Service Manual

Imperial Series

Model ：IMP-425/525/625/825/1000AP
IMD-425/525/625/825/1000AP
IMP-1025/1200/1500/2000AP
IMD-1025/1200/1500/2000AP

Contents of Service Manual

1. Safety Precautions

1.1 Service Warnings

* The UPS contains voltages what are potentially hazardous. All repairs should be performed by qualified service person.
* The UPS has its own internal energy source (battery). The output receptacles may be alive even when the UPS is not connected to an AC supply.
* No modification of any circuit should be attempted. Service work should only be performed after you are thoroughly familiar with all of the following safety checks and servicing guidelines.

* Safe and continuous operation of the UPS depends partially on the care taken by users. Please observe the following precautions:
  1.Do not attempt to power the UPS from any receptacle except a 2-pole 3-wire grounded receptacle.
  2.Do not place the UPS near water or in environments of excessive humidity.
  3.Do not allow liquid or any foreign objects to get inside the UPS.
  4.Do not plug appliances, such as hair dryers, into the UPS receptacles.
  5.Do not place the UPS under direct sunshine or close to heat-emitting sources.
  6.This UPS is intended for installation in a temperature controlled, indoor area free of conductive contaminants.

1.2 Important Safety Instructions

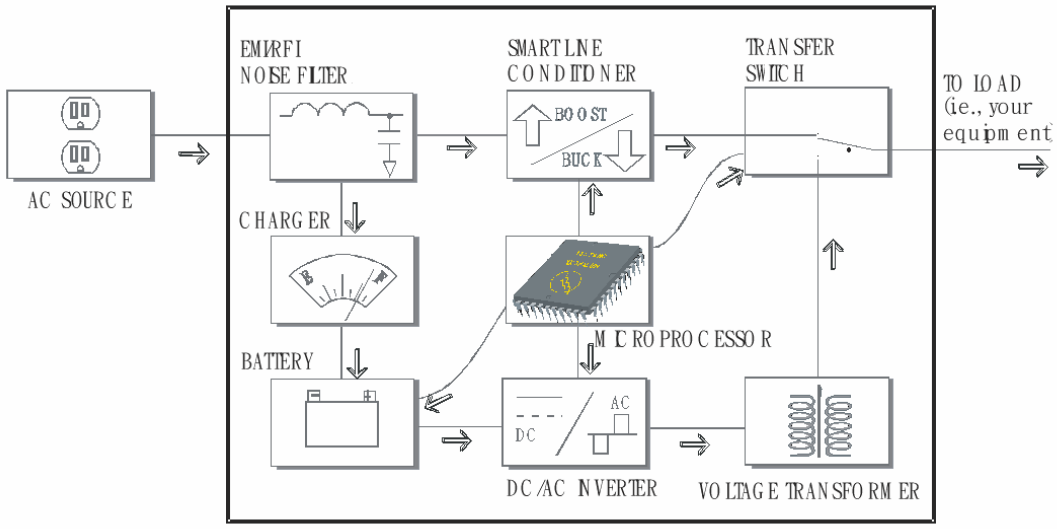
This manual contains important safety instructions. Keep this manual handy for reference.
For continued protection against the risk of fire, replace with the same type / rating of fuses.
While testing the UPS to determine the problem, always use a DC power supply in place of the batter.
A battery can be present a risk of electrical shock, burns from high short-circuit current, fire of explosion from vented cases. Observe proper precautions.

When replacing batteries, use the same number and the following type batteries: sealed lead-acid maintenance free.
Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
There are special components used in this UPS what are important for safety.
These parts are identified by the international symbol "!" on the schematic diagram and on the replacement parts list. It is essential to replace these critical parts with manufactures' specified parts to prevent shock, fire or other hazards.

2. General Information

2.1 Outline

The Imperial Series are advanced line-interactive simulated sine wave uninterruptible power systems (UPS) designed to prevent spikes, surges, sags, transients and blackouts from reaching your sensitive equipment. Your equipment may include such items as computers and computerized instruments to telecommunication systems. When AC power is present, the UPS filters and conditions the power continuously. When AC power fails, the unit employs its internal maintenance-free battery to supply back-up power without interruption.



