



PM40X/PM50X maintenance manual

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1 Product Specification

1.1 Mechanical Characteristic

Table 1-1 Mechanical Characteristics for Cabinet

Model	Unit	2-slot Cabinet	4-slot Cabinet	6-slot Cabinet	10-slot Cabinet
Mechanical Dimension (W*D*H)	mm	600*980*1150	650*960*1600	650*970*2000	1300*1100*2000
Weight	kg	120	170	220	450
color	N/A	Black			
Protection Level, (IEC60529)	N/A	IP20			

Table 1-2 Mechanical Characteristics for power module

Model	Unit	40kVA power module	50kVA power module
Mechanical Dimension (W*D*H)	mm	510*700*178	510*700*178
Weight	kg	44	45

1.2 Electrical Characteristics

Electrical Characteristics (Input Rectifier)

Table 1-3 Rectifier AC input (Mains)

Item	Unit	Parameter
Grid System	\	3 Phases + Neutral + Ground
Rated AC Input Voltage	Vac	380/400/415(three-phase and sharing neutral with the bypass input)
Rated Frequency	Vac	50/60Hz
Input voltage range	Vac	304~478Vac (Line-Line),full load 228V~304Vac (Line-Line),load decrease linearly according to the min phase voltage
Input Frequency range	Hz	40~70
Input Power factor	PF	>0.99
THDI	THDI%	<3% (full Linear Load)

Electrical Characteristics(Intermediate DC Link)

Table 1-4 Battery

Items	Unit	Parameters
Battery bus voltage	Vdc	Rated: $\pm 240V$
Quantity of lead-acid cells	Nominal	40=[1 battery(12V)] ,240=[1 battery(2V)]

Float charge voltage	V/cell (VRLA)	2.25V/cell(selectable from 2.2V/cell~2.35V/cell) Constant current and constant voltage charge mode
Temperature compensation	mV/°C/cl	3.0(selectable:0~5.0)
Ripple voltage	%	≤1
Ripple current	%	≤5
Equalized charge voltage	VRLA	2.4V/cell(selectable from : 2.30V/cell~2.45V/cell) Constant current and constant voltage charge mode
Final discharging voltage	V/cell (VRLA)	1.65V/cell(selectablefrom: 1.60V/cell~1.750V/cell) @0.6C discharge current 1.75V/cell (selectable from: 1.65V/cell~1.8V/cell) @0.15C discharge current (EOD voltage changes linearly within the set range according to discharge current)
Battery Charge	V/cell	2.4V/cell(selectable from : 2.3V/cell~2.45V/cell) Constant current and constant voltage charge mode
Battery Charging Power Max Current	kW	10%* UPS capacity (selectable from : 1~20%* UPS capacity)

Electrical Characteristics(Inverter Output)

Table 1-5 Inverter Output (To critical load)

Item	Unit	Value
Rated capacity	KVA	40-500kVA
Rated AC voltage	Vac	380/400/415 (Line-Line)
Rated Frequency	Hz	50/60
Frequency Regulation	Hz	50/60Hz±0.1%
Voltage precision	%	±1.5(0~100% linear load)
Overload	\	110%, 60min; 125%,10min; 150%,1min; >150%,200ms
Synchronized Range	Hz	Settable, ±0.5Hz ~ ±5Hz, default ±3Hz
Synchronized Slew Rate	Hz	Settable, 0.5Hz/S ~ 3Hz/S, default 0.5Hz/S
Output Power Factor	PF	0.9
Transient Response	%	<5% for step load (20% - 80% -20%)
Transient recovery		< 30ms for step load (0% - 100% -0%)
Output Voltage THDu		<1% from 0% to 100% linear load <6% full non-linear load according to IEC/EN62040-3

Electrical Characteristics (Bypass Mains Input)

Table 1-6 Bypass Mains Input

Item	Unit	2-slot Cabinet and 4-slot Cabinet	6-slot Cabinet and 10-slot Cabinet
Rated AC voltage	Vac	380/400/415 (three-phase four-wire and sharing neutral with the bypass)	
Rated Current	A	91~758(Table3-2)	
Overload	%	125%, Long term operation 125%~130%, for 10 min 130%~150%, for 1min >150%,300ms	110%, Long term operation 110%~125%, for 5 min 125%~150%, for 1 min >150%,1S
Current rating of neutral cable	A	1.7×In	
Rated frequency	Hz	50/60	
Switch time (between bypass and inverter)	ms	Synchronized transfer: 0ms	
Bypass voltage range	%	Settable, default -20%~+15% Up limited: +10%, +15%, +20%, +25% Down limited: -10%, -15%, -20%, -30%, -40%	
Bypass frequency range	Hz	Settable, ±1Hz, ±3Hz, ±5Hz	
Synchronized Range	Hz	Settable ±0.5Hz~±5Hz,default ±3Hz	

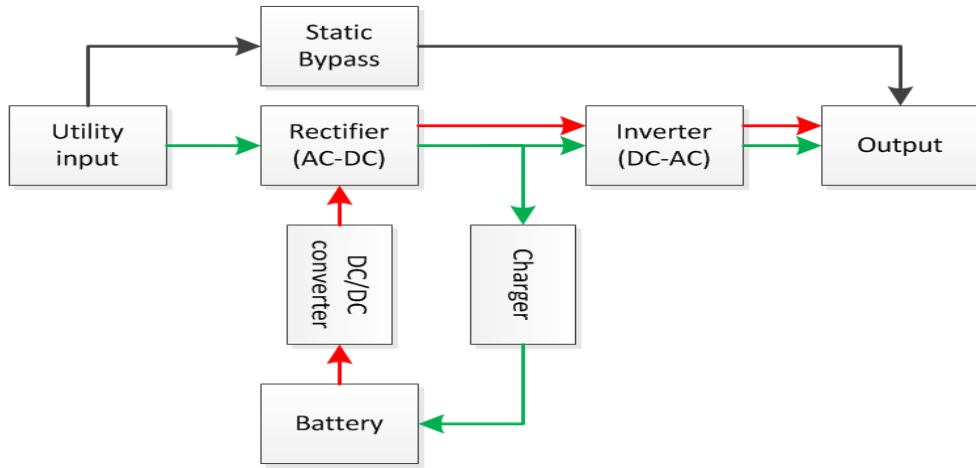
1.3 Efficiency

Table 1-7 Efficiency

Item	Unit	Value
Overall efficiency		
Normal mode(dual conversion)	%	>96
ECO mode	%	>99
Battery discharging efficiency (battery at nominal voltage 480Vdc and full-rated linear load)		
Battery mode	%	>96

