Uninterruptible Power Systems for Three-Phase AC Supply

ON LINE

NT SERIES USER MANUAL

UPS

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1. Important Safety Instructions

- This manual contains important instructions for the unit that should be followed during installation and maintenance of the UPS and batteries. Before attempting to wire or operate the unit, read all instructions thoroughly.
- Install the on-line UPS in a well ventilated area, away from flammable liquids and gases. Do not let the unit come in contact with water.
- External slits and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect from overheating these openings must not be blocked or covered. Objects must never be inserted into ventilation holes or openings.
- Do not stand beverage containers on the unit.
- This UPS was designed to power all modern computer loads and associated peripheral devices, such as monitors, modems, cartidge tape drives, external floppy drives etc.. Do not use it for pure inductive or capacitive loads. It is not rated to power life support equipment.
- All recorded media, such as diskettes, tapes and cartridges should be kept a minimum of 60cm from the UPS. Otherwise, the magnetic field created by operation of the UPS may erase data on those devices.
- All repairs or installation should be performed by qualfied service personnel. The UPS contains voltages which are potentially hazardous. The output receptacles may be alive even when the UPS is not connected to the mains.
- Rick of a possible electrocution is possible when battery is connected to the UPS. Therefore, do not forget to disconnect the batteries before any service is to be done on the UPS. To disconnect, remove the battery fuse its holder which is located at the rear panel of the battery cabinet.
- Isolate Uninterruptible Power Supply(UPS) before working on the circuit. A readily accessible disconnect device shall be incorporated in the fixed wiring.
- HIGH LEAKAGE CURRENT – Earth connection essential before connecting supply.
- The disconnect device shall be a four-pole device and shall disconnect all line conductors and the neutral conductor.
- ATTENTION, hazardous through electrical shock. Also with disconnection of this unit from the mains, hazardous voltage still may be accessible through supply from the battery(ies). The battery supply should therefore be disconnected in the plus and the minus pole when maintenance or service work inside the UPS is considered.
- Do not dispose of batteries in a fire, the battery may explode.
- Do not open or mutilate the battery or batteries, released electrolyte is harmful to the skin and eyes.
- A battery can present a risk of electric shock and chemical hazard. The following precaution should be observed when working on batteries.
  - ∗ Remove watches, rings or other metal objects.
  - ∗ Use only tools with insulated handles.

- The UPS only be installed in accordance with the requirements of IEC 60364-4-48.
- The compliance with the following standards provides the conformity:

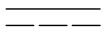
- EN 50091-1-1
- EN 50091-2
- IEC 61000-4-2 Level 4
- IEC 61000-4-3 Level 3
- IEC 61000-4-4 Level 4
- IEC 61000-4-5 Level 4
- IEC 61000-4-6

WARNING

This is a class A-UPS product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take additional measures.

SYMBOL INTRODUCTION

PROTECTIVE GROUNDING TERMINAL: A TERMINAL WHICH MUST BE CONNECTED TO EARTH GROUND PRIOR TO MAKING ANY OTHER CONNECTION TO THE EQUIPMENT.



A TERMINAL TO WHICH OR FROM WHICH A DIRECT CURRENT OR VOLTAGE MAY BE APPLIED OR SUPPLIED.

THIS SYMBOL INDICATES THE WORD "PHASE".

sheet 5 to 6

2. Introduction

The NT series UPS is a dedicated design for large scales of power systems applying on all kinds of data process systems, communication systems, satellite systems, computer network systems, medical device systems, safety and emergency systems, monitoring systems, and all factory facilities.

The NT series UPS employs a high frequency SPWM (Sinusoidal Pulse-Width Modulation) inverter technology. The inverter uses an advanced IGBT module capable to reduce the MTTR (Mean Time to Repair) and easier to be maintained, came with advantages in high efficiency, low thermal loss, low noise, small volume, and long life expectancy. The control implements on MCU that simplifies complicated control circuits and reduces number of components. Besides, in order to improved reliability of UPS, the NT series provides two methods:

Hot standby redundancy: is achieves by dual loops design.
Parallel redundancy: has no need adding external parallel control cards and capable to unite up to 8 UPS units.

A LCD display with multi-language graphical interfaces makes user easier to operate with accurate outputs. System block diagrams and statuses are also available on the interface providing users with clearly operating modes and overall conditions. Users can also implement long-distance monitoring by using various communication ports via computers or network systems. As a result, direct monitoring and controls on the UPS are available for users, which all messages on the interface are generated by MCU. If exclusive software---UPSentry is installed, 31 sets UPS status could be monitoring at the same time via only one PC reducing man forces and facilitating centralized control. The circuit boards of NT-Series could Interchangeable that minimized component-inventory management. Friendly design concepts of NT series UPS to provide optimal and durable quality power and to be the protector of the best power related devices for customers.

3. Operation Mode

There are four basic operation modes for NT series UPS, either of which can deliver loads with reliable, high quality power source in any conditions. The operation modes describe as the following:

3-1 Normal Mode (Single)

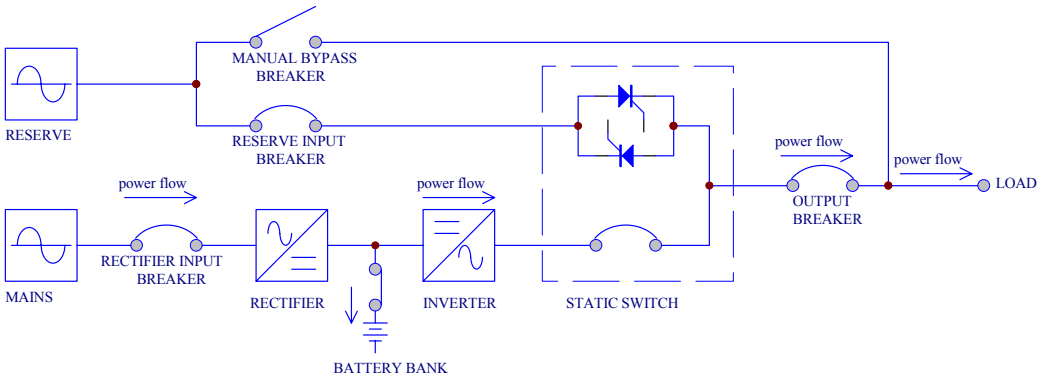


Fig. 3-1 Status block of normal mode

In a normal mode, DC power, rectifying from AC input power, charges batteries and powers the inverter that transforms DC power to stable and clean AC power for the various loads. (Shows in Fig. 3-1)

3-2 Back-up Mode (Single)

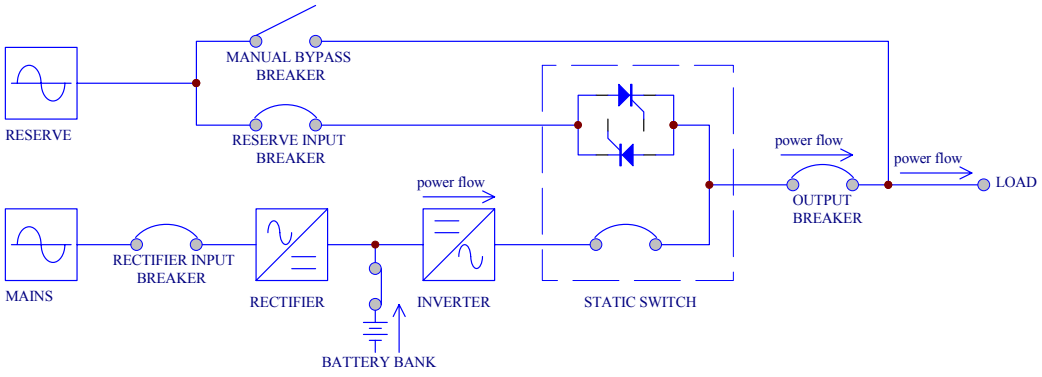


Fig. 3-2 Status block of back-up mode

When the utility AC power fails or other AC power's perturbations occur, the battery will instantly provide DC power to hold continuous operation via AC inverting process. Hence, the UPS output will not be interrupted in any possible conditions for ensuring a power delivering to the load with normal operation

sheet 7 to 8

3-3 Reserve AC Supply Mode(Single)

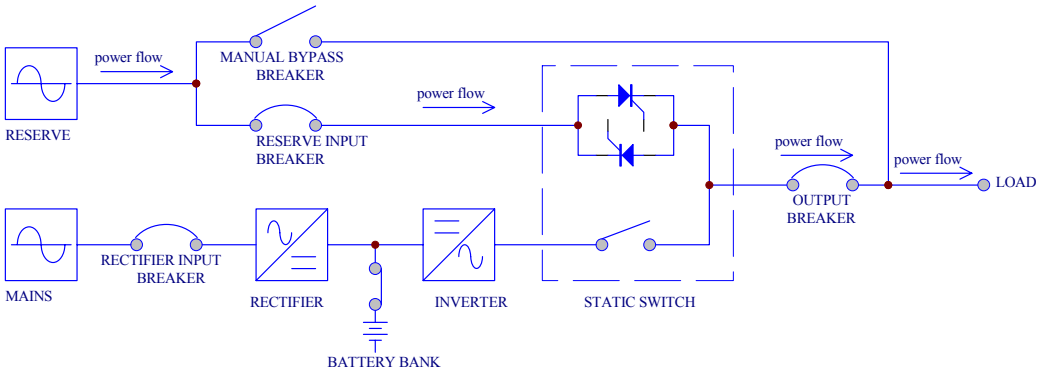


Fig. 3-3 Status block of reserve AC power supply mode

When inverter encounters abnormal situations such as over temperature, long-time overload, output shorted, abnormal output voltage, and battery exhausted, the inverter will automatically shutdown itself due to self-protection. Meanwhile if the reserve AC power is normal, the static switch will transfer the load to the reserve AC power source without any interruption of power supply. After the abnormal situations are eliminated, static switch shall transfer the load back to inverter. (Shown in Fig. 3-3)

3-4 Maintenance Bypass Mode (single)

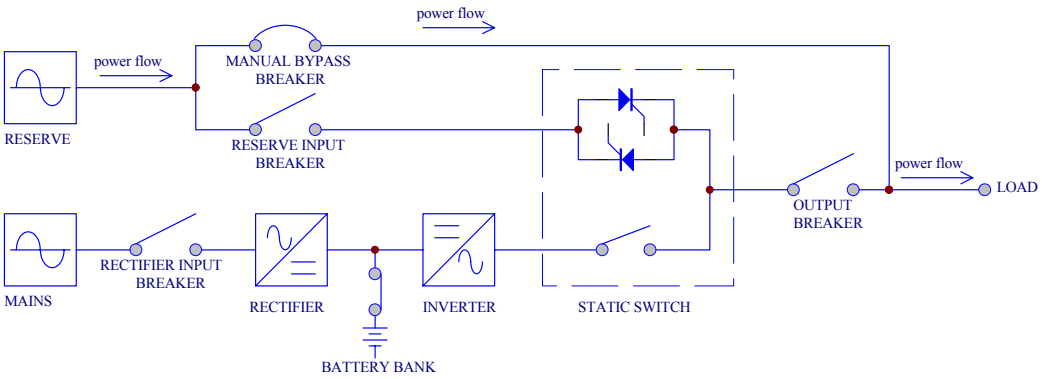


Fig. 3-4 Status block of maintenance bypass mode

When maintenance is needed, power can be switched from inverter mode to bypass mode manually with continuously power delivering to the load. No potential risks among the switching process for service personnel. (Shows in Fig. 3-4)

Note: If only single mains power is available, please utilizes the same power source for reserve AC input and rectifier input.

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3-5 Normal Mode (Parallel)

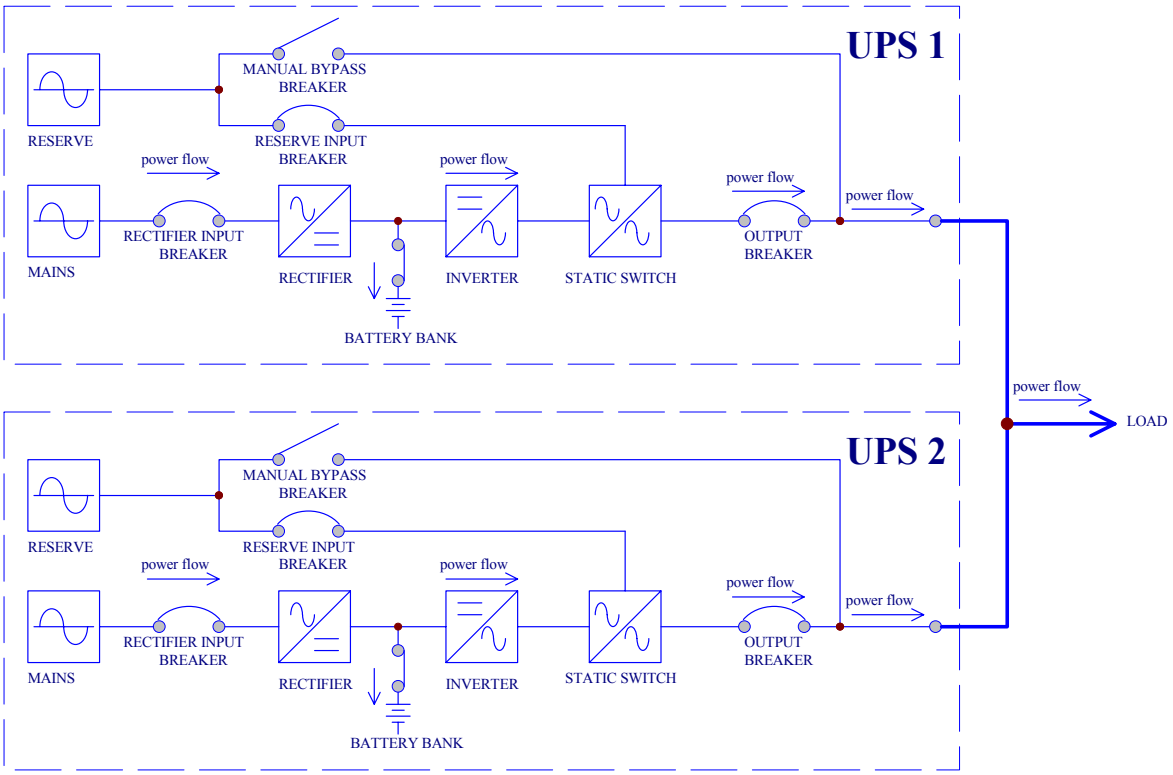

Fig. 3-5 Parallel status block of normal mode

Two or more UPS units operating in parallel have to satisfy requirements of the same capacities, output voltages, frequencies, and equal load share. If one of units fails and its loads are less than the sum of rated-load values of other units in parallel, the rest of units can share the sum of loads, else all UPS units showdown inverter and transfer the load to reserve AC power. (Show in Fig. 3-5)

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3-6 Back-up Mode (Parallel)

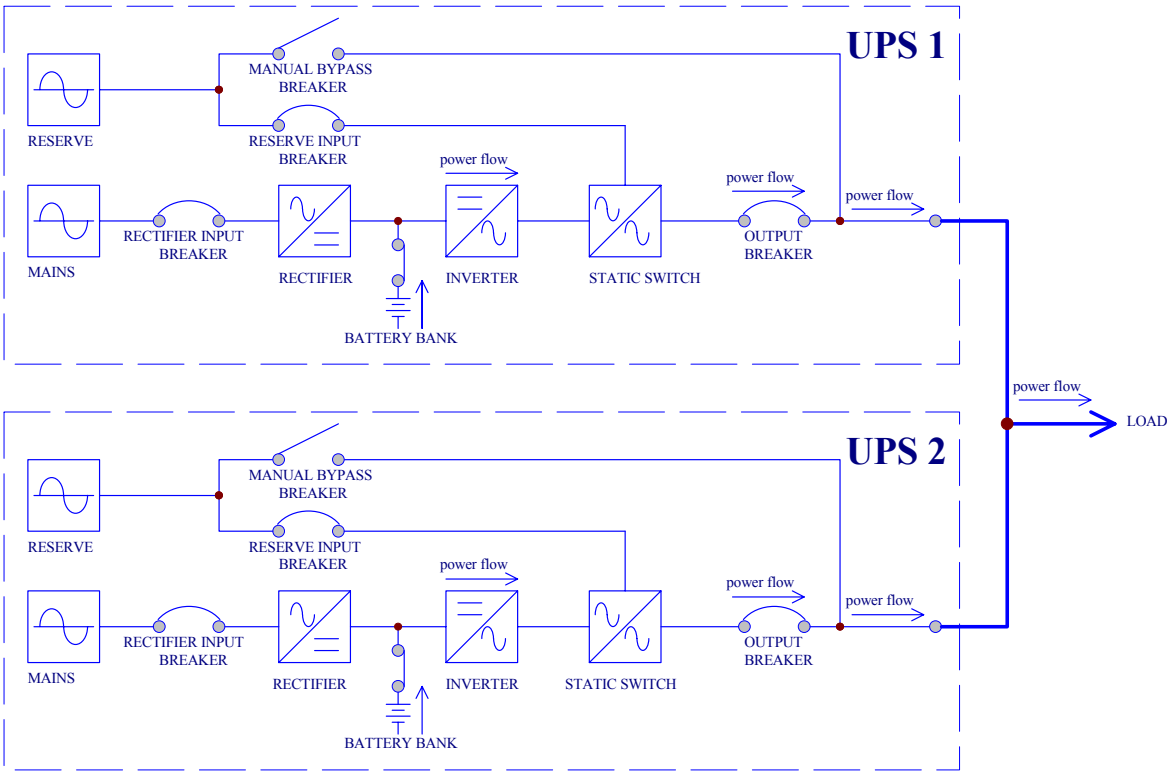


Fig. 3-6 Parallel status block of back-up mode

When the utility AC power fails or other AC power's perturbations occurs, the battery will instantly provide inverter with DC power for a continuous operation. Hence, the UPS output will not be interrupted with quality AC power delivering to the load. (Shows in Fig. 3-6)

sheet 10 to 11

3-7 Reserve AC Supply Mode (Parallel)