2.2 Features

Frequency Auto Sensing： The Imperial series UPS can operate in either a 50 or 60 Hz environment. When you plug the UPS into an AC outlet and turn it on, it will automatically detect the incoming line frequency and configure itself to match that frequency.

Smart Buck and Boost Line Conditioning： The voltage from your AC power source can fluctuate above and below the standard rating. This microprocessor controlled UPS provides line conditioning via both buck (step-down voltage) and boost (step-up voltage) functions. For example, if your normal voltage is 120V and the voltage fluctuates up to 131V, the buck function in your UPS will step it down so that your equipment receives approximately 120V. If the voltage fluctuates down to 109V, the boost function will step it up so that your equipment receives approximately 120V. This provides your equipment with excellent voltage regulation with less possibility for the UPS to drain its internal battery.

User Replaceable Battery Design： The battery is the most critical part in a UPS. The average lifetime of a battery is between 3 and 5 years. The special user-replaceable battery design of this

UPS provides significant savings and gives the UPS an almost unlimited life. You can replace the battery very easily, and without turning off your UPS or the equipment it is protecting.

Advanced Interface to Communicate with Computer： Many UPS's provide only a basic power failure warning. These models, together with UPSMON also provide you with important operating information. From your computer screen, you can know input/output voltage and current, frequency, battery voltage, etc., and analyze power problems. If software is not part of your UPS package, you can purchase it from your local dealer.

Schedule Shutdown & Startup： Using software you can locally or remotely control the shutdown and startup of equipment connected to the UPS. A customized schedule can be developed to meet your specific requirements.

Data-Line Surge Protection： The built-in data-line surge suppression on the rear panel completes your system protection. It provides an easy way to protect a network (RJ45) or modem (single line phone) connection from hazardous spikes.

3. SPECIFICATIONS

3.1 Electrical Specifications

Battery output rating

Product Name	Frequency (Hz)	Rated Voltage (V)	Capacity (W)
IMP/IMD-425AP	50/60	100/110/115/120V	255W
		220/230/240V	
IMP/IMD-525AP	50/60	100/110/115/120V	315W
		220/230/240V	
IMP/IMD-625AP	50/60	100/110/115/120V	375W
		220/230/240V	
IMP/IMD-825AP	50/60	100/110/115/120V	495W
		220/230/240V	
IMP/IMD-1000AP	50/60	100/110/115/120V	550W
		220/230/240V	
IMP/IMD-1025AP	50/60	100/110/115/120V	615W
		220/230/240V	
IMP/IMD-1200AP	50/60	100/110/115/120V	720W
		220/230/240V	
IMP/IMD-1500AP	50/60	100/110/115/120V	900W
		220/230/240V	
IMP/IMD-2000AP	50/60	100/110/115/120V	1200W
		220/230/240V	

Input Voltage Range

Upper Limit	Rated Voltage+25%
Buck	Rated Voltage+9%
Boost	Rated Voltage-9%
Lower Limit	Rated Voltage-25%

Input/Output Frequency

Input (AC mode)	45Hz – 55 Hz / 55 Hz – 65 Hz
Output (Inverter mode)	50 Hz / 60 Hz ± 1 Hz

Wave Form

AC Mode	Sine wave
Back Up Mode	Step wave

Transfer time

Power Failure AC ⇒ Inverter	4 ms (typical)

Spike/Surge protection

Version	**Continuous Voltage Vrms**	**Single pulse 8/20us**	
		Imax	**Joules**
100/110/115/120V	175V	6,000A	1050max.
220/230/240V	385V	6,000A	1050max.

