Maintenance Manual for HT1106-10 XL/XS

INVT Power System

Power Solution Specialist

INVT POWER SYSTEM (SHENZHEN) CO.,LTD

Safety Instruction

This manual contains important information on safe operation of the UPS. Please carefully read this manual prior to operation. Service personnel should understand all the information on warning and operate according to the instruction.

Warning

Battery is of high hazardous voltage and may cause large short circuit current. The following precautions should be observed before any operations on the battery.

- Wear rubber gloves and boots.
- Remove rings, watches and other metal objects.
- Use tools with insulated handles.
- Do not lay tools or other metal objects on the batteries.
- If the battery is damaged in any way or shows signs of leakage, contact your local representative immediately.
- Do not dispose of batteries in a fire. The batteries may explode.
- Handle, transport and recycle batteries in accordance with local representative.

Warning

Although the UPS has been designed and manufactured to ensure personal safety, improper use can result in electrical shock or fire. To ensure safety, observe the following precautions:

- Turn off and unplug the UPS before cleaning it.
- Clean the UPS with a dry cloth. Do not use liquid or aerosol cleaners.
- Never block or insert any objects into the ventilation holes or other openings of the UPS.
- Do not place the UPS power cord where it might be dangerous.
- Ensure the cable are correctly connected before powering on
- Ensure to place the UPS with enough space for ventilation and access to maintenance
- If there is fire accident，use dry powder extinguisher.

Attention：

In any case when the UPS needs to be operated with cover being removed, please ensure to turn off the input switch, bypass switch and battery switch to completely shut down the UPS .Wait 10 minutes before operation to avoid high voltage of the bus.