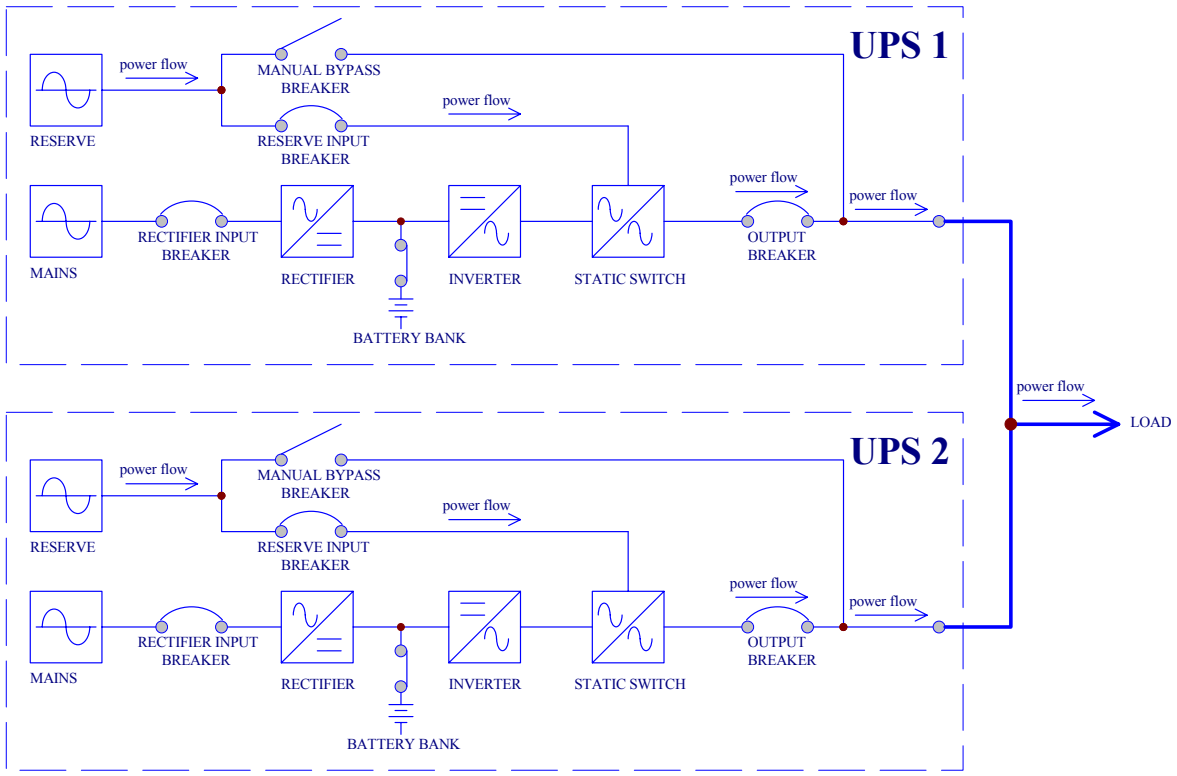


Fig. 3-7 Parallel status block of reserve AC power supply mode

When the inverter in abnormal situations such as over temperature, long-time overload, output short circuit, abnormal output voltage, and battery exhausted, the inverter will shutdown due to self-protection function. If the reserve AC power is normal, all UPS units shall transfer the load to the reserve source without any interruption of power delivering. After eliminating the abnormal situations of inverter, static switch would transfer the load to inverter. (Shows in Fig. 3-7)

3-8 Maintenance Bypass Mode (Parallel)

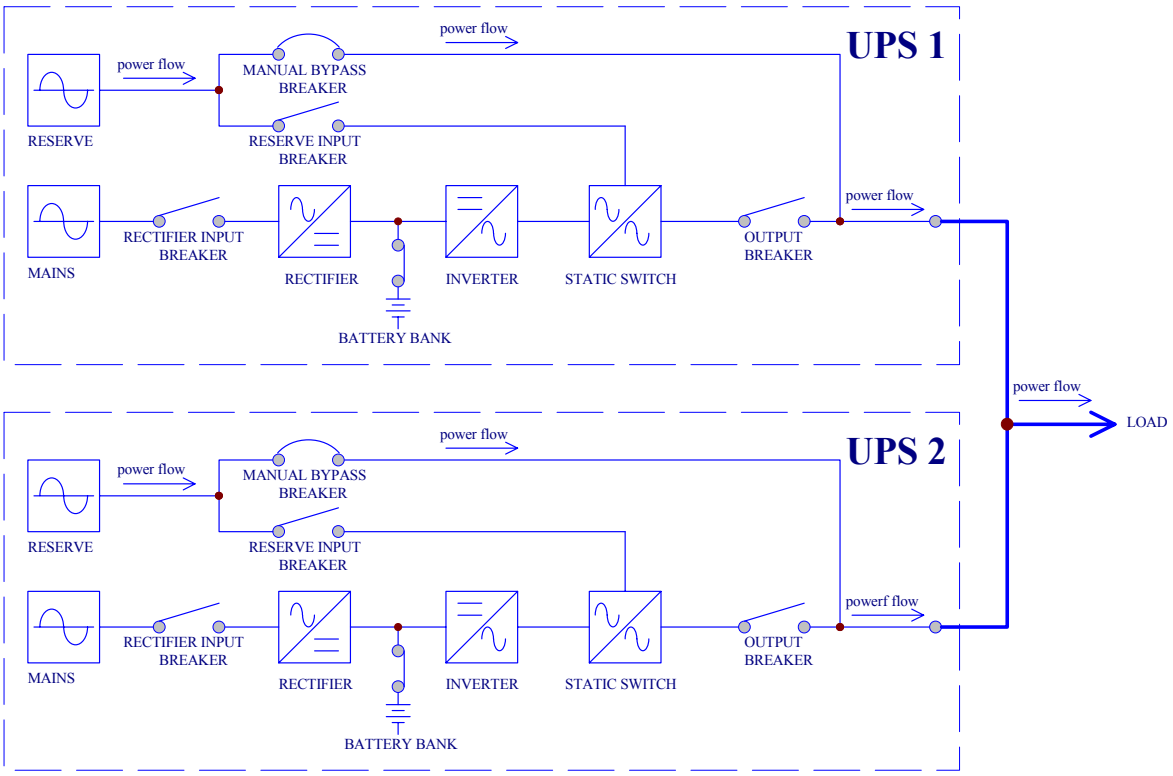


Fig. 3-8 Parallel block of maintenance bypass mode

When maintenance is needed and reserve power is normal, then, power can be switched from inverter mode to bypass mode manually with continuously power delivering to the load. Under that condition, the internal power system will be completed off except terminal and the switch, marked with " Bypass," still having high-voltages. As a result, risks will not exist in UPS for the safety of service personnel. (Show in Fig. 3-8)

3-9 Hot Standby Redundancy

In hot standby redundancy configuration, UPS1 O/P connected to the reserve power of UPS2.(Show as Fig. 3-9) This configuration would reduce the probability of cut off power supply and improved the quality in the supply of power.

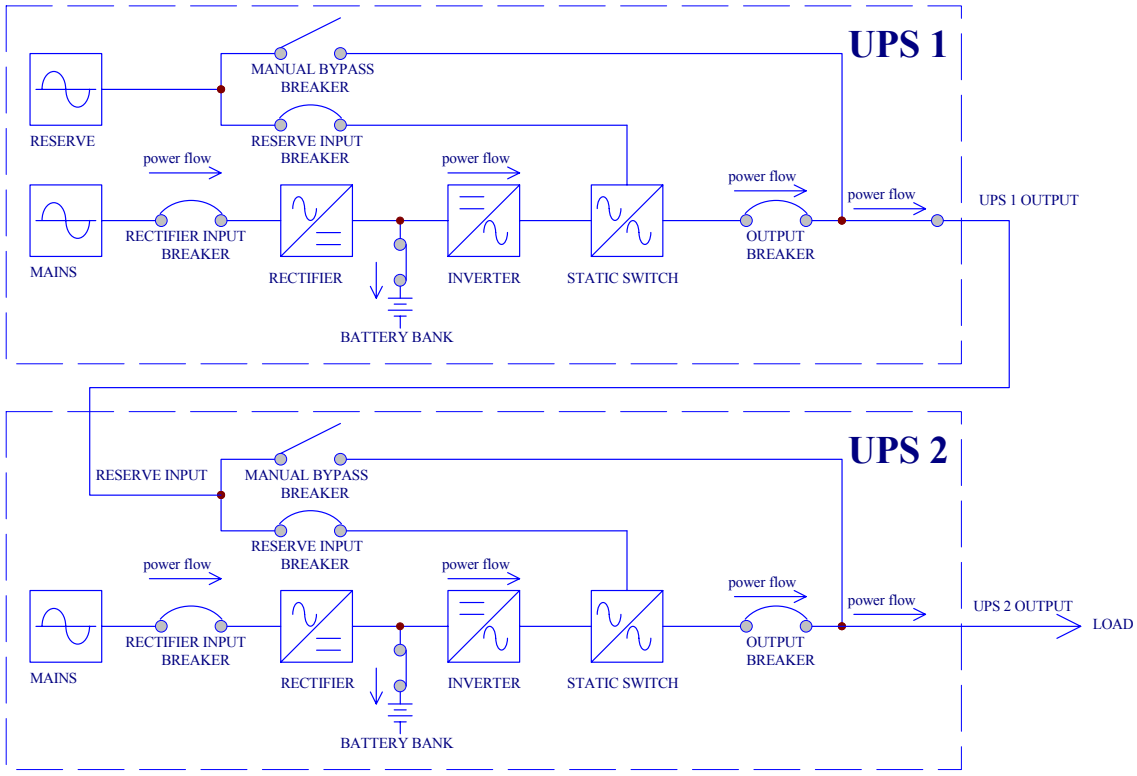
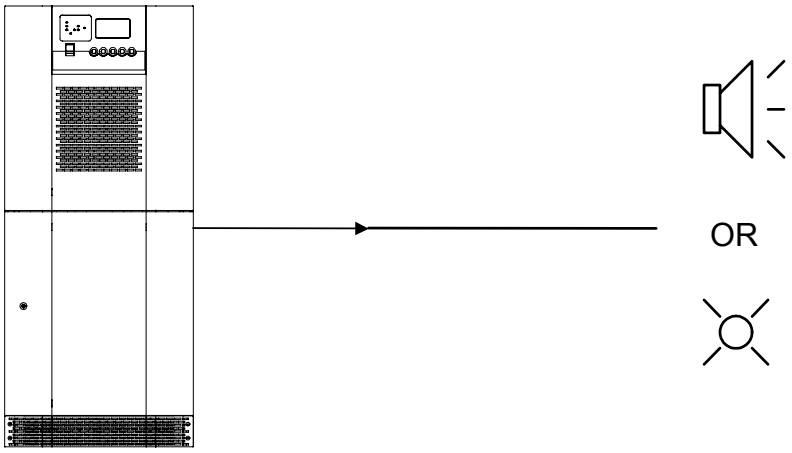


Fig. 3-9 Hot-standby configuration

In normal condition, the UPS2 supply the load. If the UPS2 fails, the static switch transfers the load to UPS1(reserve power of UPS2) without a break in the supply of power. In order to reduced cost, the O/P of UPS1 could simultaneously connect to UPS2, UPS3, …..etc..

sheet 13 to 14

3-10 Dry Contact



UPS

Fig. 3-10

The NT series UPS provides 6 statuses of dry contacts that can programmable and the dry contact can set to Normal Open or Normal Close. The 6 dry contacts of default value indicates as follow:

1. Normal: UPS normal.
2. Reserve: When inverter abnormal, load transfers to reserve power.
3. Back-up: When mains abnormal, battery supply the load.
4. BAT_LOW: When mains abnormal, battery supply the load and battery discharge exceed the setting voltage.(lower than 330V)
5. RES Main Fail: in UPS normal, if reserve power abnormal (frequency or phase sequence), the output frequency will base on the rated frequency.
6. BATT test Fail: When executed battery test, battery test abnormal.

3-11 Common Battery

When many UPS units parallel, so as to reduce cost and save the install space, these UPS units can use same battery bank. (Show in Fig. 3-11)

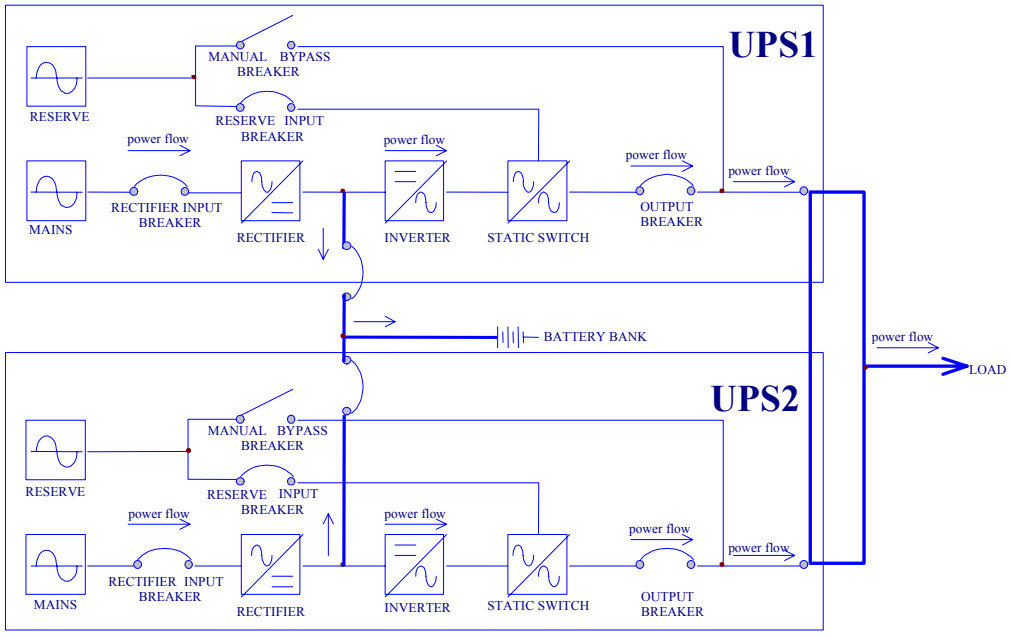


Fig. 3-11 Common battery configuration

1. When many UPS units use one battery bank, can't choose to execute "Battery test" from LCD control panel.
2. In common battery configuration, the setting of "Battery Capacity AH" and "Battery Charge Current" in LCD display, shall use actual AH and the total charger current divide UPS units.

   Example: Two UPS units parallel, the capacity of common battery is 100AH, when choose the charge current to 12A, the setting method is:

   The "Battery Capacity AH" of two UPS units set to 50AH individually and "Battery Charge Current" set to 6A.

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4. Installation

4-1. Electronics Data

3∅ NT Series UPS Technical Data (20 ~ 200KVA)

	Power rating KVA (P.F.=0.8)		20	30	40	50	60	80	100	120	160	200
Input	Nominal voltage	V	380 / 220, 400 / 230, 415 / 240 or 480/277, 208/120 (3∅4W+G)									
	Voltage range	%	±20									
	Nominal frequency	Hz	50 / 60									
	Frequency range	%	±5									
	Input fault current (480/277Vac)	A	41	62	82	102	124	164	204	248	328	408
	Input fault current (400/230Vac)	A	52	78	103	129	155	207	259	310	414	517
	Input fault current (208/120Vac)	A	95	143	190	231	285	380	472	570	--	--
Output	Nominal voltage	V	220, 230, 240 (1∅2W +G) ; ✳1 380 / 220, 400 / 230, 415 / 240 or 480/277, 208/120 (3∅4W+G)									
	T.H.D.(with linear load)	%	≦3									
	Voltage regulation :											
	—static	%	±1									
	—dynamic	%	±5									
	Nominal frequency	Hz	50 / 60									
	Frequency regulation :											
	—with internal oscillator	%	±0.01									
	—with mains synchronize	%	±1									
Alarm	Load on battery		Discontinuous alarm									
	UPS abnormal		Continuous alarm									
Indication	LED status indication		UPS status indication: AC mains normal, reserve source normal, rectifier, inverter, static switch, and battery status indication.									
	LCD display		UPS abnormal status display and self-diagnosis wisely. Input, bypass, inverter, output & battery voltage, current and frequency, load level display.									
Function	Communication interface		Standard: RS232, RS485, Status Dry Contact Option: SNMP, Ethernet Port									
	Parallel redundant		Yes (up to 8 UPS)									
	Emergency Power Off		Yes (Local and Remote)									
	Multi-speed fan speed control		Yes									
	SRAM fault sequence memory		Yes									
	Programmable parameter setting		Yes									
	Battery start function		Yes (option)									
	Input Harmonic improvement		Harmonic filter and 12-pulse rectifier (option)									

Remark: ✳1 : **220, 230, 240 (1∅2W +G) Single phase Output voltage for Model 20kva~60kva only.**

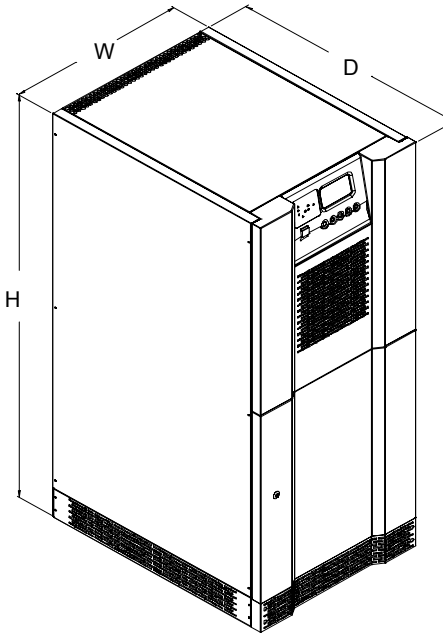
sheet 16 to 17

	Power rating KVA (P.F.=0.8)		20	30	40	50	60	80	100	120	160	200
Remote	Monitor		Multi-unit monitor, graphic display, and history data statistics.									
	Control		Inverter/horns remote control, password setting, fault information reading, and remote alarm.									
Complete system	Overall efficiency：											
	Normal mode	%	90.5	91	91	91.5	91.5	92	92.5	92.5	92.5	92.5
	Inverter overload		110% : 60min			125% : 10min			150% : 1min			
	Static switch overload current:											
	—30 minutes	%	120									
	—30 milliseconds	%	1000									
	Transfer time	msec	0									
	Ambient temperature	℃	0～40									
	Relative humidity (no condensate)	%	90									
	Operating elevation	m	0~2000 (0~6060 ft)									
	Audible noise (at a distance of 1.5m)	dBA	≤ 60	≤ 60	≤ 60	≤ 65	≤ 65	≤ 65	≤ 65	≤ 65	≤ 68	≤ 68
	Dimensions：(Model 400/230Vac only)											
	—width	mm	600	600	600	600	600	600	800	800	1200	1200
	—depth	mm	800	800	800	800	800	800	830	830	830	830
	—height	mm	1400	1400	1400	1400	1400	1400	1700	1700	1700	1700
	Weight	kg	365	365	425	460	506	525	700	745	1050	1085

sheet 17 to 18

4-2. Mechanism Data

4-2-1 20~80KVA



UPS unit profile dimensions table (Model 400/230Vac only)				
Rating (KVA)	Width (mm)	Depth (mm)	Height (mm)	
20~80	**600**	**800**	**1400**	**Fig.4-1**
100	800	830	1700	**Fig.4-2**
120				
160	1200	830	1700	**Fig.4-3**
200				