2 module instruction

2.1 PM40/PM50 module instruction

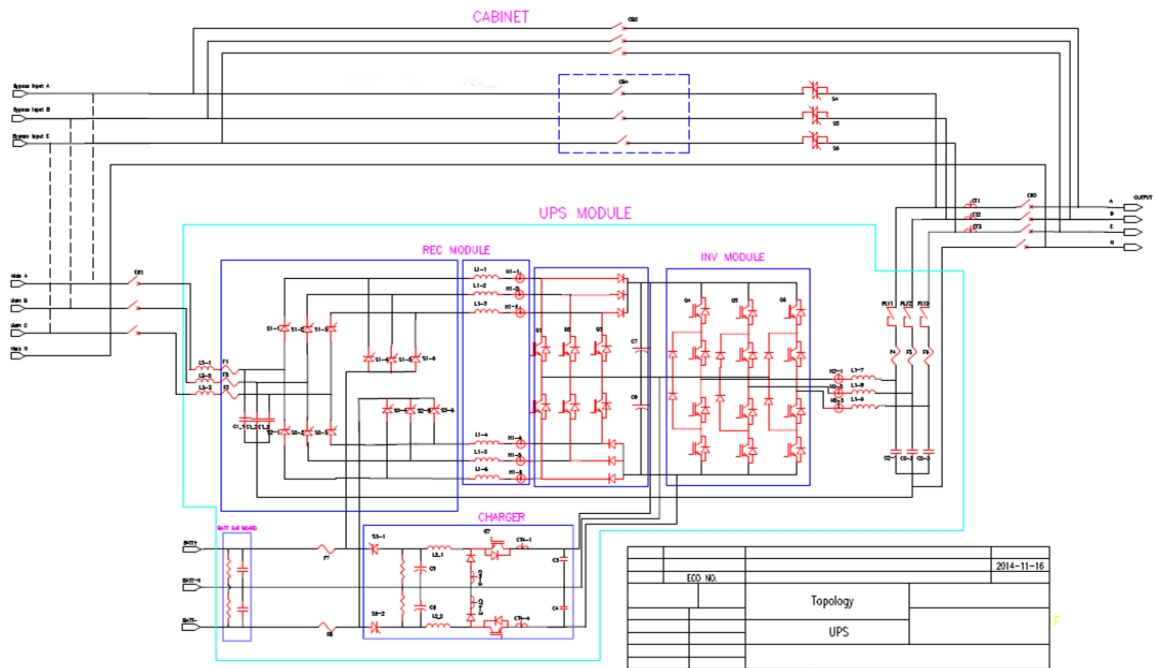


System Diagram

In AC mode (as is shown in green line), the utility power enters the rectifier through EMI and is boosted to DC bus voltage 360VDC by the PFC. The inverter inverses the DC bus voltage to AC 220VAC (Adjustable). Meanwhile the charger is charging the battery from DC bus.

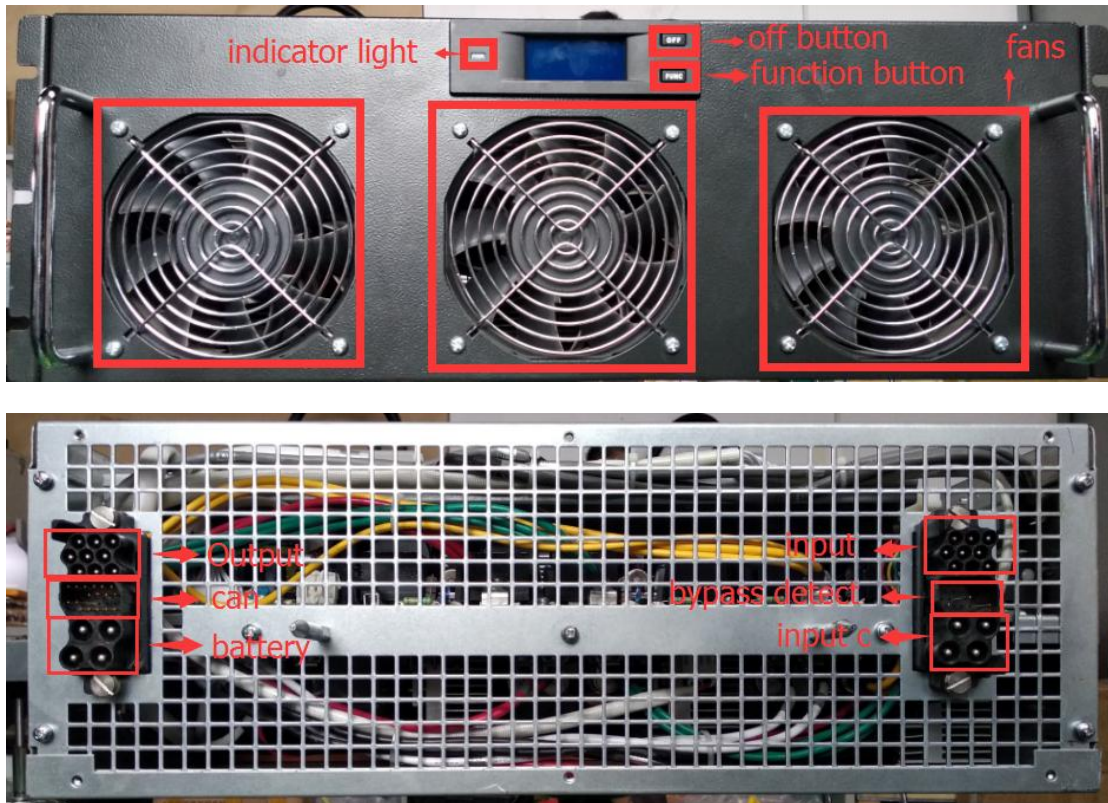
In Battery mode (as is shown in red line), the battery DC voltage is boosted to DC bus voltage ± 360 VDC by the PFC. The inverter inverses the DC bus voltage to AC 220VAC (Adjustable).

In Bypass mode (as is shown in black line), the load is powered by the utility through static bypass.



