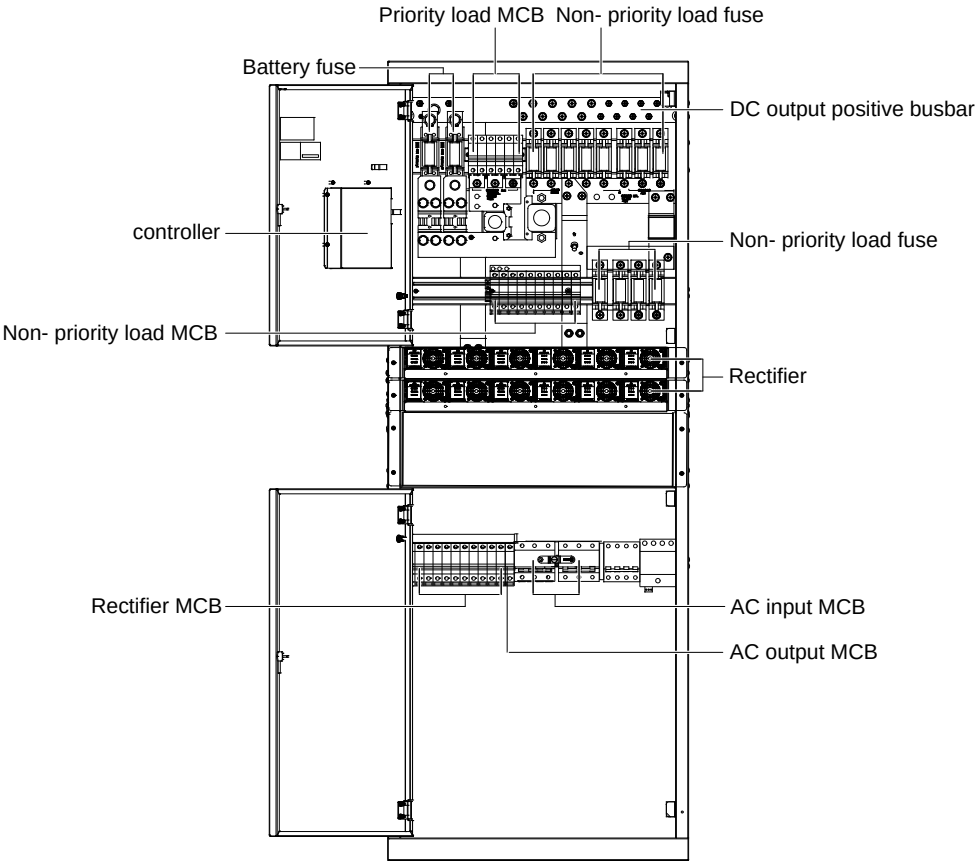


Figure 1-3 NetSure 731 CC2-X2 power system structure

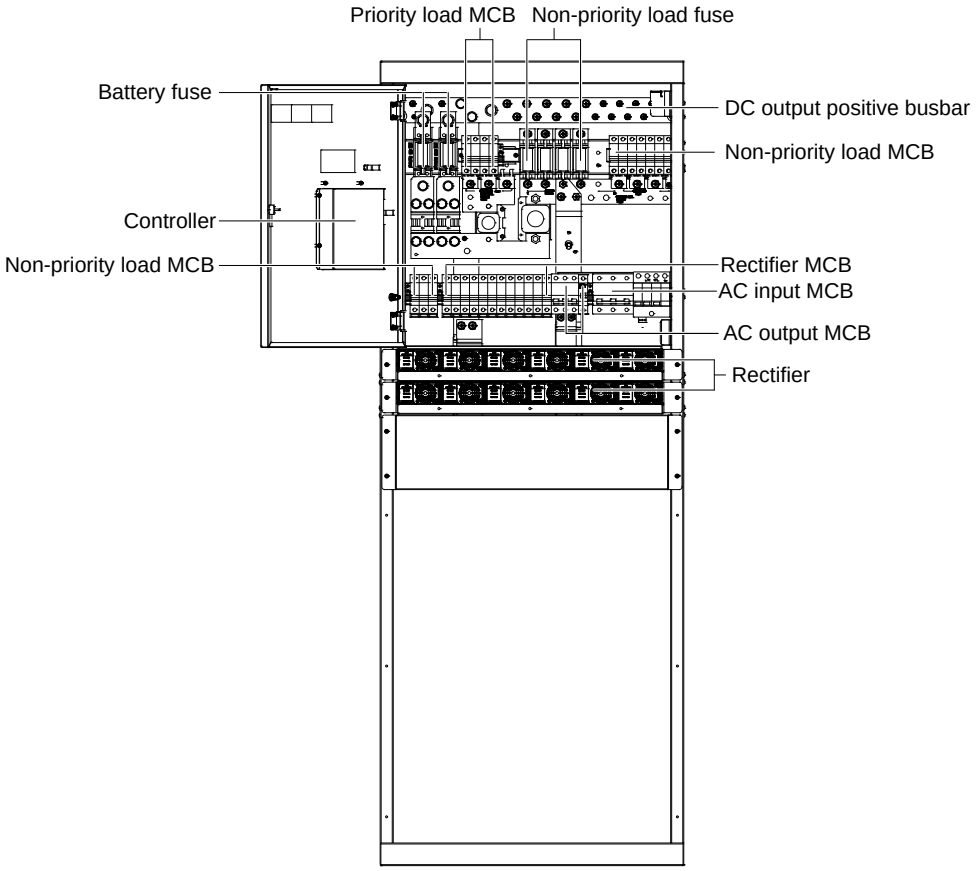


Figure 1-4 NetSure 731 CC2-X3 power system structure

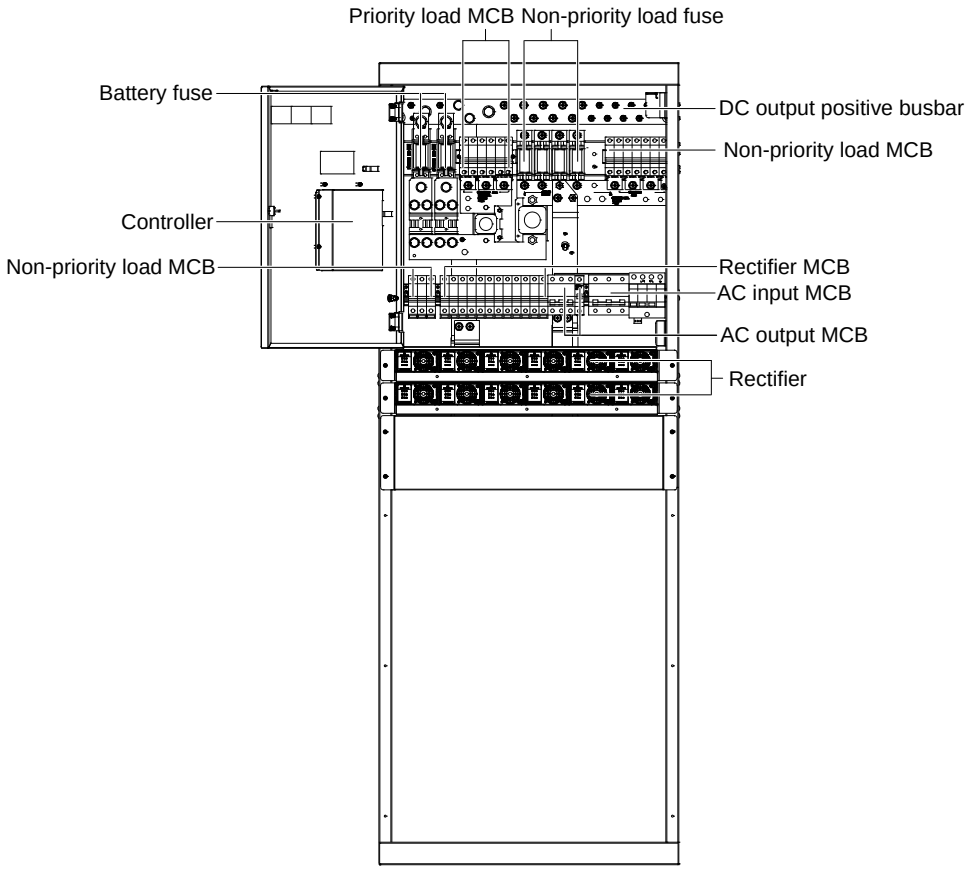


Figure 1-5 NetSure 731 CC2-X4 power system structure

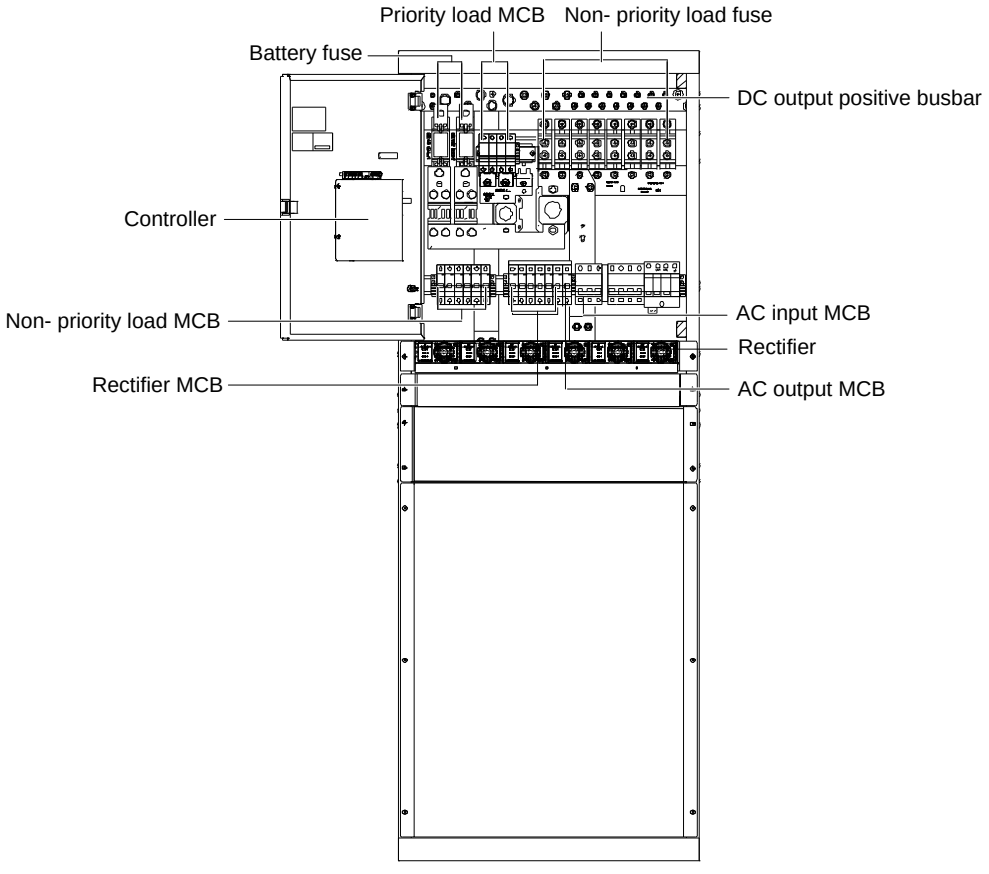


Figure 1-6 NetSure 731 C62-X1 power system structure

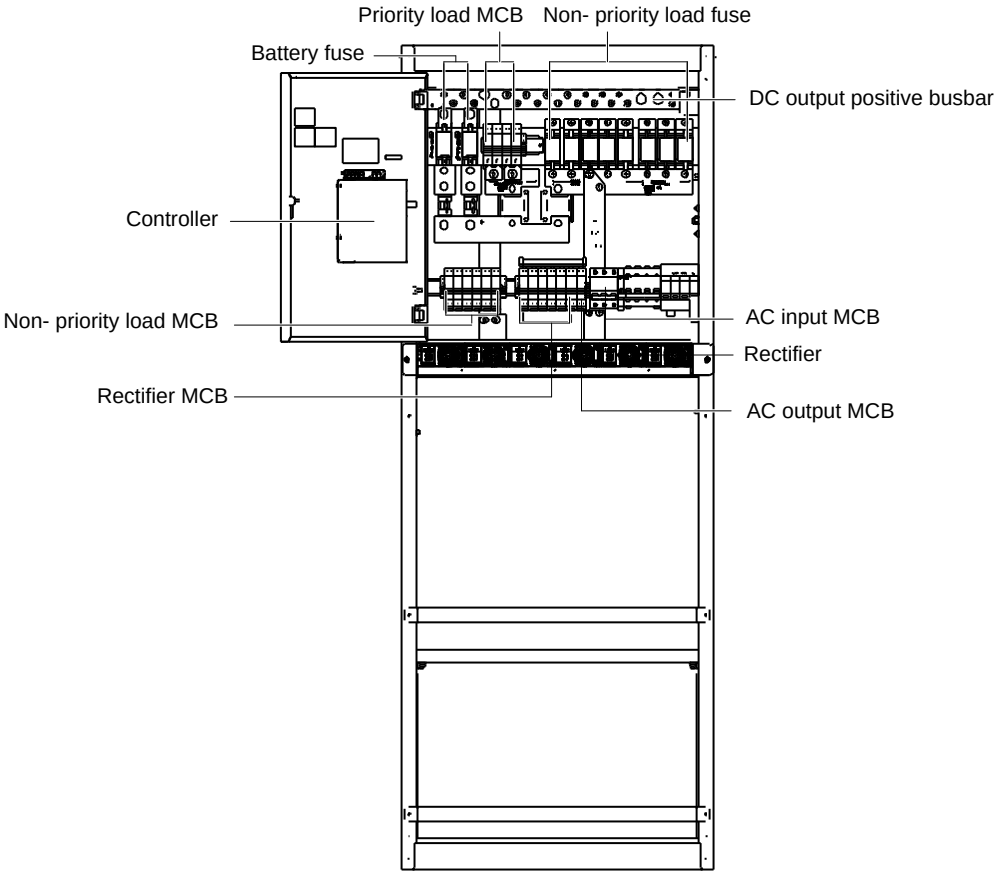


Figure 1-7 NetSure 731 C62-X2 power system structure

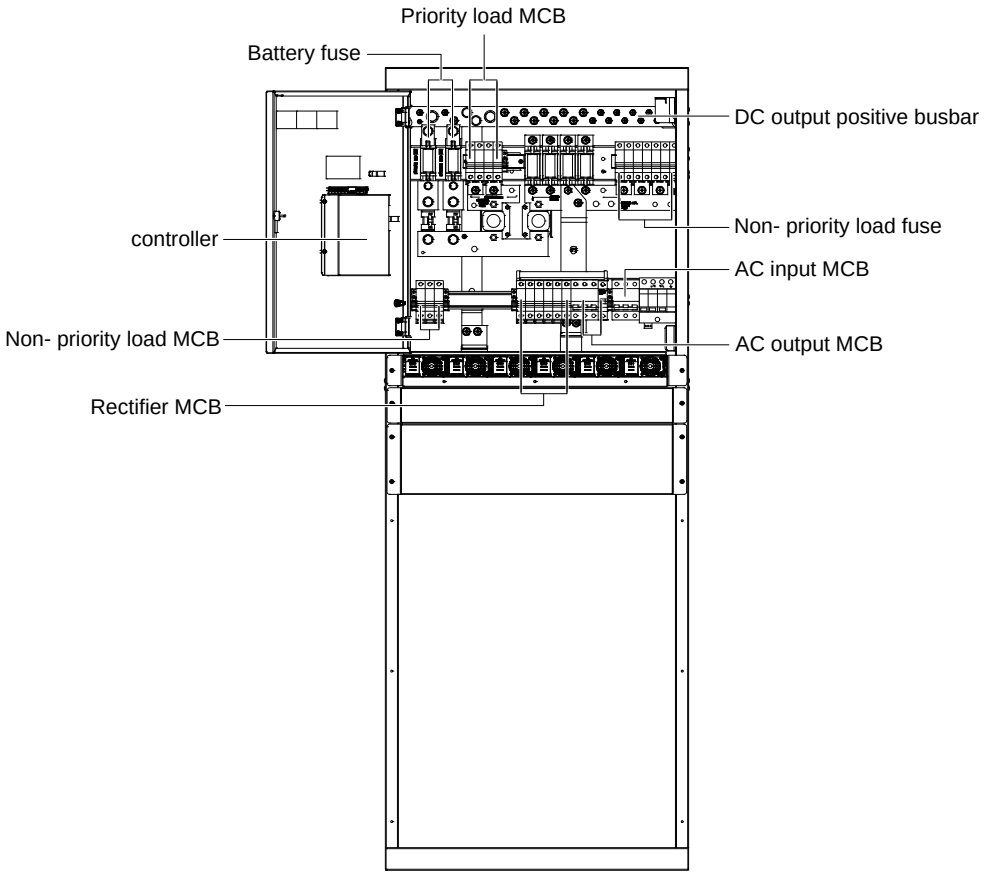


Figure 1-8 NetSure 731 C62-X3 power system structure

Configuration

(1) The configuration of the power system is listed in Table 1-1.

Table 1-1 Power system configuration

Component	Configuration	
	NetSure 731 C62	NetSure 731 CC2
Rectifier	Model: R48-3000e3 Standard: 6 pcs Optional: 2 ~ 6 pcs	Model: R48-3000e3 Standard: 12 pcs Optional: 2 ~ 12 pcs
Controller	Model: M522S; Standard: 1 pcs	Model: M522S; Standard: 1 pcs
AC distribution	AC input: NetSure 731 C62-X1, X2, X3: 1 × 63A/3P MCB	AC input: NetSure 731 CC2-X1, X3, X4: 1 × 100A/3P MCB NetSure 731 CC2-X2: 2 × 100A/3P MCB
	AC output: NetSure 731 C62-X1, X2: 1 × 16A/1P MCB NetSure 731 C62-X3: 1 × 16A/1P MCB, 1 × 16A/3P MCB	AC output: NetSure 731 CC2- X1, X2: 1 × 16A/1P MCB NetSure 731 CC2- X3, X4: 1 × 16A/3P MCB, 1 × 16A/1P MCB
DC ditribution	Priority load output: NetSure 731 C62-X1: 2 × 32A/1P MCB, 2 × 10A/1P MCB NetSure 731 C62-X2: 2 × 32A/1P MCB, 2 × 10A/1P MCB NetSure 731 C62-X3: 2 × 32A/1P MCB, 2 × 16A/1P MCB	Priority load output: NetSure 731 CC2-X1/X2: 2 × 32A/1P MCB, 4 × 10A/1P MCB NetSure 731 CC2-X3: 4 × 16A/1P MCB NetSure 731 CC2-X4: 2 × 63A/1P MCB, 2 × 32A/1P MCB, 2 × 10A/1P MCB
	Non-priority load output: NetSure 731 C62-X1: 4 × 100A fuse, 4 × 63A/1P fuse, 4 × 32A/1P MCB, 2 × 10A/1P MCB NetSure 731 C62-X2: 4 × 100A fuse, 4 × 63A fuse, 4 × 32A/1P MCB, 2 × 10A/1P MCB NetSure 731 C62-X3: 4 × 100A fuse, 4 × 63A/1P MCB, 6 × 32A/1P MCB	Non-priority load output: NetSure 731 CC2-X1/X2: 6 × 100A fuse, 6 × 63A fuse, 6 × 32A/1P MCB, 4 × 16A/1P MCB NetSure 731 CC2-X3: 4 × 100A fuse, 4 × 63A/1P MCB, 6 × 32A/1P MCB NetSure 731 CC2-X4: 4 × 100A fuse, 6 × 63A fuse, 2 × 32A/1P MCB, 2 × 16A/1P MCB
	Battery branch circuit: NetSure 731 C62-X1: 2 × 250A fuse NetSure 731 C62-X2: 2 × 250A fuse NetSure 731 C62-X3: 2 × 250A fuse	Battery branch circuit: 2 × 500A fuse
Optional parts	Top cover, temperature sensor and modem, front and back cover plate (NetSure 731 C62-X2), Battery cable (NetSure 731 C62-X2)	

(2) NetSure 731 C62-X2 power system is configured with two layers of battery rack, the battery compartment space is shown in Figure 1-9.

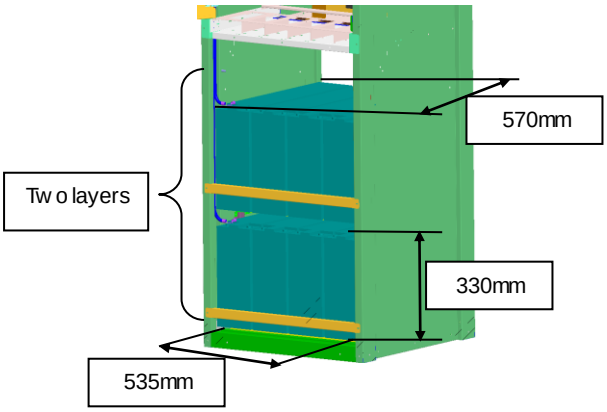


Figure 1-9 Battery compartment structure

1.3 Features

- The rectifier uses the active Power Factor Compensation (PFC) technology, raising the power factor to 0.99
- The power supply system has wide AC input voltage range: 90Vac ~ 300Vac
- The rectifier uses soft switching technology, raising the efficiency up to 95%
- The rectifier is of High power density
- The rectifier is hot pluggable. It takes less than 1min to replace a rectifier
- The rectifier has two optional over-voltage protection methods: hardware protection and software protection. The latter one also has two optional modes: lock-out at the first over-voltage and lock-out at the second over-voltage
- The power system has perfect battery management function. The management functions include BLVD, LLVD, temperature compensation, auto voltage regulation, stepless current limiting, battery capacity calculation and on-line battery test, etc
- The power system can save up to 200 pieces of historical alarm records, and 10 sets of battery test data records
- The power system is of network design. Providing multiple communication ports (such as RS232, modem and dry contacts), which enables flexible networking, remote monitoring and unmanning
- The power supply system has perfect lightning protection at both AC side and DC side
- The power supply system has complete fault protection and fault alarm functions

1.4 Operating Principle

The AC mains comes out from the AC distribution unit and is distributed to each rectifier. After rectification, the -48V DC current from each rectifier flows to the DC distribution unit through busbar, and then multiple outputs of the DC distribution unit provide power for communication equipment. Normally, the system operates in parallel float charge state, that is, the rectifiers, load and batteries work in parallel; besides powering the communication equipment, the rectifiers provide float charge for the batteries. In case of mains failure, the rectifiers will stop working, and the batteries begin to supply power to communication equipment. When the AC mains recovers, the rectifiers will resume supplying power to communication equipment and charging the batteries.

Using centralized monitoring mode, the controller module manages the AC distribution unit and DC distribution unit. It also receives the operating data of the rectifiers and controls them accordingly through CAN mode. The controller can be connected to a local computer using the RS232 port. The power system can be connected to the monitoring center through connecting a modem or other transmission resources (such as PSTN and so on) to achieve remote monitoring.

For the detailed schematic diagram of the power system, see *Appendix 5 Schematic Diagram*.

1.5 Functions

Main functions of the power system include:

Lightning and surge protection.

LLVD and BLVD.

Fault alarm and protection.

AC and DC distribution.

Perfect earthing design.

1.5.1 Lightning And Surge Protection

The power system is equipped with lightning protection at both the AC side and the DC side. The lightning protection system is shown in Figure 1-10.

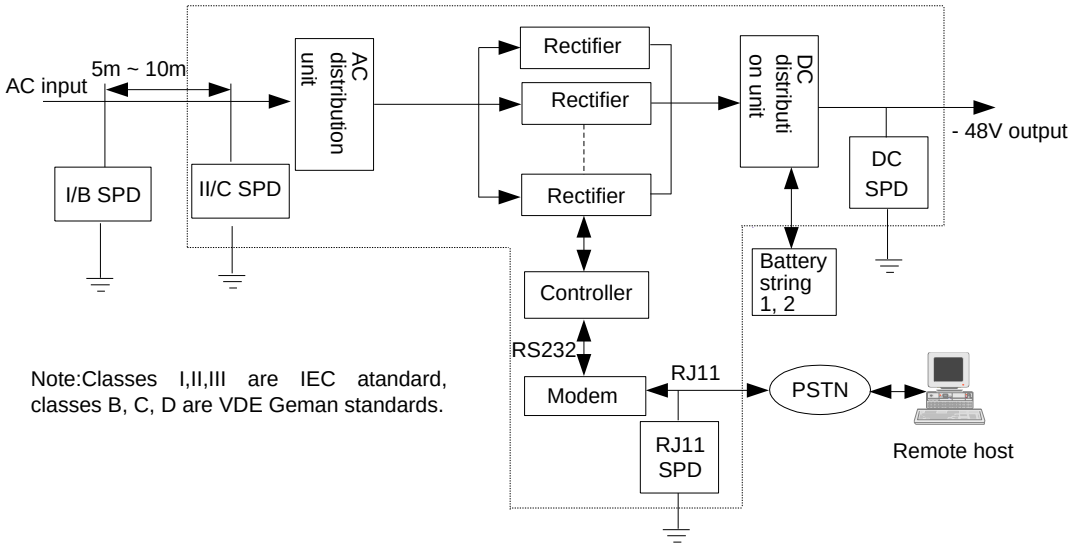


Figure 1-10 Lightning protection system

The power system is equipped with a Class II/C SPD. Meanwhile, each module of the system has perfect lightning protection circuit. The system can withstand simulated lightning surge currents of 20kA at 8/20μs five times, and 40kA at 8/20μs once. To prevent higher lightning strikes from damaging the equipment, it is recommended to install a higher protective Class I/B SPD in the cable inlet of the equipment room (lightning surge current is at least 60kA, refer to YD/T5098-2001 Signal station lightning overvoltage protection engineering design standard).

To prevent lightning strikes at the DC side from damaging the equipment, an effective lightning protection device is provided, which can withstand simulated lightning surge currents of 10kA and 15kA at 8/20 μs once respectively. To prevent conductive lightning strike from damaging the modem port of the controller, the power system provides lightning protection (optional) for the modem port. The SPD can withstand a 5kA lightning surge current at 8/20 μs and a 4kV lightning surge voltage at 10/700 μs.

The power system has perfect lighting protection at both AC side and DC side. The power system is equipped with a Class II/C SPD at AC side and SPD at DC side. To achieve better lightning protection at AC side, it is recommended to mount a Class I/B SPD, lightning surge current is at least 60kA. The Class I/B SPD should be purchased by the user. Refer to YD/T5098-2001 Signal station lightning overvoltage protection engineering design standard for the detailed technical rules. The Class I/B SPD installation is shown in Figure 1-11.

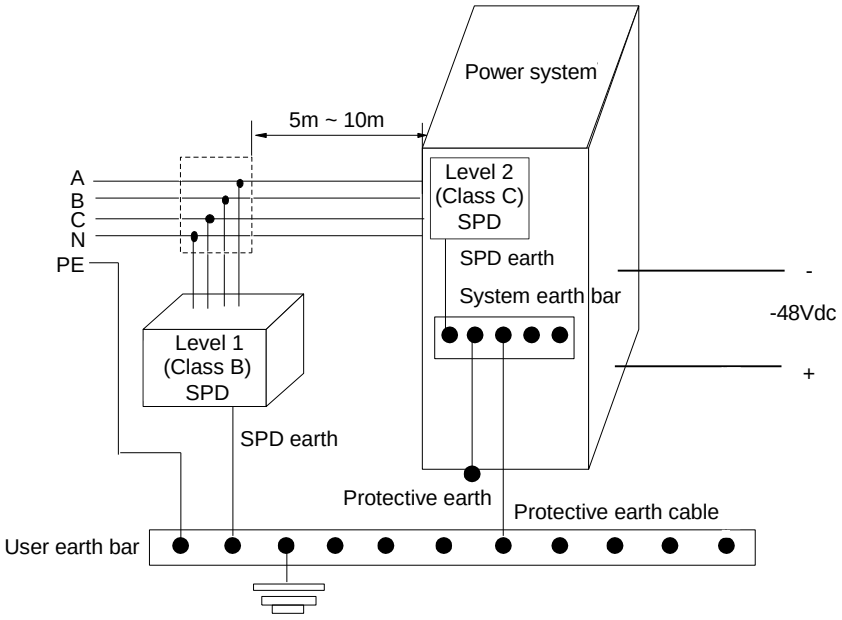


Figure 1-11 Diagram of Class I/B SPD mounting & system earthing

The Class I/B SPD should be purchased and mounted by the user. If condition permits, it is recommended that the cable length between the Class I/B SPD and the power system meet the following rules: if a voltage limiting type SPD

is used, then the cable length should be longer or equal than 5m; if a switching type SPD is used, then the cable length should be longer or equal than 10m. The cable between the Class I/B SPD and the input terminals of the AC distribution unit of the power system should be routed indoors to avoid direct lightning strike. The output cable CSA of the Class I/B SPD and the grounding cable CSA should not be less than 16mm^2. For the cable length, the shorter the better.

The power system has lighting protection at DC side, which can meet YD/T5098 requirements. There's no need to design lighting protection at DC side.

1.5.2 LLVD And BLVD

In case of mains failure, the rectifiers will stop working and the batteries will begin to discharge and power the load. When the battery voltage falls to the low voltage alarm point 45.0V (adjustable), the system will give audible/visual alarm. When the battery voltage continues to fall and reaches the LLVD point 44.0V (adjustable), the LLVD contactor will open, cutting off the power supply for the non-priority loads connected to the LLVD output branches thus the power supply to priority load can be prolonged. As the batteries discharge, the battery voltage continues to fall. When it reaches the BLVD point 43.2V (adjustable), the BLVD contactor will open, and the battery discharge will come to an end. Thus the power supply to all loads is stopped, protecting the battery from being damaged due to over-discharge. When the mains recovers and the rectifier output resumes normal functioning, the LLVD and BLVD contactors will automatically close, and the system will resume normal operation.

1.5.3 Fault Alarm And Protection

The power system provides perfect fault alarm and protection functions. The system operating data can be collected and the states of the load MCBs, load fuses, battery fuses and Level 2 (class C) SPD can be detected by the controller. The alarm level can be set and audible/visual alarms can be selected for the system alarms, such as AC input over/under voltage, DC output over/under voltage, fuse alarm, float charge and equalized charge status, rectifier fault and protection alarm. The alarm type can be configured to correspond to dry contact relay output.

1.5.4 AC And DC Distribution

The functions of AC distribution are as follows:

- The AC input uses 3-pole MCB, and has short circuit and over-current protection.
- The AC input has overvoltage and undervoltage protection.

See Table 1-2 for the functions of the AC input and output interfaces of the power system.

Table 1-2 Functions of AC input and output interfaces

Interface	Functions
AC input MCB	To AC power supply; switchable
AC output MCB	Provides phase line terminal of AC; used to power other AC equipment
AC input neutral line busbar	To the neutral line of the 3-phase AC input
Earth terminal	The junctions of the protection earth, SPD earth, operation earth of the power system; need connect to the earth bar of the equipment room

The functions of DC distribution are as follows:

- Output load branch has short circuit and over-current protections, and branch capacity can be adjusted according to user requirements.
- Battery input uses fuse which has functions like short circuit, over-current protection, alarm and fault status detection.
- Battery current detection.
- DC output overvoltage, undervoltage alarm functions.

See Table 1-3 for the functions of the DC input and output interfaces of the power system.

Table 1-3 Functions of DC input and output interface functions

Interface	Functions
Battery 1 fuse	To negative terminal of the battery string 1

Interface	Functions
Battery 2 fuse	To negative terminal of the battery string 2
DC output positive busbar	To positive terminal of battery string 1 and 2, and load output positive terminal
Priority load MCB	Negative terminal of 48V supply for priority load. Cut off the priority load output when the battery voltage drops to the BLVD point

1.5.5 Earthing Design

Protective earth, SPD earth, and DC operation earth of the power system have been connected to the earth bar before it is delivered. During the installation, user should connect the grounding terminal to the user earth bar of the equipment room, as shown in Figure 1-11.

The protective earth cable of 3-phase 5-line system can be directly connected to the earth bar of the equipment room.

The earth resistance should be in accordance with the specifications listed in Table 1-4.

Table 1-4 Earth resistance requirements for communication station

Earth resistance	Application range	Basis
< 1Ω	Integrated building, international telecom bureau, tandem station, SPC switching office above 10000 lines, toll office above 2000 lines	YDJ20-88 Provisional technical regulations of computerized telephone switching equipment installation and design
< 3Ω	SPC switching office above 2000 lines and below 10000 lines, toll office below 2000 routes	
< 5Ω	SPC switching office with less than 2000 lines, optical cable terminal station, carrier wave repeating station, earth station, microwave junction center, mobile communication machine station	
< 10Ω	Microwave relay station, optical cable relay station, small-sized earth station	YD2011-93 Microwave station lightning protection and grounding design specifications
< 20Ω	Microwave passive relay station	
< 10Ω	Suitable for those whose earth resistance rate is less than 100Ω·m, SPD earth in the interface between electric cable and aerial electric line	GBJ64-83 Industrial and civil electrical device overvoltage protection design specification
< 15Ω	Suitable for those whose earth resistance rate is 100-500Ω·m, SPD earth in the interface between electric cable and aerial electric line	
< 20Ω	Suitable for those whose earth resistance rate is 501-1000Ω·m, SPD earth in the interface between electric cable and aerial electric line	

Chapter 2 Installation Instruction

This chapter introduces installation and cable connection. Before installation, please read through the safety regulations, and then follow the instructions in this chapter to carry out the installation and connection.

2.1 Safety Regulations

Certain components in this power system carry hazardous voltage and current. Always follow the instructions below:

1. Only adequately trained personnel with satisfactory knowledge of the power supply system can carry out the installation. The Safety Precautions listed before the Contents of this manual and local safety rules in force shall be adhered to during the installation.

2. All external circuits that are below -48V and connected to the power system must comply with the requirements of SELV defined in IEC 60950.

3. Make sure that the power (mains and battery) to the power system is cut off before any operations can be carried out within the cabinet.

4. The power system shall be kept locked and placed in a locked room. The key keeper should be the one responsible for the power system.

5. The wiring of the power distribution cables should be arranged carefully so that the cables are kept away from the maintenance personnel.

2.2 Preparation

Unpacking Inspection

The equipment should be unpacked and inspected after it arrives at the installation site. The inspection shall be done by representatives of both the user and Vertiv Tech Co., Ltd. To inspect the equipment, you should open the packing case, take out the packing list and check against the packing list that the equipment is correct and complete. Make sure that the equipment is delivered intact.

Note

1. When delivered with the cabinet, the rectifier should be placed at the bottom of the cabinet subrack.
2. If the system need to configure fuse extractor, it should be strapped at the he bottom of the cabinet subrack.

Cable Preparation

The cable should be selected in accordance with relevant industry standards.

It is recommended to use the RVVZ cables as AC cables. The cable should reach at least 70°C temperature durability. Select the AC cable CSA according to Table 2-1.

