GN-UPS-6/10KVAS-RT

UPS Principle and Maintenance

Giganet Networking Solutions

Contents

1 Product introduction

1.1 Summary

GN-UPS-6/10KVAS-RT Series is a kind of high-frequency online intelligent UPS and adopts double DSP control chips, advanced control technology and double conversion topology. It eliminates various interference of the grid and makes the output a stable and pure sine wave power with low noise, no interference and low distortion. With strong load capacity, good load compatibility, wide input voltage and frequency range, excellent generator compatibility and zero transfer time, it greatly meets the requirement of variety of applications. Comprehensive protection enhances the stability and reliability of the system. It supports perfect monitoring function via the RS232 and USB. Large LCD is provided with English operation. The monitoring components can monitor the UPS running statures, send out instructions and keep the history record about fault. Intelligent battery management, equalized and floating charging auto conversion, battery discharge time prediction and battery self-test can extend the battery life. It can be used in advanced network systems.

★ Power range：6-10KVA

★ Working mode： High frequency online (one-phase in to one-phase out)

★ Application Work station、large network server、large-scale computer rooms and data center

1.2 Appearance

Figure 1. Appearance (rack mounting view)

1.3 Features

◆one-phase in to one-phase out UPS This series is single-phase in to single-phase out high-frequency online UPS

◆Digital control

Digital control is used for all parts of the UPS, which makes the performance indicators very excellent and the system more stable. It not only has self-protection and fault diagnosis, but also can avoid risks of analog device failure, which allows the control system more reliable.

◆High power density design

The height of the single unit of RT series is 2U.

◆Common Battery when parallel

RT series UPS can be paralleled with shared battery pack. The battery number has nothing with the parallel units, which greatly reduces the number of battery configuration. The user can configure the battery according to the backup time.

◆Selectable external battery number(16-20pcs optional)

The external battery number can be selected from 16/18/20pcs according to the user's requirement.

◆Standard battery pack

RT series has standard battery pack matching the UPS，the pack height is 3U，inside include 7AH＆9AH battery for 20pcs.

◆Settable charging current

By setting the battery capacity configured by user in the LCD, the reasonable charging current can be automatically allocated. The proper charging current can be also set in LCD. Constant voltage charging mode, constant current charging mode and floating charging mode can auto-switch smoothly.

◆Intelligent charging method

Advanced two-way, three-stage charging method is adopted. At the first stage, fast recharge with constant large current to 90% capacity; at the second stage, constant voltage charge can activate the battery characteristics and make the battery full; at the third stage, floating mode operates. This method can provide a balance between the fast charge and extended the battery life, which saves the battery investment.

◆EPO function

An EPO (emergency power off) button, It also has remote emergency power off function. When the EPO pin is short, the UPS will shut down.

1.4 Operating panel

1.4.1 LCD display interface: include LED, LCD display, and entity button.

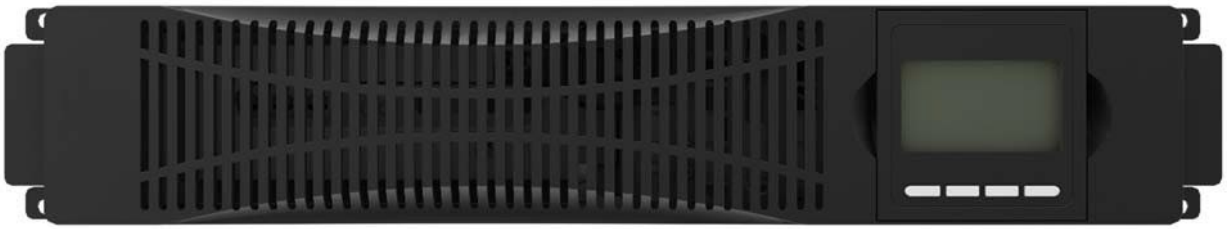


Figure 2. LED display interface

Table 1 LED description

Name	Status	Description
Inverter Led	on	Inverter normal
	flash	Inverter over load
	off	Inverter abnormal; Bypass model; ECO
Battery Led	on	Battery Discharger
	flash	Battery abnormal (battery voltage low/ battery voltage high/ battery without)
	off	Battery chargering
Bypass Led	on	Bypass mode; ECO model
	flash	Bypass voltage/frequency abnormal or out of range
	off	Bypass without power supply; online model
Alarm Led	on	UPS module fault alarm
	off	UPS module ok

Table 2 button function

BUTTON	function
ENTER/ON	INVERTER ON
ESC/OFF	Turn off inverter and transfer to bypass output in line mode (bypass normal) Turn off inverter in battery mode, power module power down
DOWN	Turn to next page
UP	Turn to last page

2 System electrical diagram

2.1 UPS block diagram

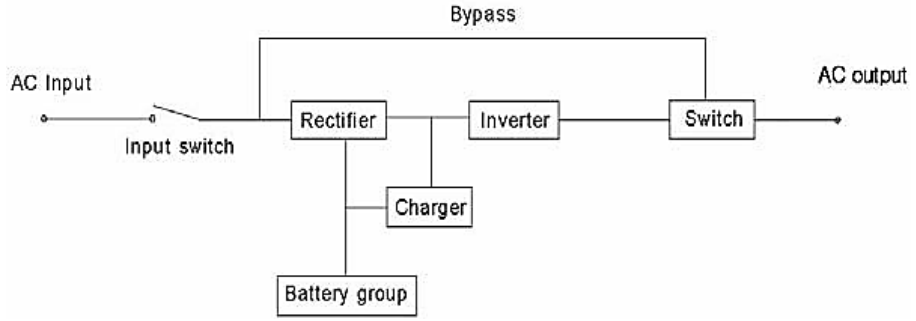


Figure 3. Block diagram

Working principle: AC is sent to double Boost-PFC rectifier after being filtered by input filter. High power factor correction PFC rectifier will transfer the AC input into positive and negative DC BUS voltages, DC BUS voltage inverter by half bridge inverter and output pure sine wave, then provides to the load after being filtered by output filter.

AC mode: UPS inverter is continuous working, rectifier converts AC into DC to supply the inverter, equalized charging or float charging the battery through the charger constituted by Buck converter.

Battery mode: when AC fails, inverter needs to supply the load uninterrupted. And at that time, battery is boosted by double boost-PFC circuit to maintain the BUS and supplies the power. So no matter AC fails or comes back, UPS can realize the uninterrupted power supply.

Bypass mode: while inverter fails, inverter's overload delay time is timing up or inverter shuts down manually, UPS will enter the bypass mode. And if bypass and inverter are synchronization at this moment, system will transfer to bypass from inverter mode uninterrupted.

