Service Manual for RM180-600kVA V2.1

Safety Instruction

Safety Message

Danger: Serious human injury or even death may be caused, if this requirement is ignored.
Warning: Human injury or equipment damage may be caused, if this requirement is ignored.
Attention: Equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.
Commissioning Engineer: The engineer who installs or operates the equipment should be well trained in electricity and safety and familiar with the operation, debug, and maintenance of the equipment.

Warning Label

The warning label indicates the possibility of human injury or equipment damage, and advises the proper step to avoid the danger. In this manual, there are three types of warning labels as below.

Labels	Description
 **Danger**	Serious human injury or even death may be caused, if this requirement is ignored.
 **Warning**	Human injury or equipment damage may be caused, if this requirement is ignored.
 **Attention**	Equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.

Safety Instruction

 **Danger**	² Performed only by commissioning engineers. ² This UPS is designed for commercial and industrial applications only, and is not intended for any use in life-support devices or system.
 **Warning**	² Read all the warning labels carefully before operation, and follow the instructions.

	² When the system is running, do not touch the surface with this label, to avoid any hurt of scald.
	² ESD sensitive components inside the UPS, anti-ESD measure should be taken before handling.

Move & Install

 **Danger**	² Keep the equipment away from heat source or air outlets. ² In case of fire, use dry powder extinguisher only, any liquid extinguisher can result in electric shock.
 **Warning**	² Do not start the system if any damage or abnormal parts founded. ² Contacting the UPS with wet material or hands may be subject to electric shock.
 **Attention**	² Use proper facilities to handle and install the UPS. Shielding shoes, protective clothes and other protective facilities are necessary to avoid injury. ² During positioning, keep the UPS way from shock or vibration. ² Install the UPS in proper environment, more detail in section 3.3.

Debug & Operate

 **Danger**	² Make sure the grounding cable is well connected before connecting the power cables, the grounding cable and neutral cable must be in accordance with the local and national codes practice. ² Before moving or re-connecting the cables, make sure to cut off all the input power sources, and wait for at least 10 minutes for internal discharge. Use a multi-meter to measure the voltage on terminals and ensure the voltage is lower than 36V before operation.
 **Attention**	² The earth leakage current of load will be carried by RCCB or RCD. ² Initial check and inspection should be performed after long time storing of UPS.

Maintenance & Replacement

 **Danger**	² All the equipment maintenance and servicing procedures involving internal access need special tools and should be carried out only by trained personnel. The components that can only be accessed by opening the protective cover with tools cannot be maintained by user. ² This UPS full complies with "IEC62040-1-1-General and safety requirements for use in operator access area UPS". Dangerous voltages are present within the battery box. However, the risk of contact with these high voltages is minimized for non-service personnel. Since the component with dangerous

	voltage can only be touched by opening the protective cover with a tool, the possibility of touching high voltage component is minimized. No risk exists to any personnel when operating the equipment in the normal manner, following the recommended operating procedures in this manual.

Battery Safety

 **Danger**	² All the battery maintenance and servicing procedures involving internal access need special tools or keys and should be carried out only by trained personnel. ² WHEN CONNECTED TOGETHER, THE BATTERY TERMINAL VOLTAGE WILL EXCEED 400Vdc AND IS POTENTIALLY LEATHAL. ² Battery manufacturers supply details of the necessary precautions to be observed when working on, or in the vicinity of, a large bank of battery cells. These precautions should be followed implicitly at all times. Particular attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid and fire-fighting facilities. ² Ambient temperature is a major factor in determining the battery capacity and life. The nominal operating temperature of battery is 20°C. Operating above this temperature will reduce the battery life. Periodically change the battery according to the battery user manuals to ensure the back-up time of UPS. ² Replace the batteries only with the same type and the same number, or it may cause explosion or poor performance. ² When connecting the battery, follow the precautions for high-voltage operation before accepting and using the battery, check the appearance the battery. If the package is damaged, or the battery terminal is dirty, corroded or rusted or the shell is broken, deformed or has leakage, replace it with new product. Otherwise, battery capacity reduction, electric leakage or fire may be caused. I Before operating the battery, remove the finger ring, watch, necklace, bracelet and any other metal jewelry I Wear rubber gloves. I Eye protection should be worn to prevent injury from accidental electrical arcs. I Only use tools (e.g. wrench) with insulated handles. I The batteries are very heavy. Please handle and lift the battery with proper Possible reason to prevent any human injury or damage to the battery terminal. I Do not decompose, modify or damage the battery. Otherwise, battery short circuit, leakage or even human injury may be caused.

	■ The battery contains sulfuric acid. In normal operation, all the sulfuric acid is attached to the separation board and plate in the battery. However, when the battery case is broken, the acid will leak from the battery. Therefore, be sure to wear a pair of protective glasses, rubber gloves and skirt when operating the battery. Otherwise, you may become blind if acid enters your eyes and your skin may be damaged by the acid. ■ At the end of battery life, the battery may have internal short circuit, drain of electrolytic and erosion of positive/negative plates. If this condition continues, the battery may have temperature out of control, swell or leak. Be sure to replace the battery before these phenomena happen. ■ If a battery leaks electrolyte, or is otherwise physically damaged, it must be replaced, stored in a container resistant to sulfuric acid and disposed of in accordance with local regulations. ■ If electrolyte comes into contact with the skin, the affected area should be washed immediately with water.

Disposal

 **Warning**	² Dispose of used battery according to the local instructions

Contents

1. Introduction to UPS Structure and Key components

1.1 Structure

The modular UPS consists of power unit, charger/discharger, STS, Bypass Maintenance Switch and external battery, as is shown in Figure 1-1 and 1-2.

Power unit：

It consists of parallel power modules. Each power module includes Rectifier and Inverter.

Charger/Discharger：

When the UPS is normally powered by the utility, the UPS charges the battery; when there is no utility or abnormal, the battery discharges and the UPS is powered by the battery.

STS： It consists of two paralleled SCR. The load can be powered directly by the utility through the STS.

Bypass Maintenance Switch： The Bypass Maintenance Switch is used when Maintenance work needs to be done while keep the load on.

External Battery：When the utility is off or being abnormal, the UPS power the load by obtaining energy from the External Battery.

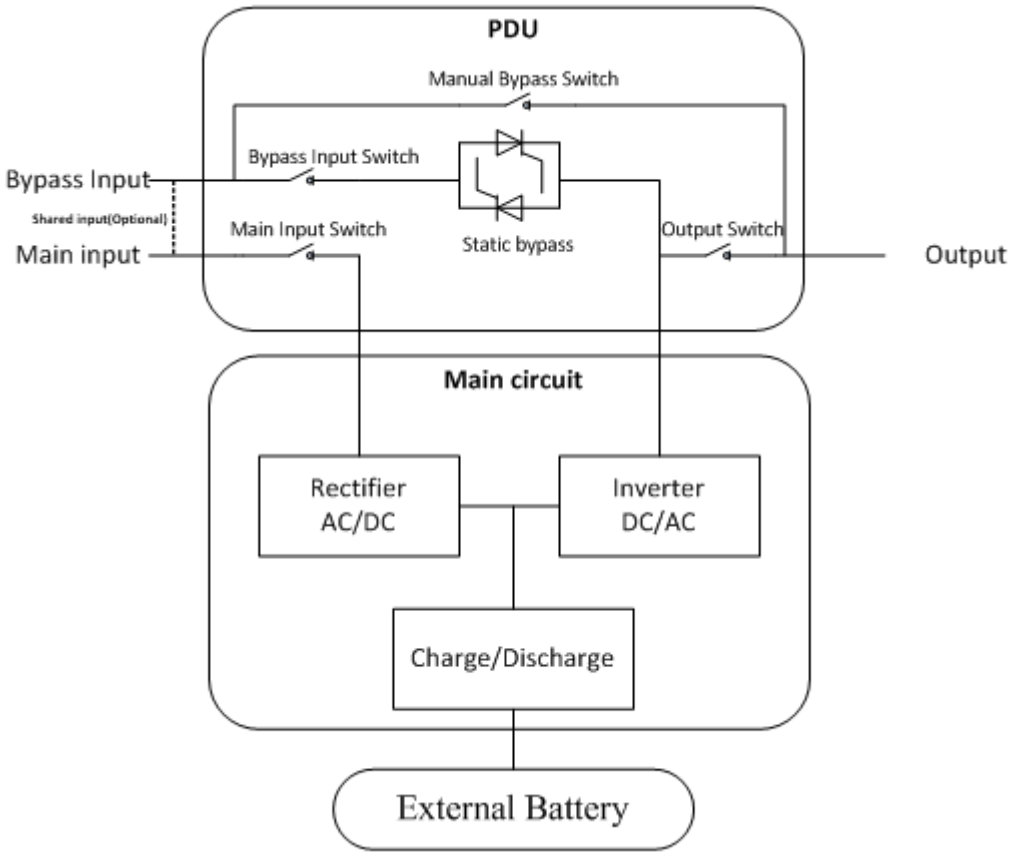


Figure 1-1 20-slot UPS Configuration

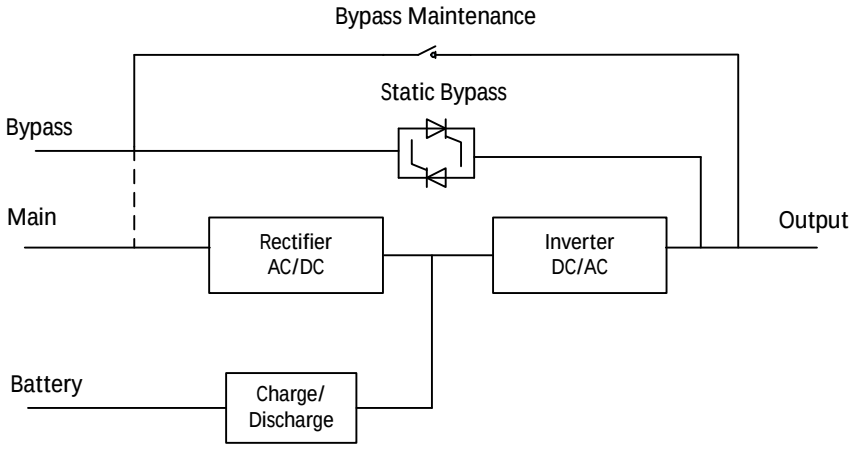


Figure 1-2 6-slot and 10-slot UPS Configuration

1.2 Topological Diagram

The Topological diagram of the system is shown as Figure 1.2:

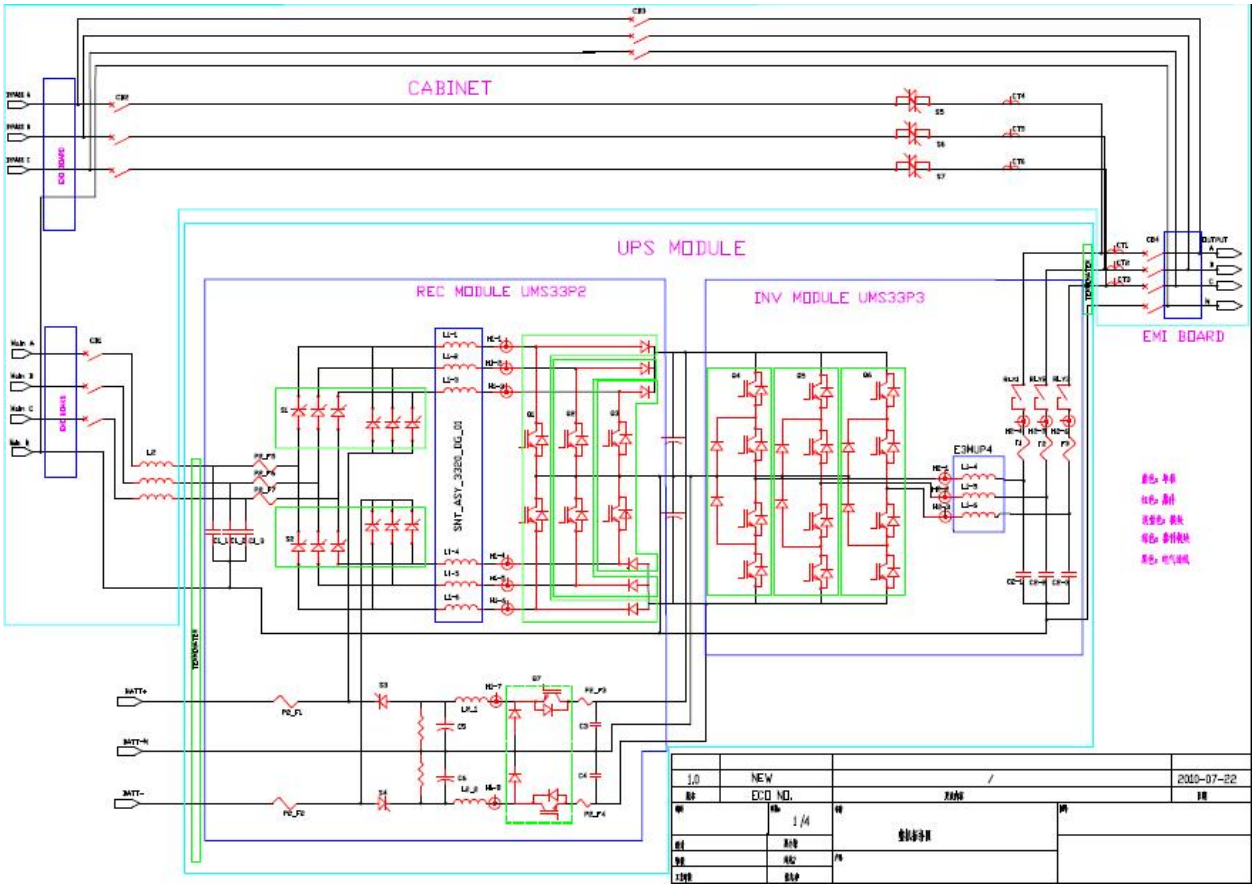


Figure 1.2 Topological diagram of the system

2 Structure of the Cabinet

2.1 Front of the Cabinet

The front contains SPD(Optional), bypass Maintenance switch, LCD, battery cold, bypass& monitoring module, dry contact, power module, SNMP(Optional), Expansion dry contact card, LBS, RS485, RS232, as is shown in Figure 2.1 and 2.2.

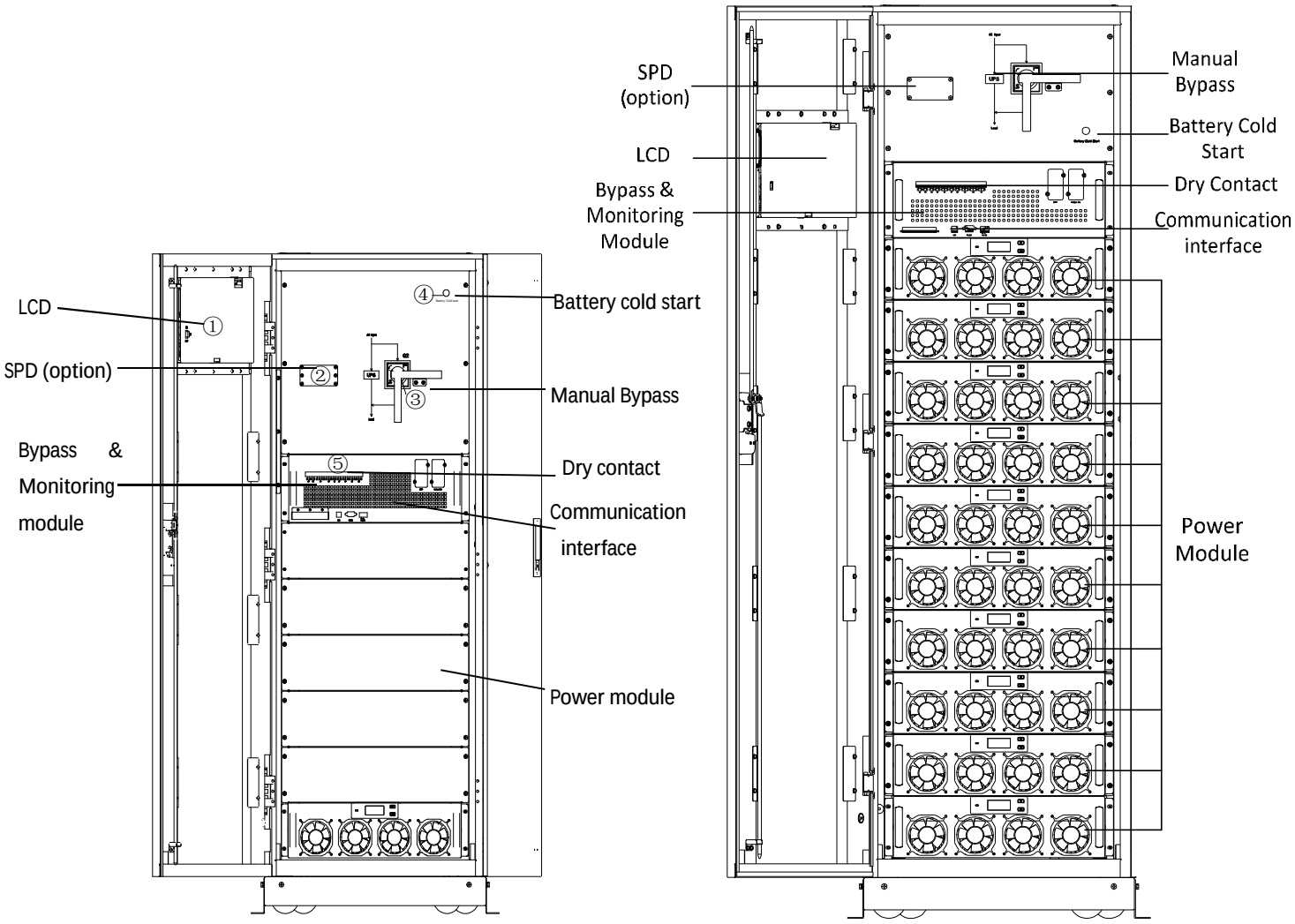


Figure 2.1 6-slot and 10 slot front view

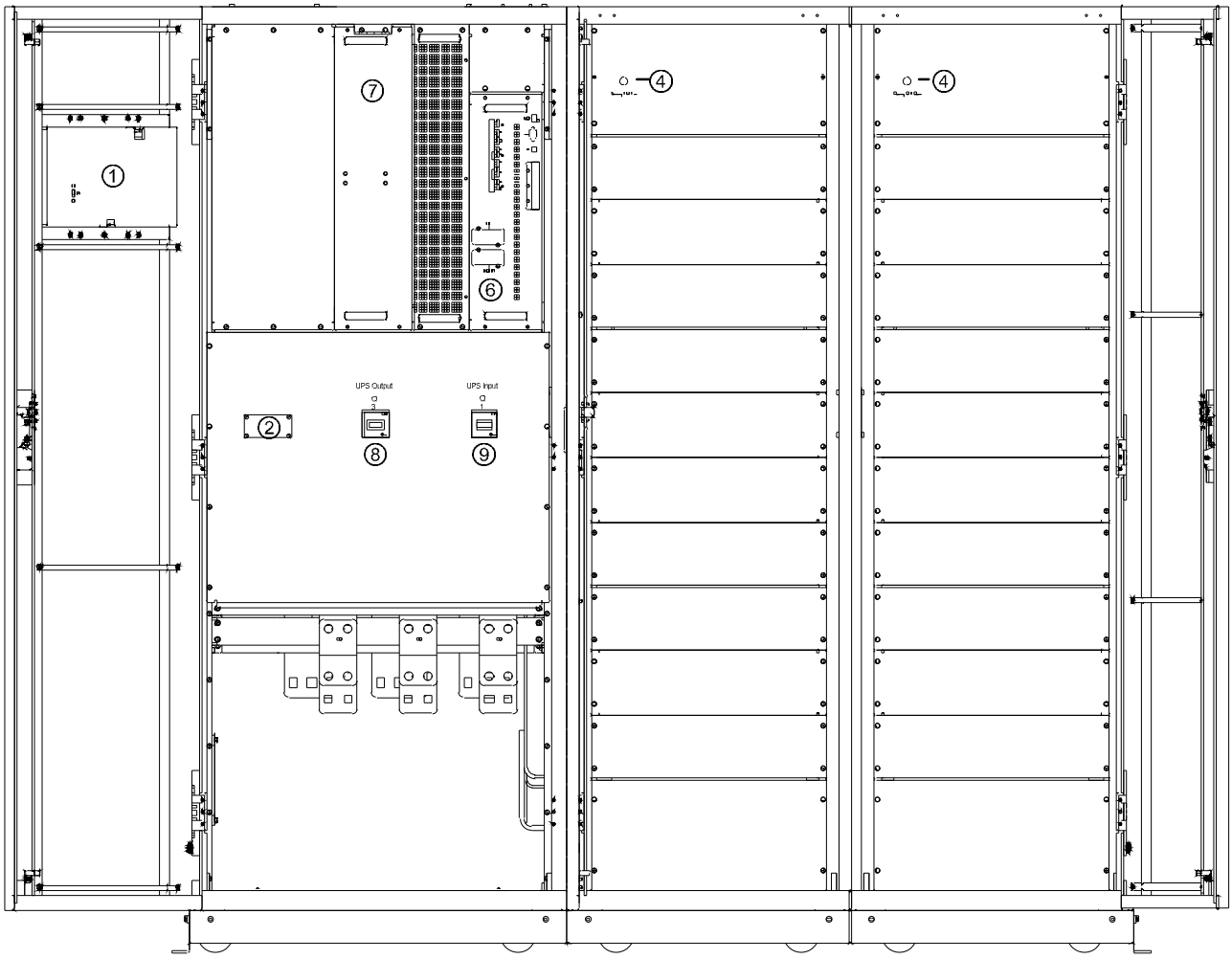


Figure 2.2 20 slot front view

①LCD control panel; ②SPD; ③Manual Bypass switch ④Battery cold start;

⑤Monitoring &static bypass module; ⑥Monitoring unit; ⑦Static Bypass unit;

⑧Output switch of 20-slot cabinet Q3; ⑨Input switch of 20-slot cabinet Q1.

2.2 Back of the Cabinet

It includes Input terminals, Output terminal, battery terminal, and power module connectors, as is shown in Figure 2.3, 2.4 and 2.5.