Table 2-1 AC cable CSA selection

Connector	Specifications	AC cable CSA
AC input MCB	1 × 63A/3P MCB, 3 H-shape tubal terminals	≤ 35mm^2
AC input neutral busbar	1 M8 tubal OT terminal	≤ 25mm^2
AC output MCB	1 × 16A/1P MCB, one H-shape tubal terminal (CC2-X1/X2, C62-X1/X2)	≤ 10mm^2
	1 × 16A/3P MCB and 1 × 16A/1P MCB, 4 H-shape tubal terminals (CC2-X3/X4, C62-X3)	
AC output neutral busbar	2 M6 screws	
Note: With cable length shorter than 30m, the CSA calculation should be based on the current density of 2.5A/mm^2. The suggested CSA value is not smaller than 15mm^2		

The CSA of DC cable depends on the current flowing through the cable, the allowable voltage drop and load peak current. The recommended load peak current is 1/2 to 2/3 as large as the MCB or fuse capacity.

Select the battery cable CSA according to Table 2-2. Select the load cable CSA according to Table 2-3.

Table 2-2 Battery cable CSA selection

Battery fuse rated current	Max. battery current	Min. CSA	Max. cable length (voltage drop: 0.5V)	Max. cable CSA	Max. cable length (volt drop: 0.5V, with max. CSA)
500A	400A	95mm² (two) or 185mm²	14m	240mm²	20m
300A	200A	70mm²	9m	120mm²	15m
250A	160A	70mm²	10m	120mm²	15m
Note: 1. The specs are applicable at ambient temperature of 25°C. If the temperature is too high, the CSA should be increased. 2. The battery cable should reach at least 90°C heat durability. It is recommended to use double-insulated copper-core flame-retardant cable as battery cable					

Table 2-3 Load cable CSA selection

Load route rated current	Max. output current	Min. CSA	Max. cable length (volt drop: 0.5V, with min. CSA)	Max. CSA	Max. cable length (volt drop: 0.5V, with max. CSA)
160A	120A	50mm2	9m	95mm2	17m
100A	50A	25mm2	14m	50mm2	25m
63A	32A	16mm2	7m	25mm2	11m
32A	16A	16mm2	14m	25mm2	22m
10A	5A	6mm2	17m	25mm2	71m
Note: The specs are applicable at ambient temperature of 25°C. If the temperature is too high, the CSA should be increased					

The CSA of the system grounding cable should be the same as that of the largest power distribution cable and not less than 35mm^2. The grounding terminal of the grounding busbar is M10 screw.

2.3 Mechanical Installation

2.3.1 Installing Power Cabinet

The power cabinet must be installed directly onto the cement floor, and kept far away from combustible materials.

1. Mark the specific installation position of the cabinet

Determine the installation position of the power cabinet in the equipment room according to Figure 2-1. (the depth of NetSure 731 C62-X2 cabinet is 600mm)

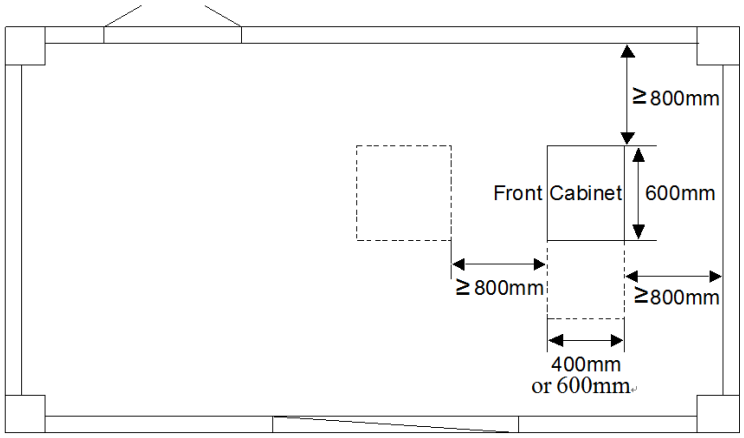
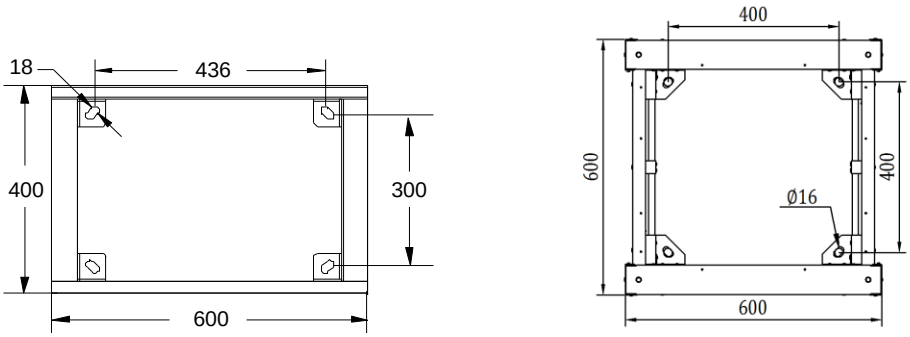


Figure 2-1 Locating power cabinet

2. Install expansion pipe

According to Figure 2-2, determine the exact central points of the installation holes on the floor, and mark them with a pencil or oil pen. Use the electric drill (aiguille: Φ14) to drill holes (depth: 70mm) at the marked points. Clean the drilled hole of dust. Put the expansion pipe into the hole and knock it with a hammer till it is totally in.



NetSure 731 CC2 & NetSure 731 C62-X1/X3 NetSure 731 C62-X2

Figure 2-2 Installation size of the cabinet base (unit: mm)

3. Fix the cabinet

Move the cabinet to the installation position. Align the installation holes on the cabinet with the expansion pipes in the floor. Secure the cabinet with bolts.

2.3.2 Installing Rectifiers

Note

1. In the non-full-configuration, install dummy plates at empty slots.
2. When installing the rectifier, hold the handle and push the rectifier into the slot gently, otherwise the slot may be damaged.

The procedures for installing rectifiers are as follows:

1. After loosing the fixing screw of the handle on the front panel of the rectifier, press the handle (see Figure 2-3) to pop it up.

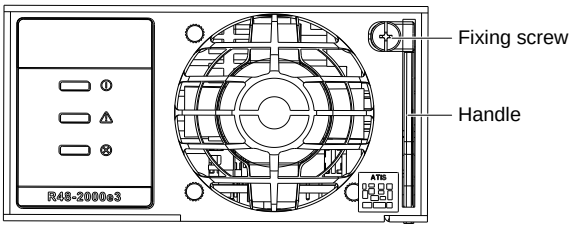


Figure 2-3 Handle of the rectifier

2. Put the rectifiers in the slot. Push the rectifier completely into the cabinet. Close the handle and tighten the fixing screw to lock the rectifiers onto the cabinet.

2.4 Electrical Installation

2.4.1 Connecting Power Cables

Danger

1. Switch off all MCBs and pull out all fuses before the electrical connection.
2. Only qualified personnel shall do the power cable connection.

The power systems uses top cabling, and all the cables should be introduced in or led out along the cable binding beam in the side wall of the cabinet.

Connecting grounding cable

Connect one end of the grounding cable to the user earth bar of the equipment room, and the other end to the grounding terminal of the power system. Put the cable through the fixing holes at the top of the cabinet. Use the cable ties to fix the modem on the top of the cabinet, as shown in Figure 2-8. Taking NetSure 731 CC2-X3/X4 and NetSure 731 C62-X1 power system as an example, the grounding terminal is shown in Figure 2-4. The grounding terminal and neutral busbar of the NetSure 731 CC2-X1、X2 power system are located under the rectifier subrack. The grounding terminal position of NetSure 731 C62-X2 and NetSure 731 C62-X1/X3 is same as that of the neutral line busbar.

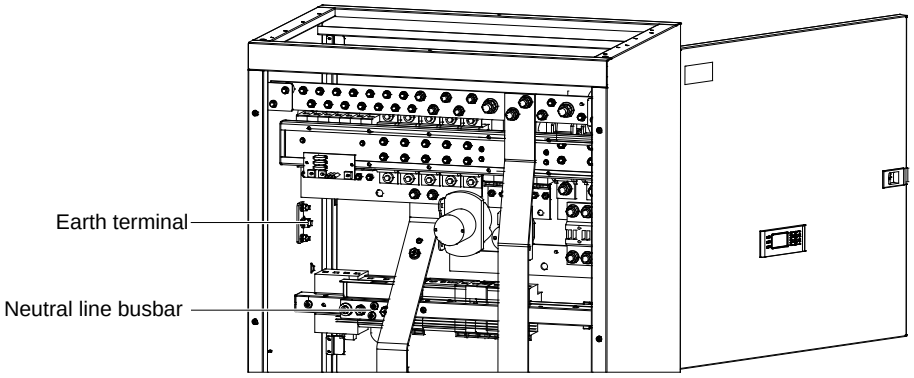


Figure 2-4 Connection terminals (rear view, rear plate removed)

Connecting AC cables

1. Connect the AC input phase cables to the AC input MCBs, as shown in Figure 2-5.

The figure shows the two routes of mains input MCB configuration. NetSure 731 CC2-X3, X4 and NetSure 731 C62-X1, X2, X3 power system only configure one route of mains input MCB, the AC input MCB is shown in Figure 2-5. The AC input MCB, AC output MCB and rectifier MCB of the NetSure 731 CC2-X1, X2 power system are located in the distribution room below the rectifier subrack.

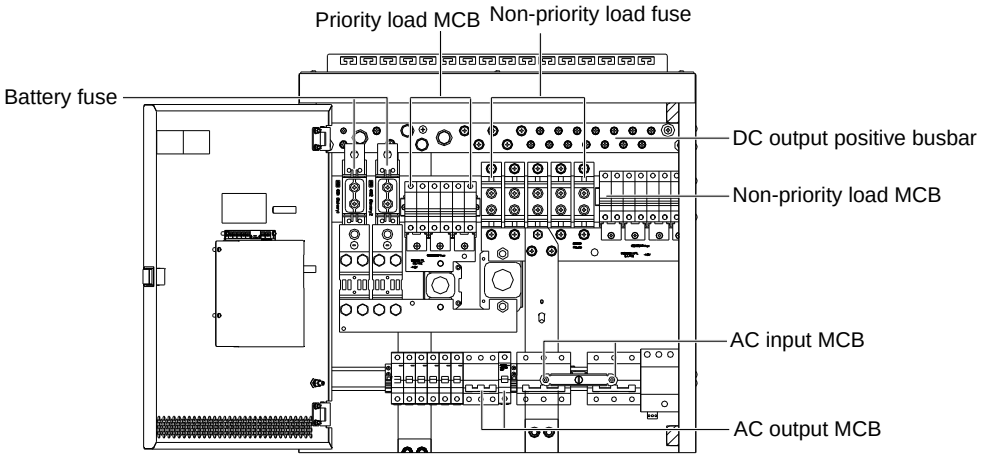


Figure 2-5 Connection terminals (front view)

2. If the power system is configured with AC output MCB, connect the AC out cables to the AC output MCB, and connect the AC out neutral line to the neutral busbar, as shown in Figure 2-4 and Figure 2-5.

Connecting load cables

Note

The total capacity of the priority loads should not exceed 100A.

Connect the negative load cable to the upper terminal of the load MCB or load fuse. Connect the positive load cable to the DC positive busbar, as shown in Figure 2-5. The specifications of the positive busbar connection screw are ¢8mm and ¢6mm. Please connect the load cable according to the priority load and non-priority load labels.

Connecting battery cables

Note

1. The batteries may have dangerous current. Before connecting battery cables, make sure that the battery fuses at the system side and the battery MCBs at the battery side are switched off. If there are no battery MCBs at the battery side, users should disconnect any one of the connectors between battery cells to avoid live state of the power system after installation.
2. Be careful not to reversely connect the battery. Otherwise, both the battery and the power system will be damaged!
3. When the load capacity exceeds 200A, it is recommended to connect two routes of batteries.

1. Connect one end of the negative battery cable to the upper terminal of the battery fuse. Connect one end of the positive battery cable to the DC positive busbar. The positions of the connection terminals are shown in Figure 2-5. The specifications of the positive busbar connection screw is ¢10mm.
2. Connect OT lugs to the other end of the two battery cables. Wrap all the bare parts with insulating tape, and put them beside the battery. Do not connect the cables to the battery until the DC distribution unit is to be tested.
3. The wiring path of battery cable configured in NetSure 731 C62-X2 is shown in Figure 2-6.

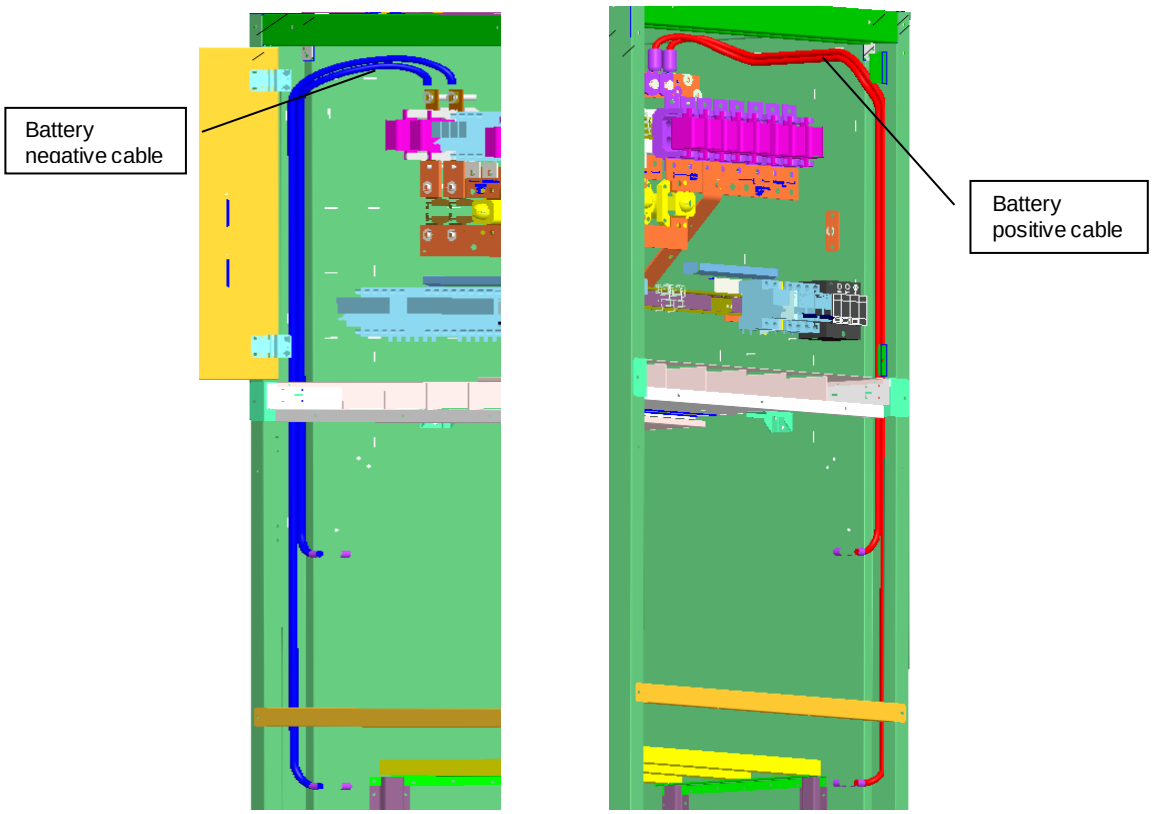


Figure 2-6 Battery cable wiring path of NetSure 731 C62-X2

2.4.2 Connecting Signal Cables

All the signal cables are connected to the controller. The position of the controller is shown in Figure 1-2 and Figure 1-3.

The interfaces of the controller are shown in Figure 2-7. The functions of the interfaces are listed in Table 2-4.

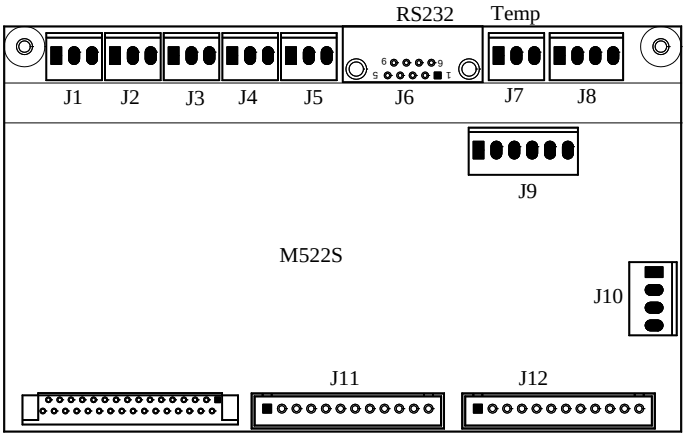


Figure 2-7 Interfaces of the controller

Table 2-4 Interface functions

Interface	Definition	Connection
J1 ~ J5	Dry contact output	To signal cables
J6	RS232 port	To modem or host
J7	Battery temperature sensor interface	Connected before delivery
J8	Power interface of the controller	Connected before delivery
J9_1 and J9_2	CAN interface	Connected before delivery
J10_1 and J10_2	LLVD normally-closed contact	The signal terminal has been connected to the PCB before delivery LLVD normally-closed contact, when this interface is connected, the LLVD contactor is controlled by the controller. Refer to *4.7.2 Battery Settings* for the method of controlling LLVD contactor
J10_3 and J10_4	BLVD normally-closed contact	The signal terminal has been connected to the PCB before delivery BLVD normally-closed contact, when this interface is connected, the LLVD contactor is controlled by the controller. Refer to *4.7.2 Battery Settings* for the method of controlling BLVD contactor
J11 and J12	Detect and alarm interface	To battery shunt sampling, battery fuse and alarm cables of output routes

Procedures for connecting signal terminal J1 ~ J5:

Step 1: Unplug the signal terminal connector from the monitoring board;

Step 2: Use a slotted screwdriver, press the raised part of the terminal hardly, and push it out from the shell.

Step3: Peel off the insulation outer layer (about 3mm), as shown in Figure 2-8. Then press the naked wire and insulation out layer.

Step 4: The well-compacted terminal is shown in Figure 2-8.

Step 5: Plug the terminal into the terminal shell, as shown in Figure 2-8.

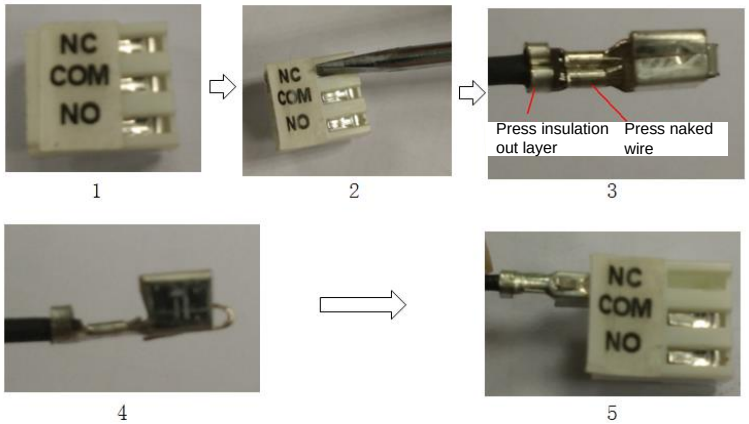


Figure 2-8 Connecting J1-J5 signal terminal

Connecting temperature sensor

The temperature sensor is an optional accessory.

Probe operating voltage: 12V.

Measurement range: -5°C ~ +100°C.

Measurement precision: ± 2°C.

When installing the temperature sensor, put the temperature probe in the battery room that best represents the battery temperature, far away from other heat-generating equipment. When the batteries are placed outside the cabinet, the temperature probe shall not be placed inside the cabinet.

Installing modem

Modem is an optional accessory, suitable for those who have purchased the modem remote monitoring system.

The following expounds the modem installation and connection, taking e-TEK TD-5648DCII modem for example.

1. Fix the modem

Put the cable ties through the fixing holes at the top of the cabinet. Use the cable ties to fix the modem on the top of the cabinet, as shown in Figure 2-9.

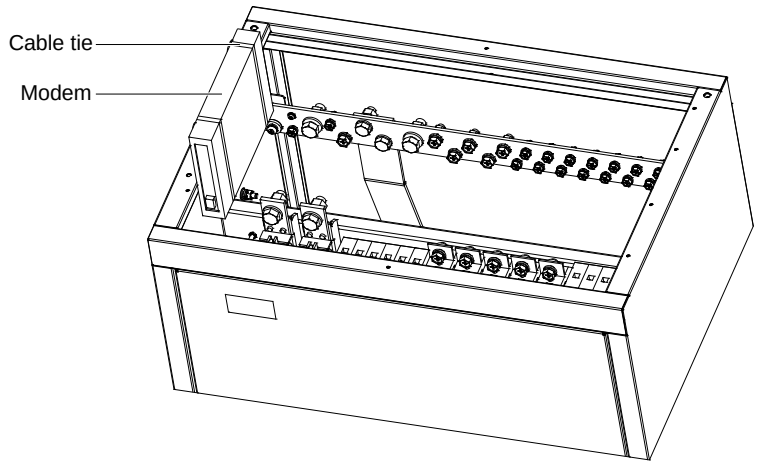


Figure 2-9 Position for placing modem

2. Connect modem with the controller

The input and output interfaces of the modem are shown in Figure 2-10.

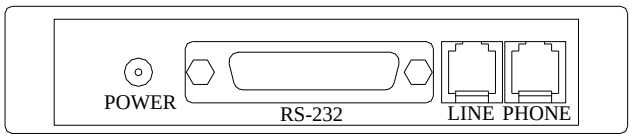


Figure 2-10 Input & output interfaces of TD-5648DCII Modem

1) Connect a telephone line to the 'LINE' interface on the modem.

2) Use a power cable to connect the positive and negative power terminals (screenprint: POWER) of the modem to the DC positive busbar and negative busbar (below the battery fuse) of the power system respectively.

3) Use a communication cable to connect the communication interface of the modem (DB25 female, screenprint: RS-232) to the J6 interface (DB9 male) of the controller.

Note

During system testing, set the parameter 'Modem' of the controller to 'Y'.

Connecting dry contacts

The controller provides five pairs of dry contacts, which are J1 ~ J5 interfaces shown in Figure 2-7. Peel one end of the signal cable (optional) and insert it into the J1 ~ J5 sockets. The functions of the dry contacts are given in Table 2-5.

Table 2-5 Dry contact functions

Interface	Function		Interface	Function
J1	AC mains failure		J4	LLVD
J2	DC over/undervoltage		J5	BLVD
J3	Rectifier failure			
Note: The above functions are default settings. Users can change them through the controller				

2.4.3 Bottom Cabling Cabinet

If the cabinet must use bottom cabling method, a rear cover plate should be installed at the rear of the cabinet. User should follow the procedures below to install the cover plate. (Note: The bottom cabling method is not applicable to NetSure 731 C62-X2.)

1. Remove the original rear cover plate of the cabinet, and then install the new rear cover plate (100mm thickness) in the main frame of the cabinet. First install one screw on both of the right and left vertical pole of the new rear cover plate respectively. Then fix the upper and lower beam, and the cable binding beam in the middle of the cabinet. Finally, install the other screws on both of the right and left vertical pole, as shown in Figure 2-11.

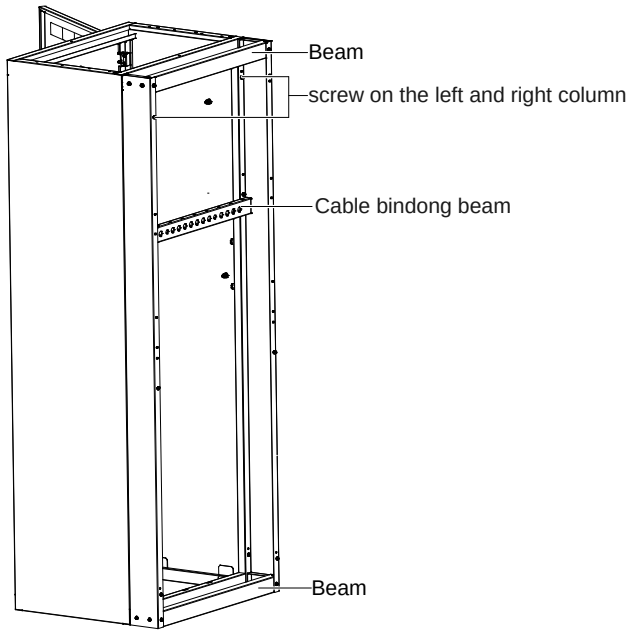


Figure 2-11 Rear cover plate installation for bottom cabling method (1)

2. Install the original rear cover plate on the outside of the new one, as shown in Figure 2-12.

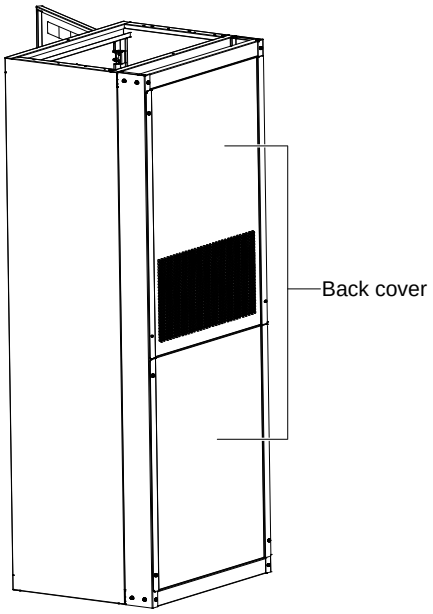


Figure 2-12 Rear cover plate installation for bottom cabling method (2)

Chapter 3 Testing

This chapter introduces the testing procedures after installation. The corresponding safety rules shall be adhered to in the test.

3.1 Installation Check And Startup

Before the test, inform the chief manufacturer representative. Only trained electrical engineers shall maintain and operate the power system. In operation, the installation personnel are not allowed to wear conductive objects such as watches, and rings.

During operation, parts of this power system carry hazardous voltage. Misoperation can result in personnel injury and property loss. Before the test, check the equipment to ensure the proper earthing. Installation check must be done before testing. Then the batteries can be charged for the first time.

Make sure that the AC input MCBs, rectifier MCBs and load MCBs are switched off. Make sure that all the devices are properly installed.

Check the power system step by step according to the following listed items.

Installation check

Check item	OK	Comments
Check all the models of MCBs, fuses and cables are correct	☐	
Check the busbar connections, input and output cable connection, and connection between the power system and the system grounding are correct	☐	
Check whether the number and connections of the batteries are correct; check the polarity of the battery string are correct	☐	
Make sure all the connections are solid and reliable	☐	
Make sure all the communication cables and alarm cables are connected to the controller. Check that the temperature sensor, if any, has been installed	☐	

Startup preparations

Check item	OK	Comments
Make sure that all the MCBs are switched off and all the fuses are removed	☐	
Measure the AC input voltage. Make sure the input voltage is within the allowable range	☐	Umin= V
Check that at least one short-circuit copper bar in battery string circuit is not connected before installation, prevent short-circuit caused by positive and negative short-connect	☐	
Connect the disconnected batteries to the battery string circuit	☐	
Measure with a voltmeter across the connection points of each battery and make sure that the polarity is right. For a lead-acid battery with 24 cells, the voltmeter should read 2.0V ~ 2.1V/cell or 48V ~ 51V/battery. If the voltage of certain cell is lower than 2.0V, that cell must be replaced	☐	Umin= V
Check with an ohmmeter that there is no short circuit between the positive & negative distribution busbars, or between the positive & negative battery poles (Note: Pull out all the rectifiers before the check and restore them after the check)	☐	

Startup

Check item	OK	Comments
Switch on the AC input MCB. Switch on one rectifier MCB. The green LED on the rectifier will be on and the fan will start running after a certain delay. The controller will show that the power supply voltage is 53.5V	☐	
Check the voltage and busbar polarity with a voltmeter. The voltage difference between the measured value and displayed value should be less than ±0.3V	☐	
Start and stop each rectifier of the power system by switching on and switching off the rectifier MCBs. Check their output voltages	☐	

3.2 Basic Settings

When the power system is put into service for the first time, the parameters of controller must be set based on the actual system configuration, such as battery string number, capacity, user's charge current limit and other functional requirements. Only after that can the controller display system operation information and control the output.

Select the main menu → Settings (password: 1) → Battery Settings → Basic Settings. Set the 'Mode' parameter to 'Manual'. Return to the Settings menu to set the parameters in relative submenus. Refer to 4.7 Setting Parameters.

Check item	OK	Comments
The power supply system model has been set correctly in factory before delivery, check that the setting agrees with the actual situation. (The system models are: NetSure 731 C62: 48V/300; NetSure 731 CC2: 48V/500)	☐	
The battery string number set at the controller should be the same as the number actually connected. By default: 2	☐	
Set the battery capacity at the controller according to the actual capacity of the battery connected to the power supply system. By default: 300Ah	☐	
Configure the temperature compensation coefficient at the monitoring module according to the battery manufacturer's requirement. Setting range: 0 ~ 500mV/°C. By default: 72mV/°C. (if no temperature sensor is installed, do not set this parameter)	☐	
Set the charge current limiting point. Setting range: 0.1C10 ~ 0.25C10. By default: 0.1C10	☐	
Set the monitoring module according to the voltage suggested by the battery supplier. Floating Charge (FC) voltage range: 42V ~ Boost Charge (BC) voltage. By default: 53.5V. BC voltage range: FC voltage ~ 58V. By default: 56.4V. For batteries that do not need BC, set the BC voltage to FC voltage plus 0.1V	☐	
Measure the battery voltage with a multimeter and record it. Enter Main menu → Maintenance (password: 1) → RectTrim submenu. Set the output voltage of the rectifier to the value of the battery voltage. Insert the battery fuse. Set the output voltage of the rectifier to 53.5V	☐	
Enter the Basic Parameters submenu. Set the 'Mode' parameter to 'Auto'	☐	

3.3 Alarm Check And System Operation Status Check

Alarm check

Check that all functional units can trigger alarms that can be displayed on the controller.

Check item	OK	Comments
Pull out one rectifier. The 'Rect N Com Failure' alarm should be triggered. Insert the rectifier in. The alarm should disappear. Repeat the same procedures on other rectifiers	☐	
Remove battery fuse 1. The 'Batt1 Failure' alarm should be triggered. Put on the fuse. The alarm should be cleared. Repeat the same on battery fuse 2	☐	
Switch off a load MCB connected to a load route. The alarm 'Load Fuse N Failure' should be triggered. Switch on the MCB, and the alarm should be cleared. Repeat the same on the other load MCBs	☐	
Remove all the battery input fuses. Keep only one rectifier in operation. Through the controller, adjust the rectifier FC voltage to make it lower than the alarm point. The alarm 'DC Voltage Low' should be triggered	☐	
Pull out the varistor of the AC SPD. The 'SPD fault' alarm should be triggered. Insert the varistor, the alarm should be cleared	☐	
Note: When the preceding alarms are generated, the controller will give alarms after approximately 3s. For querying the alarm information in the controller, please refer to 4.5 Quering Alarm Information		

System operation status check

There's no alarm if the system works normally. User can check whether the system runs normally through the controller. For querying the controller parameters, please refer to *4.3 Querying System Main Information* and *4.4 Querying Rectifier Status*.

Check item	OK	Comments
The system models are NetSure 731 C62: 48V/300; NetSure 731 CC2: 48V/500	☐	
The controller should display the correct AC voltage	☐	
The controller should be able to display the DC voltage. The difference between the displayed voltage and that measured at the busbar with should be less than ± 0.3V	☐	

Check item	OK	Comments
The controller should display the battery current. The difference between the displayed and measured battery current should be less than 1%	☐	
Check the number of the rectifier through the controller. The number should be consistent with the settings and actual values	☐	
Check the voltage, current, current limiting point of rectifiers through the controller. They should agree with the actual parameters	☐	
For the power system configured with temperature sensor, the battery and ambient temperature displayed by the controller should be normal. Hold the probe of the temperatures sensor and the displayed temperatures should change	☐	

3.4 Final Steps

Check item	OK	Comments
Make sure that materials irrelevant to the equipment have been all removed	☐	
Fill in the installation report and hand it over to the user	☐	
Fill in the parameter table at the cabinet door	☐	

If any defect is found in this equipment, inform the personnel responsible for the contract.

If repairing is needed, please fill in the FAILURE REPORT and send the report together with the defective unit to the repairing center for fault analysis.

Chapter 4 Use Of The Controller

This chapter introduces the operation panel indicators and functional keys of the controller briefly, and expounds the main screen contents, access method, system controlling, information querying and parameter setting.

When the controller is powered on, the language selection screen will appear. The default language is Chinese, and you do not need to do any operation. Then the controller will be initialized. After the initialization, the first system information screen will appear.

4.1 Operation Panel

The operation panel of the controller provides the backlit LCD, functional keys and indicators, as shown in Figure 4-1.

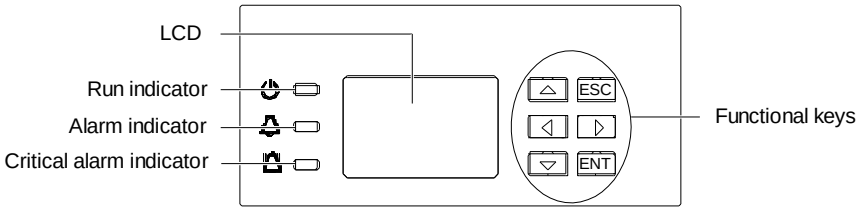


Figure 4-1 Operation panel of the controller

Description of the indicators on the operation panel is given in Table 4-1.

Table 4-1 Description of the controller indicators

Indicator	Color	Normal state	Fault state	Fault cause
Run indicator	Green	On	Off	No operation power supply
Alarm indicator	Yellow	Off	On	There are observation alarms
Critical alarm indicator	Red	Off	On	There are major or critical alarms

The controller uses a 128 × 64 LCD unit, and a keypad with six functional keys. The interface language is Chinese/English optional (8 × 4 Chinese characters can be displayed). Table 4-2 shows the description of the controller functional keys.

Table 4-2 Description of the controller functional keys

Screenprint	Name	Function
ESC	Escape	Return to the upper level menu. When the audible alarm is generated, press this key to cancel it
ENT	ENT	Enter the lower level menu or confirm the menu operation. When changing or inputting parameters, press this key to get into editing state. After any change is made, press this key to validate the change
▲	Up	Shift among parallel menus. For a character string, these two keys can be used to change values
▼	Down	
◄	Left	In value setting interface, these two keys can be used to change values. These two keys can move the cursor, only when one LCD screen requires character string to be input
►	Right	

4.2 Main LCD Screens

The following LCD screens will be mentioned in this chapter for many times. This section is a centralized introduction about the contents and access methods of these LCD screens.

4.2.1 System Information Screen

When the controller is powered on, the language selection screen will appear. The default language is English, and you do not need to do any operation. Then the controller will be initialized. After the initialization, the first system information screen will appear.

The system information screen shows the main information, which is displayed on five pages. You can press ▲ or ▼ repeatedly to select different system information screens. The first system information screen has 7-level contrast, you can press ◄ or ► to adjust the LCD contrast. The first system information screen is shown in Figure 4-2.

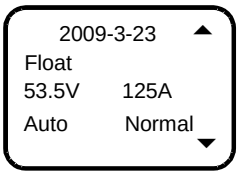


Figure 4-2 First system information screen

1. The first row displays the date and time alternately.

2. At the main menu screen, press the ESC key to return to the first system information screen.

3. If no operation is conducted on the controller keypad for eight minutes, the LCD screen will return to the first system information screen. The time of that return will be recorded, and can be queried through the host.

4. At any one of the system information screen, press the ESC key to display the serial No., software version and runtime of the controller.

5. At the system information screen, pressing and holding the ESC and ENT keys simultaneously for several seconds, resets the controller, and restarts the system.