2.2 Power unit AC/DC & DC/DC principle circuit diagram

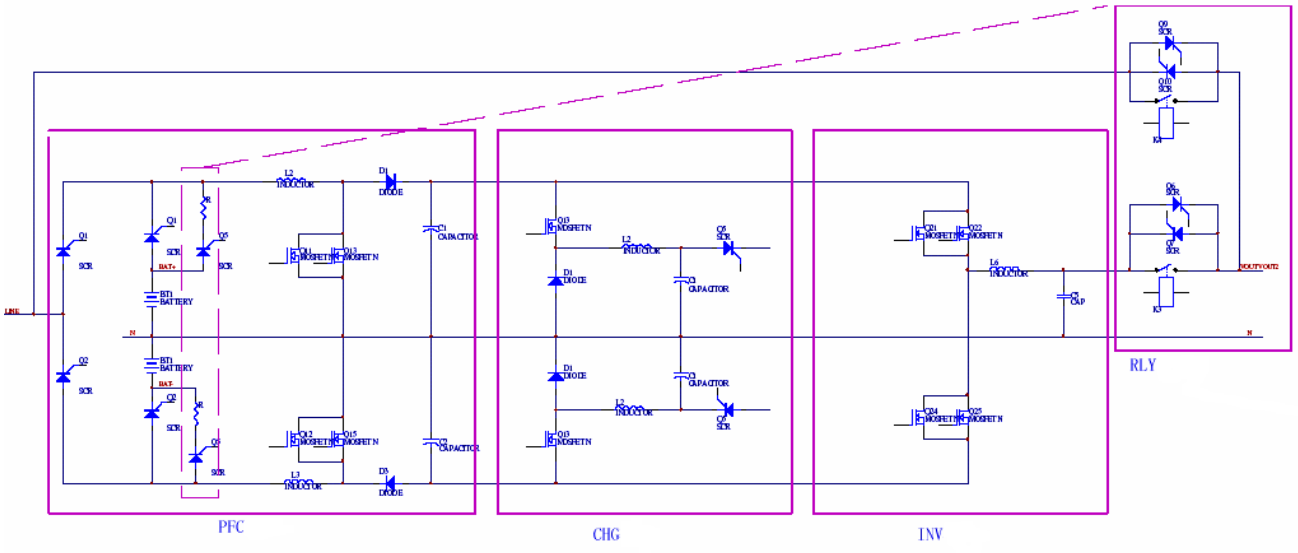


Figure 4. Unit block diagram

Double Boost-PFC rectifier part: Rectifier and boost circuit. Through controlling the conduction time of SCR to achieve the slow start of positive and negative BUS.

Battery boost part: lead the battery voltage into PFC circuit through relay. Share the double Boost-PFC circuit to maintain a stable positive and negative BUS and the working of inverter.

Charge part: positive and negative BUS voltages via Buck circuit respectively, and then charge the battery.

Inverter part: positive and negative BUS voltages via half bridge inverter and LC filter output pure sine wave.

Relay part: by SCR and relay realize 0ms transform for bypass and inverter.

3 Parameters

3.1 UPS specification

Table 3 UPS specification

MODEL	**6kVA**	**6kVA**	**10kVA**	**10kVA**
Capacity (VA/Watts)	6k / 5.4k	6k / 6k	10k / 9k	10k / 10k
INPUT				
Nominal voltage	220/230/240Vac(L+N+PE)			
Operating voltage range	110VAC-286Vac			
Operating frequency range	40~70Hz			
Power factor	≥0.99			
Bypass voltage range	Max. voltage：220V：+25%(optional+10%,+15%,+20%) 230V：+20%(optional+10%,+15%) 240V ：+15%(optional+10%) Min. voltage：-45% (optional-20%,-30%)			
ECO range	Same as bypass			
THDI	≤3% (100% liner load，input THDV ≤1%)			
	≤5% (100% non liner load，input THDV ≤1%)			
OUTPUT				
Output voltage	220/230/240Vac			
Voltage regulation	±2%			

Frequency	Line Mode	±1%/±2%/±4%/±5%/±10% of the rated frequency(optional)
	Bat. Mode	(50/60±0.1)Hz
Crest factor		3:1
Harmonic distortion (THD)		⩽2% with linear load ⩽5% with nonlinear load
Waveform		Pure Sine wave
Efficiency		⩾92%
BATTERY		
Battery voltage		Optional Voltage: ±96/108/120Vdc
Backup time		Long run unit depends on the capacity of external batteries Estimated remaining time displayed on the LCD
Typical recharge time		6-8 hours (to 90% of full capacity)
Charge current		Maximum Current 10A; charge current can be set according to battery capacity installed.
SYSTEM FEATURES		
Transfer time		Utility to Battery : 0ms; Utility to bypass: 0ms
load capacity （Mains, drop a level in battery mode） （PF0.9）		105 %～ 110 %，lasts 1 hour
		110%～125%,lasts 10 minutes
		125%～150%, lasts 1 minute
		＞150%，switch to bypass immediately
load capacity （Mains, drop a level in battery mode） （PF1.0）		105%～110%,lasts 10 minutes
		110%～130%, lasts 1 minute
		＞130%，switch to bypass immediately
Overload for bypass		＞95%, can not inverter-fed
		Load for a long time when rated output current under 125%
		Bypass load capacity is controlled by bypass circuit breaker, tripping when circuit breaker operating current.
Short Circuit		Hold Whole System
Overheat		Line Mode: Switch to Bypass; Backup Mode: Shut down UPS immediately
Low battery voltage		Alarm and Switch off
Self-diagnostics		Upon Power On and Software Control
EPO		Shut down UPS immediately
Battery		Advanced Battery Management
Noise Suppression		Complies with EN62040-2
Audible & Visual alarms		Line Failure, Battery Low, Overload, System Fault
Status LED & LCD display		Line Mode, Backup Mode, Eco Mode, Bypass Mode, Battery Low, Battery Bad, Overload & UPS Fault
Reading on the LCD display		Input Voltage, Input Frequency, Output Voltage, Output Frequency, Load Percentage, Battery Voltage, Inner Temperature & Remaining Battery Backup Time
Communication interface		USB, Parallel Port, SNMP card(optional), Relay card (optional)
ENVIRONMENTAL		
Operating temperature		0℃～40℃
Storage temperature		-25℃～55℃
Humidity range		0～95% (non condensing)
Altitude		< 1500m
Noise level		<55dB

PHYSICAL		
Dimension W×H×D (mm)	443×86.5×620(2U)	
Net Weight (kg)	16	18
STANDARDS		
Safety	IEC/EN62040-1,IEC/EN60950-1	
EMC	IEC/EN62040-2,IEC61000-4-2,IEC61000-4-3,IEC61000-4-4,IEC61000-4-5,IEC61000-4-6,IEC61000-4-8	