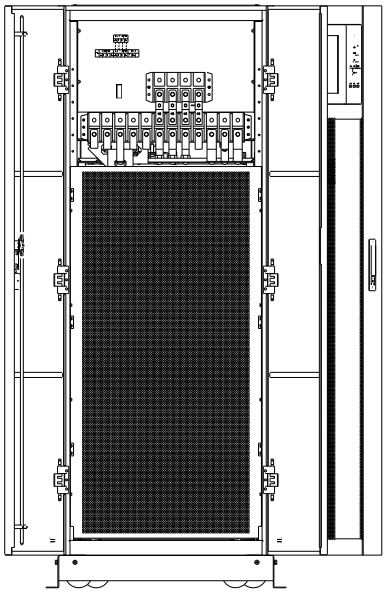


Figure 2.3 Back view of 6-slot UPS

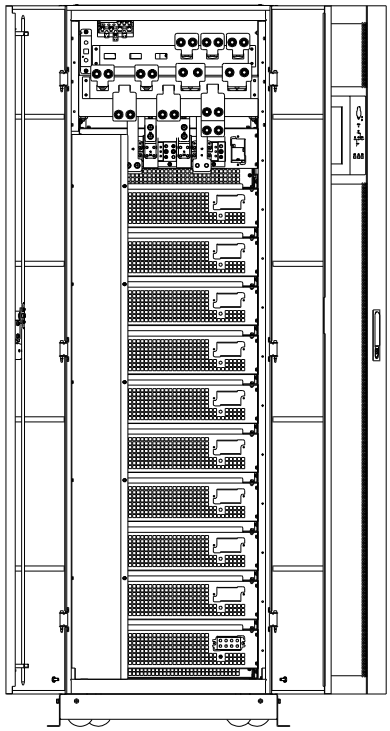


Figure 2.4 Back view of 10-slot UPS

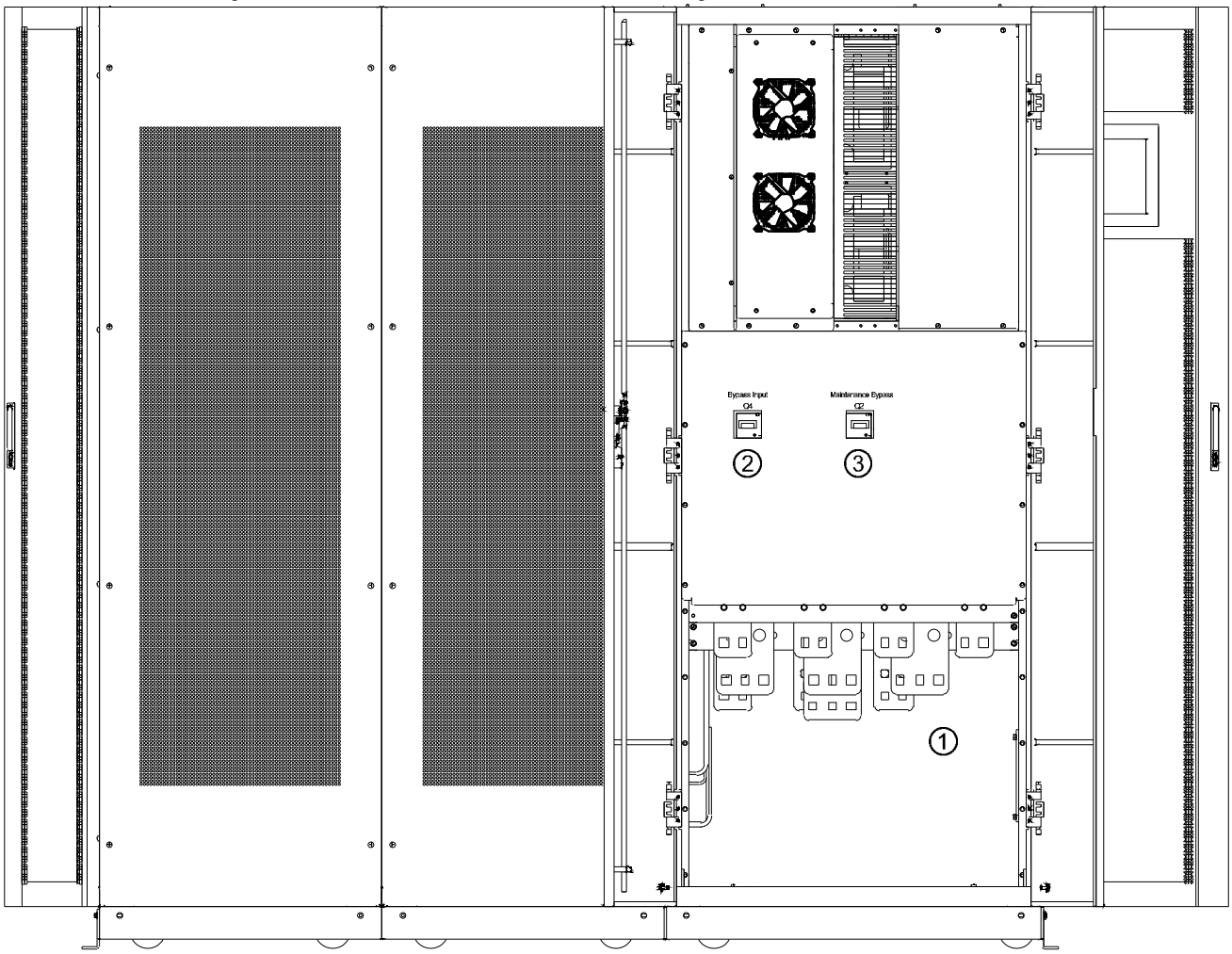


Figure 2.5 Back view of 20-slot UPS

①PDU; ②Bypass Input switch of 20-slot cabinet Q3; ③Manual bypass switch of 20-slot cabinet Q3

2.3 Top view of the cabinet

It includes the Input EMI and Battery cold board.

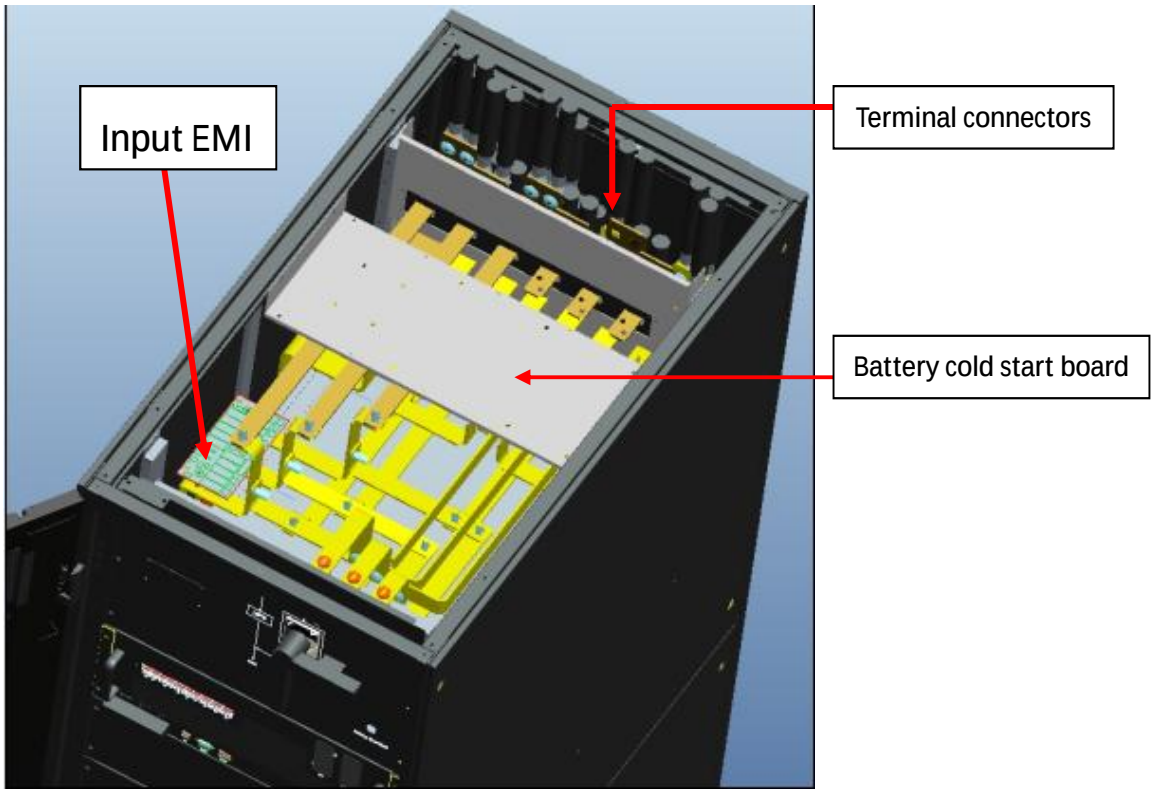


Figure 2.3 10-slot top view

3 Power Cable

3.1 The recommended the cable is shown in the following Table 3.1

Table 3.1 Cable selection

Contents			180KVA	300KVA	600kVA
Main Input	Main Input Current		310A	520A	1050A
	Cable section （mm^2）	A	95	185	2*185
		B	95	185	2*185
		C	95	185	2*185
		N	95	185	2*185
Output	Output Current		272A	450A	900A
	Cable section （mm^2）	A	70	150	2*150
		B	70	150	2*150
		C	70	150	2*150
		N	70	150	2*150
Bypass Input （Optional）	Bypass Input Current		272A	450A	900A
	Cable section （mm^2）	A	70	150	2*150
		B	70	150	2*150
		C	70	150	2*150
		N	70	150	2*150
Battery Input	Battery Current		355A	600A	1200A
	Cable section （mm^2）	+	120	240	2*240
		-	120	240	2*240
		N	120	240	2*240
PE	Cable Section （mm^2）	PE	75	120	2*120

Note

The recommended cable section for power cables are only for situations described below：

- Ambient temperature：+30℃.
- AC loss less than 3%，DC loss less than 1%，The length of the AC power cables are no longer than 50 m and the length of the DC power cables are no longer than 30 m.
- Currents listed in the table are based on the 380V system (Line-to-line voltage) .For 400 V system, the currents is 0.95 times and for the 415V system the current is 0.92 times.
- The size of neutral lines should be 1.5~1.7 times the value listed above when the predominant load is non-linear.

4 Structure of Power Module

4.1 Components

The power module consists of inductance board，charger，power supply board，rectifier board，boost power board, inverter board, EMI board and control board. The PCB list is shown as below.

Series number	PCB	PCB Name	Description
1	Power Module LCD	Power Module LCD	Display information of the power module
2	PCB_PS1203_DR1	Input SCR board	Input SCR
3	PCB_PS1203_DR2	Rectifier board	Rectifier board for battery and Utility
4	PCB_PS1203_DR4	Inverter board	Inverse the DC to AC
5	PCB_PS1203_EM1	Output EMI board	EMI for output
6	PCB_PS1203_CP2	Rectifier Inductor board	Rectifier Inductance
7	PCB_PS1203_CP3	Inverter Inductor board	Inverter Inductance
8	PCB_PS1203_CP4	Input inductor board	Input inductance
9	PCB_PS1203_PW1	Power supply for fans	LED display and supply power for fans
10	PCB_PS1203_PW2	Charging board	Charging the battery
11	PCB_PS1203_PW3	Power supply board	Supply power for control unit
12	PCB_PS1203_CT1	Control board	Monitoring and control of power module

4.2 Lower Layer

The lower layer of the power module contains inductance board, power supply and charge board whose locations are shown as Figure 4.1 below.

