

SMART ON-LINE UPS

User's Manual

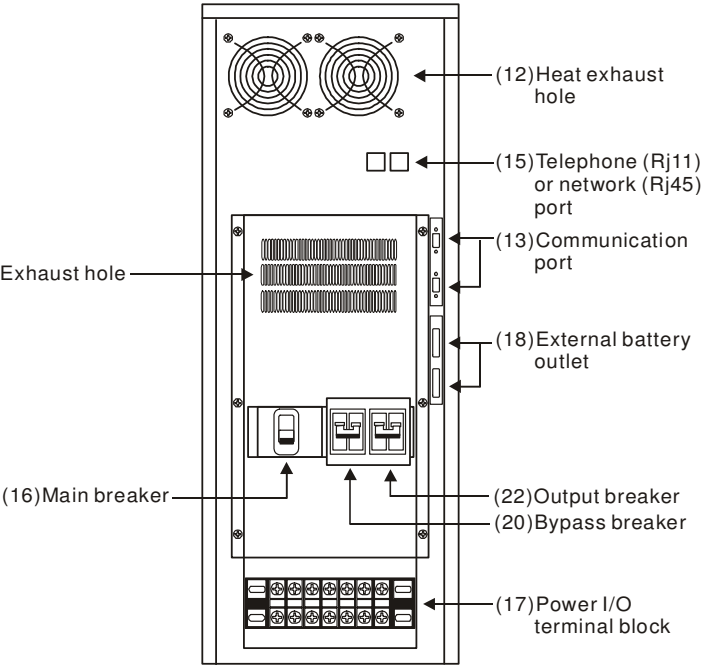


*U*ninterruptible *P*ower *S*ystem

Smart On-Line UPS 2KVA ~ 20KVA



◆ 20KVA



4-1 Function Description

- (1) **LCD display panel :**
Displays the UPS status
- (2) **Select/Light key :**
Allows you to select the LCD screen display on panel, and illuminates when the background light is suspended.
- (3) **Over charge LED :**
LED is on when the battery charging voltage is too high.
- (4) **BAT. level LED :**
Indicates the battery capacity level (5LED's). LED flashes and decreases when the external power is suspended.
- (5) **Over load LED :**
LED flashes when UPS output is overloaded.
- (6) **Fault LED :**
LED is on when UPS is abnormal.
- (7) **Bypass LED :**
LED is on when UPS power output supplied from by-pass.
- (8) **Inv. LED :**
LED is on when the status of the inverter is normal.
- (9) **Line LED :**
LED is on when the line input is normal.
- (10) **Inv. ON/OFF switch :**
This switch allows you to turn on and off the UPS.
- (11) **Battery discharging LED :**
LED flashes when the utility power is failed otherwise this LED is off.
- (12) **Heat exhaust hole :**
This hole allows the system to release the internal heat of the UPS.
- (13) **Communication port :**
This connector allows the UPS to connect the computer.
- (14) **Output receptacles :**
This is the output receptacles of the UPS. Electrical apparatus with relatively smaller load can be connected to this outlet.
- (15) **Telephone(RJ11) or network(RJ45) port :**
Modem and fax machines and computers are protected by integrated surge absorbing element.
- (16) **Main breaker :**

This breaker controls all the power of the UPS.

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- (17) **Power I/O terminal block :**
UPS utility power input, the external battery and the output power are connected to this port.
- (18) **External battery outlet :**
This outlet is used when battery is connected outward.
- (19) **Battery breaker :**
This is the power breaker of the battery.
- (20) **Bypass breaker :**
This is a bypass used when fault occurs in the UPS. (It remains OFF normally.)
- (21) **Input breaker :**
This is the breaker of the UPS utility power input.
- (22) **Output breaker :**
This is the breaker of the UPS AC power output. (It remains ON normally.)