← **Fig. 4-1**

Front

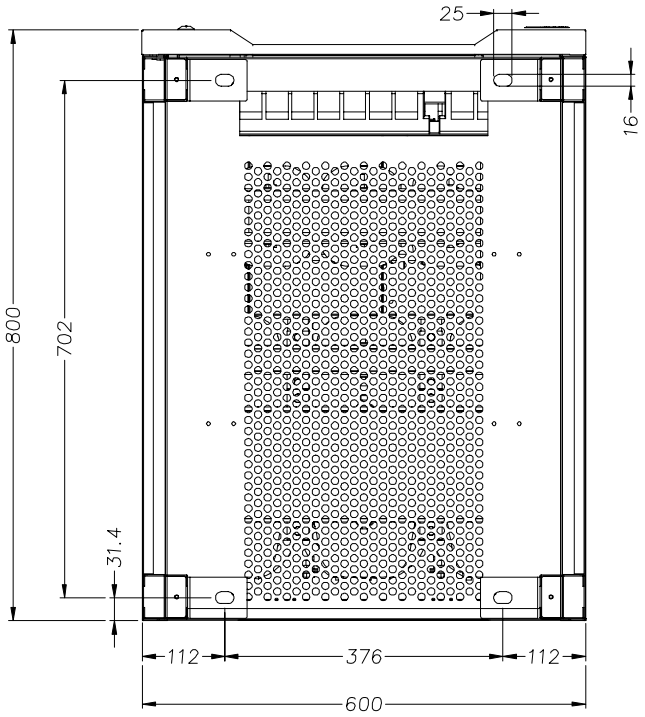
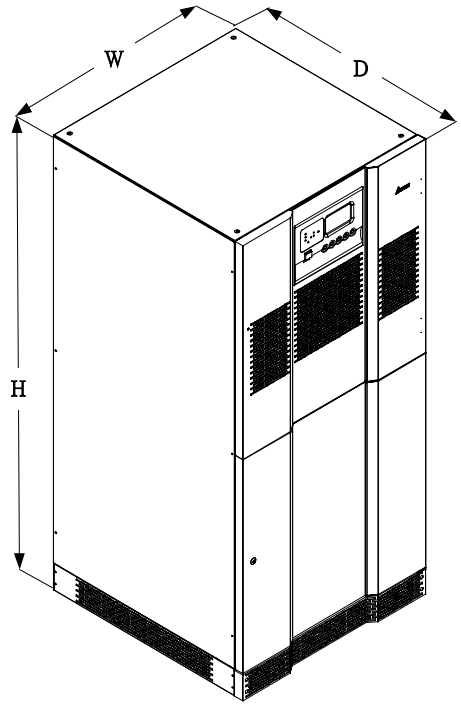


Fig 4-1 Base

sheet 18 to 19

4-2-2 100~120KVA



UPS unit profile dimensions table (Model 400/230Vac only)				
Rating (KVA)	Width (mm)	Depth (mm)	Height (mm)	
20~80	**600**	**800**	**1400**	**Fig.4-1**
100	800	830	1700	**Fig.4-2**
120				
160	1200	830	1700	**Fig.4-3**
200				

← Fig.4-2

Front

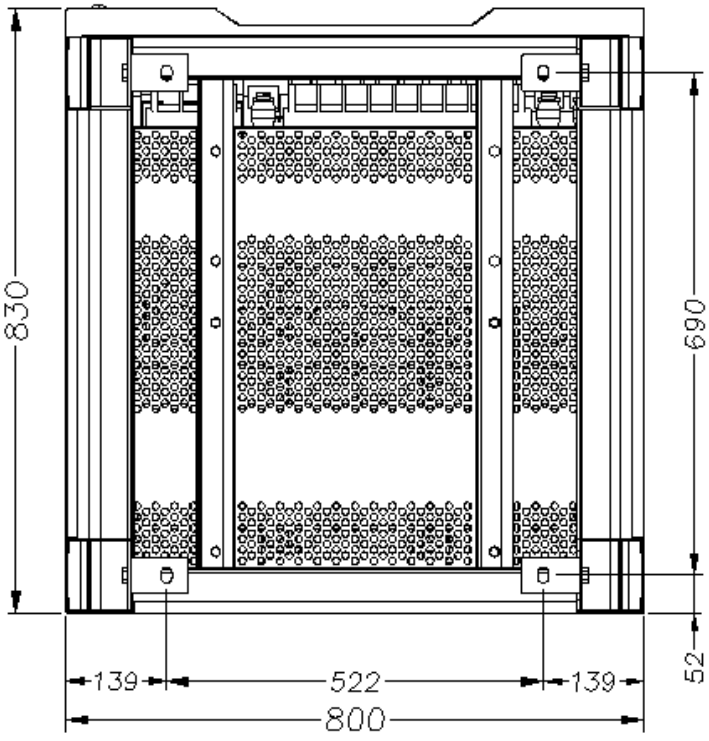
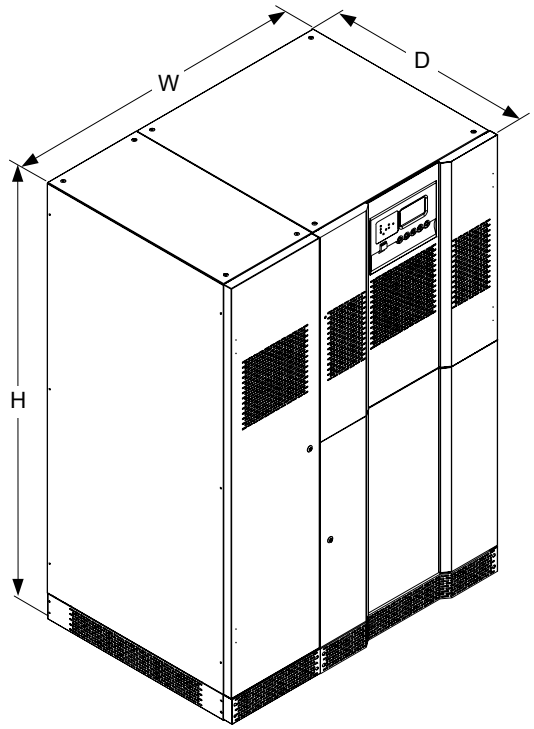


Fig 4-2 Base

4-2-3 160~200KVA



UPS unit profile dimensions table (Model 400/230Vac only)				
Rating (KVA)	**Width (mm)**	**Depth (mm)**	**Height (mm)**	
20~80	**600**	**800**	**1400**	**Fig.4-1**
100	800	830	1700	**Fig.4-2**
120				
160	1200	830	1700	**Fig.4-3**
200				

← Fig.4-3

Front

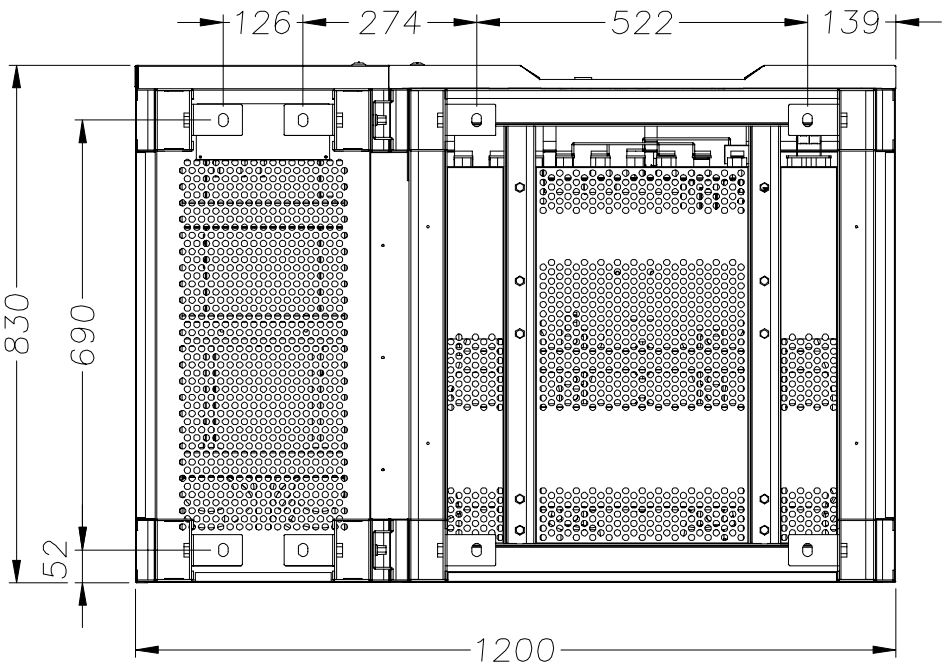


Fig. 4-3 Base

sheet 20 to 21

4-2-4 Battery Cabinet

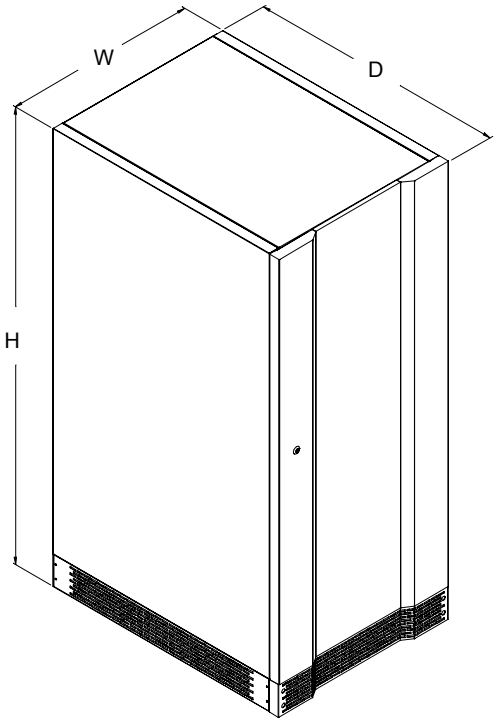


Fig 4-4

Battery cabinet dimensions table (Fig. 4-4)			
Battery type	Width (mm)	Depth (mm)	Height (mm)
12V26AH*29PCS	600	800	1400
12V/40AH*29PCS	600	800	1400
12V26AH*58PCS	900	830	1700
12V/40AH*58PCS	900	830	1700
12V/100AH*29PCS	970	830	1700

4-3 Appearance Diagram

4-3-1 20~80KVA

Fig. 4-5 Front view: can see LCD control panel.

Fig. 4-6 Lateral view: open the front door.

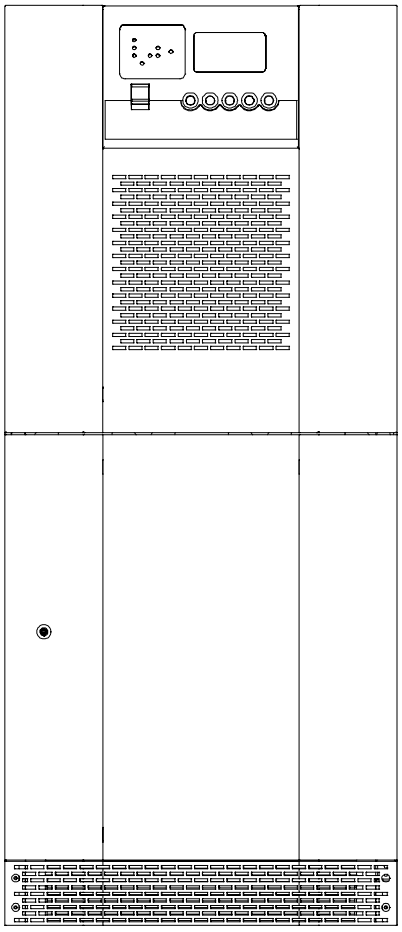


Fig 4-5

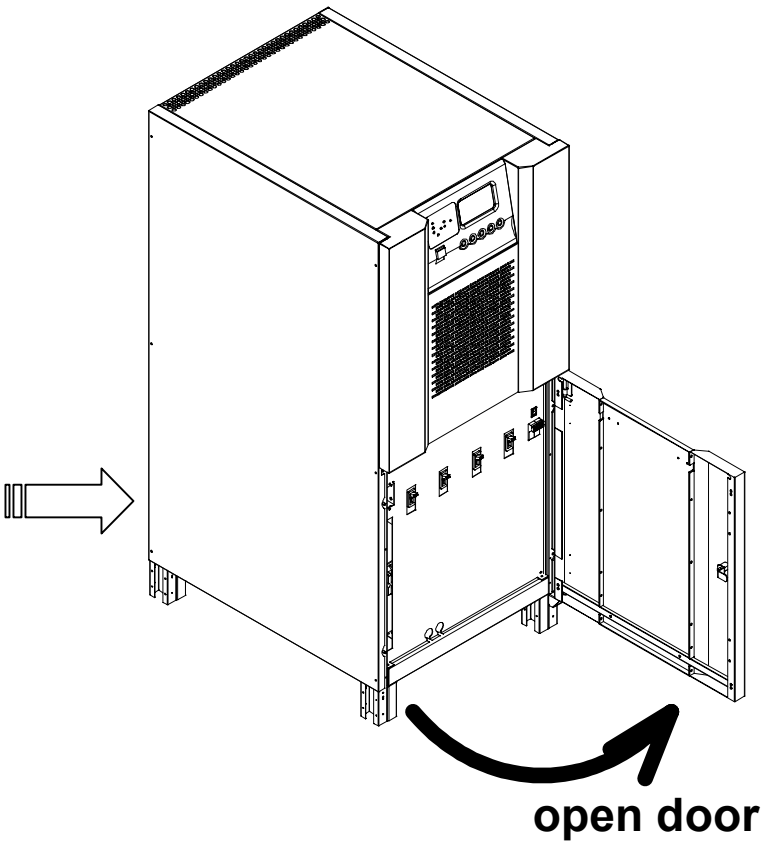


Fig 4-6

sheet 22 to 23

Fig. 4-7 Front view with door open: can see the status switch and communication board.

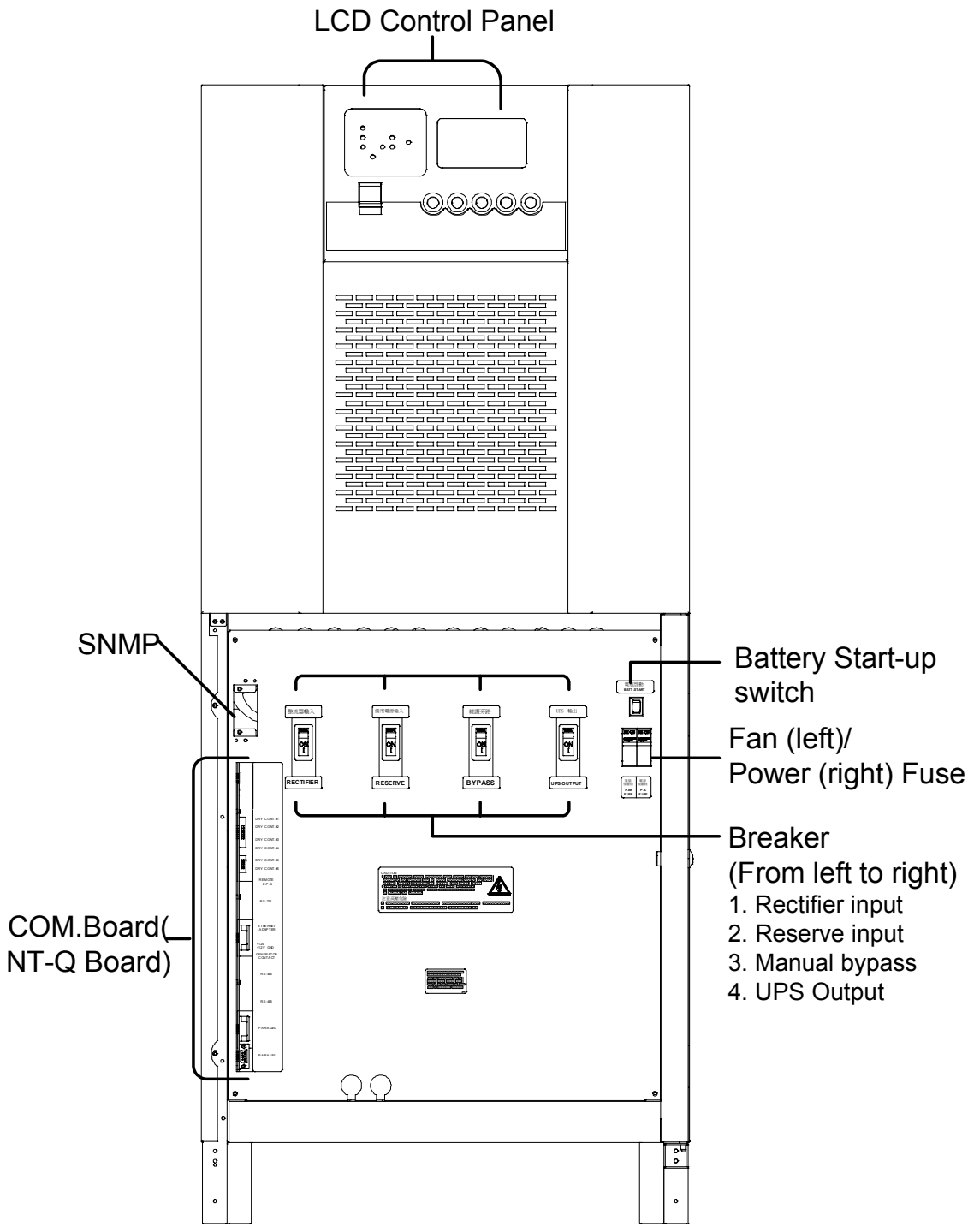


Fig 4-7

sheet 23 to 24

4-3-2 100~120KVA

Fig. 4-8 Front view: can see LCD control panel.

Fig. 4-9 Lateral view: open the front door.

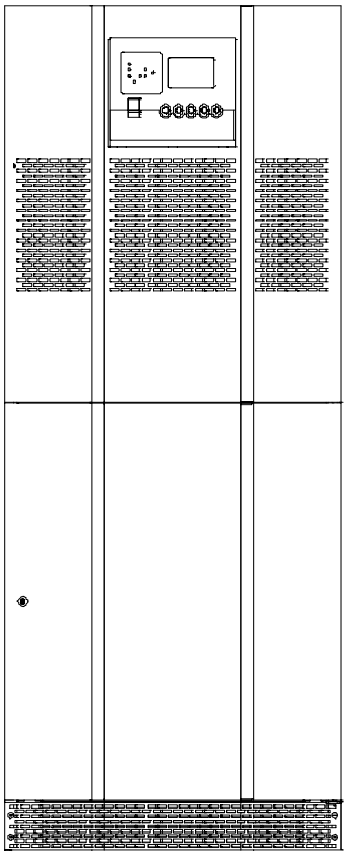


Fig. 4-8

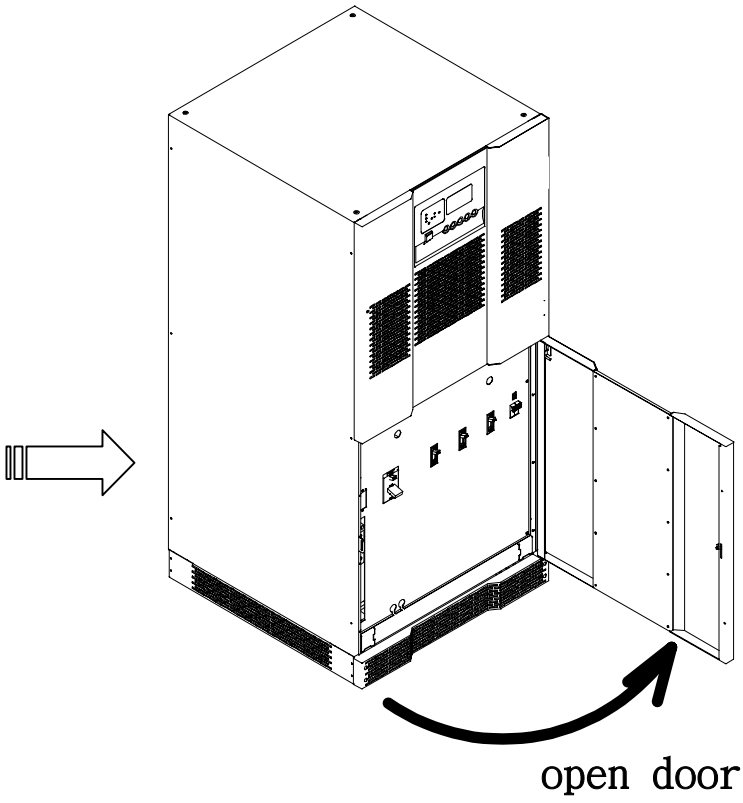


Fig. 4-9

Fig. 4-10 Front view with door open: can see the status switch and communication board.