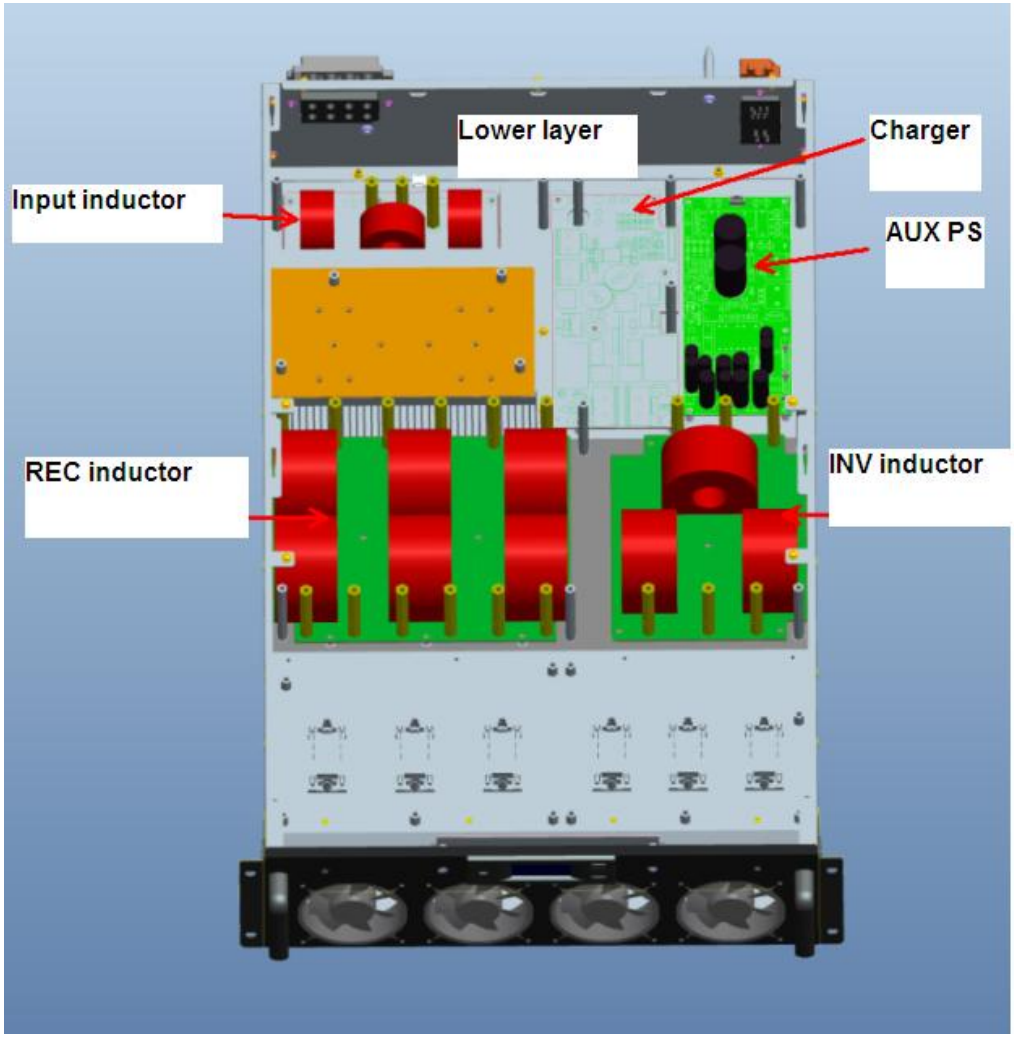


Figure 4.1 Lower Layer of the power module

4.3 Upper Layer

The upper layer of the power module contains input SCR board, rectifier board, inverter board, output board, control board and fan board, as is shown in the Figure 4.2

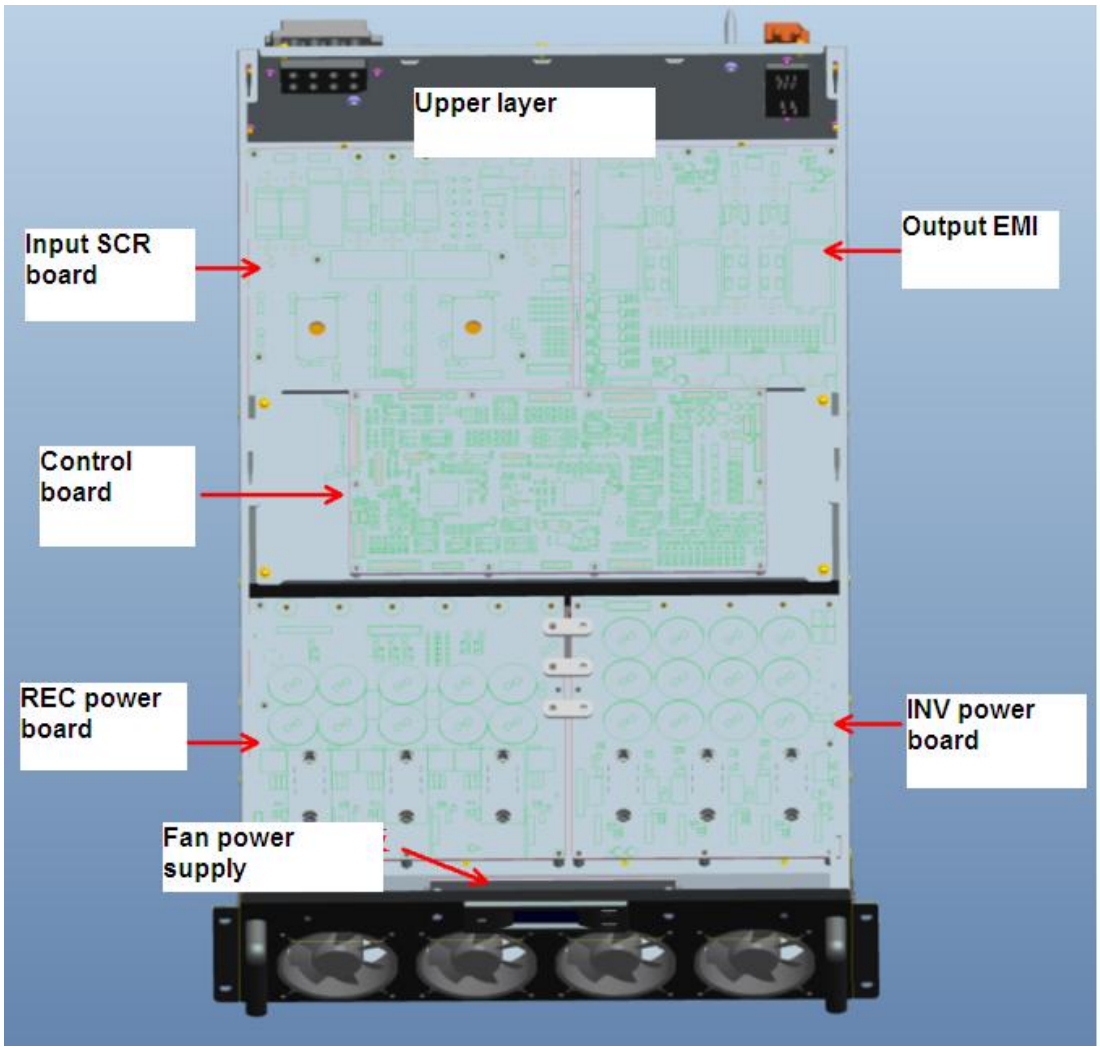


Figure 4.2 Upper Layer of the power module

4.4 LED panel of the power module

The LED panel of the power module is shown in Figure 4.3.

Figure 4.3 LED panel for power module

4.5 Wiring diagram of the power module

The connection inside the power module is shown in Figure 4.4.

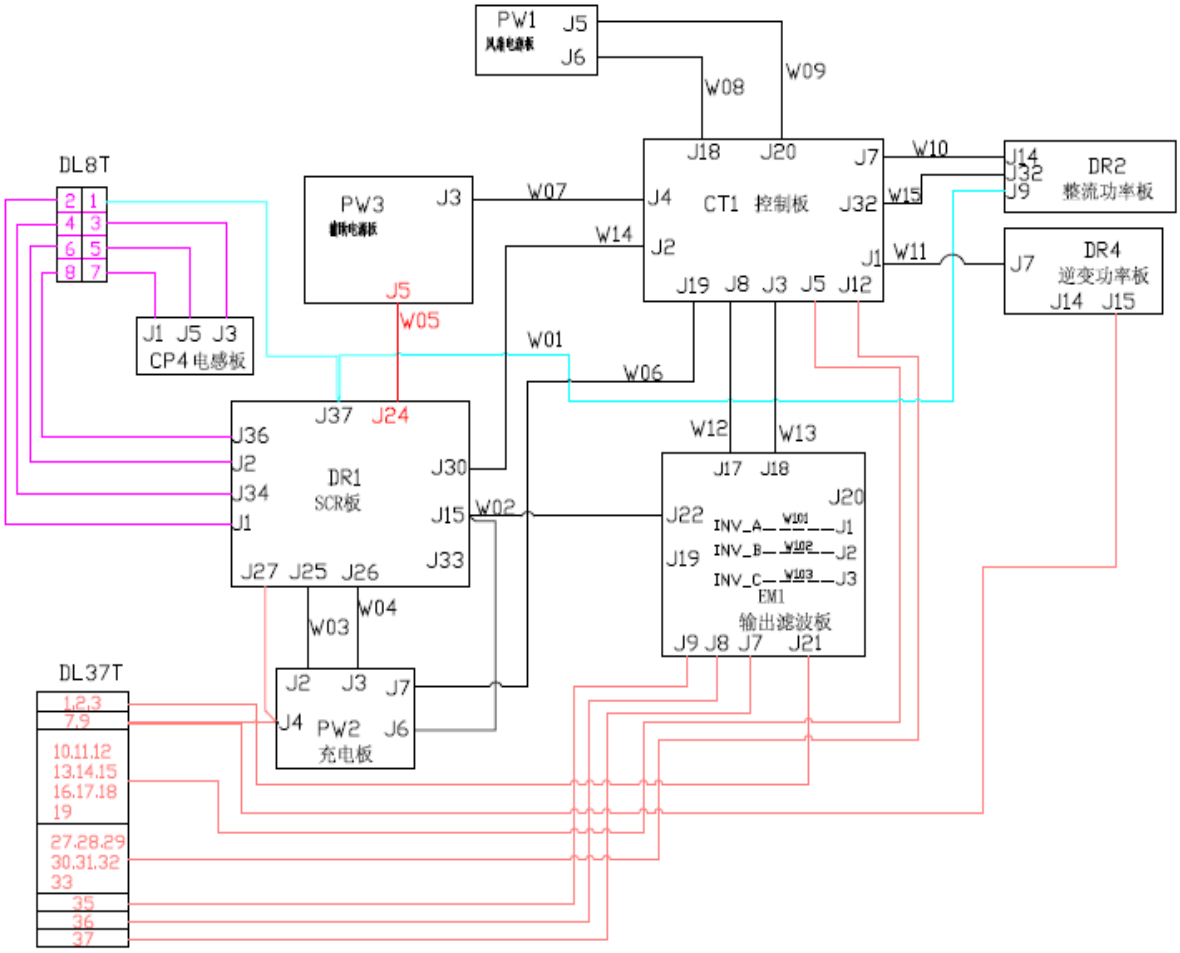


Fig 4.4 Connection inside the power module

5 Power module inspection

First ,please follow the below steps to check the components in the power module.

① Exam the connectors terminals at the back of the power module if they are out of shape, burnt or drawn in.

② Open the cover to check visually whether the circuit paths are burnt, broken or have bumps on copper foils. To exams whether the components are burnt or have bumps(such as input or output capacitors) ;

③ Exam the fuses of input and output;

④ Detect rectifier SCR,IGBT of rectifier and inverter, as is shown in chapter 7

⑤ Exam the relay of the output;

⑥ Record the fault information on the cabinet.

5.1 Testing of Rectifier SCR module and its drive

5.1.1 Pin measurement of SCR module

Turn the multimeter to the resistive channel, measure the resistance of pin A-K as 29-2, 20-6, 18-15, 11-10, 35-28, 25-23, **the normal value should be around 30Ω**; measure the resistance of pin G-K as 1-2,5-6, 12-15, 9-10, 14-28,24-23, the normal value should be around 1MΩ. The pins of the SCR are defined in Figure 5.1.

