

UNINTERRUPTIBLE POWER SYSTEMS

SERVICE MANUAL

Value 400E / Value 600E / Value 800E

Date	Version.	Remark
2006/08/15	00	ISSUE

Table of Contents

1. Introduction -----	03
2. Components Location -----	04
3. Principle Of Operation -----	06
3.1 System Function Block -----	06
3.2 Normal Mode -----	06
3.3 UPS Boost Mode -----	07
3.4 UPS Buck Mode -----	07
3.5 UPS Battery Mode -----	08
4. Repair Procedure -----	09
4.1 Test Procedure -----	09
4.2 Test Equipment -----	09
4.3 Repair Steps -----	10
4.4 Turn on the unit -----	12
4.5 Connect the UPS to AC Input -----	12
4.6 Charging Circuitry -----	12
4.7 Get Load Connected -----	12
4.8 Customer Service -----	13
5. Schematic -----	14
5.1 Input / Output Main Circuit -----	14
5.2 Charger Circuit -----	15
5.3 Communication Circuit -----	15
5.4 MCU & USB Circuit -----	16
5.5 Inverter Circuit -----	16
5.6 Starting & System Power Circuit -----	17
5.7 Input Voltage/Frequency Sensing Circuit -----	18
5.8 Output Current Sensing Circuit -----	18

1.Introduction

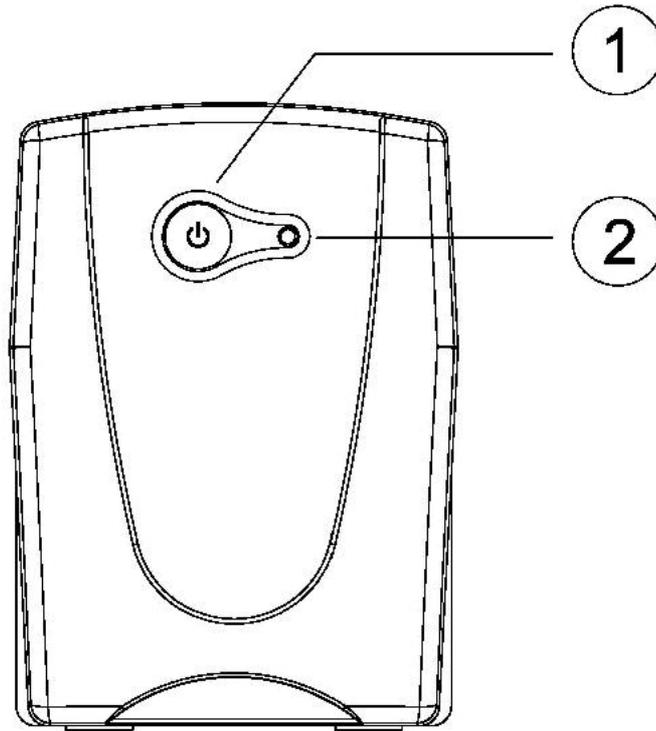
Value Series UPS with Automatic Voltage Regulator (AVR) is the best solution for SOHO to supply a clean and stable power. Value series UPS is compatible with many different operating systems, including Microsoft Windows 98/Me/2000/NT/XP. PowerPanel® Personal Edition management software included for USB Port shows versatility of a UPS, like power voltage、 scheduled shutdown, and remaining battery runtime、 battery status...etc. Value Series UPS is the most cost-economy and reliable UPS to bring you the best power supplies.

Features:

- I Microprocessor control guarantees high reliability.
- I Equipped with Boost and Buck AVR to stabilize input voltage.
- I Built-in DC start function enables UPS to be started up without AC power supplied.
- I Auto restart while AC recovery.
- I Compact size, light weight.
- I Auto charge even though UPS is off.
- I Provides Overload Protection.
- I PowerPanel® Personal Edition software included.
- I USB and Serial connectivity.

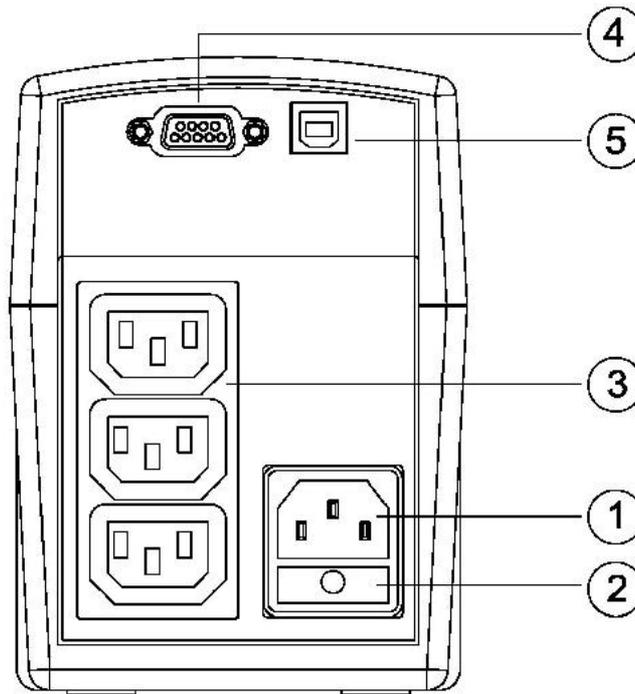
2.Components Location

Value Series Front Panel



No.	Description	Q'TY	Remark
	Power Switch	1	ON / OFF
	Power On Indicator	1	Green LED