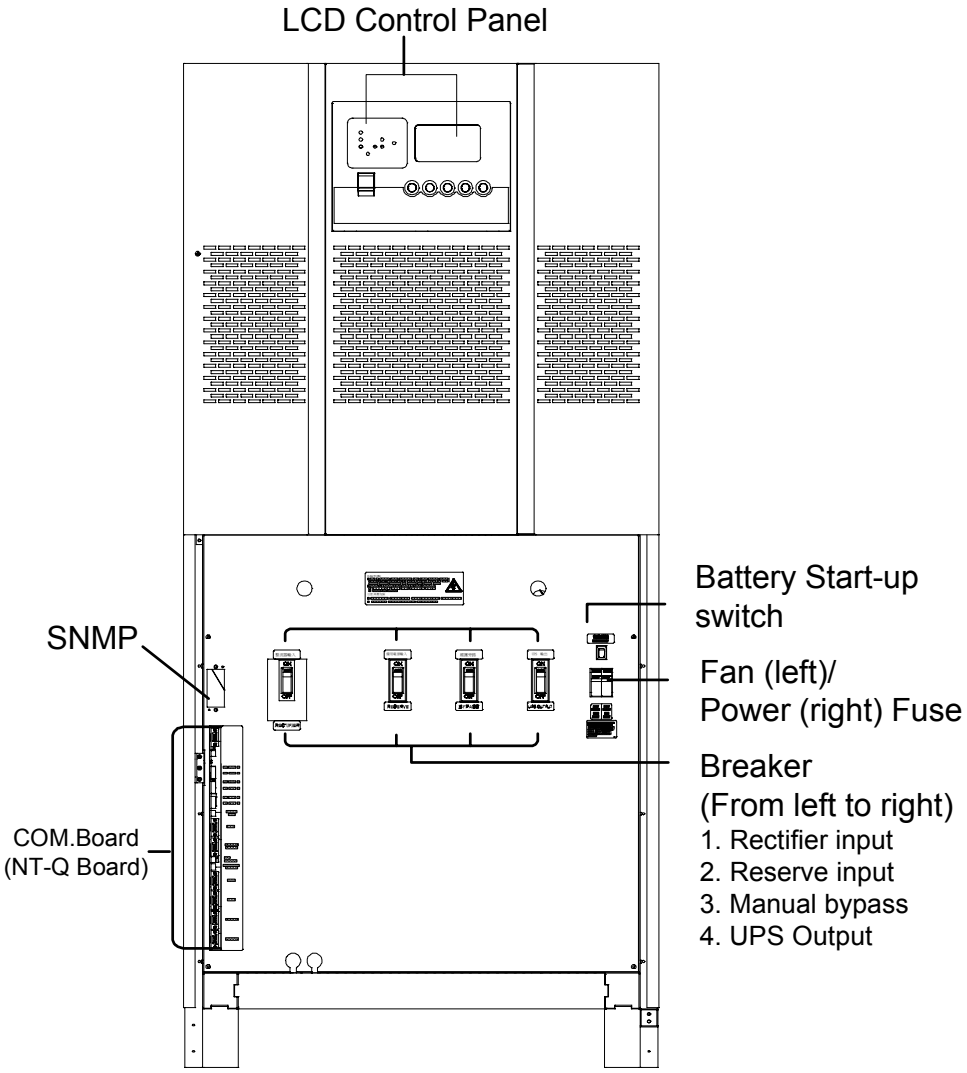


Fig. 4-10

sheet 25 to 26

4-3-3 160~200KVA

Fig. 4-11 Front view: can see LCD control panel.

Fig. 4-12 Lateral view: open the front door.

Fig. 4-13 Front view with door open: can see the status switch and communication board.

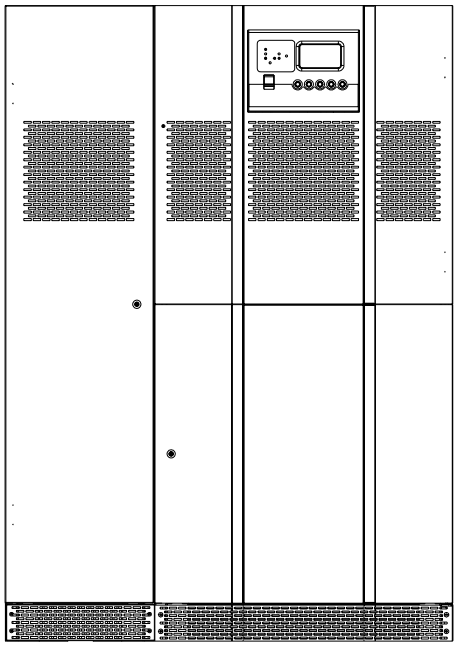


Fig. 4-11

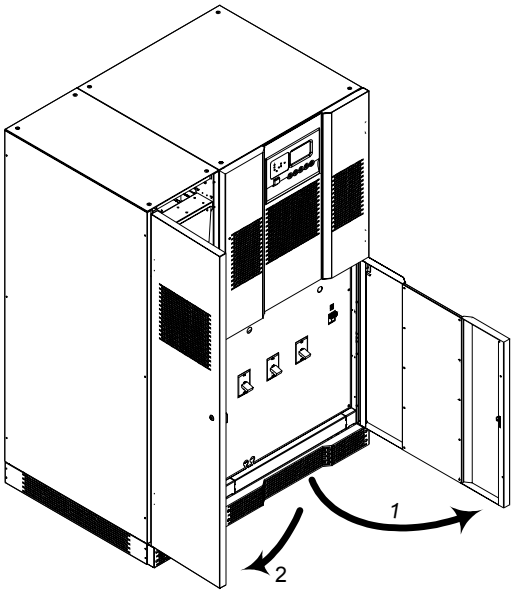


Fig. 4-12

Fig. 4-13 Front view with door open: can see the status switch and communication board.

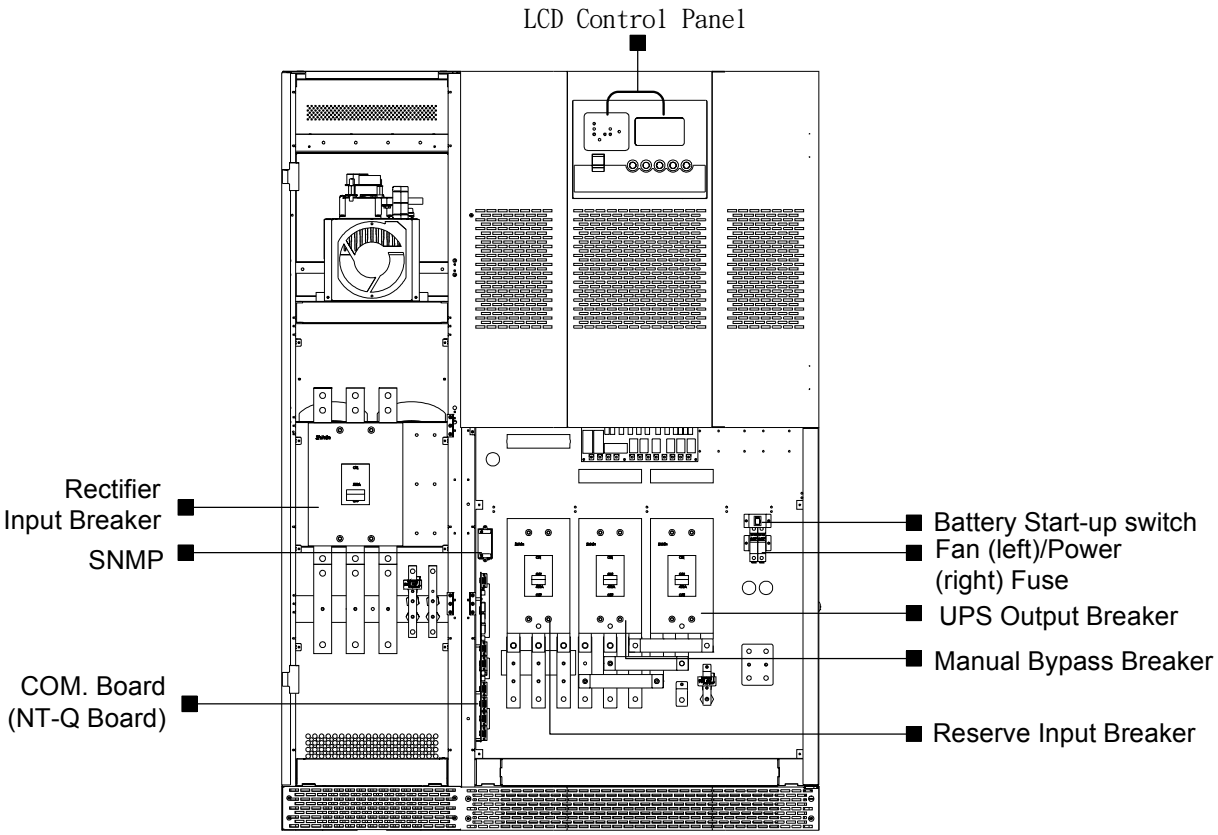


Fig. 4-13

sheet 27 to 28

4-4 Location Environment and Safety Precaution

For ensuring UPS normal operation, prolonging UPS lifetime, and protecting UPS from disorder and malfunction, users should select an optimal installing location and environment according to the following instructions, and observe the noticed items of safety.

1. The UPS only place indoors, can't place outdoors.
2. The weight of the UPS system is concentrated on a relatively small floor area due to the cabinet design. The installing location must therefore have a sufficient floor loading capacity adequate to bear the load.
3. The UPS and battery cabinet should be located on enough space for maintenance and good ventilation.
   Rear panel should be kept away from wall at least 50 cm.
   Ahead area of UPS should be kept at least 100cm.
   On top of UPS should be kept at least 50cm.
4. For optimum performance and reliability to prolong UPS lifetime, the temperature should be kept below 25℃environment, and humidity must be maintained within a range of 0 to 95% (non-condensing).
5. Check the length and diameter of wires for standard.
6. Walls, ceiling, floors, as well as everything surrounding or near the UPS should be preferably constructed of noncombustible materials. The room should be equipped with a portable fire extinguisher.
7. The floor area surrounding the UPS should be kept clean. Access to the UPS room should be limited to a minimum number of operation and maintenance personnel only. The doors should be kept locked and the keys should be controlled to authorized personnel only.

4-5 Electrical Connect Precaution

1. Ensuring input power was turn off.
2. Check the cables size of input, output and battery cabinet, and ensures the amplitude, phase and polarization of these voltage.
3. Checked the accessories of UPS unit and battery cabinet, and inspected the profile with a knock or component loose or component fall.
4. If the input power and output power of UPS was Y connection, then Neutral wire wasn't connect together with Ground wire. If the input power system existed a floating voltage between Neutral and Ground, and client requested the V_{NG} must be 0 volt inside the UPS, then recommended client to add an isolation transformer in the input of UPS, and Neutral wire connect together with Ground wire inside the UPS.
5. When parallel connection of UPS units, the total length of input cables and output cables must be same in each UPS unit.
6. **Battery cabinet must be grounded by cable and connected to UPS terminal pole "Battery Cabinet Ground", Battery cabinet should not connect to any other Grounding system.**

4-6 UPS Installation Checklist

All the followings need to be complied with before UPS installation:

1. Whether the floor area where the UPS placed has enough supporting strength.
2. Whether the entrances and hallways have enough spaces for UPS transportation.
3. Whether the UPS placed cell-room has enough space around for UPS ventilation and personnel maintenance.
4. Whether the space between the top of UPS and the ceiling is large enough for heat ventilation.
5. Whether the air conditioning is capable to keep ambient around 25°C.
6. Whether the humidity is in rated limit.
7. Whether the cell room is periodically inspected, and all UPS unrelated stuffs are kept off.
8. If want to improve noise, whether the noise insulation devices are set.
9. Whether all the wiring choices are correct, and diameters of wire comply with electrical standards.
10. Confirm the input power source have been switch off before wiring.
11. Make sure each wire has clear labels for polarities and phases.
12. Whether the floor, wall, and ceiling are made of flameproof materials.
13. Whether the fire extinguisher complies with safety standard.
14. Whether the cell room equips with sprinkler system. (not essential)
15. Whether users know how to operate fire extinguisher.
16. Whether all cell rooms have security lock and UPS door keys are in charge of by specific personnel's.
17. Whether all operators and maintenance personnel have sufficient trainings for the following tasks:
    ---- Procedures of normal and emergency operations.
    ---- Emergency first-aid.
    ---- Usage of fire extinguisher.
18. During installation, ensure that the UPS input neutral is solidly connected to the untility power neutral.

4-7 Floor Weight Loading Table

UPS cabinet

UPS rating (KVA)	20	30	40	50	60	80	100	120	160	200
Weight (Kg)	365	365	425	460	506	525	700	745	1050	1085
Weight loading (kg/㎡)	760	760	885	958	1054	1094	1054	1122	1054	1089

Battery cabinet

Battery Type (AH)	12V26AH* 29PCS	12V/40AH* 29PCS	12V26AH* 58PCS	12V/40AH* 58PCS	12V/100AH *29PCS
Weight (Kg)	360	520	796	1118	1420
Weight loading (kg/㎡)	750	1084	1066	1497	1764

4-8 Cable sizes

UPS Rated VA	I/P Voltage (V)	O/P Voltage (V)	I/P C.B. (A)	I/P Cable (mm^2)	RES C.B. (A)	RES Cable (mm^2)	O/P C.B. (A)	O/P Cable (mm^2)	BAT. Cable (mm^2)	BAT. Fuse (A)
20K	120/208	120/208	100	22	75	22	75	22	14	80
	220/380	220/380	50	14	40	14	40	14		
	277/480	277/480	40	14	30	14	30	14		
30K	120/208	120/208	125	38	100	30	100	30	22	125
	220/380	220/380	75	14	75	14	75	14		
	277/480	277/480	75	14	50	14	50	14		
40K	120/208	120/208	175	50	150	50	150	50	22	160
	220/380	220/380	100	22	75	14	75	14		
	277/480	277/480	75	22	75	14	75	14		
50K	120/208	120/208	200	100	175	60	175	60	50	200
	220/380	220/380	125	38	100	22	100	22		
	277/480	277/480	100	22	75	22	75	22		
60K	120/208	120/208	250	100	200	80	200	80	50	200
	220/380	220/380	150	38	125	22	125	22		
	277/480	277/480	100	30	100	22	100	22		
80K	120/208	120/208	350	185	300	125	300	125	80	315
	220/380	220/380	200	50	150	38	150	38		
	277/480	277/480	150	38	125	38	125	38		
100K	120/208	120/208	400	240	350	185	350	185	100	400
	220/380	220/380	225	80	200	80	200	80		
	277/480	277/480	175	60	150	38	150	38		
120K	120/208	120/208	500	250 or 100*2	400	200 or 80*2	400	200 or 80*2	125	400
	220/380	220/380	300	125	225	100	225	100		
	277/480	277/480	225	80	175	60	175	60		
160K	120/208	120/208	700	185*2	600	150*2	600	150*2	100x2	600
	220/380	220/380	350	185	300	150	300	150		
	277/480	277/480	300	125 or 50*2	250	100 or 38*2	250	100 or 38*2		
200K	120/208	120/208	800	240*2	700	185*2	700	185*2	100x3	600
	220/380	220/380	500	80x2	400	185 or 80*2	400	185 or 80*2		
	277/480	277/480	350	185 or 60*2	300	150 or 50*2	300	150 or 50*2		

20 ~ 200KVA cable sizes select table

sheet 32 to 33

4-9 Electrical Connections

Attention:

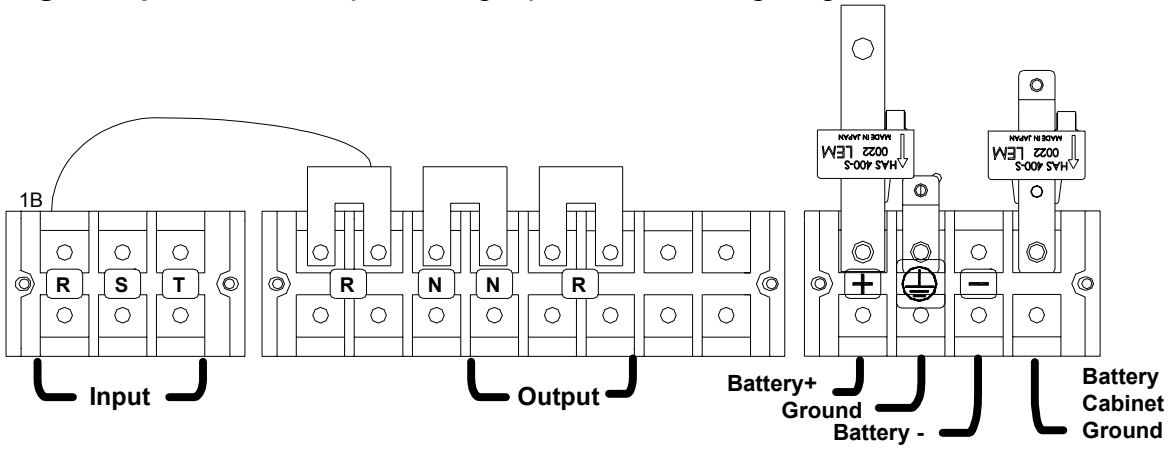
a. ac power source connection: Three phase(R/S/T) of power source must be in positive phase sequence and the R/S/T/N cables must be connected to the terminal poles “R” “S” “T” “N”, indicated in figure.

b. Battery source connection: The positive / negative pole of battery bank must be connected to the terminal pole ”+” and “-”, indicated in figure.