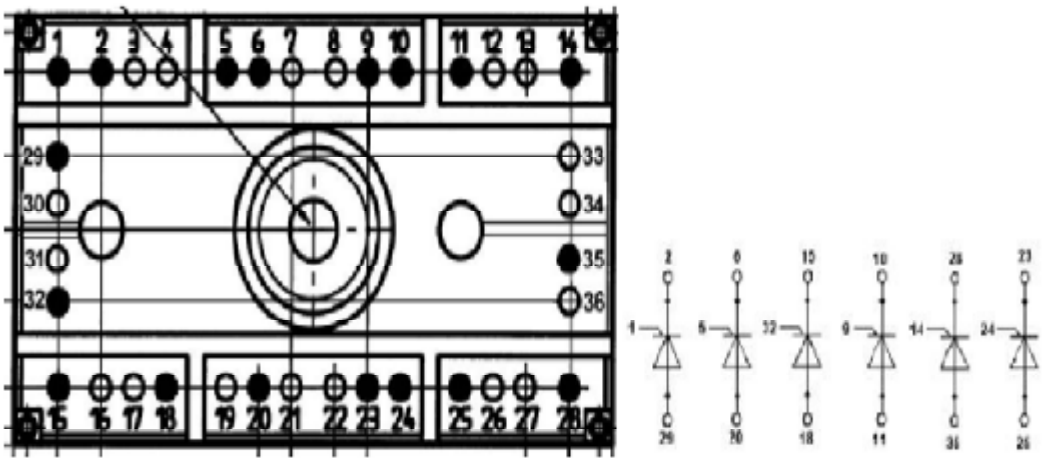


Figure 5.1 Pins definition the SCR module

5.1.2 Drive signal of the SCR pin A-K

The normal drive signal of the pin A-K SCR is shown in Figure 5.2

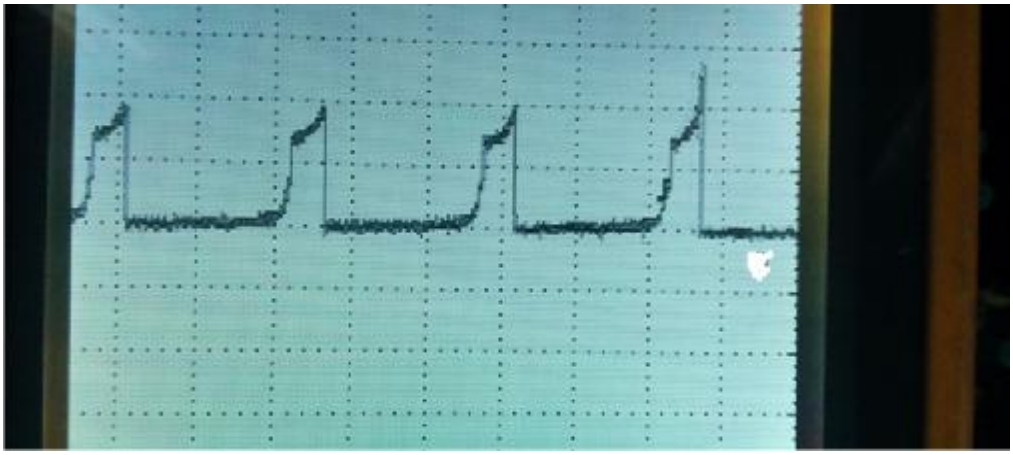
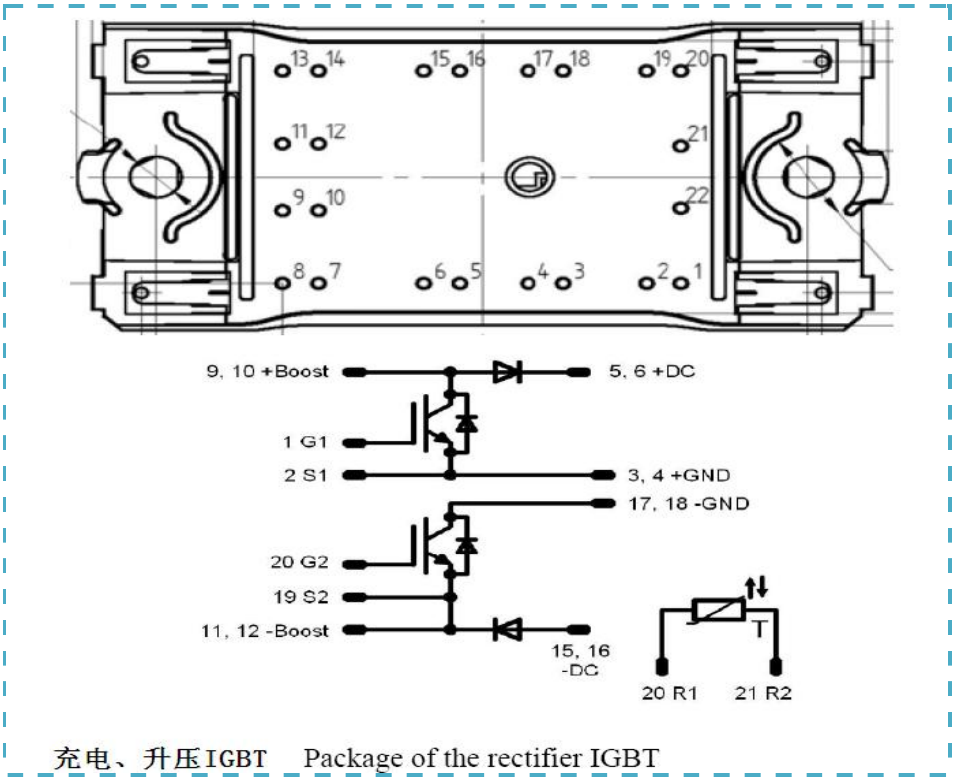


Figure 5.2 Drive signal of the SCR pin A-K

5.2 Rectifier IGBT

5.2.1 The test of the Rectifier IGBT

Turn the multimeter to the diode channel, measure the status of diode (anode to cathode) as 9-5, 3-9, 11-17, 15-11, **the normal value should be around 0.4V.**
Turn the multimeter to the resistive channel, measure the resistance of pin G-K of the IGBT module as 1-3 and 20-11, the normal value should be around 10K Ω
Turn the multimeter to the diode channel, measure the status of diode of the IGBT drive board as from D1 to D12, the normal value of each diode should be around 0.8V, as is shown in Figure 5.3.



充电、升压IGBT Package of the rectifier IGBT

Figure 5.3 Rectifier IGBT pin test

5.2.2 Drive signal of Rectifier IGBT modules

Test the G-K pin of IGBT modules with multimeter, the normal wave should be as follows, as is shown in Figure 5.4.

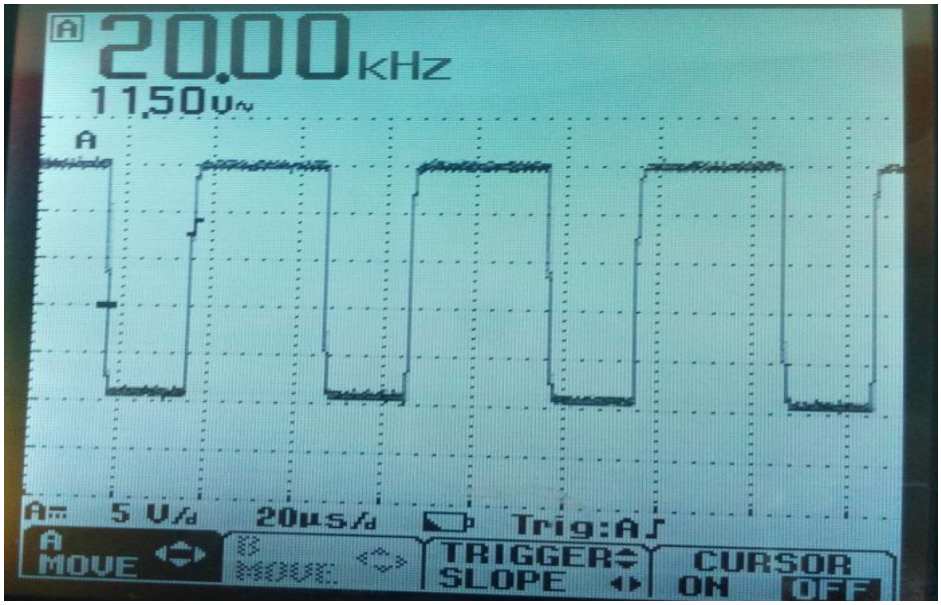


Figure 5.4 Normal drive signal wave for IGBT

5.3 Inverter IGBT

5.3.1 Test of Inverter IGBT

The definition and measurement are shown as Figure 5.5.

Turn the multimeter to the Diode Channel，measure the status of diode (anode to cathode) as 17-15, 8-17, 6-8, 3-6, 5-17, 6-5 ,the normal value should be around 0.4V.

Turn the multimeter to the resistive channel, measure the resistance of pin G-K of the IGBT module as 18-17, 12-13, 7-6 and 1-2, the normal value should be around 10K Ω

Turn the multimeter to the diode channel, measure the status of diode of the IGBT drive board (Located in the Inverter Board) as from D8 to D31, **the normal value of each diode should be around 0.8V**, as is shown in Figure 5.3.

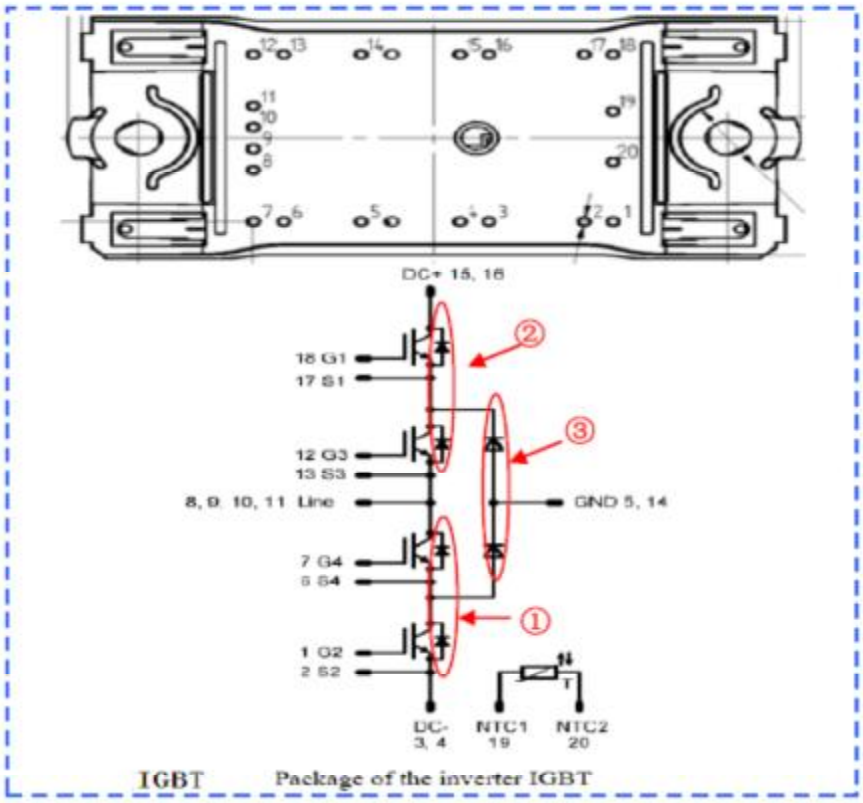
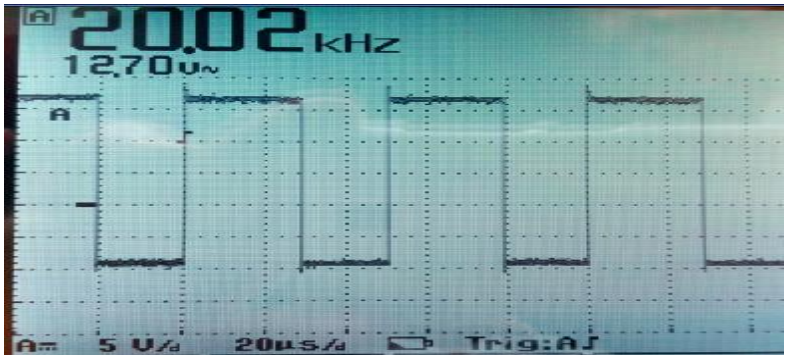


Figure 5-3 Pins of Inverter IGBT

Figure 5.5 Definition of the pin

5.3.2 The drive signal wave

The drive signal wave is as following, as shown in Figure 5.6.



