

Service hotline:400-6655-778



UNINTERRUPTIBLE POWER SYSTEM

SERVICE MANUAL

1KVA model

General Information

Getting start

If you want to know:

- ? Overview and what special for this UPS, refer to section Introduction.
- ? Replacing Battery Pack, refer to Replacing The Battery Pack.
- ? Open external case, refer to Steps to Open the Case.
- ? Electrical function and principle, refer to Principle of Operation.
- ? Whether UPS works properly, refer to Alignments.
- ? What happened to the UPS, refer to Trouble Shooting.
- ? Electrical performance, refer to Electrical Spec.

Conventions

This service manual uses the following conventions to alert you some important information for safe operation and quick working.



Warning: Denotes a procedure or operation, which, if not perform correctly, may result in personal injury. **Be sure not to continue operation until indicated conditions are fully understood and met.**



Caution: Denotes a procedure or operation, which, if not perform correctly, may cause damage to the UPS. **Be sure not to continue operation until indicated conditions are fully understood and met.**



Information and Tips: There are some tips and skills after this symbol. During service operations, these skills are provided by our design engineers which may help you quickly finish your work.

Important Safety Instructions



1. **For qualified service personnel only.**
2. **DO NOT** perform any internal service or adjustment of this product unless another person is capable of rendering first aid and resuscitation is present.
3. Dangerous voltage exists at several points in this product. To avoid personal injury, don't touch any exposed connections or components while UPS is active.
4. Turn off the UPS and disconnect input power cord before removing outside protective cover.
5. AC voltage is always present if the input AC power is still available.
6. High voltage may present at DC capacitors. Before opening the outside cover, wait for at least five minutes after turning off the UPS.
7. Verify input source (voltage and frequency) before service.



1. **DO NOT** make internal batteries short-circuited.
2. If the battery connectors (P5, P8) are disconnected, be sure to plug in the input power cord and the input power is available before re-connect the battery connectors.
3. After service, verify the polarity of batteries, the tightness of all screws and connectors before restarting the UPS.



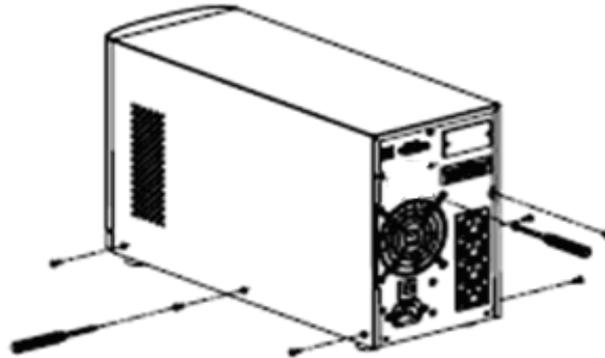
After opening the cover, please always check the tightness of all wires, connectors, and screws first. Then check if there is any de-colored components inside

STEPS TO OPEN THE CASE

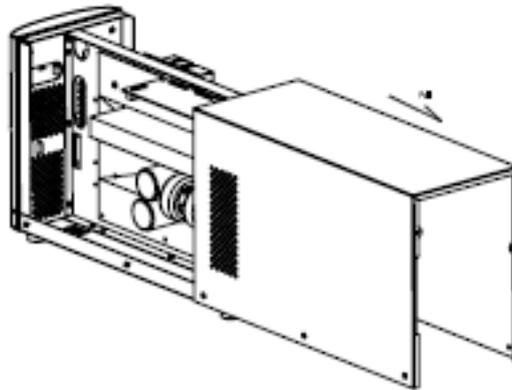
To open the outside case, please follow steps and figures below:

1. Remove related screws on STEP 1 figure.
2. Slide outside cover in the direction shown in STEP 2.
3. Done.

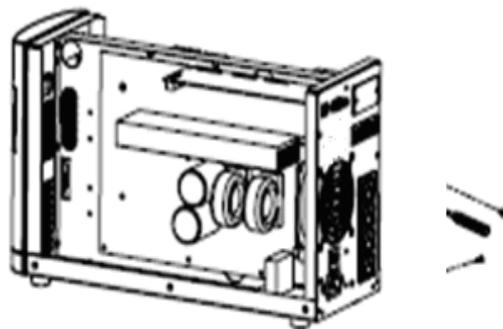
STEP 1



STEP 2



STEP 3



I. INTRODUCTION

For all series of UPS, they are strictly tested and carefully designed. We always do our best to make our products more reliable and safer; this is also the goal of our company. However, due to the lifetime of electrical components and some unpredictable reasons, there will be unavoidable failures of this UPS. If this situation occurs, service of qualified person is needed. This service manual will guide the technicians to repair and adjust a problematic UPS. If the UPS still does not work properly, please contact with us and we will be glad to solve any problems you met.

Because of the following unique features of this series UPS (Uninterruptible Power System), it is very easy to maintain and service.

- * All major power components are put on PCB.
- * All PCBs are interconnected with connectors.
- * Major parts are simply connected with flexible insulated wires and plugs.

This service manual consists of 4 major parts:

1. Introduction.
2. Principle of operation: It describes the functions and principles of each part.
3. Alignments: It describes the locations and methods needed to adjust this UPS.
4. Trouble shooting: This part describes the possible failure conditions and procedures to repair it.

Before starting to serve this UPS, be sure to read this manual carefully for a correct and safe operation.

II. PRINCIPLE OF OPERATION

This 1KVA high input power factor UPS system contains two major PCB assemblies. They are including:

1. PSDR:	contains major parts of (1) charger, (2) DC power supply, (3) unit power factor correction, (4) DC-DC converter, (5) inverter and (6) output circuits.
2. CNTL :	contains major parts of protection, signaling circuits, regulation and control circuits of inverter

The simplified schematic in figure 1 shows how the major circuits are connected and illustrates the overall system functions.