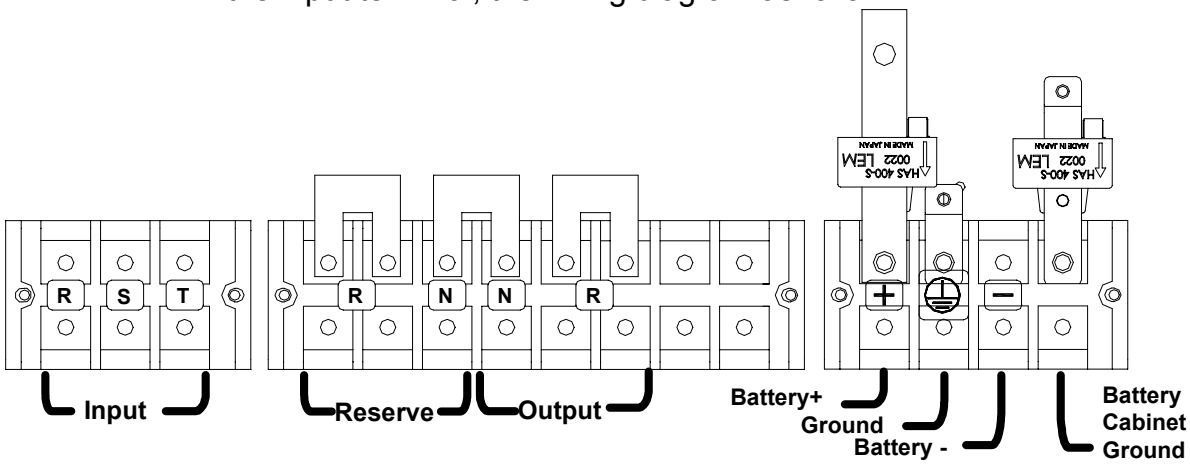
c. Battery cabinet grounding connection: battery cabinet must be grounded by cable and connected to UPS terminal pole” Battery Cabinet Ground”, **Battery cabinet should not connect to any other Grounding system.**

4-9-1 20~60KVA Output 220Vac Terminal wiring diagram

Single loop: When the input is single power, the wiring diagram as follow:



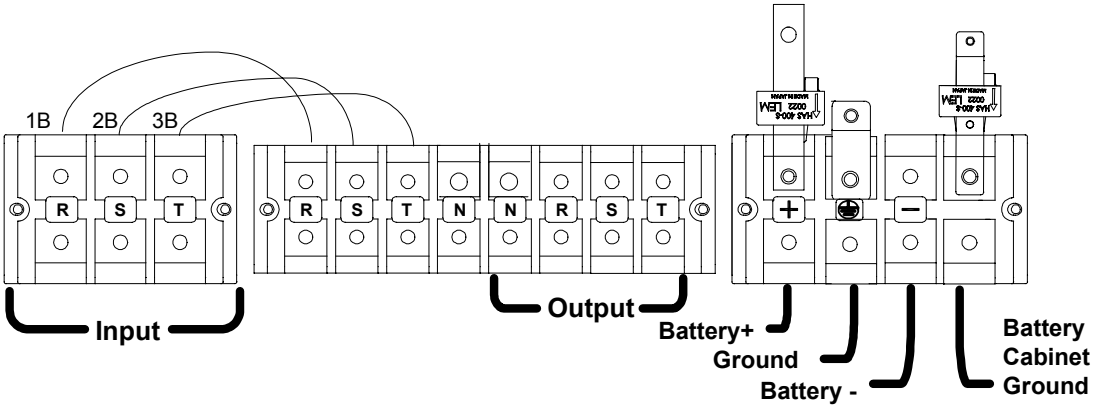
Double loop: When the input is double power, remove the cables (wire number 1B) on the input terminal, the wiring diagram as follow:



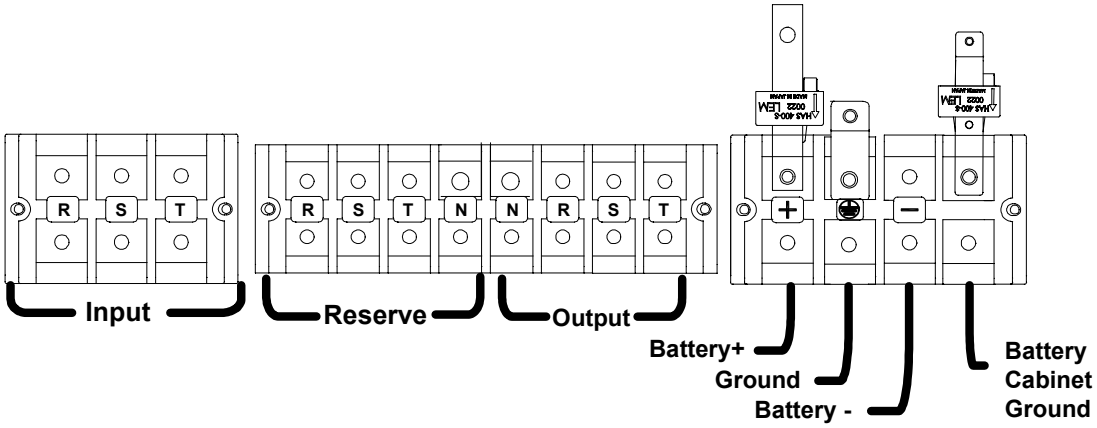
sheet 33 to 34

4-9-2 20~60KVA Output 220/ 380Vac Terminal wiring diagram

Single loop: When the input is single power, the wiring diagram as follow:



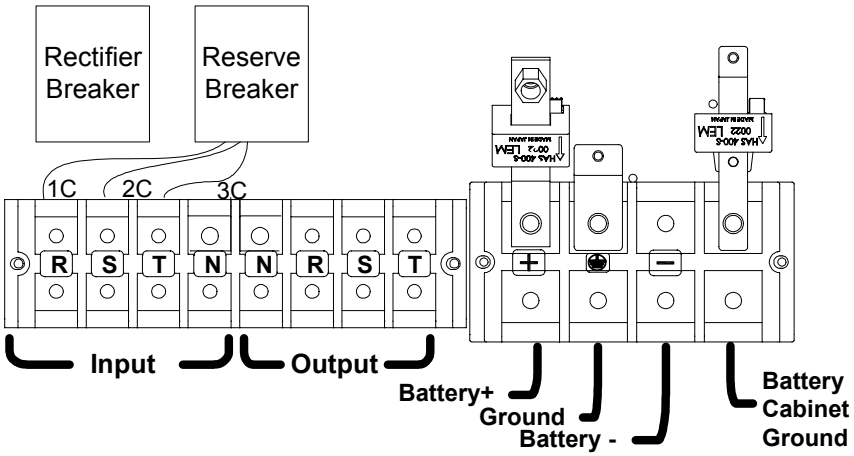
Double loop: When the input is double power, remove the cables(wire number 1B, 2B, 3B) on the input terminal, the wiring diagram as follow:



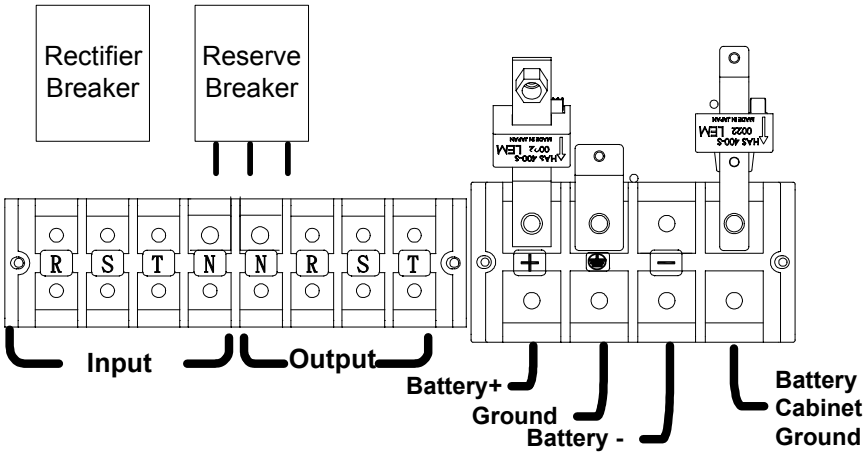
sheet 34 to 35

4-9-3 80KVA Output 220/ 380Vac Terminal wiring diagram

Single loop: When the input is single power, the wiring diagram as follow:



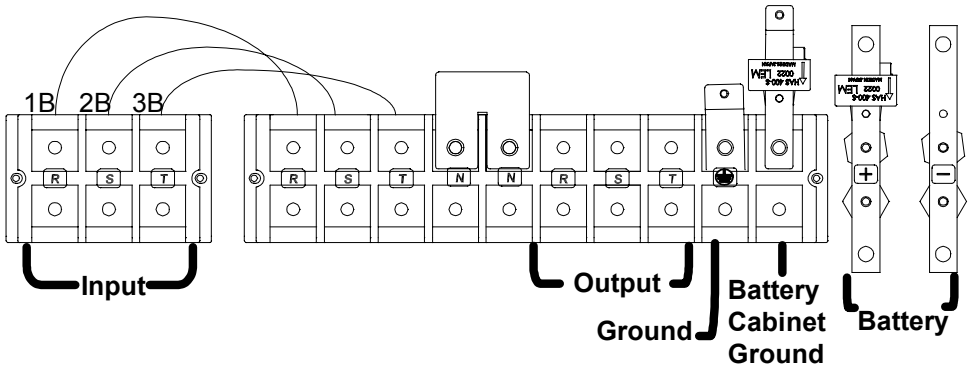
Double loop: When the input is double power, remove the cables (wire number 1C, 2C, 3C) under “Reserve Power Breaker” and the reserve power of client connect to the terminal under “Reserve Power Breaker”. The wiring diagram as follow:



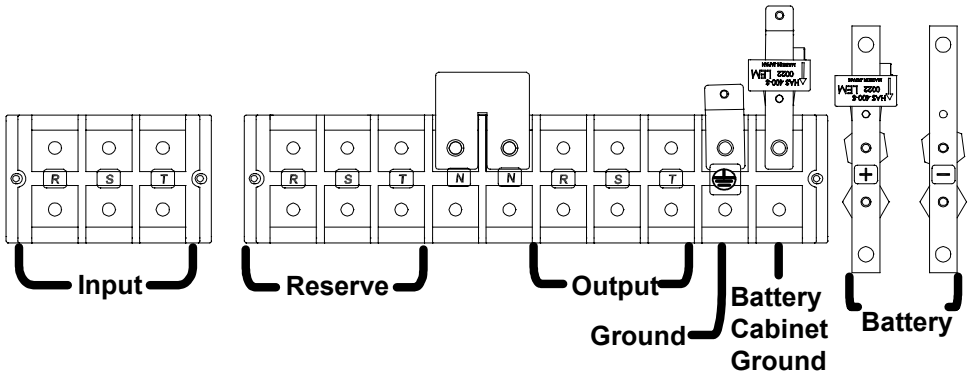
sheet 35 to 36

4-9-4 100KVA Output 220/ 380Vac Terminal wiring diagram

Single loop: When the input is single power, the wiring diagram as follow:



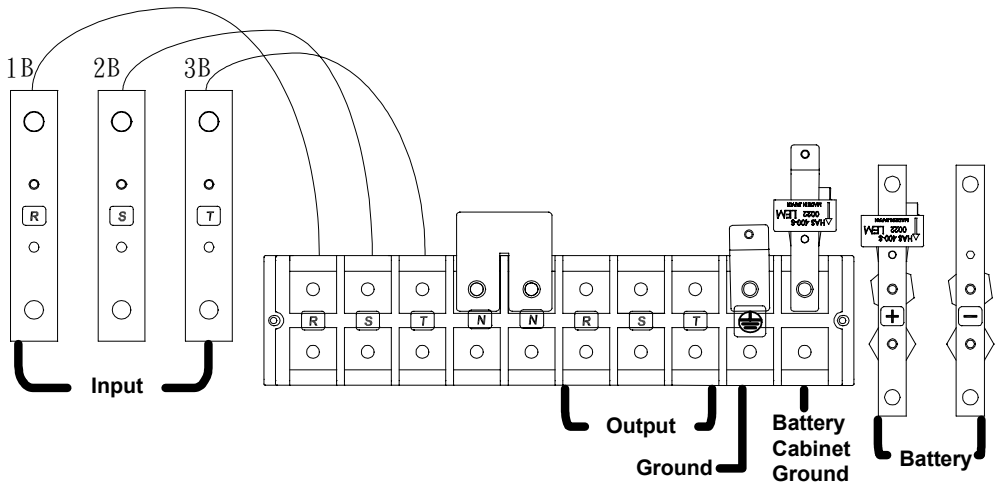
Double loop: When the input is double power, remove the cables(wire number 1B, 2B, 3B) on the input terminal, the wiring diagram as follow:



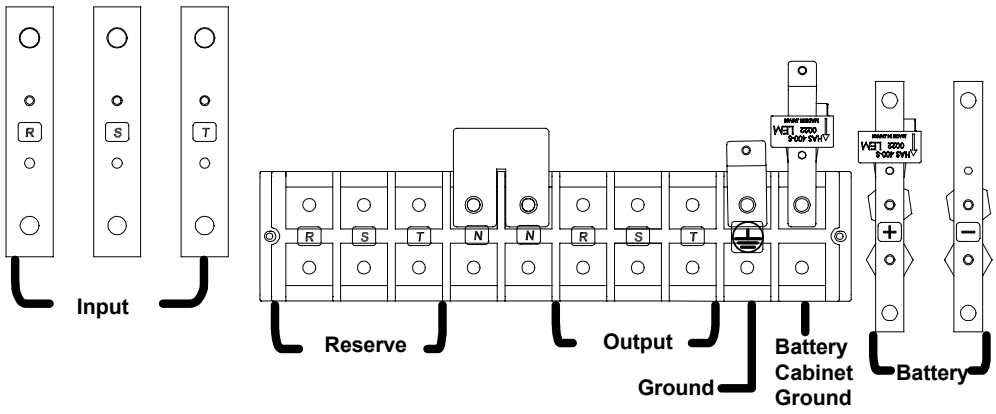
sheet 36 to 37

4-9-5 120KVA Output 220/ 380Vac Terminal wiring diagram

Single loop: When the input is single power, the wiring diagram as follow:



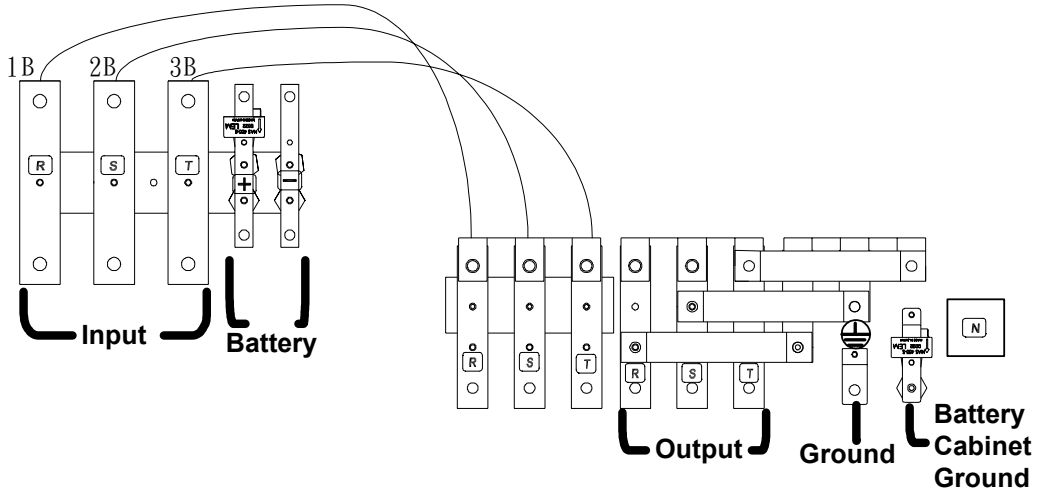
Double loop: When the input is double power, remove the cables(wire number 1B, 2B, 3B) on the input terminal, the wiring diagram as follow:



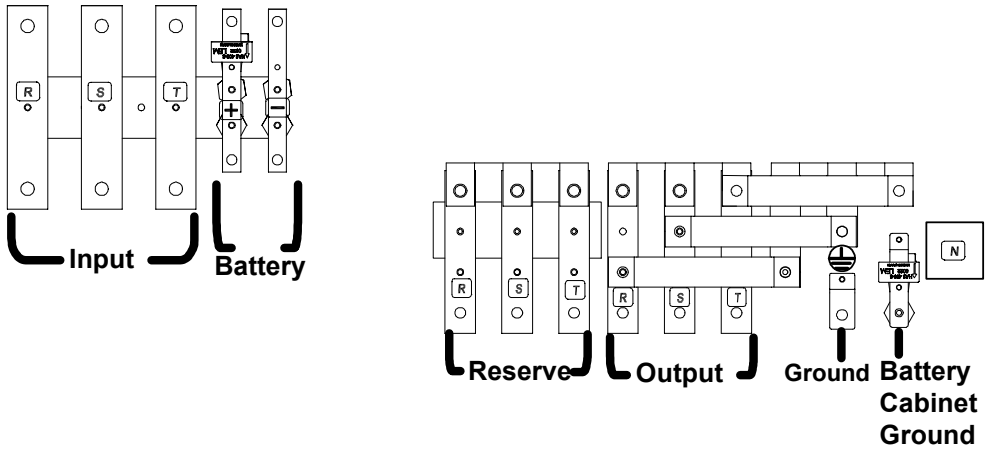
sheet 37 to 38

4-9-6 160/ 200KVA Output 220/ 380Vac Terminal wiring diagram

Single loop: When the input is single power, the wiring diagram as follow:



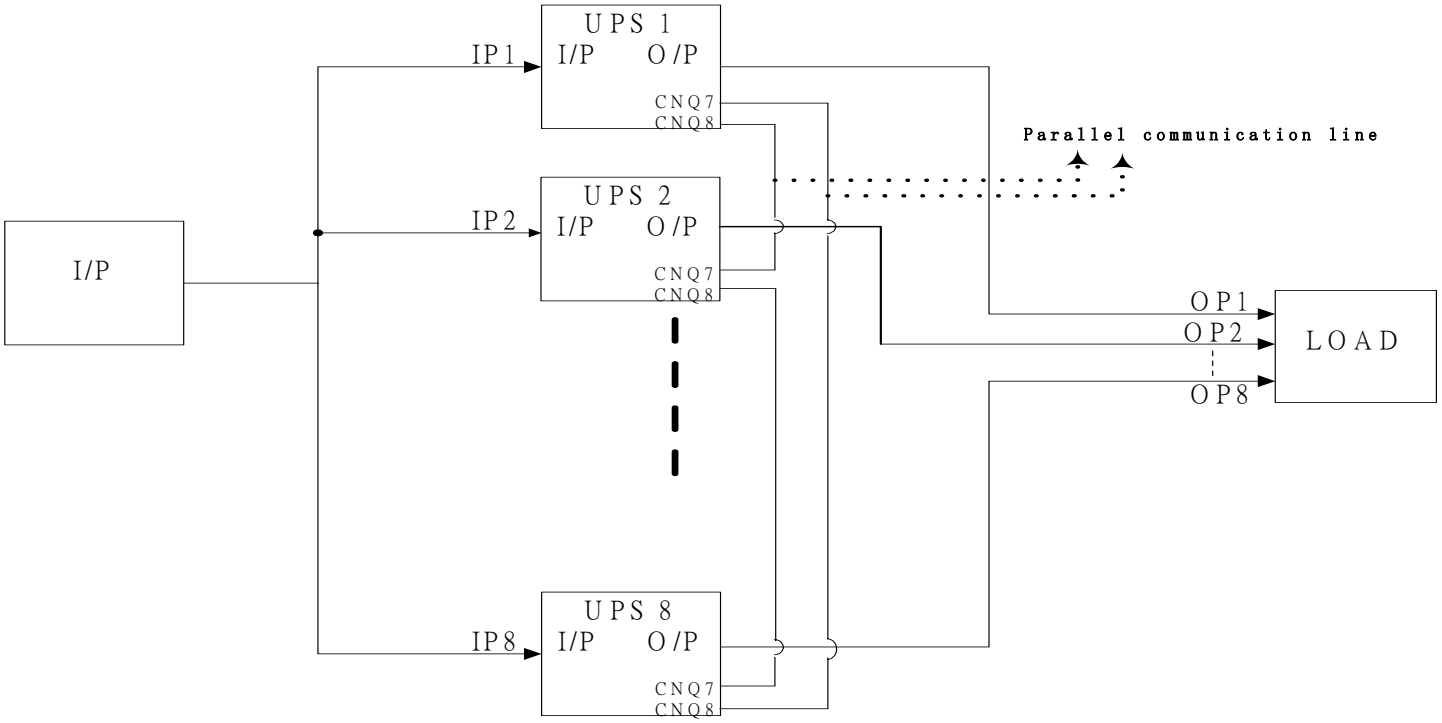
Double loop: When the input is double power, remove the cables(wire number 1B, 2B, 3B) on the input terminal, the wiring diagram as follow:



sheet 38 to 39

4-9-7 UPS parallel wiring diagram (single loop)