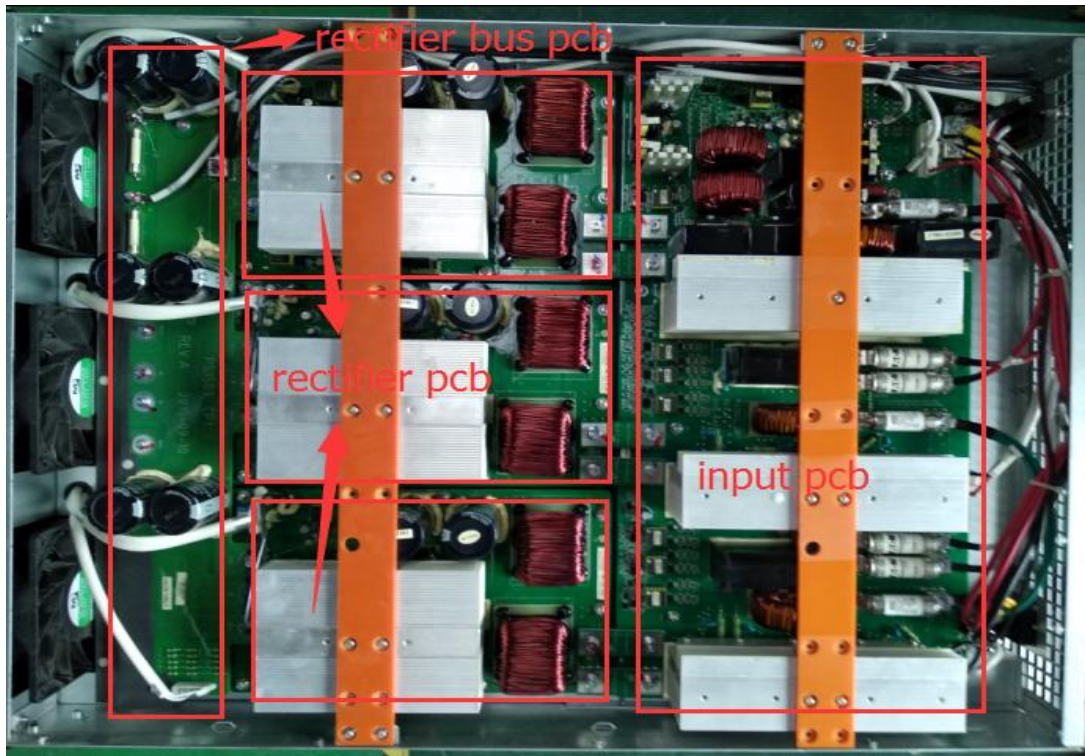
PM40/PM50 Topological graph

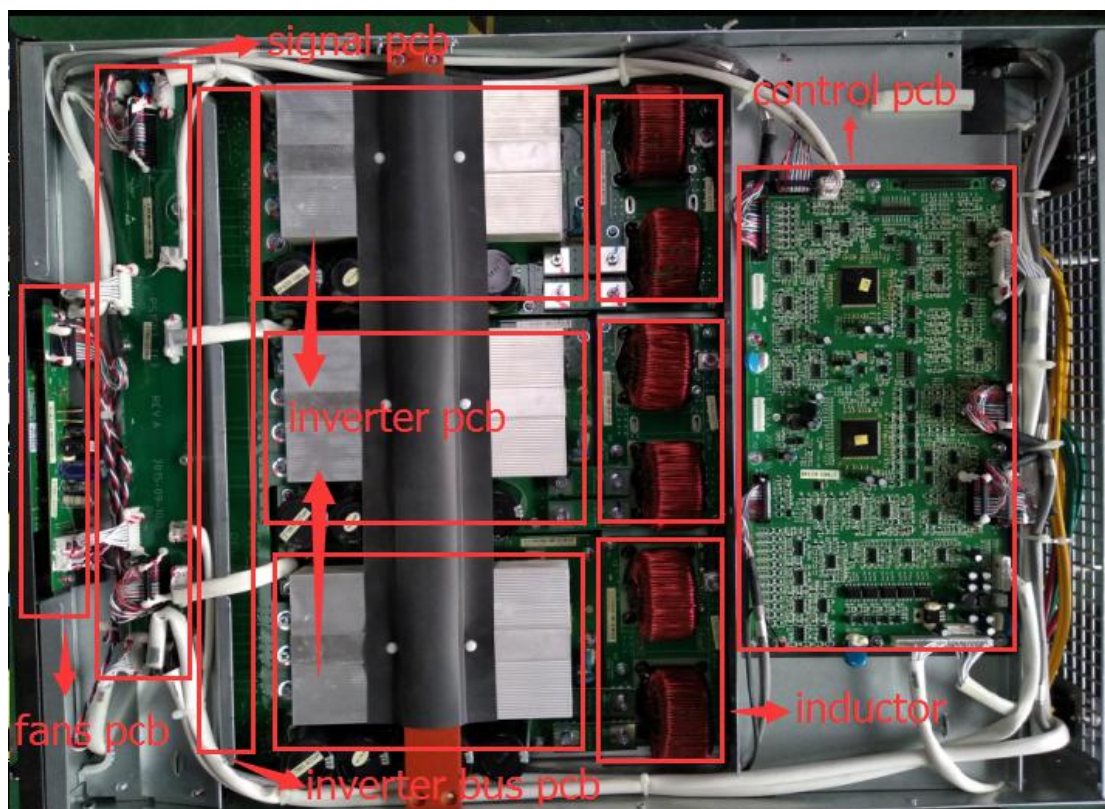
2.2 PM40X/PM50X Outlook



PM40X/PM50X front and back appearance

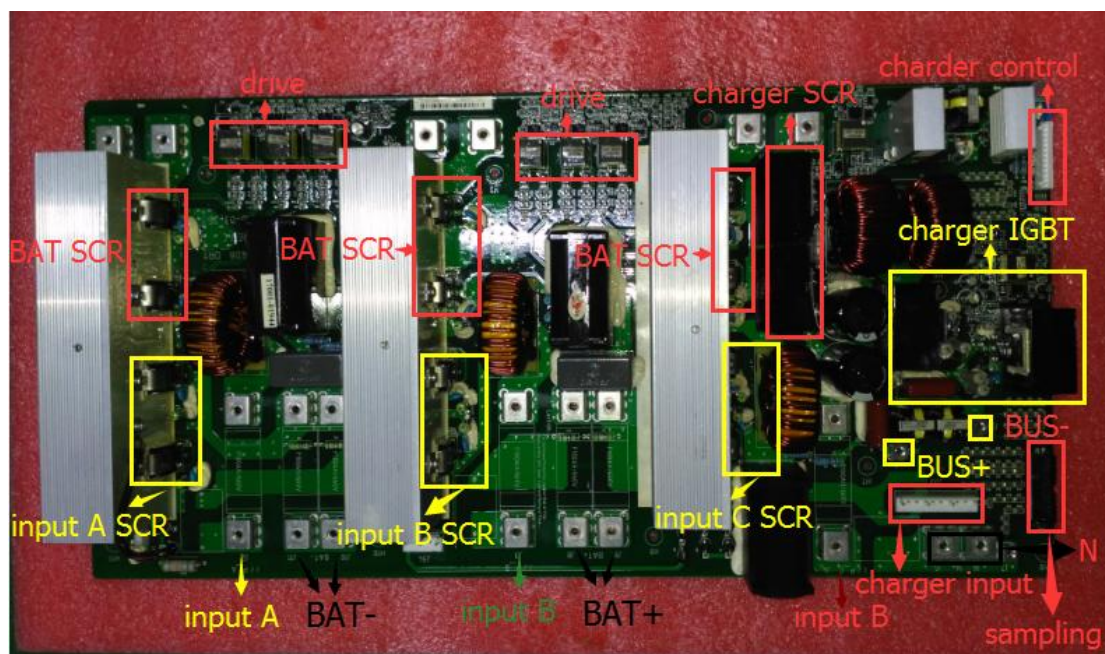
2.3 PM40/PM50 internal structure diagram