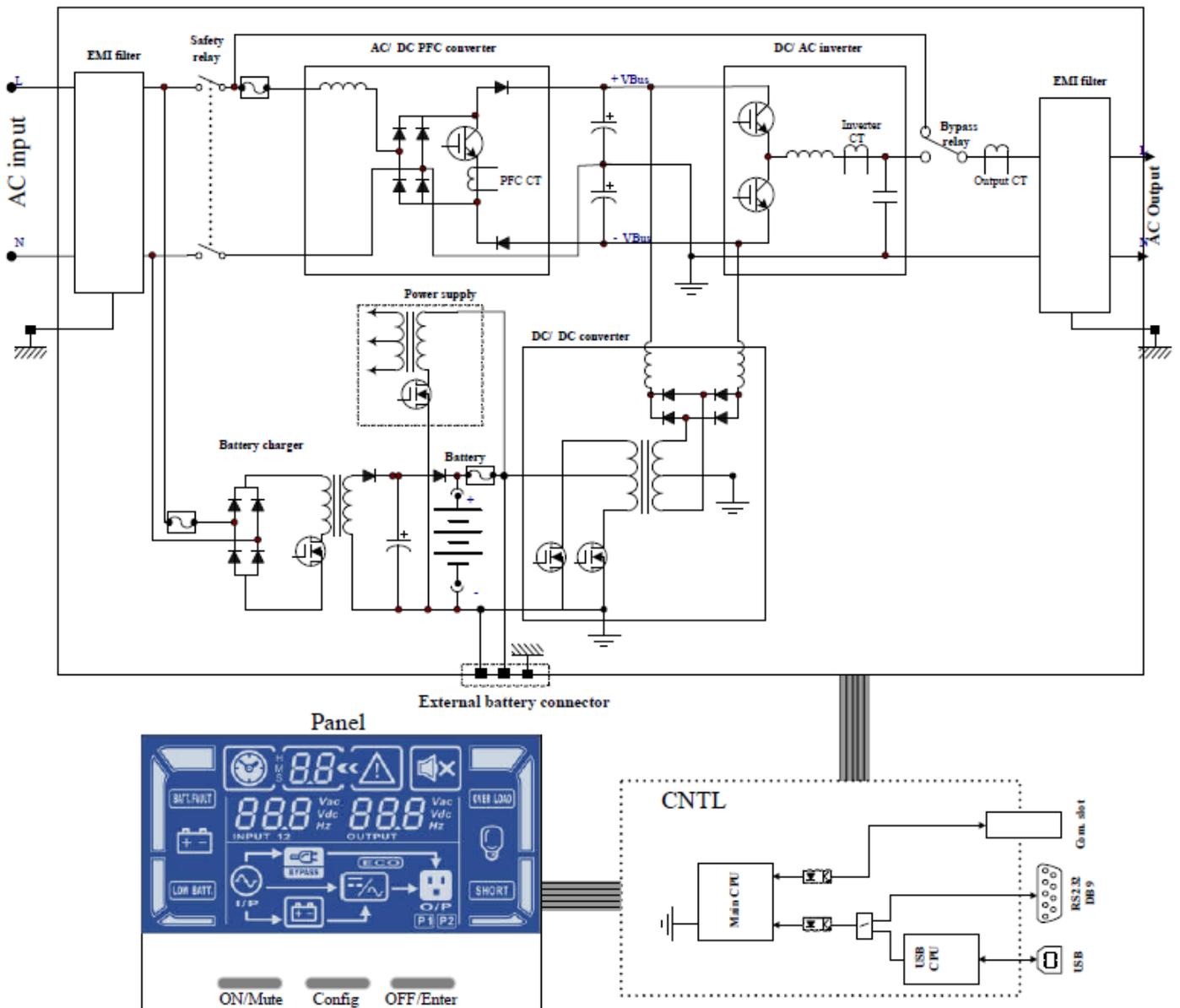


Figure 1: Circuit connection for 1KVA

The locations of these assemblies in this machine are shown in figure 2.

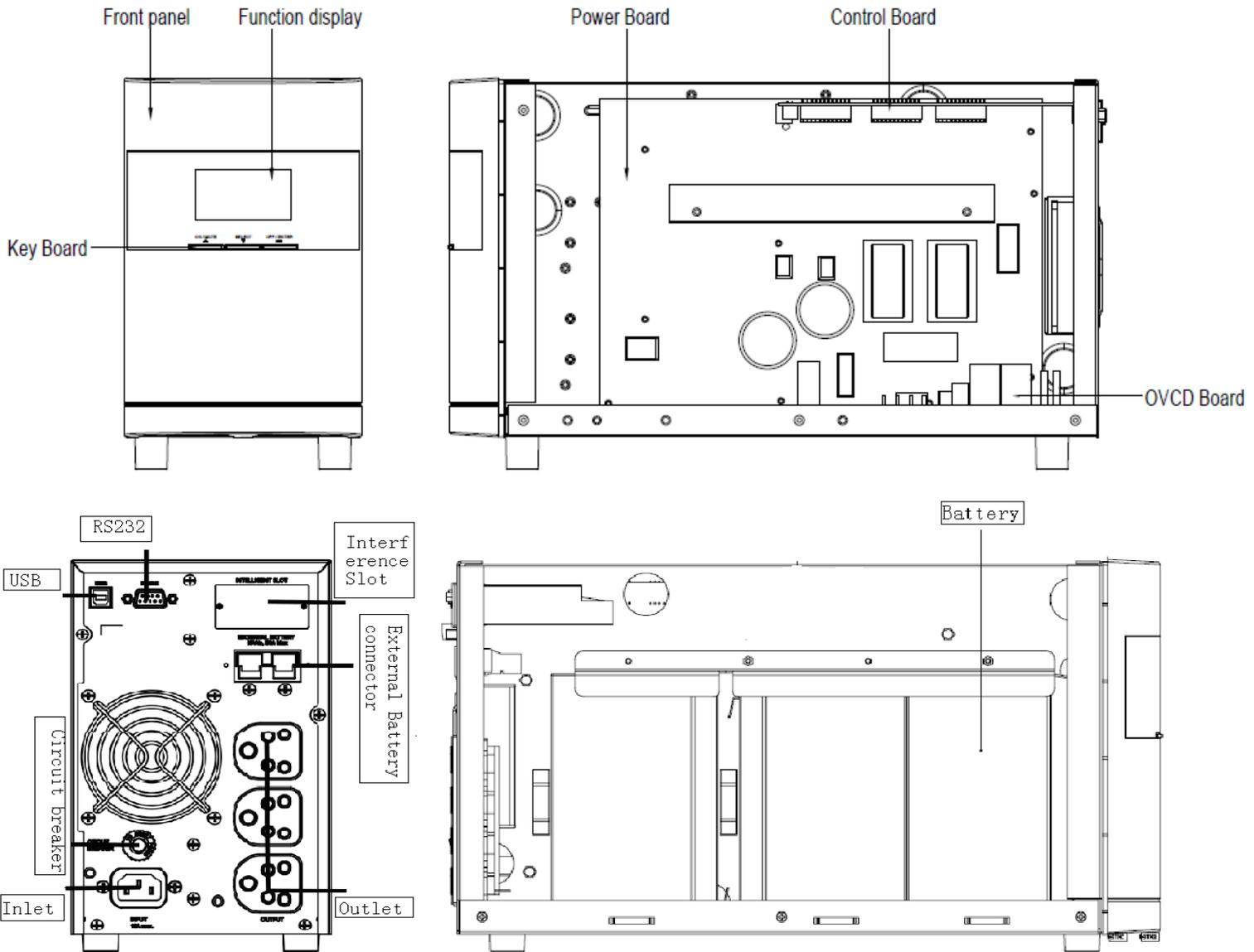


Figure 2: Sub-assembly location

The block diagram in figure 3, shows the UPS at normal operation from left to right. When a protection circuit is triggered or a fault condition occurs, the output supply is transferred immediately from inverter to AC mains by a bypass relay. The operation principle will be explained in later section.