4 UPS internal structure

4.1 Internal structure of UPS

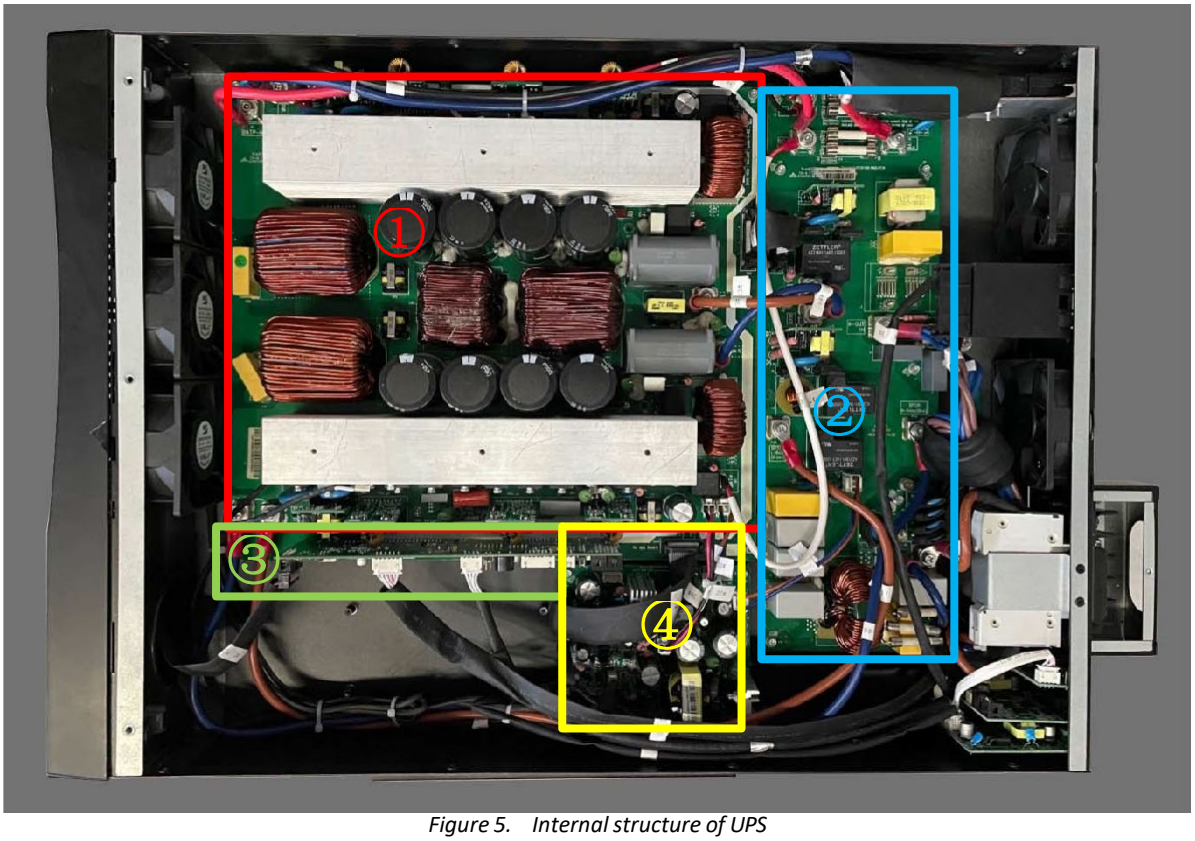


Figure 5. Internal structure of UPS

1. Power board
2. Input/Output EMI board
3. Control board
4. Auxiliary Power board

4.2 UPS rear

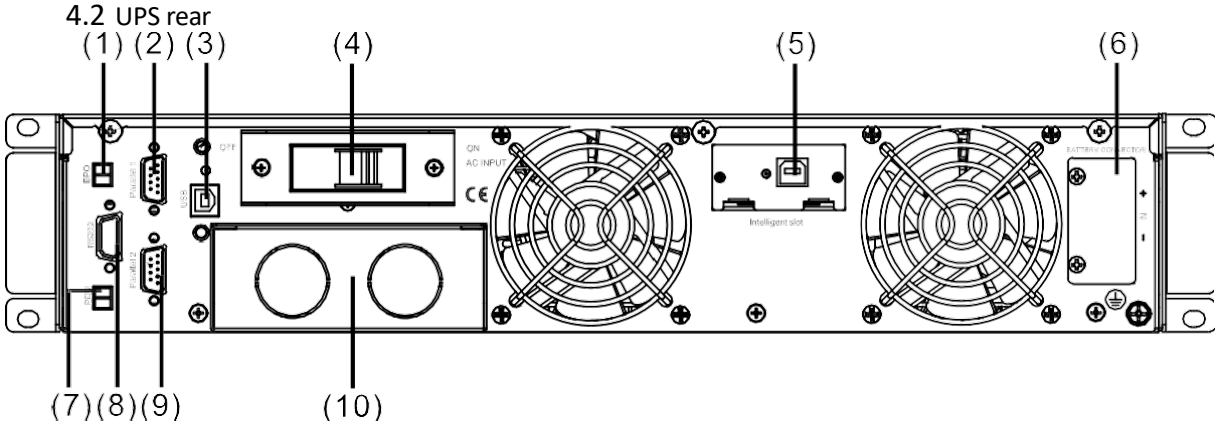


Figure 6. UPS rear

(1)EPO
(2)Parallel Port 1
(3)USB
(4)Input breaker
(5)Intelligent slot
(6)Battery Slot (8)COM（RS232）
(7)PDU
(9)Parallel Port 2
(10)terminal

5 Each PCB board and its interface signals

5.1 Power board

Function overview

- Rectifier and PFC IGBT circuit
- Charger circuit
- Half-bridge inverter circuit