5. Connection/Installation

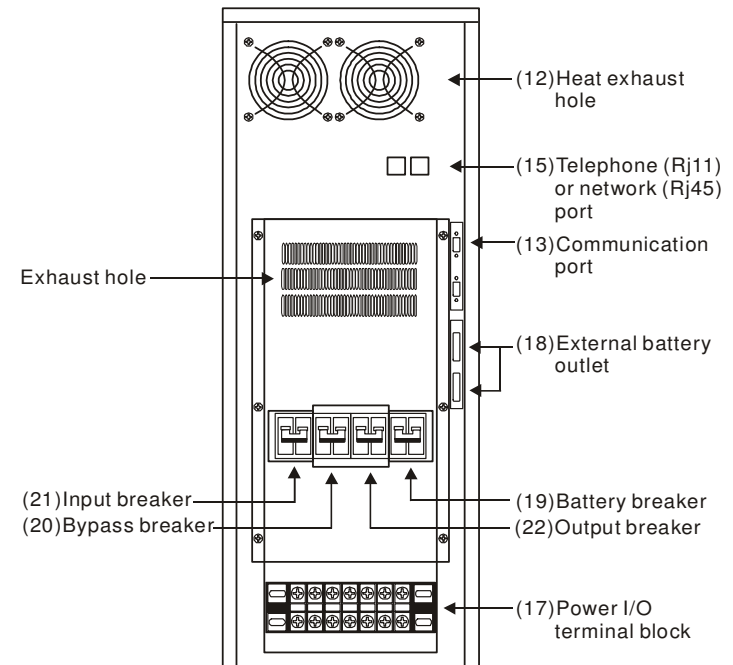
5-1 Input

1. First of all, make sure the UPS specification is in conformity with the input. Please do not connect to a household wall outlet if the current is higher than 15 A.
2. Take off the cover when connecting the lines, put the cover back when finished.
3. Please refer to the following drawings for wiring, and do not connect the electrode to the opposite positions.
4. In shortage of neutral wire from the AC input power source, connect the wire with higher voltage to the front line position and the wire with lower voltage to the neutral position.
5. Make sure the grounding procedure is completed for the safety operation of the computer and personnel.
6. Turn off the power when connecting. (Caution : When constructing, please abide related regulation for electrical work.)
7. Do not use additional apparatus on the same switch when connecting to the power distribution panel.

8. The 'L' on the terminal block stands for the front line position, 'N' for the neutral wire position, 'G' for the grounding position, 'B+' for the position pole of the external battery and 'B-' for the negative pole of the external battery.

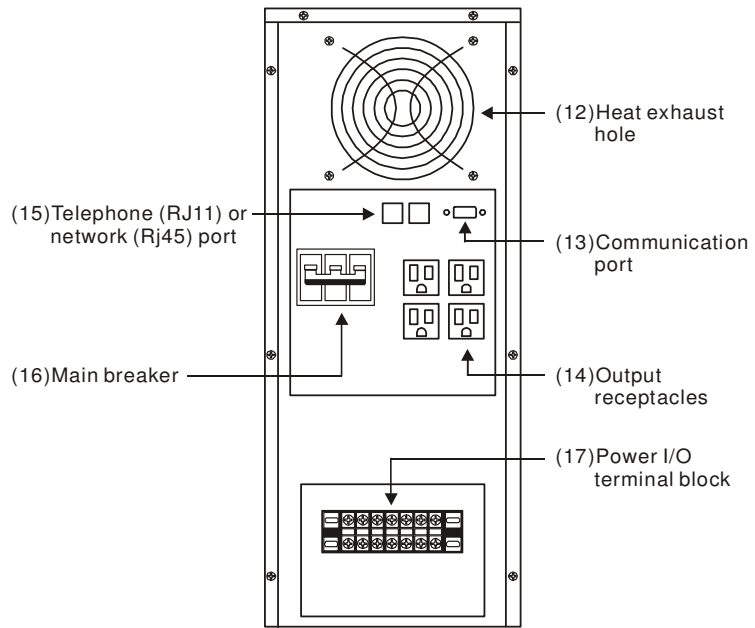
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◆ 10K ~ 15KVA