Basically, this ON-LINE UPS system utilizes high frequency PWM techniques to achieve high efficient performance. This UPS can deliver a clean, regulated sine-wave output at any load under full load. The sub-systems are described as below:

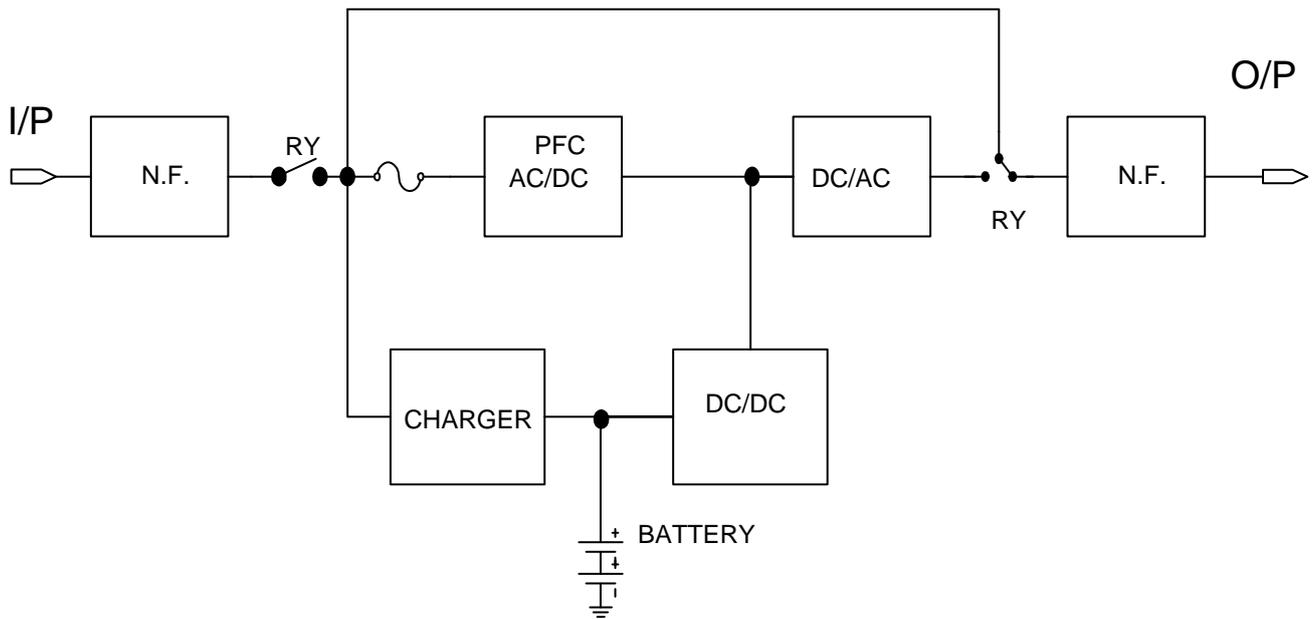


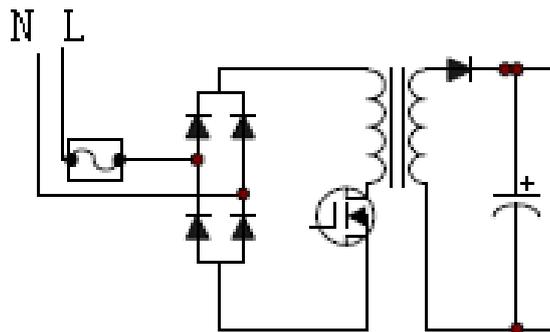
Figure 3: Block Diagram for UPS.

1. POWER STAGE (PSDR)

As shown in figure1, the power stage consists of charger, unit power factor correction, DC power supply, DC-DC converter, inverter and output circuits.

1-1 Charger Sub-System:

The purpose of charger is to charge and to maintain the batteries at full charged condition. Refer to figure 4, the voltage fly back switching power supply provides a constant DC voltage (42.4Vdc) for batteries. Besides providing constant voltage, the power supply also limits the current flowing into batteries and therefore protects and prolongs the life time of charged batteries.



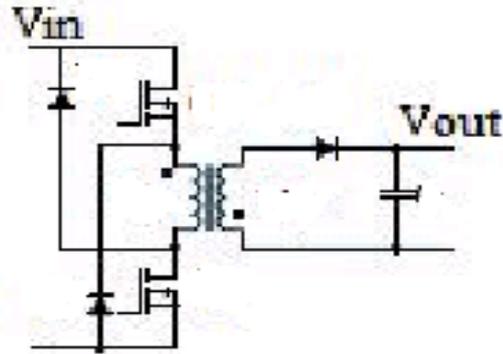


Figure 4: Charger Circuit Diagram

1-2 DC Power Supply Sub-System:

The input of the DC power supply is connected to the battery bus, i.e., the output of the charger. The output of DC power supplies provides +12 Vdc for the bias supply of IC's working voltage and the fan(s) voltage. The DC power supply works only when the 12 Vdc regulator supplies Vcc to its control IC. To have proper operation of 12 Vdc regulator, its input power is controlled by the switch as indicated in figure 5.

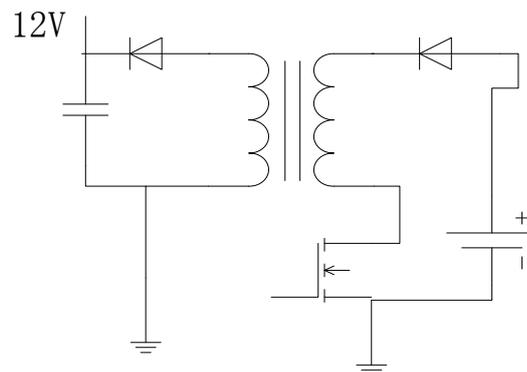


Figure 5: Schematic for DC power supply

1-3 Inverter Sub-System:

The UPS transfers +, - DC bus voltages to the AC output voltage through an inverter of half bridge configuration at normal operation. The schematic diagram of inverter is shown in figure 6.

To construct a high frequency (19.2kHz) PWM inverter, the drivers receive switching signals from PWM generation circuit through a pair of photo-couplers to trigger the upper IGBT and the lower IGBT alternately. The output of IGBT's is filtered by an LC circuit to reduce the o/p voltage harmonics distortion.