Audible Alarm

Battery discharge at power failure	Beep every 2 seconds
Battery approaches final discharge	Beep every half second
Overload	Continuous buzzer
UPS faulty	Continuous buzzer

Battery and Charger

Battery type: Maintenance-free sealed-lead acid. Recharge time 6 to 8 hours typical from total discharge. (The UPS may be used immediately after discharge but will provide shorter backup time)

Battery Specifications

	IMP/D-425AP	IMP/D-525AP	IMP/D-625AP	IMP/D-825AP	IMP/D-1000AP	IMP/D-1025AP	IMP/D-1200AP	IMP/D-1500AP	IMP/D-2000AP
DC voltage	12V	12V	12V	12V	12V	24V	24V	24V	24V
Type	12V 7.2AH	12V 7.2AH	12V 7.2AH	12V 34W	12V 34W	12V 7.2AH	12V 7.2AH	12V 7.2AH	12V 34W
Quantity	1	1	1	1	1	2	2	2	2

3.2 Mechanical Specifications:

Product Name	Dimensions	Weight (Kg)	
	W × D × H (mm)	Net	Shipping
IMP/IMD-425AP	105*334*168	5.8	6.3
IMP/IMD-525AP	105*334*168	5.8	6.3
IMP/IMD-625AP	105*334*168	6.3	6.8
IMP/IMD-825AP	105*334*168	6.4	6.9
IMP/IMD-1000AP	105*334*168	6.5	7.0
IMP/IMD-1025AP	130*382*192	13.4	14.8
IMP/IMD-1200AP	130*382*192	13.4	14.8
IMP/IMD-1500AP	130*382*192	13.6	15.0
IMP/IMD-2000AP	130*382*192	14.5	15.9

3.3 Environmental Specifications:

	Operating	Storage and Shipment
Temperature	0 ~ 40°C (32° ~ 104°F)	-20° ~ +60°C (-4° ~ +140°F)
Humidity	0 ~ 95% (non-condensing)	0 ~ 95% (non-condensing)
Altitude	3,000 m (10,000 ft) (Max.)	12,000 m (40,000 ft) (Max.)

4. Communications Interface

The communication port on the rear panel of the UPS allows for connection to a host computer. When used with UPSMON communication software you will have access to important operating information. From your computer screen, you can monitor input/output voltage, AC frequency, battery voltage, etc., and analyze power problems. UPSMON will also initiate automatic graceful shutdowns during extended power failures.

If UPSMON and a communication cable are not included in your UPS package purchase it from your local dealer.

The following are some of the parameters you can monitor:

Input Voltage	Indicates the actual input voltage to the UPS when AC power is present
Output Voltage	Indicates the actual output voltage of the UPS
Input Frequency	Indicates the actual Input frequency of the UPS
Output Frequency	Indicates the actual output frequency of the UPS
Battery Voltage	Indicates the actual output DC voltage of the UPS battery
Load Percent	Indicates the percentage of UPS Voltage-Ampere(VA) capacity being utilized by your equipment

The Imperial Series also supports software which relies on basic "contact closure signals" such as the built in UPS Service in Windows NT (you will need to purchase a special cable for this type of application). The major functions of this type of software normally include the following:

* To broadcast a warning when power fails.
* To close any open files before the battery rescues are exhausted.
* To turn off the UPS.

Note: You can connect your computer to your UPS without also connecting to the communication port. In this case, your UPS warns you of a power failure by beeping, but you have to manually shut down your UPS and computer.

Dsub9 Pin assignments:

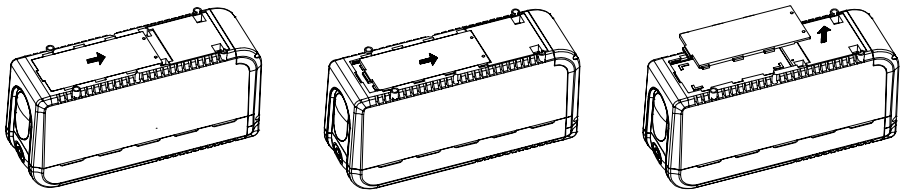
Pin No.	RS-232 Signal	Contact Closure Signal
1		
2	Tx (UPS > Computer)	
3	Rd (Computer > UPS)	Shut Down
4	+12V (Computer > UPS)	
5	GND	GND
6		AC failure
7	-12V (Computer > UPS)	
8		Battery Low
9	Tx (Short with pin2)	

5. Battery Replace Procedure

Changing the batteries in your UPS is a safe and easy procedure. Since the battery is not isolated from the AC input, you must power off your UPS and unplug the power cord before proceeding the following procedure.