5.6 Drive signal wave

5.4 IGBT Drive Circuit

5.5 Drive Circuit for Rectifier IGBT

Take the Rectifier IGBT of Phase A for example. Test the status of diode D3 and D8 (or the same position for Rectifier IGBT of Phase B and C), the normal value should be 0.45-0.8V; test the resistance of R7 and R3 (or the same position for Rectifier IGBT of Phase B and C). The schematic diagram is shown in Figure 5.8

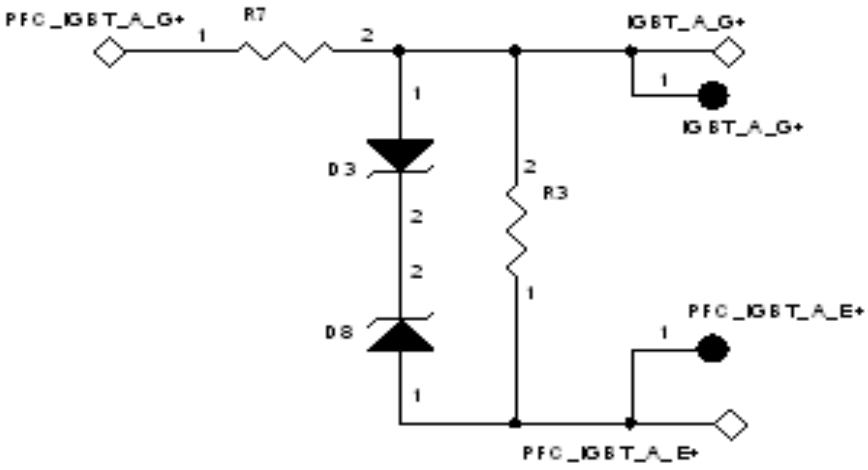
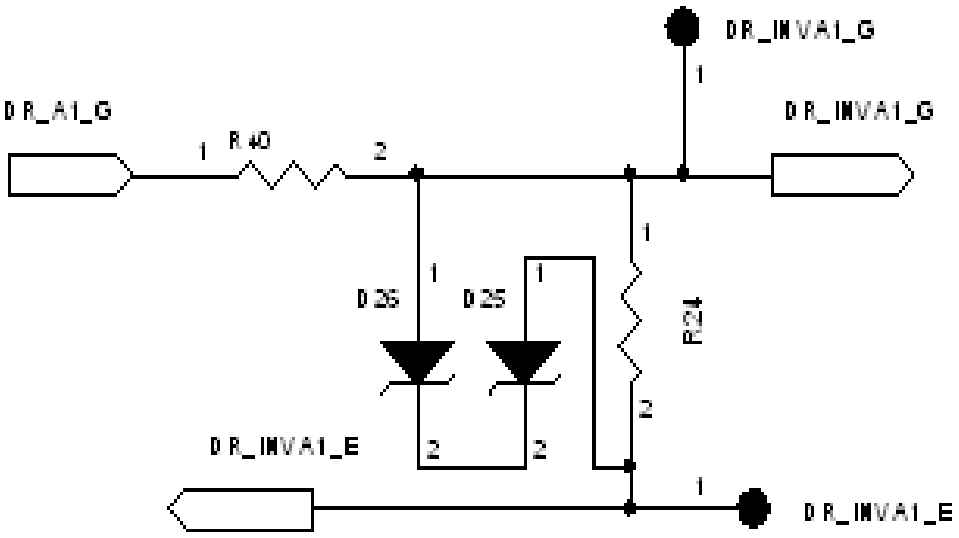


Figure 5.8 Schematic diagram for the Rectifier IGBT

5.6 Drive Circuit for Inverter IGBT

Take the Inverter IGBT of Phase A for example. Test the status of Zener D25 and D26 (or the same position for Rectifier IGBT of Phase B and C), the normal value should be 0.45-0.8V; test the resistance of R24 and R40(or the same position for Rectifier IGBT of Phase B and C). The schematic diagram is shown in Figure 5.9:



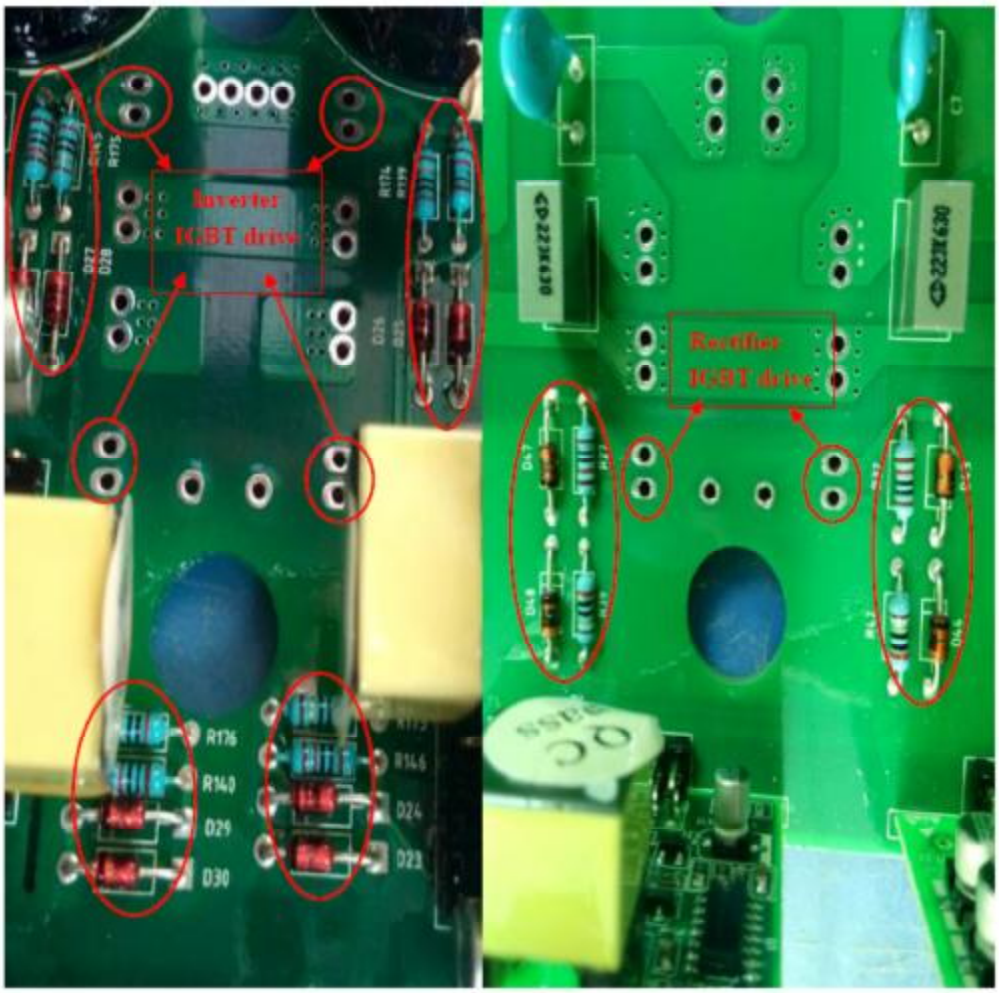


Figure 5.9

5.7 Fuse and Relay

Please check the fuses and relays if they are broken or not.

6 Introductions to S-Code

Please refer to the document of S-code trouble shooting

INVT RM Serial Maintenance Guide

7 Trouble shooting for Cabinet

7.1 Configuration in the Cabinet

Series number	PCB	PCB Name	Description
1	Cabinet LCD	LCD for the cabinet	Displaying the system information
2	PCB_PS1203_KY1	Keyboard	For view the information
3	PCB_PS1203_EM2	Input EMI board	Filter for utility
4	PCB_3320_FR	Battery EMI board	Filter for battery
5	PCB_3320_QD	Battery cold start board	The system can start up by the Battery cold start PCB, when there is no utility
6	PCB_PS1203_TF1	Power module interface board	For the communication among the power modules
7	PCB_PS1203_TF2	Monitoring module interface board	For the communication between power modules and monitoring module
8	PCB_PS1203_TF4	LBS and Parallel board	Used for LBS when needed or for cabinet paralleling

7.2 Configuration in the Bypass Module

Series number	PCB	PCB Name	Description
1	PCB_PS1203_PW3	Power supply board	Supplying power for the control unit
2	PCB_PS1203_MN1	Monitoring board	For monitoring and bypass control unit
3	PCB_PS1203_TF3	Dry contact board	Dry contact function
4	PCB_ 3320_CQ	Bypass SCR drive board	Bypass SCR drive

7.3 The signal connection in bypass，

The signal cable connection in bypass is shown in Figure7.1.