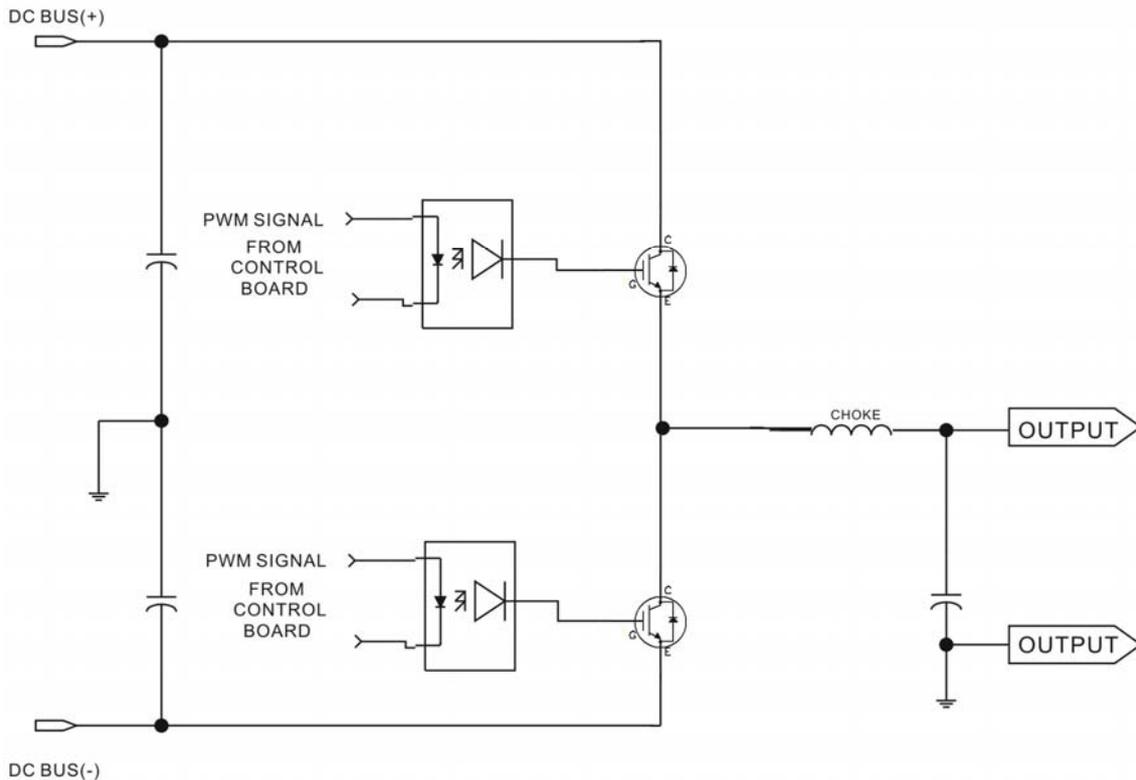


Figure 6: Schematics for inverter

1-4 Output Sub-System:

The bypass relay receives signal from control circuit to switch the output of the UPS from bypass to inverter, and vice versa. The output noise filter circuit blocks EMI noise to the loads.

1-5 Input Power Factor Correction Sub-System:

The purpose of power factor correction (P.F.C.) circuit is to make the input current and voltage in phase and therefore achieve a high input power factor. The schematic is indicated in figure 7.

When the input AC power cord is plugged in, the AC relay is activated and the AC power goes through noise filter to the charger and to the line detector. Both DC buses present voltages at about 1.4 times of input RMS voltage. When the "on" switch is pressed, the P.F.C. circuit is enabled and the DC buses are regulated at ± 370 Vdc.

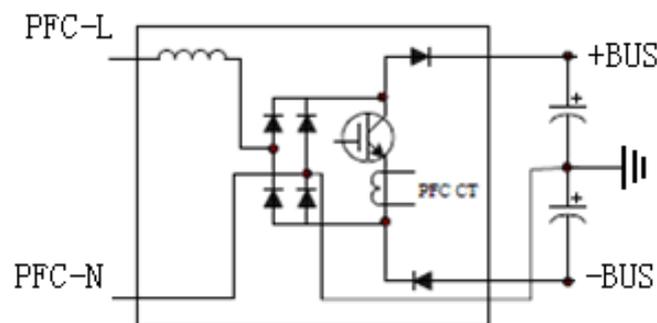


Figure 7: I/P PFC configuration

1-6 DC-DC Converter Sub-System:

The major function of the UPS is to deliver accurate AC power to the loads connected to it whenever the AC line is correct or fails. In this system, the batteries release the stored energy to supply inverter immediately upon AC line fails.

Refer to figure 8, the battery voltage is transformed through a push-pull DC-DC converter to $\pm 360\text{Vdc}$ as DC buses for inverter. When the line fails, the $\pm 360\text{Vdc}$ DC sources are caught up to supply the power needed by the inverter immediately.

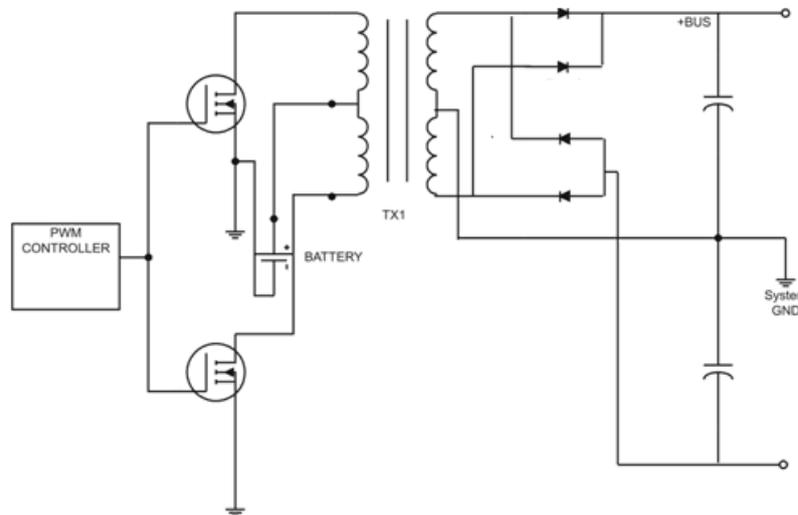


Figure 8 : DC -DC circuit for 1K series

2.MAIN CONTROL PCB ASSEMBLIES (CNTL)

These assemblies are the control center of UPS. It is composed of three major circuits as following.

- (1) Regulation & control
- (2) Protection
- (3) Signaling

2-1 REGULATION & CONTROL SUB-SYSTEM:

This portion can be seen as brain of the UPS. It provides the control pulses to the switching elements which deliver power to the output. The sub-system also regulates the output to ensure that the UPS is delivering constant AC voltage to the loads.

The inverter signal is sensed directly by resistor division. It is compared with a reference signal from sine wave generator. The difference of these two signals (error signal) alter the pulse widths of PWM signals which control the duty cycles of switching elements to regulate the output voltage within specification.

In order to avoid un-wanted surge current at the transfer of bypass relay, the bypass signal activates the tracking circuit. It matches the inverter voltage with the line voltage by having the amplitude of the reference signal following the variation of line voltage.

When the main is applied and the switch is turned on, a 10-second timer is triggered. The bypass relay stays at bypass position in this time period. At the end of this period, the bypass signal is removed and the relay transfers to inverter output.

2-2 PROTECTION SUB-SYSTEM:

The UPS provides the following protection circuits:

1. Overload protection

The load detector senses the load current. I.e. the inverter current, and sends the signal by two paths. In battery mode, the UPS will go to failure mode if overload condition happened. The panel will indicate the fault condition. There are two kinds of protection in our UPS:

- a. **Overload Protection:** The UPS collects the continuous overload signals through CPU switch the bypass relay. If the output load is lower than 110% of rated load (VA, or Wattage) the UPS keeps running on inverter running and warning. If the output load is between 110% and 130% of rated load (VA, or Wattage) the UPS transfers to bypass after 30s. If the output load is higher than 130% of rated load, the UPS transfers to bypass after 1.5s immediately.
- b. **Cycle by Cycle Current Limit:** When output loads sink a high surge current for a short time, a high inverter current is detected and the inverter switches, i.e. the IGBT's, are turned off pulse by pulse to protect themselves from thermal runaway. The output relay stays at inverter output position unless a continuous overload is detected or an abnormal inverter operation occurs.