4.2.2 Password Confirmation Screen

During operation, some controllers will prompt you to enter password, as shown in Figure 4-3. Only the correct password allows you to enter the screen you need to operate.

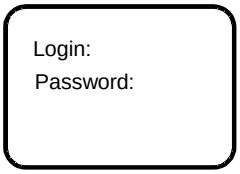


Figure 4-3 Password confirmation screen

When inputting the password, use the ENT key to get into editing state, use ▲ or ▼ to modify numbers, and use ◄ or ► to move the cursor. After the input, press the ENT key to confirm. If the password is correct, the next screen will appear. Otherwise, the system will prompt 'Password incorrect'. During this operation, pressing the ESC key returns to the main menu screen.

The controller has three password levels: user level password (default: 1), engineer level password (default: 2) and administrator level password (default: 640275).

Once you enter the correct password, you never need to enter the password again during the operation. If the interval between adjacent operations is more than four minutes, the system will prompt you to input the password again. Therefore, if you want to enter senior setting screens, you need to wait four minutes and cannot do any operation during waiting, and then the system will enter the senior setting screens after you input the higher level password. If the two level passwords are the same, the controller will display the senior menus after you enter the password.

4.2.3 MAINMENU Screen

The main menu is the highest-level menu of the controller. At the sub-menus of this screen, you can query the settings, controls, rectifiers and alarms information of the power system. The main menu screen is shown in Figure 4-4.

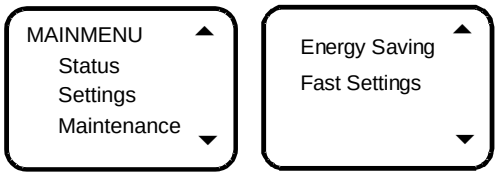


Figure 4-4 MAINMENU screen

1. At any one of the system information screen, press the ENT key to enter the MAINMENU screen.

2. At any sub-menu of the MAINMENU screen, press the ESC key repeatedly to return to the higher-level menu, and ultimately to the MAINMENU screen.

4.2.4 STATUS Screen

The STATUS screen is a sub-menu of the main menu. It contains rectifiers, active alarm and history alarm. The STATUS screen is shown in Figure 4-5.

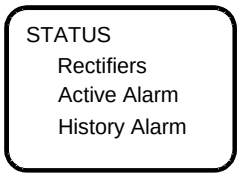


Figure 4-5 STATUS screen

1. At the MAINMENU screen, press ▲ or ▼ to select the 'STATUS' menu, and press the ENT key to enter the STATUS screen.

2. At any sub-menu of the STATUS screen, press the ESC key repeatedly to return to the higher-level menu, and ultimately to the STATUS screen.

4.2.5 Settings Screen

Displayed in two screens, the Settings screen is a sub-menu of the main menu. It is used to set all the parameters of the power system. The Settings screen has password protection, only the correct password allows you to enter it. See Figure 4-6 for the Settings screen.

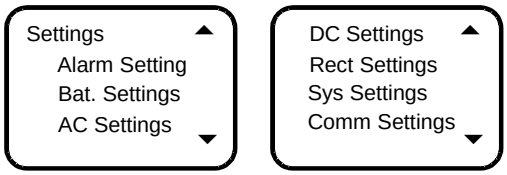


Figure 4-6 Settings screen

1. At the MAINMENU screen, press ▲ or ▼ to select the 'Settings' menu, and press the ENT key to enter the password confirmation screen.

2. Input the correct password and press the ENT key to enter the Settings screen. Press ▲ or ▼ to enter the screen you need.

In the settings screen, each password level has different authority. See Table 4-3 for the operation authorities.

Table 4-3 Password levels and operation authorities

Password level	Operation authority	Default password
User	General parameter settings	1
Engineer	All the user's authorities, plus operation authorities such as resetting system, resetting password and changing system type	2
Administrator	All the engineer's authorities, plus operation authorities such as modifying passwords, controlling alarm volume and browsing system parameters set by host	640275

Once you enter the correct password, you never need to enter the password again during the operation. If the interval between adjacent operations is more than four minutes, the system will prompt you to input the password again. Therefore, if you want to enter senior setting screens, you need to wait four minutes and cannot do any operation during waiting, and then the system will enter the senior setting screens after you input the higher level password. If the two level passwords are the same, the controller will display the senior menus after you enter the password.

4.2.6 Maintenance Screen

Displayed in two screens, the Maintenance screen is a sub-menu of the main menu. It is used to control the system in real time. The Maintenance screen has password protection, only the correct password allows you to enter it. For this screen, the user level password, engineer level password and administrator level password all have the same authority. The Maintenance screen is shown in Figure 4-7.

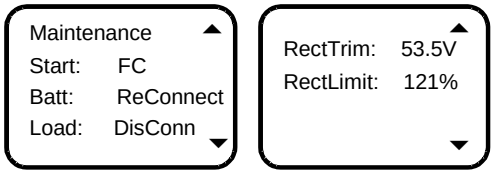


Figure 4-7 Maintenance screen

1. At the MAINMENU screen, press ▲ or ▼ to select the 'Maintenance' menu, and press the ENT key to confirm. The system will prompt you to input the password if the 'Sys Mode' is set to 'Manual' (see 4.7.2 Battery Settings for setting method).

2. Input the correct password and press the ENT key to enter the Maintenance screen. Press ▲ or ▼ to enter the screen you need.

4.2.7 Energy Saving Screen

The Energy Saving screen is a sub-menu of the main menu, as shown in Figure 4-8. It is used to set the relevant parameters for energy saving.

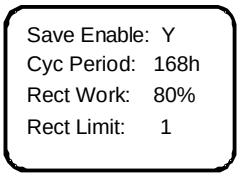


Figure 4-8 Energy saving screen

1. At the MAINMENU screen, press ▲ or ▼ to select the 'Energy Saving' menu, and press the ENT key to display the password confirmation screen.

2. Input the correct password and press the ENT key to enter the Energy Saving screen. Press ▲ or ▼ to select the parameters you need.

4.2.8 Fast Settings Screen

The Fast Settings screen is a sub-menu of the main menu, as shown in Figure 4-9. It is used to set the system type and battery capacity.

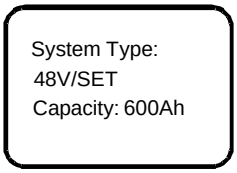


Figure 4-9 Fast settings screen

1. At the MAINMENU screen, press ▲ or ▼ to select the 'Fast Settings' screen, and press the ENT key to display the password confirmation screen.

2. Input the correct password and press the ENT key to enter the Fast Settings screen. Press ▲ or ▼ to select the parameters you need.

4.3 Querying System Main Information

DC, system state, battery state and energy management mode information

At any one of the system information screen, press ▲ or ▼ repeatedly to enter the first system information screen. At other screens, press the ESC key repeatedly to return to the first system information screen. DC voltage and current, system state, battery state and energy management mode information are all displayed in the first system information screen, as shown in Figure 4-10.

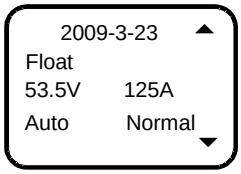


Figure 4-10 First system information screen

The date and time are alternately displayed every two seconds. The system state contains Normal and Alarm. The energy management mode includes Auto and Manual. The battery state includes Float, Temp Comp, Boost, Cyclic Boost, Batt. Test, ShortTest and TimeTest.

Save state, rectifier output power and cyclic BC after information

At the first system information screen, press ▼ to enter the screen shown in Figure 4-11.

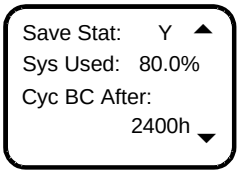


Figure 4-11 Save state, output power and cyclic BC after information screen

The first row displays the save state. The second row displays the percentage ratio of the rectifier output power to the rectifier rated power. The last two rows display the boost charge prompt information, they will be different for different states of the power system, including:

1. Prompt the time of the next cyclic BC according to the battery state.

2. If BC is going on or prohibited, '---' will be prompted.

Battery and remain information

At the screen shown in Figure 4-11, press ▼ to view the battery information shown in Figure 4-12.

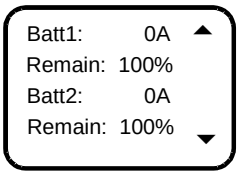


Figure 4-12 Battery information screen

'Batt1' and 'Batt2' in the preceding screen represent respectively the current that flowed through battery shunt 1 and battery shunt 2. If several battery strings are connected to one shunt, the displayed current is their total current; if the 'Shunt Coeff' of one battery string is set to 'N', the corresponding battery information will display 'None', and the remaining capacity will not be displayed.

The remaining battery capacity can be displayed in percentage (default), remaining ampere hours and remaining time.

AC voltage information

At the battery information screen, press ▼ to display the AC information page. The system will display AC voltage of the A, B and C phases, as shown in Figure 4-13.

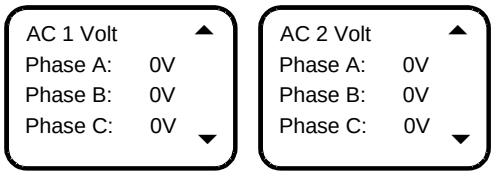


Figure 4-13 AC information screen

System temperature information

At the AC information screen, if a temperature sensor is configured, pressing ▼ displays the screen shown in Figure 4-14.

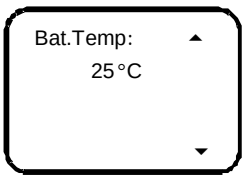


Figure 4-14 Battery temperature screen

If the temperature sensor is not connected or is faulty, the system will prompt '---'. Meanwhile, the alarm information screen will be displayed. If the controller bans BC and no temperature sensor is configured, this screen will not be displayed.

4.4 Querying Rectifier Status

> 🕮 Note
>
> If the controller has not detected rectifiers, you cannot query the rectifier information.

The rectifier information includes the serial No., output voltage, output current, current limit, input voltage, AC and DC states, AC power limit and temperature power limit of each rectifier.

At the STATUS screen (see Figure 4-5), press ▲ or ▼ to select the 'Rectifiers', and press the ENT key to enter the screen shown in Figure 4-15.

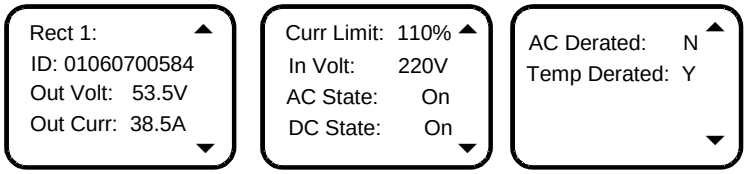


Figure 4-15 Rectifier information screen

The information of every rectifier is displayed in three screens. Press ▲ or ▼ to scroll to the three information screens. Press ◄ or ► to query other rectifiers' information. At most 24 pieces of rectifier information can be displayed in the controller. When selecting one rectifier, the green indicator of the rectifier will blink. If the rectifier communication is interrupted, the information will be displayed in high light.

4.5 Querying Alarm Information

You can query the active alarms and history alarms through the LCD of the controller. The query methods are given in the following sections.

4.5.1 Querying Active Alarm

When a new alarm is generated, and there is no operation on controller keypad for two minutes, the LCD of the controller will prompt an active alarm screen automatically. If there are multiple alarms in the current system, you can query alarms through the following steps.

At the STATUS screen (see Figure 4-5), press ▲ or ▼ to select the 'Active Alarm', and press the ENT key to enter it.

1. If there is no active alarm, the alarm prompt will not appear; if there is an active alarm, after entering the active alarm screen, the alarm will disappear and 'Active alarm: None' will appear.

2. If there is an active alarm, the screen shown in Figure 4-16 will appear.

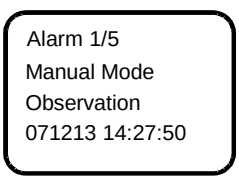


Figure 4-16 Active alarm screen

The Figure 4-16 screen includes alarm serial No./ alarm total number, alarm name, alarm level and alarm time. The alarm generating time determines the sequence it is displayed, with the latest alarm displayed first. Use ▲ or ▼ to view all active alarms.

When querying the rectifier alarms, press ► to display the rectifier ID, and the green indicator of the rectifier will blink.

In case of battery test alarm or maintenance time alarm, press ► to display the prompt information screen, then press the ENT key to confirm that the alarm is cleared. The active alarms in the controller are given in Table 4-4.

Table 4-4 Active alarm of the controller

No.	Alarm type	Alarm	Description
1	Rectifier alarm	Rect AC Fail	Press ► to browse the serial No. of the faulty rectifier
2		Rect Over Temp	
3		Rect Fault	
4	Rectifier alarm	Rect Protect	Press ► to browse the serial No. of the faulty rectifier
5		Rect Fan Fails	
6		Rect Derated	
7		Rect Not Respond	
8		Multi-Rect Alarm	
9		Rectifier Lost	You can clear this alarm manually
1	AC alarm	SPD Fault	SPD fault is the alarm of Digital 1
2		Digital Alarm	
3		AC High	
4		AC Low	
5		AC PH Fail	
6		Mains Failure	
1	DC alarm	DC Volt High+	
2		DC Volt Low	
3		DC Volt Low -	
4		Batt Over Temp	
5		Batt Temp High Alarm	
6		Batt Temp Low Alarm	
7		Ambient Temp High Alarm	
8		Ambient Temp Low Alarm	
9		T No Probe	
10		Sensor Fault	
11		LVD	
12		BLVD	
13		Load Fuse Alarm 1	
14		Load Fuse Alarm 2	
15		Load Fuse Alarm 3	
16		Load Fuse Alarm 4	
17		Load Fuse Alarm 5	
18		Load Fuse Alarm 6	
19		Aux Load Fails	
20		Batt Fuse Alarm 1	
21		Batt Fuse Alarm 2	
22		Batt 1 Curr High	
1	Battery management alarm	Non Float Status	
2		Batt Discharge	
3		Load Share Alarm	
4		Batt Test Fail	Press ► to prompt you to clear this alarm
5		Short Test Fail	
6		Save Power	
7		Save Power Fault	
1	Controller self-detect alarm	Self Detect Fail	
2		Manual Mode	
3		Volt Discrepancy	
4		Maintain Alarm	
5		Alarm Block	

4.5.2 Querying History Alarm

1. At the STATUS screen (see Figure 4-5), press ▲ or ▼ to select the 'History Alarm', and press the ENT key to enter it.

1) If there is no history alarm, the system cannot access the lower level menu.

2) If there is an active alarm, the screen shown in Figure 4-17 will appear.

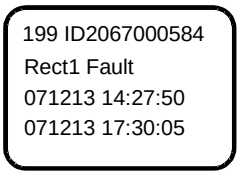


Figure 4-17 History alarm screen

If the alarm is a rectifier alarm, the first row in Figure 4-17 will display the latter 10 digits of the rectifier ID.

The history alarms of the controller are stored in cyclic order. At most 200 alarms will be recorded, above that, the earliest alarm will be cleared automatically.

2. Use ▲ or ▼ to view other history alarms.

3. At any History Alarm screen, press the ESC key repeatedly to return to the higher-level menu, and ultimately to the first system information screen.

4.6 Maintenance

📖 Note

Be careful! BLVD operations may result in load power interruption.

1. From the battery basic parameters, you can change the 'Sys Mode' from 'Auto' to 'Manual', and then press the ENT key to confirm. For the detailed procedures, see Basic parameters in 4.7.2 Battery Settings.

2. At the MAINMENU screen, press ▲ or ▼ to select the 'Maintenance' menu. Press the ENT key, the system will prompt you to input the password.

3. Input the password and press the ENT key to enter the Maintenance screen (displayed in two screens), as shown in Figure 4-18.

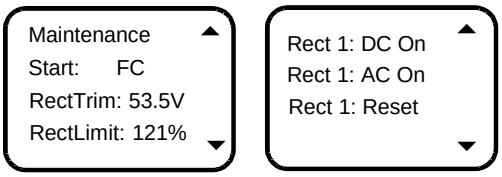


Figure 4-18 Maintenance screen

4. Press ◄ or ► to select the needed operation, and press the ENT key to confirm. The screen pops up the corresponding prompt. If the system satisfies control situation, press the ENT key to make the control valid, otherwise, the controller will prompt you that the control is disabled. Press the ESC key to cancel. The control contents are given below.

1) Start: The option includes FC, BC and Test. Press ◄ or ► to select the needed action. After selecting the Start option, press ◄ or ► to select the needed operation. If there is an AC power-off alarm, or the busbar undervoltage, the boost charge and battery test control will not be executed by the system. No battery test control can be conducted when the rectifier communication is interrupted. After the battery test, the management mode will be changed from 'Manual' to 'Auto' automatically.

2) RectTrim: Range: 42V ~ 58V. The control voltage value of this parameter cannot exceed the overvoltage alarm point, otherwise, the parameter will be invalid.

3) RectLimit: Range: 10% ~ 121%.

4) Rect: The operations for a single rectifier include: DC On/Off, AC On/Off and Reset.

Operation method:

Use ▲ or ▼ to select the rectifier parameter, and use ◄ or ► to change the rectifier serial No.. Then press the ENT key to confirm. The bottom row of the screen displays the rectifier ID automatically. Use ▲ or ▼ to move the cursor to the operation area (that is, 'DC On' in Figure 4-18), and use ◄ or ► to select the value, and then press the ENT key to confirm.

If a rectifier shuts down due to over-voltage, you can select the Reset order to reset the rectifier once. If the overvoltage fault disappears afterwards, this rectifier will resume normal operation; otherwise, the rectifier will shut down again. The control orders of RectTrim, RectLimit and single rectifier can be executed only when the system is in float charge state.

5. Press the ESC key to return to the MAIN MENU screen, and change the management mode from 'Manual' to 'Auto'. Then press the ESC key to return to the system information screen.

4.7 Setting Parameters

The power system parameters are divided into seven kinds: alarm, battery, AC, DC, rectifier, system and communication parameters. Without any special needs, you only need to reset the battery string and battery capacity according to system configuration and battery actual instance, and accept the factory settings for other parameters. The setting methods of parameters are given in the following sections.

4.7.1 Alarm Settings

At the Settings screen, press ▲ or ▼ to select the 'Alarm Settings' menu, then press the ENT key to enter the Alarm Settings screen, as shown in Figure 4-19.

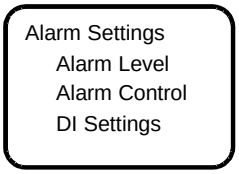


Figure 4-19 Alarm settings screen

There are three sub-menus shown as follows.

Setting alarm level

At the Alarm Settings screen, press ▲ or ▼ to select the 'Alarm Level' menu. Then press the ENT key to enter the Alarm Level screen, as shown in Figure 4-20.

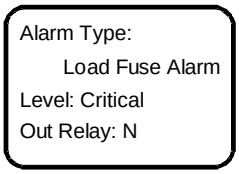


Figure 4-20 Alarm level screen

Press ▲ or ▼ to move the cursor to the needed option. Press ◄ or ► to select the corresponding content and press the ENT key to confirm.

The controller alarms are classified into four types: critical alarm, major alarm, observation and no alarm.

Critical alarm, major alarm: These two types of alarms have strong impacts on the power system performance. Whenever these alarms are generated, you are supposed to handle them immediately. The alarm indicators will be on and audible alarm will be generated.

Observation alarm: When this type of alarm is generated, the power system maintains normal DC output for a while. If the alarm occurs during watch time, it should be handled immediately. If the alarm occurs during non-watch-time, handle it during watch time. The alarm indicators will be on when observation alarm occurs.

No alarm: No visual or audible alarm.

The alarm and its default value of the controller are listed in Table 4-5.

Table 4-5 Description of alarm setting parameter

No.	Alarm	Description	Alarm level	Related relay	Related parameter
1	SPD Fault	Lighting protection circuit failure	Critical	None	
2	DI	The alarm name is user-defined, at most 10 letters. In this system, eight DIs can be defined. Among which, the first DI is defined as 'SPD Fault', the other seven DIs can be defined by the user	No alarm	None	
3	AC Voltage High	The AC input voltage is higher than the setting of AC input over-voltage alarm point	Critical	None	Over-voltage alarm
4	AC Voltage Low	The AC input voltage is lower than the setting of AC input under-voltage alarm point	Critical	None	Low-voltage alarm
5	Mains Failure	All the AC input voltages from the rectifier are less than 80V	Major	1	
6	DC Volt High	The DC output voltage is higher than the setting of DC output over-voltage alarm point	Critical	2	Over-voltage alarm
7	DC Volt Low	The DC output voltage is lower than the setting of DC output under-voltage alarm point	Critical	2	Low-voltage alarm
8	DC Volt Under	DC output voltage lower than the setting of 'DC output under- voltage alarm point'	Observation	None	Under-voltage alarm
9	Batt Over Temp	The battery temperature is higher than the setting of over-temperature point	Critical	None	Over Temp alarm point
10	Batt Temp High Alarm	The battery temperature is higher than the setting of high temperature point	Observation	None	High Temp alarm point
11	Batt Temp Low Alarm	The battery temperature is lower than the setting of low temperature point	Observation	None	Low Temp alarm point
12	Ambient Temp High Alarm	The ambient temperature is higher than the setting of high temperature point	Observation	None	High Temp alarm point
13	Ambient Temp Low Alarm	The ambient temperature is lower than the setting of low temperature point	Observation	None	Low Temp alarm point
14	T No Probe	Configured with temperature sensor, but not connected	Critical	None	
15	Sensor Fault	The temperature sensor measures unreasonable temperature	Critical	None	
16	LVD 1	Load low voltage disconnects manually	Critical	5	LLVD enabled
17	LVD 2	Battery low voltage disconnects manually	Critical	4	BLVD enabled
18	Load Fuse Alarm 1 ~ 6	Load failure caused by overload, short circuit, manual disconnect, or alarm circuit failure	Critical	None	
19	Aux Load Fails	The last load fuse fails	Critical	None	
20	Batt Fuse Alarm 1 ~ 2	Battery failure caused by overload, short circuit, manual disconnect, and alarm circuit failure	Critical	None	
21	Batt 1 Curr High	The charging current of battery string 1 is higher than the setting of charging over current limit	Observation	None	Over current point
22	Batt 2 Curr High	The charging current of battery string 2 is higher than the setting of charging over current limit	Observation	None	Over current point
23	Rect AC Fail	The AC input voltage of this rectifier is lower than under-voltage alarm point	Major	3	
24	Rect Over Temp	The internal temperature of the rectifier is higher than 90°	Observation	3	
25	Rect Failure	The rectifier voltage is higher than upper limit voltage	Critical	3	
26	Rect Protect	The rectifier performs self-protection and has no output	Observation	3	
27	Rect Fan Fails	Rectifier fan failure	Major	3	
28	Rect Derated	The rectifier limits its output power	Observation	3	
29	Rect Not Respond	The rectifier does not communicate with the monitoring unit	Major	3	
30	HVSD	The rectifier shuts down under high voltage	Major	3	
31	Multi-Rect Alarm	More than two rectifiers alarm	Critical	None	
32	Self-detect Err	Hardware self-detect error	No alarm	None	
33	Manual Mode	The battery management is in 'Manual' mode	No alarm	None	
34	Non Float Status	The battery is not under float charge status	No alarm	None	
35	Batt Discharge	The battery is discharging	Observation	None	

No.	Alarm	Description	Alarm level	Related relay	Related parameter
36	Load Share Alarm	In the system with load current shunt, the sampled load current plus battery current differs greatly from rectifier current	No alarm	3	
37	Batt Test Fail	The battery discharging time is shorter than expected time	Observation	None	
38	Short Test Fail	In short test, the battery discharging capacity is bigger than setting value	Observation	None	
39	Volt Discrepancy	The actual output voltage is different from both the measured DC bus voltage and the voltage reported by the rectifier to monitoring unit. The error is bigger than 1V	Observation	None	
40	Maintain Alarm	Time to maintain the system	Observation	None	
41	Rectifier Lost	The monitoring unit has detected a reduction in the number of running rectifiers	Critical	None	
42	Save Power	The system is running under energy saving status	No alarm	None	

Setting alarm control

At the Alarm Settings screen, press ▲ or ▼ to select the 'Alarm Control' menu. Then press the ENT key to enter the Alarm Control screen, as shown in Figure 4-21.

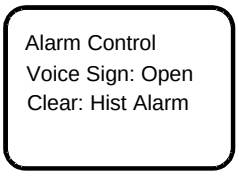


Figure 4-21 Alarm control screen

'Voice Sign' option includes: open, off, 3min, 10min, 1h, 4h. You can set it according to your requirements.

'Clear: Hist Alarm' option includes: Hist Alarm, Rect Lost, TestFail, ShortTest, ESaveFail and Maintain. If you press the ENT key, the corresponding alarm information saved in the controller will be cleared.

DI settings

DI settings only have an impact on user-defined DI alarm. At the Alarm Settings screen, press ▲ or ▼ to select the 'Active: High' menu, then press the ENT key to enter the DI Settings screen, as shown in Figure 4-22.

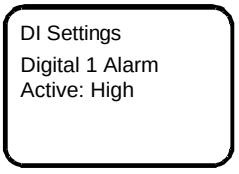


Figure 4-22 DI settings screen

Press ▲ or ▼ to select the needed option. Press ◄ or ► to select the parameter value and press the ENT key to confirm. Press ▲ or ▼ to modify the number and letter of DI name on the third row after pressing the ENT key to confirm, and press ◄ or ► to move the cursor left or right, and then input '#' to end. Finally, press the ENT key to confirm. The value description of the alarm setting parameter is listed in Table 4-6.

Table 4-6 Description of the alarm parameter setting

Parameter	Range	Factory setting	Value description
DI No.	1 ~ 8	1	The eight corresponding connecting terminals, queued up in the order that the hardware switches are put
DI Name	Figures or letters, 10 at most	SPD	When there are DI alarms, this parameter shows the alarm name you have defined
Alarm Mode	High, Low	Low	High: alarm upon high level; low: alarm upon low level

4.7.2 Battery Settings

Battery parameters are important, because they are related to the life of battery.

At the Settings screen (see Figure 4-6), press ▲ or ▼ to select the 'Bat. Settings' menu, then press the ENT key to enter the BAT Settings screen, as shown in Figure 4-23.

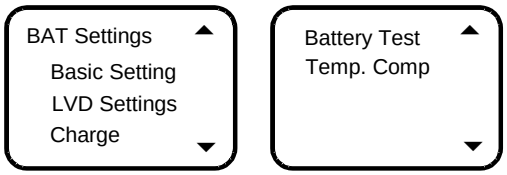


Figure 4-23 BAT settings screen

The battery parameters include: 'Basic Setting', 'LVD Setting', 'Charge', 'Battery Test' and 'Temp. Comp'. The setting methods of the battery parameters are given as follows.

Basic parameters

1. At the BAT Settings screen, press ▲ or ▼ to select the 'Basic Setting' menu, then press the ENT key to enter the basic battery parameter setting screen, as shown in Figure 4-24.

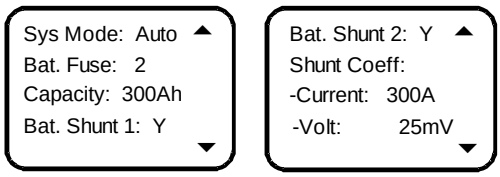


Figure 4-24 Basic battery parameter setting screen

2. Press ▲ or ▼ to select one screen or one of the parameters, and press ◄ or ► to select the parameter value. Then press the ENT key to confirm, and the controller will automatically save the setting value.

The value description of the basic battery parameters is listed in Table 4-7.

Table 4-7 Description of the basic battery parameter setting

Parameter	Range	Factory setting	Value description
Sys Mode	Auto, Manual	Auto	In the Auto mode, you can manage the system through the controller. In the Manual mode, you can manage the system manually, and the controller calculates the battery boost charge time protection and capacity automatically. When the system has DC undervoltage alarm, the parameter can automatically switch to the 'Auto' mode
Bat. Fuse	0 ~ 2	2	You should set this parameter according to the actual battery fuse configuration
Capacity	50Ah ~ 5000Ah	300Ah	The capacity sum of the total battery strings connected with each shunt. You should set this parameter according to the actual battery configuration
Bat. Shunt1	Y, N	Y	You can set the shunt parameters only when the system type is SET
Bat. Shunt2	Y, N	Y	
Shunt Coeff -Current	1A ~ 5000A	500A	
Shunt Coeff -Volt	1mV ~ 500mV	25mV	

LVD parameters

At the BAT Settings screen, press ▲ or ▼ to select the 'LVD Settings' menu. Then press the ENT key to enter the LVD Settings screen, as shown in Figure 4-25.

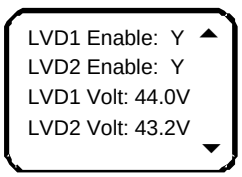


Figure 4-25 LVD settings screen

Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value. Then press the ENT key to confirm.

LVD1 means the controller receives power supply from the battery upon AC power-off, so the non-priority load will be powered off automatically. In this way, the battery remaining capacity can sustain the priority load longer.

LVD2 means the controller receives power supply from the battery upon AC power-off, so the battery will be powered off automatically. In this way, the battery over-discharge can be avoided.

The value description of the LVD parameters is listed in Table 4-8.

Table 4-8 Description of the LVD parameter setting

Parameter	Range	Factory setting	Value description
LVD1 Enable	Y, N	Y	Select 'Y' to enable the LVD1/LVD2 function; Select 'N' to disable the LVD1/LVD2 function
LVD2 Enable		Y	
LVD1 Volt	40V ~ 60V	44.0V	Select the battery voltage, when the battery voltage is lower than the preset LVD1 Volt, the load will be disconnected, and so does the battery when the battery voltage is lower than the preset LVD2 Volt
LVD2 Volt		43.2V	

Charge management parameters

At the BAT Settings screen, press ▲ or ▼ to select the 'Charge' menu, then press the ENT key to confirm.

There are five screens, as shown in Figure 4-26.

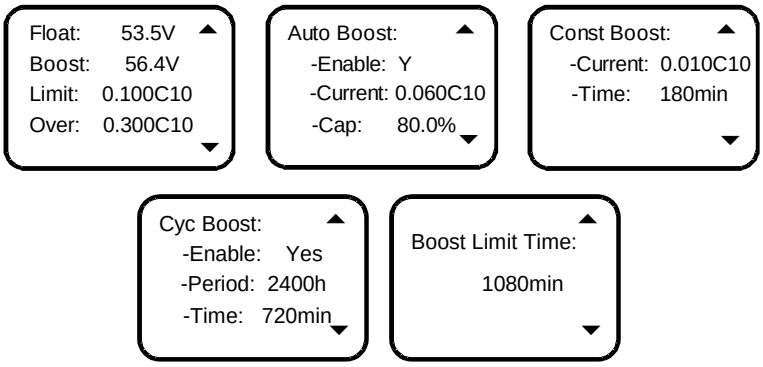


Figure 4-26 Charge management settings screen

Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value. Then press the ENT key to confirm.

The value description of the charge parameters is listed in Table 4-9.

Table 4-9 Description of the charge parameter setting

Parameter	Range	Factory setting	Value description
Float	42V ~ 58V	53.5V	The rectifier output voltage in FC state
Boost		56.4V	The rectifier output voltage in BC state. The Boost must be higher than the Float
Limit (current limit point)	0.1C10 ~ 0.25C10	0.1C10	The maximum battery charging current. C10 is the battery nominal capacity, which is generally set to 10% ~ 20% of the capacity of one battery string
Over (over current point)	0.3C10 ~ 1.0C10	0.3C10	When the battery charging current is higher than the 'Over' value, the controller will generate the battery charge over-current alarm
Automatic Boost -Enable	Y, N	Y	Select 'Y' to enable this function; Select 'N' to disable this function
Automatic Boost -Current	0.050C10 ~ 0.080C10	0.06C10	The controller will control the system to enter the BC state when the battery capacity decreases to the value of 'To Boost Cap', or when the charging current reaches the 'To Boost Current'. The battery charging voltage is the 'Boost' value
Automatic Boost -Cap	10% ~ 99%	80%	
Const Boost -Current	0.002C10 ~ 0.02C10	0.01C10	The system in BC state will enter the FC state automatically when the charging current decreases to the 'Const Boost Current' value and after the 'Const Boost Time'. The battery charge voltage then will be the Float state
Const Boost -Time	30min ~ 1440min	180min	
Cyclic Boost -Enable	Y, N	Y	Select 'Y' to enable this function Select 'N' to disable this function

Parameter	Range	Factory setting	Value description
Cyclic Boost -Period	48h ~ 8760h	2400h	The 'Cyc Boost Period' is the interval between two cyclic BCs. The battery charging voltage is the 'Boost' value, and the charging time is the 'Cyc Boost Time'
Cyclic Boost -Time	30min ~ 2880min	720min	
Boost Limit Time	60min ~ 2880min	1080min	During the BC state, to ensure the system safety, the controller will forcibly control the system to enter the FC state, when the BC time reaches the 'BoostLimitTime'

The BC/FC switchover diagram is shown in Figure 4-27.

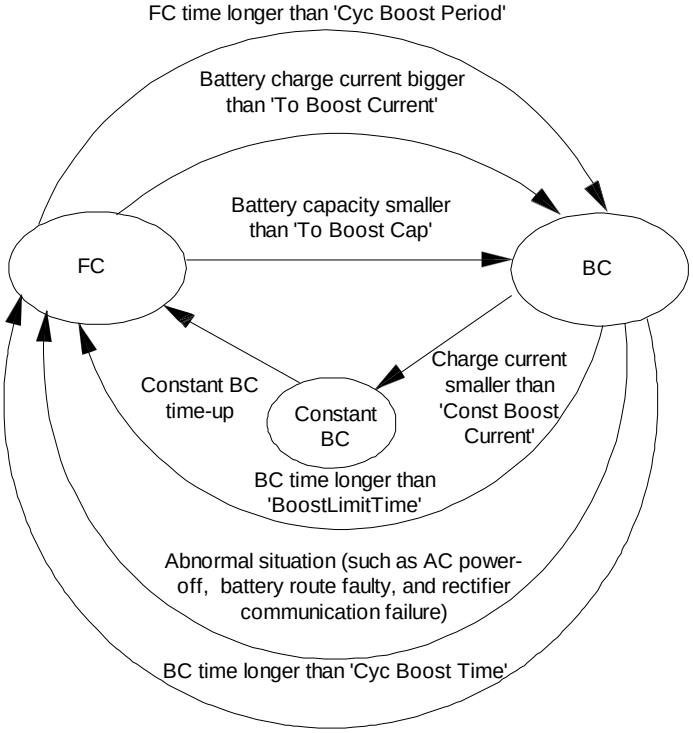


Figure 4-27 BC/FC switchover diagram

Battery test parameters

1. At the BAT Settings screen, press ▲ or ▼ to select the 'Battery Test' menu, then press the ENT key to confirm. There are five screens, as shown in Figure 4-28.