When UPS units in parallel, the total length of input and output cables must be the same in each UPS units, to prevent the load inequality-share from different lengths in reserve AC power. The wirings show as following:

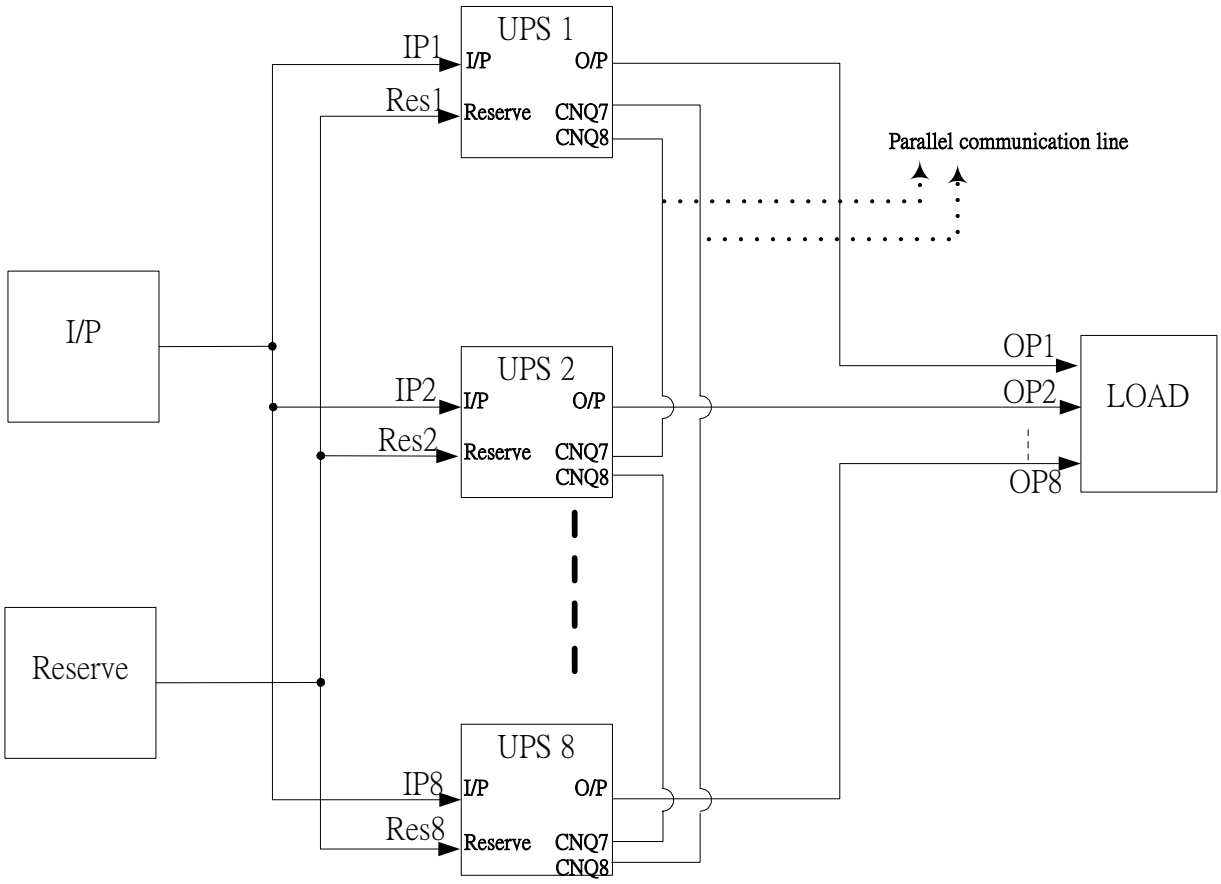


IP1+OP1=IP2+OP2=……..=IP8+OP8

sheet 39 to 40

4-9-8 UPS parallel wiring (double loop)

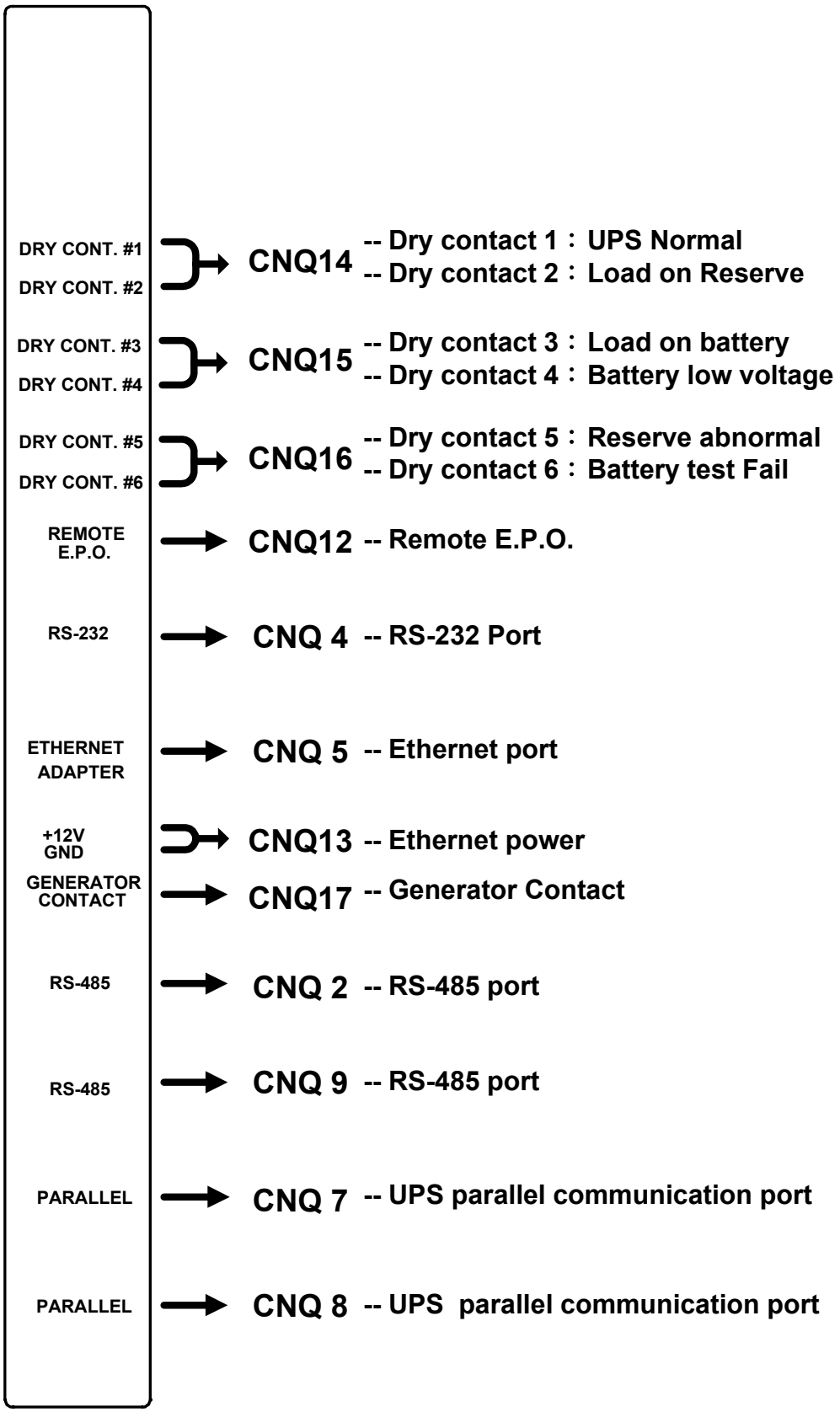
When UPS units in parallel, the total length of reserve and output power cables must be the same in each UPS units, to prevent the load inequality-share from different lengths in reserve AC power. The wirings show as the following:



Res1+OP1=Res2+OP2=……..=Res8+OP8

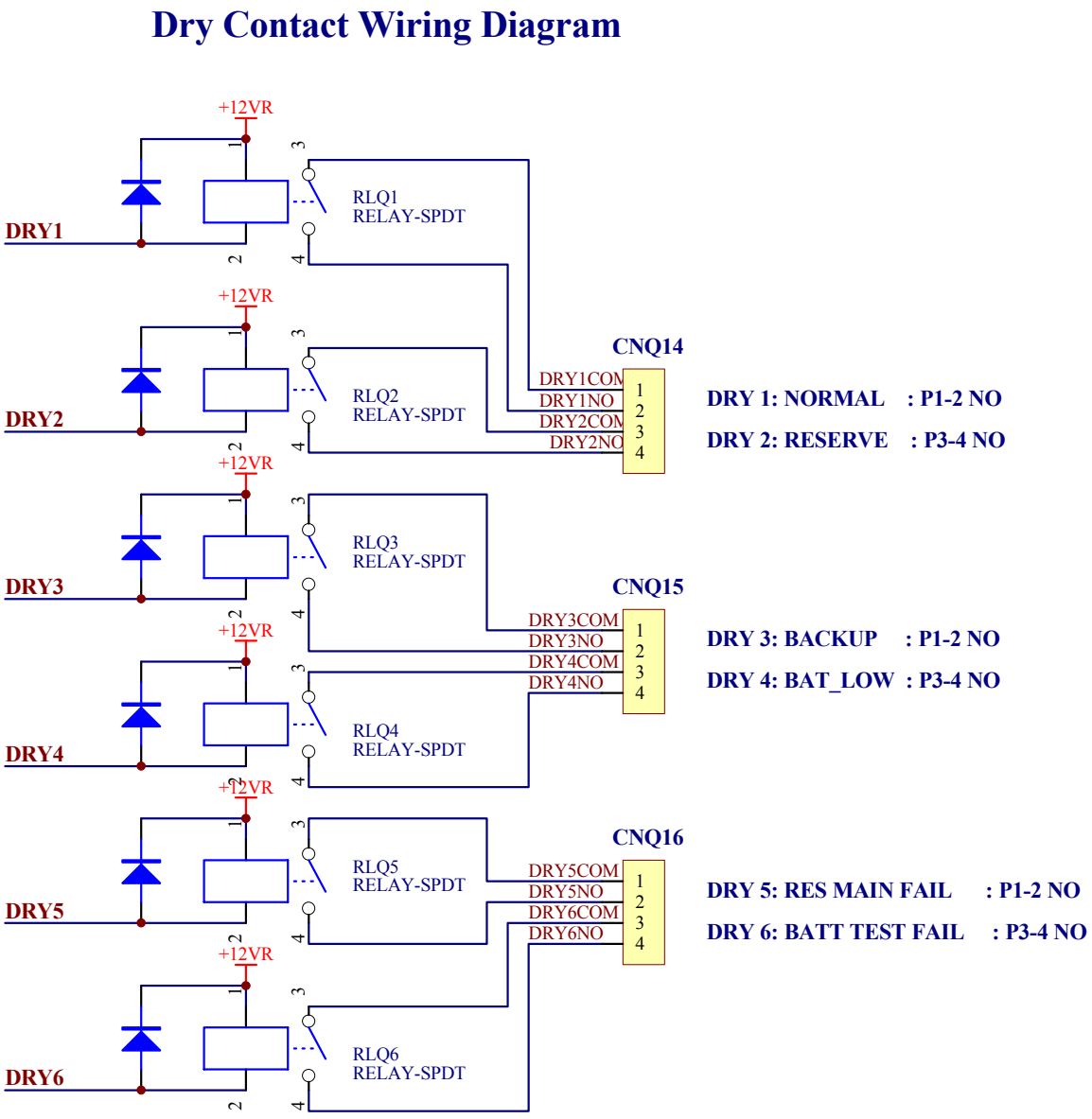
sheet 40 to 41

4-10 Communication Interface (NT-Q Board)



sheet 41 to 42

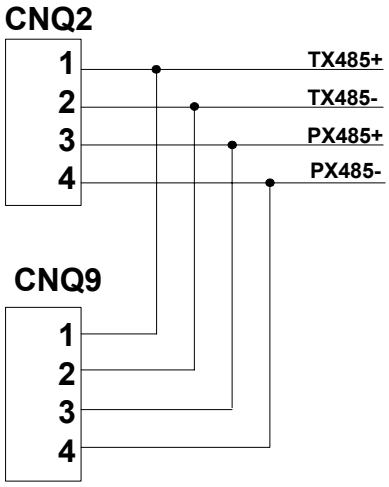
4-11 Dry Contact wiring diagram (Default value)



sheet 42 to 43

4-12 RS485 Pins Assignment

RS485 Pin Assignment



PIN1 : RS485 Transmit+
PIN2 : RS485 Transmit -
PIN3 : RS485 Receive +
PIN4 : RS485 Receive -

5. UPS Display and Setting

5-1. Control Panel

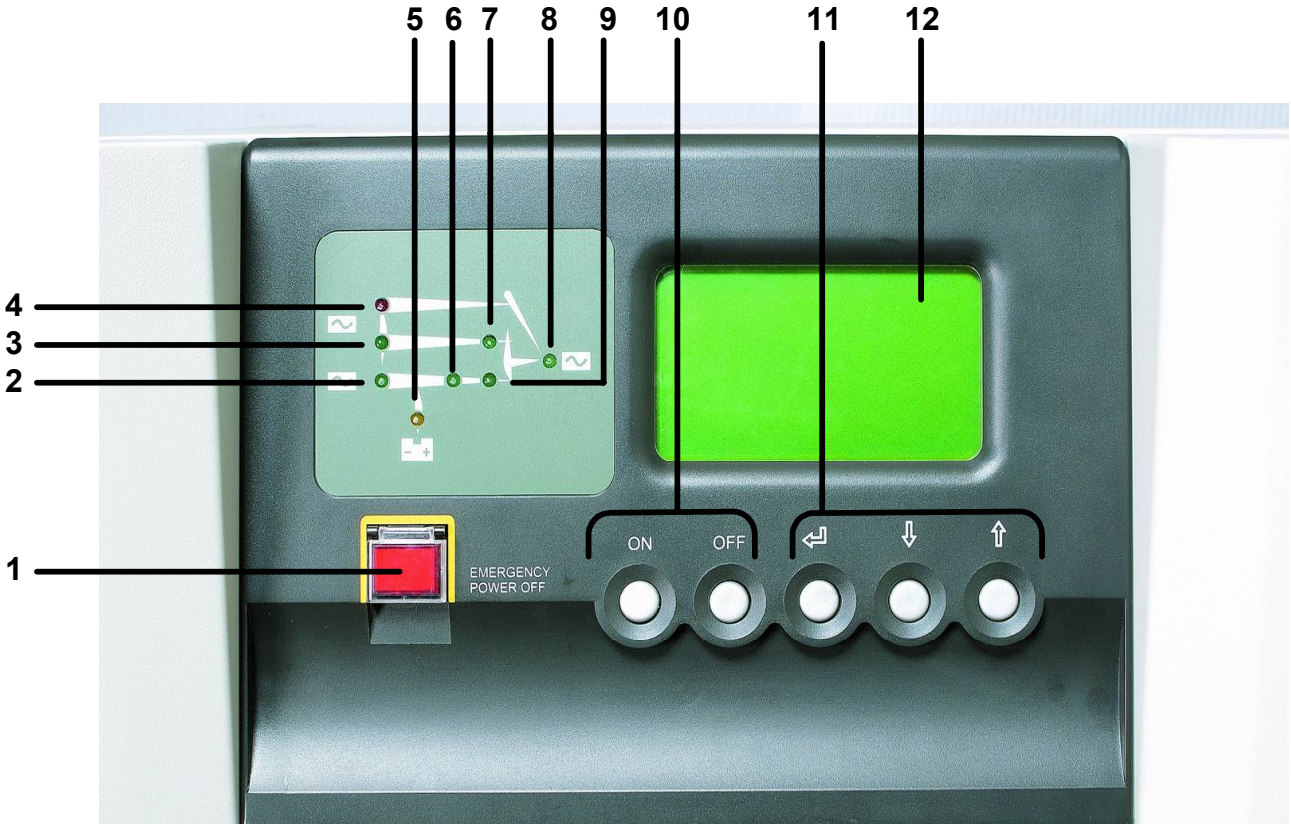


Fig. 5-1 Visible control panel

Legend for figure 5-1:

1. EPO switch: When emergency events occur, presses the EPO switch to turn off rectifier, inverter, and output of UPS.
2. Rectifier LED (green): indicates the rectifier operating.
3. Reserve power LED (green): indicates the reserve power breaker and source.
4. Maintenance bypass power LED (red): indicates maintenance bypass power breaker and source.
5. Battery LED (orange): indicates load on battery with mains abnormal.
6. Inverter LED (green): indicates inverter operating.
7. Reserve power static switch LED (green): indicates load on reserve power.
8. AC output LED (green): indicates the UPS supplies load.
9. Inverter M.C. LED (green): indicates load on inverter.
10. Inverter control buttons: Press “ON” and “⏎ “ for 3 seconds simultaneously to turn on the inverter and Press “OFF” and “⏎ “ for 3 seconds simultaneously to turn off the inverter.
11. “⏎ ”、“⇩”、“⇧” buttons: control LCD display screen and setting parameters.
12. LCD module

5-2 LCD Display Screen

1. Button functions:
   (A.) "⏎ " 、"⇩" 、"⇧" buttons:
      a. Uses "⇩" and "⇧" buttons to choose different functions, and then presses "⏎ " button to enter the choice.
      b. Presses "⇩" and "⇧" buttons simultaneously back to last display screen.
   (B.) "ON" and "OFF" buttons:
      a. Presses "ON" and "⏎ " for 3 seconds simultaneously to turn on inverter.
      b. Presses "OFF" and "⏎ " for 3 seconds simultaneously to turn off inverter.
2. When UPS normal, LCD screen will stay in start display as follow:

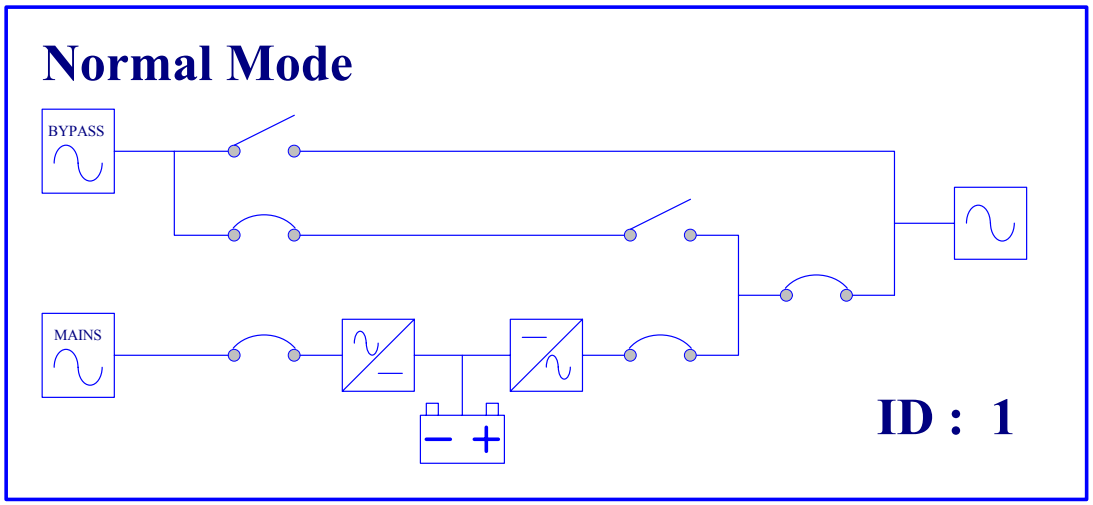
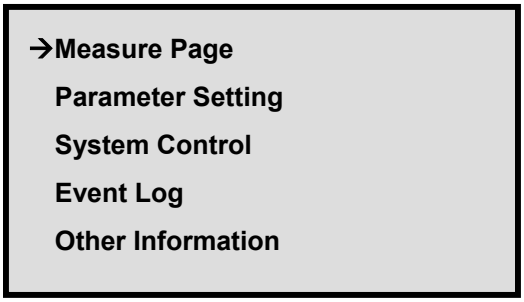