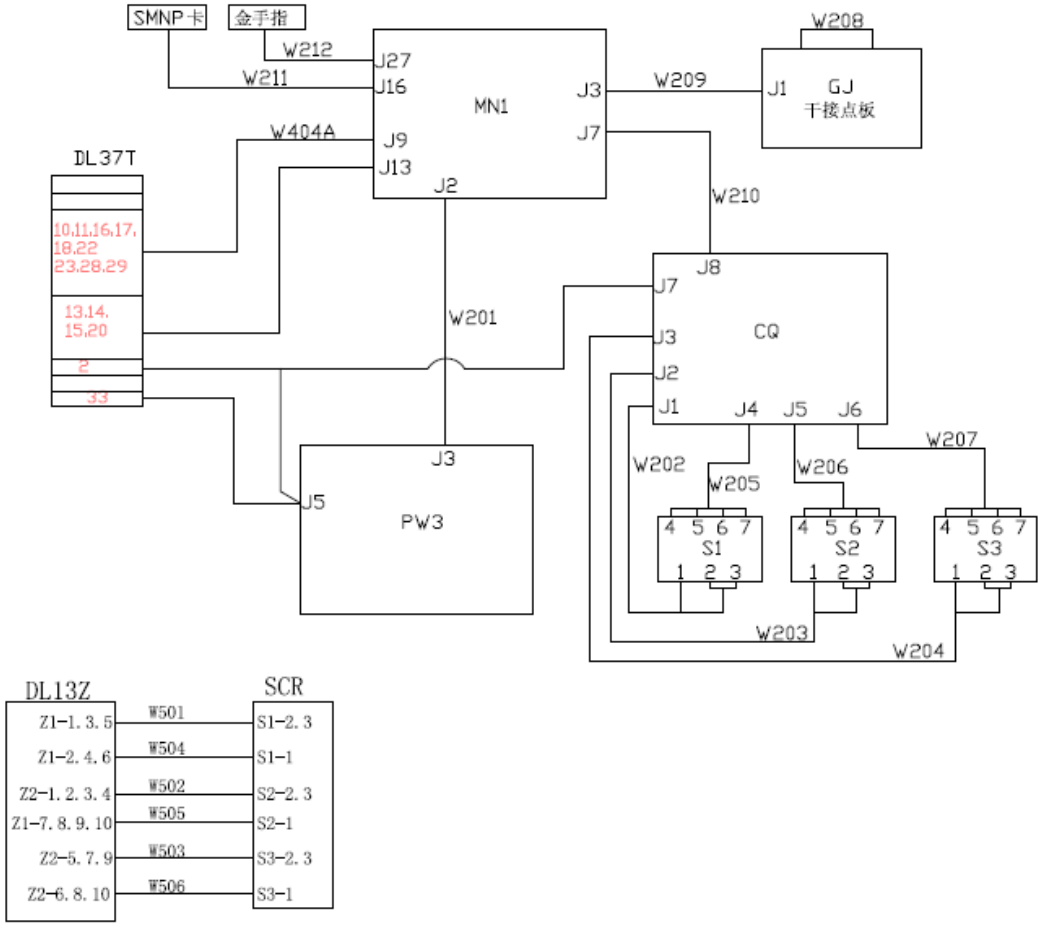


Figure 7.1 signal cable connection

8 Trouble shooting

8.1 Status Bits Description

Seq.				Items	0	1	2	4	8
1	S0	1	1	Load on status	None	UPS	BYP	Other Module	
2			2	REC status	OFF	Soft-start	Normal work		
3			3	INV status	OFF	Soft-start	Normal work		
4			4	BYP status	Out range	Ok for supply			
5		2	5	Battery status	Not connected	Boost	float	Discharging	not work
6			6	Reserved					
7			7	Reserved					
8			8	Reserved					
9		3	9	Maintenance CB status	Open	Closed			
10			10	Reserved					
11			11	Reserved					
12			12	Positive Battery connect status	Not connect	Connected			
13		4	13	negative Battery connect status	Not connect	Connected			
14			14	INV allow on status	Inhibited On	Allow On			
15			15	INV supply status	Not allow to supply	Ready for supply	Supplying		
16			16	Generator in	Not Generator	Generator In			
17	S1	1	1	Reserved					
18			2	Reserved					
19			3	Reserved					
20			4	Exterior BCB trip	Trip signal inactive	Trip signal active			
21		2	5	Exterior BCB connect status	Not connecte	Connected			

					d				
22			6	Exterior BCB status	Open	Closed			
23			7	EPO status	Not EPO	EPO			
24			8	Module pulled Out	Pushed (Connected OK)	Pulled (Connected Fail)			
25		3	9	Inv available	Inv not available	Available			
26			10	System power up end	During power up step	Power up step ended.			
27			11	Reserved					
28			12	Reserved					
29		4	13	Reserved					
30			14	Reserved					
31			15	Reserved					
32			16	Reserved					

8.2 Alarm Bits Description

Seq.				Items	0	1	2	4	8
1	A0	1	1	Synchronous Fault	Sync.	Not sync.			
2			2	Main Input Fault	OK	Fault			
3			3	REC Fault	OK	Fault			
4			4	INV Fault	OK	Fault			
5		2	5	Reserved					
6			6	Reserved					
7			7	Reserved					
8			8	Reserved					
9		3	9	Reserved					
10			10	Reserved					
11			11	Reserved					
12			12	Reserved					
13		4	13	Input phase A over current	OK	Fault			
14			14	Input phase B over current	OK	Fault			
15			15	Input phase C over	OK	Fault			

				current					
16			16	Output phase A voltage Fault	OK	Fault			
17	A1	1	1	Output phase B voltage Fault	OK	Fault			
18			2	Output phase C voltage Fault	OK	Fault			
19			3	Reserved					
20			4	Reserved					
21		2	5	Reserved					
22			6	Positive bus voltage Fault	OK	Low voltage	Over voltage		
23			7	Negative bus voltage Fault	OK	Low voltage	Over voltage		
24			8	Input current unbalance Fault	OK	Fault			
25		3	9	Input voltage Fault	OK	Fault			
26			10	Input Frequency Fault	OK	Fault			
27			11	Input Sequence Fault	OK	Fault			
28			12	REC soft-start Fault	OK	Fault			
29		4	13	REC IGBT over current	OK	Fault			
30			14	Reserved					
31			15	REC over temperature	OK	Fault			
32			16	Positive bus over voltage Fault	OK	Fault			
33	A2	1	1	Negative bus over voltage Fault	OK	Fault			
34			2	Fan Fault	OK	Fault			
35			3	Reserved					
36			4	Reserved					
37		2	5	Positive bus under voltage	OK	Fault			
38			6	Negative bus under voltage	OK	Fault			
39			7	Positive battery reversed	OK	Fault			
40			8	Negative battery reversed	OK	Fault			
41		3	9	Reserved					
42			10	Reserved					
43			11	Positive charger	OK	under	over		

				voltage Fault		voltage	voltage		
44			12	Negative charger voltage Fault	OK	under voltage	over voltage		
45		4	13	Reserved					
46			14	Reserved					
47			15	Positive charger Fault	OK	Fault			
48			16	Negative charger Fault	OK	Fault			
49		1	1	Positive battery voltage low	OK	Fault			
50			2	Negative battery voltage low	OK	Fault			
51			3	Positive battery EOD	OK	Fault			
52			4	Negative battery EOD	OK	Fault			
53		2	5	Input neutral lost	OK	Fault			
54			6	BYP sequence Fault	OK	Fault			
55			7	BYP voltage Fault	OK	Fault			
56	A3		8	Reserved					
57		3	9	Reserved					
58			10	Reserved					
59			11	BYP frequency over track range	OK	Fault			
60			12	Reserved					
61		4	13	Reserved					
62			14	Over load time out	OK	Fault			
63			15	Reserved					
64			16	Reserved					
65		1	1	Manual shutdown	normal	shutdown			
66			2	INV protect	OK	Fault			
67			3	Transfer times limit in one hour	OK	Fault			
68			4	INV power back feed	OK	Fault			
69		2	5	Reserved					
70			6	Reserved					
71	A4		7	Reserved					
72			8	INV over temperature Fault	OK	Fault			
73		3	9	INV IGBT over current	OK	Fault			
74			10	Reserved					
75			11	Over load	normal	over load			
76			12	INV relay or fuse Fault	OK	Fault			
77		4	13	Reserved					

78			14	Reserved					
79			15	Reserved					
80			16	Reserved					
81	A5	1	1	Reserved					
82			2	Output shorted	OK	Fault			
83			3	Battery test	None	OK	Fault		
84			4	Battery maintenance	None	OK	Fault		
85		2	5	Reserved					
86			6	Reserved					
87			7	Reserved					
88			8	Reserved					
89		3	9	Reserved					
90			10	Reserved					
91			11	Reserved					
92			12	Reserved					
93		4	13	Reserved					
94			14	Reserved					
95			15	Reserved					
96			16	Reserved					

8.3 Alarms Check and Solution tips

8.3.1 Synchronous Fault

A) BYP frequency out of synchronize range.
B) SYNC signal in the parallel Fault.

8.3.2 Main Input Fault

A) Main input voltage out of range.
B) Main input frequency out of range.
C) Main input sequence is reversed

8.3.3 REC Fault

A) REC over temperature.
B) Dc bus over voltage latched.
C) REC soft-start Fault.
D) Input current unbalance.

8.3.4 INV Fault

A) INV IGBT over current.

B) INV over temperature.
C) INV voltage abnormal

8.3.5 Input phase A/B/C over current
A) Input current over limited.
Tip 1: IGBT Fault.
Tip 2: DC bus shorted.
Tip 3: IGBT driver Fault.

8.3.6 Output Phase A/B/C Voltage Fault
A) INV voltage out of range.
Tip 1: IGBT open.
Tip 2: IGBT driver lost.
Tip 3: Voltage detects and sample fail.

8.3.7 Positive/Negative Bus Voltage Fault
A) DC bus voltage out of range.

8.3.8 Input current unbalance fault
A) The difference of max current and min current of the input three phases is out of the limited range.
Tip 1: One of the input current detecting CT/HALL fail..
Tip 2: Some REC IGBT open.
Tip 3: input current detecting and sample circuit fail.

8.3.9 Input Voltage Fault
A) Input voltage out of range.

8.3.10 Input Frequency fault
A) Input frequency out of range

8.3.11 Input Sequence Fault
A) Input sequence is reversed

8.3.12 REC soft-start fault
A) After the REC soft-start step, the bus voltage can not reach the default value.
Tip 1: REC SCR fail.
Tip 2: REC SCR driver fail.
Tip 3: Bus voltage detects and sample fail.

8.3.13 REC IGBT over current
A) Big current flow through REC IGBT.
Tip 1: REC IGBT fail.

Tip 2: DC Bus shorted.
Tip 3: REC IGBT driver fail.

8.3.14 REC over temperature
A) REC temperature out of the limited range.

8.3.15 Positive/Negative bus over voltage fault
A) Bus voltage over the up limited.

8.3.16 Fan fault
A) At least one of the fan fail.

8.3.17 Positive/Negative bus under voltage
A) Bus voltage out of the down limited.

8.3.18 Positive/Negative battery reversed
A) Battery connection reversed.

8.3.19 Positive/Negative charger voltage fault
A) Charger voltage out of the range limited.
Tip I: Charger IGBT fail.
Tip 2: Charger IGBT driver fail.
Tip 3: Charger voltage detecting and sampling circuit fail.

8.3.20 Positive/Negative charger fault
A) During charging step (boost or float), the charger voltage out of the range limited.
Tip I: Charger IGBT fail.
Tip 2: Charger IGBT driver fail.
Tip 3: Charger voltage detecting and sampling circuit fail.

8.3.21 Positive/Negative battery voltage low
A) Battery voltage is low (a little bigger than the EOD point).

8.3.22 Positive/Negative battery EOD
A) Battery voltage reaches the end of discharge point.

8.3.23 BYP sequence fault
A) BYP sequence reversed.

8.3.24 BYP voltage fault
A) BYP voltage out of the range limited.

8.3.25 BYP frequency over track range
A) BYP frequency out of the sync window.

8.3.26 Over load time out
A) INV over load time out.

8.3.27 Manual shutdown
A) Manual Off button is pressed to shutdown the PM.

8.3.28 INV protect.
A) INV detects power back feed to dc bus.
B) INV voltage out of range.
C) INV detects the bus voltage over the limited.

NOTES: INV protect fault is auto cleared.

8.3.29 Transfer times limit in one hour
A) Transfer to BYP times in one hour exceeds the limited.

8.3.30 INV power back feed
A) INV detects power back feed to dc bus.

8.3.31 INV over temperature fault
A) INV temperature out of the limited range.

8.3.32 INV IGBT over current
A) Big current flow through INV IGBT.
Tip 1: INV IGBT fail.
Tip 2: INV IGBT driver fail.

8.3.33 Over load
A) PM over load.

8.3.34 INV relay or fuse fault.
A) INV relay Fail
Tip 1: relay can not be closed.
Tip 2: relay can not be opened.
B) INV fuse fail.

8.3.35 Output shorted
A) Output shorted is detected.
Notes: This fault could be cleared only by “Fault Clear” button.

8.3.36 Battery test Fail.

A) Battery test condition is not allowed.
Tip 1: Battery voltage (cell) smaller than (float voltage (cell) – 0.1V).
Tip 2: BYP is not qualified.
Tip 3: At least one Alarm exists in the system.

B) Battery discharging time is less than 20 Sec.

8.3.37 Battery maintenance Fail.

A) Battery test condition is not allowed.
Tip 1: Battery voltage (cell) smaller than (float voltage (cell) – 0.1V).
Tip 2: BYP is not qualified.
Tip 3: At least one Alarm exists in the system.

B) The time lasted before battery voltage low is less than 20 Sec.

8.4 Cabinet trouble shooting

8.4.1 Maintenance CB Operation.

Step 1: Transfer system to BYP manually.
Step 2: Close Maintenance CB.
Step 3: Open Output and Input CB.
Step 4: Doing maintenance.
Step 5: After system is fixed, Close Output and Input CB.
Step 6: After BYP SCR is fired, Open Maintenance CB.
Step 7: System will works automatically.