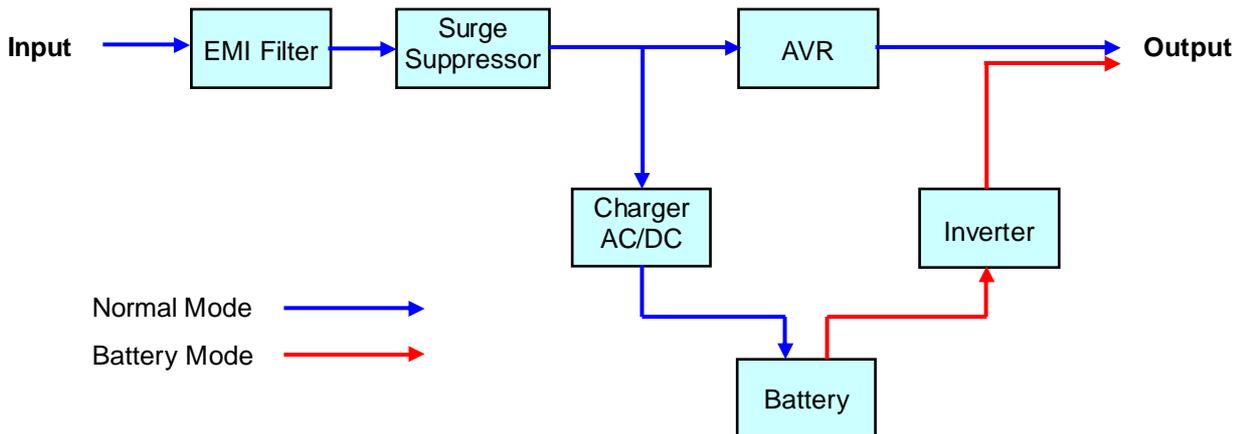
Value Series Rear Panel



No.	Description	Q'TY	Remark
	AC Inlet	1	IEC 320 C14
	Input Fuse	2	3.15A for Value 400E 5A for Value 600E 6.3A for Value 800E
	AC Outlets	3	IEC 320 C13
	Serial Port	1	Contact closure
	USB Port	1	USB 1.1

3. Principle Of Operation

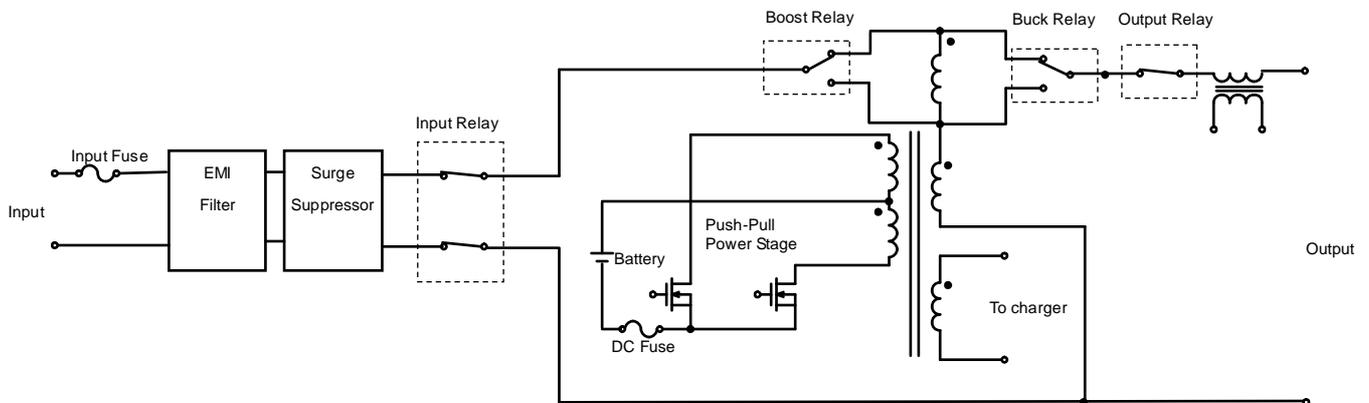
3.1 System Functional Block Diagram



System Functional Block Diagram

3.2 UPS Normal Mode

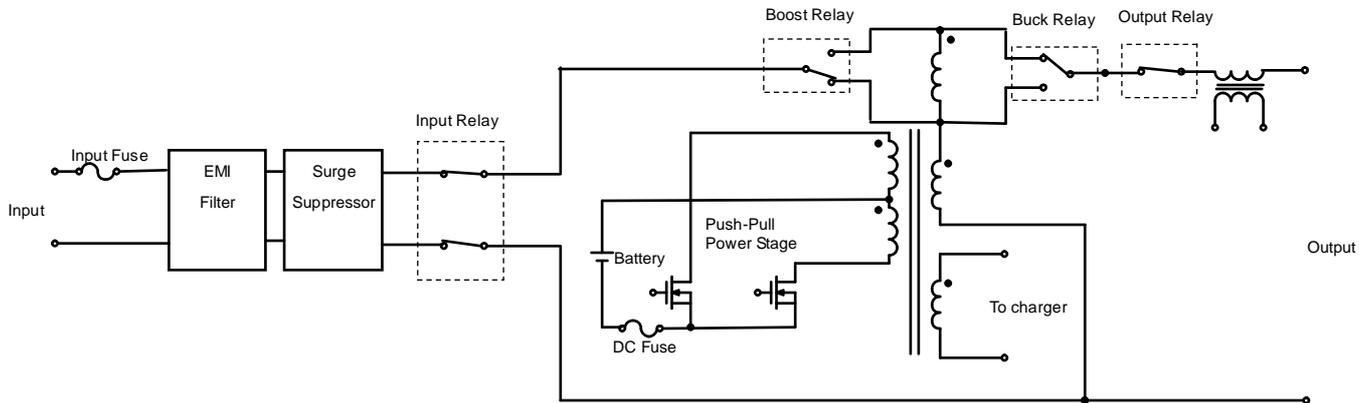
When AC utility power is normal, it will go through the UPS to provide power (Bypass), at the same time it will charge battery through AC/DC circuit (UPS Normal Mode).