contents

1. Product structure

1.1 Outlook

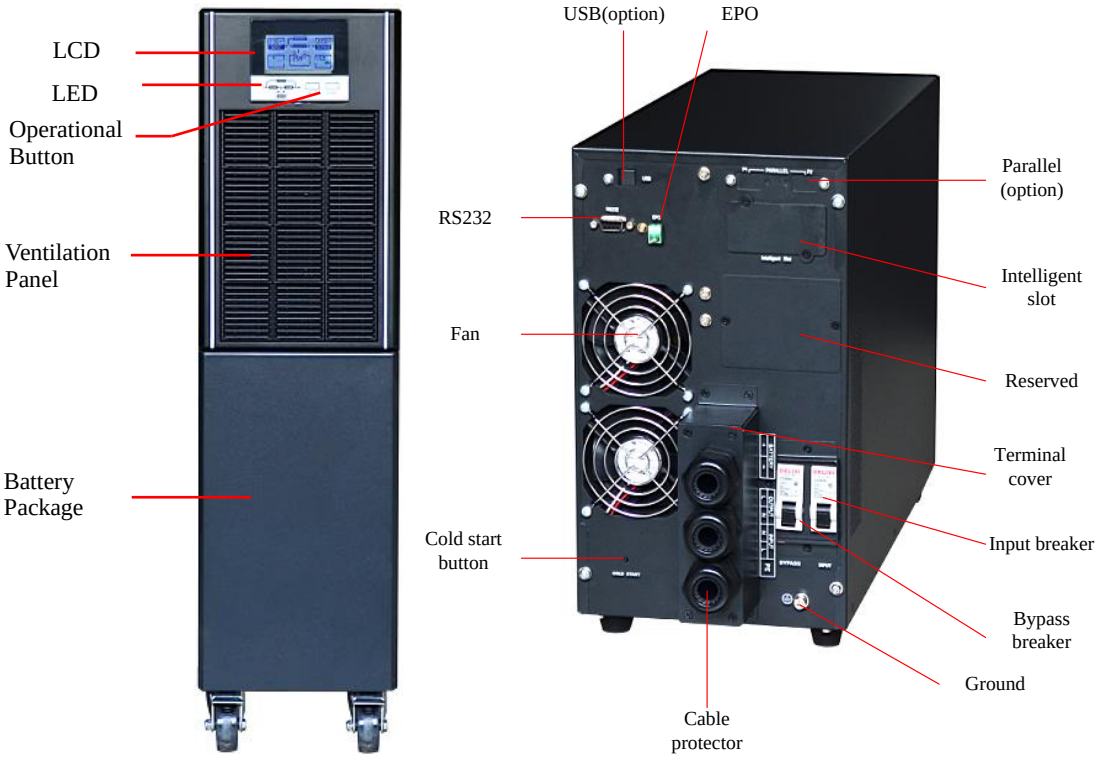


Fig.1-1 6/10kVA System outlook

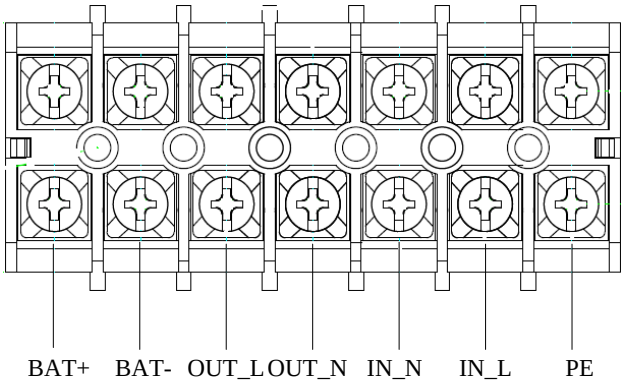


Fig.1-2 connections terminals for 6/10kVA

1.2 LCD Panel

The structure of operator control and display panel for ups is shown in Fig.1-3.

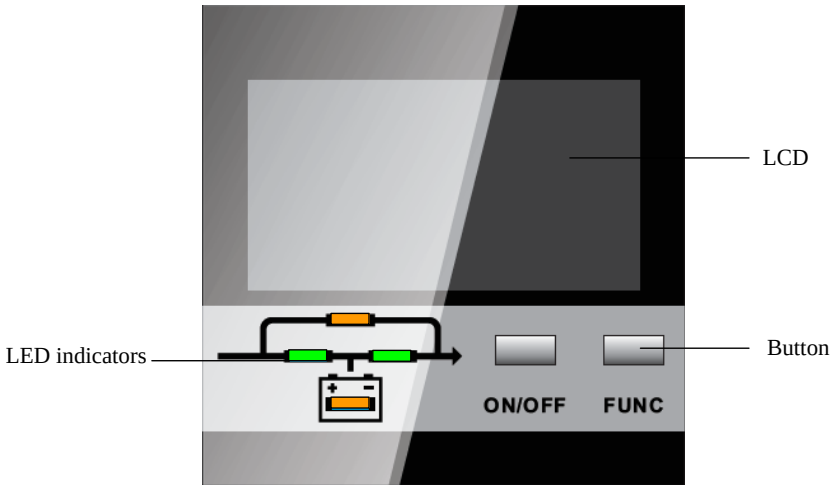


Fig.1-3 Control and display panel for ups

Description of Panel

Controls	Description
ON/OFF	1.Press ON/OFF to start inverter when rectifier is OK **NOTE** *Not available when UPS is set in automatically start mode* 2.Press ON/OFF to shutdown inverter and transfer to bypass 3.Press ON/OFF to shutdown UPS completely when UPS is in battery mode 4.Press ON/OFF to confirm setting when in setting mode
FUNC	Functional button: 1.Press FUNC to page down to see LCD menu 2.Press FUNC for 2.5s at the page 1 to mute off, press again to mute on 3.Press FUNC and ON/OFF together for 2.5s to enter in setting mode 4.Press FUNC for 2.5s at the page 4 to fault clear
Indicators	**Description**
REC	Rectifier indicator: green--rectifier is normal, green flicker--rectifier is starting, dark—rectifier is not working
INV	Inverter indicator: green--inverter is normal, green flicker--inverter is starting or tracking with bypass(ECO), dark—inverter is not working
BYP	Bypass indicator: yellow—bypass is normal, yellow flicker—bypass alarm ,dark—UPS is in normal mode and bypass is normal
BAT	Battery indicator: yellow—battery discharged, yellow flicker—No battery or battery alarm, dark—battery is connected