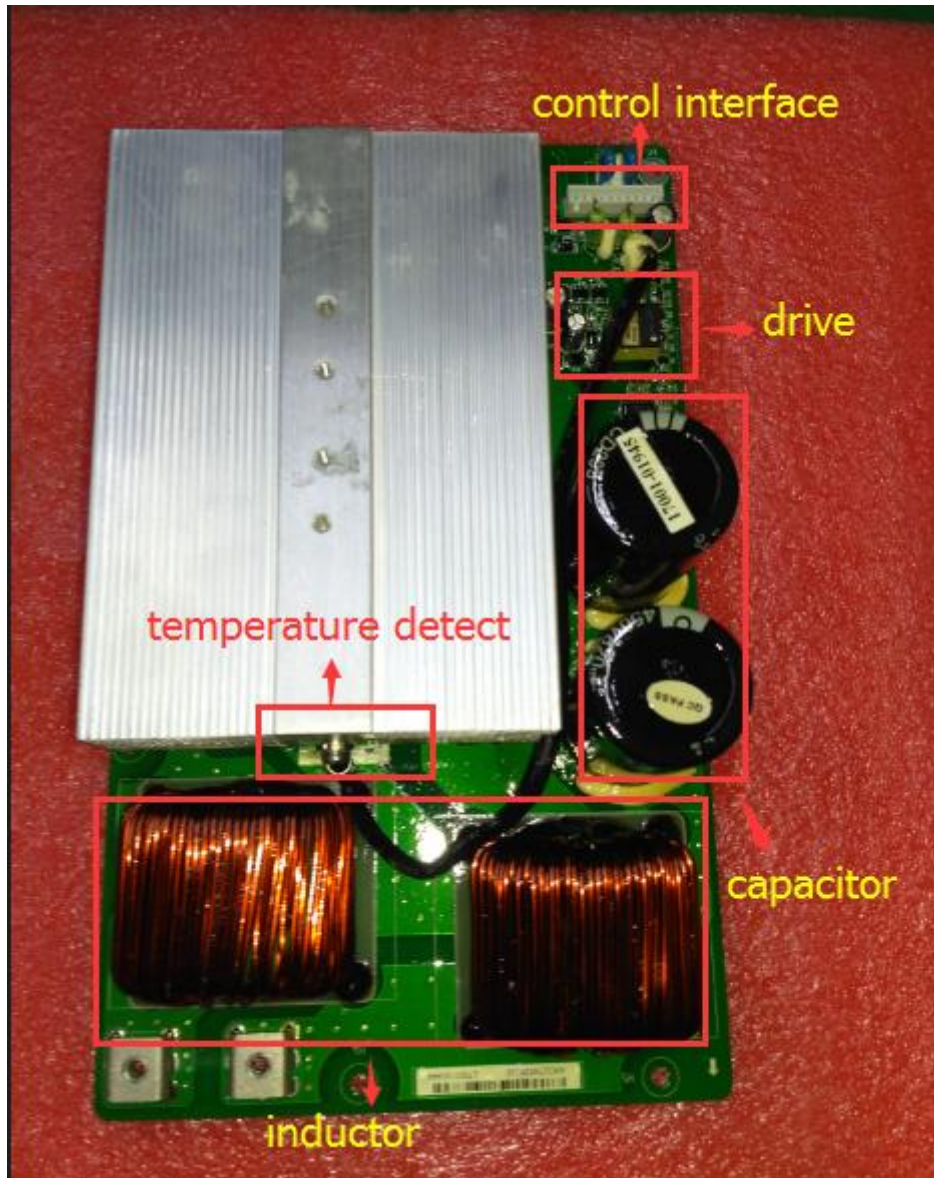


2.4 Main board and introduction of DTX33 20-30KVA

(1) input SCR board



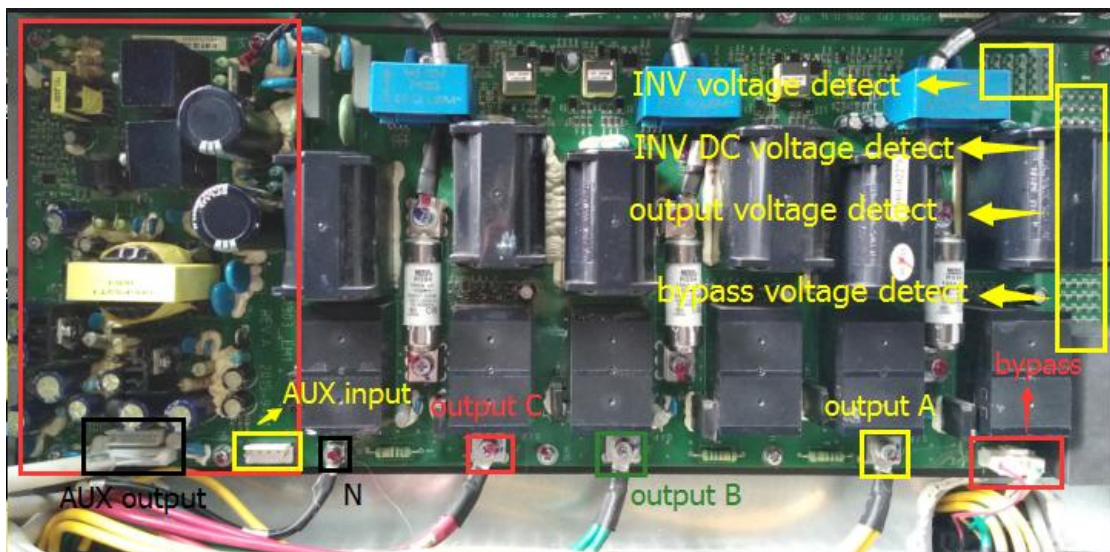
(2) rectifier board (PFC)