UPS Normal Mode

3.3 UPS Boost Mode

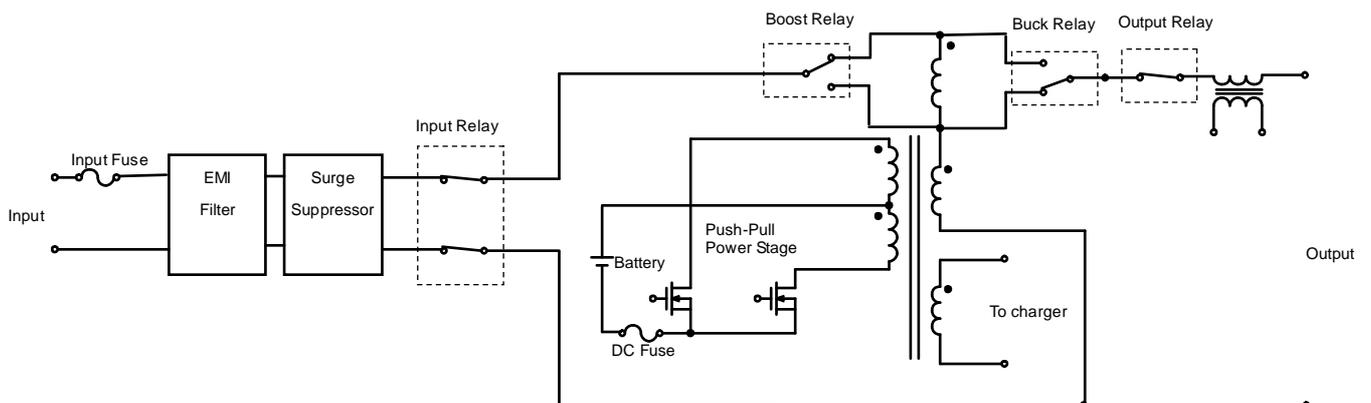
When AC utility power is low, it will go through boost circuit of the UPS to provide power, and correct it back to normal, at the same time it will charge battery through AC/DC circuit (UPS Boost Mode).



UPS Boost Mode

3.4 UPS Buck Mode

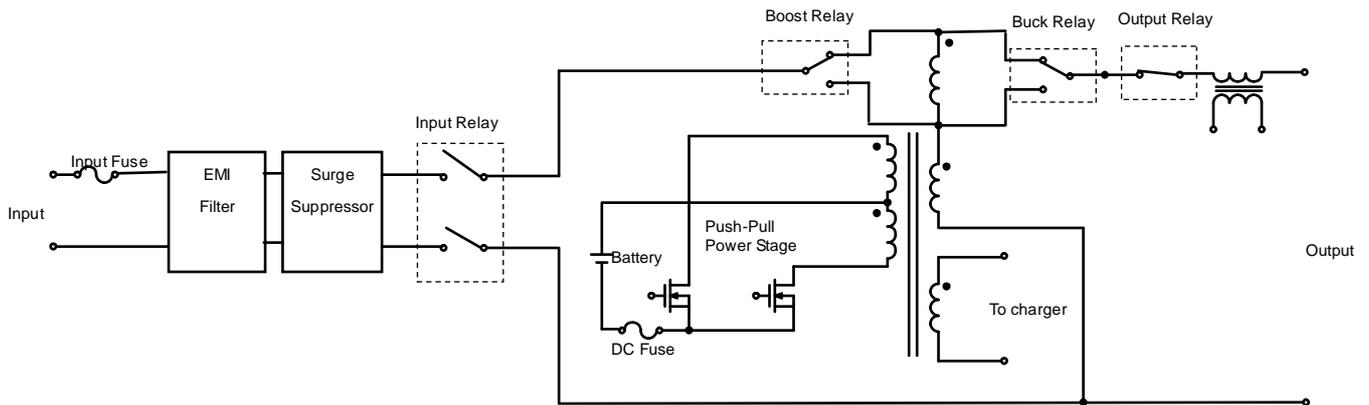
When AC utility power is high, it will go through buck circuit of the UPS to provide power, and correct it back to normal, at the same time it will charge battery through AC/DC circuit (UPS Buck Mode).



UPS Buck Mode

3.5 UPS Battery Mode

When AC utility power is abnormal, battery will provide power via DC/AC circuit (push-pull power stage) to output socket.



UPS Battery Mode

4.Repair Procedure

4.1 Test Procedure

Item	Test point	Test Procedure	Expected result
Battery Charge Voltage	D11-N (+) JP28 (-)	1.Connect power cord to AC 230V then start UPS. 2.Connect DVM(DC) to test points.	13.8V±0.2V
+12V	JP41 (+) JP28 (-)	1.Start UPS at Line mode or Battery mode. 2.Connect DVM(DC) to test points.	12V±0.5V
+5V	C9 Anode (+) JP28 (-)	1.Start UPS at Line mode or Battery mode. 2.Connect DVM(DC) to test points.	5V±0.1V
RESET+5V	U6 p8(+) JP28 (-)	1.Start UPS at Line mode or Battery mode. 2.Connect DVM(DC) to test points.	5V±0.1V
OSC waveform	U6 p2(+) U6 p3(+) JP28 (-)	1.Start UPS at Line mode or Battery mode. 2.Connect DSO to test points.	24M Hz
AC output	Output	1.Start UPS at Line mode or Battery mode. 2.Connect DVM(AC) to test points.	230V±5%

4.2 Test Equipment

- Digital Multi-Meter (DMM) with true RMS measurement
- DC power supply 15V 5A
- Digital Storage Oscilloscope (DSO)
- Load: 100~200W/230V milky light bulb.