2. Battery over or under shut down

Upon the battery voltage declines to battery-under/over level, the UPS will warning and the LCD will display the fault code, then shut down.

In case of the battery voltage is high voltage, the UPS will warning and the LCD will display the fault code.

3. Inverter output abnormal protection

The inverter failure signal shuts down the inverter immediately, makes the buzzer a continuous alarm, and the LCD displays the fault code.

"The failure signal latches itself unless SW off or battery is empty".

4. Over temperature protection

The thermal switch detects the temperature of PSDR heat sink. The thermal switch is electrically connected to the CPU. An opened thermal switch is thought as temperature failure by the UPS. The LCD will display the fault code.

5. Bus over/under/unbalance-voltage protection

To protect any BUS over/under/unbalance -voltage condition especially for the half-bridge load. The LCD will display the fault code.

2-3 Signaling Sub-System:

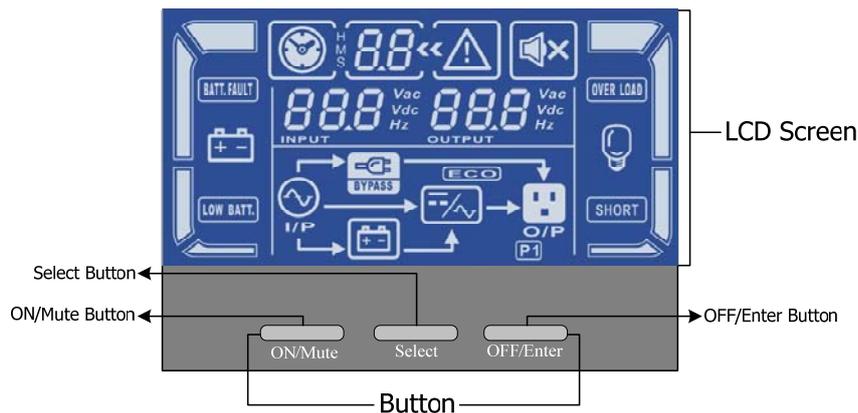
When the AC line is unable to supply, the batteries release energy inside to supply the inverter immediately. At the same time, the buzzer beeps every 4 seconds.

Upon the batteries are discharged to battery-low level, the battery-low signal is activated and the buzzer beeps every 1 second.

Remote shutdown signal is enabled only when the line fails.

3. Front Panel:

The front panel consists 2 parts: push button and display LCD set. The push button is used to turn on and off the UPS. LCD display indicates the load level; the battery voltage level and operation status of the UPS. Besides, when the system works abnormally, The LCD will display the fault code.



Button	Function
ON/Mute Button	<ul style="list-style-type: none"> ➤ Turn on the UPS: Press and hold ON/Mute button for at least 2 seconds to turn on the UPS. ➤ Mute the alarm: After the UPS is turned on, press and hold this button for at least 5 seconds to disable the alarm system. But it's not applied to the situations when warnings or errors occur. ➤ Down key: Press this button to display previous selection in UPS setting mode.
OFF/Enter Button	<ul style="list-style-type: none"> ➤ Turn off the UPS: Press and hold this button at least 2 seconds to turn off the UPS in battery mode. UPS will be in standby mode under power normal or transfer to Bypass mode if the Bypass enable setting by pressing this button. ➤ Confirm selection key: Press this button to confirm selection in UPS setting mode.
Select Button	<ul style="list-style-type: none"> ➤ Switch LCD message: Press this button to change the LCD message for input voltage, input frequency, battery voltage, output voltage and output frequency. It will return back to default display when pausing for 10 seconds. ➤ Setting mode: Press and hold this button for 5 seconds to enter UPS setting mode when UPS is off. ➤ Up key: Press this button to display next selection in UPS setting mode.
ON/Mute + Select Button	<ul style="list-style-type: none"> ➤ Switch to bypass mode: When the main power is normal, press ON/Mute and Select buttons simultaneously for 5 seconds. Then UPS

	will enter to bypass mode. This action will be ineffective when the input voltage is out of acceptable range.
ON/Mute + OFF/Enter Button	➤ Switch to UPS self-test mode: Press ON/Mute and OFF/Enter buttons simultaneously for 5 seconds to enter UPS self-testing while in AC mode, ECO mode, or converter mode.

IV. ALIGNMENTS

List below are some test points and procedures when a qualified service person wants to check whether EUT (Equipment Under Test) will work properly. Before beginning following procedures, please **make sure that EUT is OFF and disconnected from Utility.**

TEST ITEM	TEST POINT	TEST AND ADJUSTMENT SEQUENCE	EXPECTED RESULT
Charger Voltage	P5/P11(+), P7/P8(-)	1. Disconnect <u>P5(+)</u> and <u>P8(-)</u> wires from pins respectively. 2. Connect DVM (set to measure DC) to test pins and plug input power cord to utility.	1. Cooling fans on back panel begin to rotate. 2. 41.4Vdc±0.9V
+DC Bus Voltage @ Line Mode	JP93 (+), P7/P8(GND)	1. Connect DVM (Set to measure DC) to test point. 2. Plug input power cord to utility. 3. Press "ON" button for 2 seconds to turn EUT on.	+370VDC±10V
-DC Bus Voltage @ Line Mode	JP92 (+), P7/P8(GND)	4. Waiting for 10 seconds to make sure the EUT work in line mode according to the LCD display. 5. Check reading on DVM.	-370VDC±10V
+DC Bus Voltage @ Battery Mode	JP93 (+), P7/P8(GND)	1. Disconnect I/P power cord from utility and press "ON" button for 2 seconds to turn the EUT ON.	+360VDC±10V
-DC Bus Voltage @ Battery Mode	JP92 (+), P7/P8(GND)	2. Connect DVM (Set to measure DC) to test point. 3. Waiting for 4 seconds to make sure the ETU word in battery mode.	-360VDC±10V
O/P DC Balance @ Line Mode	O/P socket	1. Keeping UPS on @ Line mode. 2. Connect DC measurement tool ¹ to O/P socket. 3. Check reading on DVM.	50mV max.