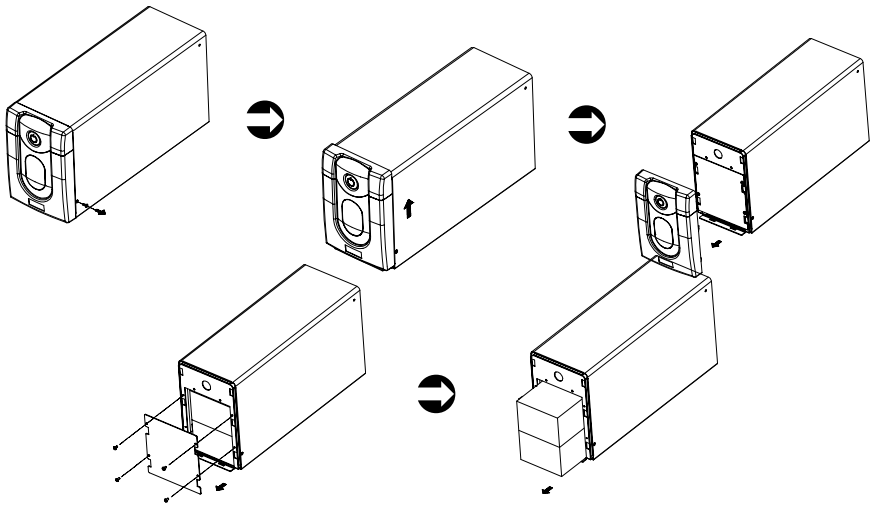
5.1 Replacement Procedure for IMP/IMD-425~1000AP (Optional function)

1. Remove the two screws on the battery cover.
2. Pull and open the cover as the following illustrations. Gently pull out the battery.
3. Disconnect the two wires connecting the battery to the UPS.
4. Connect the wires to the new battery, making sure that the red wire is connected to the red battery terminal and the black wire is connected to the black battery terminal.
5. Push the new battery into place.
6. Close the cover, and replace the screws back to the cover.



5.2 Replacement Procedure for IMP/IMD-1025~2000AP

1. Remove the screws on the battery cover.
2. Pull and open the cover.
3. Remove the screws of the battery retaining plate.
4. Pull out the battery.
5. Disconnect the two wires connecting the battery pack to the UPS
6. Connect the wires to the new battery pack, making sure that the red wire is connected to the red battery terminal and the black wire is connected to the black battery terminal.
7. Push the new battery into place.
8. Reposition the battery retaining plate and tighten the screws.
9. Slide the front panel back into place.
10. Tighten the two small screws on the bottom of the front panel.



6. Disassembly Procedure

6.1 Disassembly procedure for IMP/IMD-425~1000AP

6.1.1 Top Cover Removal

* Turn the UPS off and unplug it from the utility line.
* Remove the 6 screws on the bottom.
* Open the top cover.

6.1.2 Remove the battery wire

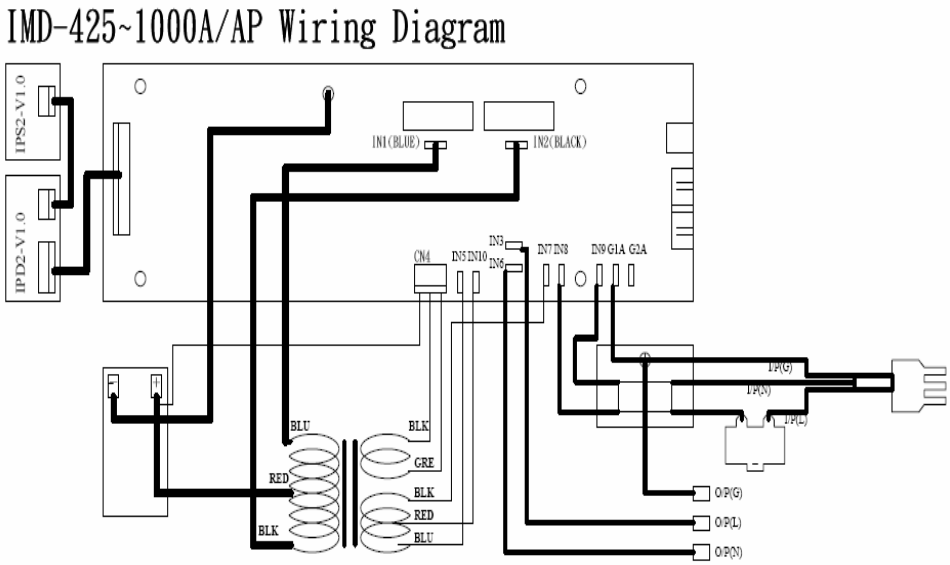
* Remove the black wire from PCB to battery.