8.4.2 Cabinet Failures Description.

8.4.2.1 On UPS Inhibited

A) System transfer to UPS is inhibited.
Tip 1: BYP SCR shorted.
Tip 2: System is in EPO.
Tip 3: Maintenance CB is Closed.
Tip 4: Manual transfer to BYP latched.
Tip 5: Transfer times per hours Limited.
Tip 6: Output load is more than the total capacitor of the ready INV.

8.4.2.2 BYP Fault

A) BYP SCR shorted.
Tip 1: SCR fail.
Tip 2: SCR driver fail.

B) BYP SCR opened.
Tip 1: SCR fail.
Tip 2: SCR driver lost.

Part III: LED INDICATION

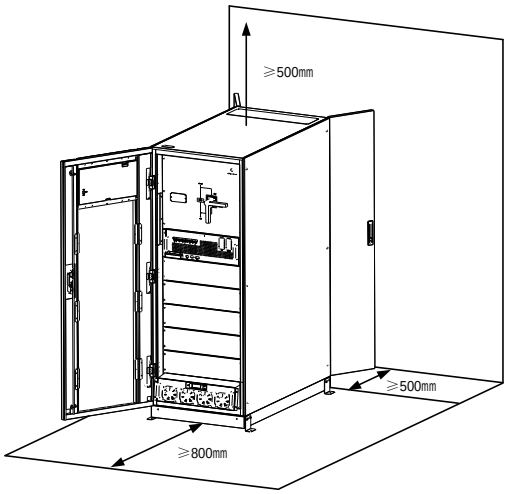
		OFF	FLASHING GREEN	CONSTANT GREEN	FLASHING RED	CONSTANT RED
Power Module	REC	REC not work	REC soft-start.	REC works normally.	Input is abnormal.	REC failure.
	INV	INV not work	INV soft-start or started but not supply.	INV is supplying.	INV is not allowed to start.	INV failure.
	BATT	BATT not work	BATT is discharging.	BATT is charging.	BATT voltage is low.	EOD, not connected or connected reversely.
Cabinet Monitor	STATUS	---	---	System is normal.		Alarm or failure exists.
	REC	REC of all PMs do not work.	At least one PM's REC soft-starts.	REC of all PMs work normally.	At least one PM detected input failure.	At least one PM's REC failure.
	BYP	BYP is OK, but not supply output.	---	BYP is normal and is supplying output.	BYP is abnormal or frequency is out of the trace range.	BYP Failure (SCR shorted or Open)
	INV	INV of all PMs do not work.	At least one PM's INV soft-start or started but not supply.	At least one PM's INV is supplying output and all INV are not failure.	At least one PM's INV is supplying output and some INV is failure.	None INV supplies output and at least one INV is failure.
	OUTPUT	Output None.	---	Output is normal	Output is in over load	Over load time out or output shorted and output lost.
	BATTERY	Battery not work	Battery is discharging.	Battery is charging.	BATT voltage is low.	EOD, not connected or connected reversely.

Part IV Size and Weight

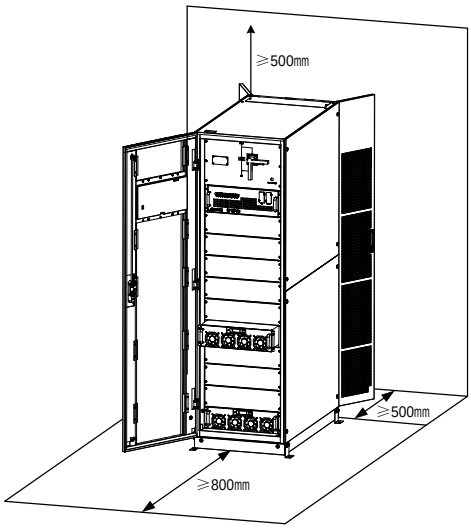
Ensure there is enough space for the placement of the UPS. Please check the room reserved for the UPS cabinet.

Attention

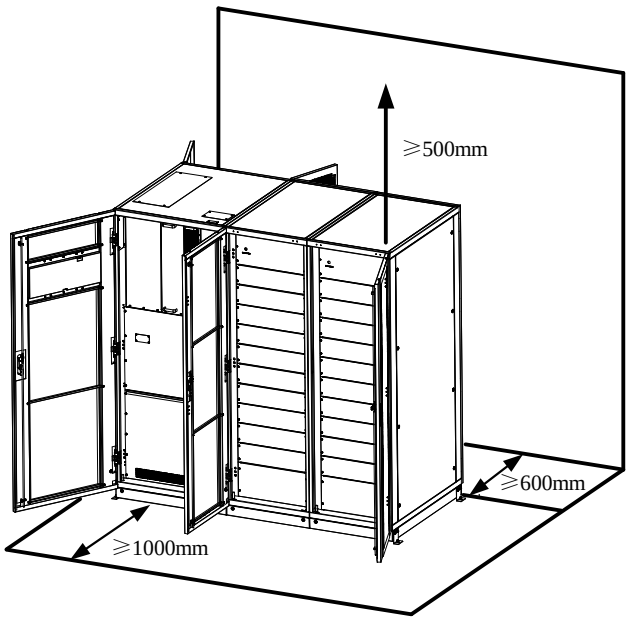
Ensure the following space margin: at least 0.8m before the front of the 6-slot or the 10-slot cabinet, at least 1 m for the 20-slot cabinet, so as to easily maintain the power module with the front door fully open; at least 0.5m at behind of 6-slot or the 10-slot cabinet, at least 0.6 m for 20-slot cabinet for ventilation and cooling. The space reserved for the cabinet is shown in Fig.3-2.



6-slot cabinet



10-slot cabinet



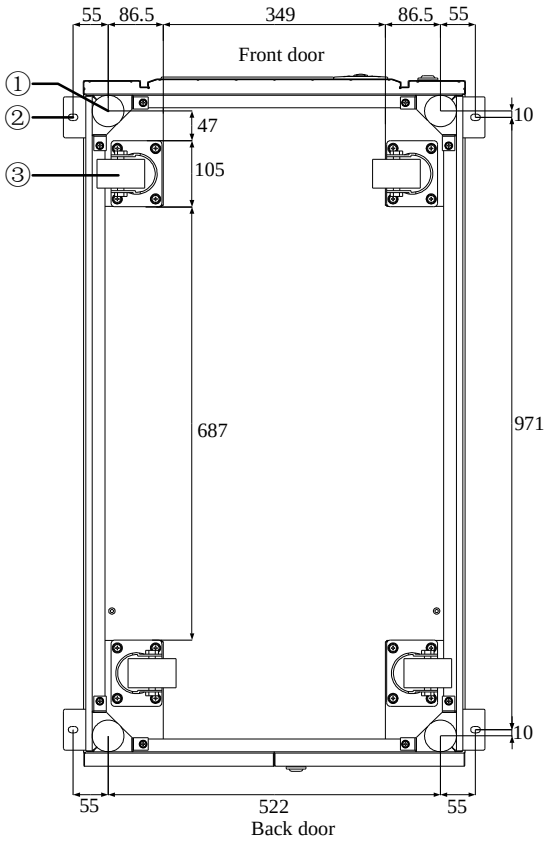
20-slot cabinet

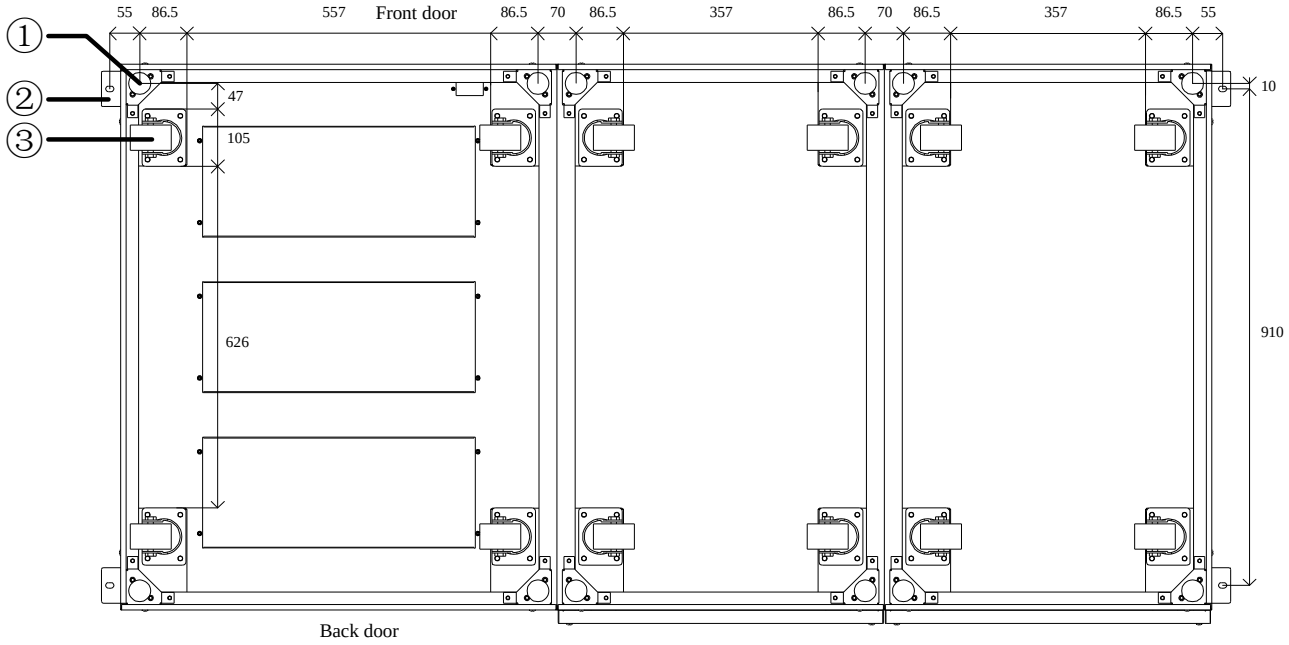
The dimension and weight for the UPS cabinet is shown in the following table.

Configuration	Dimension(W×D×H)(mm)	Weight(Kg)
6-slot Cabinet (with bypass module)	600×1100×1600	170
10-slot Cabinet (with bypass module)	600×1100×2000	220
20-slot Cabinet (with bypass module)	2000×1100×2000	620
25KVA power module	460×790×133	32
30KVA power module	460×790×133	34

Part V Positioning

The UPS cabinet has two way of supporting itself: One is to support itself temporarily by the 4 wheels at the bottom(12 for the 20-slot)，making it convenient to adjust the position of the cabinet；The other is by anchor bolts to support the cabinet permanently after adjusting the position of the cabinet. The supporting structure is shown in Fig. 3-8.





20-slot cabinet

①Adjustable anchor bolt ②L-shape corner fittings ③ supporting wheels

Figure Supporting structure（Bottom view）

The steps to position the cabinet are as follows：

1. Ensure the supporting structure is in good condition and the mounting floor is smooth and strong.
2. Retract the anchor bolts by turning them counterclockwise using wrench, the cabinet is then supported by the four wheels.
3. Adjust the cabinet to the right position by the supporting wheels.
4. Put down the anchor bolts by turning them clockwise using wrench, the cabinet is then supported by the four anchor bolts.
5. Ensure the four anchor bolts are in the same height and the cabinet is fixed and immovable.
6. Positioning done.

Attention

Auxiliary equipment is needed when the mounting floor is not solid enough to support the cabinet, which helps distribute the weight over a larger area. For instance, cover the floor with iron plate or increase the supporting area of the anchor bolts.