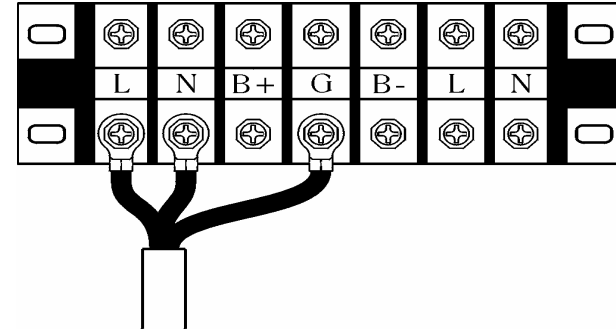
- 10 -

◆ 2K ~ 10KVA



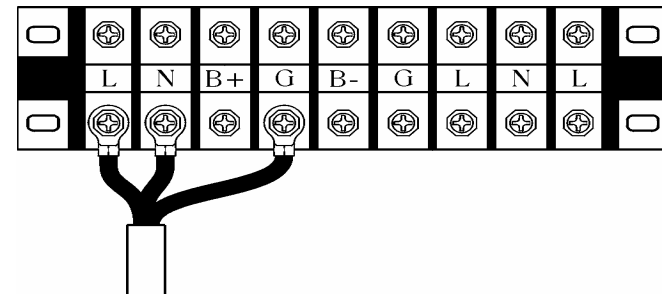
I/P : 1Φ2W

O/P : 1Φ2W



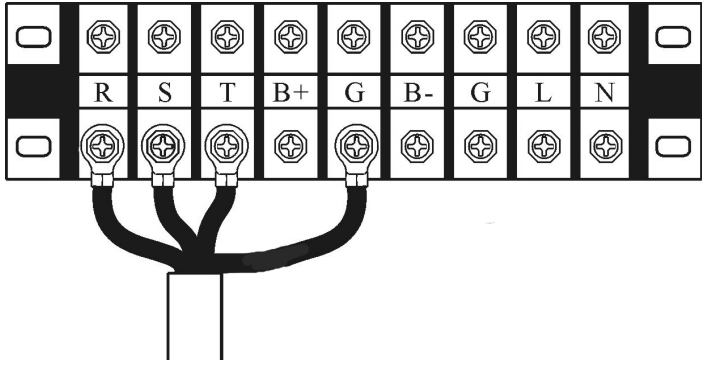
I/P : 1Φ2W

O/P : 1Φ3W



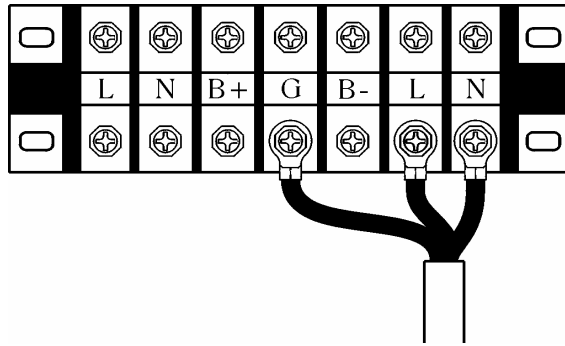
I/P : 3Φ

O/P : 1Φ2W



5-2 Output

1. Some UPS models have outlets on their back. Any apparatus with lower load of 15 A can be connected, and for the higher than 15 A or long distance, connection to the output terminal block is necessary.
2. Please refer to the following drawings when connecting, and do not reverse the electrode directions.
3. Please refer to INPUT section for the Work specification.
4. Please avoid short and overloading.



I/P : 1Φ2W

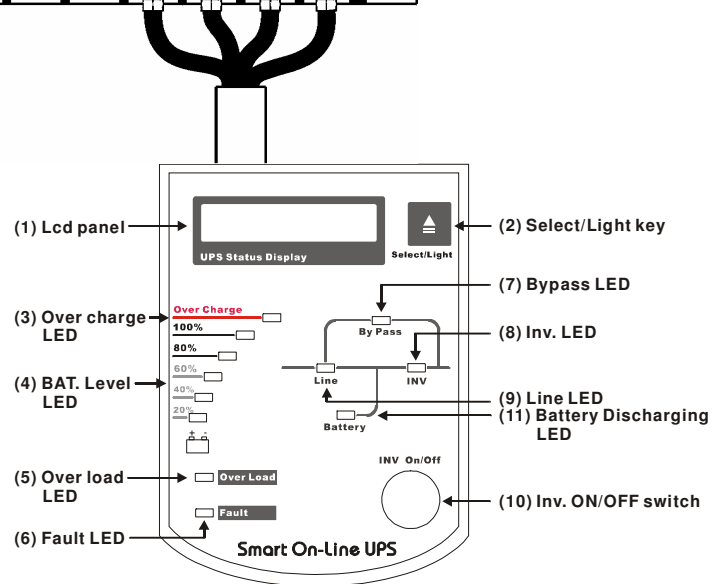
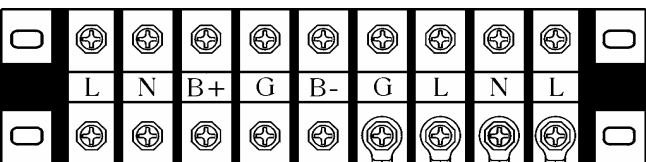
O/P : 1Φ2W