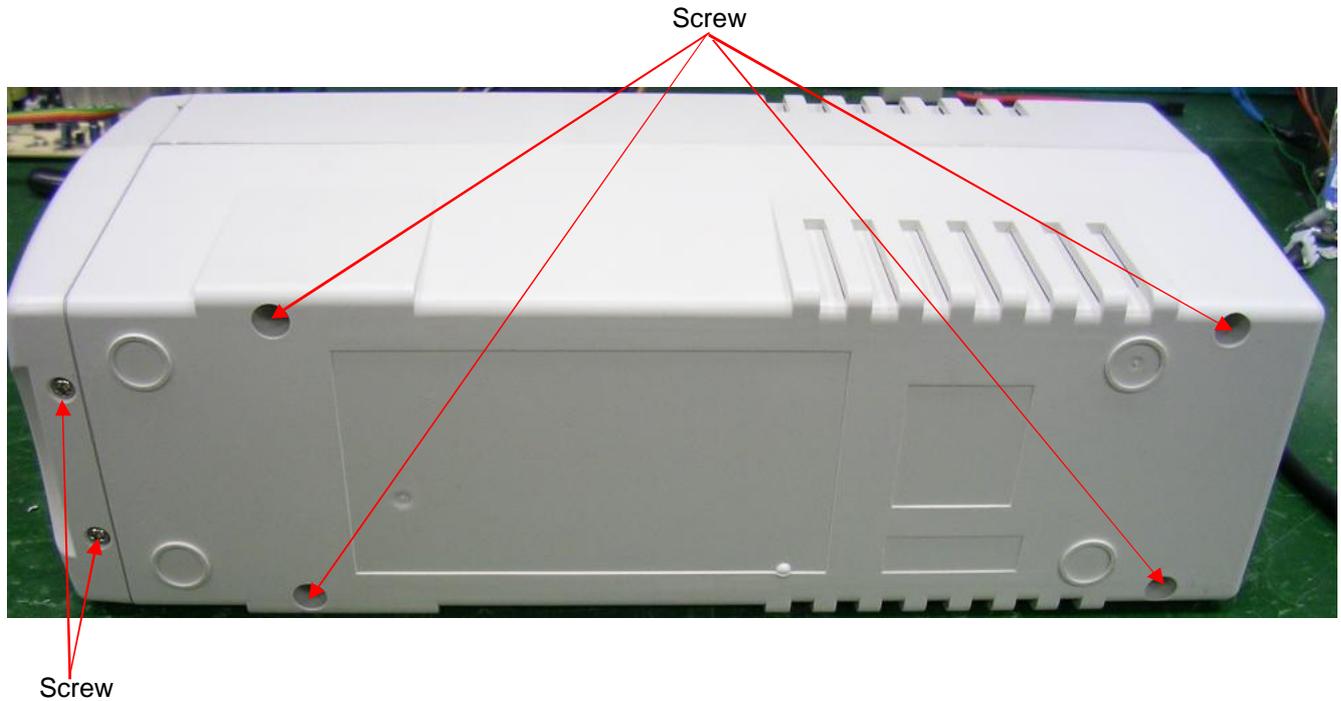
4.3 Repair Steps

Please follow the repair procedures step by step.

- Check the outlook of the unit to see if there is any damage on the surface.

4.3.1 Preparation

- Remove the UPS cover.



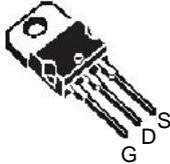
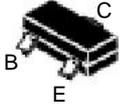
- Disconnect the battery wires.



- Measure the battery voltage by DC voltage meter, the normal voltage should be within the range of 10.8V~13.8V

4.3.2 Check the voltage of MOSFET、BJT and DIODE of the Inverter circuit of PCB

- Remove the PCB from the cover.
- Select the “”function on DMM then use DMM check the voltage of the MOSFET and BJT as described below.
- Read the figure of voltage difference between S-G (“Source” and “Drain”) and the S-D (“Source” and “Gate”) of the MOSFET. The reading should be within the range of 1.3-2.5V / 0.45-0.65V.
- Read the figure of voltage difference between B-E (“Base” and “Emitter”) or B-C (“Base” and “Collector”) of the BJT. The reading should be within the range of 0.45-0.65V.
- Read the figure of voltage difference between A-K (“Anode” and “Cathode”) of the diode. The reading should be within the range of 0.45-0.65V
- If the figures are out of normal range, the components shown in the table might be damaged.

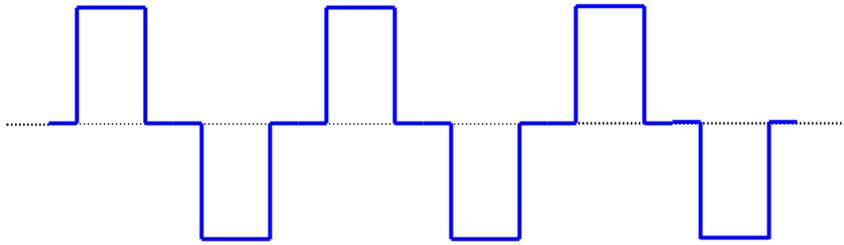
Part reference	Measured location	Expected Reading	Part Outline
Q1	S-G / S-D	1.3-1.5V / 0.45-0.65V	
Q2	S-G / S-D	1.5-2.5V / 0.45-0.65V	
Q3	S-G / S-D	1.5-2.5V / 0.45-0.65V	
Q4	S-G / S-D	1.5-2.5V / 0.45-0.65V	
Q5	S-G / S-D	1.5-2.5V / 0.45-0.65V	
Q6-Q22	B-E / B-C	0.45-0.65V / 0.45-0.65V	
D6-D11	P-N	0.45-0.65V	

4.3.3 Check the resistance of RESISTOR of the Inverter circuit of the PCB

Part reference	Measured location	Expected Reading	Remark
R68,R82,R85,R97		1K or 2KOhm	

4.4 Turn on the unit with DC power supply

- Setup the instrument: adjust the output voltage of DC power supply to 13V with current limit set at 5Adc.
- Connect the positive output of the DC power supply to the BAT(+)(Red wire) of the transformer and the negative output to the BAT(-)(Black wire) of the PCB.
- Turn on the UPS.
- Check the reading of output current from the power supply, it should be between 0.6-0.9A.
- Check the output voltage of UPS. The reading should be within 225~240Vac.
- Check the waveform of UPS output, it should be square wave.