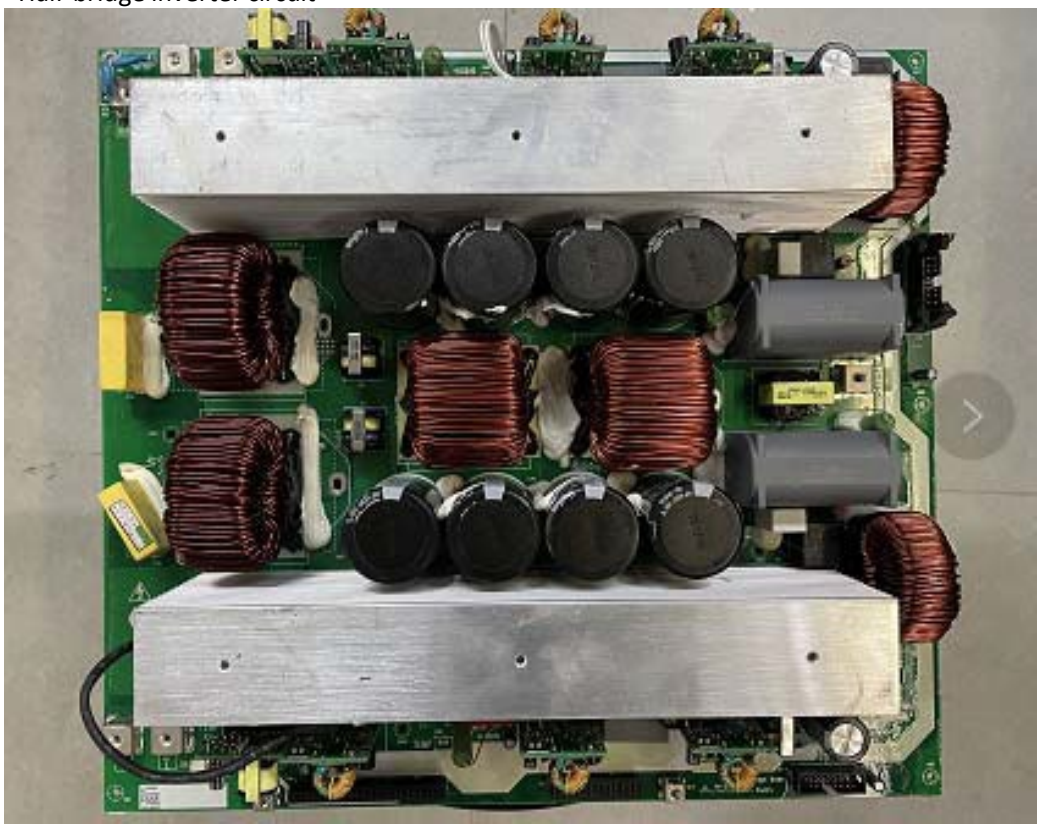


Figure 7. power board

Input/output interface definition

Table 4 POWER board

No.	Definition	Connected to
J27	BAT+	EMI board DC+(P6)
J16	BAT_N	Battery terminal BAT_N
J26	BAT-	EMI board DC –(P7)
J18	BATN_N	EMI board DC-(P7)
J17	BATP_N	EMI board DC+(P6)
J11	INVL	EMI board INVL(P19)
J20	INVN	EMI board INVN(P30)
CN3	signal	EMI board CN3
CN8	Control signal 1	Control board CN1
CN7	Control signal 2	Control board CN4
J12	N(to BPS)	EMI board BPSN(P46)
J19	L(to BPS)	EMI board BPSL(P44)
CN1/CN2	Temperature signal	temperature sensor
CN24	signal	Auxiliary Power board CN41
J21	SPS_POWER	Auxiliary Power board J42
J22	SPS_POWER	Auxiliary Power board J43

5.2 Auxiliary power board

Function overview：

- Auxiliary power circuit

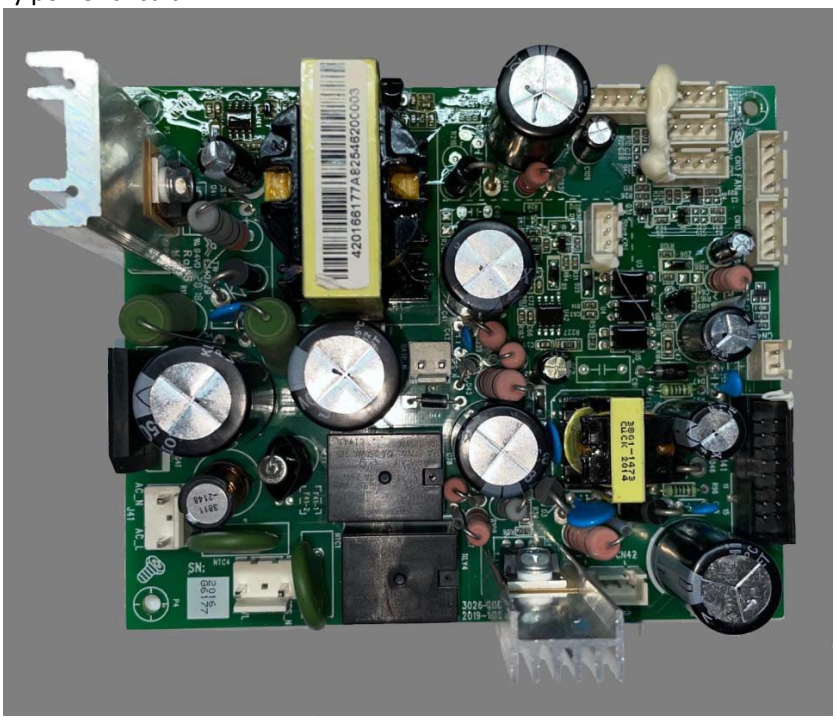


Figure 8. Auxiliary power board

Input and output interface definition

Table 5 Auxiliary power board

No.	Definition	Connected to
J41	SPS_POWER	EMI board CN2
J42	SPS_POWER	Control board J21
J43	SPS_POWER	Control board J22
CN41	signal	Control board CN24
CN45	SPS_POWER	Communication board CN4
CN44	Start ON	Dot LCD screen CON2
CN1	FAN	Front FAN
CN14	FAN	Front FAN
CN15	FAN	Front FAN
CN12	FAN	Back FAN
CN13	FAN	Back FAN

5.3 Control board

Function overview：

- UPS control
- Communication circuit
- Display circuit

Figure 9. control board

Input and output interface definition

Table 6 control board

No.	Definition	Connected to
CN1	Control signal 1	Power board CN8
CN4	Control signal 2	Power board CN7
CN7	SNMP signal	Communication board J4
CN21	USB signal	Communication board J2
CN3	Segment LCD screen	Segment LCD screen
CN8	Parallel interface	Parallel board J1