I/P : 1Φ2W

O/P : 1Φ3W

4. The exterior structure and functions





Lcd display panel

3. Technical Specifications

Model		202	302	402	502	602	802	103	123	153	203	
	Capacity		2KVA 1.4KW	3KVA 2.1KW	4KVA 2.8KW	5KVA 3.5KW	6KVA 4.2KW	8KVA 5.6KW	10KVA 7KW	12KVA 8.4KW	15KVA 10.5 KW	20KVA 14KW
Input	Voltage	115V, 230V +/-25%						190V, 208V, 220V, 230V, 240V, 380V				
	Frequency	50Hz or 60Hz ±5%										
	Phase	1φ2ω + G						1φ2ω + G or 3φ3ω + G or 3φ4ω + G				
Output	Voltage	100VAC, 110VAC, 120VAC, 220VAC, 230VAC or 240VAC										
	THD	3% (Linear Load)										
	Voltage Regulation	± 1%						± 1% (±3% with ISO Transformer)				
	Frequency Stability	± 0.5% (Free running)										
	Crest Factor	3 : 1										
	Transient Response	± 5% (100% load change)										
	Short Circuit	Auto cut-off output no transferring to bypass										
	Wave Form	Sine-Wave										
	Transfer Time	Zero-cross transfer										
	Overload Capacity	105%~150% for 30 seconds > 150% for 10 cycle										
	Efficiency	≥83%										
Battery	Battery Voltage	Lead acid maintenance-free battery										
	Battery Type	192V										
	Back up Time (Full)	14mins	8mins	6mins	8mins	6mins	5mins	3mins	4mins	9mins	5mins	
	Recharge Time	5 hours to 90%				8 hours to 90%						
Indicator	LCD	System operating status display, input / output voltage, frequency, output loading%, battery voltage, temperatures °C										
	LED	Line (green), inverter (green), Bypass (orange), battery (green), fault (red), overload (orange), over charge (orange), battery level (5 LED indicators)										
Audible Alarm	Utility Power Fail	Beeping every 4 seconds approx, 2min. Auto-alarm reset										
	Low Battery	Rapid beeping every second as battery approached final discharge										
	Fault, Over Charge	Continuous										
	Overload	Beeping 2 seconds on every other second										
Environment	Humidity	0~90% (non-condensing)										
	Temperature	0°C~40°C (32°F~104°F)										
	Audible Noise	< 50db						< 60db				
Appearance	Weight (kgs)	75	80	88	120	130	140	156	234	320/410	336/436	
	Size W*D*H	235*585*620 mm			265*634*735 mm			285*670 *895 mm	353*930*1017 mm			
Interface	Communication	RS232 / Dry Contact or AS 400 (Option)										

6. Operation

6-1 Turn on the UPS for the very first time :

- 1.Sway the input/output cable by hand and check if it is loosen, if so, tighten it again.
- 2.Check input voltage , and see if it conforms to the specification of the UPS.
- 3.Pull every circuit breaker (16) upward on the back of the UPS. (Some breakers over 10 KVA are sealed by cover, please do not remove for maintenance purpose.) At this moment, LINE LED (9) and BYPASS LED (7) are on, UPS output is exactly the same as the utility power.
- 4.Push the INV ON/OFF switch (10) and UPS executes auto self-monitoring. At this moment INV LED (8) , LCD Display panel (1) and BAT. LEVAL LED (4) are on, and after about 20 seconds the BYPASS LED (7) is off, which indicating the normal operation of the UPS.
- 5.Measuring the output voltages, and see if it fits your requirement.
- 6.If everything goes on smoothly, please turn on your electrical apparatus to enjoy safety use.

6-2 Turn the UPS off :

Turn off all equipments connected to UPS.

Push the INV ON/OFF switch (10) once again. After BYPASS LED (7) is on, but INV LED (8) off, LCD Display panel (1) and BAT. LEVEL LED (4) are off.

Pull all circuit breaker downward on the back of the UPS. The turn off procedure is complete.

6-3 Turn the UPS on for daily use :

Just push INV ON/OFF switch (10) for daily use, no need to turn off the circuit breaker (16) on the back of UPS, otherwise recharging is failed.

Note : Auto system ON/OFF function is available when monitoring software is used.

6-4 Maintenance Switch Operate Procedure for 12KVA, 15KVA, 20KVA :

When UPS fails, users only have to turn off INV Switch (10). The maintenance procedure has to be operated by a technician, or any incorrect operating may damage the connected device (such as a computer) or even UPS.