If there is no output voltage, then the PCB needs to be checked by a higher level service center.

4.5 Connect the UPS to AC Input

- Connect UPS to the utility power, the UPS should transfer to AC mode at this moment.
- If the transfer fails, check if input fuse is blown. When this occurs, replace the fuse.

4.6 Charging Circuitry

- In AC mode: Check the charging voltage by measuring the voltage between battery wires (Note: the battery wires are not connected to battery nor to the DC power supply at this moment). $V_{bat}=13.6 - 14V_{dc}$.
- Turn off the UPS then connect the battery wires back to the batteries and make PCB and other cables properly assembled inside the UPS. Then start the UPS in AC mode.

4.7 Get Load Connected

- Connect load to the outlet of the UPS.
- Disconnect the AC input. The UPS should supply power to the load.
- Connect a computer to the UPS. Recover the AC input to UPS then disconnect the AC utility power again.
- The computer should work properly without reboot OS when the UPS transfers between AC mode and Battery mode.

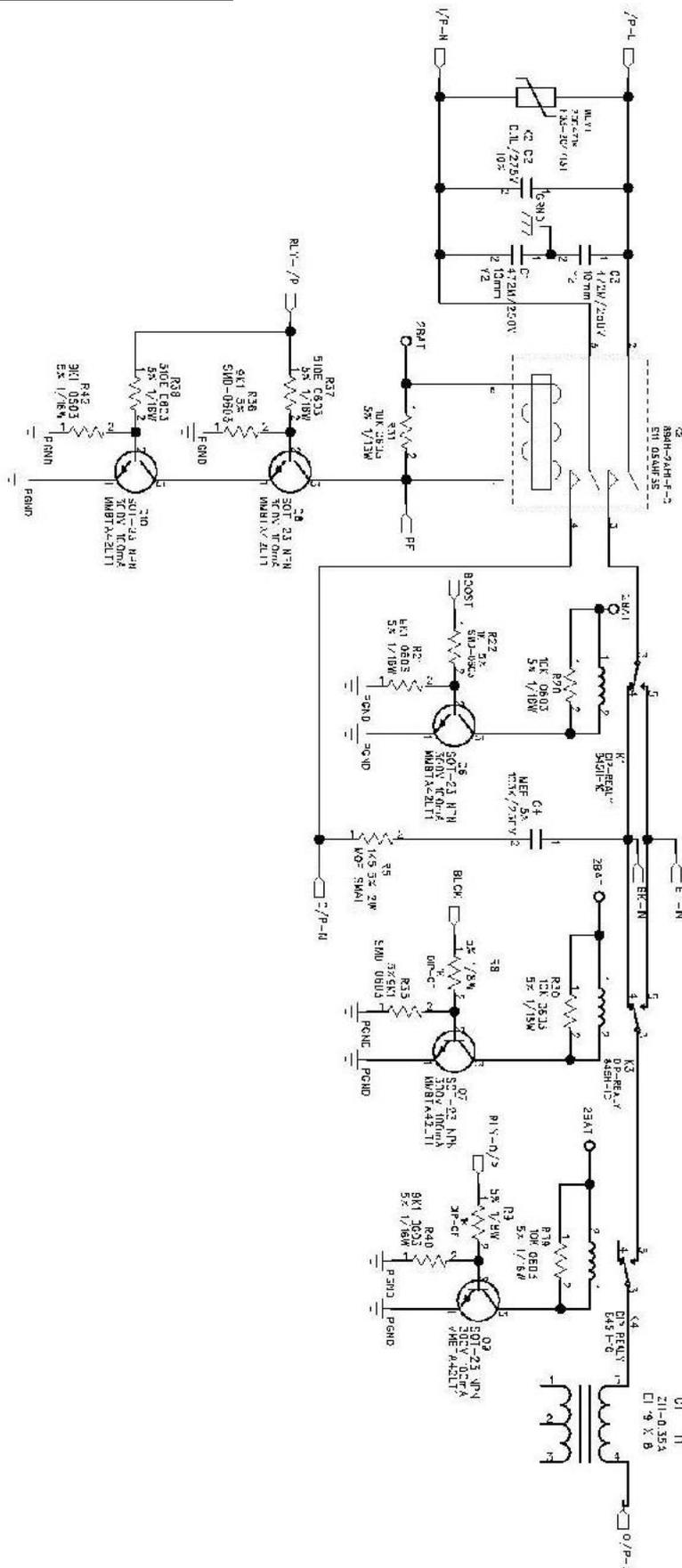
4.8 Customer Service

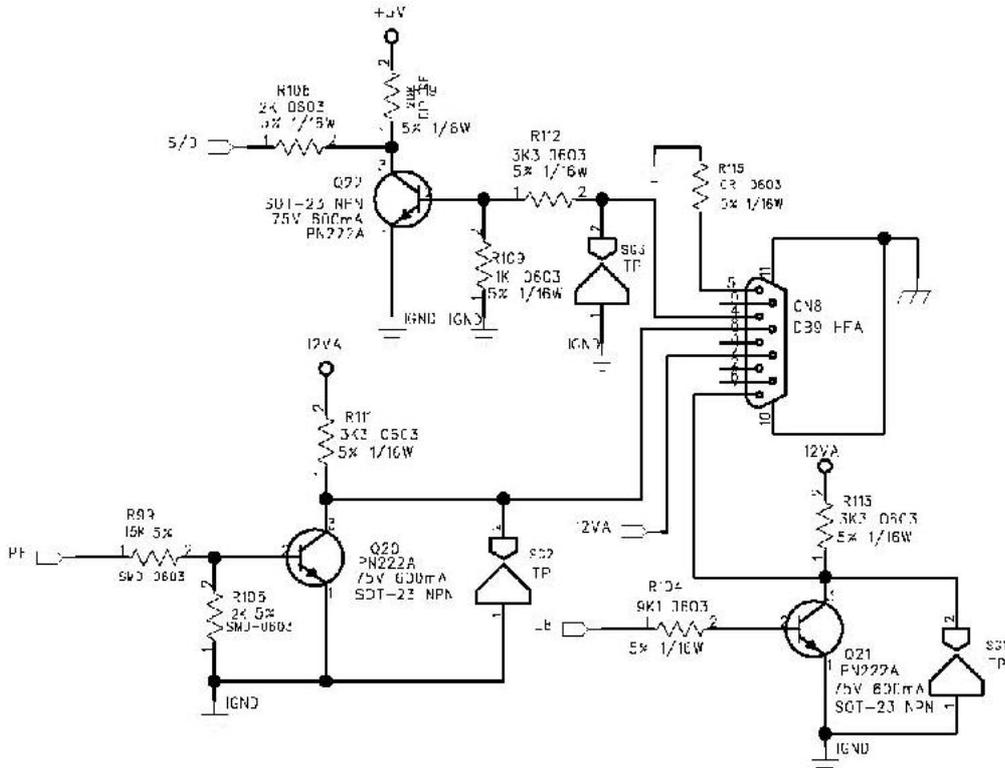
Question for the customer when they call or return the unit back to the distributor:

- Date of purchase, from what distributor or store?
- Serial number
- Description of the problem
- Check if the input fuse is normal and if the input power cord is properly connected.
- Disconnect all the loads that are connected to the UPS and turn on the unit again.
- Confirm how many loads connected to the UPS while malfunction occurred
- When does the malfunction occur?
 1. When the unit just first turned on.
 2. When power failure occurs.
 3. When the UPS return to AC mode.
 4. When the UPS is in battery mode.