6.1.3 Removal the PCB and Transformer

* Take off all the wires on the PCB.
* Remove all the screws on the PCB.
* Take off the PCB.
* Take off the transformer.

6.1.4 Remove the rear panel

* Remove the 4 screws on the real panel.
* Take off the rear panel.



6.2 Disassembly procedure for IMP/IMD-1025~2000AP

6.2.1 Top Cover Removal

* Remove the 8 screws on the bottom and rear panel.

* Take off the top cover.

6.2.2 Batter Removal

* Turn the UPS off and unplug it from the utility line.

* Remove the front panel and disconnect the LED wire.

* Remove the battery cover.

* Pull the battery out from the chassis.

6.2.3 Removal the PCB and Transformer

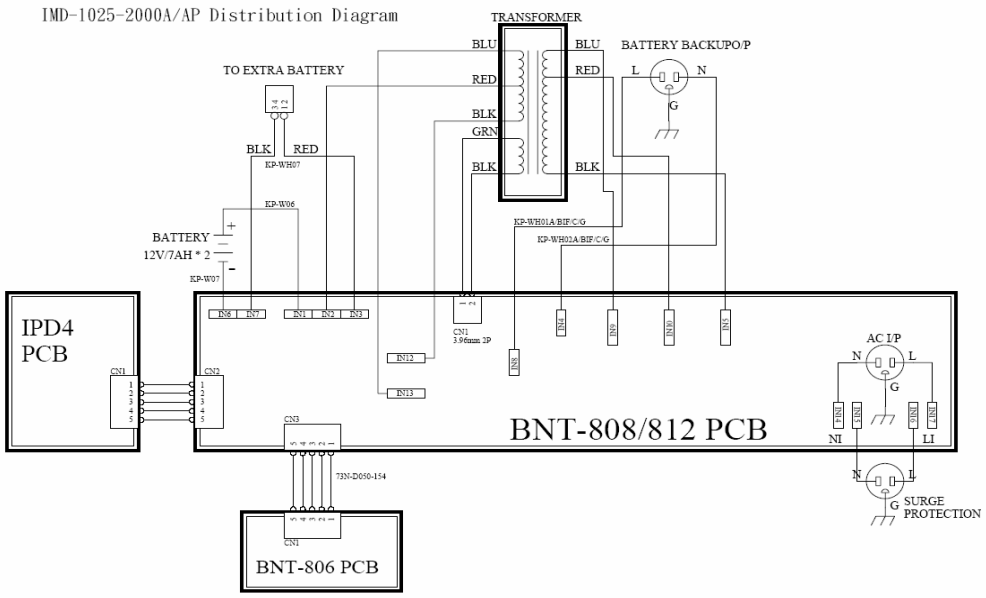
* Take off all the wires on the PCB.

* Remove the 5 screws on the PCB.

* Take off the PCB.

* Remove the 4 screws on the transformer.

* Take off the transformer.



7. Test & Adjustment Procedure

This Procedure outlines the steps to functionally test the IMP/IMD-425AP~2000AP models. The functional test is broken down into several sections to test each different function of the UPS.