The operate procedure is as following:

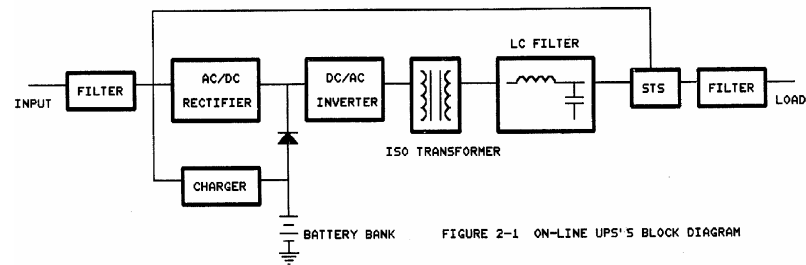
1. First, make sure INV Switch (10) on the front panel has been turned off. When INV Switch (10) is off, the power provision will be switched from INV mode to bypass mode automatically.
2. Remove the maintenance panel on the rear. Then, turn on Bypass Breaker (20).
3. Turn off Output Breaker (22). When Output Breaker is off, the power for any connected equipment (such a computer) will directly be provided by bypass. Attention!! Any incorrect procedure may cause power loss.
4. Now, maintenance of UPS can be preceded. (The mode of Input Breaker (21) or Battery Breaker (19) will not affect the power provision.)

After UPS is repaired, the reboot procedure is as following:

Make sure INV Switch (10) is in OFF mode -> Turn on the Input Breaker (21) -> Turn on Battery Breaker (19) -> Turn on Output Breaker (22) -> Turn off Bypass Breaker (Now UPS is ready for use.)

20 seconds after INV Switch is turned on, the power provision will be switched from bypass mode to INV mode. If everything works as usual, close the maintenance panel.

2-2 On-Line UPS's Structure In Block Diagram



The Smart ON-LINE UPS is a highly acclaimed reliable and intelligent designed UPS. The main features are such as:

- (1) **RECTIFIER** : A Full-Bridge type rectifier to perform the filtering.
- (2) **CHARGER** : For 3 ~ 8 K, the Charger Board is of Boost - Type. For 10 ~ 20 K the Charger Board is of Flyback-Type.
- (3) **BATTERY BANK** : The whole ON-LINE UPS series is of 192 DCV, the battery capacity will be pertinently matched to the various models accordingly.
- (4) **INVERTER** : The device of Inverter is of PWM 20KHZ Full-Bridge design with an Ultra Super Isolated Transformer added.
- (5) **STS(Static Transfer Switch)** : It is functioned by both Relay and TRIAC together.

To provide users the most considerate and convenience, there is a double display system design respectively LCD and LED to indicate a very comprehensive UPS operation mode status in case users are not available with soft ware application.

Whenever the Inverter occurs an unexpected fails or having too much load, circumstances like this for a well-designed UPS, it must be capable to detect by its Auto-detect circuit device and instantly transfer to By-pass (AC Line) by Static Transfer Switch without any interruption, the operation mode is printed in Bold-face line as Figure 1-2 (c). The Inverter will get back in operation when its fault is precluded, until then, the Load side will be supplied by By-pass or to be shut down if AC Line fails at this very same time.

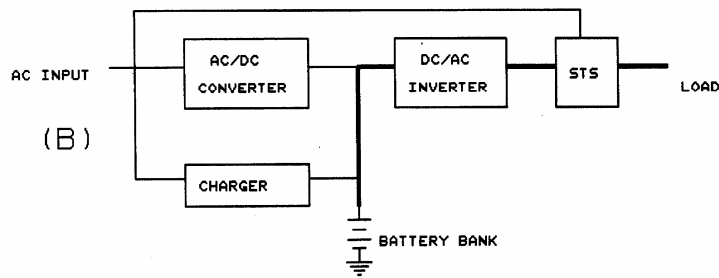


Figure 1-2(b)

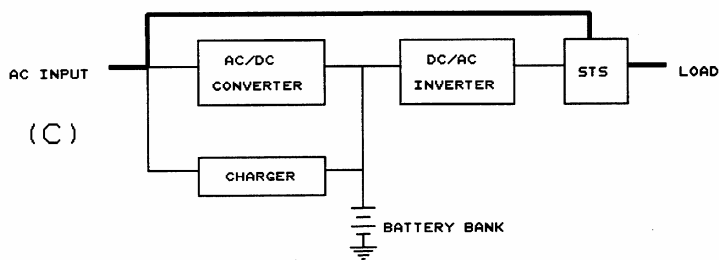


Figure 1-2(c)

6-5 The Operation and contents of the LCD display panel

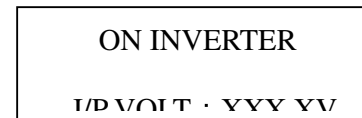
1. Push INV ON/OFF switch (10) and the following screen will show up.