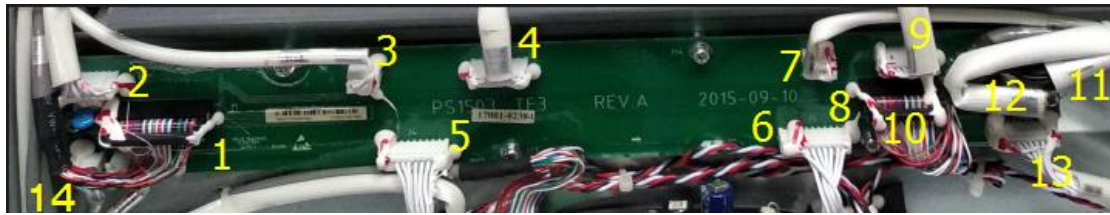
(3) inverter board



(4) output board

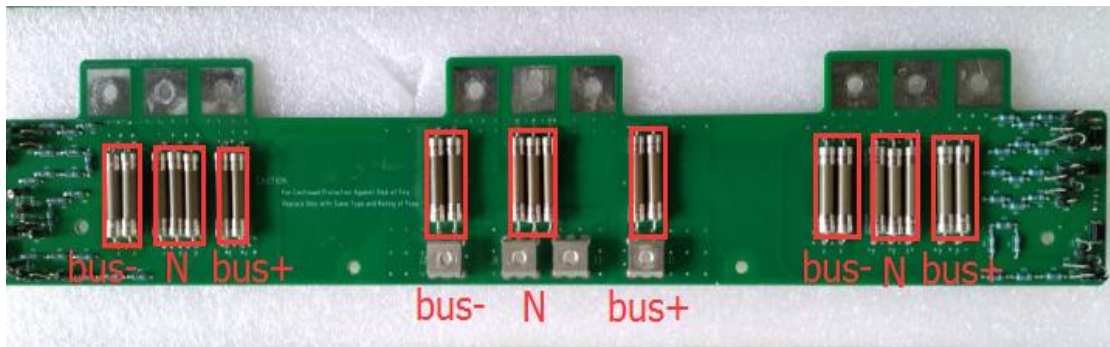


(5) signal board

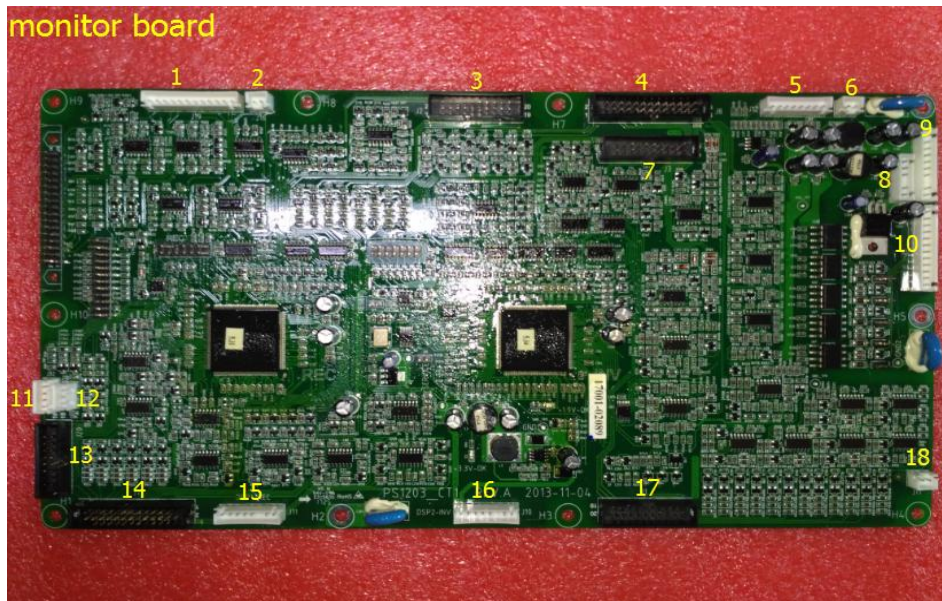


- | | |
|------------------------------|--------------------------|
| 1. drive for inverter | 2.drive for inverter A |
| 3. drive for AUX | 4. drive for inverter B |
| 5. drive for rectifier A | 6. drive for rectifier B |
| 7. drive for AUX | 9. drive for inverter C |
| 10.drive for rectifier | 11. can communicate |
| 12. power from control board | 13.drive for rectifier A |
| 14.bus detect | |

(6) inverter bus board and rectifier bus board



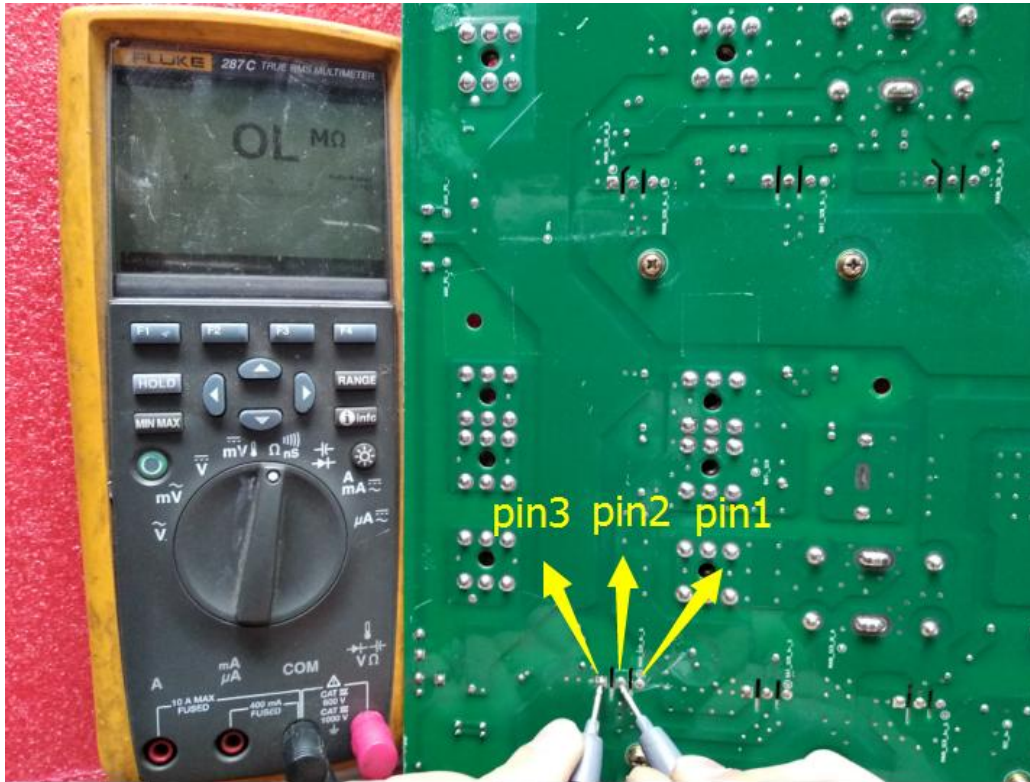
(7) Monitor board



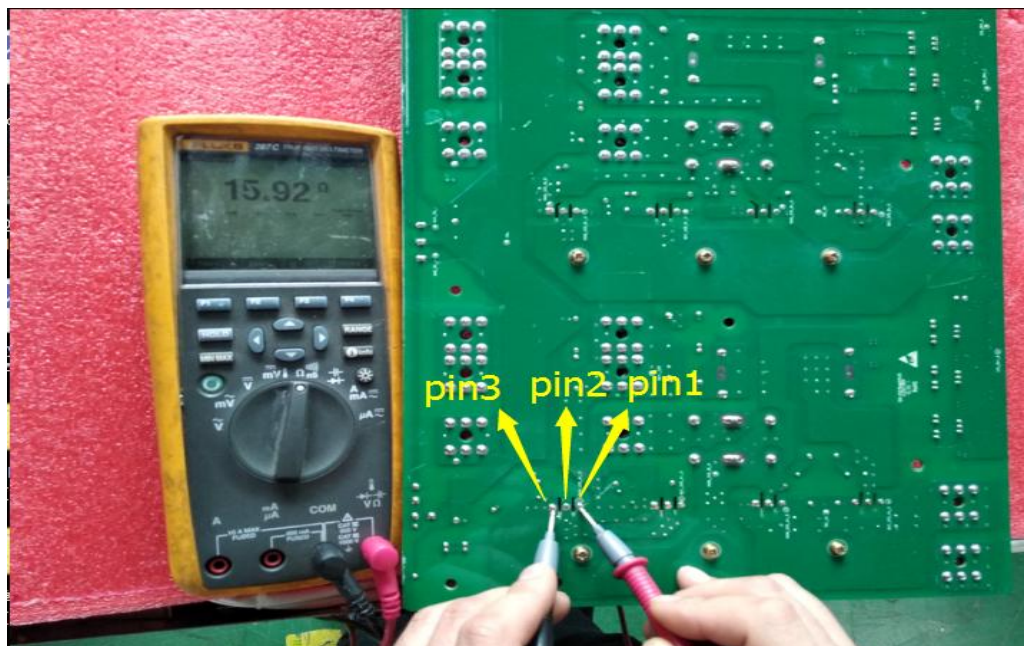
- 1.Control charge board
- 2.Outlet temp detect
- 3.SCR drive + bat voltage detect + current detect + relay control
- 4.INV voltage detect + current detect + relay control
5. Identify module ID , short 7,8 pin test service
- 6.Temp control
- 7.Bypass detect + output voltage detect
- 8.+15V and -15V power
- 9.Power supply from auxiliary power board
- 10.CAN communication
11. Temp detect (on heat sink)
- 12.24V and 3.3V power source
- 13.LED display + power for fans +fans detect
- 14.PFC drive + bus detect
- 15.PFC TXD & RXD
- 16.INV TXD & RXD
- 17.INV drive +15V source
- 18.Inlet temp detect