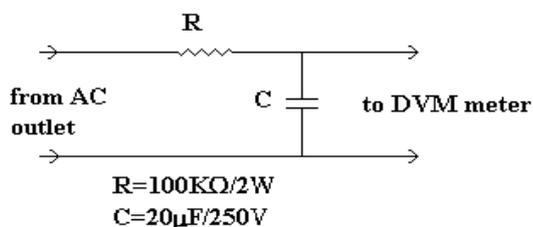
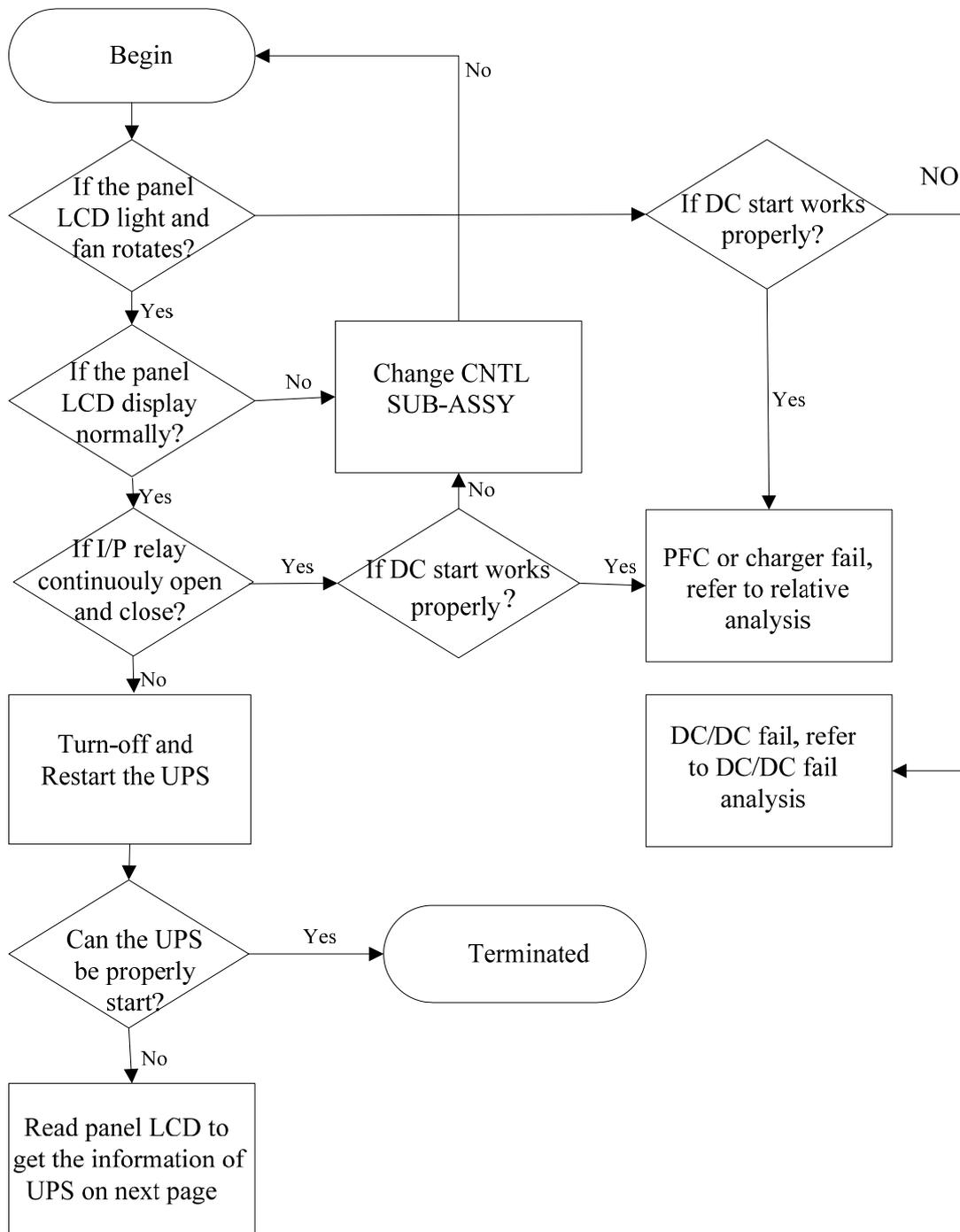


Figure 9 : Circuit for test output balance

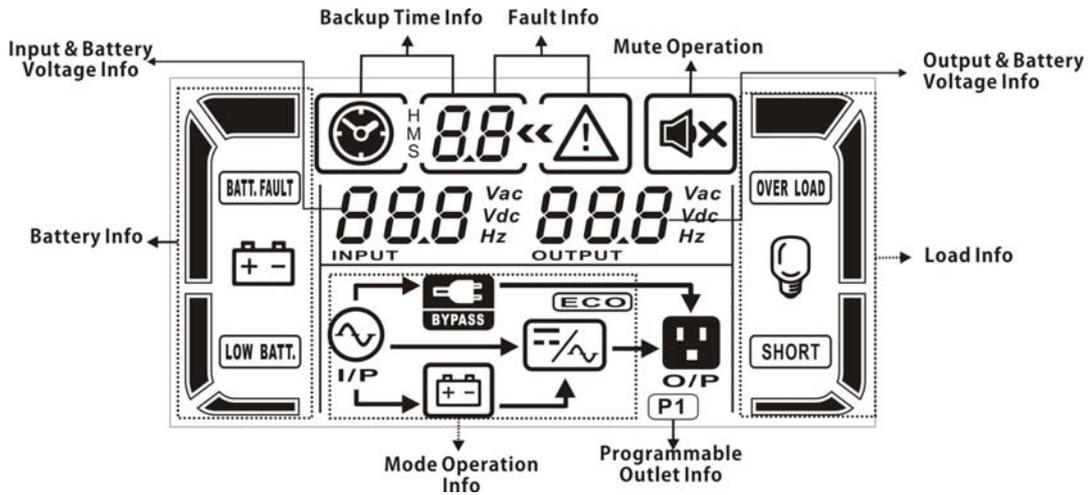
V. TROUBLE SHOOTING

Due to careful design and strict tests of our products, fail of UPS seldom occurs. However, once they do fail in some situations, please check them according to **Trouble Shooting Chart**, which will help you solve the most problems on UPS.

Trouble Shooting Chart



Panel LCD Display Explanation



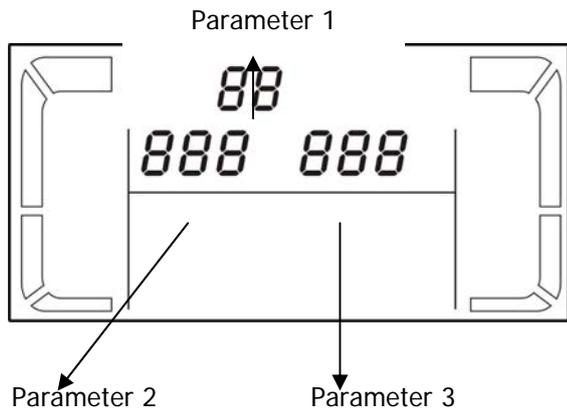
Display	Function
Backup time information	
	Indicates the backup time in pie chart.
H M S 8.8	Indicates the backup time in numbers. H: hours, M: minute, S: second
Fault information	
	Indicates that the warning and fault occurs.
8.8	Indicates the warning and fault codes, and the codes are listed in details in 3-5 section.
Mute operation	
	Indicates that the UPS alarm is disabled.
Output & Battery voltage information	
8.8.8 Vac Vdc Hz OUTPUT	Indicates the output voltage, frequency or battery voltage. Vac: output voltage, Vdc: battery voltage, Hz: frequency
Load information	
	Indicates the load level by 0-25%, 26-50%, 51-75%, and 76-100%.
	Indicates overload.
	Indicates the load or the UPS output is short circuit.
Mode operation information	
	Indicates the UPS connects to the mains.
	Indicates the battery is working.
	Indicates the bypass circuit is working.