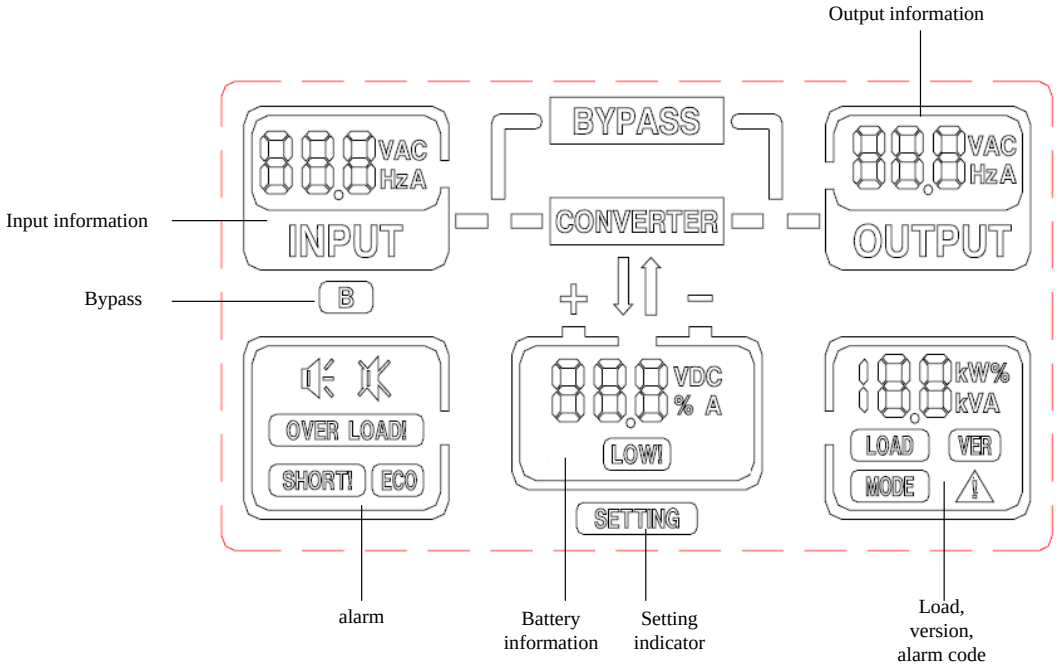


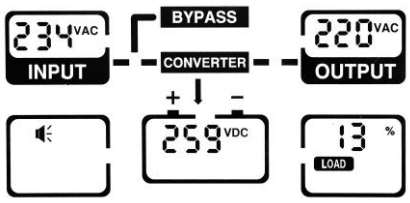
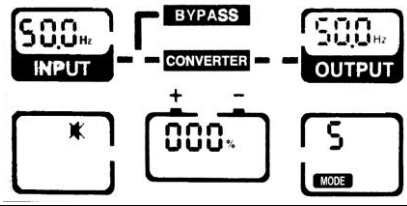
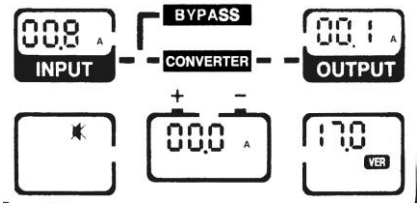
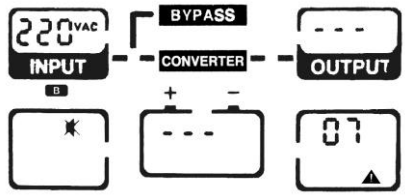
Fig.1-4 Home page

The description of LCD Menu is shown in Table 1-1

Table 1-1 Description of LCD Menu

Menu	Information
Input information	Main input: voltage VAC, current A, frequency Hz Bypass input(bypass "B" flicks): Voltage VAC, current A, frequency Hz
Battery information	Battery: voltage VDC, discharge/charger current A, remained capacity %, battery low alarm LOW!
Output information	Output information: Voltage, current, frequency
Alarm	:mute on/off OVER LOAD!: over load SHORT: output short ECO: working in ECO mode
Load/Version/Code	Load: active load KW, apparent load KVA, load percent % VER: firmware version MODE: system mode, S-single mode, P-parallel mode, E-ECO mode, A-self aging mode ⚠: warning code, refer to "***7. Trouble Shooting***" to get detailed code list
Others	B: bypass input menu SETTING: LCD is in setting mode BYPASS: bypass conversion

Press **FUNC** to check menu:

Page	description
	Page 1: INPUT voltage: 234VAC OUTPUT voltage: 220VAC Battery voltage: 259VDC LOAD : 13%. Load percent(%), active power(KW), apparent power(KVA) are displayed in turn *Press "FUNC" for 2.5s in this page to mute off*
	Page 2: INPUT frequency: 50Hz OUTPUT frequency: 50Hz Remained battery capacity: 0% (no battery) System MODE: S-single unit
	Page 3: INPUT current: 0.8A OUTPUT current: 0.1A Battery current: 0.0A (downwards arrow: charge, upwards arrow: discharge, no arrow: no battery) Firmware VERsion: V0.17 (17.0)
	Page4: "B": flicks, bypass input menu now Bypass INPUT voltage: 220VAC ⚠alarm code: 07 *Press "FUNC" for 2.5s to manually fault clear*

Parameters setting

If want to set rated parameters, press ON/OFF and FUNC buttons together for 2.5s to enter in setting mode, "SETTING" on the bottom of LCD present and all LEDs flicks. Press the FUNC to change the parameters, and press the ON/OFF to

1.3 Inner structure

The HT1106XL/XS and the HT1110XL/XS are similar in structure. Consisting of follow parts: control PCB, power PCB, port PCB, charging PCB, bus capacitor PCB, battery fuse PCB and EMI PCB. The aux power is at the input PCB,. The inner structure is shown in Fig.1-5 and Fig.1-6.