7.1 Charger Voltage Test

* Plug the UPS into an AC power source and turn the UPS on.
* Disconnect positive (red) battery wire.
* Using a multi-meter, verify the B+ to B- voltage is at 13.4V~14.0V(IMP/IMD-425~1000AP) or 26.8V~27.8V(IMP/IMD-1025~2000AP). If not, adjust VR1.

7.2 Over Load Test

* Set the AC power source to the rating voltage.
* Plug the UPS into an AC power source and turn the UPS on.
* Connect a true RMS power meter to the output of the UPS.
* Connect the SPS load to the output.
* Add the SPS load slowly till the UPS over load alarm.
* Use the following chart to verify' the power handling capabilities of the UPS.

Load	Product Name	Overload Alarm (AC Mode)
SPS	**IMP/IMD-425AP**	425VA~510VA
	IMP/IMD-525AP	525VA~630VA
	IMP/IMD-625AP	625VA~750VA
	IMP/IMD-825AP	825VA~990VA
	IMP/IMD-1000AP	1000VA~1200VA
	IMP/IMD-1025AP	1025VA~1230VA
	IMP/IMD-1200AP	1200VA~1440VA
	IMP/IMD-1500AP	1500VA~1800VA
	IMP/IMD-2000AP	2000VA~2400VA

7.3 Transfer Point Test

* Using a variac, set the output for the rated UPS's voltage.
* Slowly reduce the variac output while monitoring the UPS's input voltage. The UPS should transfer to Boost when the voltage drops to the level given in the following Transfer Point Chart. Repeat this procedure to ensure accurate results.
* While the UPS is in Boost mode. continue to slowly reduce the variac output until the UPS transfers to battery mode. The UPS should transfer to battery when the voltage drops lo the level given in the following Transfer Point Chart.
* Slowly increase the variac output until the UPS goes back to on-line operation.
* Continue to increase the variac output until the UPS transfers to Buck when the voltage increases to the level shown in the Transfer Point Chart. Repeat this procedure to ensure accurate results.
* While the UPS is in Buck mode, continue to slowly increase the variac output until the UPS transfers to battery mode.
* Check the output voltage for each step according to the Transfer Point Chart. Load

	100V	110V	115V	120V	220V	240V	240V
Hi to INV	122–128	134–141	140–147	146–154	268–282	281–294	293–307
INV Hi recover	118–124	130–136	135–143	142–149	260–273	271–285	283–298
Buck	106–112	117–123	122–129	127–134	233–246	244–258	254–269
Buck Recover	103–109	113–120	118–125	124–131	227–240	237–251	247–262
Boost Recover	91–97	100–107	104–112	109–116	200–213	209–223	218–233
Boost	88–94	97–103	101–108	106–113	194–207	202–216	211–226
INV Low recover	76–82	84–90	87–94	91–98	167–180	175–189	182–197
Low to INV	72–78	79–86	83–90	86–94	158–172	166-179	173–187

7.4 Startup On Battery

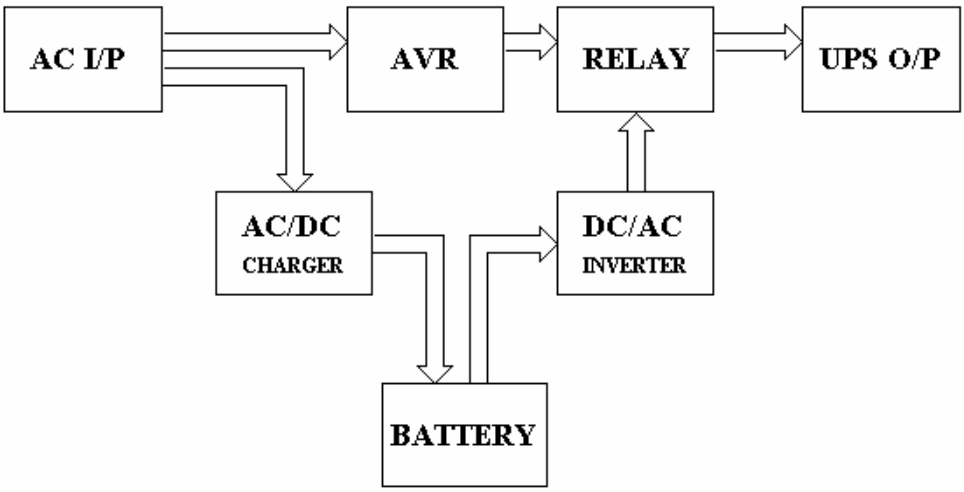
Unplug the UPS from the variac, and press the front panel On/Off button for three seconds, and the UPS should turn on