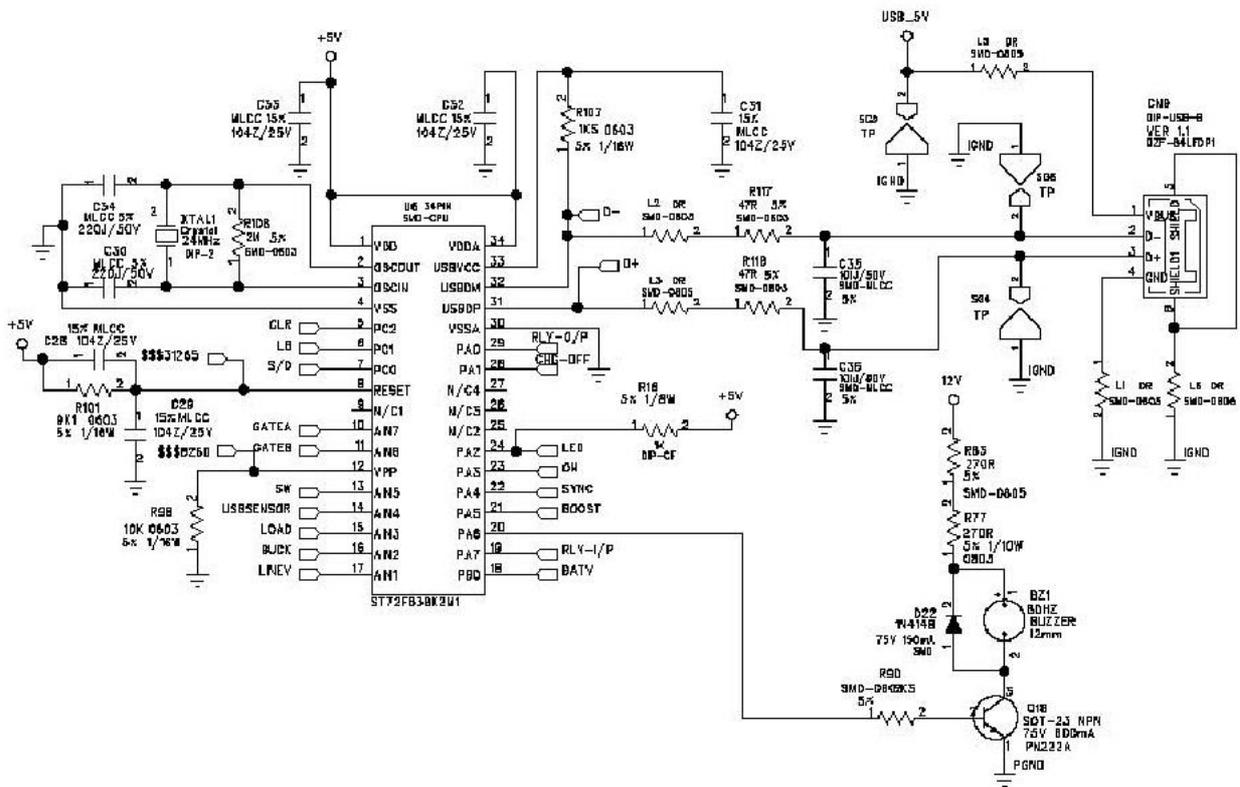
5. Schematic

5.1 Input / Output Main Circuit



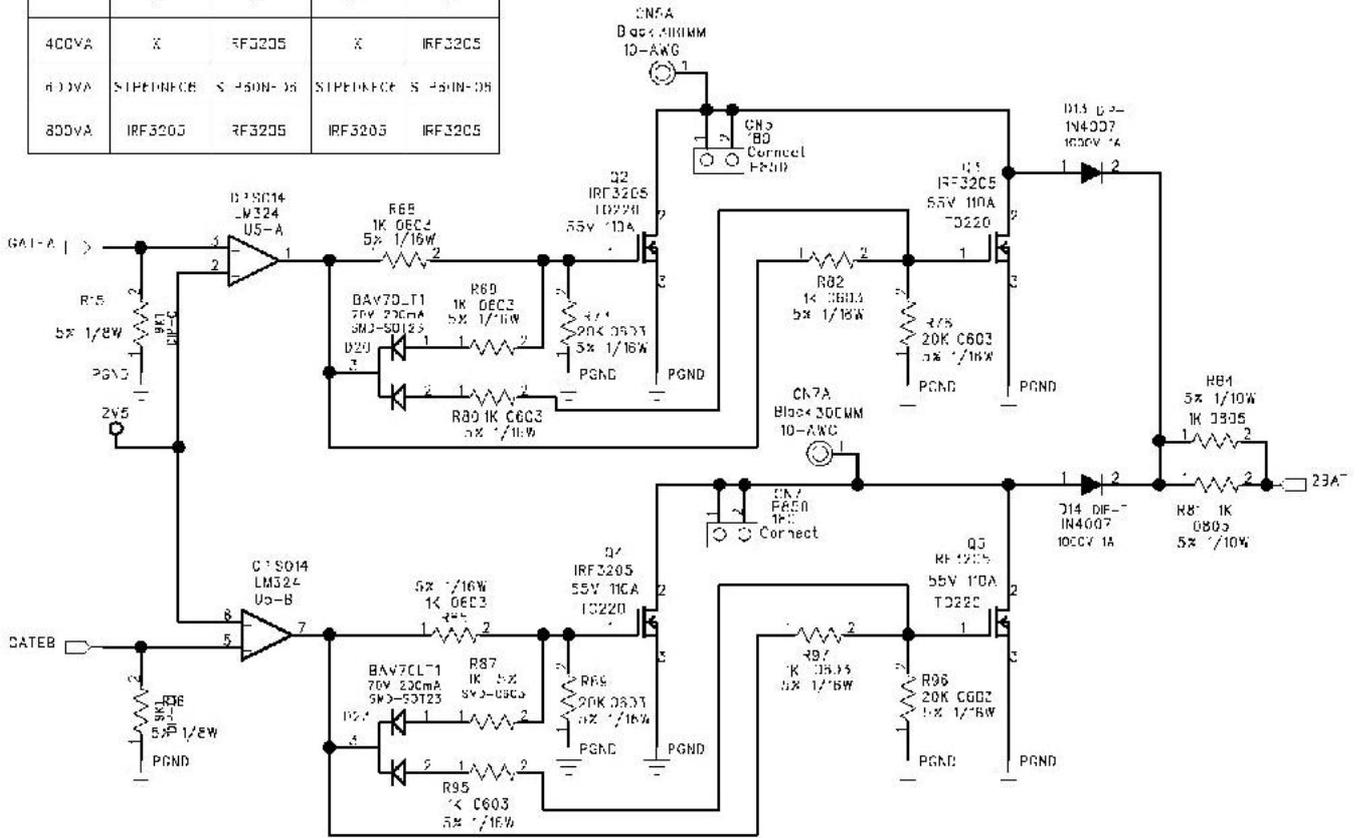


5.4 MCU & USB Circuit

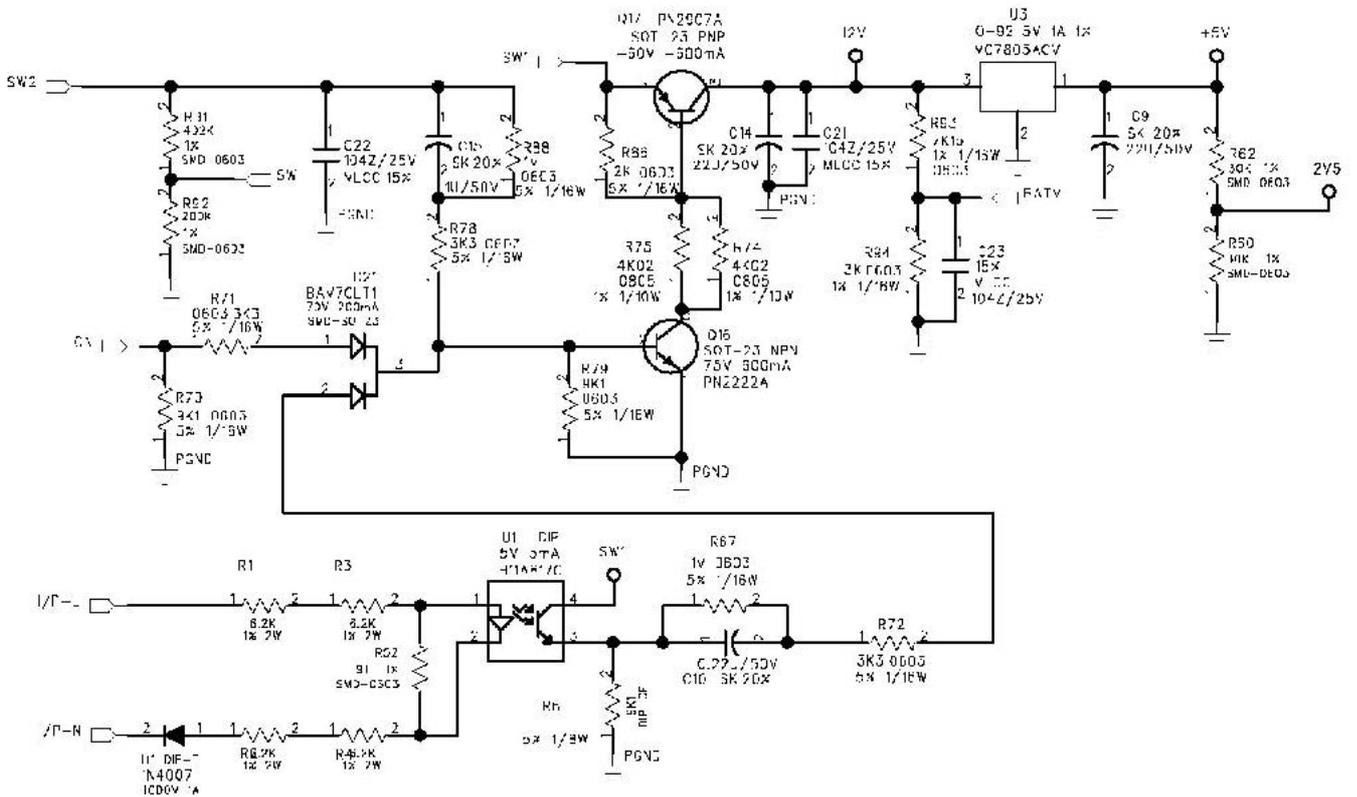