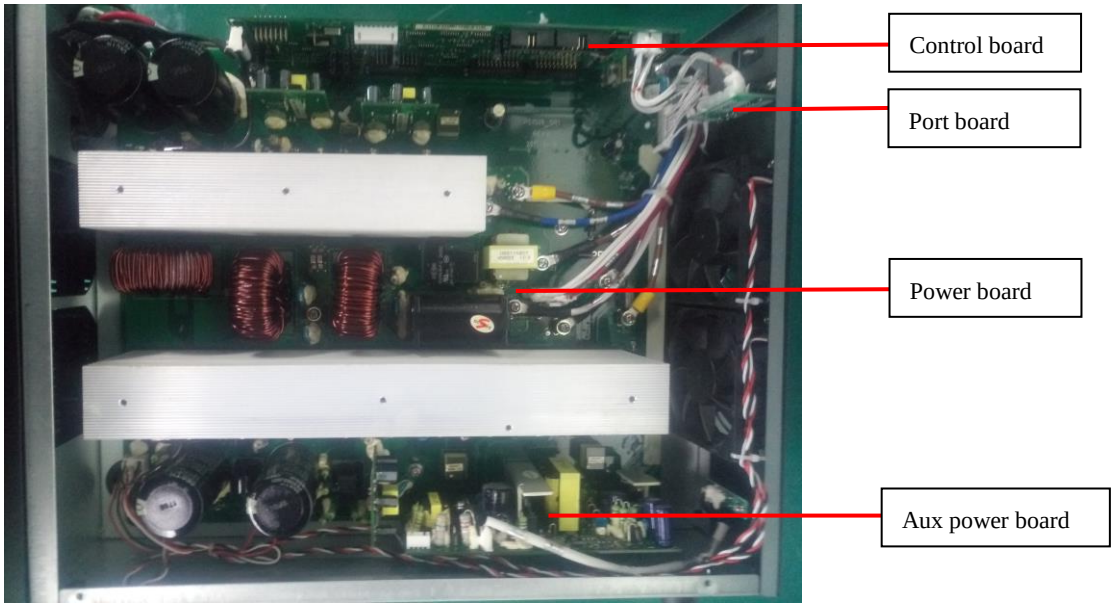


Fig.1-5 Inner structure (a)

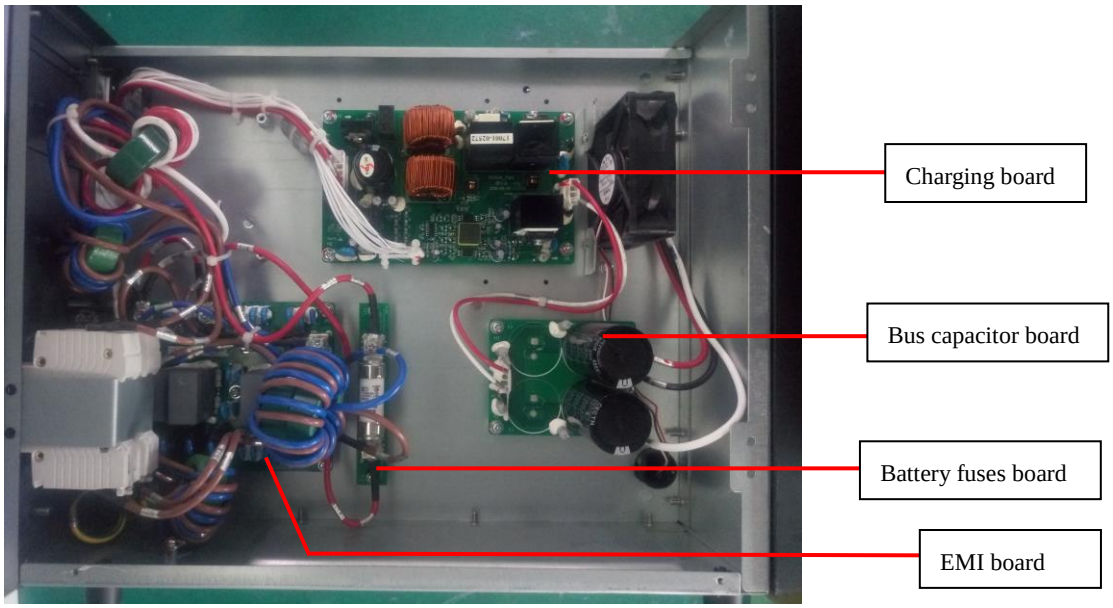


Fig.1-6 Inner structure (b)

2. Topology and System description

2.1 Topology

The topology is shown in Fig.2-1.