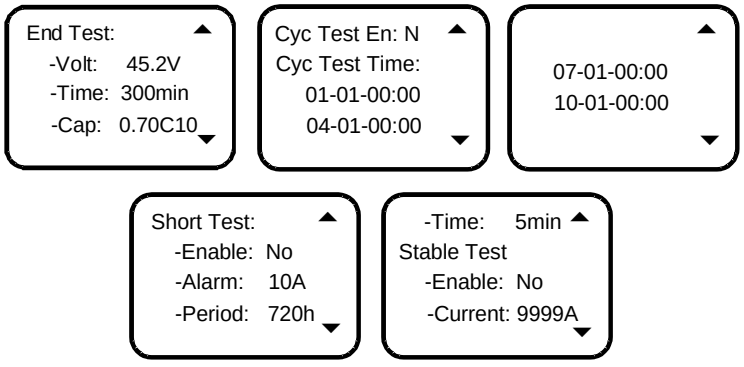


Figure 4-28 Battery test settings screen

2. Press ▲ or ▼ to select one screen or one of the parameters, and press ◄ or ► to select the parameter value. Then press the ENT key to confirm and save the change.

The controller can do battery test, and record 10 groups of battery test data (accessible only through the host). After the battery test is started, the controller will adjust the rectifier output voltage to the setting value of the 'End Test Volt', then the battery discharge will begin. The controller will stop the battery test if the battery voltage reaches the 'End Test Volt', or the discharge time reaches the 'End Test Time', or the battery capacity reaches the 'End Test Cap'. Afterwards, it will restore the rectifier output voltage to the normal FC voltage, begin the battery charge and switch the system to battery auto-management.

Meanwhile, the test start time-voltage, end time-voltage and battery remaining capacity will be recorded. The records can be queried through the host. During the battery test, if abnormalities occur, the controller will stop the battery test automatically. The value description of the battery test parameters is listed in Table 4-10.

Table 4-10 Description of the battery test parameter setting

Parameter	Range	Factory setting	Value description
End Test Volt	43.1V ~ 57.9V	45.2V	The controller will stop the battery test and switch to FC state if the battery voltage reaches the 'End Test Volt', or the discharge time reaches the 'End Test Time', or the battery capacity reaches the 'End Test Cap'
End Test Time	5min ~ 1440min	300min	
End Test Cap	$0.01C_{10}$ ~ $0.95C_{10}$	$0.7C_{10}$	
Cyc Test En	Y, N	Y	Select 'Y' to enable this function; Select 'N' to disable this function
Cyc Test Time	Month, day, time	01-01-00:00	When the parameter 'Cyc Test En' is set to 'Y', the controller will test the battery according to the 'Cyc Test Time'
		04-01-00:00	
		07-01-00:00	
		10-01-00:00	
Short Test Enable	Y, N	y	Whether using the short test function
Short Test Alarm	1A ~ 100A	10A	The short test is used for discharge test comparison of the two battery strings. The inspection for the battery feature is valuable when one battery is not discharged for a long time. If the battery is not discharged within the 'ShortTest Period', the controller will start a short test, whose operation time is set by the parameter 'ShortTest Time'. By the end of the test, if the difference in the discharge currents of the two battery strings is bigger than the 'Short Test Alarm', the battery discharge abnormal alarm will be generated
Short Test Period	24h ~ 8760h	720h	
Short Test Time	1min ~ 60min	5min	
Stable Test Enable	Y, N	N	The stable test is conducted with constant battery discharge current. To execute the stable test, the present load current should be bigger than the current value set by stable test. The stable test is suitable for bigger load and relative stable load current, otherwise, do not exercise it. The current value is set through the parameter 'Stable Test Current'. If the parameter 'StableTest Enable' is set to 'Y', the test will be started once the battery satisfies the test condition
Stable Test Current	0 ~ 9999A	9999A	

The schematic diagram of the test function is shown Figure 4-29.

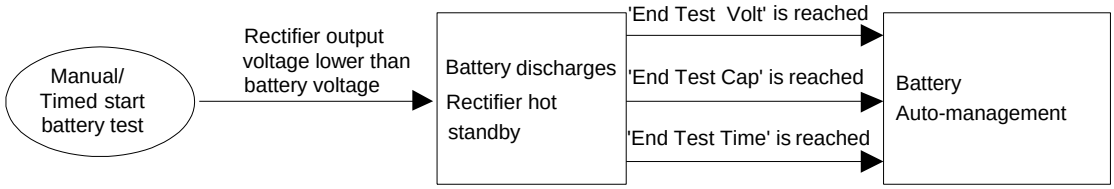


Figure 4-29 Schematic diagram of the test function

Temperature compensation parameters

1. At the BAT Settings screen, press ▲ or ▼ to select the 'Temp. Comp' menu, then press the ENT key to confirm. There are two screens, as shown in Figure 4-30.

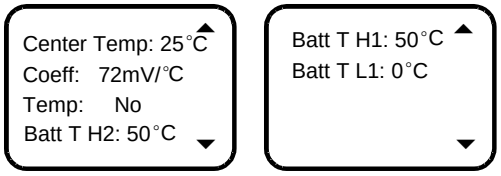


Figure 4-30 Temperature compensation settings screen

2. Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value. Then press the ENT key to confirm and save the change.

The value description of the temperature compensation parameters is listed in Table 4-11.

Table 4-11 Description of the temperature compensation parameter setting

Parameter	Range	Factory setting	Value description
Center Temp	10°C ~ 40°C	25°C	FC voltage derated value = (Batt Temp – 'Center Temp') * Temp Coeff. In the case of rectifier communication interruption, DC over/undervoltage or battery fuse alarm, the controller will not do temperature compensation to the battery FC voltage
Coeff	0 ~ 500mV/°C	72mV/°C	
Temp	Ambient Temp, None, Battery Temp	None	Amb Temp: The temperature measured by sensor is the ambient temperature; Batt Temp: The temperature measured by sensor is the battery temperature; None: No temperature is measured by sensor
Batt T H2	-40°C ~ +100°C	50°C	When the detected battery temperature is higher than Batt T H2/Batt T H1, the controller will generate an alarm
Batt T H1	-40°C ~ +100°C	50°C	
Batt T L1	-40°C ~ +100°C	0°C	The controller will generate an alarm when the detected battery temperature is lower than Batt T L1

4.7.3 AC Settings

At the Settings screen, press ▲ or ▼ to select the 'AC Settings' menu, then press the ENT key to enter the AC Settings screen, as shown in Figure 4-31.

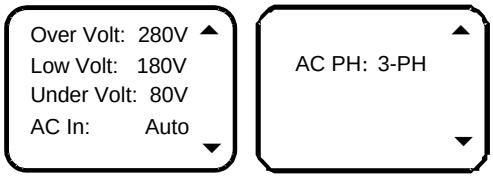


Figure 4-31 AC settings screen

Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value, then press the ENT key to confirm.

The value description of the AC parameters is listed in Table 4-12.

Table 4-12 Description of the AC parameter setting

Parameter	Range	Factory setting	Value description
Over Volt	50V ~ 300V	280V	The controller will generate an AC over-voltage alarm when the AC input voltage is higher than the setting value
Low Volt	50V ~ 300V	180V	The controller will generate an AC low-voltage alarm when the AC input voltage is lower than the setting value The value of the Low Volt must be lower than that of the Over Volt
Under Volt	50V ~ 300V	80V	Set it according to the actual requirement
AC In	Auto, No, Manual	Auto	Set it according to the AC input mode of AC sampling board. Choose 'N' if the AC sampling board is not configured
AC PH	1-PH, 3-PH	3-PH	Set it according to the actual configuration. Choose '1-PH' or '3-PH' if the AC sampling board is configured

4.7.4 DC Settings

At the Settings screen, press ▲ or ▼ to select the 'DC Settings' menu, then press the ENT key to enter the DC Settings screen, as shown in Figure 4-32.

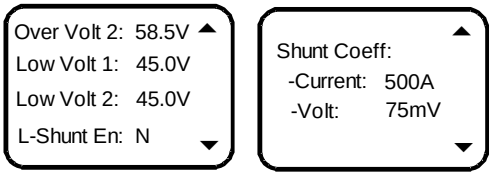


Figure 4-32 DC settings screen

Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value, then press the ENT key to confirm. The value description of the DC parameters is listed in Table 4-13.

Table 4-13 Description of the DC parameter setting

Parameter	Range	Factory setting	Value description	
Over Volt	40V ~ 60V	58.5V	The DC OverVolt alarm will be generated when the system DC voltage is higher than the setting value	The values of these three parameters should be: Over Volt > Low Volt 1 > Low Volt 2
Low Volt 1		45.0V	The DC Low Volt1 alarm will be generated when the system DC voltage is lower than the setting value	
Low Volt 2		45.0V	The DC Low Volt2 alarm will be generated when the system DC voltage is lower than the setting value	
L-Shunt	Y, N	N	Set it according to the actual instance	
Shunt Coeff -Current	1A ~ 5000A	-	They can be set when the shunt options are 'SET' in the system with load shunt	
Shunt Coeff -Volt	1mV ~ 500mV	-		

4.7.5 Rectifier Settings

At the Settings screen, press ▲ or ▼ to select the 'Rect Settings' menu, then press the ENT key to confirm. There are three screens, as shown in Figure 4-33.

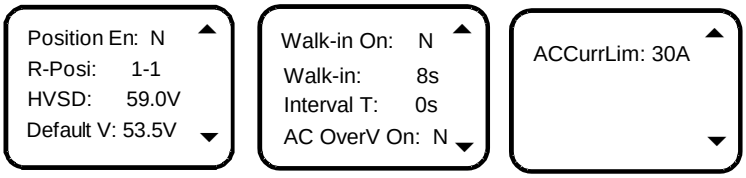


Figure 4-33 Rectifier settings screen

Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value, then press the ENT key to confirm. The value description of the rectifier parameters is listed in Table 4-14.

Table 4-14 Description of the rectifier parameter setting

Parameter	Range	Factory setting	Value description
Position En	Y, N	Y	Y: The controller will prompt you to set the rectifier position after the rectifier and controller are powered on. N: You do not need to set the rectifier position
R-Posi	1 ~ 30		R-Posi: represented in two figures, the first figure represents the rectifier number, the next figure represents the position number. Press the ENT key to select the rectifier, press ◄ or ► to change the position number. When the controller is communicating with a rectifier, the green indicator on the corresponding rectifier will blink
HVSD	56V ~ 59V	59V	The rectifier over-voltage alarm will be generated when the rectifier output voltage is higher than the setting value
Default V	48V ~ 58V	53.5V	'Default V' output occurs when rectifier communication is interrupted. This setting value must be lower than the 'HVSD' voltage value
Walk-in On	Y, N	N	It means the rectifier voltage will rise from 0V to the 'Default V' value after the 'Walk-in T' value
Walk-in	8s ~ 128s	8s	
Interval T	0s ~ 10s	0s	The controller can set the DC-DC interval start of the system rectifiers. Start time = rectifier address * interval
AC OverV On	Y, N	N	The controller can set the rectifier to 'Over Volt En', meanwhile, the rectifier can start forcibly. The controller will automatically set the rectifier with least address to have this function. If the rectifier always exceeds the normal voltage for 60s, the function will be cancelled automatically
ACCurrLim	1A ~ 50A	30A	The controller limits the input current of the rectifier within the AC current limit range

4.7.6 System Settings

At the Settings screen, press ▲ or ▼ to select the 'Sys Settings' menu, then press the ENT key to enter the password confirmation screen. After inputting the correct password (user level password, default: 1), the three screens shown in Figure 4-34 are displayed.

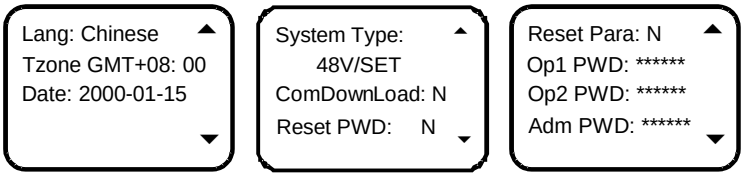


Figure 4-34 Settings screen upon user level

If the 'Rest Para' is set to 'Y', press the ENT key and prompt a screen shown in Figure 4-35.

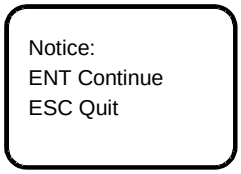


Figure 4-35 Prompt screen for resetting system

Press the ESC key to cancel the resetting. Press the ENT key to execute the resetting. At this time, all the parameters will return to the default value. It is recommended to execute system resetting when the controller cannot work normally through the method of powering off or restoration.

Press ▲ or ▼ to select the parameter you need, and press ◄ or ► to select the parameter value, then press the ENT key to confirm.

The value description of the system parameters is listed in Table 4-15.

Table 4-15 Description of the system parameter setting

Parameter	Range	Factory setting	Value description
Lang	Chinese, English	English	Set it according to your need
Tzone	-	-	Set it according to actual instance
Date	2000 ~ 2099	-	Set the time according to the current actual time, regardless of whether it is a leap year or not
System Type	24V/100 24V/300 24V/500 24V/1000 24V/SET 48V/100 48V/300 48V/500 48V/1000 48V/SET	PS48300-3B/1800: 48V/300	The system type of the controller has been set according to the actual instance before the controller is delivered with power system. You do not need to change the value except that the controller needs to be replaced with a new one. After changing the type, the controller will restart and other parameters will resume the default. You need to change some parameters according to the battery and other equipment configured with the system
ComDownLoad	Y, N	N	
Reset PWD	Y, N	N	Whether resetting the password to the default
Reset Para	Y, N	N	Whether resetting the parameters to the defaults
Op1 PWD	-	-	The password can be six digits long at most. If it is shorter than six digits, end it with a #. Use ▲ or ▼ to change the number, and ◄ or ► to move the cursor left or right. Press the ENT key to confirm. You should input the same number twice to validate the setting
Op2 PWD	-	-	
Adm PWD	-	-	

4.7.7 Communication Settings

At the Settings screen, press ▲ or ▼ to select the 'Comm Settings' menu, then press the ENT key to enter the screen shown in Figure 4-36.

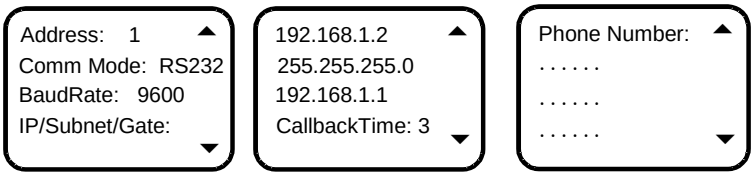


Figure 4-36 Communication settings screen

When the communication mode is set to 'Modem', the callback phone number and callback time should be set. Use ◄ or ► to modify the number and move the cursor to left or right to change the callback phone number, then press the ENT key to confirm. The value description of the communication parameters is listed in Table 4-16.

Table 4-16 Description of the communication parameter setting

Parameter	Range	Factory setting	Value description
Address	1 ~ 254	1	The addresses of the power systems in the same monitored office should be different
Comm Mode	Modem	RS232	The power system only supports RS232 communication mode
BaudRate	1200bps ~ 9600bps	9600bps	Make sure that the baud rates of both sending and receiving parties are the same
IP/Subnet/Gate	-	-	Set it according to the actual instance
CallbackTime	-	-	
Phone Number	-	-	

4.8 Energy Saving Settings

The Energy Saving is a sub-menu of the main menu. At the MAINMENU screen, press ▲ or ▼ to select the 'Energy Saving' menu, then press the ENT key to enter the password confirmation screen. After inputting the correct password, the screen shown in Figure 4-37 is displayed.

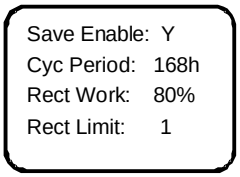


Figure 4-37 Energy saving screen

If you want the system to operate in energy saving mode, set 'Save Enable' to 'Y', otherwise, set it to 'N'. Set 'Cyc Period' according to the actual instance. The energy saving operating principle of the system is described below.

1. Operating principle

In energy saving mode, the controller will switch off some rectifiers, the operative rectifiers will power all loads. Each operative rectifier works on the best efficiency to improve utilization ratio of the rectifier and reduce energy consumption. After certain time (that is, 'Cyc Period' shown in Figure 4-37), the previously inoperative rectifiers will work, while the previously operative rectifiers will stop work. The two states alternate to make sure that the working hours of the rectifiers in the system approach. If the battery current and load current change, the controller will switch off some operative rectifiers or switch on some inoperative rectifiers, according to the actual condition. In any case, the system guarantees at least one rectifier to work.

2. Prerequisite

If the battery is configured and the load current has no instant shock, the system will operate in energy saving mode, that is, 'Save Enable' is set to 'Y'.

3. Advantage

- Working on the best efficiency to save energy.
- Balancing working hours of the rectifiers to prolong the life of the rectifier.
- In shutdown state, preventing rectifiers from being damaged by AC inrush to reduce lightning fault.

4. Abnormal situation handling

- Switch on all the rectifiers when the busbar voltage is faulty (DC over-voltage or under-voltage).

- Switch on all the rectifiers when a rectifier alarm (communication interruption) is generated.
- Switch on all the rectifiers when an AC alarm (AC power-off) is generated.
- Switch on all the rectifiers automatically when the system has no controller or the communication between the rectifier and the controller is interrupted.
- Delay implementation when the rectifier receives shutdown command, immediately execute when the rectifier receives startup order.

The value description of the energy saving parameters is listed in Table 4-17.

Table 4-17 Description of the energy saving parameter setting

Parameter	Range	Factory setting	Value description
Save Enable	Y, N	Y	It can be set to 'Y' only when the battery is configured with no instant load current shock
Cyc Period*	1h ~ 8760h	48h	Time of rectifier is in power-on state and power-off state, it can be set according to the actual requirement
Rect Work	30% ~ 90%	80%	Output capacity percentage. More rectifiers will start to work when larger than this setting percentage
Rect Limit	1 ~ 30	1	Minimum number of the rectifier in energy saving state
Note*: Cyc Period, Rect Work and Rect Limit are available only when 'Save Enable' is set to 'Y'			

4.9 Fast Settings

The Fast Settings is a sub-menu of the main menu. At the MAINMENU screen, press ▲ or ▼ to select the 'Fast Settings' menu, then press the ENT key to enter the password confirmation screen. After inputting the correct password, the screen shown in Figure 4-38 is displayed.

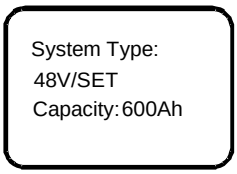


Figure 4-38 Fast settings screen

At the Fast Settings screen, you can set the system type and battery capacity, as listed in Table 4-18.

Table 4-18 List of fast settings

Parameter	Range	Factory setting	Value description
System Type	24V/100 24V/300 24V/500 24V/1000 24V/SET 48V/100 48V/300 48V/500 48V/1000 48V/SET	NetSure 731 C62：48V/300 NetSure 731 CC2：48V/500	The system type of the controller has been set according to the actual instance before the controller is delivered with power system. You do not need to change the value except that the controller needs to be replaced with a new one. After changing the type, the controller will restart and other parameters will resume the defaults. You need to change some parameters according to the battery and equipment configured with the system
Capacity	50Ah ~ 5000Ah	300Ah	The total capacity of the batteries connected with each shunt. You should set this parameter according to the actual battery configuration

Chapter 5 Technical Parameters of Rectifier

This chapter introduces the appearance and structure, functions and features, and technical parameters of the rectifier.

5.1 Appearance and Structure

Front panel

The front panel of the rectifier has three indictors, as shown in Figure 5-1.

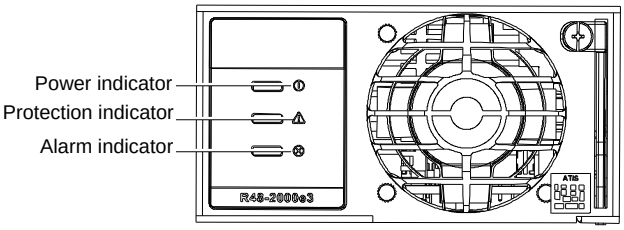


Figure 5-1 Front panel of the rectifier

The description of the indicator function is shown in Table 5-1.

Table 5-1 Description of the indicator function

Abnormal	Alarm	Abnormal state	Suggested Action(s)
Power indicator	No alarm	No input, output voltage	Restore the input, output voltage
		Auxiliary power source failure	Change the position of the abnormal rectifier and normal rectifier, if the abnormal rectifier does not work, replace the rectifier
Protection indicator on	Rectifier over-temperature	Fan rotor blocked	Remove any object that may be blocking a fan rotor.
		Ventilation blocked	Remove any object that may be blocking the inlet or outlet.
		Ambient temperature too high or rectifier inlet too close to a heat source.	Lower the ambient temperature; relocate the heat source.
	Rectifier protection	Rectifier load sharing imbalance	Check whether the communication of the rectifier is normal, if no, check whether the communication cable connection is normal, if the connection is abnormal, replace the faulty rectifier.
		PFC output over/under voltage protection	Change the position of the abnormal rectifier and normal rectifier, if the abnormal rectifier doesnot work, replace the rectifier
		AC input out the normal range	Correct the AC input voltage to within the acceptable range.
Protection indicator flashing	Rectifier communication failure	Communication failure between controller and rectifier	Check whether the communication cable connection is normal
Alarm indicator on	Rectifier failure	Rectifier overvoltage	Pull out the rectifier and restart, if overvoltage persists, replace the rectifier
		Two or more rectifiers have the same ID in one system	Contact Vertiv for repair
Alarm indicator on	System current sharing imbalance	Rectifier severe load sharing imbalance	Check whether the communication of the rectifier is normal, if no, check whether the communication cable connection is normal, if the connection is abnormal, replace the faulty rectifier.
Alarm indicator flashing	Faulty rectifier fan	Faulty rectifier fan	Replace the fan.

Rear panel

There are AC input socket and DC output socket on the rear panel of the rectifier, as shown in Figure 5-2.

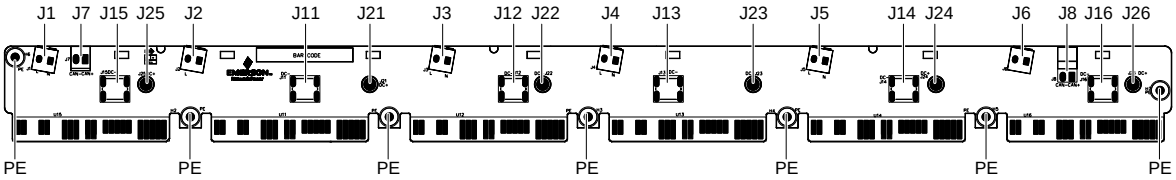


Figure 5-2 Rear panel of the rectifier

Functions of the socket pins are listed in Table 5-2.

Table 5-2 Pin functions

Socket	Pin	Function
AC input socket	J1	Rectifier 1 AC input
	J2	Rectifier 2 AC input
	J3	Rectifier 3 AC input
	J4	Rectifier 4 AC input
	J5	Rectifier 5 AC input
	J6	Rectifier 6 AC input
	PE	Rectifier AC earthing
DC output socket	J11 ~ J16	Negative pole of the DC output
	J21 ~ J26	Positive pole of the DC output
	J7	CAN/matching resistance
	J8	Matching resistance/CAN

5.2 Functions And Features

Hot swappable

The rectifier is hot pluggable. When the rectifier is plugged into or removed from the system which is powered on, the system or module will not be damaged.

Active load-sharing

When the loads (60 rectifiers at most) range from 10% ~ 100%, rectifiers in the same cabinet can perform load sharing, and maintain the average current difference of the rectifiers within ± 2A. Current sharing condition: 220V input, 53.5V output, loads range from 10% ~ 100%.

Power limiting based on input voltage

The rectifier can output its maximum power (3000W) when the input voltage ranges from 176Vac to 305Vac. The rectifier can work normally (but in linear power limiting mode) when the input voltage ranges from 85Vac to 176Vac. The relationship between the output power and input voltage is shown in Figure 5-3.

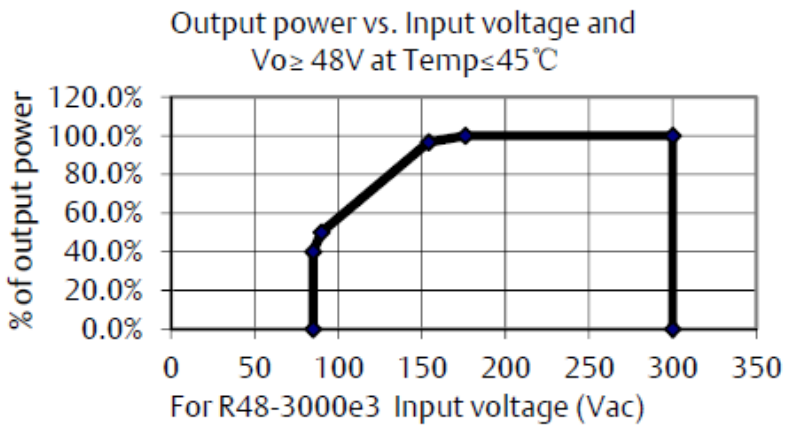


Figure 5-3 Relationship between output power and input power

Output characteristics

The relationship between output voltage and current is listed in Table 5-4.

Table 5-3 Output characteristics

Output power	Output current	Output voltage
3000W	51.7A	58Vdc
3000W	62.5A	48Vdc

Power limiting based on temperature

Rectifier can work in the range of -40°C to 70°C;

The input voltage range: 176V ~ 264V;

Temperature in the range of -40°C ~ 45°C, outputs full power: 3000W;

Temperature in the range of 45°C ~ 55°C, derating from 3000W to 2900W;

Temperature in the range of 55°C ~ 65°C, derating from 2900W to 2250W;

Temperature in the range of 65°C ~ 70°C, derating from 2250W to 0W.

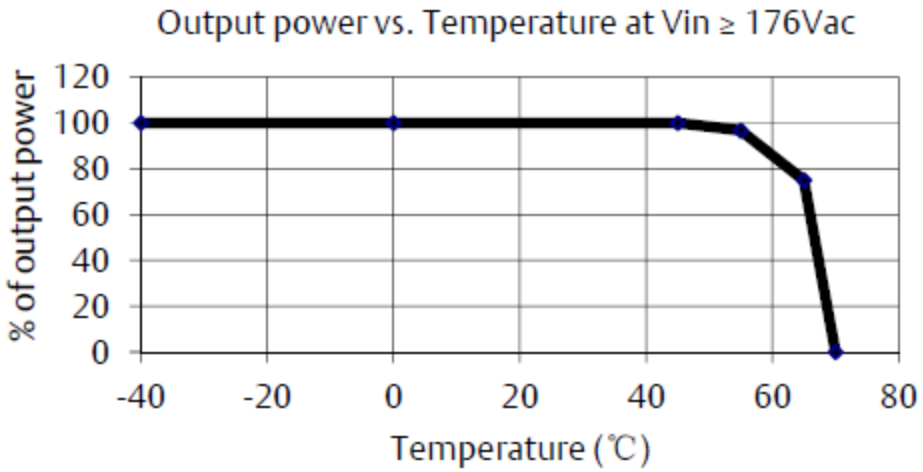


Figure 5-4 Output power and temperature

Output current limiting adjustment

The maximum current of the rectifier can range from 10% to 120% of the full load through the controller programming. If the controller communication fails, the default rectifier current is 100% of the full load rated power. The full load rectifier is defined as the maximum available current (62.5A) in the output load range. The rectifier can start as long as connected to a fully discharged battery or capacitor bank. There is no need to run the rectifier protection device, manual intervention is also unnecessary.

Output voltage regulation

Nominal output voltage: -48V DC, positive earthing. Adjustable within the range: -42V from -58V. User can regulate the range through the controller, regulation precision is ± 0.1V.

Fan control

When the input voltage is in the normal range, the in-built processor will regulate the fan speed (stepless regulation) according to the internal temperature and output power of the rectifier. For example, the fan speed increases with the rectifier temperature or the output power. The rectifier can be set to full speed through the corresponding controller.

Input over/under voltage protection

When the input voltage is less than 80Vac, the yellow indicator will be on, and the rectifier will stop working. When the input voltage returns to the normal range, the rectifier will automatically work in normal state. Low input voltage will not trigger the corresponding input protection device.

When the input voltage exceeds 305Vac, the yellow indicator will be on, and the rectifier will stop working. When the input voltage returns to the normal range, the rectifier will automatically work in normal state.

The rectifier will report the event to the controller when overvoltage protection occurs.

Output overvoltage protection

1. The SW overvoltage protection point can be set through the controller, the setting range is 56V ~ 59V. It should be 0.5V higher than output voltage, and the default value is 59V.

The SW overvoltage protection mode can be selected through the controller:

1) Lock out at the first overvoltage

Once the output voltage reaches software protection point, the rectifier will shut down and hold that state. it requires manual resetting to restore the operation

2) Lock out at the second overvoltage (by default)

When the output voltage reaches the software protection point, the rectifier will shutdown, and restart automatically after 5 seconds. If the overvoltage happens again within a set time (default: 5min. Configurable through controller), the rectifier will shut down and hold that state. It requires manual resetting to restore the operation. If the output current is less than 10 percent of the rated output current, the rectifier will not shut down.

Manual resetting: Resetting can be done manually through the controller, or by removing the rectifier from system

Note

If the output current is less than 10 percent of the rated output current, the rectifier will not shut down.

2. Overvoltage hardware protection: When the output voltage (unadjustable) reaches the hardware protection point (58.5V ~ 60V), the rectifier will shutdown, and restart automatically after 5 seconds. If the overvoltage happens again within a set time (default: 5min. configurable through controller), the rectifier will shut down and hold that state. It requires manual resetting to restore the operation.

Overtemperature protection

Power limiting based on temperature

Each rectifier monitors the working temperature of the power-switching circuit. No matter in what reason (for instance, high ambient temperature or fan fault) the temperature increase + 35 °C, the rectifier will not power off. But it will limit the maximum power output, and then turn into the power limiting status to guarantee the power-switching circuit temperature is in the setting range. The operation at temperature from +35 °C to +70°C will minimize the output power. When the temperature dropped to about +35°C, the full power will restore.

Warning

The continuous running rated full power output temperature of the rectifier reaches up to +35°C full power. The operation at the temperature from +35°C to +70°C will minimize the output power. The operation at temperature above +70°C is abnormal, the running is temporary1.

1Temporary running at abnormal temperature: The continuous running time for temporary running in one day cannot exceed 8 hours, in one year cannot exceed 15 days (that is, it cannot exceed 120 hours in one year, the frequency cannot exceed 15 days).

PFC over/under voltage

If the inner bus voltage value exceeds the over/under voltage threshold, the rectifier would be shut down, and the yellow indicator would be on.

Communication failure

The yellow indicator on the rectifier panel will flash when the rectifier experiences a communication failure. To protect the battery, when the rectifier communication failure occurs, the rectifier output voltage will automatically adjust to 53.5V (according to actual need, different voltages can be preset). The yellow indicator on the rectifier panel will be normal when the rectifier communication is restored. Auto-recovery is enabled upon the clearing of the corresponding fault.

Fan fault protection

An alarm will be generated upon a fan fault. In such cases, the red indicator on the rectifier panel will flash, the rectifier will be off, no voltage output. Auto-recovery is enabled upon the clearing of the corresponding fault.

Imbalance output current

When there are multiple rectifiers in the power system, the rectifier with high load sharing error will be recognized automatically, and the yellow indicator on the panel will be on.

The failure information will be reported to the associated system controller and the controller will process the failure accordingly.

Monitoring function

There's a built-in digital signal processor in the rectifier. The processor monitors and controls the rectifier operation, and communicates with the controller in real time through the CAN bus. Table 5-5 lists the exchanged commands and information between the rectifier and controller.

Table 5-4 Exchanged information between the rectifier and controller

Receiving command and signal of the rectifier	Power on / Off, current marching technique on / off, overvoltage shutdown reset, current limiting regulation, voltage regulation
Controller information reported by the rectifier	Input voltage, output voltage, output current, current limiting setting, temperature, overvoltage setting, power on / off status, fault alarm (overvoltage shutdown, fan fault), protection information (input voltage protection, internal busbar voltage protection, high temperature protection), high temperature derating, input derating, input power failure, output current not sharing, address, code, date, software version, hardware version

5.3 Technical Parameters

Table 5-5 Technical parameters of the rectifier

Parameters	Name	Description
Environmental	Operating temperature	-5°C ~ 40°C (derating is necessary above 35°C, startup in -40°C)
	Relative humidity	≤ 95% , non-condensing
	Altitude	≤ 2000m, derating is necessary above 2,000m
	Cooling mode	Forced cooling
AC input	Input system	1-phase 3-wire
	Voltage range	85Vac ~ 305Vac
	Rated voltage	200Vac ~ 240Vac
	Max. static voltage upon no operation	415Vac
	Input current	< 22A
	Impact current upon startup	< 31A

Parameters	Name	Description
AC input	Input impact current	< 150% steady state input peak current
	Allow able grid frequency	45Hz ~ 65Hz
	Rated grid frequency	50Hz/ 60Hz
DC output	Voltage range	42V ~ 58V
	DC current	0 ~ 62.5A
	Total regulation	≤ ±0.6%
	Load regulation	≤ ±0.5%
	Voltage regulation	≤ ±0.1%
	Startup impact range	≤ ±1%
Mechanical parameters	Dimension	43.6mm (H) × 85.1mm (W) × 330mm (D)
	Weight	≤ 3kg

Chapter 6 Troubleshooting

This chapter describes the alarm handling and maintenance of the power system. The maintenance personnel must have adequate knowledge about the power system.

Note

1. The maintenance must be conducted under the guidance of related safety regulations.
2. Only trained personnel with adequate knowledge about the power system shall maintain the inner part of the cabinet.

6.1 Handling Alarms

The controller alarms are classified into four types: critical alarm, major alarm, observation and no alarm. The phenomenon and description of the alarm are shown in Table 6-1.

Table 6-1 Alarm description and phenomenon

Alarm level	Description	Phenomenon
Critical alarm, major alarm	These two types of alarms have strong impacts on the system performance. Whenever these alarms are generated, users are supposed to handle them immediately	The alarm indicator of the controller will be on and audible alarm will be given
Observation	When this type of alarm is raised, the power system maintains normal output for a while. If the alarm occurs during watch time, it should be handled immediately. If the alarm occurs during non-watch time, it should be handled during watch time	Only the alarm indicator of the controller will be on
No alarm	If alarms are set as 'no alarm' by users, when these alarms occur, no visual or audible indication will be generated and the power system works normally	None

The handling methods of common alarms are given in Table 6-2.