3. components test of PM40/PM50 module

3.1 Detection of rectifier SCR

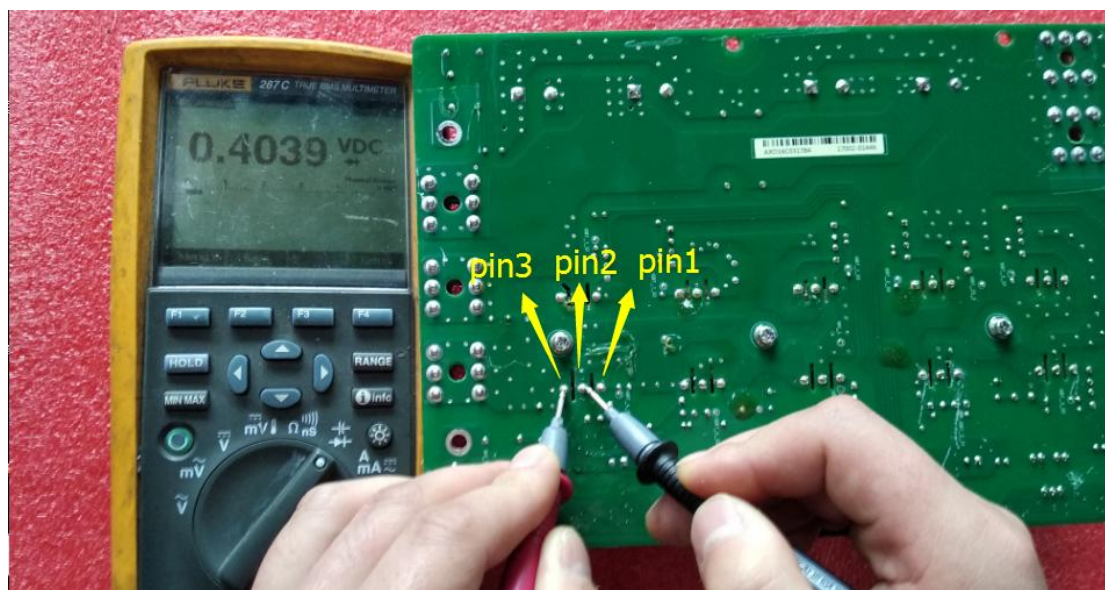


Switch the multimeter to resistance Channel and test the the rectifier IGBT, the normal value is open between pin2 and pin3.

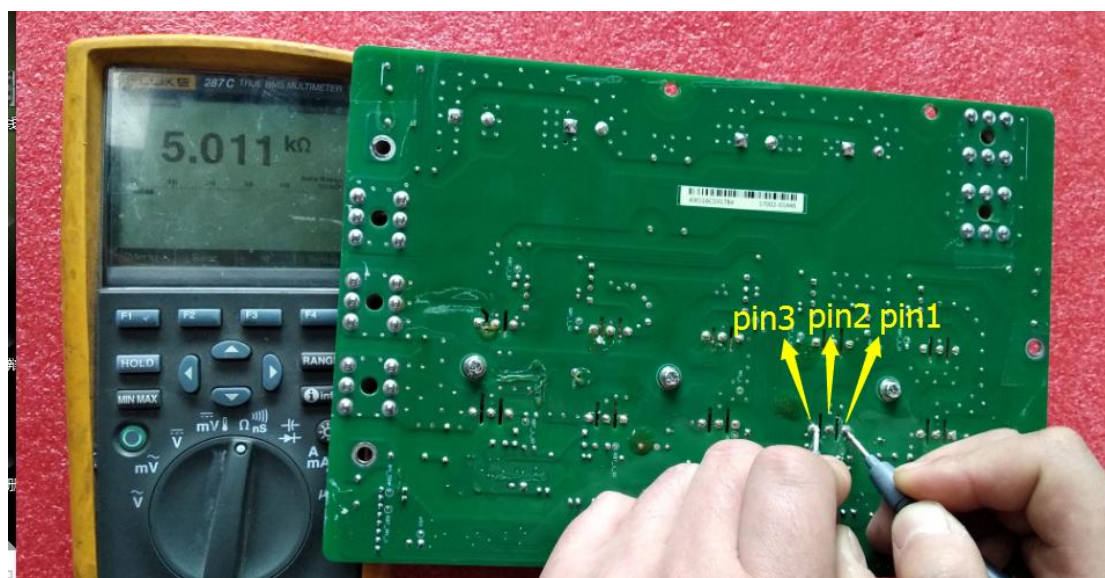


Switch the multimeter to resistance Channel and test the voltage drop of the rectifier IGBT, the normal value should be 15-17 Ω

3.2 Detection of rectifier IGBT and inverter IGBT



Switch the multimeter to Diode Channel and test the voltage drop of the rectifier IGBT and inverter IGBT, the normal value should be 0.35V~0.45V.



Switch the multimeter to resistance Channel and test the rectifier IGBT and inverter IGBT, the normal value should be about 3KΩ or 5KΩ .