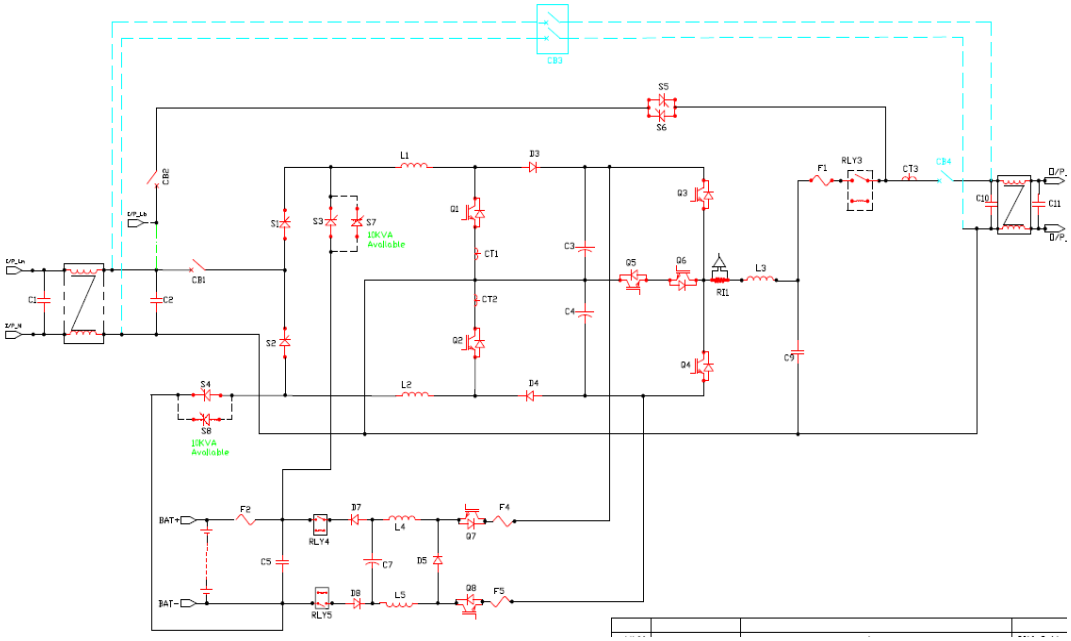


Fig.2-1 HTX 6KVA~10KVA Topology

2.2 System description

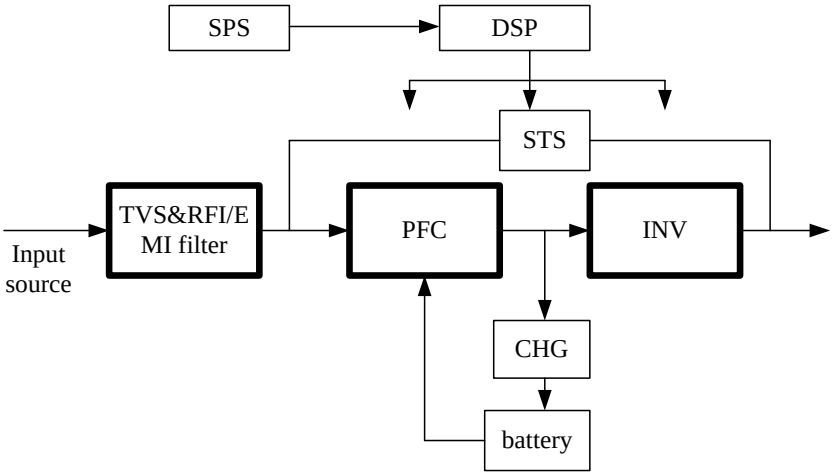


Fig 2-2 UPS system

(1)Transient Voltage Surge Suppression (TVSS) and EMI/FRI Filters

These UPS components provide surge protection and filter both electromagnetic interference (EMI) and radio frequency interference (RFI). They minimize any surge or interference present in the utility line and keep the sensitive equipment protected.

(2) Rectifier/Power Factor Correction (PFC) Circuit

In normal operation, the rectifier/power factor correction (PFC) circuit converts utility AC power to regulated DC power for use by the inverter while ensuring that the waveform of the input current used by the UPS is near ideal. Extracting this sinewave input current achieves two objects:

The utility power is used as efficiency as possible by the UPS.

The amount of distortion reflected on the utility is reduced.

This results in cleaner power being available to other devices in the building not being protected by the UPS.

(3) Inverter

In normal operation, the inverter utilize the DC output of the power factor correction circuit and inverters it into precise, regulated sine wave AC power. Upon a utility power failure, the inverter receives its required energy from the battery through the DC-to-DC converter. In both modes of operation, the UPS inverter is on-line and continuously generating clean, precise, regulated AC output power.

(4)Battery Charger

The battery charger utilizes energy from the DC bus and precisely regulates it to continuously charge the batteries. The batteries are being charged whenever the UPS is connected to utility power.

(5) DC-to-DC Converter

The DC-to-DC converter utilizes energy from the battery system and raises the DC voltage to the optimum operating voltage for the inverter. The converter includes boost circuit which is also used as PFC.