5.4 Parallel board

Function overview：

- Parallel communication
- Parallel circuit

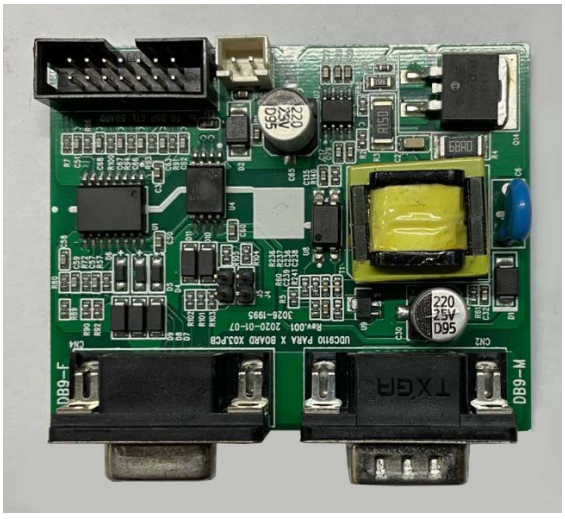


Figure 10. parallel board

Input and output interface definition

Table 7 parallel board

No.	Definition	Connected to
J1	Parallel interface	Control board CN8

5.5 Input/Output EMI board

Function overview：

- Filter circuit
- EMI
- Bypass static switch

Figure 11 Input/Output EMI board

Input and output interface definition

Table 8 Input/Output EMI board

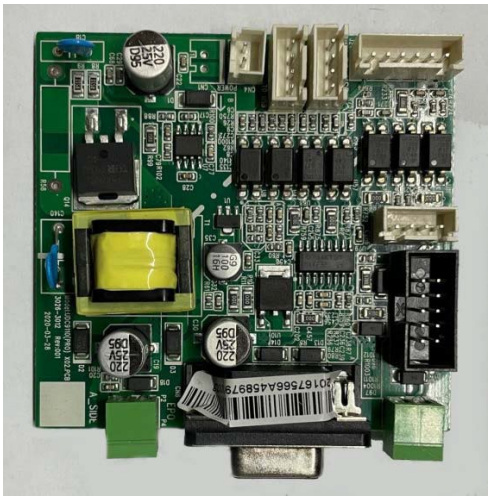
No.	Definition	Connected to
P19	INVL	Power board J11
P30	INVN	Power board J20
P44	BPSL	Power board J19
P46	BPSN	Power board J12
P6	DC+	Power board J17/J27
P7	DC-	Power board J18/26
P1	BAT+	Battery terminal BAT+
P3	BAT-	Battery terminal BAT-
P24	L-IN	Input breaker Lo
P35	N-IN	Input terminal Nin
P32	N-OUT	Output terminal No
P11	L-OUT	Output terminal Lo
CN2	SPS_POWER	Auxiliary power board J41
CN3	signal	Power board CN3

5.6 Communication board

Function overview：

- USB communication circuit
- RS232/EPO/PDU

1. USB Port



2. RS232/EPO/PDU Port

Figure 12. Communication board

Input and output interface definition

Table 9 Communication board

No.	Definition	Connected to
CN4	SPS_POWER	Auxiliary power board CN45
J2	Communication signal 1	Control board CN21
J5	USB signal	USB port J1
J4	Communication signal 2	Control board CN22
J47	SNMP	SNMP slot
J20		/

6 Inspection before installation

6.1 Room environment inspection

- ✓ UPS room：

UPS should be installed in a cool, dry, clean and well-ventilated environment, such as the room temperature should be < 40℃, the humidity≤95% when 20℃, not obvious dust on the floor, especially without any conductive powder. The room air cannot contain acid mist or other conductive medium. For detail, please refer to the users' manual and other specifications.

- ✓ Battery room：

The battery should be also placed in a cool, dry, clean and well-ventilated environment. The available temperature is 15℃-25℃, typically is 20℃. The place where the battery located should keep the constant temperature and far away from heat and vents.

6.2 UPS location inspection

The users' manual offers the detailed installation instruction; it can be referred for installation.

- ✓ Check if enough space is left for maintenance operation; ensure that the operator can still pass through freely when the door is fully opened.
- ✓ There is no obstruction in the front, above and below of UPS. Enough space should be left for ventilation.
- ✓ Air is primarily comes from front door, so check if the front door leave enough air inlet space.

6.3 UPS visual inspection

- ◆ **Particularly important: it is necessary to have a comprehensive inspection of internal and external of UPS**

1. Check the external power cable connection(include input /Output phase sequence battery polarity、fasten bolt and ect.)
2. Check if the parallel cables are connected well? If they are routed separately from power cables?
3. Check if the external signal of the battery box and LBS (when needed) connections are good or correct?
4. Check if the internal signal cable is connected well，if the cable is loosed by shaking it gently.
5. Check if the internal boards or components are in connected or damaged?

6.4 External cables and switch capacity inspection

- ✓ For power cable selection and connection method, please refer to the user manual and related specification.
- ✓ Check if the breakers rated capacity of UPS input、Output and distribution cabinet are appropriate.
- ✓ Pay attention to the Neutral and Ground protection inspection:

  If the Neutral and Ground cable size meets the requirement?

Neutral has separate input and output， connect to the same Neutral is not allowed.

Check and confirm all the cabinets and cable ducts have been grounded according to the local provisions.

- ✓ If the bypass has different power source, please check if the short copper bar of the internal mains and bypass has been removed, do the connection correctly according to the users' manual.
- ✓ If the battery breaker box is provided, check if the connection of it is correct.
- ✓ Check if the UPS input/output wiring is reasonable and the cable is not in contact with any sharp edges of objects.
- ✓ If the user install the remote contact to realize the EPO function, make sure that the EPO cable is not interference by other main power signals to avoid UPS malfunction. About how to realize the EPO function by remote contact, please refer to user's manual.
- ✓ About other control cables connection, please refer to the relevant chapters of the user's manual.

6.5 External auto switching and generator power distribution inspection

- ✓ Confirm that the ATS at the input side is three level switch, that is the Neutral cannot be cut off; if it is four level, confirm that when transfer between two sources, neutral should meet on-before-off principle.
- ✓ If the AC and generator can be selected at the input side, please confirm the proper connection between Neutral and Ground according to the relevant specifications.
- ✓ If the generator has dry contact, it is necessary to connect it to the generator dry contact of the monitor board.

6.6 Battery inspection

The important security guidance when operating battery：

1) Battery exists danger of short-circuit and possibly causes burning due to the short-circuit current.
2) The voltage may reach 280VDC when battery connected in series, which has deadly danger. So keep in mind to prevent electric shock.
3) The installation and operation of the battery must be carried out by professionals.
4) Note of eye protection to avoid accidental arc damage.
5) Remove all rings, watched, necklaces, bracelets and other metal objects.
6) **The tools must be used with insulated handles.**
7) **Wear rubber gloves and protective aprons when do the battery operation.**
8) **If the battery has liquid leakage or housing damaged, place it in the ant-acid container and deal it according to the local regulations.**
9) **If the electrolyte touches your skin, immediately wash it with a plenty of water.**
10) **The battery must be handled with reference to local environmental regulations.**

Focus on the following aspects：

1) If the battery surface is clean, the appearance is damaged, deformed and leakage;
2) Check if the connection among battery is reliable, if the screws are tightened, if there

is corrosion and confirm that all battery terminals are coated with insulating material；

3) Check if there at least 10mm interval between the vertical side of the battery to ensure the free flow of the air around the battery；
4) At least 150mm space should be left between battery top and upper frame for monitoring and maintenance of the battery;
5) Check if the battery cabinet or battery rack installed reliably, if there is good grounded. One cable must be individually connected between battery breaker box and UPS;
6) About connections between battery pack and UPS, battery and battery, battery pack and battery pack and rated capacity of breaker, please refer to the user's manual and relevant specifications;
7) Check if the wiring is reasonable and the cable is not in contact with any sharp edges of objects;
8) If the battery cabinet is installed on a raised floor, the battery power cable and breaker controlled cable can route through the floor; if the battery cabinets are side-by-side and installed on a solid floor, cables can go into the outlet holes at the bottom of the cabinet side to connect the battery cabinets;
9) Check and confirm that the cables are correctly and safely connected to the battery terminal blocks of the UPS. Don't reverse the battery. About the terminal block diagram, please refer to the user's manual.
10) Make sure that the battery breaker box is switched off.