The screen switches to the following after 4 seconds.



Another 20 seconds later, UPS starts normally and screen turns to :



Pushes INV ON/OFF switch (10) once again to turn off the UPS and LCD display screen disappears.

2. The SELECT/LIGHT key (2) use

* The background light of the LCD display panel will auto-disappear after 3 minutes, pushes the SELECT/LIGHT key(2) again to have LCD background light again.

* There are two lines of words indicated on LCD display panel. Upper line indicates the UPS status and the lower line indicates various figures of UPS condition for user under following sequence :

I/P VOLT : **XXX.XV** (UPS input voltage)

O/P VOLT : **XXX.XV** (UPS output voltage)

BAT VOLT : **XXX V** (Battery voltage)

LOADING : **XXX %** (Load %)

FREQ . : **XX.XHZ** (Input frequency)

TEMP : **XX.XC** (UPS Internal temperature)

Push SELECT/LIGHT key once, you can change the screen data displayed on the LCD.

3. The meaning represented UPS status (LCD first line)

ON BYPASS—The UPS is under Bypass status.

ON INVERTER—The UPS works properly.

BACKUP MODE—The UPS is under utility power failure condition.

LOW BATTERY—Indicates the low capacity of battery.

FAULT—Some fault occurs on the UPS.

UPS SHUTDOWN—The UPS is off.

UPS TESTING—The UPS is executing the self-monitoring function.

4. Associated with monitoring software, additional functions are possible except the mentioned function by LCD.

More specifically, there are three respective drawings shown in the below can very clearly indicate how is the ON-LINE UPS really in operation modes. In Figure 1-2(a), the AC Line regularly supplies power to Converter, and then becomes Converter to supply power to Inverter, in the last is the Inverter supplies the power to the Load side. In the meantime, the charger is doing the charging into the Battery set. At the output sector, there is a Static Transfer Switch design to connect the Inverter with the Load, the Bold-faced line print in Figure 1-2(a) exactly shows this mode in operation.

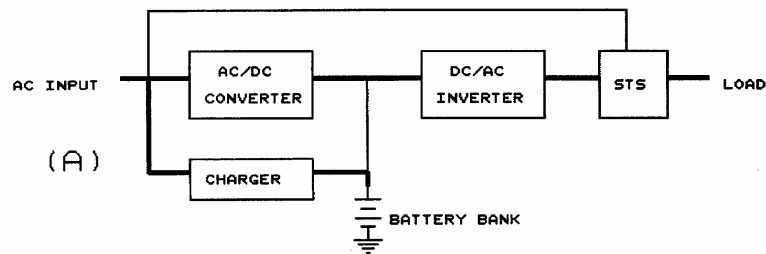


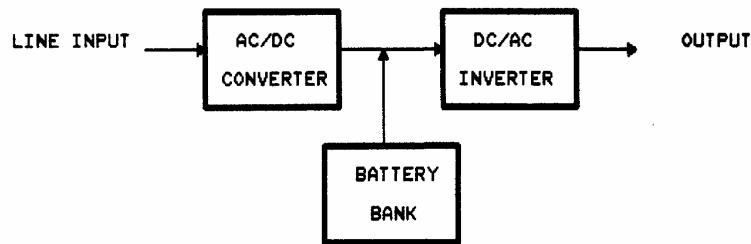
Figure 1-2 (a)

In Figure 1-2 (b), please refer to the Bold-faced line print, when AC Line fails, the Battery set will instantly back up the power to the Inverter and uninterruptedly output to the Load side, the Load side actually will not be affected by the AC fails due to the Zero transfer time. The Battery set which supplies the power to Inverter will steadily keep its output to the Load side and will not be affected by the Battery set's voltage level, only the back-up time will be descended in accords with the decrease of the discharging current. The back-up time is subject to Ampere Hour (AH) or Battery capacity.

2. System Concept

2-1 On-Line Main Designs

There are mainly three major parts to perform the ON-LINE UPS FUNCTIONS, they are AC TO DC Converter, Battery Bank as well as DC to AC Inverter which are all shown as the drawing in the below:



(FIGURE 1-1) ON-LINE UPS MAIN DESIGNS

The figure above shows AC to DC Converter converts AC power into DC power and supplies power also to Inverter as well as to the Charger to proceed the charging to the batteries in the UPS.