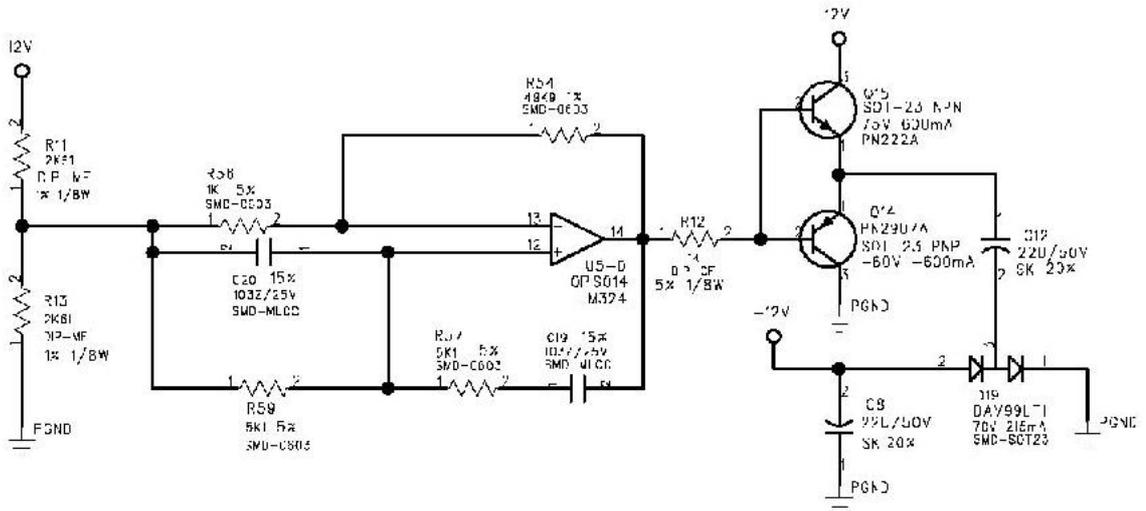
5.5 Inverter Circuit

	Q2	Q3	Q4	Q5
400VA	X	RF3205	X	IRF3205
600VA	SIP6N10CE S 450N-36		SIP6N10CE S 450N-36	
800VA	IRF3205	RF3205	IRF3205	IRF3205