3.3 Main fault and trouble shooting

Common faults	Solution and Maintenance
Input Grid Neutral Lost	Put on the output breaker, and turn on the ups again.
Utility Abnormal	Check the whether the input power is normal,

	then check whether the input fuses are work well. If the fuses are broken, replace the input board.
RectifierSoft Start Fail	Replace the input board.
Rectifier Fail	Replace the rectifier board.
Inverter Protect	Replace the inverter board and bus fuses board
Inverter Fail	Replace the inverter board
INV IGBT Driver Block	Replace the inverter board and bus fuses board
Output short and output overload	Check the loads firstly, if the loads have no problem, replace the output board
Relays connection lost	Replace the output board.
Fans fail	Replace the fans

4.UPS Event List

NO.	UPS events	Description
1	Fault Clear	Manually clear fault
2	Log Clear	Manually clear History log
3	Load On UPS	Inverter feeds load
4	Load On Bypass	Bypass feeds load
5	No Load	No load
6	Battery Boost	Charger is working in boost charging mode
7	Battery Float	Charger is working in float charging mode
8	Battery Discharge	Battery is discharging
9	Battery Connected	Battery is connected already
10	Battery Not Connected	Battery is not yet connected.
11	Maintenance CB Closed	Manual maintenance breaker is closed
12	Maintenance CB Open	Manual maintenance breaker is opened
13	EPO	Emergency Power Off
14	Module On Less	Available power module capacity is less than the load capacity. Please reduce the load capacity or add extra power module to make sure that the UPS capacity is big enough.
15	Generator Input	Generator is connected and a signal is sent to the UPS.
16	Utility Abnormal	Utility (Grid) is abnormal. Mains voltage or frequency exceeds the upper or lower limit and results in rectifier shutdown. Check the input phase voltage of rectifier.
17	Bypass Sequence Error	Bypass voltage Sequence is reverse. Check if input power cables are connected correctly.
18	Bypass Volt Abnormal	<p>This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage exceeds the limit. The alarm will automatically reset if the bypass voltage becomes normal.</p> <p>First check if relevant alarm exists, such as “bypass circuit breaker open”, “Byp Sequence Err” and “Ip Neutral Lost”. If there is any</p>

		<p>relevant alarm, first clear this alarm.</p> <p>1. Then check and confirm if the bypass voltage and frequency displayed on the LCD are within the setting range. Note that the rated voltage and frequency are respectively specified by “Output Voltage” and “Output Frequency”.</p> <p>2. If the displayed voltage is abnormal, measure the actual bypass voltage and frequency. If the measurement is abnormal, check the external bypass power supply. If the alarm occurs frequently, use the configuration software to increase the bypass high limit set point according to the user’s suggestions</p>
19	Bypass Module Fail	Bypass Module Fails. This fault is locked until power off. Or bypass fans fail.
20	Bypass Module Over Load	Bypass current is over the limitation. If bypass current is under 135% of the rated current. The UPS alarms but has no action.
21	Bypass Over Load Tout	The bypass overload status continues and the overload times out.
22	Byp Freq Over Track	<p>This alarm is triggered by an inverter software routine when the frequency of bypass voltage exceeds the limit. The alarm will automatically reset if the bypass voltage becomes normal.</p> <p>First check if relevant alarm exists, such as “bypass circuit breaker open”, “Byp Sequence Err” and “Ip Neutral Lost”. If there is any relevant alarm, first clear this alarm.</p> <p>1. Then check and confirm if the bypass frequency displayed on the LCD are within the setting range. Note that the rated frequency are respectively specified by “Output Frequency”.</p> <p>2. If the displayed voltage is abnormal, measure the actual bypass frequency. If the measurement is abnormal, check the external bypass power supply. If the alarm occurs frequently, use the configuration software to increase the bypass high limit set point according to the user’s suggestions</p>
23	Exceed Tx Times Lmt	The load is on bypass because the output overload transfer and re-transfer is fixed to the set times during the current hour. The system can recover automatically and will transfer back to the inverter with 1 hour
24	Output Short	Output shorted Circuit.

	Circuit	<p>Fist check and confirm if loads have something wrong.</p> <p>Then check and confirm if there is something wrong with terminals, sockets or some other power distribution unit.</p> <p>If the fault is solved, press “Fault Clear” to restart UPS.</p>
25	Battery EOD	Inverter turned off due to low battery voltage. Check the mains power failure status and recover the mains power in time
26	Battery Test	System transfer to battery mode for 20 seconds to check if batteries are normal
27	Battery Test OK	Battery Test OK
28	Battery Maintenance	System transfer to battery mode until to be 1.1*EOD voltage to maintenance battery string
29	Battery Maintenance OK	Battery maintenance succeed
30	Module inserted	Power Module is inserted in system.
31	Module Exit	Power Module is pulled out from system.
32	Rectifier Fail	The N# Power Module Rectifier Fail, The rectifier is fault and results in rectifier shutdown and battery discharging.
33	Inverter Fail	The N# Power Module Inverter Fail. The inverter output voltage is abnormal and the load transfers to bypass.
34	Rectifier Over Temp.	<p>The N# Power Module Rectifier Over Temperature. The temperature of the rectifier IGBTs is too high to keep rectifier running. This alarm is triggered by the signal from the temperature monitoring device mounted in the rectifier IGBTs. The UPS recovers automatically after the over temperature signal disappears.</p> <p>If over temperature exists, check:</p> <ol style="list-style-type: none"> 1. Whether the ambient temperature is too high. 2. Whether the ventilation channel is blocked. 3. Whether fan fault happens. 4. Whether the input voltage is too low.
35	Fan Fail	At least one fan fails in the N# power module.
36	Output Over load	<p>The N# Power Module Output Over Load. This alarm appears when the load rises above 100% of nominal rating. The alarm automatically resets once the overload condition is removed.</p> <ol style="list-style-type: none"> 1. Check which phase has overload through the load (%) displayed in LCD so as to confirm if this alarm is true.

		<p>2. If this alarm is true, measure the actual output current to confirm if the displayed value is correct.</p> <p>Disconnect non-critical load. In parallel system, this alarm will be triggered if the load is severely imbalanced.</p>
37	Inverter Overload Tout	<p>N# Power Module Inverter Over Load Timeout. The UPS overload status continues and the overload times out.</p> <p>Note:</p> <p>The highest loaded phase will indicate overload timing-out first.</p> <p>When the timer is active, then the alarm “module over load” should also be active as the load is above nominal.</p> <p>When the time has expired, the inverter Switch is opened and the load transferred to bypass.</p> <p>If the load decreases to lower than 95%, after 2 minutes, the system will transfer back to inverter mode. Check the load (%) displayed in LCD so as to confirm if this alarm is true. If LCD displays that overload happens, then check the actual load and confirm if the UPS has over load before alarm happens.</p>
38	Inverter Over Temp.	<p>The N# Power Module Inverter Over Temperature.</p> <p>The temperature of the inverter heat sink is too high to keep inverter running. This alarm is triggered by the signal from the temperature monitoring device mounted in the inverter IGBTs. The UPS recovers automatically after the over temperature signal disappears.</p> <p>If over temperature exists, check:</p> <p>Whether the ambient temperature is too high.</p> <p>Whether the ventilation channel is blocked.</p> <p>Whether fan fault happens.</p> <p>Whether inverter overload time is out.</p>
39	On UPS Inhibited	<p>Inhibit system transfer from bypass to UPS (inverter). Check:</p> <p>Whether the power module’s capacity is big enough for load.</p> <p>Whether the rectifier is ready.</p> <p>Whether the bypass voltage is normal.</p>
40	Manual Transfer Byp	Transfer to bypass manually
41	Esc Manual Bypass	Escape from “transfer to bypass manually” command. If UPS has