Table 6-2 Handling methods of common alarms

No.	Alarm	Handling method
1	Mains Failure	If the failure does not last long, the battery will power the load. If the cause is unknown or the failure lasts too long, a diesel generator is needed. Before using the generator power to supply the power system, it is suggested to run the generator five minutes to minimize the impact on the power system
2	AC Voltage High	Check if the AC over-voltage value is too low. If yes, change the value. A mild over-voltage does not affect the system operation. However, the rectifier will stop operation when the mains voltage is more than 530V. If the mains voltage is above the AC over-voltage value, the mains grid should be improved
3	AC Voltage Low	Check if the AC Under- voltage point is too high. If yes, change the value. When the mains voltage is lower than 304V, the output power of the rectifiers will be derated. And if lower than 260V, the rectifiers will stop working. If the mains voltage is under the AC under-voltage value, the mains grid should be improved
4	SPD failure	Check the SPD condition. If the SPD is damaged, replace it
5	DC Volt High	Check the DC over-voltage value through the controller. If the set value is inappropriate, correct it. Otherwise, find out the rectifier that has caused the alarm: 1. Ensure that the batteries can operate normally. 2. Switch off the AC input of all rectifiers. 3. Power on the rectifiers one by one. 4. If the over-voltage protection is triggered when a certain rectifier is powered on, that rectifier is the faulty one. Replace it
6	DC Volt Low	1. Check if the alarm is caused by mains failure, if yes, disconnect some loads to prolong the operation of the whole system. 2. Check the DC under-voltage value set through the controller. If the set value is inappropriate, correct it. 3. Check if any rectifier is inoperative, or has no output current. If yes, replace it. 4. Check if the total load current exceeds the total rectifier current during float charge. If yes, disconnect some loads or add more rectifiers to make the total rectifier current bigger than 120% of the total load current with one redundant rectifier

No.	Alarm	Handling method
7	Load Fuse Alarm, Batt Fuse Alarm	Check if the corresponding MCB is switched off. If the MCB is open, find out the fault and remove it. Otherwise, the alarm circuit is faulty. Please contact Vertiv
8	LVD2	1. Check if there is mains failure, and the battery voltage is lower than the value of 'LVD2'. 2. Check whether the battery is disconnected from the system manually
9	Rect Failure	The rectifier with the fault indicator (red) on is faulty. Power off the rectifier, and then power it on after a while. If the alarm persists, replace the rectifier
10	Rect Protect	Check if the mains voltage is above 530V or under 260V. If the mains voltage is under the AC under-voltage value or above the AC over-voltage value, the mains grid should be improved
11	Rect Fan Fails	Pull out the rectifier to check if the fan is obstructed. If yes, clean it and push the rectifier back. If the fan is not obstructed or if the fault persists after cleaning, replace the fan
12	Rect Not Respond	Check if the communication cable is connected properly between rectifier and controller. If yes, restart the rectifier. If the alarm persists, replace the rectifier
13	Batt Over Temp	1. Check if the battery compartment temperature is too high. If yes, cool down the battery compartment. 2. Check if there is battery internal fault. If yes, replace the faulty battery

6.2 Handling Rectifier Fault

Fault judgement and handling method

Rectifier faults include power indicator (green) off, protection indicator (yellow) on, protection indicator (yellow) flashing, fault indicator (red) on and fault indicator (red) flashing.

The indicators are shown in Figure 6-1.

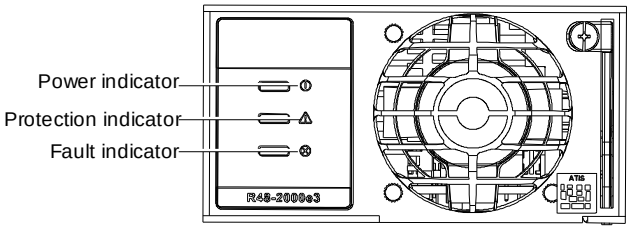


Figure 6-1 Rectifier indicator

The methods to handle the fault of the rectifier are listed in Table 6-3.

Table 6-3 Methods to handle the fault of the rectifier

Symptom	Controller alarms	Causes		Handling method
Green indicator off	No alarm	No input/output voltage		Restore input voltage
		Input fuse broken		Replace the rectifier
Yellow indicator on	Rect Protect	Over-temperature protection due to:	Fan blocked	Remove the object that blocks the fan
			Ventilation path blocked at the inlet or vent	Remove the object at the inlet or vent
			Ambient temperature too high or the inlet too close to a heat source	Decrease the ambient temperature or remove the heat source
		Load sharing imbalance		Check whether the rectifier communication is normal. If not, check whether the communication cable is in normal connection. If the communication is normal while the protection indicator is on, replace the rectifier
Yellow indicator on	Rect Protect	PFC output overvoltage protection		Change the position of the normal rectifier and faulty rectifier. If the faulty rectifier cannot working, replace the rectifier
		AC input voltage abnormal		Make sure that the AC input voltage is normal
Red indictor on	Rect Failure	Rectifier overvoltage		Pull out the rectifier. If the protection is triggered again, replace the rectifier
		Inner fuse broken		Contact Vertiv for maintenance
	System bad	Serious load sharing imbalance		Check whether the rectifier communication is normal.

Symptom	Controller alarms	Causes	Handling method
Red indictor on	current imbalance	Serious load sharing imbalance	If not, check w hether the communication cable is in normal connection. If the communication is normal w hile the protection indicator is on, replace the rectifier
Red indicator blinks	Rect Fan Fails	Fan fault	Replace the fan

Replacing rectifier fan

If the rectifier fan is faulty, use the following procedures to replace the fan:

1. Performing this procedure may activate external system alarms. Do one of the following. If possible, disable these alarms. If these alarms cannot be easily disabled, notify the appropriate personnel to disregard any future alarms associated with this system.

2. Remove the rectifier from the shelf. Refer to the related procedure for step-by-step instructions.

3. Place the rectifier on a static-safe work surface. Connect an approved grounding strap to your wrist for the remainder of this procedure.

4. Remove the two faceplate mounting screws shown in Figure 5-2 from the Rectifier Module. Remove the faceplate.

5. Carefully pull the fan(s) out from the rectifier, until the fan power cable(s) can be accessed.

6. Unplug the fan power cable(s) from connector(s) on the PC board, and remove the fan(s).

7. Plug the power cable(s) of the replacement fan(s) into the connector(s) on the PC board.

8. Place each fan in its cavity in the module, orienting the fan so that:

- The arrow on the fan body points toward the rear of the Rectifier Module, and
- The power cable exits the fan body toward the other fan, as shown in Figure 6-2.

9. Reinstall the faceplate on the rectifier. Ensure that no fan wiring is pinched. Secure faceplate with the two previously removed screws.

10. Reinstall the rectifier into the shelf as described in the previous procedure.

11. When the fans start, check to ensure that each is providing front-to-back airflow. If air direction is wrong, immediately remove the rectifier from the shelf. Repeat previous steps to check fan orientation, and correct as necessary. Reinstall the rectifier and again check for proper airflow.

12. Enable the external alarms, or notify appropriate personnel that this procedure is finished.

13. Ensure that there are no local or remote alarms active on the system.

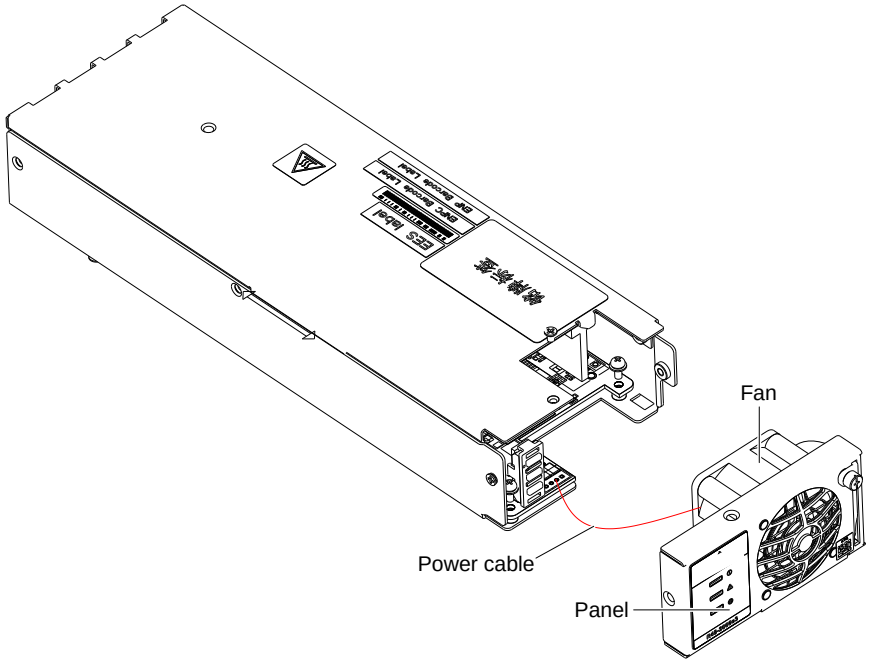


Figure 6-2 Rectifier fan replacement

Rectifier replacement

Other than a rectifier fan replacement, no attempt should be made to troubleshoot or repair individual components on any rectifier. You should take the following procedures when a rectifier is faulty.

1. Refer to Figure 5-2Figure 6-2 during this procedure.

2. Performing this procedure may activate external system alarms. Do one of the following. If possible, disable these alarms. If these alarms cannot be easily disabled, notify the appropriate personnel to disregard any future alarms associated with this system.

3. On the module being replaced, loosen the screw that is located on the module handle. (Turn the screw several turns counterclockwise to loosen.) Pivot the handle 90 degrees to the open position.

4. Grasp the handle and pull firmly to remove the module from the shelf.

5. On the replacement module, loosen the screw that is located on the module handle. (Turn the screw several turns counterclockwise to loosen.) Pivot the handle 90 degrees to the open position.

6. Place the module into the mounting position in the shelf, and with the handle still in the open position, push the module completely into the shelf.

7. Push the handle into the front panel of the module. This will lock the module securely in the shelf. Tighten the screw on the handle.

8. Reset the system controller as required.

9. Enable the external system alarms, or notify appropriate personnel that this procedure is finished.

10. Ensure that there are no local or remote alarms active on the system.

6.3 Handling Controller Fault

Fault judgement

The fault phenomena of the controller are LCD failure or displayed contents incorrect. You should take the following procedures to judge fault causes:

1. Loosen the three fixing screws on the PCB cover and remove the cover, as shown in Figure 6-3.

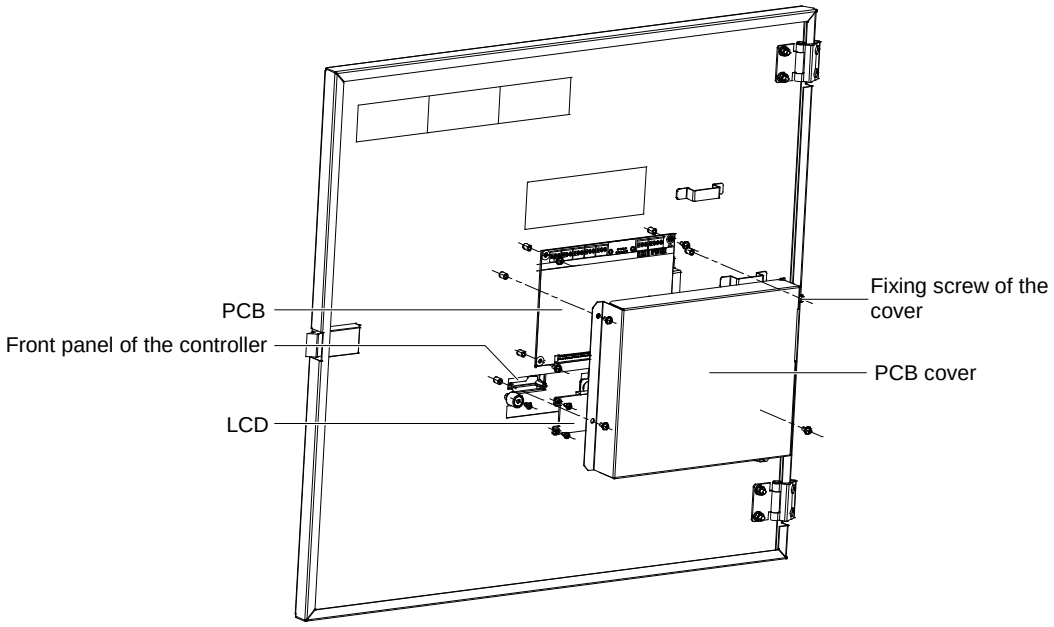


Figure 6-3 Removing cover

2. Judge fault causes according to the indicator status of the PCB, as listed in Table 6-4.

Table 6-4 Fault causes and handling methods of the controller

Phenomenon	Fault cause	Handling method
Watchdog indicator off, power indicator off	PCB has no auxiliary power supply	Check if J8 terminal on PCB is connected reliably. If the connection is reliable and the terminal voltage is normal (approximately the busbar voltage of the power system), the PCB is faulty and needs replacement
Power indicator on, watchdog indicator on or off	Software not running	Replace the PCB
Watchdog indicator flashing, LCD display incorrect	Signal cable connection incorrect or PCB faulty	Check if the signal cable connection is correct and reliable. If not, reconnect it. If yes, the PCB is faulty and needs replacement
Watchdog indicator flashing, LCD no display	PCB faulty or LCD faulty	Replace the LCD according to *Replacing the LCD* in this section. Check if the LCD displays normally. If yes, the fault handling is over. If not, the PCB is faulty and needs replacement
Power indicator on, watchdog indicator on or off, LCD displaying 'Bootloader is Running'	Software is updating about firmware	The controller will switch back to main program automatically after five minutes. If not, the application has not been written successfully or has been destroyed. You need to write the application again. If still not, the CPU is damaged

The indicators and terminals of the PCB are shown in Figure 6-4.

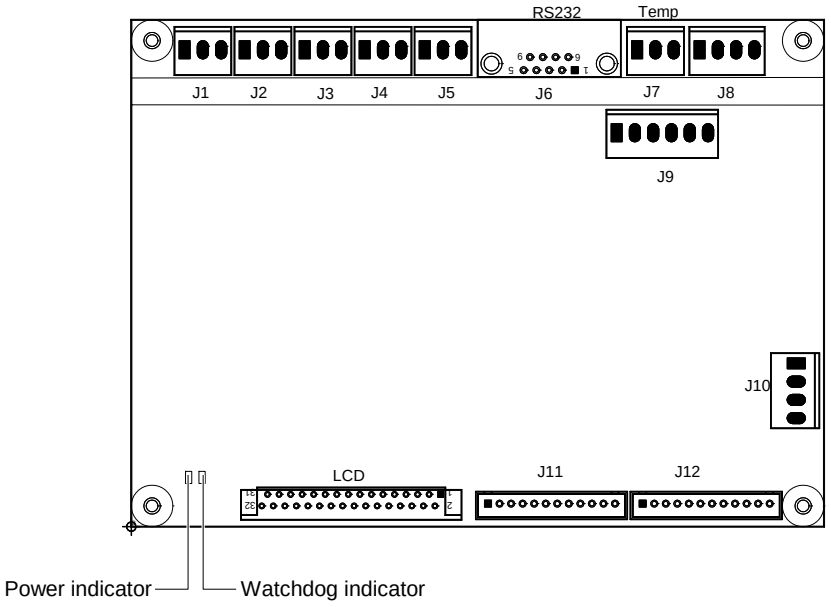


Figure 6-4 Indicators and terminals of the PCB

Replacing the PCB

Note

Take care when replacing components of the controller. During replacement, unplug the terminals strictly in the order shown in the following procedures, failure to observe this may result in system shutdown.

The procedures for replacing PCB are described as follows:

1. Unplug the J8 power supply terminal to power off the PCB.

2. Unplug other terminals and DI/DO cables.

3. Wrap the DI/DO cable terminals with insulating tape. To prevent short circuit, keep the disconnected terminals and cables insulated from components of the power system and the PCB.

4. Remove the fixing screws of the PCB and replace the PCB. Note that the screwdriver should be prevented from touching the bare parts of the signal cables to prevent short circuit.

5. Connect the signal cables in reverse sequence, that is, reconnect signal cables other than J8, J10 terminal cables and DI/DO cables.

6. Check the cable connections. If the connections are correct, reconnect J8 terminal. If the watchdog indicator flashes and power indicator is on, the PCB works normally.

7. Check the voltages of J10 terminal with a multimeter. Make sure that it outputs low voltage. Connect J10 terminal.

8. Set the parameters of the controller according to Chapter *4.7 Setting Parameters*.

Replacing the LCD

The procedures for replacing the LCD are described as follows:

1. Unplug J8 and J10 terminals of the PCB.

2. Unplug the terminal tape cable connected the LCD and screen.

3. Replace the LCD. Restore the J3 terminal tape cable connected the LCD and screen. Pay attention not to short the LCD with the power system or the PCB.

4. Check the voltages of J10 terminal with a multimeter. Make sure that it outputs low voltage.

5. Insert the J10 terminal, and the LCD is replaced.

6. Insert the J8 terminal to power on the PCB of the controller.

Appendix 1 Technical Data

Table 1 Technical data

Parameter category	Parameter	Description
Environmental	Operating temperature	-5°C ~ +40°C
	Storage temperature	-40°C ~ +70°C
	Relative humidity	5%RH ~ 95%RH
	Altitude	≤ 2000m (derating is necessary above 2,000m)
	Overvoltage level	Level Ⅱ
	Pollution level	Level Ⅱ
	Others	No conductive dust or erosive gases. No possibility of explosion
AC input	AC input system	3-phase 4-wire system, 3-phase 5-wire system, TN, TT
	Rated input phase voltage	220Vac
	Input voltage range	85Vac ~ 300Vac, output derating under 176Vac
	Input AC voltage frequency	45Hz ~ 65Hz
	Max input current	NetSure 731 C62 ≤ 37A (176V input); NetSure 731 CC2 ≤ 74A (176V input)
	Power factor	≥ 0.99
DC output	Output DC voltage	42.3Vdc ~ 57.6Vdc
	Output DC current	NetSure 731 C62: load current ≤ 200A, battery charge current ≤ 100A NetSure 731 CC2: load current ≤400A, battery charge current ≤ 200A
	Total regulation	≤ 1%
	Efficiency	≥ 94.2%
	Noise (peak-peak)	≤ 200mV (0 ~ 20MHz)
	Weighted noise	≤ 2mV (300Hz ~ 3400Hz)
	Wide frequency noise	≤ 50mV (3.4kHz ~ 150kHz), ≤ 20mV (150kHz ~ 30MHz)
	Discrete noise	≤ 5mV (3.4 kHz ~ 150kHz), ≤ 3mV (150kHz ~ 200kHz), ≤ 2mV (200kHz ~ 500kHz), ≤ 1mV (0.5MHz ~ 30MHz)
AC input alarm and protection	AC input overvoltage alarm point	Default: 280Vac ± 5Vac, configurable through controller
	AC input overvoltage recovery point	Default: 270Vac ± 5Vac, 10Vac lower than the AC input overvoltage alarm point
	AC input undervoltage alarm point	Default: 180Vac ± 5Vac, configurable through controller
	AC input undervoltage recovery point	Default: 190Vac ± 5Vac, 10Vac higher than the AC input undervoltage alarm point
	AC input overvoltage protection point	Default 305Vac ± 5Vac, configurable through controller
	AC input overvoltage protection recovery point	10Vac lower than the AC input overvoltage protection point
	AC input undervoltage protection point	Default: 80Vac ± 5Vac, configurable through controller
	AC input undervoltage protection recovery point	15Vac higher than the AC input undervoltage alarm point

Parameter category	Parameter	Description
DC output alarm and protection	DC output overvoltage alarm point	Default: 58.5Vdc ± 0.2Vdc, configurable through controller
	DC output overvoltage recovery point	Default: 58.0Vdc ± 0.2Vdc, 0.5Vdc lower than the overvoltage alarm point
	DC output undervoltage alarm point	Default: 45.0Vdc ± 0.2Vdc, configurable through controller
	DC output undervoltage recovery point	Default: 45.5Vdc ± 0.2Vdc, 0.5Vdc higher than the undervoltage alarm point
	LLVD point	Default: 44.0Vdc ± 0.2Vdc, configurable through controller
	BLVD point	Default: 43.2Vdc ± 0.2Vdc, configurable through controller
Rectifier	Load sharing	The rectifiers can work in parallel and share the current. The unbalance is better than ± 3% rated output current. Test current range: 10% ~ 100% rated current
	Derate by input (at 45°C)	176Vac～300Vac input, maximum rectifier output power is 100% rated power (3000W); 85Vac input, maximum rectifier output power is 20% rated power
	Slow output start function	Upon rectifier power-on, the output voltage increases slowly, and the rise time can be set
	Fan speed can be set	The rectifier fan speed can be set to be regulated automatically. It can also be set to full speed
	Overvoltage protection	The rectifier provides overvoltage hardware and software protection. The hardware protection point is 59.5V ± 0.5V, and it requires manual resetting to restore operation. The software protection point is between 56V and 59V (0.5V above output voltage, 59V by default), and can be set through the controller There are two software protection modes, which can be selected through the software at the host: 1. Lock out at the first overvoltage Once the output voltage reaches software protection point, the rectifier will shut down and hold that state. it requires manual resetting to restore the operation 2. Lock out at the second overvoltage When the output voltage reaches the software protection point, the rectifier will shutdown, and restart automatically after 5 seconds. If the overvoltage happens again within a set time (default: 5min. Configurable through controller), the rectifier will shut down and hold that state. It requires manual resetting to restore the operation Manual resetting: Resetting can be done manually through the controller, or by removing the rectifier from system
	Temperature derating	Rectifier can work in temperature below -40°C; Temperature below 45°C, outputs full power: 3000W; Temperature in the range of 45°C ~ 55°C, derating from 3000W to 2900W; Temperature in the range of 55°C ~ 65°C, derating from 2900W to 2250W; Temperature in the range of 65°C ~ 70°C, derating from 2250W to 0W
EMC	EFT	Level 4 EN61000-4-4
	ESD	Level 3 EN61000-4-2
	Immunity to surges	Level 4 EN61000-4-5
Lightning protection features	At AC side	The AC input side can withstand five times of simulated lightning voltage of 5kV at 10/700μs, for the positive and negative polarities respectively. It can withstand five times of simulated lightning voltage of 20kV at 8/20μs, for the positive and negative polarities respectively. It can also withstand one time of simulated lightning surge current of 40kA at 8/20μs. The test interval is not smaller than 1 minute.
	At DC side	The DC side can withstand one event of simulated lightning current of 15kA at 8/20μs

Parameter category	Parameter	Description	
Others	Safety regulation	EN60950	
	Noise	≤ 60dB (A) (When the ambient temperature is 30°C)	
	Insulation resistance	At temperature of 15°C ~ 35°C and relative humidity not bigger than 90%RH, apply a test voltage of 500Vdc, the insulation resistances between AC circuit and earth, DC circuit and earth, and AC and DC circuits are all not less than 10MΩ	
	Insulation strength	(Remove the SPD, controller and rectifiers from the power system before the test.) AC circuit to DC circuit: 50Hz, 3000Vac AC circuit to earth: 50Hz, 1500Vac	
Other	Insulation strength	DC circuit to earth: 50Hz, 500Vac For all the three tests above, there should be no breakdown or flashover within 1min, with leakage current not bigger than 10mA	
	MTBF	200000hr	
Mechanical	Dimensions (mm)	Cabinet	600 (W) × 400 (D) × 1600 (H) (NetSure 731 C62-X1/X3, NetSure 731 CC2-X1\X2\X3\X4) 600 (W) × 600 (D) × 1600 (H) (NetSure 731 C62-X2)
		Rectifier	43.6 (H) × 85.1 (W) × 330 (D)
	Weight (kg)	Cabinet (including rectifiers)	NetSure 731 C62 ≤ 100 NetSure 731 CC2 ≤ 110
		Rectifier	≤ 3.0

Appendix 2 Engineering Diagram

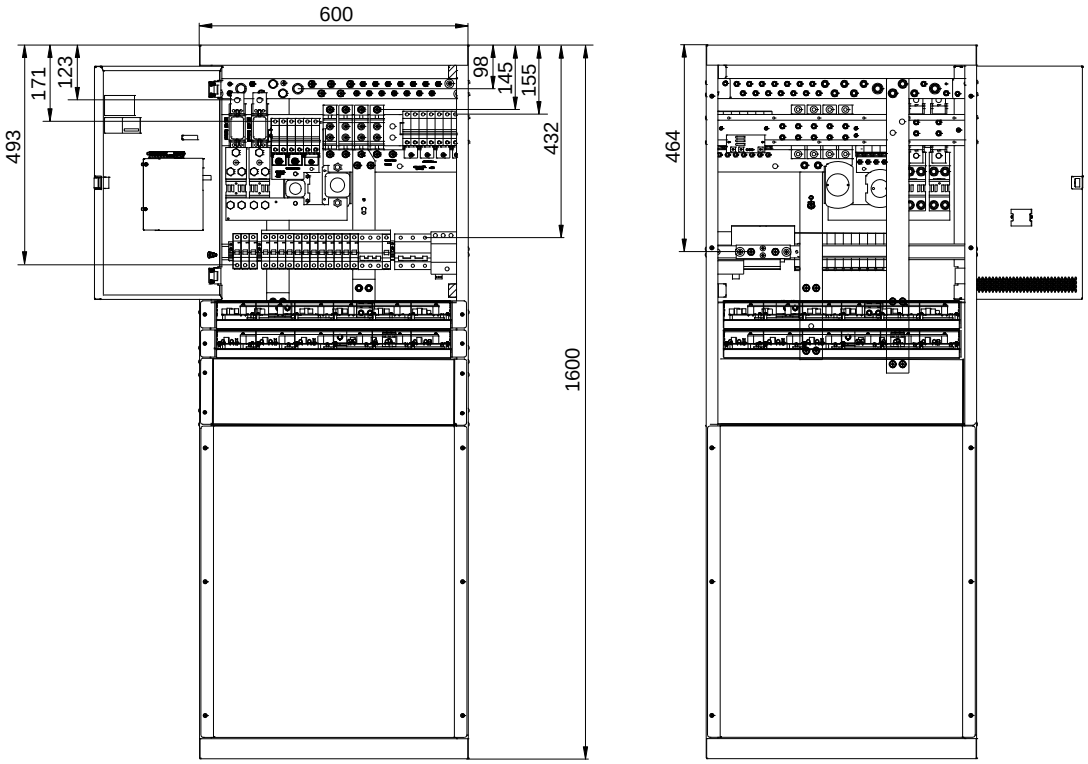


Figure 1 NetSure 731 CC2-X3/X4 engineering diagram (unit: mm)

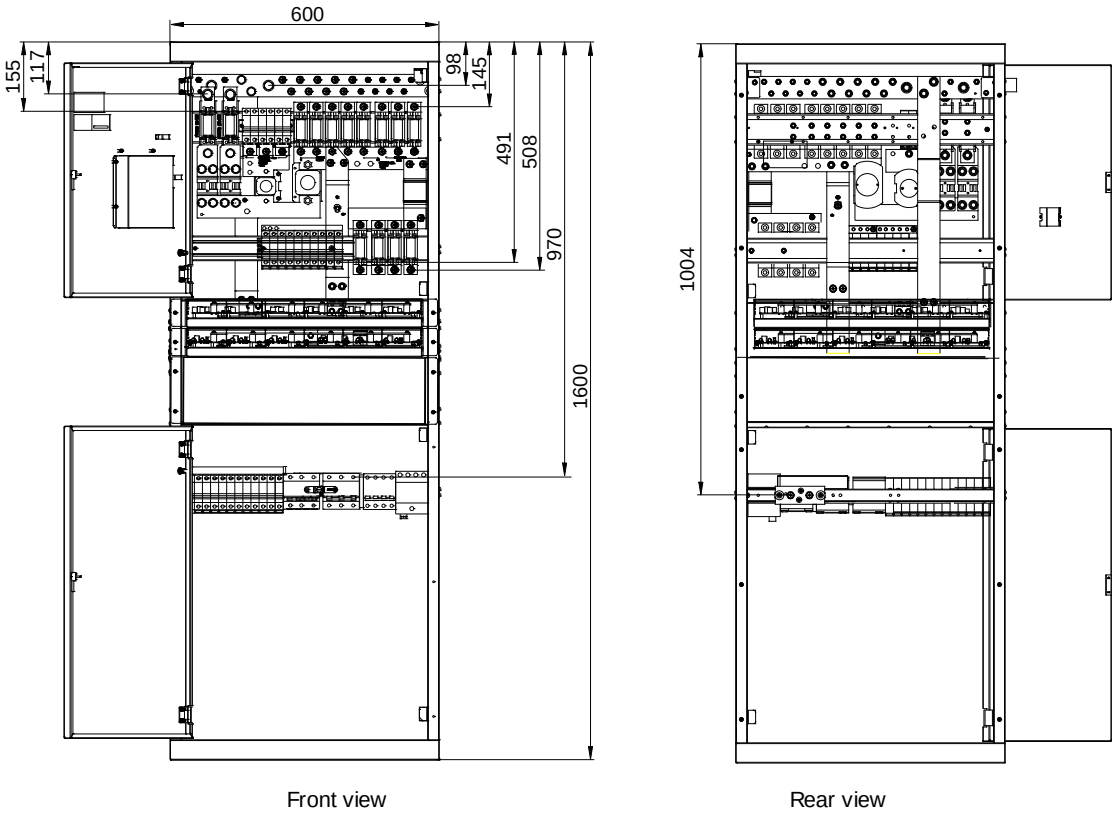


Figure 2 NetSure 731 CC2-X1/X2 engineering diagram (unit: mm)

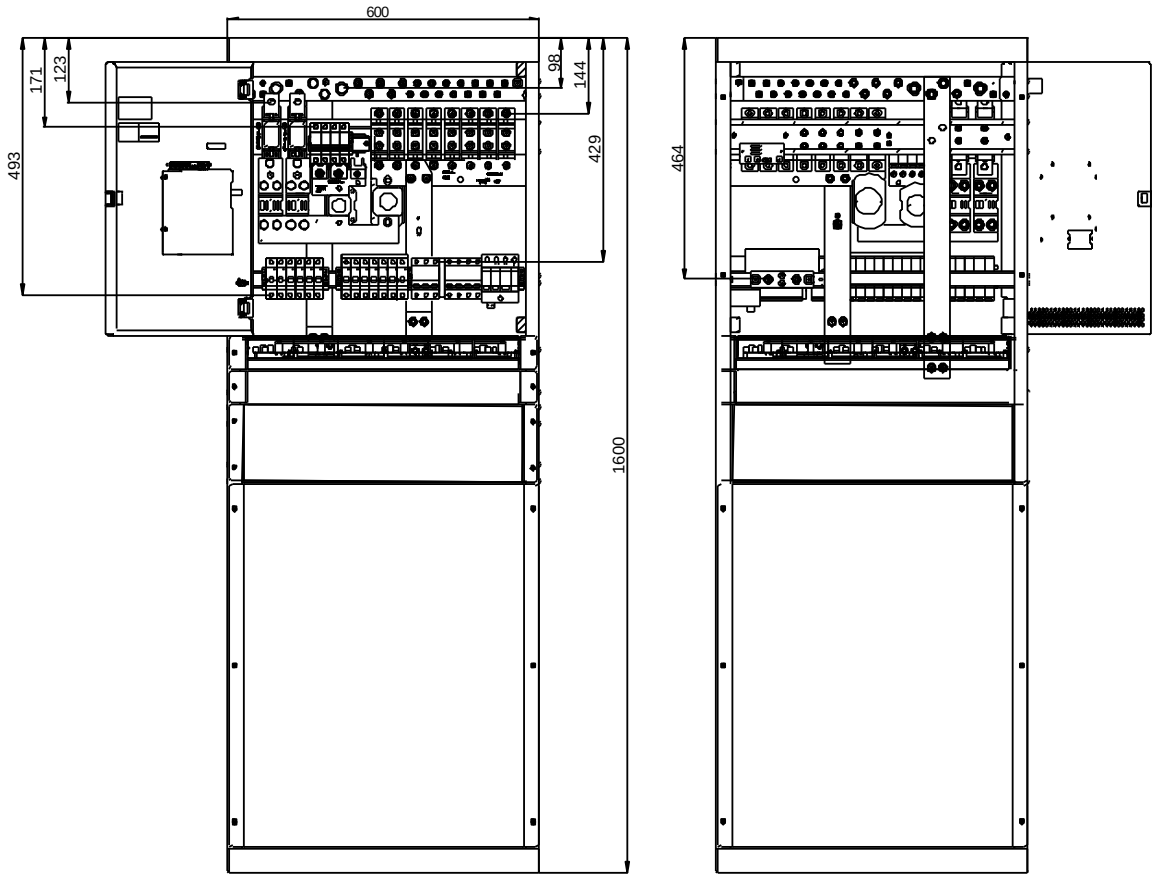


Figure 3 NetSure 731 C62-X1 engineering diagram (unit: mm)

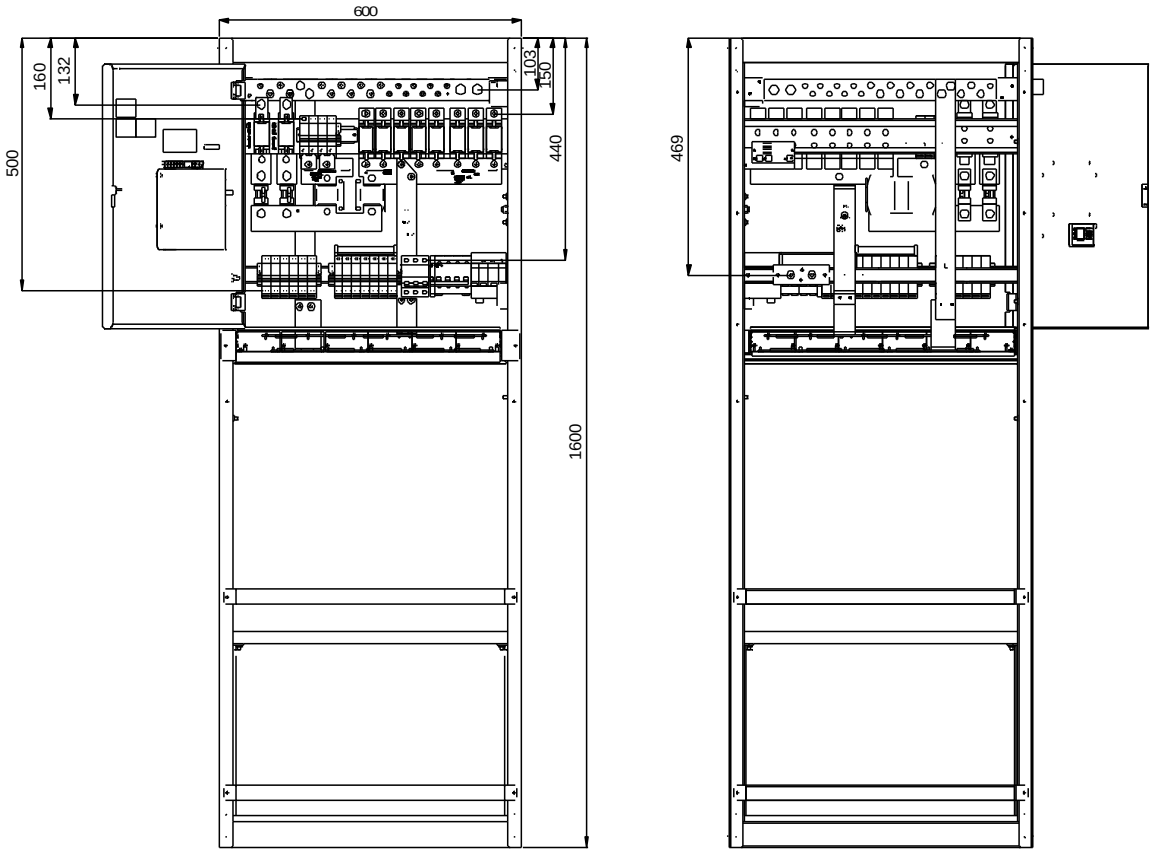


Figure 4 NetSure 731 C62-X2 engineering diagram (unit: mm)