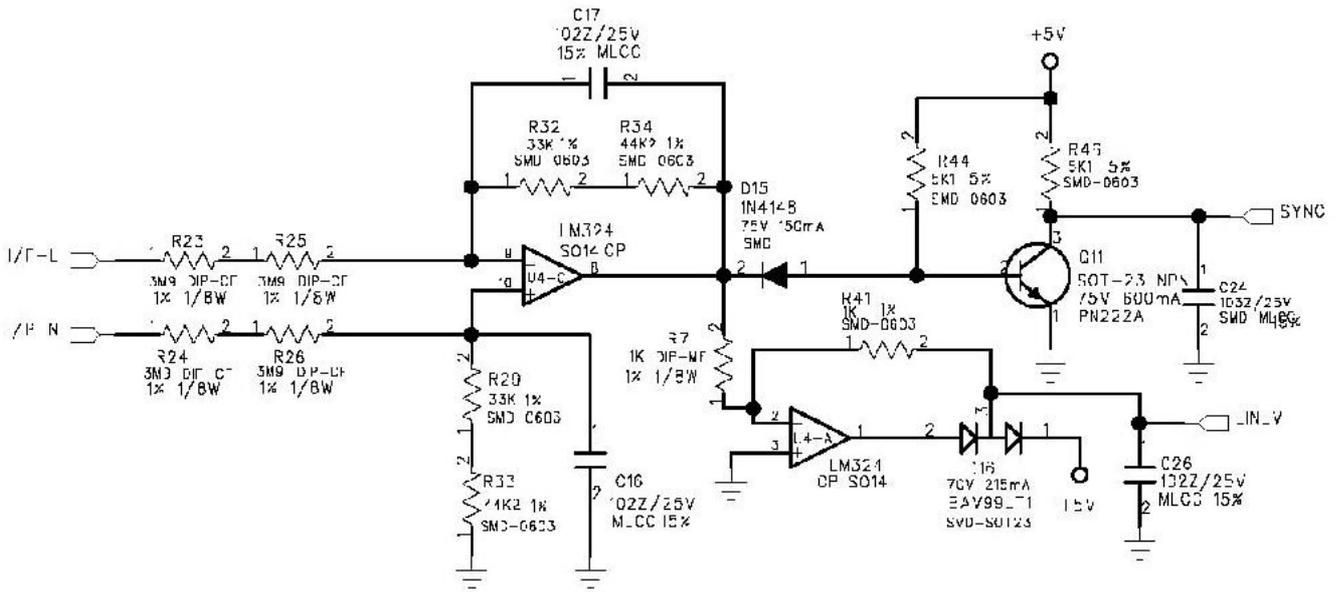


5.6 Starting & System Power Circuit





5.7 Input Voltage/Frequency Sensing Circuit



5.8 Output Current Sense Circuit