7.5 Communications Port Test

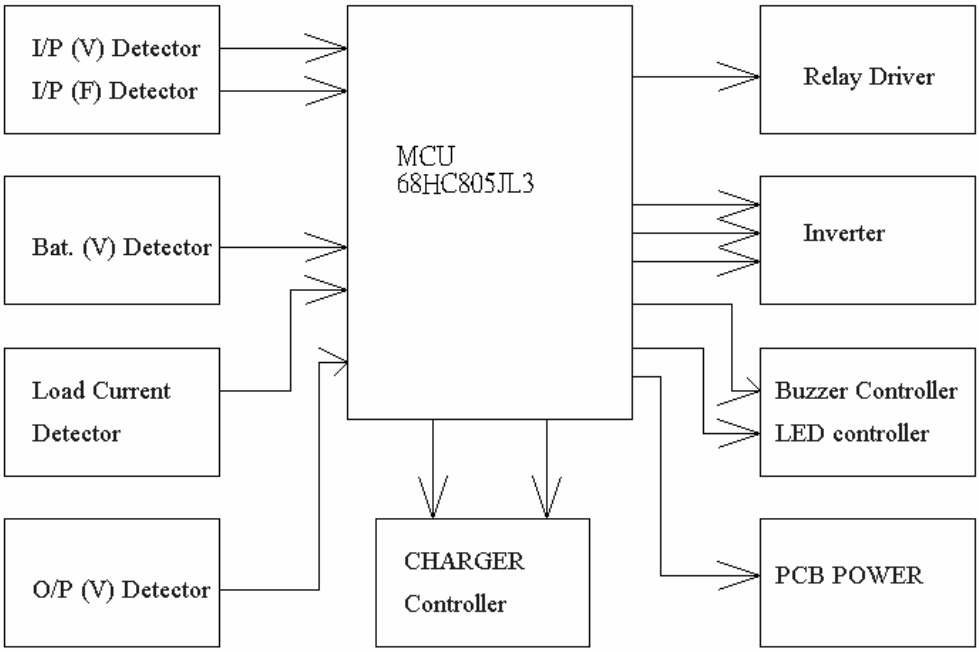
* Plug the UPS into the variac and turn on the UPS.
* Connect the USB or 9 pin communication cable (721-9266-dd8) between the computer com port and UPS com port.
* Start the UPSMON Monitor & Manager programs and verify the information is displayed correctly (Model, Voltage/Frequency Configuration, Input/Output etc...).
* UPSMON will also initiate automatic graceful shutdowns during extended power failures.
* If UPSMON and a communication cable are not included in your UPS package, you can purchase it from your local dealer.

8. Function Block Diagram

8.1 Main structure



8.2 Control circuit



9. Troubleshooting

Problem	Possible Cause	Action to take
UPS can’t turn on (LED not light)	Switch on the display board fail	Replace the display PCB
	Per Battery voltage less than 9V	Recharge the ups at least 8 hours, or change the battery.
	PCB failure	Replace the PCB
UPS can’t turn on (LED light)	Battery failure	Replace the battery
	PCB failure	Replace the PCB
	Transformer failure	Replace the transformer
UPS always at battery mode	AC Fuse or breaker open	Replace the AC fuse in inlet or reset the circuit breaker.
	PCB Failure	Replace PCB
	Transformer failure	Replace the transformer
Back up time too short	Battery not fully charged	Recharge the UPS at least 8 hours
	Battery too old	Replace Battery, call for service
	PCB failure	Replace PCB
Buzzer continuous beeping	Overload	Replace PCB