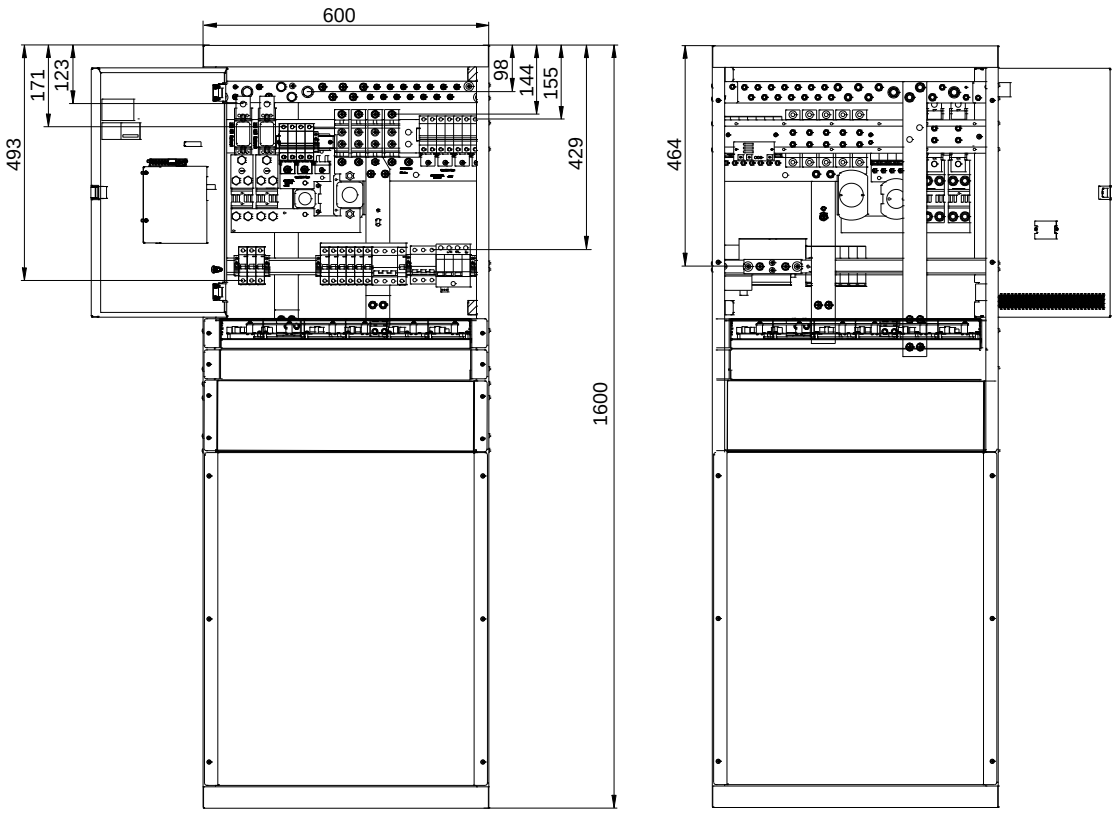


Figure 5 NetSure 731 C62-X3 engineering diagram (unit: mm)

Table 2 System engineering data

Connector		Specs		Connection
		Capacity	Connector specs	
AC distribution	AC input MCB[1]	1 × 100A/3P or 1 × 63A/3P	3 H-shape cable terminals, CSA ≤ 35mm^2	The live line of AC power supply
	Grounding busbar	One M10 bolt	CSA ≤ 35mm^2	Connected to the earth bar of the equipment room
	Input neutral terminal	2 bolts	CSA ≤ 25mm^2	Neutral line of AC power supply
	Output neutral busbar	2 M6 bolts		Neutral terminal of the AC output power, serving other equipment
	AC output MCB[2]	1 × 16A/3P, 1 × 16A/1P	4 H-shape cable terminals, CSA ≤ 10mm^2	Live terminal of the AC output power, serving other equipment
DC distribution	Positive busbar	2 × M12 (for battery connection), 4 × M8, 14 × M6		
	Battery fuse	NetSure 731 CC2-X1/X2/X3/X4: 2 × 500A fuse, 2 × M12 fuse bolt NetSure 731 C62-X1/X2/X3: 2 × 250A fuse, 2 × M10 fuse bolt		
	Load route	NetSure 731 C62-X1: Battery protection routes: 2 × 32A/1P, 2 × 10A/1P MCB; LLVD routes: 4 × 100A fuse, 4 × 63A fuse, 4 × 32A/1P MCB, 2 × 10A/1P MCB; NetSure 731 C62-X2: Battery protection routes: 2 × 32A/1P, 2 × 10A/1P MCB; LLVD routes: 4 × 100A fuse, 4 × 63A fuse, 4 × 32A/1P MCB, 2 × 10A/1P MCB; NetSure 731 C62-X3: Battery protection routes: 2 × 32A/1P, 2 × 16A/1P MCB; LLVD routes: 4 × 100A fuse, 4 × 63A/1P MCB, 6 × 32A/1P MCB; NetSure 731 CC2-X1/X2: Battery protection routes: 2 × 32A/1P, 4 × 10A/1P MCB; LLVD routes: 6 × 100A fuse, 6 × 63A fuse, 6× 32A/1P, 4 × 16A/1P MCB; NetSure 731 CC2-X3： Battery protection routes: 4 × 16A/1P MCB; LLVD routes: 4 × 100A fuse, 4 × 63A/1P, 6 × 32A/1P MCB; NetSure 731 CC2-X4： Battery protection routes: 2 × 63A/1P, 2 × 32A/1P, 2 × 10A/1P MCB; LLVD routes: 4 × 100A, 6 × 63A fuse, 2 × 32A/1P, 2 × 16A/1P MCB		
Note: NetSure 731 C62-X1/X3, NetSure 731 CC2-X1 & NetSure 731 CC2-X3 & NetSure 731 CC2-X4 have single AC input; NetSure 731 CC2-X2 has double AC inputs; NetSure 731 C62-X2 have single AC input, The cabinet is equipped with two battery racks				

Appendix 3 Parameter Setting Of The Controller

This chapter gives the description of the controller parameter setting. The detailed information of parameter setting and operating method are given in *Chapter 4 Use Of The Controller*. See *4.7.1 Alarm Settings for alarm setting method*.

Table 3 Parameter setting of the controller

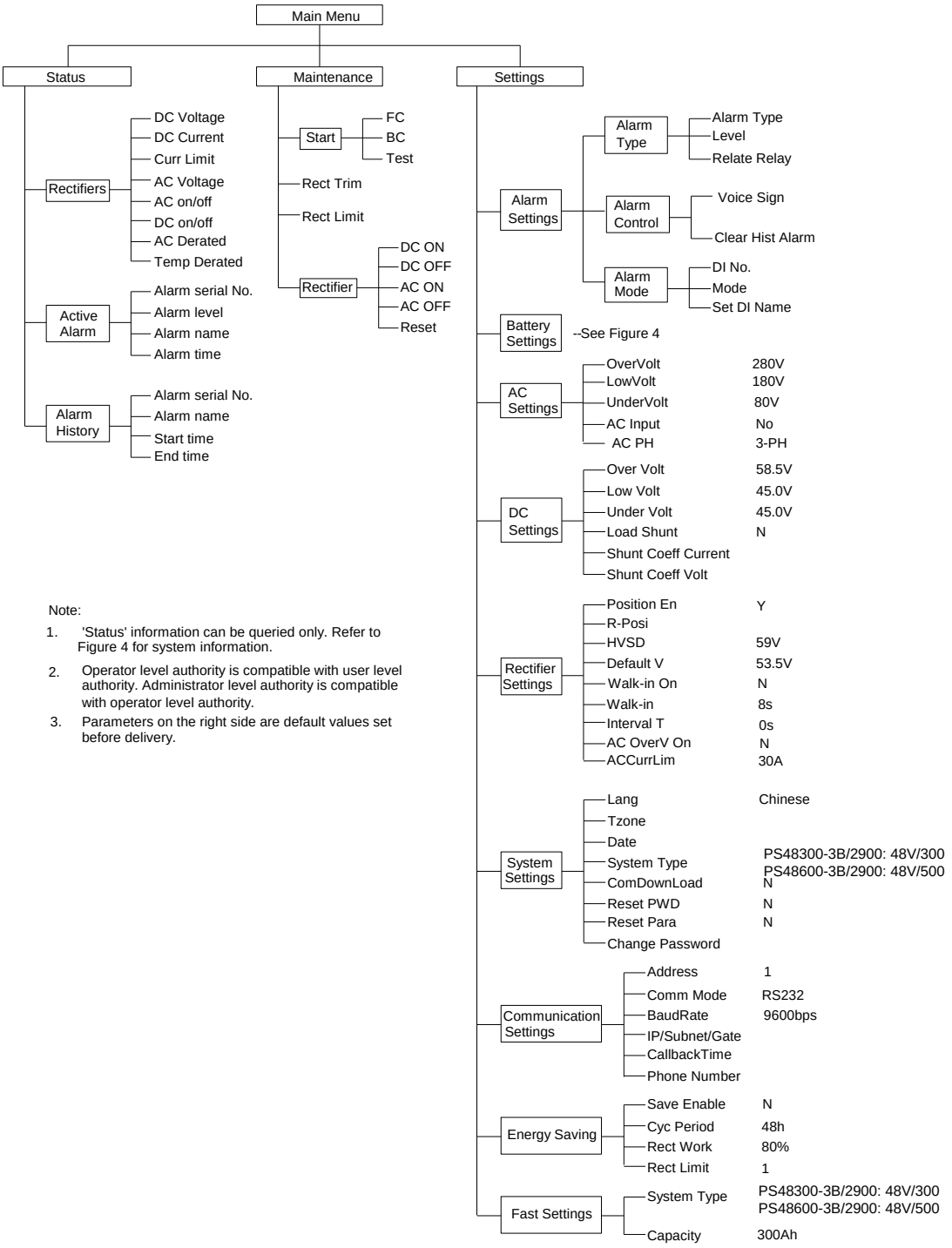
Item		Parameter	Range	Factory setting	Value description
Alarm		DI No.	1 ~ 8	1	The 8 corresponding connecting terminals, queued up in the order that the hardware switches are put
		DI Name	-	SPD	Figures or letters, 10 at most
		Alarm Mode	High, Low	Low	Alarm upon high level or upon low level
Battery	Basic	Sys Mode	Auto, Manual	Auto	Managing the power system through the controller or manually
		Bat. Fuse	0 ~ 2	2	You should set this parameter according to the actual battery configuration
		Capacity	50Ah ~ 5000Ah	300Ah	The capacity of each battery strings. You should set this parameter according to the actual battery configuration
		Bat. Shunt1	Y, N	Y	You can set shunt parameters when 'System Type' is SET
		Bat. Shunt2	Y, N	Y	
		Shunt Coeff Current	1A ~ 5000A	500A	
		Shunt Coeff Volt	1mV ~ 500mV	25mV	
	LVD	LVD1 Enable	Y, N	Y	Select 'Y' to enable LVD1/ LVD2 function Select 'N' to disable the LVD1/ LVD2 function
		LVD2 Enable		Y	
		LVD1 Volt	40V ~ 60V	44.0V	Select Voltage. When the battery voltage is lower than the preset LVD1 Volt, the load will be disconnected, and so will the battery when the battery voltage is lower than the preset LVD2 Volt
		LVD2 Volt		43.2V	
	Charge management	Float	42V ~ 58V	53.5V	Battery float charging voltage
		Boost		56.4V	Battery boost charging voltage, and the 'Boost' must be higher than the 'Float'
		Limit (current limit point)	$0.1C_{10}$ ~ $0.25C_{10}$	$0.1C_{10}$	Maximum battery charging current
		Over (over current point)	$0.3C_{10}$ ~ $1.0C_{10}$	$0.300C_{10}$	Battery charge over- current alarm point
		Automatic Boost	Y, N	Y	Select 'Y' to enable this function Select 'N' to disable this function
		Automatic Boost Current	$0.050C_{10}$ ~ $0.080C_{10}$	$0.06C_{10}$	The controller will control the power system enter the BC state when the battery capacity decreases to the value of To Boost Capacity, or when the charge current reaches the To Boost Current. The charge voltage will be the Boost
		Automatic Boost Cap	10%~ 99%	80%	
		Const Boost Current	$0.002C_{10}$ ~ $0.02C_{10}$	$0.01C_{10}$	The power system in the BC state will enter the FC state when the charge current decreases to the Constant BC Curr and after the Duration. The battery charge voltage then will be the Float
		Const Boost Time	30min ~ 1440min	180min	
		Cyclic Boost	Y, N	Y	Select 'Y' to enable this function Select 'N' to disable this function

Item		Parameter	Range	Factory setting	Value description
Battery	Charge management	Cyclic Boost Period	48h ~ 8760h	2400h	Select 'Y', and the controller will control the power system to enter the Cyclic Boost when the FC time reaches the Cyclic Boost Interval. The battery charging voltage is the preset Boost, and the time is the preset Cyclic Boost Time
		Cyclic Boost Time	30min ~ 2880min	720min	
		Boost Limit Time	60min ~ 2880min	1080min	To ensure safety, the controller will forcibly control the power system to enter the FC state if during the BC state, the BC time reaches the Boost Limit
Battery	Battery test	End Test Volt	43.1V ~ 57.9V	45.2V	The controller will stop the test and change to FC if the battery voltage reaches the Battery Test Voltage, or the discharge time reaches Battery Test Time, or the battery capacity reaches Test End Cap
		End Test Time	5min ~ 1440min	300min	
		End Test Cap	$0.01C_{10}$ ~ $0.95C_{10}$	$0.7C_{10}$	
		Cyc Test En	Y, N	Y	Select 'Y' to enable this function Select 'N' to disable this function
		Cyc Test Time 1	Month, day, time	01-01-00:00	When the parameter Cyc Test En is set to Y, the controller will test the battery
		Cyc Test Time 2		04-01-00:00	
		Cyc Test Time 3		07-01-00:00	
		Cyc Test Time 4		10-01-00:00	
		Short Test Enable	Y, N	Y	Whether using Short Test function
		Short Test Alarm	1A ~ 100A	10A	If the battery is not discharged within the Short Test Period, the controller will start a short test, whose operation time is set by the parameter Short Test Time. By the end of the test, if the difference in the discharge current of two batteries is bigger than the Short Test Alarm, the battery discharge imbalance alarm will be raised
		Short Test Period	24h ~ 8760h	720h	
		Short Test Time	1min ~ 60min	5min	
		Stable Test Enable	Y, N	N	Whether using Stable Test function
		Stable Test Current	0 ~ 9999A	9999A	Battery discharging current under stable test
	Temperature coefficient	Center Temp	10°C ~ 40°C	25°C	<FC = BattTemp – Center Temp) * Temp Coeff Upon alarms such as Rect Not Respond, DC Volt High, DC Volt Low and Batt Fuse Alarm, the controller will not do temperature compensation to the battery FC voltage
		Coeff	0 ~ 500mV/°C	72mV/°C	
		Temp	Ambient Temp, None, Battery Temp	None	Measurement of ambient temperature, battery temperature, no measurement
		Batt T H2	-40°C ~ 100°C	50°C	When the detected battery temperature is higher than the set value, the controller will raise an alarm. The Batt T H1 must not be higher than the Batt T H2
		Batt T H1	-40°C ~ 100°C	50°C	
		Batt T L1	-40°C ~ 100°C	0°C	When the detected battery temperature is lower than the set value, the controller will raise an alarm

Item	Parameter	Range	Factory setting	Value description
AC	Over Volt	50V ~ 300V	280V	Power system AC input over voltage alarm point
	Low Volt	50V ~ 300V	180V	Power system AC under voltage alarm point, The value of the Low Volt must lower than that of the Over Volt
	Under Volt	50V ~ 300V	80V	Setting according to actual requirement
	AC In	Auto, No, Manual	No	Setting according to the AC input mode of AC sampling board. Choose 'No' if the AC sampling board is not configured
	AC PH	1-PH, 3-PH	3-PH	Setting according to the actual configuration. Choose 1-PH or 3-PH if the AC sampling board is configured
DC	Over Volt	40V ~ 60V	58.5V	DC overvoltage alarm point
	Low Volt 1		45.0V	DC low-voltage alarm point, must be lower than DC overvoltage alarm point
	Low Volt 2		45.0V	DC undervoltage alarm point, must be lower than DC low-voltage alarm point
	L-Shunt	Y, N	N	Setting according to the actual instance
	Shunt Coeff Current	1A ~ 5000A	-	They can be reset when the shunt options are 'SET' in the power system with load shunt
	Shunt Coeff Volt	1mV ~ 500mV	-	
Rectifier	Position En	Y, N	Y	'Y': The controller will prompt you to set rectifier position before the rectifier and controller are powered on. 'N': You need not to set rectifier position
	R-Posi	1 ~ 30	-	R-Posi: represented in two figures, the first figure represents the rectifier number, the next figure represents position number. Press ENT to select the rectifier, press ◄ or ► to change position number. When the controller communicates with the rectifier, the green indicator on the corresponding rectifier will blink
	HVSD	56V ~ 59V	59V	Rectifier overvoltage alarm point
	Default V	48V ~ 58V	53.5V	Output voltage when communication interrupted. Must be lower than the HVSD voltage
	Walk-in On	Y, N	N	The output soft start function means the rectifier voltage will rise from 0V to the Default Volt after the Walk-in time
	Walk-in	8s ~ 128s	8s	
	Interval T	0 ~ 10s	0s	The controller can set the DCDC Interval Start of the rectifiers. Start time = rectifier address * interval time
	AC OverV On	Y, N	N	The controller can set the rectifier to OverVolt Enable, meanwhile, the rectifier can start forcibly. The controller will set automatically the rectifier with least address to have this function. If the rectifier always exceeds the normal voltage for 60s, the function will be cancelled automatically
	ACCurrLim	1A ~ 50A	30A	The controller limits the input current of the rectifier in the AC current limiting.
System	Lang	Chinese, English	Chinese	Set according to your need
	Tzone	-	-	Set according to actual instance
	Date	2000 ~ 2099	-	Set the time according to the current actual time, regardless of whether it is a leap year or not

Item	Parameter	Range	Factory setting	Value description
System	System Type	24V/100 24V/300 24V/500 24V/1000 24V/SET 48V/100 48V/300 48V/500 48V/1000 48V/SET	NetSure 731 C62：48V/300 NetSure 731 CC2：48V/500	The system type of the controller has been set according to the actual instance before the controller is delivered with power system. You need not to change the value except that the controller is replaced with a new one. After changing the type, the controller will restart and the other parameters will resume the default. You need to reset and change some parameters according to the battery and equipment configured with system
	ComDownLoad	Y, N	N	Whether resetting the password to the default
	Reset PWD	Y, N	N	
	Reset Para	Y, N	N	Whether resetting the parameter to the default
	Op1 PWD	-	-	The password can be 6 digits long at most. If it is shorter than 6 digits, end it with a #
	Op2 PWD	-	-	
	Adm PWD	-	-	
Communication	Address	1 ~ 254	1	The addresses of power systems that are at the same monitored office should be different
	Comm Mode	Modem	RS232	The power system only supports RS232 mode communication
	BaudRate	1200bps ~ 9600bps	9600bps	Make sure the baud rates of both the sending and receiving parties are the same
	IP/Subnet/Gate	-	-	Set according to actual instance
	CallbackTime	-	-	
	Phone Number	-	-	
Energy saving	Save Enable	Y, N	N	It can be set to 'Y' when the battery is configured and load current without instantly shocks
	Cyc Period*	1h ~ 8760h	48h	Time of rectifier under power-on state and power-off state, it can be set according to actual requirement
	Rect Work	30% ~ 90%	80%	Output capacity percentage. More rectifiers will startup to work when larger than this setting percentage
	Rect Limit	1 ~ 30	1	Minimum number of the rectifier
Fast settings	System Type	24V/100 24V/300 24V/500 24V/1000 24V/SET 48V/100 48V/300 48V/500 48V/1000 48V/SET	NetSure 731 C62：48V/300 NetSure 731 CC2：48V/500	The system type of the controller has been set according to the actual instance before the controller is delivered with power system. You need not to change the value except that the controller is replaced with a new one. After changing the type, the controller will restart and the other parameters will resume the default. You need to reset and change some parameters according to the battery and equipment configured with system
	Capacity	50Ah ~ 5000Ah	300Ah	The capacity of the total battery strings. You should set this parameter according to the actual battery configuration
Note*: Cyc Period, Rect Work and Rect Limit are available when 'Save Enable' is set to 'Y'				

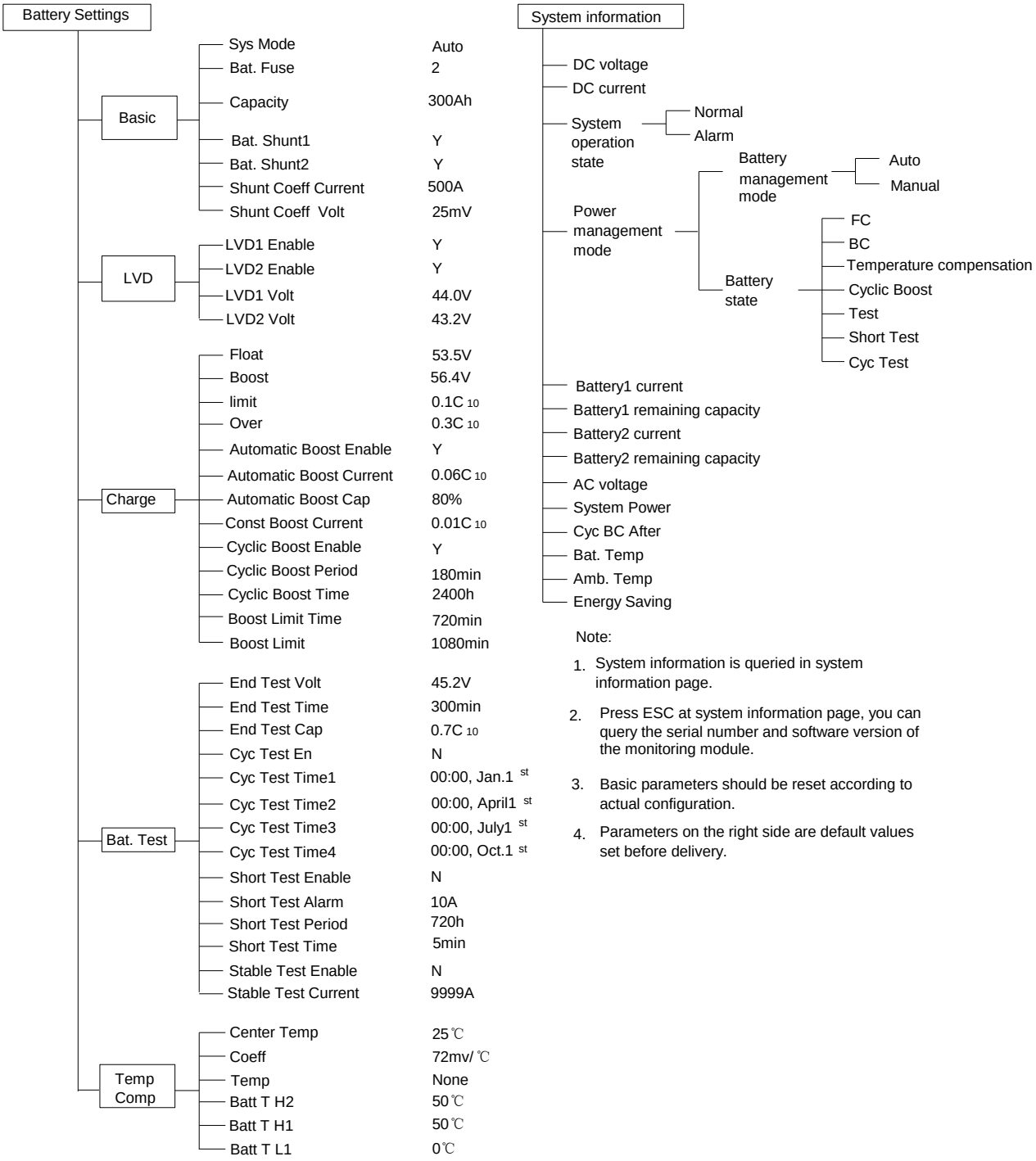
Appendix 4 Menu Structure Of The Controller



Note:

1. 'Status' information can be queried only. Refer to Figure 4 for system information.
2. Operator level authority is compatible with user level authority. Administrator level authority is compatible with operator level authority.
3. Parameters on the right side are default values set before delivery.

Figure 6 Menu structure of the controller

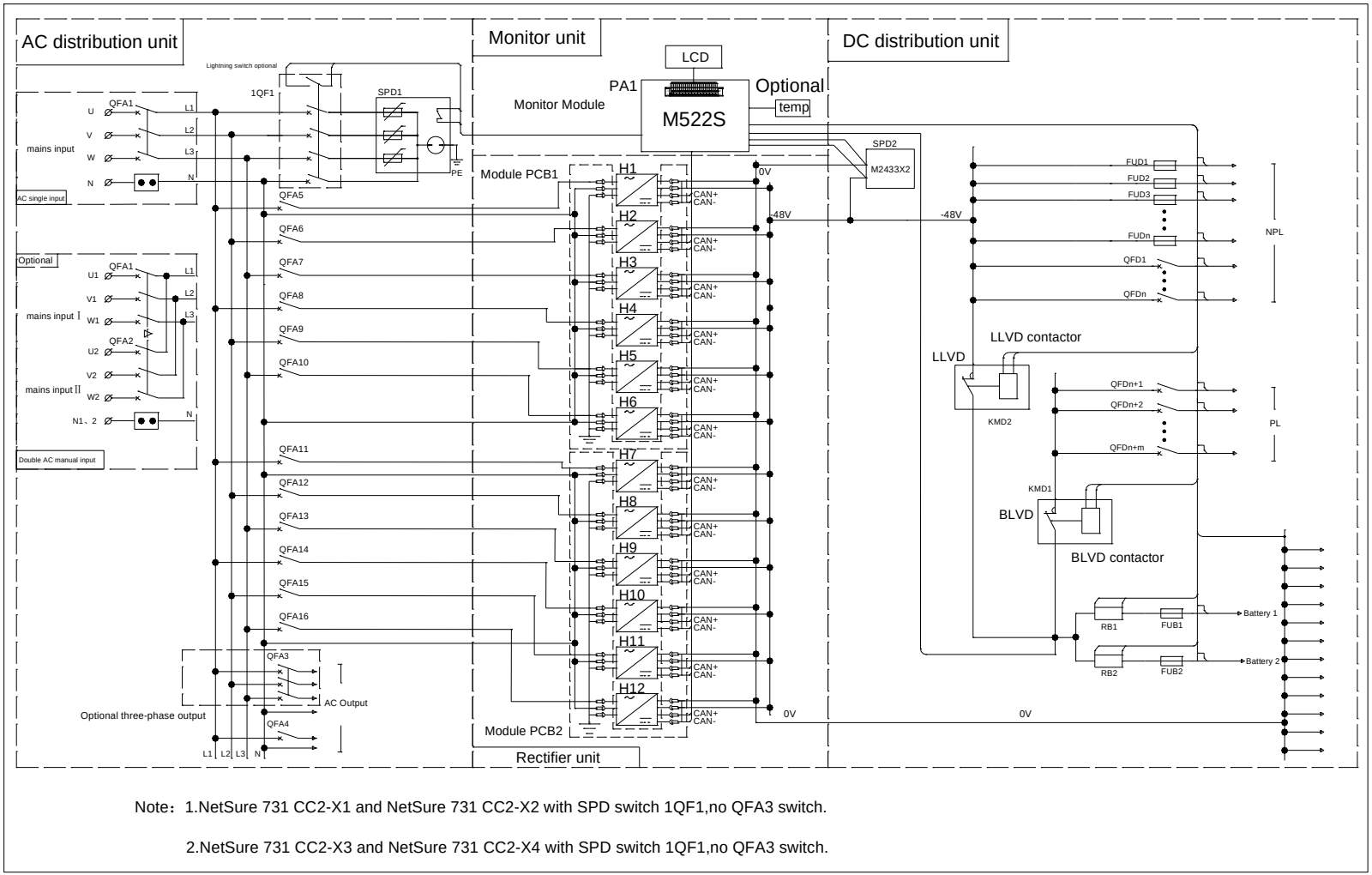


Note:

1. System information is queried in system information page.
2. Press ESC at system information page, you can query the serial number and software version of the monitoring module.
3. Basic parameters should be reset according to actual configuration.
4. Parameters on the right side are default values set before delivery.

Figure 7 Menu structure of battery settings

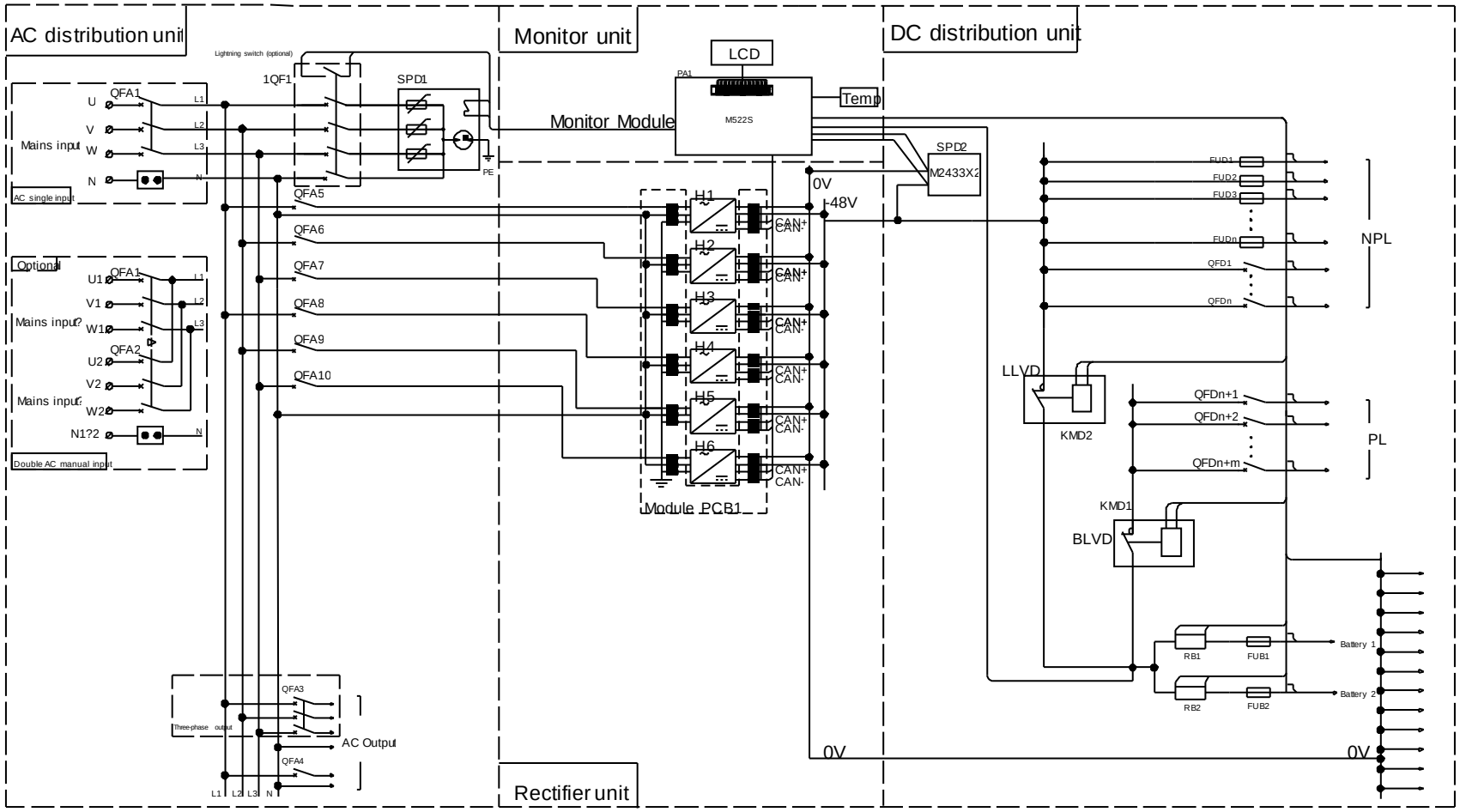
Appendix 5 Schematic Diagram



Note：1.NetSure 731 CC2-X1 and NetSure 731 CC2-X2 with SPD switch 1QF1,no QFA3 switch.

2.NetSure 731 CC2-X3 and NetSure 731 CC2-X4 with SPD switch 1QF1,no QFA3 switch.

Figure 8 NetSure 731 CC2 schematic diagram



Note: 1. NetSure 731 C62-X1, NetSure 731 C62-X2 are configured with SPD switch1QF1, no QFA3.
2. NetSure 731 C62-X1 is different from the cabinet structure of NetSure 731 C62-X2.
3. NetSure 731 C62-X1 cabinet is with no battery rack, the NetSure 731 C62-X2 cabinet is equipped with two battery racks.
4. NetSure 731 C62-X3 cabinet has no battery rack and SPD switch 1QF1, is configured with QF3 MCB.