(6) Battery

The 6K/10K Standard include value-regulated, non-spillable, lead acid batteries inside. To maintain battery design life, operate the UPS in an ambient temperature of 15-25°C.

(7) Static Bypass

The UPS provides an alternate path for utility power to the connected load in the unlikely event of a UPS malfunction. Should the UPS have an overload, over temperature or any other failure condition, the UPS automatically transfers the connected load to bypass. Bypass operation is indicated by an audible alarm and illuminated amber Bypass LED. To manually transfer the connected load from the inverter to bypass, press the ON/OFF button once.

3. Trouble Shooting

This chapter describes checking the UPS's status. This section also indicates various UPS symptoms a user may encounter and provides a troubleshooting guide in the event the UPS develops a problem. Use the following information to determine whether external factors caused the problem and how to remedy the situation.

If UPS alarms and buzzer sound, please press "FUNC" to get alarm code on the menu of alarm code (page⚠) on LCD. And press "FUNC" for 2.5s when at page 4 to manually fault clear. If alarm is still existent, please check the problem follow the Table 3-1:

Table 3-1 the alarm code

Code	Cause	Solution
7	no battery	Check if the battery cables are connected correctly Check battery breaker or fuses are opened Check if batteries are damaged
8	Manual bypass on	Manual bypass is closed, the UPS will transfer to bypass and forbidden to transfer back to inverter
10	EPO	Check if EPO is closed correctly Check if EPO is activated manually
16	Utility abnormal	UPS mains input is abnormal. Check if mains input is normal Check if mains input voltage and frequency is over the working range Check if mains input breaker or external input breaker is opened Check if the input phase sequence against Please recover mains input power, otherwise output will be shut-down if battery is discharged to EOD
20	Bypass abnormal	Check if bypass input power is abnormal Check if bypass input breaker is opened Please recover bypass input power, otherwise there will be no backup circuit when UPS is faulty
22	Bypass faulty	Bypass SCR is opened or shorted, please contact with local dealer
24	Bypass overload	Check the load and remove some non-critical load until the load is below 95%
26	Bypass	Bypass overload and timeout, UPS will

	overload timeout	shut-down output
28	Over synchronization	Bypass voltage or frequency is over tracking range. There could be interruption if manually transfer to bypass or inverter is faulty
30	Over transfer times	Mains and battery or inverter and bypass transfer for 5 times in 1hour
32	Output shorted	Load is abnormal or output breaker is shorted. Check if load is abnormal and the faulty load is shutdown Check if output breaker is faulty If the faulty load is removed, please manually fault clear to restart UPS.
47	Rectifier fault	DC bus over voltage, low voltage, shorted or IGBT opened. Please manually clear the fault and if the fault is still on, please contact with local dealer
49	Inverter fault	Inverter voltage is abnormal, or inverter IGBT opened. Please manually clear the fault and fi the fault is still on, please contact with local dealer
51	Rectifier over temperature	Rectifier heat sink is over temperature or the temp sensor is not connected correctly. Check if fans are working normally Check if anything block ventilation Check if the sensor is connected correctly Check if the environmental temp is over the range of UPS
53	Fan fault	One or more fans are faulty or blocked Check if all fans working normally Check if something blocks fan
55	Overload	Inverter is overload. Please remove numbers of non-critical loads, or else UPS could transfer to bypass
57	Over load timeout	UPS will transfer to bypass and if bypass overload, output could be shutdown caused by bypass overload timeout. Please remove numbers of loads and the UPS will transfer back to inverter
59	Inverter over temperature	Inverter heat sink is over temperature or the temp sensor is not connected correctly. Check if fans are working normally Check if any thin block ventilation

		Check if the sensor is connected correctly Check if the environmental temp is over the range of UPS
63	Manual transfer to bypass	If bypass is over synchronization range, output could be interrupted if manually transfer to bypass
65	Battery low	Remained battery capacity is low when in battery mode
67	Battery reversed	Check if battery cables are connected correctly Check if inverter cables of battery packs are connected correctly
69	Inverter protect	Inverter voltage abnormal or DC bus is over voltage. UPS will fault clear automatically. If not, please contact with local dealer
78	Parallel cables error	Check if all parallel communication cables are connected correctly
81	Charger fail	Charger is faulty or is not disconnected. Please contact with local dealer
119	Relay opened	Inverter relay is opened. Please contact with local dealer
121	Relay closed	Inverter relay is closed. Please contact with local dealer