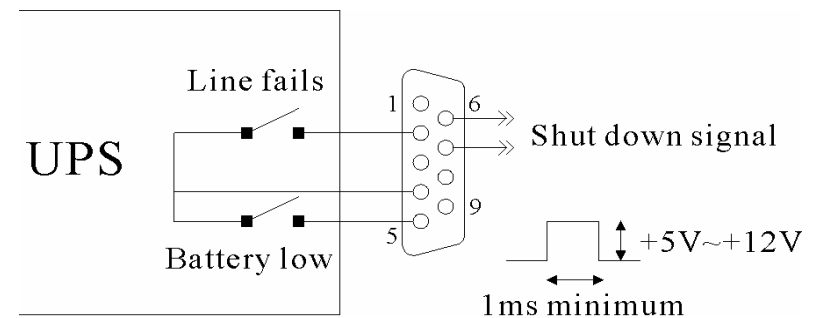
Under normal operation status, the Converter supplies power to Inverter, whenever the AC Line fails, the Battery set will take the role to supply power to Inverter and output the requested Sine Wave to the Load side.

7. The communications interface of computer

The computer communicational interface of UPS "Smart" series is True RS232 if integrated with LCD display panel, otherwise it is a simulative relay interface (DRY CONTACT)

7-1 Simulative relay interface(DRY CONTACT)

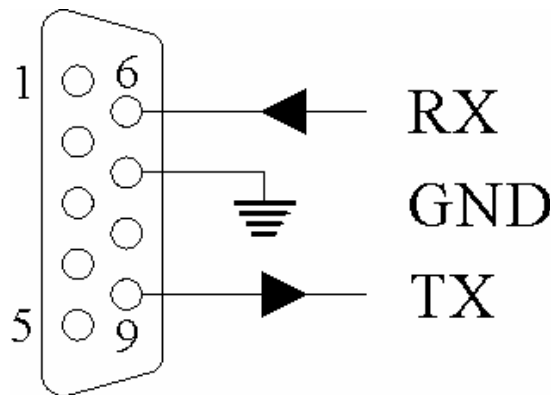
PIN	FUNCTION
2	A closed circuit signal, which can be simulated by UPS when utility power is suspended. It remains open under normal condition and close when the utility power is suspended.
4	The reference point of pin2 and pin5.
5	A closed circuit signal, which can be simulated by UPS when battery capacity is low. It remains open under normal condition and close when the battery capacity is low.
6	Remote control shutdown only 500ms of the voltage is required for this pin. This function is performed only under back up mode.
7	The reference point of pin 6.



7-2 TRUE RS232 Interface

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PIN	FUNCTION	I/O
6	RS232RX	INPUT
7	GROUND	INPUT
9	RS232TX	OUTPUT



Set up of the RS232 Interface is as following :

Baud Rate : 2400bps

Data length : 8bit

Stop bit : 1bit

Parity : None

1-2 Cautions

1. Read this user's manual thoroughly before your use.
2. Follow the indicated instructions step by step.
3. Please handle the machine with care when moving it.
4. When installing the power supply, be sure to follow the instructions.
5. Do not open the engine casting to avoid electric shock hazard to the personnel and machine damage.
6. Please recharge the battery for 12 hours every 3 months, when not in use for a long period.
7. Do not overload, it may cause UPS failure.
8. Always keep the UPS clean.
9. Please retain this user's manual within reachable range for future reference.

1. Introduction

1-1 The introduction of the system

The "Smart" series UPS is a kind of smart on-line sine wave uninterruptible power system, which is intelligent, highly reliable and can provide good quality output AC power. The system is self-sustained and can display its input voltages, output voltages, frequencies, load, battery capacity, battery voltage, temperature and UPS status on both LED and LCD, and no need for the extra monitoring software.