Figure 9 NetSure 731 C62 schematic diagram

Appendix 6 Wiring Diagram

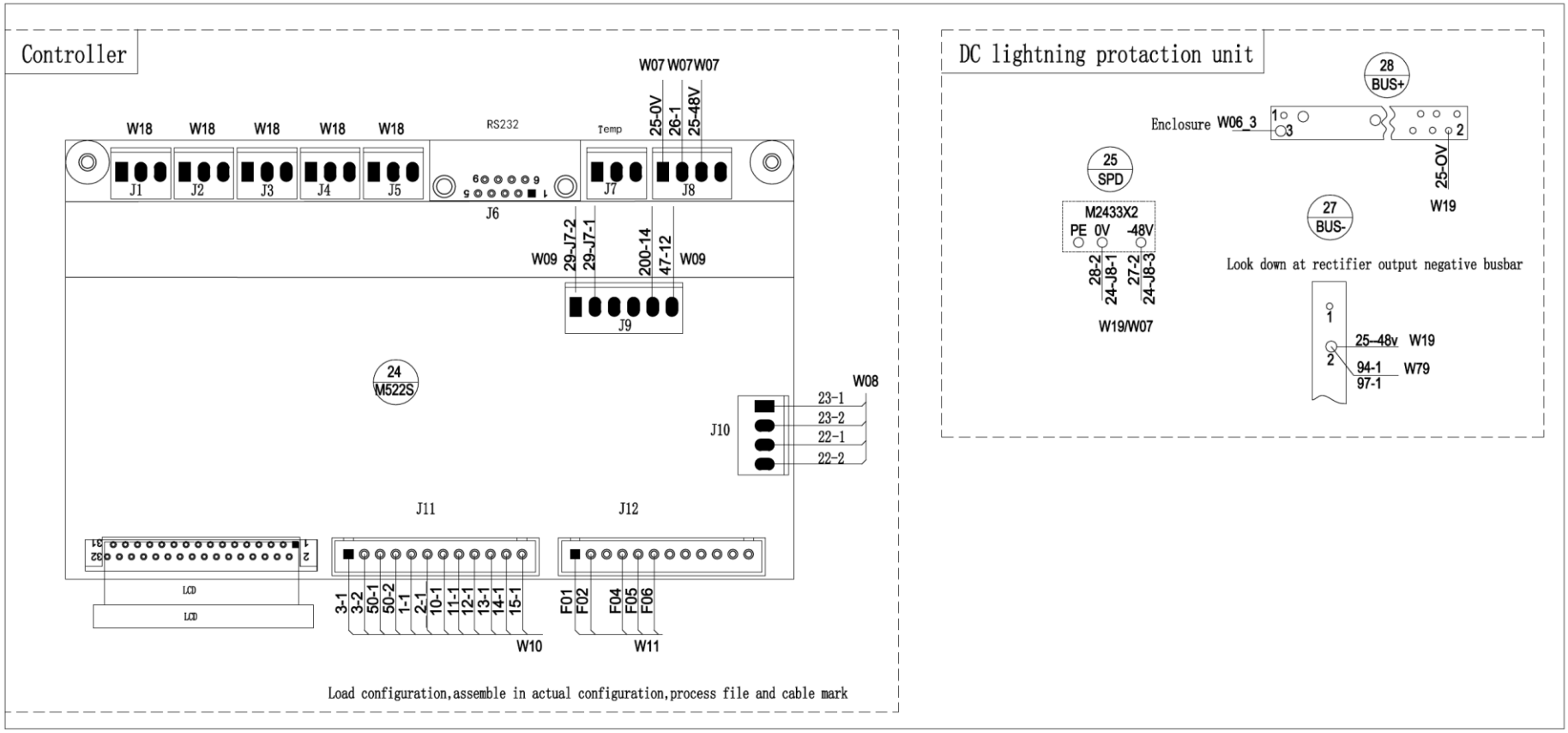


Figure 10 Wiring diagram of NetSure 731 C62-X1 (1)

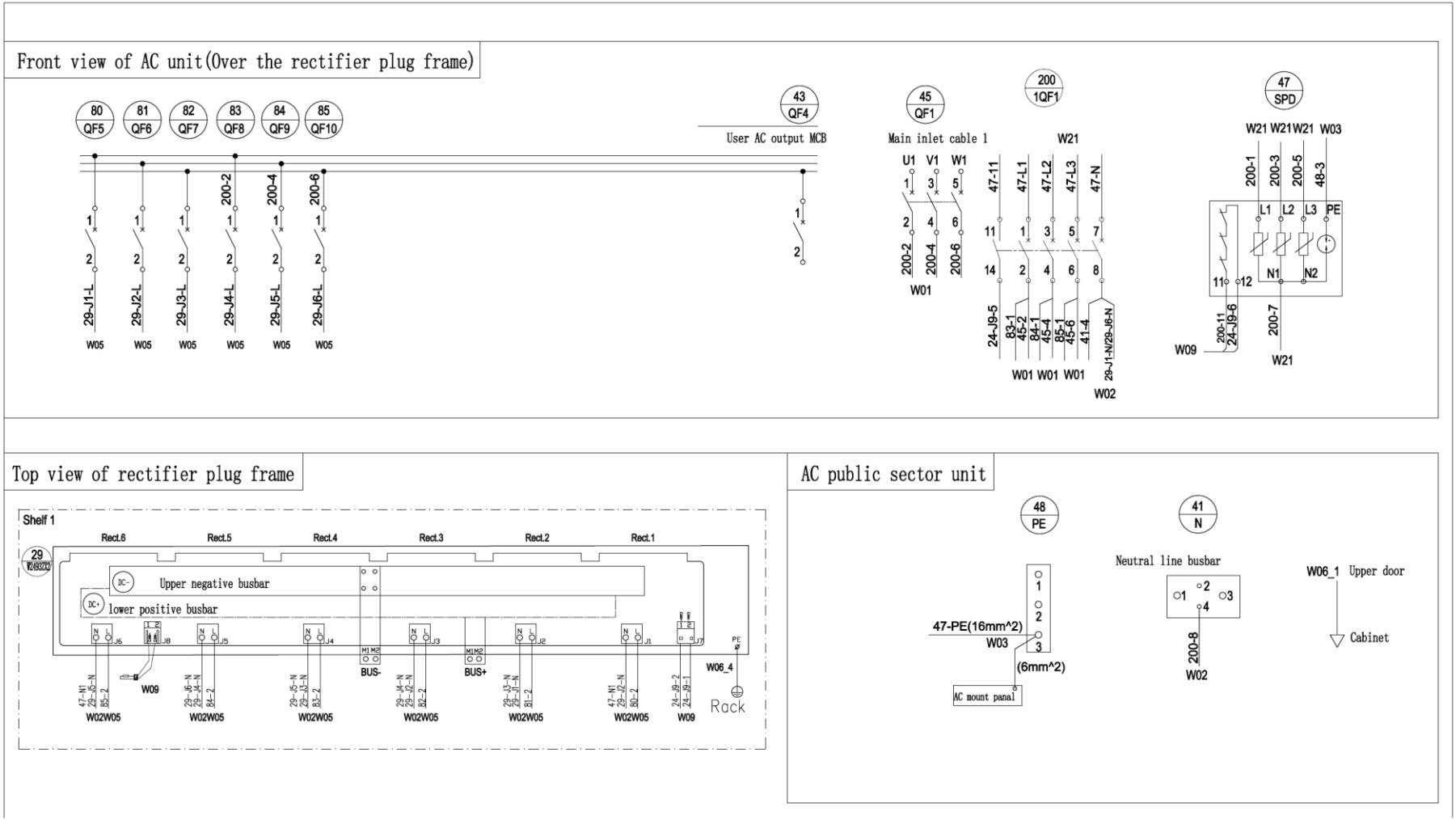


Figure 11 Wiring diagram of NetSure 731 C62-X1 (2)

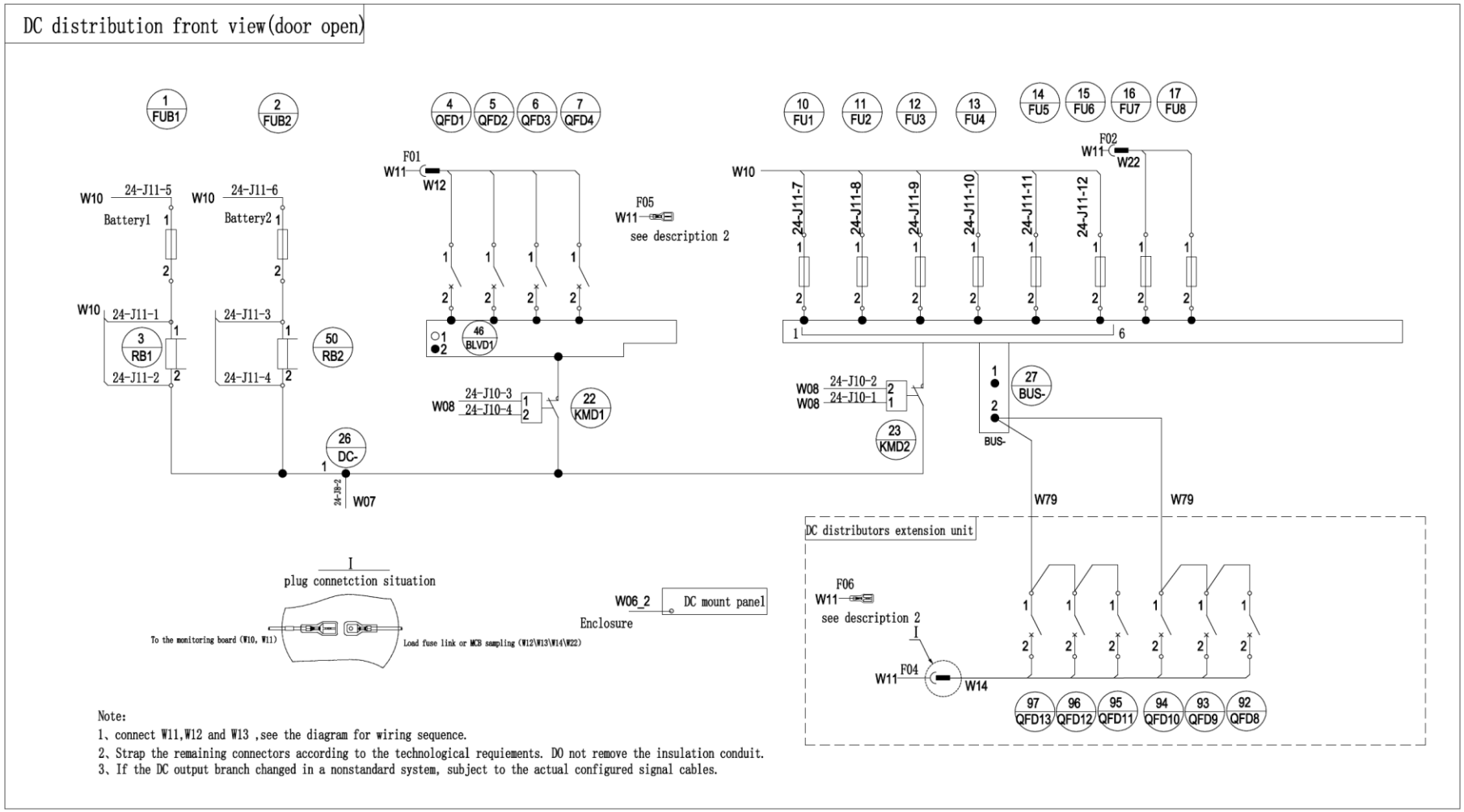


Figure 12 Wiring diagram of NetSure 731 C62-X1 (3)

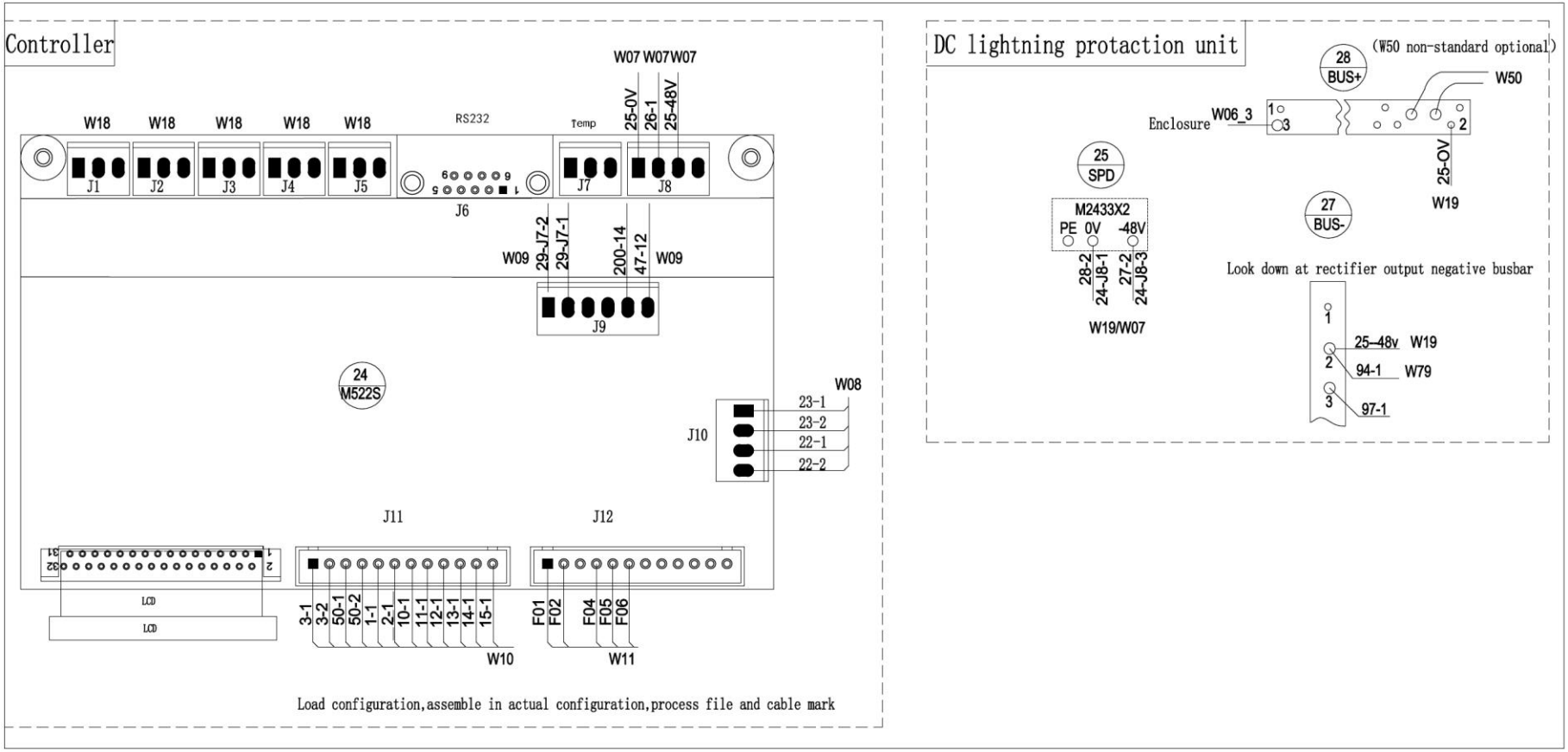


Figure 13 Wiring diagram of NetSure 731 C62-X2 (1)

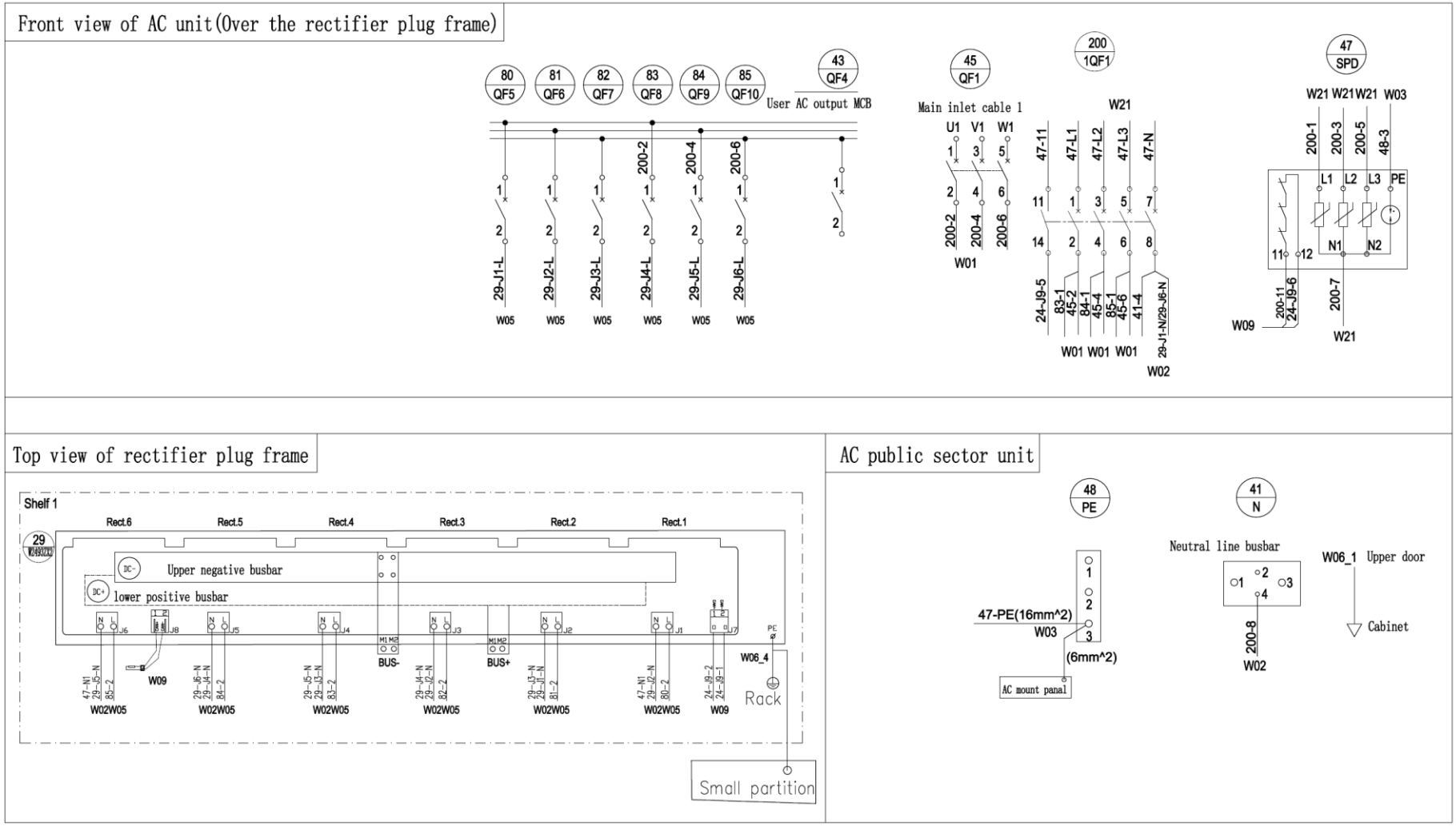


Figure 14 Wiring diagram of NetSure 731 C62-X2 (2)

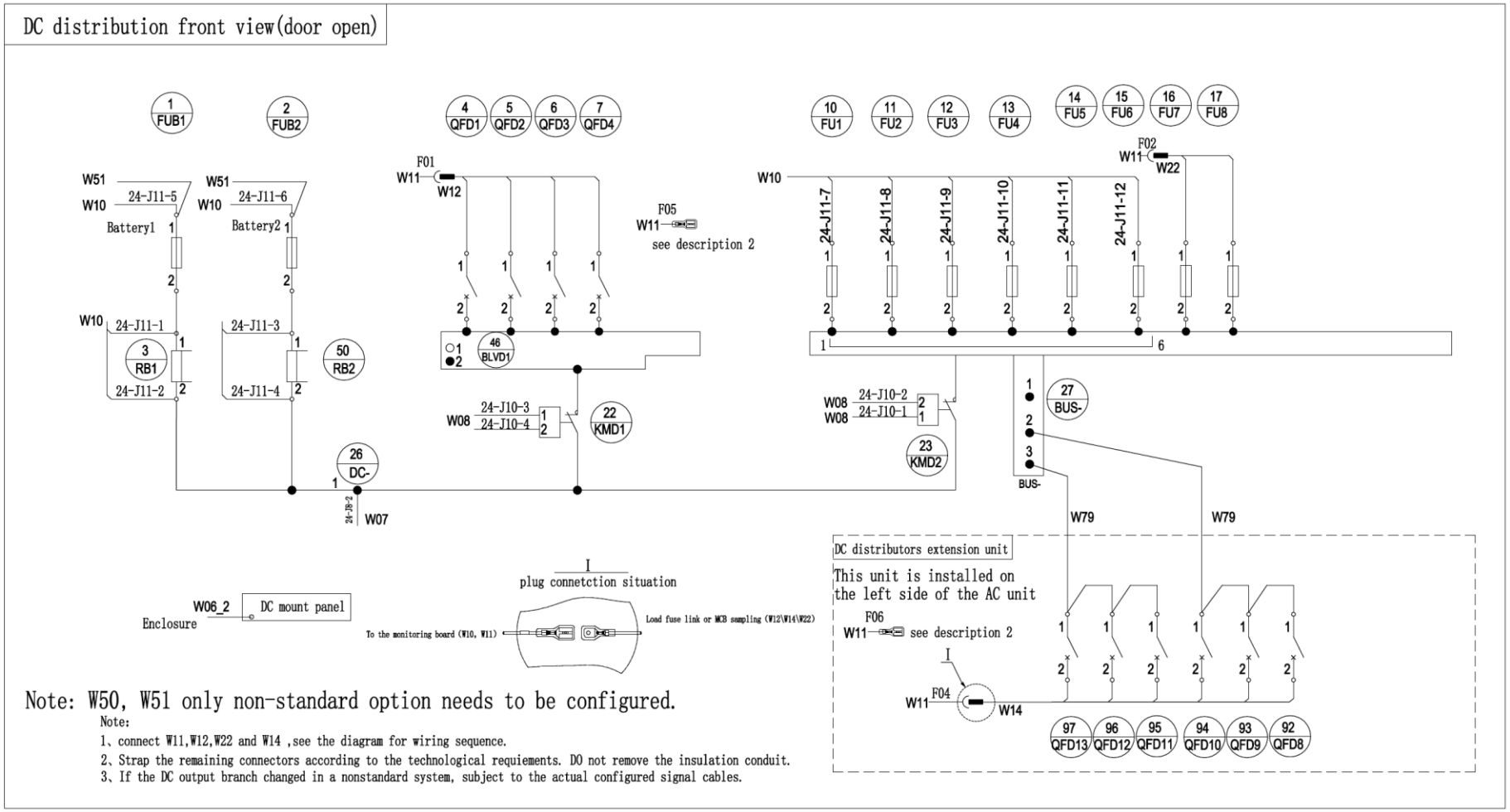
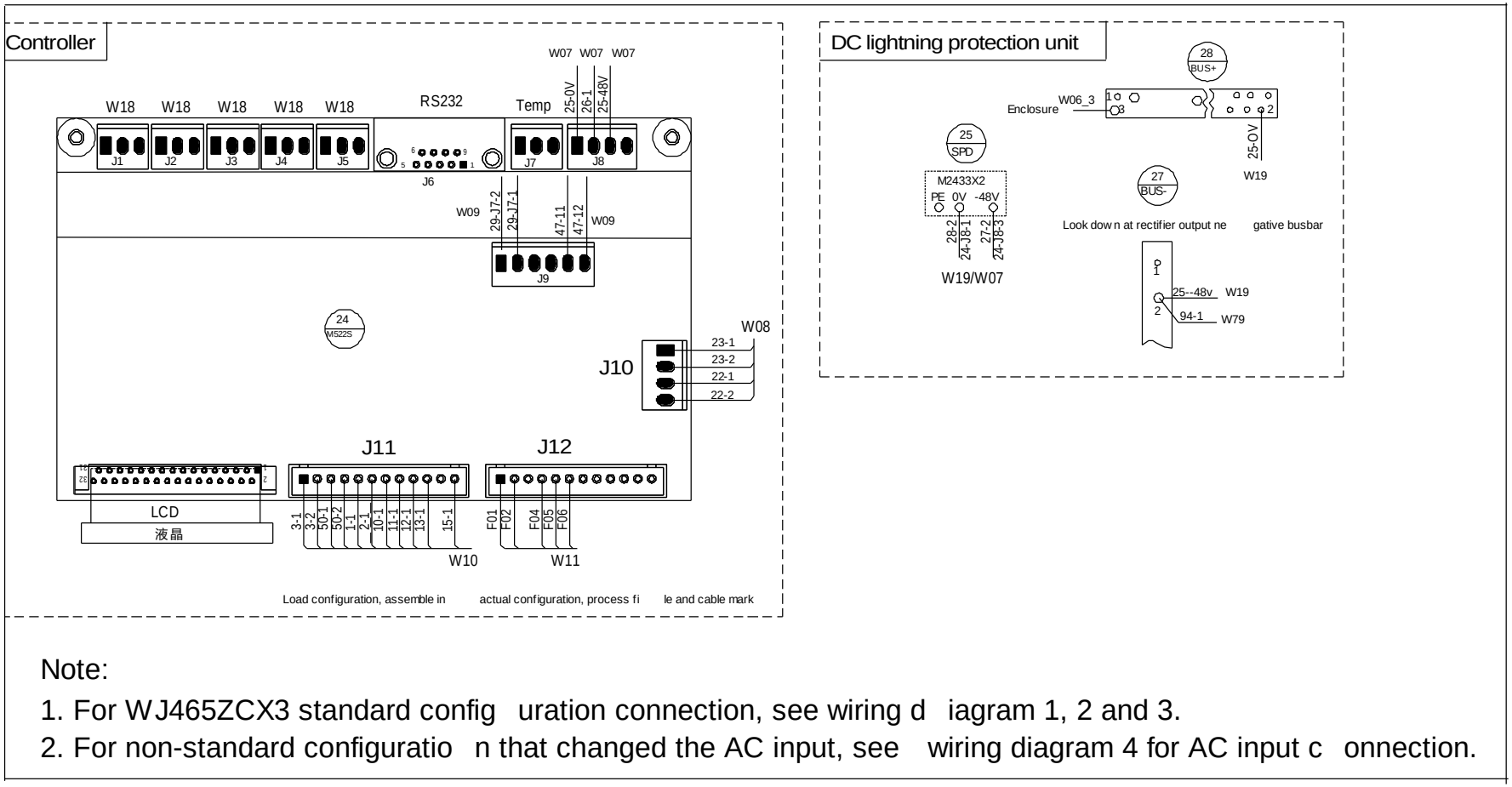


Figure 15 Wiring diagram of NetSure 731 C62-X2 (3)



Note:

1. For WJ465ZCX3 standard configuration connection, see wiring diagram 1, 2 and 3.
2. For non-standard configuration that changed the AC input, see wiring diagram 4 for AC input connection.

Figure 16 Wiring diagram of NetSure 731 C62-X3 (1)

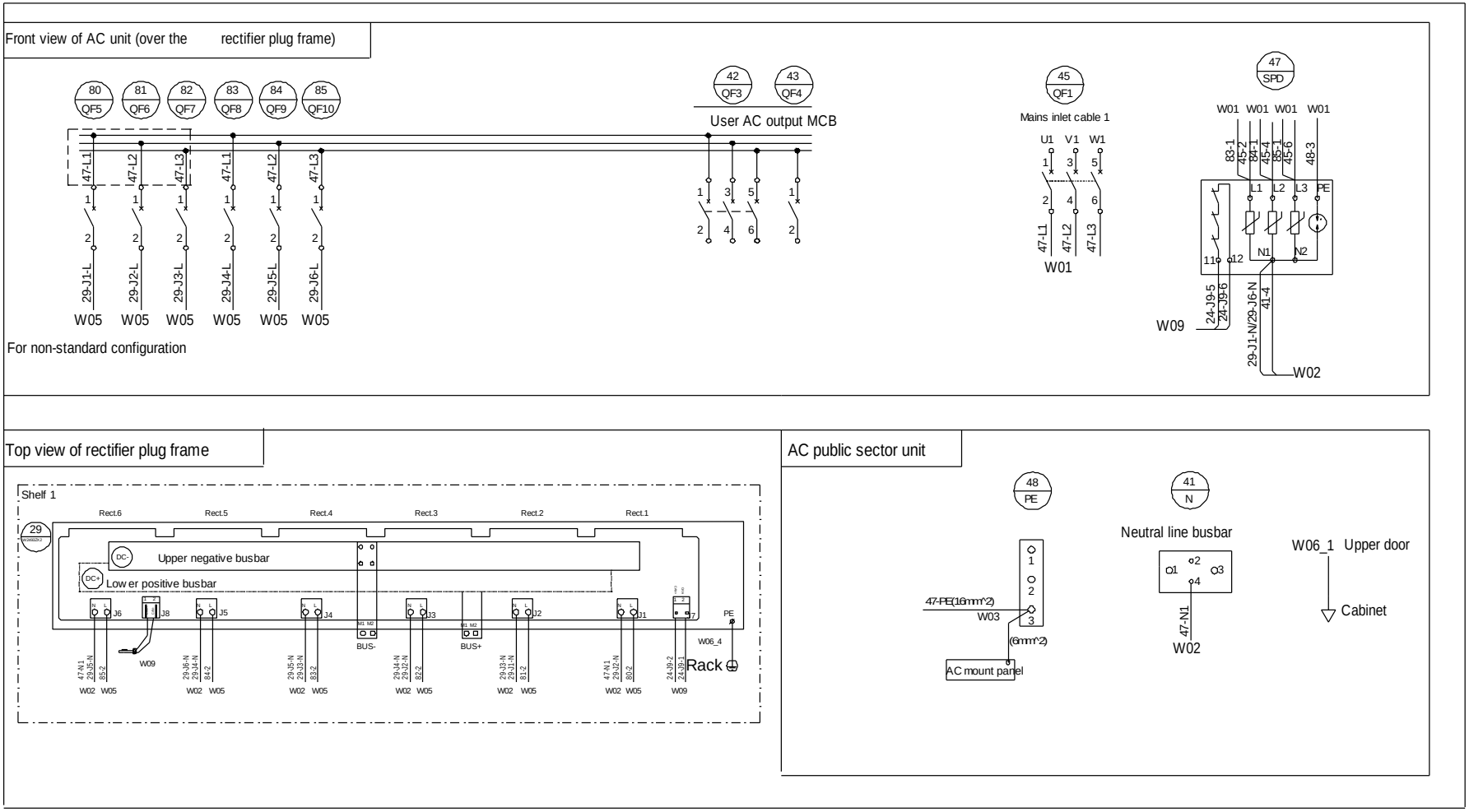


Figure 17 Wiring diagram of NetSure 731 C62-X3 (2)

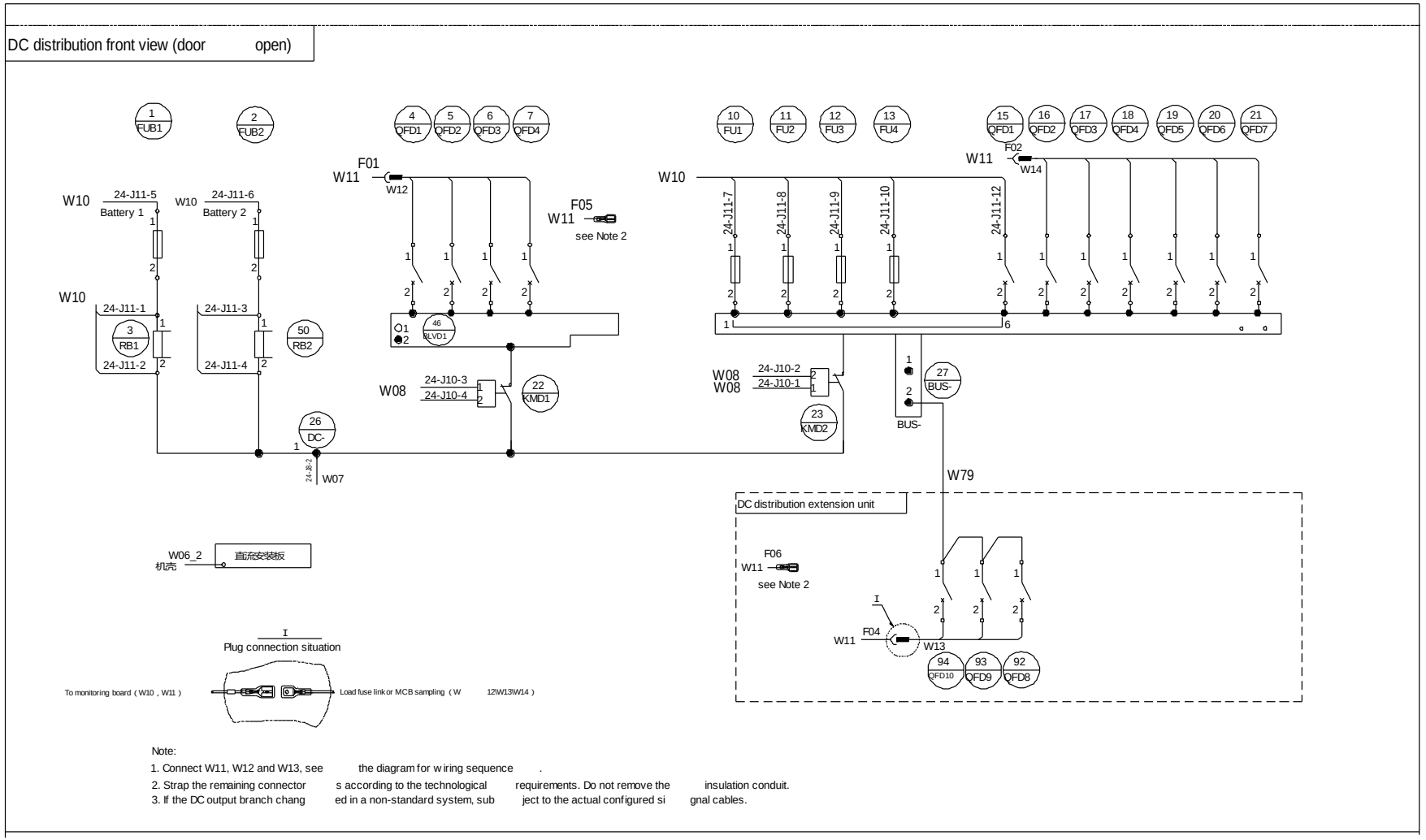


Figure 18 Wiring diagram of NetSure 731 C62-X3 (3)

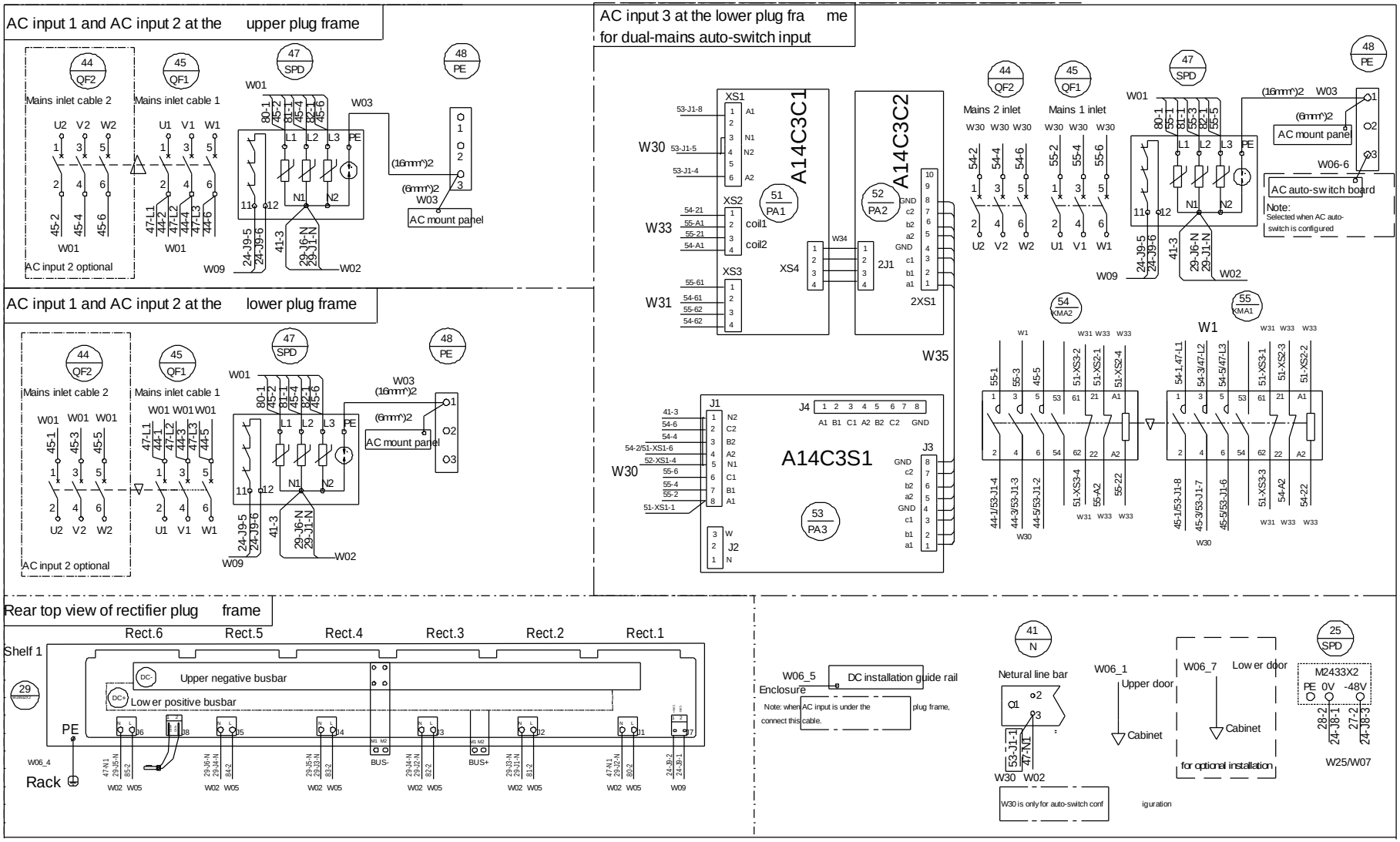


Figure 19 Wiring diagram of NetSure 731 C62-X3 (4)