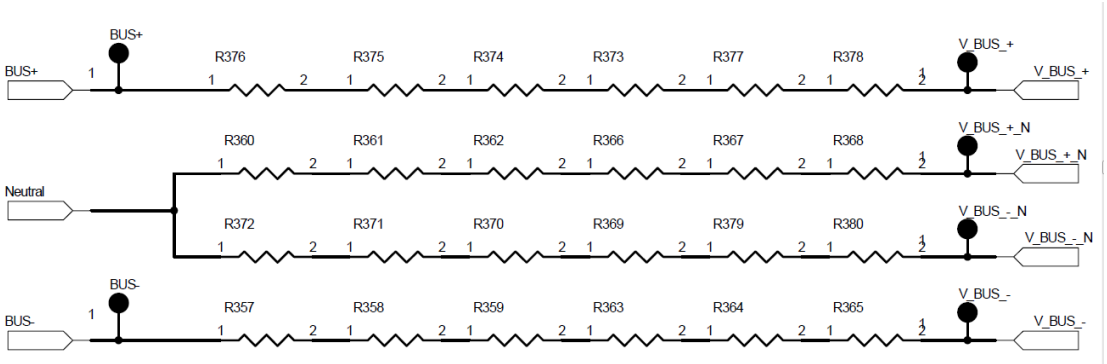
4. Check the broken components

4.1 Rectifier failure

Model	Components	Serial number	Methods of detection
6K	Rectifier SCR	Q1,Q2	Measure the resistor between pin3 and pin1, if the value is between 20~70Ω it's ok. And measure the resistor between pin2 and pin, not short circuit is normal, the value is usually several KΩ or MΩ.
10K		Q1,Q2	
6K	Rectifier IGBT	Q5,Q6,Q7,Q8	Using the diode measure function of multi-meter to measure the voltage between pin3 and pin2, if the voltage is near 0.5V, it's ok. If shorted or opened, it's broken. Check every two pins, if shorted, it's broken.
10K		Q5,Q6,Q7,Q8	
6K	IGBT driver resistor	R335,R336,R327,R328	Check the resistor value, if in the range of +-5% of rated value, it's ok.
10K		R335,R336,R327,R328	
6K	IGBT driver zener	D3,D4,D5,D21,D22 ,D23,D24,D30	Using the diode measure function of multi-meter to measure the zener, if voltage is near 0.7V, it's ok. Or else, it's broken.
10K		D3,D4,D5,D21,D22 ,D23,D24,D30	
6K	PFC Diode	D1,D2	Using the diode measure function of multi-meter to measure the voltage between pin2 and pin1, if the voltage is near 0.7V, it's ok. If it's shorted or opened, it's broken
10K		D1,D2	

Check if the sampling resistors for bus voltages are OK

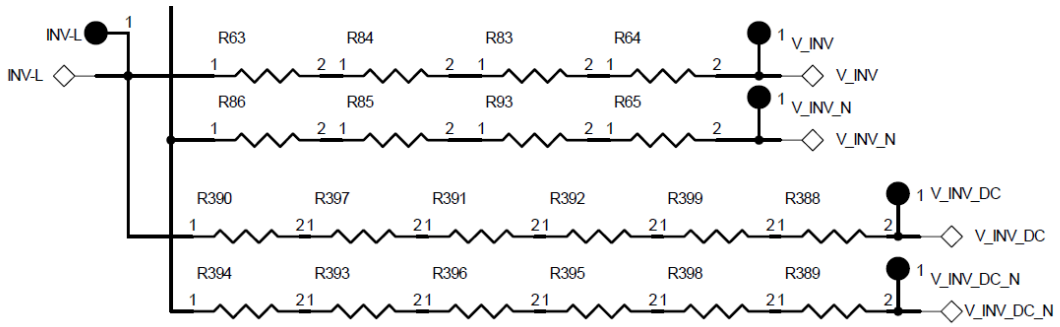
The following figure shows the sampling resistors for bus voltages.



4.2 Inverter failure and inverter protection

Model	Components	Serial number	Methods of detection
6K	Inverter IGBT	Q58,Q67,Q66,Q71	Using the diode measure function of multi-meter to measure the voltage between pin3 and pin2, if the voltage is near 0.5V, it's ok. If shorted or opened, it's broken. Check every two pins, if shorted, it's broken.
10K		Q67,Q66,Q58,Q60,Q61,Q59	
6K	IGBT driver resistor	R329,R330,R331,R332	Check the resistor value, if in the range of +-5% of rated value, it's ok.
10K		R329,R330,R331,R332	
6K	IGBT driver zener	D8,D14,D15,D16, D17,D18,D19,D26	Using the diode measure function of multi-meter to measure the zener, if voltage is near 0.7V, it's ok. Or else, it's broken.
10K		D8,D14,D15,D16, D17,D18,D19,D26	

Check if the sampling resistors for bus voltages and inverter output are OK
The following figure shows the sampling resistors for inverter output.