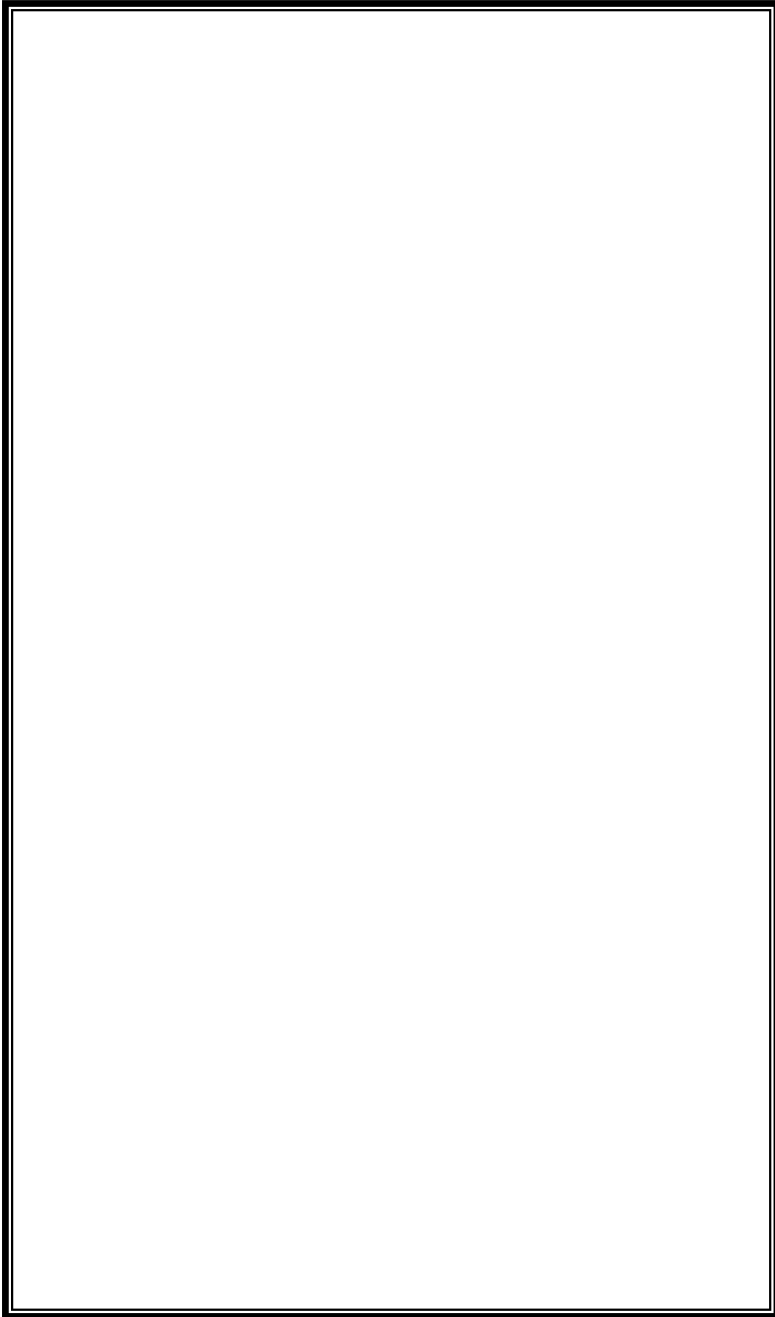
If monitoring software is put in use, the system can also achieve performances of self-examination, time switch and remote control through network, which allows users to manage the power more efficient from a distance. When external power is suspended or UPS battery low, the monitoring function can be triggered unmanned, to achieve the security function of turning off after auto saving system, so as to send out multilateral warning signals, including transmitting the warning message by e-mail automatically, calling the warning message automatically. The users no need to worry for the file the file loss by sudden power cut and real time contingency can be adapted when necessary.

8. Trouble shooting

For daily use, the operating indicators and warning signs on the panel of the UPS are as following :

☆ LED ON ★ LED OFF — Not beep ▲ Beep

LCD	LED Indicator							Beeper	UPS working condition	Solution
	LINE	INV	BYPASS	BATTERY	BAT. LEVEL	OVER CHARGE	OVER LOAD			
On bypass ↓ On inverter	☆	★ ↓ ☆	☆ ↓ 20sec ★	★	☆ All 5 LED ON	★	★	★	Self-exam	None
On inverter	☆	☆	★	★	☆ All 5 LED ON	★	★	★	Normal	None
Backup mode	★	☆	★	☆ Flashing	☆ Flashing and LED decreasing	★	★	★	Utility power failure	Turn off the UPS ASAP
Nil	☆	★	☆	★	★	★	★	★	INV ON/OFF switch (10) is not pushed	Push the INV ON/OFF switch
On bypass	☆	★	☆	★	☆ All 5 LED ON	★	☆ Flashing	★	Overload	Reduce the load until the beeping is off
Low battery	★	☆	★	☆ Flashing	☆ Only 1 LED is flashing	★	★	★	The capacity of the battery is running out	Remove the load and then turn off the UPS
On bypass	★	★	★	☆ Flashing	★	★	★	★	The capacity of the battery is out and the power is not returned yet	Turn it off
Fault	☆	★	★	★	★	★	★	☆	UPS Fault	Restart the UPS if the fault occurs, please contact us for the service
On bypass	☆	☆	☆	★	☆ LED decreasing from 5 to none	★	★	★	UPS charger breakdown	Need maintenance



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