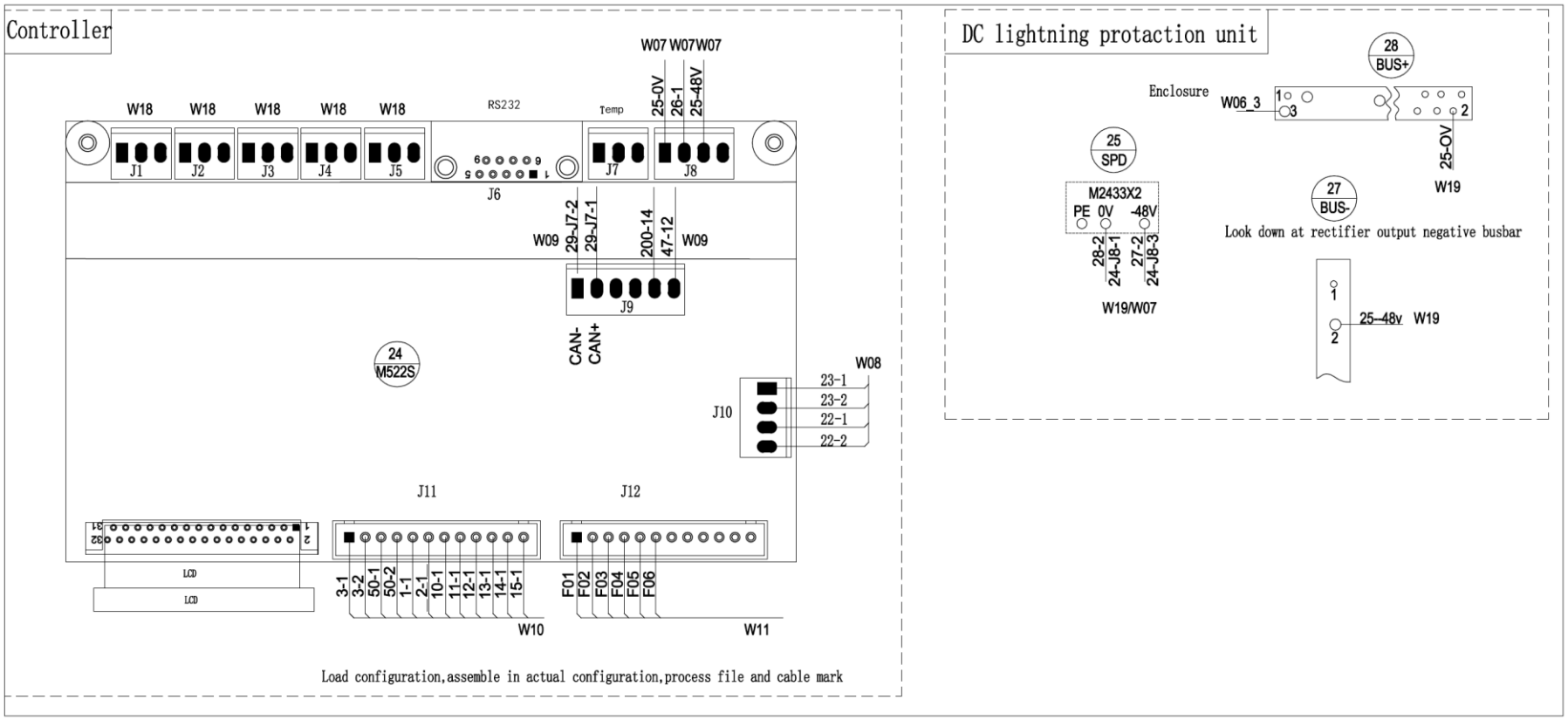


Figure 20 Wiring diagram of NetSure 731 CC2-X1 X2 (1)

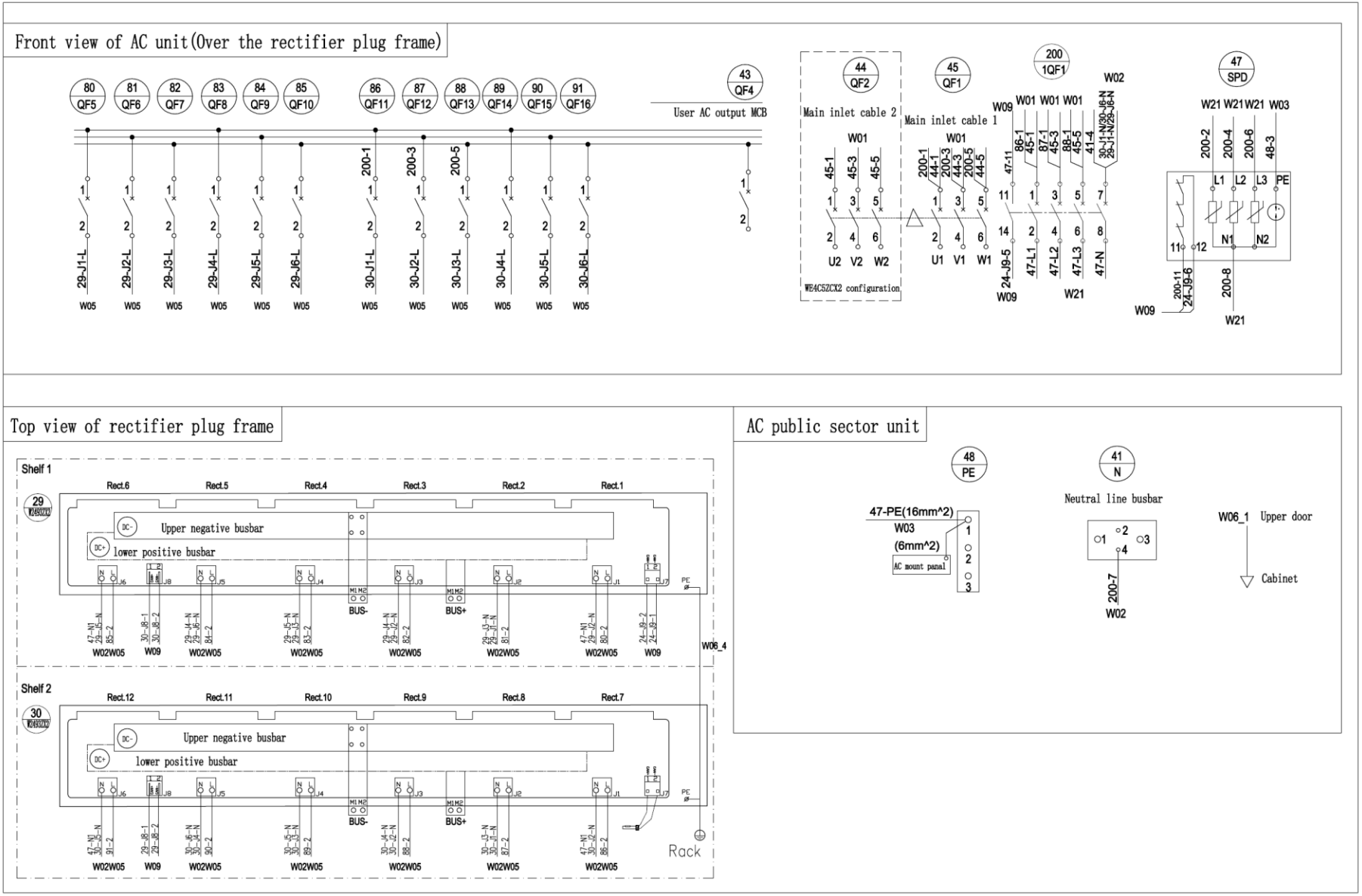


Figure 21 Wiring diagram of NetSure 731 CC2-X1 X2 (2)

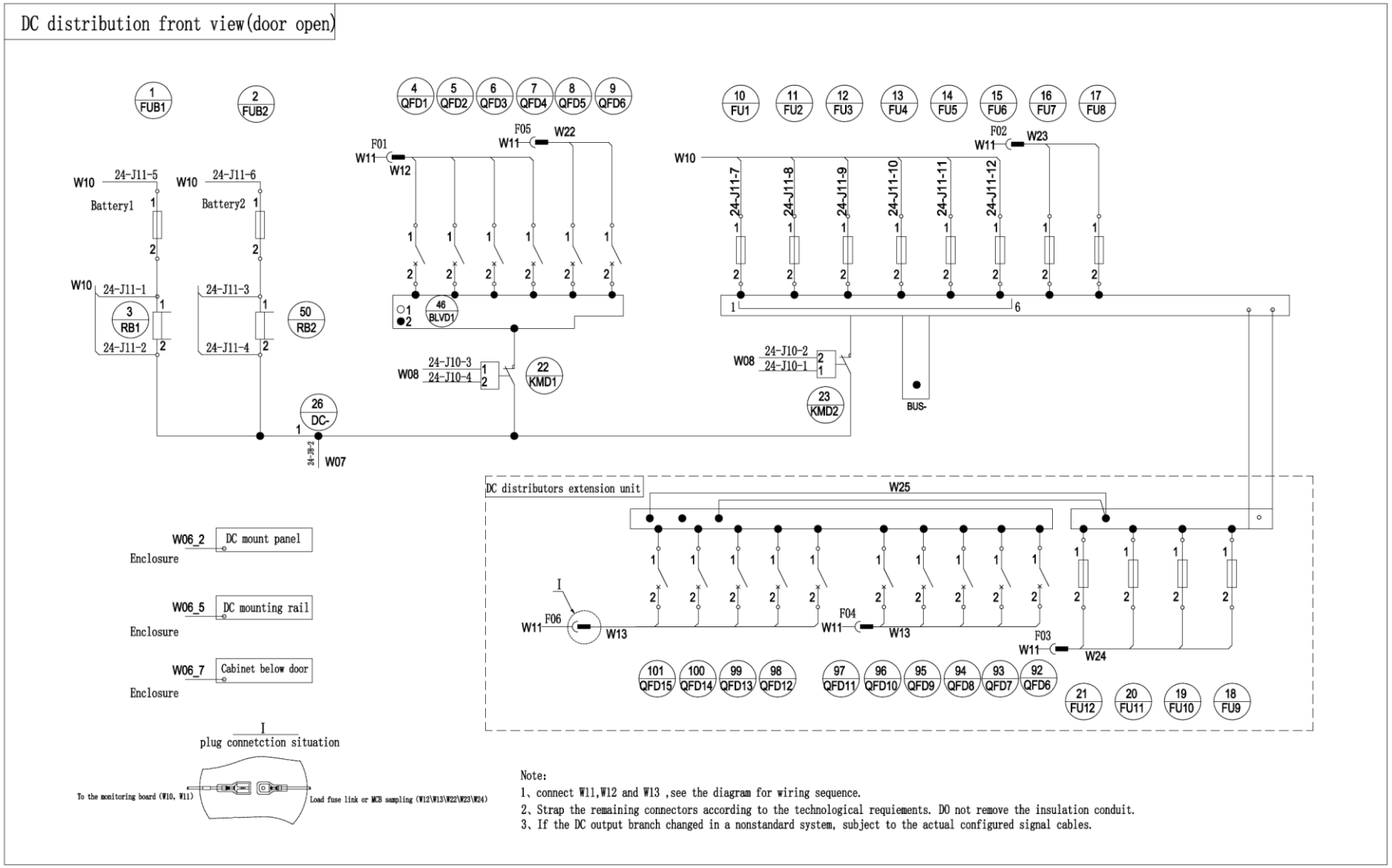


Figure 22 Wiring diagram of NetSure 731 CC2-X1 X2 (3)

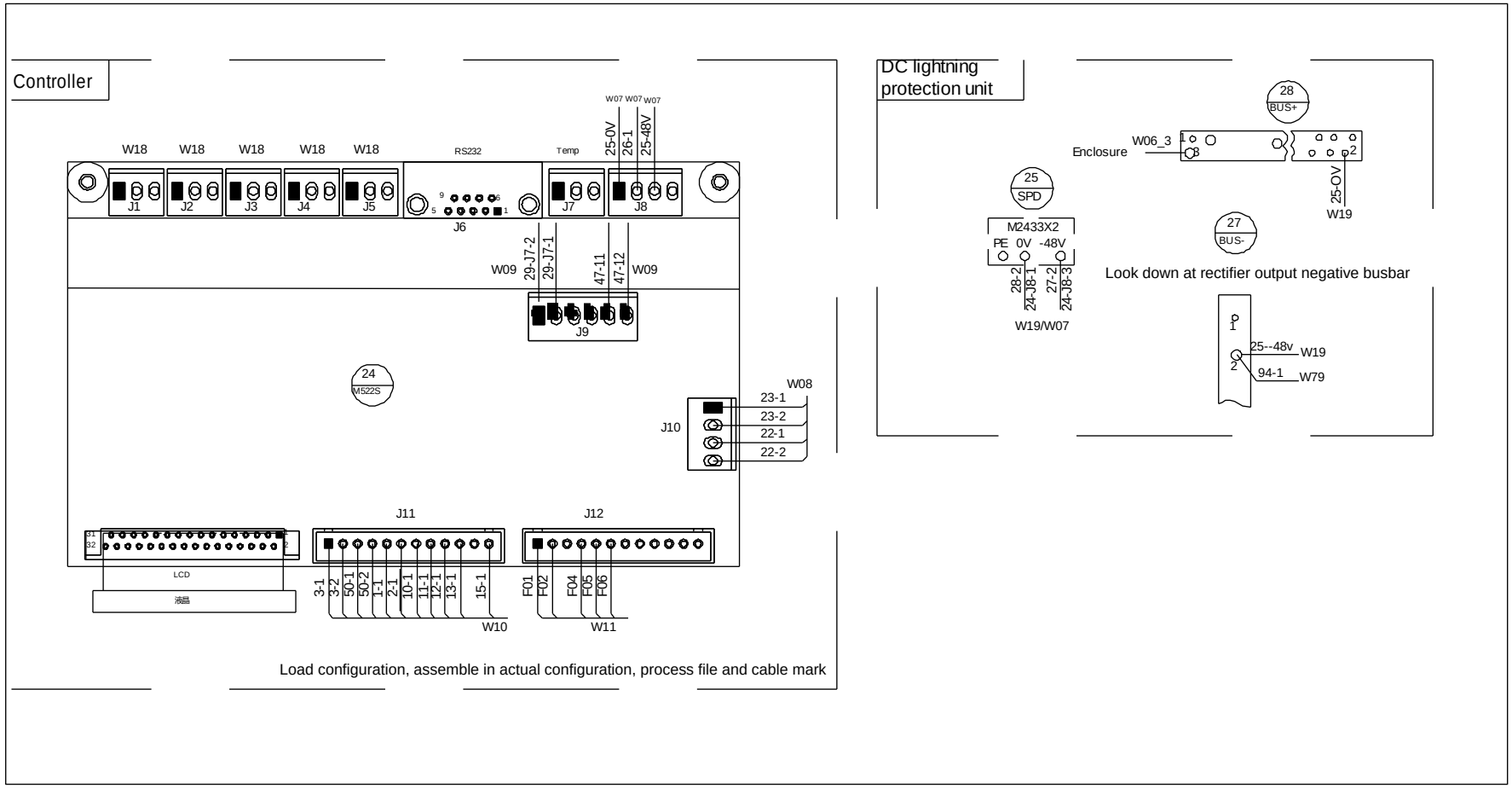


Figure 23 Wiring diagram of NetSure 731 CC2-X3 (1)

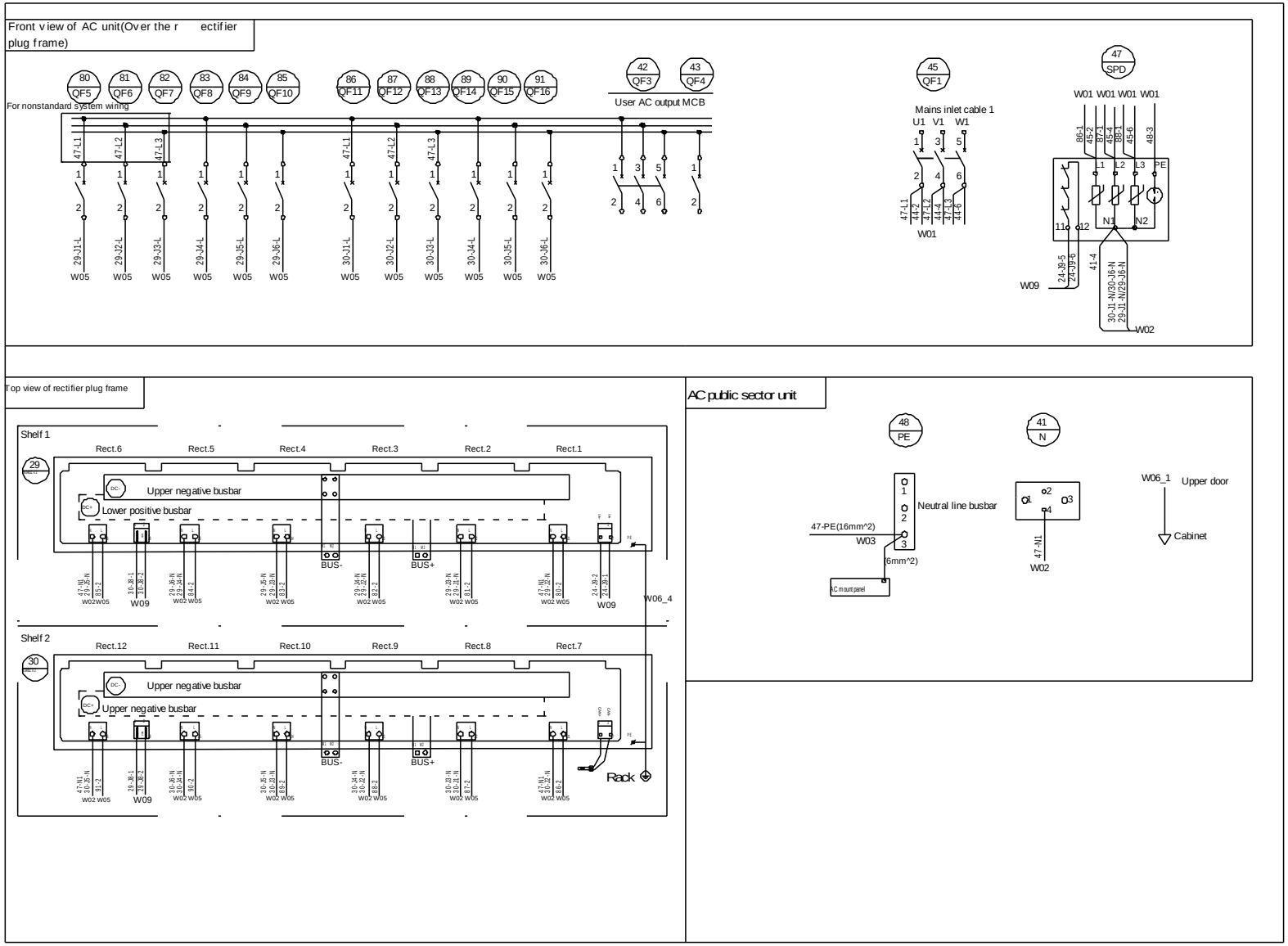


Figure 24 Wiring diagram of NetSure 731 CC2-X3 (2)

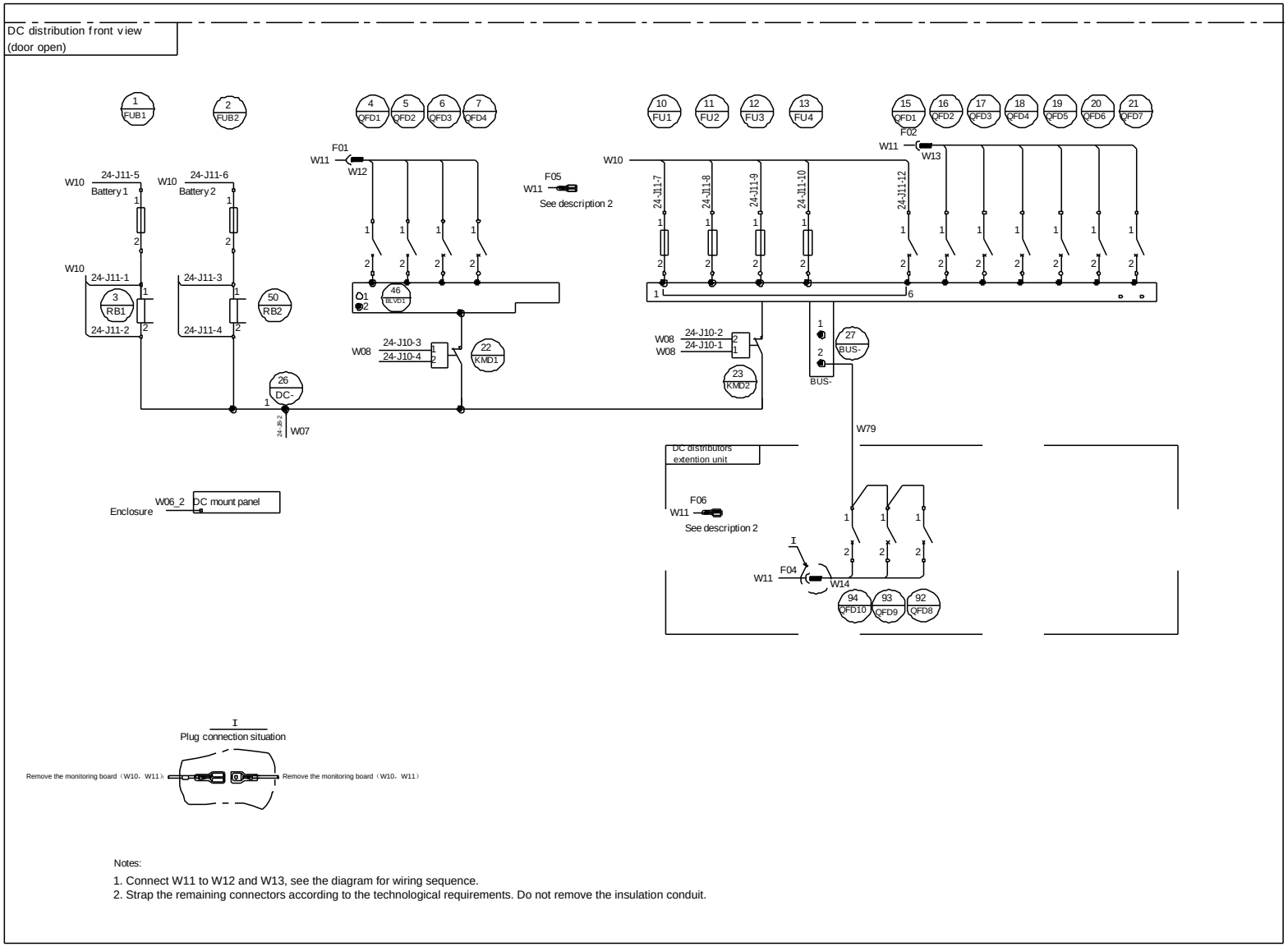


Figure 25 Wiring diagram of NetSure 731 CC2-X3 (3)

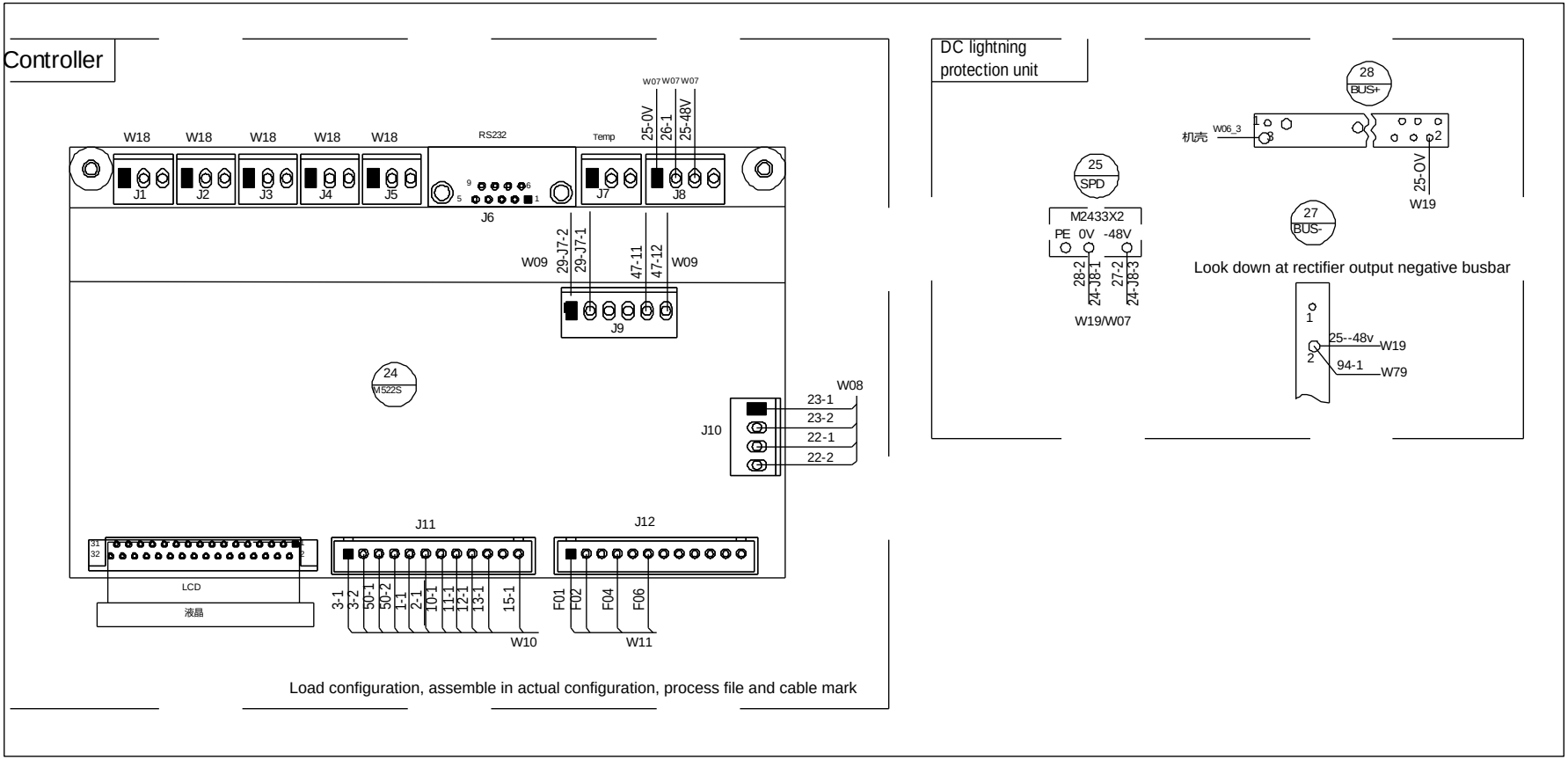


Figure 26 Wiring diagram of NetSure 731 CC2-X4 (1)

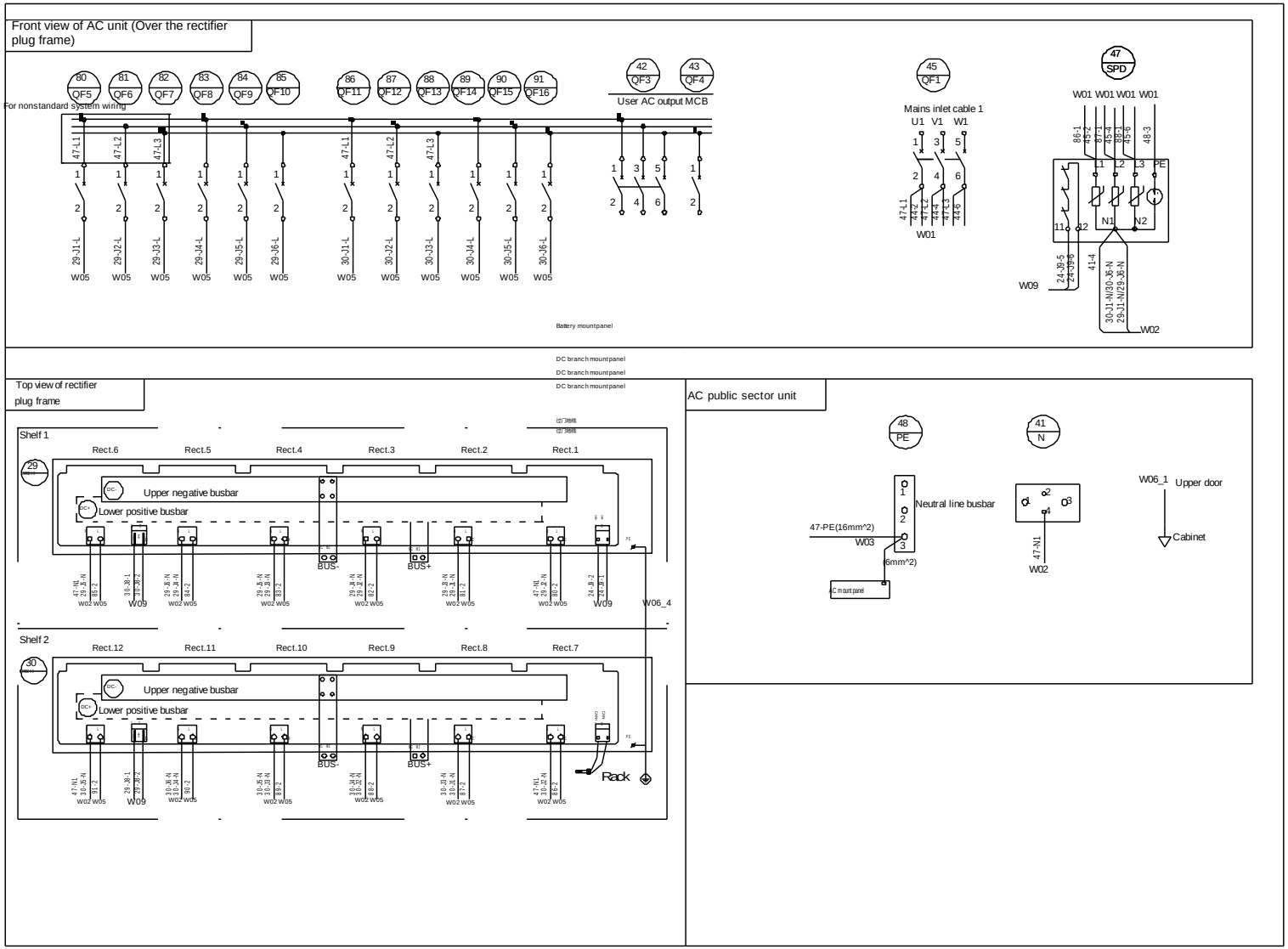


Figure 27 Wiring diagram of NetSure 731 CC2-X4 (2)

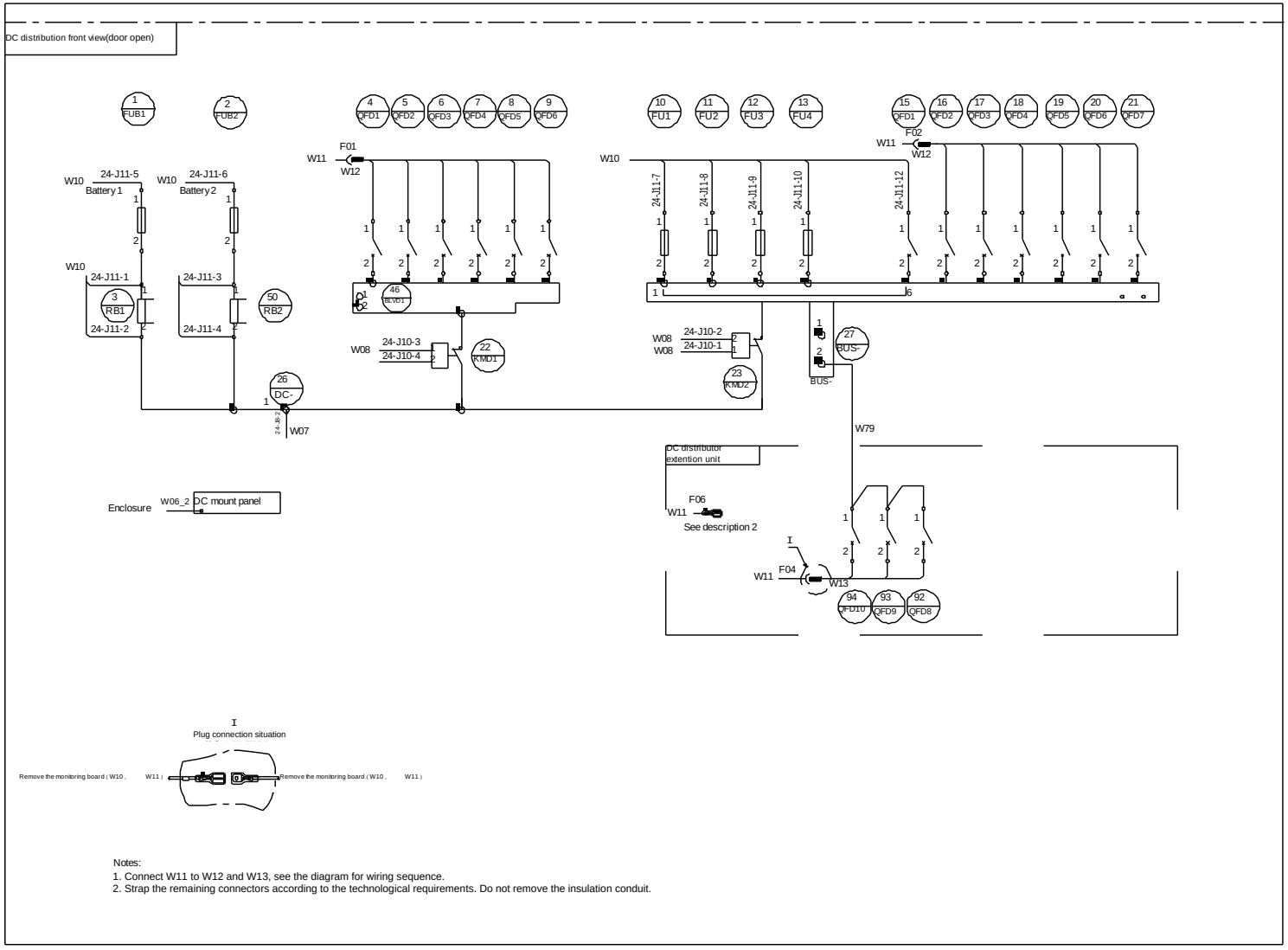


Figure 28 Wiring diagram of NetSure 731 CC2-X4 (3)