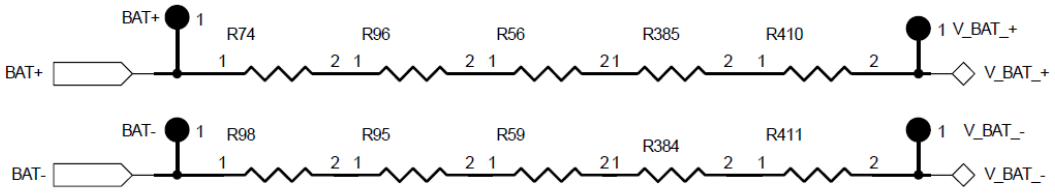
4.3 Bypass failure

Model	Components	Serial number	Methods of detection
6K	Bypass SCR	Q9,Q10	Measure the resistor between pin3 and pin1, if the value is between 20~70Ω it's ok. And measure the resistor between pin2 and pin, not short circuit is normal, the value is usually several KΩ or MΩ.
10K		Q9,Q10	

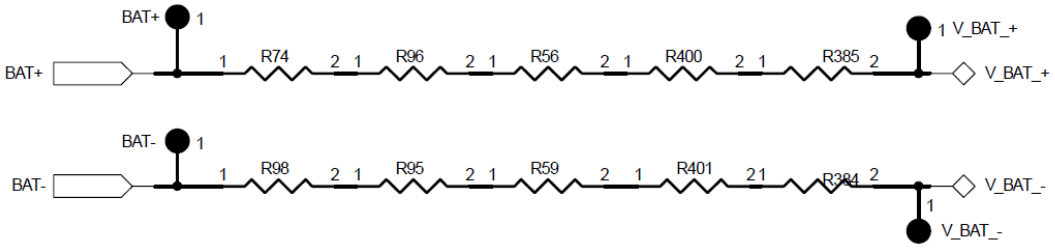
4.4 Charger failure and battery issues

Model	Components	Serial number	Methods of detection
6K	Battery fuse	F1	Measure the resistor of fuse, if near 0Ω it's ok. If opened, it's broken.
10K		F1	
6K	Battery SCR	Q3,Q4	Measure the resistor between pin3 and pin1, if the value is between 20~70Ω it's ok. And measure the resistor between pin2 and pin, not short circuit is normal, the value is usually several KΩ or MΩ.
10K		Q3,Q4,Q71,Q72	
6K	Charger IGBT	Q10,Q11	Using the diode measure function of multi-meter to measure the voltage between pin3 and pin2, if the voltage is near 0.5V, it's ok. If shorted or opened, it's broken. Check every two pins, if shorted, it's broken.
10K		Q10,Q11	
6K	Diode	D9,D10,D67	Using the diode measure function of multi-meter to measure the voltage between pin2 and pin1, if the voltage is near 0.7V, it's ok. If it's shorted or opened, it's broken
10K		D9,D10,D67	

Check if the sampling resistors for battery voltages are OK.
The following figure shows the sampling resistors for battery voltages.



HTX 6K sampling resistors for battery voltages

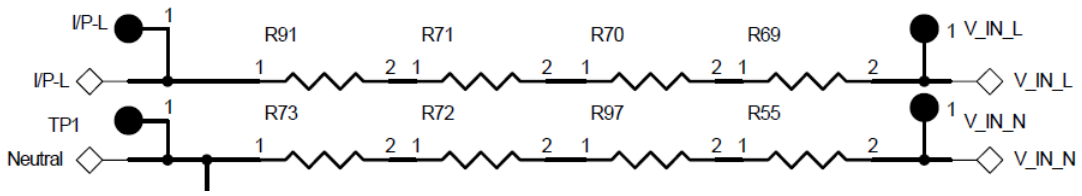


HTX 10K sampling resistors for battery voltages

4.5 Utility abnormal

Check if the sampling resistors for main input are OK.

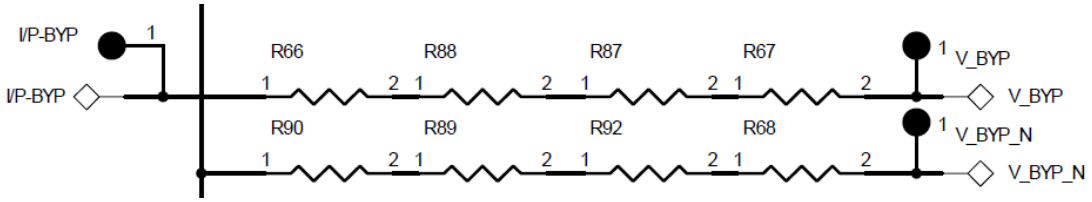
The following figure shows the sampling resistors for input sides.



4.6 Bypass voltage abnormal

Check if the sampling resistors for bypass are OK.

The following figure shows the sampling resistors for bypass.



4.7 Output overload or overload time out

Check if the sampling resistors for output are OK.

The following figure shows the sampling resistors for output.