	Indicates the ECO mode is enabled.
	Indicates the Inverter circuit is working.
 O/P	Indicates the output is working.
Battery information	
	Indicates the Battery level by 0-25%, 26-50%, 51-75%, and 76-100%.
	Indicates the battery is fault.
	Indicates low battery level and low battery voltage.
Input & Battery voltage information	
 INPUT 12	Indicates the input voltage or frequency or battery voltage. Vac: Input voltage, Vdc: battery voltage, Hz: input frequency

LCD display wordings index

Abbreviation	Display content	Meaning
ENA	<i>ENR</i>	Enable
DIS	<i>di S</i>	Disable
ESC	<i>ESC</i>	Escape
HLS	<i>HLS</i>	High loss
LLS	<i>LLS</i>	Low loss
BAT	<i>bAt</i>	Battery
CF	<i>CF</i>	Converter
TP	<i>tP</i>	Temperature
CH	<i>CH</i>	Charger

UPS Setting



There are three parameters to set up the UPS.

Parameter 1: It's for program alternatives. There are 8 programs to set up: output voltage setting, frequency converter enable/disable, output frequency setting, ECO enable/disable, ECO voltage range setting, Bypass enable/disable, Bypass voltage range setting, Backup time setting for outlets.

● 01: Output voltage setting
Interface

Setting

For 200/208/220/230/240 VAC models, you may choose the following output voltage:

200: presents output voltage is 200Vac

208: presents output voltage is 208Vac

220: presents output voltage is 220Vac

230: presents output voltage is 230Vac

240: presents output voltage is 240Vac

For 100/110/115/120/127 VAC models, you may choose the following output voltage:

100: presents output voltage is 100Vac

110: presents output voltage is 110Vac

115: presents output voltage is 115Vac

120: presents output voltage is 120Vac

127: presents output voltage is 127Vac



● 02: Frequency Converter enable/disable
Interface

Setting

CF ENA: converter mode enable

CF DIS: converter mode disable



● 03: Output frequency setting
Interface

Setting



You may set the initial frequency on battery mode:

BAT 50: presents output frequency is 50Hz

BAT 60: presents output frequency is 60Hz

If converter mode enable, you may choose the following output frequency:

CF 50: presents output frequency is 50Hz

CF 60: presents output frequency is 60Hz

● 04: ECO enable/disable

Interface



Setting

ENA: ECO mode enable

DIS: ECO mode disable

● 05: ECO voltage range setting

Interface



Setting

Press the Down key or Up key to set the acceptable high voltage point and acceptable low voltage point:

HLS: High loss voltage in ECO mode (For 200/208/220/230/240 VAC models, the setting range is from +7V to +24V of the nominal voltage. For 100/110/115/120/127 VAC models, the setting range is from +3V to +12V of the nominal voltage).

LLS: Low loss voltage in ECO mode (For 200/208/220/230/240 VAC models, the setting range is from -7V to -24V of the nominal voltage. For 100/110/115/120/127 VAC models, the setting voltage is from -3V to -12V of the nominal voltage)

● 06: Bypass mode enable/disable

Interface



Setting

ENA: Bypass mode enable

DIS: Bypass mode disable

● 07: Bypass voltage range setting

Interface



Setting

Press the Down key or Up key to set the acceptable high voltage point and acceptable low voltage point:

HLS: Bypass high voltage point

LLS: Bypass low voltage point

For 200/208/220/230/240 VAC models:

230-264: setting the high voltage point from 230Vac to 264Vac

170-220: setting the low voltage point from 170Vac to 220Vac

For 100/110/115/120/127 VAC models:
 120-132: setting the high voltage point from 120Vac to 132Vac
 85-115: setting the low voltage point from 85Vac to 115Vac

● 08: Backup time setting for outlets

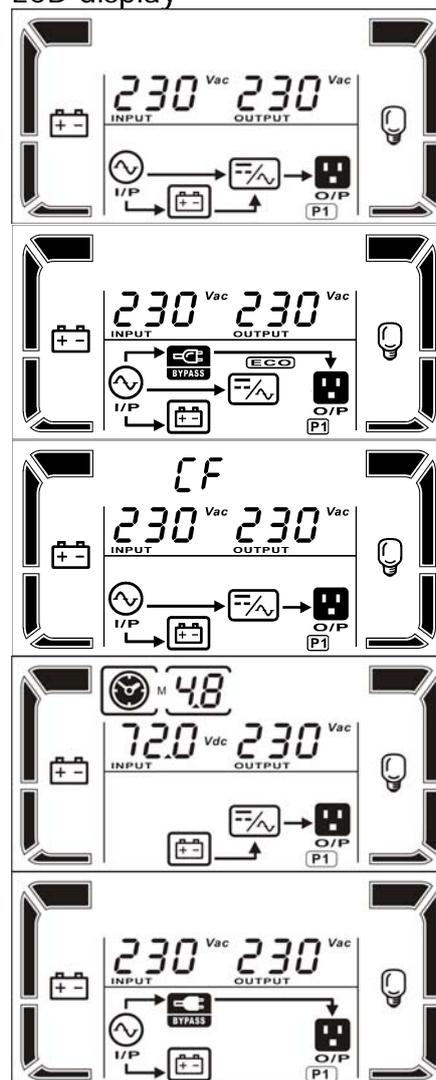
Interface	Setting
	Parameter 3: Set up backup time on battery mode for general outlets. 0-999: setting the backup time in minutes from 0-999 for general outlets on battery mode. 0: When setting as "0", the backup time will be only 10 seconds. 999: When setting as "999", the backup time setting will be disabled.

● 00: Exit setting

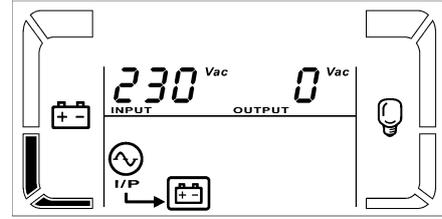
Operating Mode Description

Operating mode	Description
Online mode	When the input voltage is within acceptable range, UPS will provide pure and stable AC power to output. The UPS will also charge the battery at online mode.
ECO mode	Energy saving mode: When the input voltage is within voltage regulation range, UPS will bypass voltage to output for energy saving.
Converter mode	When input frequency is within 40 Hz to 70 Hz, the UPS can be set at a constant output frequency, 50 Hz or 60 Hz. The UPS will still charge battery under this mode.
Battery mode	When the input voltage is beyond the acceptable range or power failure and alarm is sounding every 4 second, UPS will backup power from battery.
Bypass mode	When input voltage is within acceptable range but UPS is overload, UPS will enter bypass mode or bypass mode can be set by front panel. Alarm is sounding every 10 second.

LCD display



Standby mode UPS is powered off and no output supply power, but still can charge batteries.