7 UPS maintenance

7.1 Guidelines for good service

7.1.1 The UPS is almost maintenance-free and is designed to have a failure rate less than 1% a year.

Periodical service is only needed for the fans; the UPS has a low heat generation.

A battery change after 3-6 years can be expected and, apart from the service to the fan, it should normally be the only service done to the unit.

7.1.2 Due to the size of the UPS and the highly complex of the PCB, board level repair is not recommended, take the following measures instead:

Improve the reliability of the design；

Replace the PCBA；

7.2 Security conditions

Warning：When the UPS is operating, all the electronic parts connected directly to the power supply and all internal components including the battery exist high voltage. Even disconnected from the power supply, all internal parts including the battery still have dangerous voltage (except the communication output).

7.2.1 Only authorized professionals with relevant knowledge can open the machine, the others cannot open it for maintenance.

For authorized service personnel：

Do not work alone，a second person should be standing by to assist and render help in case of accident.

Danger may occur only during the installation and maintenance. Any person operating in a normal manner is safe.

7.2.2 If the UPS is in need of repair, the process A operation is recommended(This is completely safe)：Disconnect all input power supply and battery. Load is allowed to turn off for process A. The specific steps can be seen in chapter 3.

If the load is not allowed to turn off, please enter the maintenance bypass mode for maintenance. Follow the process B (refer to chapter III for specific information). Please note that the do the maintenance in maintenance bypass mode is not absolutely safe， Part of circuits are still at work.

In maintenance mode, the load is directly connected to the power via the bypass, so the UPS will not provide any protection.

7.2.3 To avoid electrostatic discharge damage，ensure that the maintenance is under the ESD safe conditions

- work on an anti-static mat；
- ground yourself and the unit when it is opened.

7.2.4 Be careful when disconnect the battery：

- Do not wear metal bracelets and etc.
- do not short circuit the batteries

7.2.5 If the UPS must be repaired during the operation such as measurement，Make sure that the power supply is isolated. In this case, a transformer can be used between the UPS and power.

Before maintenance, this manual should be entirely read.

7.3 Shutdown-disassembly/reassembly UPS

Warning： when UPS works，a large amount of energy is stored in the internal BUS capacitor，no electricity cannot be guaranteed inside the UPS with mains isolation, so it needs extra attention when maintenance. Disconnect all external input power of the fault machine for maintenance，After opening the case, use the bleed resistor to release the energy stored in BUS capacitor to avoid injury to person.

7.3.1 Please refer to the user's manual on UPS installation content；

7.3.2 First read chapter 2 "Security conditions"

7.3.3 If the UPS is in need of repair, the process A operation is recommended (This is completely safe)：Disconnect all input power supply and battery. Load is allowed to turn off for process A. The specific steps can be seen in chapter 3.

If the load is not allowed to turn off, please enter the maintenance bypass mode for

maintenance. Follow the process B (refer to chapter III for specific information). Please note that the do the maintenance in maintenance bypass mode is not absolutely safe， Part of circuits are still at work.

In maintenance mode, the load is directly connected to the power via the bypass, so the UPS will not provide any protection.

Step A：the load may be powered off.

A1 Turn off the load，disconnect all input power supply and battery；

A2 Put the input/output/battery air-switches to OFF；

A3 Remove the screws of the UPS，take off the cover；

********** UPS maintenance work **********

A4 close and fix the UPS cover

A5 Tighten the screws；

A6 Connect the mains/battery/load, switch on the battery air-breaker, press the ON button to turn on the UPS

A7 If UPS has no fault, it will has output when output air-switch is switched on.

A8 Switch-on the input -air-switch, the UPS will transfer to mains, and charge the battery.

A9 finished.

Step B: The load may not be powered off.

B1 Remove the maintenance screws and baffles to check whether the machine enter the maintenance bypass mode

B2 If the UPS goes to the maintenance bypass mode，switch on the maintenance bypass switch ，otherwise do the maintenance in accordance with the process A；

B3 Remove the screws of the UPS，take off the cover；

********** UPS maintenance work **********

B4 close and fix the UPS cover；

B5 Tighten the screws，the unit goes into the maintenance bypass mode；

B6 Switch off the maintenance switch，install baffles and screws，the unit goes to the bypass mode；

B7 If both the mains and battery are normal，the UPS goes into the line mode and charging after a period of time；

B8 finished.

7.4 Troubleshooting

This chapter provides information that can help you to locate faults in HIP UPS.

Some data may have to be measured to fix the fault. If it needs to be measured during the operation, the device should be isolated from the mains. In this case, a transformer can be used between device and the power. It also applies to the bypass input.

Warning： when UPS works，a large amount of energy is stored in the internal BUS capacitor， it cannot be guaranteed that there is no electricity inside the UPS with mains
isolation, so it needs extra attention when maintenance. Disconnect all external input power of the fault machine for maintenance. After opening the case, use the bleed resistor to release the energy stored in BUS capacitor to avoid injury to person.

Before maintenance, please confirm the related reliable cable connection.
For the UPS fault, please record the software version and PCB version correctly.

Warning s and precautions:

When fault occurs, make a note of the display (refer to code table) as the reference for maintenance.

Note: the UPS mains input switch cannot be OFF arbitrarily to avoid electricity interruption.

Fault analysis:

Record the status of display，then fix the reason in accordance with the following questions.

1. if the input supply is abnormal？(over/under voltage)
2. If load changes？(capacity or type)
3. If fire？
4. If smelly odor？
5. If abnormal noise？
6. If bad environment？(dust or moisture)
7. High temperature of UPS or ambient environment？

Troubleshooting

Failure view:

Please ensure the safe conditions before starting the maintenance. Please read chapter 2 “Security conditions” and chapter 3 “shutdown-disassembly/reassembly UPS”;
After remove the case，checking the following items:

1. If the CONNECTOR or terminals loose？
2. If the transformer or other parts burst or discoloration especially the power components on the heat sink?
3. Is capacitor rupture or leak？
4. If any parts serious blow up especially power components on heat sink？

Solutions:

1. If the unit fails，due to higher probability damage of the POWER board，replace the

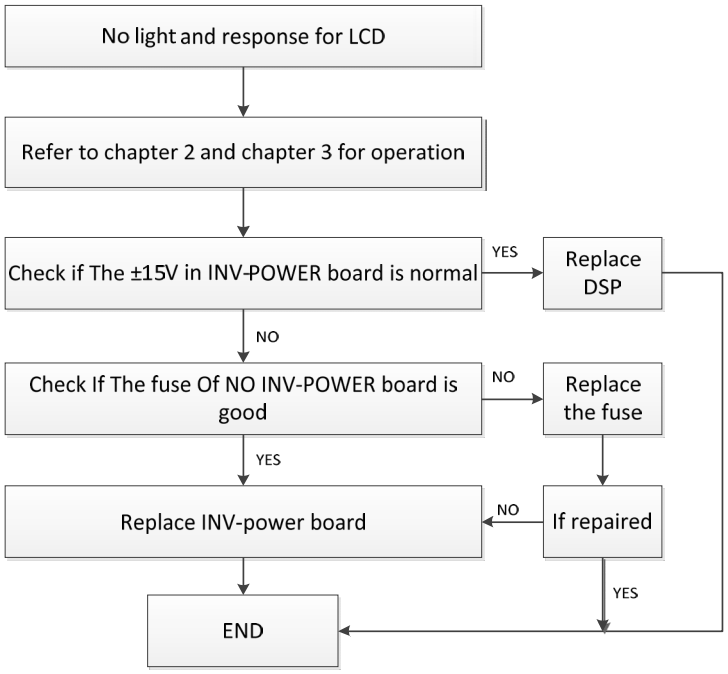
power board is ok.