Fig. 5-2 LCD start display→UPS system diagram

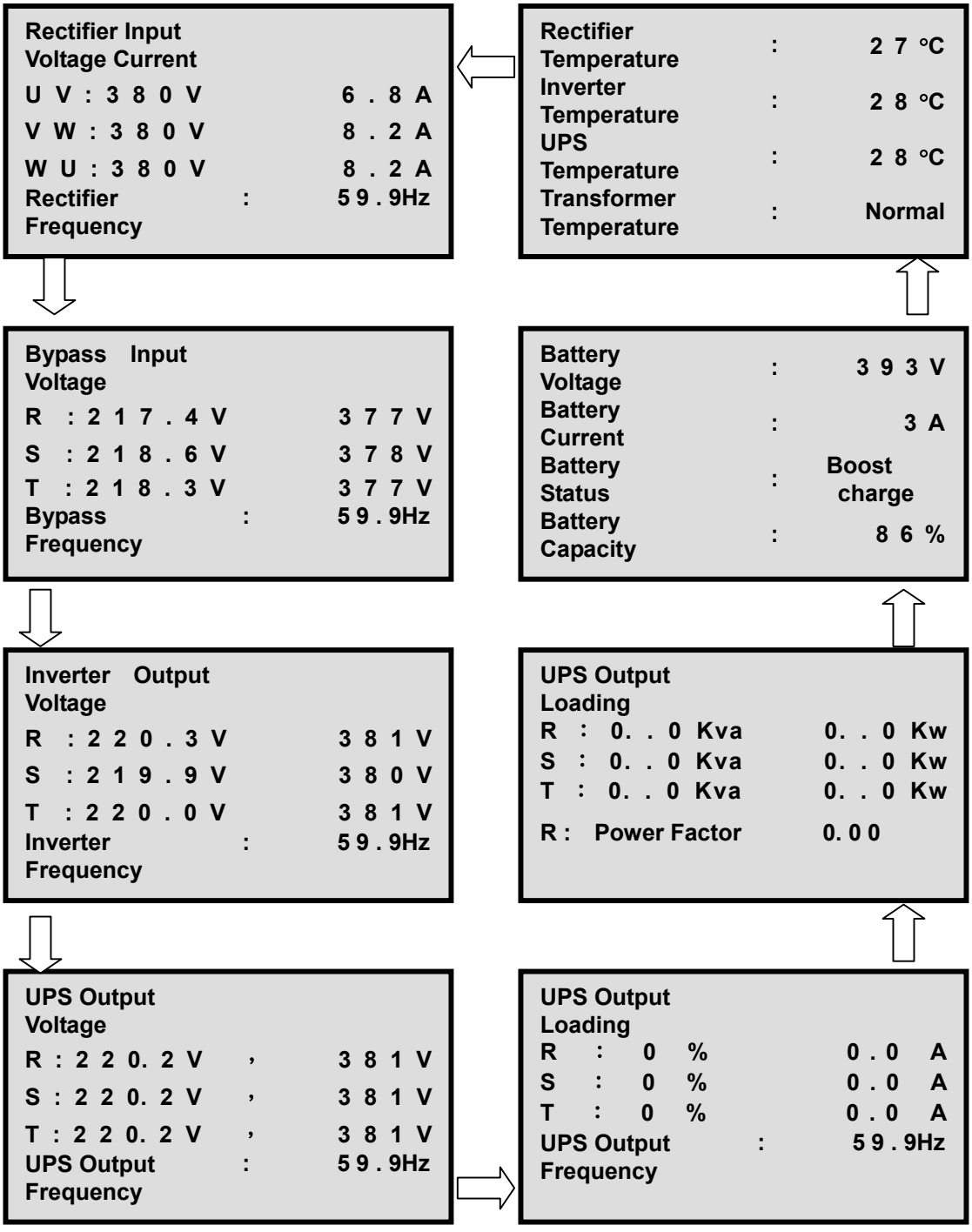
3. Presses "⏎ " button to enter main menu, as the following:

➢ Uses "⇩" and "⇧" buttons to choose the functions.



sheet 45 to 46

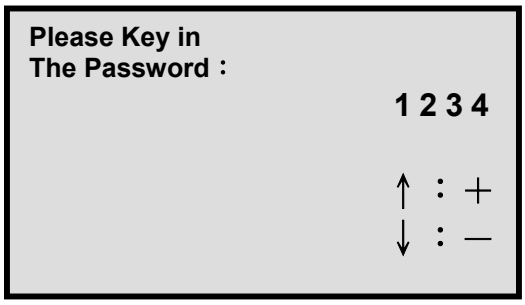
4. Presses “⇩” or “⇧” button to choose “Measure Page”, and then presses “⏎ ” button to enter measure page.
After entering the measure page, presses “⇩” or “⇧” button to monitor the present status and parameters of UPS.
The procedures show as following:

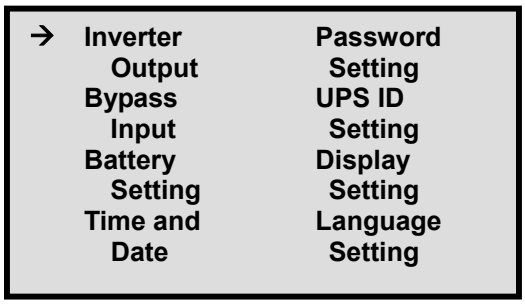


When want to close “Measure Page”, presses “⇩” and “⇧” buttons simultaneously that will back to main menu.

5. In main menu, presses “⇩” or “⇧” to choose “Parameter Setting” and presses ”↵ ” button to enter the parameter setting menu. Before entering the “Parameter Setting” menu, passwords need to be keyed in.

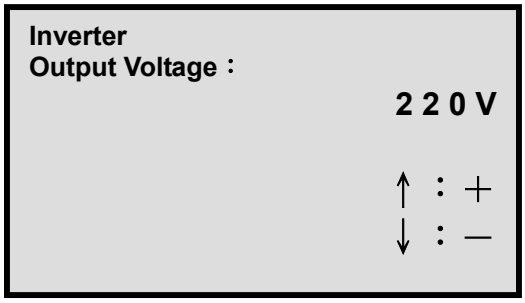
- If the password was wrong, parameters could not be set.
- If the password was correct, then enter to “ Parameter Setting” menu.





5-1. Presses “⇩” or “⇧” button to choose “ Inverter Output” and presses ”↵ ” button to enter the “Inverter Output Voltage” setting page.

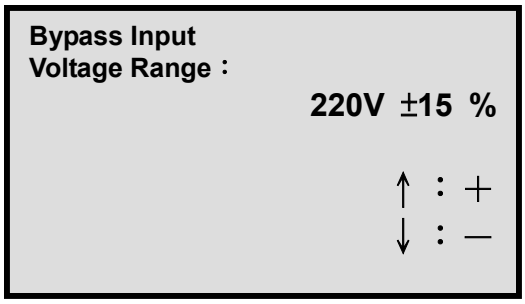
- Presses “⇩” or “⇧” button to choose the output voltage of inverter and presses ”↵ ” button to finish the setting.



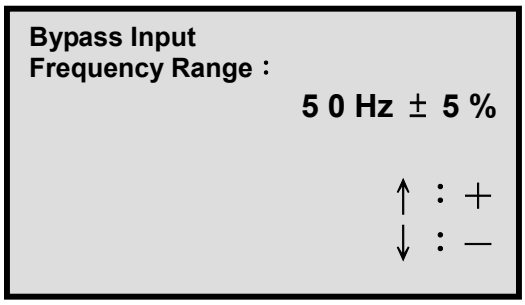
When want to close “Inverter Output Voltage” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

5-2. Presses “⇩” or “⇧” button to choose “ Bypass Input” and presses ”⏎ ” button to enter the “Bypass Input Voltage/Frequency” setting page.

- Presses “⇩” or “⇧” button to choose the input voltage range of bypass and presses ”⏎ ” button to finish the setting.

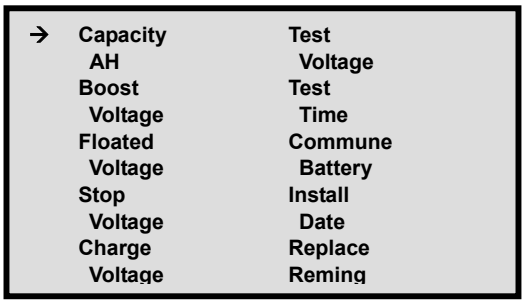


- Presses “⇩” or “⇧” button to choose the input frequency range of bypass and presses ”⏎ ” button to finish the setting.



When want to close “Bypass Input” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

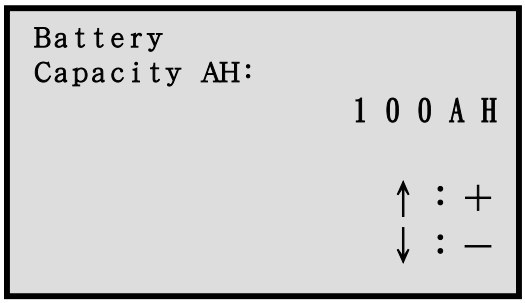
5-3. Presses “⇩” or “⇧” button to choose “ Battery Setting” and presses ”⏎ ” button to enter the “Battery setting” menu.



sheet 48 to 49

5-3.1. Presses “⇩” or “⇧” button to choose “ Capacity AH” and presses ”⏎ ” button to enter the “Battery Capacity AH” setting page.

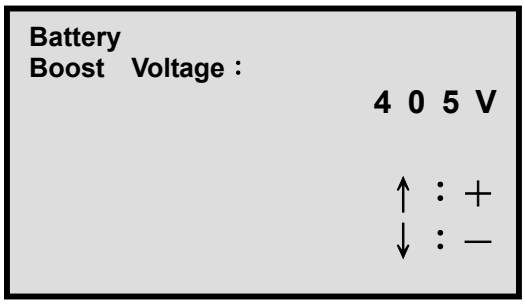
- Presses “⇩” or “⇧” button to choose the battery capacity and presses ”⏎ ” button to finish the setting.



When want to close “Battery Capacity AH” setting page, presses “⇩” and “⇧” buttons simultaneouslv that will back to “Batterv Settina” menu.

5-3.2. Presses “⇩” or “⇧” button to choose “Boost Voltage” and presses ”⏎ ” button to enter the “Battery Boost Voltage” setting page.

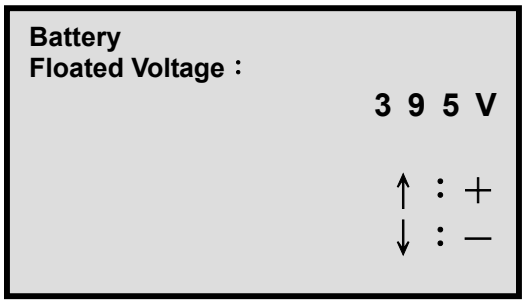
- Presses “⇩” or “⇧” button to choose the battery boost voltage and presses ”⏎ ” button to finish the setting.



When want to close “Battery Boost Voltage” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Battery Setting” menu.

5-3.3. Presses “⇩” or “⇧” button to choose “Floated Voltage” and presses ”⏎ ” button to enter the “Battery Floated Voltage” setting page.

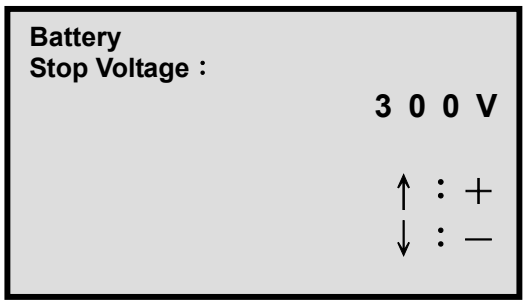
- Presses “⇩” or “⇧” button to choose the battery floated voltage and presses ”⏎ ” button to finish the setting.



When want to close “Battery Floated Voltage” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Battery Setting” menu.

5-3.4. Presses "⇩" or "⇧" button to choose "Stop Voltage" and presses "↵ " button to enter the "Battery Stop Voltage" setting page.

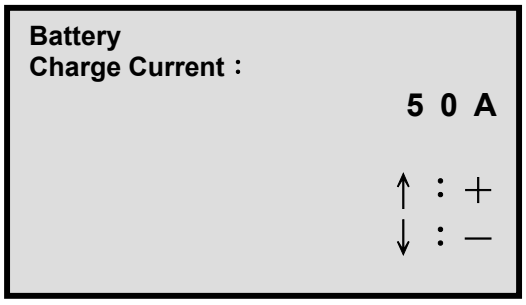
- Presses "⇩" or "⇧" button to choose the battery stop voltage and presses "↵ " button to finish the setting.



When want to close "Battery Stop Voltage" setting page, presses "⇩" and "⇧" buttons simultaneously that will back to "Battery Setting" menu.

5-3.5. Presses "⇩" or "⇧" button to choose "Charge Current" and presses "↵ " button to enter the "Battery Charge Current" setting page.

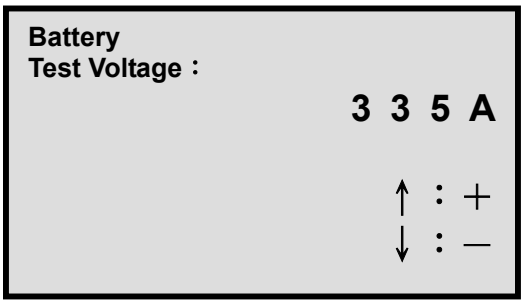
- Presses "⇩" or "⇧" button to choose the battery charge current and presses "↵ " button to finish the setting.



When want to close "Battery Charge Current" setting page, presses "⇩" and "⇧" buttons simultaneously that will back to "Battery Setting" menu.

5-3.6. Presses "⇩" or "⇧" button to choose "Test Voltage" and presses "↵ " button to enter the "Battery Test Voltage" setting page.

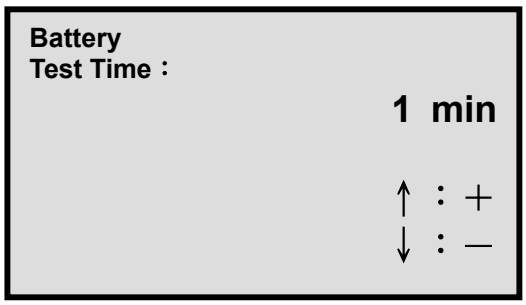
- Presses "⇩" or "⇧" button to choose the battery test voltage and presses "↵ " button to finish the setting.



When want to close "Battery Test Voltage" setting page, presses "⇩" and "⇧" buttons simultaneously that will back to "Battery Setting" menu.

5-3.7. Presses “⇩” or “⇧” button to choose “Test Time” and presses ”⏎ ” button to enter the “Battery Test Time” setting page.

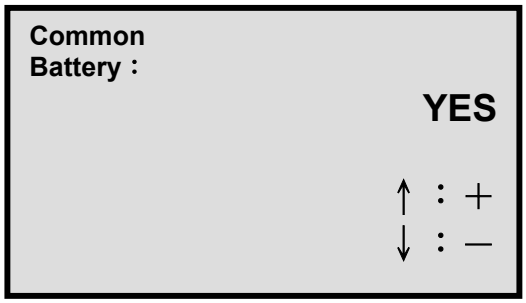
- Presses “⇩” or “⇧” button to choose the battery test time and presses ”⏎ ” button to finish the setting.



When want to close “Battery Test Time” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Battery Setting” menu.

5-3.8. Presses “⇩” or “⇧” button to choose “Common Battery” and presses ”⏎ ” button to enter the “Common Battery” setting page.

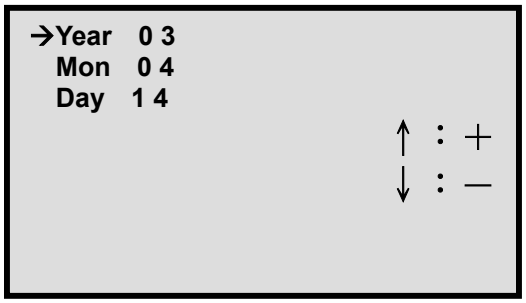
- Presses “⇩” or “⇧” button to choose the UPS units whether used common battery and presses ”⏎ ” button to finish the setting.



When want to close “Common Battery” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Battery Setting” menu.

5-3.9. Presses “⇩” or “⇧” button to choose “Install Date” and presses ”⏎ ” button to enter the “Install Date” setting page.

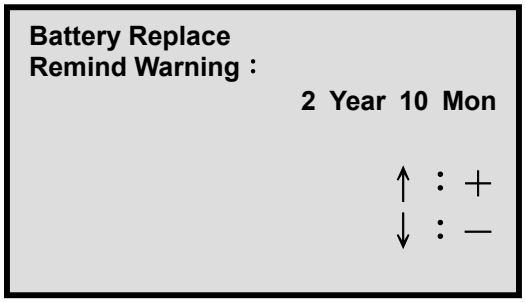
- Presses “⇩” or “⇧” button to choose the UPS install date and presses ”⏎ ” button to finish the setting.



When want to close “Install Date” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Battery Setting” menu.

5-3.10. Presses “⇩” or “⇧” button to choose “Replace Remind” and presses ”⏎ ” button to enter the “Battery Replace Remind Warning” setting page.

- Presses “⇩” or “⇧” button to choose the remind time of battery replace and presses ”⏎ ” button to finish the setting.

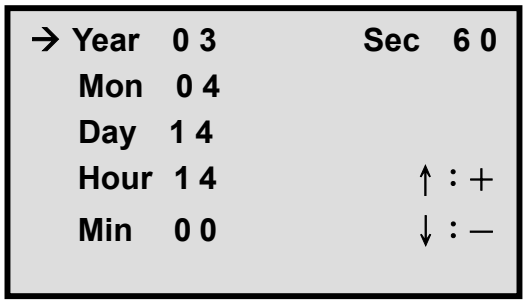


When want to close “Battery Replace Remind Warning” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Battery Setting” menu.

When want to close “Battery Setting” menu, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

5-4. Presses “⇩” or “⇧” button to choose “Time and Date” and presses ”⏎ ” button to enter the “Time and Date” setting page.

- Presses “⇩” or “⇧” button to choose the time and date, and presses ”⏎ ” button to finish the setting.