Faults Reference Code

Fault event	Fault code	Icon	Fault event	Fault code	Icon
Bus start fail	01	x	Inverter voltage Low	13	x
Bus over	02	x	Inverter output short	14	
Bus under	03	x	Battery voltage too high	27	
Bus unbalance	04	x	Battery voltage too low	28	
Bus short	05	x	Over temperature	41	x
Inverter soft start fail	11	x	Over load	43	
Inverter voltage high	12	x			

Warning indicator

Warning	Icon (flashing)	Alarm
Low Battery		Sounding every second
Overload		Sounding twice every second
Battery is not connected		Sounding every second
Over Charge		Sounding every second
Over temperature		Sounding every second
Charger failure		Sounding every second
Out of bypass voltage range		Sounding every second

Failure Diagnosis

1. OVERVIEW:

Circuit Block	Components to be checked	Fail condition

FUSE	F1,F2,F3	short or open
U.P.F. CORRECTION	D10, D11,REC1,Q1	short or open
Push-Pull Booster	Q2,Q3,Q4,Q6	D-S short or open
	D15,D16, D17, D18	short or open
Inverter	Q7,Q8	D-S short or open
Charger	Q3, Q301,Q306	D-S short or open
	D2,D3,D5, D300,D302,D305,D306	short or open
DC Power Supply	Q2	D-S short or open

2. U.P.F. CORRECTION:

Step	Checked components	Instrument function	Reference Value	Failed condition
1	F1	Ω	short	open
2	Q1 (D,S)	DIODE	0.46	short or open
3	D10, D11	DIODE	0.44	short or open
4	R18	Ω	47	open or value change
5	REC1(+, \sim),(\sim ,-)	DIODE	0.46	short or open

3. PUSH-PULL DC-DC CONVERTER:

Step	Checked components	Instrument function	Reference Value	Failed condition
1	F2,F3	Ω	short	open
2	Q2,Q3,Q4,Q6 (D,S)	DIODE	0.47	short or open
3	R31, R32, R54, R56	Ω	10	open
4	D15,D16, D17, D18	DIODE	0.41	short or open

4.DC/AC INVERTER:

Step	Checked components	Instrument function	Reference Value	Failed condition
1	F1,F2,F3	Ω	short	open
2	<u>Q7,Q8</u> (D,S)	DIODE	0.47	short or open
3	<u>R64, R70</u>	Ω	47 Ω	open

5.DC POWER SUPPLY :

Step	Checked components	*Instrument function	Reference Value	Failed condition
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1	Q2(D,S)	DIODE	0.47	short or open
2	R18	Ω	22	open
3	R104	Ω	0.22	open
4	U1 (3845) PIN : 5-6 5-7 5-8 6-8	Ω	>1M >1M 3.5k >1M	too low

6. AC/DC CHARGER :

Step	Checked components	Instrument function	Reference Value	Failed condition
1	Q3, Q301,Q306 (D,S)	DIODE	0.49	short or open
2	R6	Ω	47	open
3	R37	Ω	0.5 Ω	open
4	U3(3845) PIN : 5-6 5-7 5-8 6-8	Ω	45k >1M 3.5k 53.5k	too low
5	D2,D3,D5, D300,D302,D305,D306	DIODE	0.57	short or open
6	C1, C2	Ω visual	open	short deformed

Step	Checked components	Instrument function	Reference Value	Failed condition
1	Q301,Q306 (D,S)	DIODE	0.49	short or open
2	R309	Ω	100	open
	R325	Ω	0.2	open
3	R326	Ω	1	open
4	U3(3845) PIN : 5-6 5-7 5-8 6-8	Ω	45k >1M 3.5k 53.5k	too low
5	D300,D302,D305,D306	DIODE	0.57	short or open
6	C307, C308	Ω visual	open	short deformed

After you have replaced all defect components on power stage (PSDR), connect with control board. Supply DC voltage 36Vdc/2Amp (limited current) with DC power supply via P5+ and

P8-. Turn on the switch on panel, you will see "current limit" on the DC power supply for about 2 seconds (If not, there are some defective components you have not found).

When everything seems good, turn off the switch on panel and remove DC power supply. Plug in the power cord and supply UPS with the mains. Test the output of charger (P5+, P7-). Is it 41.2Vdc. The fan will also active. If there is no problem in charger, connect the batteries via P11, P8.

Finally, turn on the switch on panel again and follow the procedure listed in part III (Alignment) to adjust the DC offset, and measure voltage on DC bus, output voltage.

CAUTION: **DO NOT** supply UPS with the mains unless you are sure that you have replaced all defective components

APPENDIX I: ENGINEERING SPEC.

I/P Specification

Cold Start	Yes, default frequency = 50 Hz
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Acceptable Input Voltage	0-300 VAC
Low line transfer	160VAC; $\pm 5\%$ (Full Load)
Line low comeback	168 VAC; $\pm 5\%$ (Full Load)
Line high transfer	300 VAC; $\pm 5\%$
Line high comeback	290 VAC; $\pm 5\%$
Start-up Voltage with Output Power	110 VAC to 300 VAC; $\pm 5\%$
Ratings (at nominal input voltage)	5A
earth leakage	3.5 mA, maximum (UPS only)
Input power factor	> 0.99
Input frequency	40 Hz to 70 Hz
Input protection type	circuit protector

O/P Specification

O/P Power	
Power (VA)	1000
Power (Watts)	800
Output Power Factor Rating	0.8
Load Power Factor Range	0.5 lagging to 1.0 (unity)
Output Voltage	200//208/220/230/240
Waveform	Sinusoidal
Nominal Voltage	230 VAC
Line Mode Voltage Regulation	$\pm 3\%$ of nominal; no load to full load, resistive & RCD loads
Battery Mode Voltage Regulation	$\pm 3\%$ of nominal; no load to full load, resistive & RCD loads
Transient Response (line mode)	0%-100%-0%; $\pm 9\%$ max. 20%-100%-20%; $\pm 6\%$ max.

APPENDIX II: COMMUNICATION

1. RS232 PORT

The RS232 provides proprietary command sequence for the computer to monitor the line and UPS status and to control the UPS. The data format is listed as following:

PIN TYPE: female
 BAUD RATE : 2400 bps
 DATA LENGTH : 8 bits
 STOP BIT : 1 bit
 PARITY : NONE

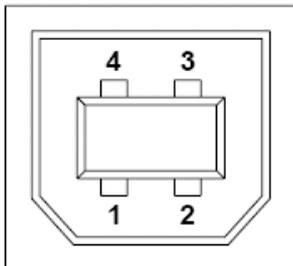
The pin assignment and description are listed in the following table and the interface configuration is indicated in figure VI-1. Note that, the computer will control information exchange by a query followed by <cr> (Character Return). UPS will respond with information followed by a <cr> or action. UPS data will be provided at 2400 baud rate and consist of 8 data bits, 1 stop bit, and no parity bit. All the information is provided in ASCII format.

PIN #	Description	I/O type
1,4,6,7,8,9	not connected	
3	UPS RS232 receiver Rx from computer.	input
2	UPS RS232 transmitter to computer	output
5	GND	

2. USB PORT

The USB is compatible to USB1.1 specification, and implemented for HID device and bus-powered.

The USB connector is "B" receptacles, seeing the following figure. The following table is signal definition of USB interface.



PIN#	SIGNAL
1	VBUS
2	D-
3	D+
4	GND