2. If any power component on the power board is founded to blow up, replace it according to the “replace PCB”;

3. If fan doesn’t work with mains input, confirm that if the auxiliary power board is damaged and needs to be replaced

4. Charger shows abnormal, check if the charging circuit in the power board is damaged and need to be replaced.

4.1 The display has no light and response when connected mains



7.5 Battery replacement

1. Refer to the user’s manual for battery installation operation;

2. Ensure the safe conditions before any operation. Please read chapter 2《Security conditions》 and chapter 3《shutdown - disassembly/reassembly UPS》carefully. Be careful when disconnecting the battery. Short circuit will damage the battery or wiring.

Note:

The battery with the same brand/type/date of manufacture is recommended to ensure a long battery life. The voltage difference among the batteries should not more than ±150 mV。

We recommended to measure the voltage of each battery during discharge to ensure the voltage differences no more than ±150 mV。The battery pack capacity will be affected if there is one or more battery voltages differ too much. In the worst case, it will damage the other battery.

The voltage difference should be reduced after a long period of charging.

5.1 RT standard battery string：

1. Switch of the battery switch(if have)，remove the middle baffle；
2. Pull out the battery drawer，remove the screws，take out the battery，replace the new battery；
3. Replace the remaining drawer of battery；
4. Thoroughly check if all the connections are correct；
5. Re‐install the battery drawer；
6. Measure the total voltage of the battery；
7. Install all screws、baffles，switch on the battery switch(if have).

5.2 Single Battery cabinet：

1. Close the battery switch(if have)；
2. Disconnect the connection between the UPS and the battery cabinet；
3. Replace the battery according to the battery cabinet user's manual；
4. Thoroughly check if all the connections are correct；
5. Measure the total voltage of the battery；

7.6 Devices replacement

Warning：when UPS works, a large amount of energy is stored in the internal BUS capacitor, it cannot be guaranteed that there is no electricity inside the UPS with mains isolation, so it needs extra attention when maintenance. Disconnect all external input power of the fault machine for maintenance. After opening the case, use the bleed resistor to release the energy stored in BUS capacitor to avoid injury to person.

7.6.1 PCBA replacement

The internal voltage of the UPS is high enough to cause serious personal injury or death。

1. Ensure the safe conditions before any operation. Please read chapter 2《Security conditions》 and chapter 3《shutdown-disassembly/reassembly UPS》carefully. Be careful when disconnecting the battery. Short circuit will damage the battery or wiring.
2. ESD (electrostatic discharge) precautions: The PCB is very sensitive to electrostatic. When pick and place the board, ensure that the operating personnel and equipment are grounded well.
3. The new board is taken out from the anti-static packaging only when necessary，the old board removed from the UPS should be immediately placed in anti-static packaging.
4. Shut down the UPS according to the process A or B in chapter 3.
5. When disconnect any connectors, hold the male while pulling the female（sometimes need to press the connector snaps），otherwise, it will make the connector or PCB bending.
6. Mark it before disconnecting in order to facilitate the re-assembly connector.
7. Ensure the compatibility between the new board and old board before replacement.
8. Confirm if the connection is correct after replacing PCB.

7.6.2 Replace fan

Four fans are provided

1. Ensure the safe conditions before any operation. Please read chapter 2《Security conditions》 and chapter 3《shutdown-disassembly/reassembly UPS》carefully.
2. Operate according to the steps 1-3 of process A or steps 1-3 of process B in chapter 3；
3. Remove the upper and lower cover screws of the bad UPS，remove the cover，use the bleeder resistor to release the energy stored in the Bus capacitor；
4. Remove the fan cables of the Auxiliary power board；
5. Remove all the screws of the fan；
6. Replace with a new fan；
7. Install the screws and cables；
8. Install the upper and lower covers, screws of the UPS；
9. Continue with the steps 4-9 in process A or 4-8 in process B in chapter 3;

8 Single UPS commissioning

Warning： When UPS is working, the internal Bus capacitor stores a lot of energy. But isolated with mains cannot guarantee completely no electricity inside the UPS and need extra attention when do the maintenance. When cut off all the external input power supplied for maintenance, use the bleed resistor to release the energy stored in Bus capacitor after open the case firstly to avoid causing injury to persons.

Please refer to the “UPS repair/maintenance”, especially the “Security maintenance conditions” and “ Close-Disassembly/Reassembly UPS”.

The stand-alone commissioning requires intact power module.

8.1 Startup steps

1) Before startup, confirm that the input/output connection is correct, measure the positive and negative battery voltage, battery breaker is temporarily open
2) Close the output switch
3) Close input switches of the UPS. Close the external main input switch to start by AC
4) After start, check the LCD to see if the display of working mode, the VA of UPS, output voltage level and the frequency is the same with the actual values(refer to the user’s manual). If not the same, immediately disconnect the mains to check or call the customer service hotline
5) Close the external battery breaker, check if the charge current on the LCD is normal
6) Simulate mains power failure test: Disconnect external main input breaker and check if the UPS can transfer to battery inv. Mode and the output is uninterruptable. Then close the external mains breaker to confirm the UPS enter the line mode. At last, check if the charge and output are normal.

8.2 Shutdown steps：

1) turn off the output switch
2) Press the “OFF” button and keep for no less than 2 seconds, UPS inverter LED is off

3) Open the battery breaker
4) Open the input switch, UPS shut down
5) To completely isolate the AC power supply, the external grid input switch should be open. The main input distribution board is usually away from the UPS. It is necessary to inform the service personnel that the UPS is in repair by posting a label on it.

8.3 Emergency shutdown instructions：

In case of emergency, press EPO button for 3 seconds, the UPS shutdown can be achieved.