		been transferred to bypass manually, this command enable UPS to transfer to inverter.
42	Battery Volt Low	Battery Voltage is Low. Before the end of discharging, battery voltage is low warning should occur. After this pre-warning, battery should have the capacity for 3 minutes discharging with full load.
43	Battery Reverse	Battery cables are connected not correctly.
44	Inverter Protect	The N# Power Module Inverter Protect. Check: Whether inverter voltage is abnormal Whether inverter voltage is much different from other modules, if yes, please adjust inverter voltage of the power module separately.
45	Input Neutral Lost	The mains neutral wire is lost or not detected. For 3 phases UPS, it's recommended that user use a 3-poles breaker or switch between input power and UPS.
46	Bypass Fan Fail	At least one of bypass module Fans Fails
47	Manual Shutdown	The N# Power Module is manually shutdown. The power module shuts down rectifier and inverter, and there's on inverter output.
48	Manual Boost Charge	Manually force the Charger work in boost charge mode.
49	Manual Float Charge	Manually force the charger work in float charge mode.
50	UPS Locked	Forbidden to shutdown UPS power module manually.
51	Parallel Cable Error	Parallel cables error. Check: If one or more parallel cables are disconnected or not connected correctly If parallel cable round is disconnected If parallel cable is OK
53	Lost N+X Redundant	Lost N+X Redundant. There is no X redundant powers module in system.
54	EOD Sys Inhibited	System is inhibited to supply after the battery is EOD (end of discharging)
55	Battery Test Fail	Battery Test Fail. Check if UPS is normal and battery voltage is over 90% of float voltage.
56	Battery Maintenance Fail	Check If UPS is normal and not any alarms If the battery voltage is over 90% of float voltage

		If load is over 25%
57	Ambient Over Temp	Ambient temperature is over the limit of UPS. Air conditioners are required to regulate ambient temperature.
58	REC CAN Fail	Rectifier CAN bus communication is abnormal. Please check if communication cables are not connected correctly.
59	INV IO CAN Fail	IO signal communication of inverter CAN bus is abnormal. Please check if communication cables are not connected correctly.
60	INV DATA CAN Fail	DATA communication of inverter CAN bus is abnormal. Please check if communication cables are not connected correctly.
61	Power Share Fail	The difference of two or more power modules' output current in system is over limitation. Please adjust output voltage of power modules and restart UPS.
62	Sync Pulse Fail	Synchronization signal between modules is abnormal. Please check if communication cables are not connected correctly.
63	Input Volt Detect Fail	Input voltage of N# power module is abnormal. Please check if the input cables are connected correctly. Please check if input fuses are broken. Please check if utility is normal.
64	Battery Volt Detect Fail	Battery voltage is abnormal. Please check if batteries are normal. Please check if battery fuses are broken on input power board.
65	Output Volt Fail	Output voltage is abnormal.
66	Bypass Volt Detect Fail	Bypass voltage is abnormal. Please check if bypass breaker is closed and is good. Please check if bypass cables are connected correctly.
67	INV Bridge Fail	Inverter IGBTs are broken and opened.
68	Outlet Temp Error	Outlet temperature of power module is over the limitation. Please check if fans are abnormal. Please check if PFC or inverter inductors are abnormal. Please check if air passage is blocked. Please check if ambient temperature is too high.
69	Input Curr Unbalance	The difference of input current between every two phases is over 40% of rated current. Please check if rectifier's fuses, diode, IGBT or PFC diodes are broken.

		Please check if input voltage is abnormal.
70	DC Bus Over Volt	Voltage of DC bus capacitors is over limitation. UPS shutdown rectifier and inverter.
71	REC Soft Start Fail	While soft start procedures are finished, DC bus voltage is lower than the limitation of calculation according utility voltage. Please check <ol style="list-style-type: none"> 1. Whether rectifier diodes are broken 2. Whether PFC IGBTs are broken 3. Whether PFC diodes are broken 4. Whether drivers of SCR or IGBT are abnormal 5. Whether soft start resistors or relay are abnormal
72	Relay Connect Fail	Inverter relays are opened and cannot work or fuses are broken.
73	Relay Short Circuit	Inverter relays are shorted and cannot be released.
74	PWM Sync Fail	PWM synchronizing signal is abnormal
75	Intelligent Sleep	UPS works in intelligent sleep mode. In this mode, the power modules will be standby in turn. It will be more reliability and higher efficiency. It must be confirmed that remained power modules' capacity is big enough to feed load. It must be conformed that working modules' capacity is big enough if user add more load to UPS. It's recommended that sleeping power modules are waken up if the capacity of new added loads is not sure.
76	Manual Transfer to INV	Manually transfer UPS to inverter. It's used to transfer UPS to inverter when bypass is over track. The interrupt time could be over 20ms.
77	Input Over Curr Tout	Input over current timeout and UPS transfer to battery mode. Please check if input voltage is too low and output load is big. Please regulate input voltage to be higher if it's possible or disconnect some loads.
78	No Inlet Temp. Sensor	Inlet temperature sensor is not connected correctly.
79	No Outlet Temp. Sensor	Outlet temperature sensor is not connected correctly.
80	Inlet Over Temp.	Inlet air is over temperature. Make sure that the operation temperature of UPS is between 0-40°C.
81	Capacitor Time	Reset timing of DC bus capacitors.

	Reset	
82	Fan Time Reset	Reset timing of fans.
83	Battery History Reset	Reset battery history data.
84	Byp Fan Time Reset	Reset timing of bypass fans.
85	Battery Over Temp.	Battery is over temperature. It's optional.
86	Bypass Fan Expired	Working life of bypass fans is expired, and it's recommended that the fans are replaced with new fans. It must be activated via software.
87	Capacitor Expired	Working life of capacitors is expired, and it's recommended that the capacitors are replaced with new capacitors. It must be activated via software.
88	Fan Expired	Working life of power modules' fans is expired, and it's recommended that the fans are replaced with new fans. It must be activated via software.
89	INV IGBT Driver Block	Inverter IGBTs are shutdown. Please check if power modules are inserted in cabinet correctly. Please check if fuses between rectifier and inverter are broken.
90	Battery Expired	Working life of batteries is expired, and it's recommended that the batteries are replaced with new batteries. It must be activated via software.
91	Bypass CAN Fail	The CAN bus between bypass module and cabinet is abnormal.
92	Dust Filter Expired	Dust filter need to be clear or replaced with a new one
102	Wave Trigger	Waveform has been saved while UPS fail
103	Bypass CAN Fail	Bypass and cabinet communicate with each other via CAN bus. Check If connector or signal cable is abnormal. If monitoring board is abnormal.
105	Firmware Error	Manufacturer used only.
106	System Setting Error	Manufacturer used only.
107	Bypass Over Temp.	Bypass module is over temperature. Please check If bypass load is overload

			<p>If ambient temperature is over 40°C</p> <p>If bypass SCRs are assembled correctly</p> <p>If bypass fans are normal</p>
108	Module Duplicate	ID	At least two modules are set as same ID on the power connector board, please set the ID as correct sequence