9 Parallel system commissioning

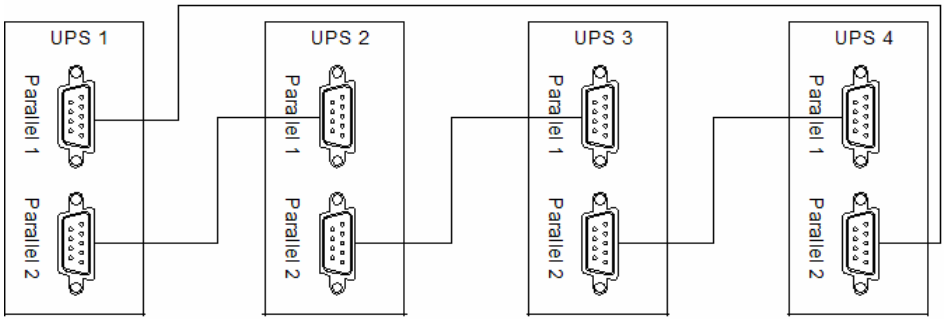
Warning： When UPS is working, the internal Bus capacitor stores a lot of energy. But isolated with mains cannot guarantee completely no electricity inside the UPS and need extra attention when do the maintenance. When cut off all the external input power supplied for maintenance, use the bleed resistor to release the energy stored in Bus capacitor after open the case firstly to avoid causing injury to persons.

Please refer to the “UPS repair/maintenance”, especially the “Security maintenance conditions” and “ Close‐Disassembly/Reassembly UPS”.

Parallel system should be commissioning when the stand‐alone are all intact.

9.1 Startup steps

1) Before parallel UPS, every UPS must startup by Single UPS commissioning step, and set up the ID of each UPS. The ID must be different for each UPS. Up to four units can be paralleled.
2) Properly connect the parallel cables(refer to the users’ manual)、input/output cables、battery cables.
3) Measure the positive and negative battery pack voltage，battery breaker is temporarily opened.
4) Close the output switch of each UPS.
5) Close all bypass switch of UPS at the back door. Close all mains switch of UPS, Close external input switch to start UPS from AC.
6) After startup, check the ID of UPS, check if the VA is the same with actual value. If not the same, please cut off mains for check or call the service hotline.
7) Close all external battery breakers of all cabinets. Check if the charge current displayed in LCD is normal.



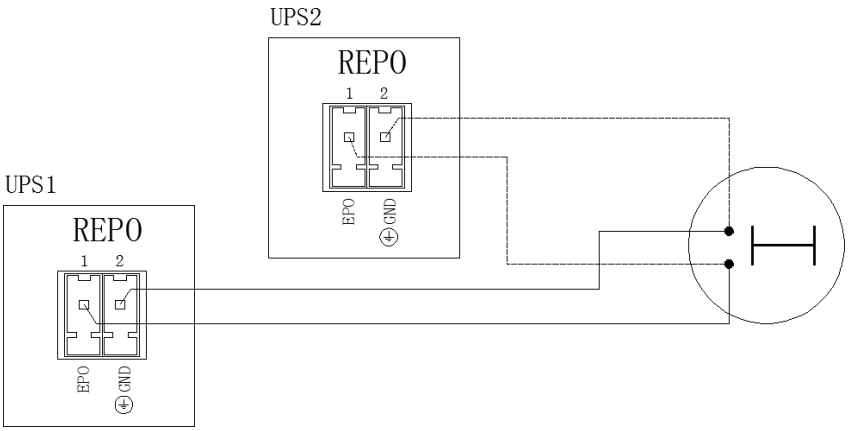
Parallel cable connect

9.2 Shutdown steps

1) Confirm the load information to avoid overload when turn off single UPS；
2) Shut down each UPS according to the stand‐alone UPS shutdown steps.

9.3 Emergency shutdown

1) According to the stand‐alone emergency shutdown steps, select any one unit can shut down all the outputs of UPS in the parallel system.
2) In addition to the local EPO push button on the front panel of the UPS (that stops operation of that module when pressed for more than 3 second), the UPS also supports a remote emergency stop (REPO).
3) A remote emergency stop switch (Dry contact signal and “normally open” ‐ not provided) can be installed in a remote location and connection through simple wires to the REPO connector.
4) The remote switch can be connected to several UPS’s in a parallel architecture allowing the user to stops all units at once.
5) Additionally, a second system (not provided) can be connected to the remote switch to disconnect the main input and the secondary (bypass) input sources



Appendix A Difference among the each power unit of GN-UPS-6/10KVAS-RT

Item	UPS Alarm Warning	Buzz	LED
1	Rectifier Fault	Beep continuously	Fault LED lit
2	Inverter fault(Including Inverter bridge is shorted)	Beep continuously	Fault LED lit
3	Inverter Thyristor short	Beep continuously	Fault LED lit
4	Inverter Thyristor broken	Beep continuously	Fault LED lit
5	Bypass Thyristor short	Beep continuously	Fault LED lit
6	Bypass Thyristor broken	Beep continuously	Fault LED lit
7	Fuse broken	Beep continuously	Fault LED lit
8	Parallel relay fault	Beep continuously	Fault LED lit
9	Fan fault	Beep continuously	Fault LED lit
10	Reserve	Beep continuously	Fault LED lit
11	Auxiliary power fault	Beep continuously	Fault LED lit
12	Initialization fault	Beep continuously	Fault LED lit
13	P-Battery Charger fault	Beep continuously	Fault LED lit
14	N-Battery Charger fault	Beep continuously	Fault LED lit
15	DC Bus over voltage	Beep continuously	Fault LED lit
16	DC Bus below voltage	Beep continuously	Fault LED lit
17	DC bus unbalance	Beep continuously	Fault LED lit
18	Soft start failed	Beep continuously	Fault LED lit
19	Rectifier Over Temperature	Twice per second	Fault LED lit
20	Inverter Over temperature	Twice per second	Fault LED lit
21	Reserve	Twice per second	Fault LED lit
22	Battery reverse	Twice per second	Fault LED lit
23	Cable connection error	Twice per second	Fault LED lit
24	CAN comm. Fault	Twice per second	Fault LED lit
25	Parallel load sharing fault	Twice per second	Fault LED lit
26	Battery over voltage	Once per second	Fault LED blinking
27	Mains Site Wiring Fault	Once per second	Fault LED blinking
28	Bypass Site Wiring Fault	Once per second	Fault LED blinking
29	Output Short-circuit	Once per second	Fault LED blinking
30	Rectifier over current	Once per second	Fault LED blinking
31	Bypass over current	Once per second	BPS LED blinking
32	Overload	Once per second	INV or BPS blinking
33	No battery	Once per second	BATTERY blinking
34	Battery under voltage	Once per second	BATTERY blinking
35	Battery low pre-warning	Once per second	BATTERY blinking
36	Overload Delay	Once per second	Bypass LED blinking

Item	UPS Alarm Warning	Buzz	LED
37	DC component over limit.	Once per 2 seconds	INV blinking
38	Parallel Overload	Once per 2 seconds	INV blinking
39	Mains volt. Abnormal	Once per 2 seconds	BATTERY LED lit
40	Mains freq. abnormal	Once per 2 seconds	BATTERY LED lit
41	Bypass Not Available		BPS blinking
42	Bypass unable to trace		BPS blinking
43	Inverter on invalid		
44	Reserve		
45	EPO	Beep continuously	Fault LED lit
46	PDU		Bypass LED lit