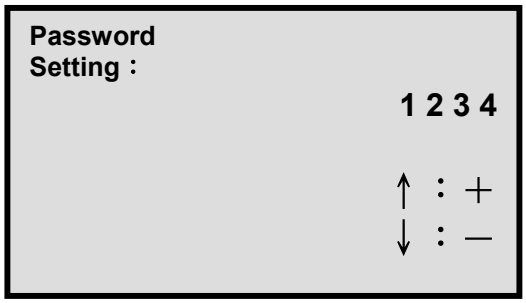


When want to close “Time and Date” Setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

sheet 52 to 53

5-5. Presses “⇩” or “⇧” button to choose “Password Setting” and presses ”↵ ” button to enter the “Password Setting” setting page.

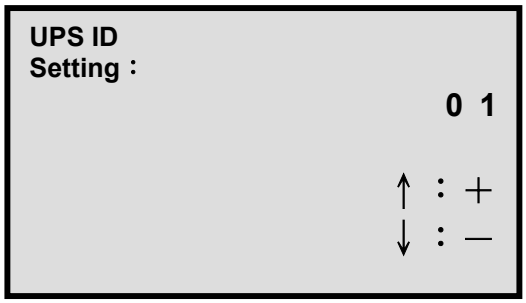
- Presses “⇩” or “⇧” button to choose the password and presses ”↵ ” button to finish the setting.



When want to close “Password Setting” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

5-6. Presses “⇩” or “⇧” button to choose “UPS ID Setting” and presses ”↵ ” button to enter the “UPS ID Setting” setting page.

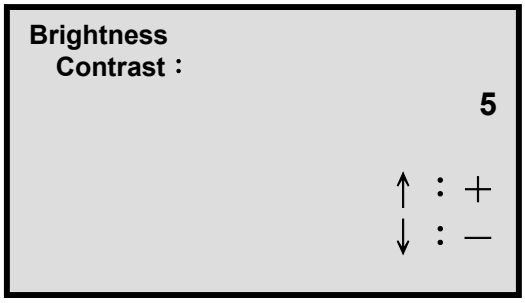
- Presses “⇩” or “⇧” button to choose the UPS ID (the UPS ID can’t repeat of those UPS units in parallel) and presses ”↵ ” button to finish the setting.
- The UPS ID in main page that is used by RS-485 and UPSentry. It can be setting from LCD control panel.



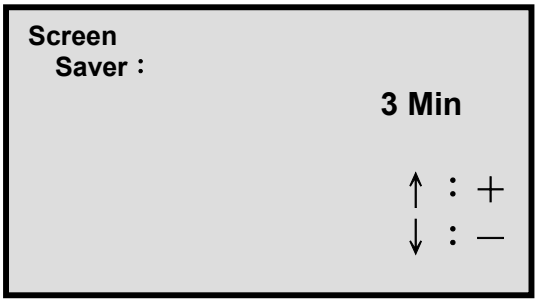
When want to close “UPS ID Setting” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

5-7. Presses “⇩” or “⇧” button to choose “Display Setting” and presses ”⏎ ” button to enter the “Display Setting” setting page.

- Presses “⇩” or “⇧” button to choose the brightness contrast of LCD screen and presses ”⏎ ” button to finish the setting.



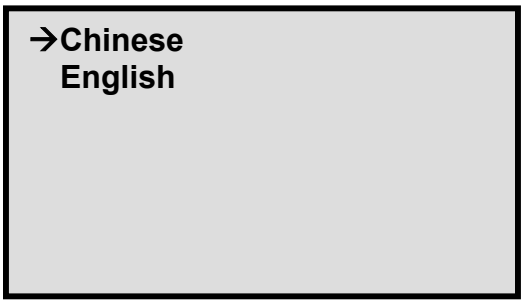
- In order to extend the life of LCD, presses “⇩” or “⇧” button to choose the screen save and presses ”⏎ ” button to finish the setting.



When want to close “Display Setting” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

5-8. Presses “⇩” or “⇧” button to choose “Language Setting” and presses ”⏎ ” button to enter the “Language Setting” setting page.

- Presses “⇩” or “⇧” button to choose the “Chinese” or “English” and presses ”⏎ ” button to finish the setting.



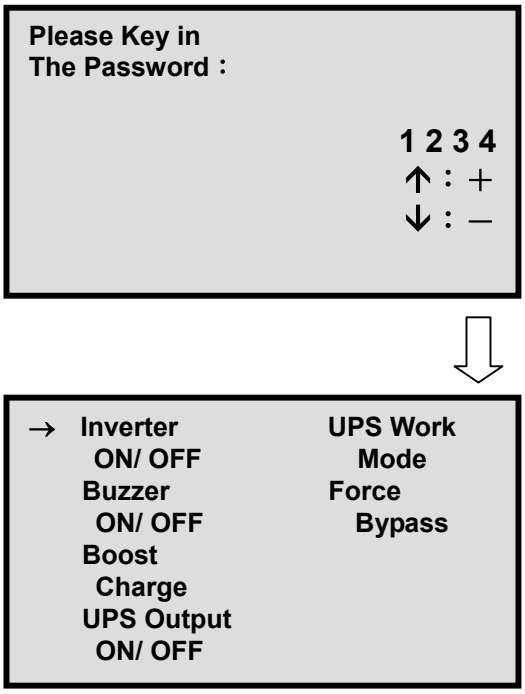
When want to close “Language Setting” setting page, presses “⇩” and “⇧” buttons simultaneously that will back to “Parameter Setting” menu.

When want to close “Parameter Setting” menu, presses “⇩” and “⇧” buttons simultaneously that will back to main menu.

sheet 54 to 55

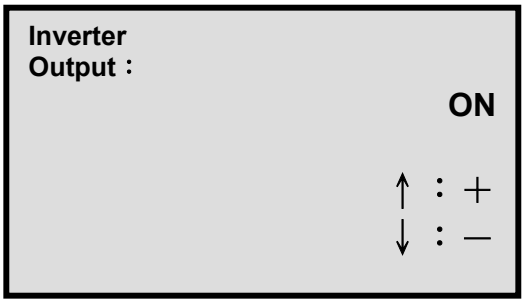
6. In main menu, presses “⇩” or “⇧” to choose “System Control” and presses ”⏎ ” button to enter the system control menu. Before enter the “System Control” menu, have to key in the password.

- If the password was wrong, then couldn’t set the parameter.
- If the password was true, then enter to “System Control” menu.



6-1. Presses “⇩” or “⇧” button to choose “ Inverter ON/OFF” and presses ”⏎ ” button to enter the “Inverter Output” setting page.

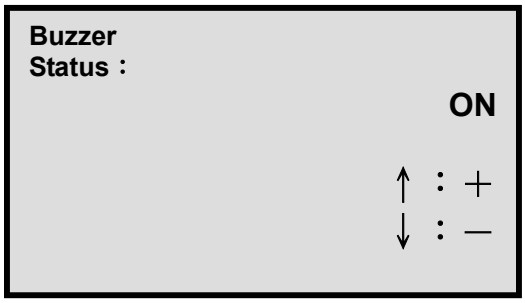
- Choose ON: turn on inverter.
- Choose OFF: turn off inverter
- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.



sheet 55 to 56

6-2. Presses “⇩” or “⇧” button to choose “ Buzzer ON/OFF” and presses ”⏎ ” button to enter the “Buzzer Status” setting page.

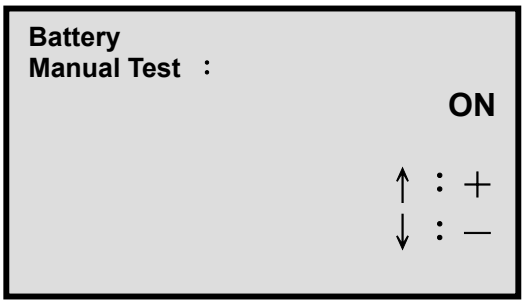
- Choose ON： when UPS has “WARNING” or “FAULT” status, buzzer could sound.
- Choose OFF： when UPS has “WARNING” or “FAULT” status, buzzer couldn’t sound.

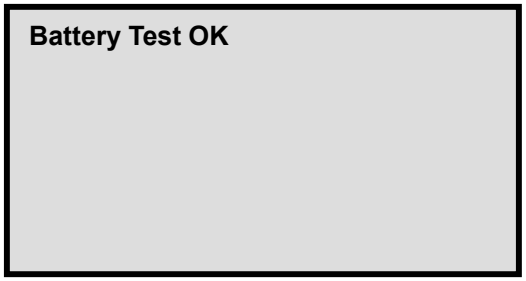


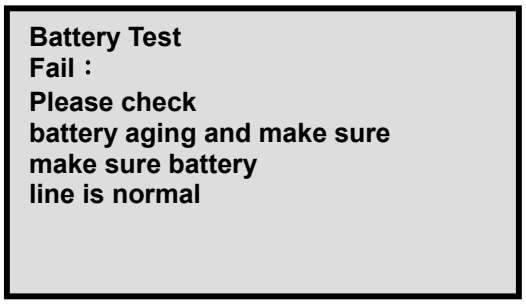
- Choose SILENT： a. In “WARNING” status, buzzer could sound.
  b. In “WARNING” status, buzzer couldn’t sound.
- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.

6-3. Presses “⇩” or “⇧” button to choose “ Battery Test” and presses ”⏎ ” button to enter the “Battery Manual Test” setting page.

- Choose ON: Execute battery test.
  When battery normal, LCD screen would show “Battery Test OK”
  When battery abnormal, LCD screen would show “Battery Test Fail”
- Choose OFF: Don’t execute battery test.
- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.



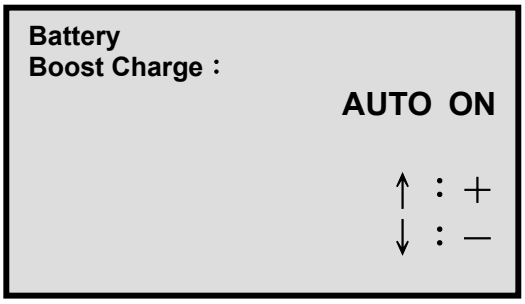


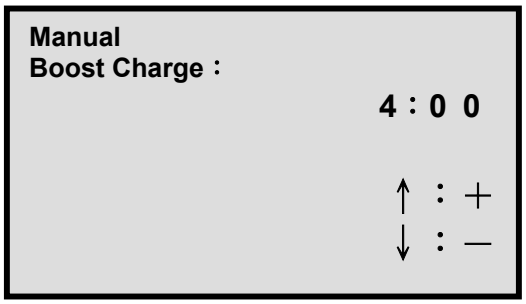


sheet 56 to 57

6-4. Presses “⇩” or “⇧” button to choose “Boost charge” and presses ”⏎ ” button to enter the “Battery Boost charge” setting page.

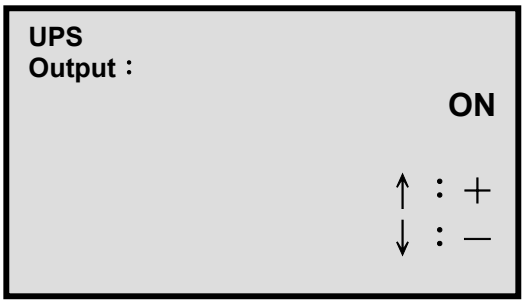
- Choose AUTO ON: UPS would auto control whether to boost charge. (When battery voltage less than 348V, UPS auto execute boost charge)
- Choose AUTO OFF: UPS disable boost charge.
- Choose Manual: UPS forces to boost charge and could set the time of boost charge.
- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.





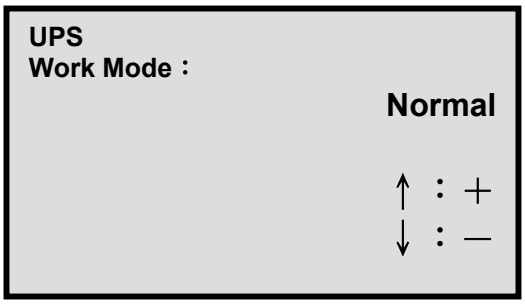
6-5. Presses “⇩” or “⇧” button to choose “UPS Output ON/OFF” and presses ”⏎ ” button to enter the “UPS Output” setting page.

- Choose ON: UPS normal output.
- Choose OFF: UPS turn off output.
- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.



6-6. Presses “⇩” or “⇧” button to choose “UPS Work Mode” and presses ”⏎ ” button to enter the “UPS Work Mode” setting page.

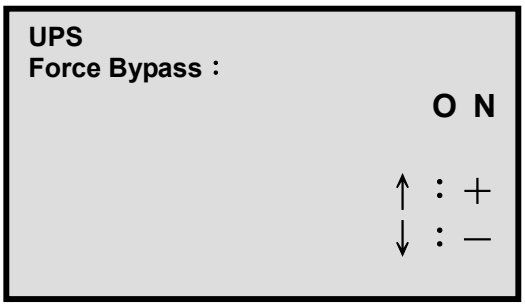
- Choose Normal: UPS normal output. (from Inverter)
- Choose ECO: UPS supplies the load from reserve power with normal, but when reserve power abnormal, the load would transfer to inverter. (During the transfer, output power would cutoff with some interval.)



- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.

6-7. Presses “⇩” or “⇧” button to choose “Force Bypass” and presses ”⏎ ” button to enter the “UPS Force Bypass” setting page.

- Choose ON: Load transfer to reserve power in any status.
- Choose OFF: UPS normal Output. (When inverter abnormal, load would transfer to reserve power.)

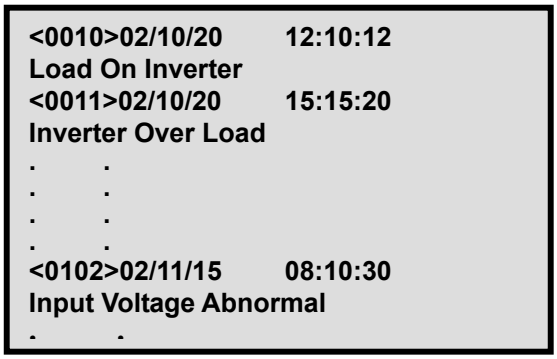


- Presses “⇩” and “⇧” buttons simultaneously that will back to “System Control” menu.

When want to close “System Control” menu, presses “⇩” and “⇧” buttons simultaneously that will back to main menu.

7. In main menu, presses “⇩” or “⇧” to choose “Event Log” and presses ”⏎ ” button to enter the event log page.

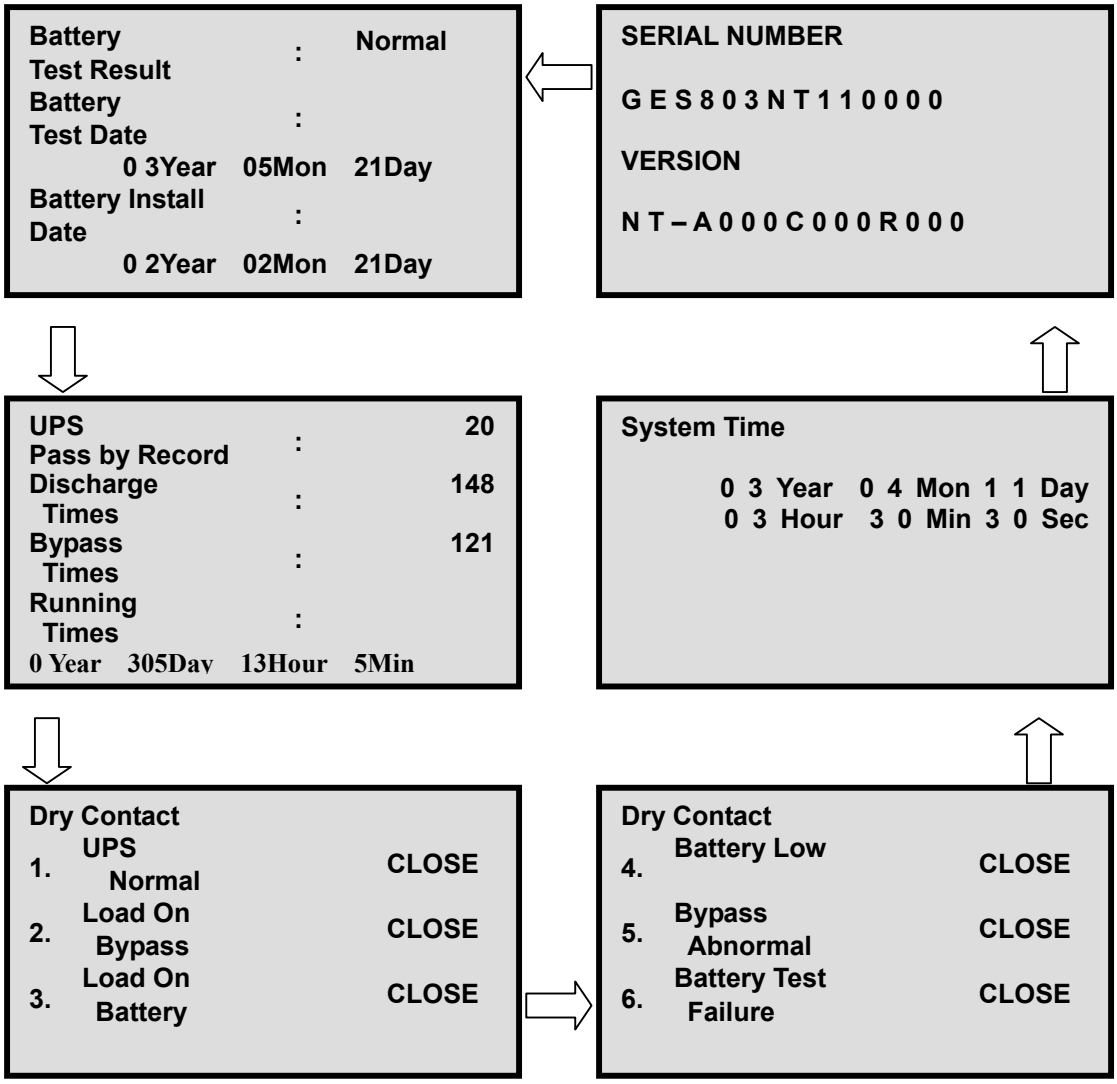
In the event log page, would press “⇩” or “⇧” button to look into the present status of UPS. To analyze the malfunction of UPS that could depend on the event record. The event log could record 500 data, when event exceeds 500 data, record would cover with the earliest event.



When want to close “Event Log” menu, presses “⇩” and “⇧” buttons simultaneously that will back to main menu.

sheet 58 to 59

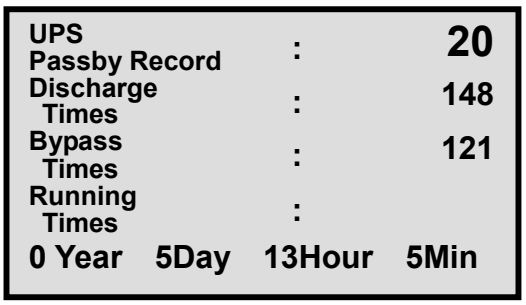
8. In main menu, presses “⇩” or “⇧” to choose “Other Information” and presses ”⏎ ” button to enter the other information page.



When want to close “Other Information” menu, presses “⇩” and “⇧” buttons simultaneously that will back to main menu.

9. UPS status code

The number of “UPS record” in LCD display that indicate the code of UPS status, illustrate as follow:



Code	UPS Status
0	Inhibit Bypass Output
2	Load on Reserve
10	Rectifier AC soft-start
18	Do Inverter test
20	Load on Inverter
22	Load on Inverter at Backup Mode
24	Low Battery
26	Low Battery shutdown
28	UPS shutdown due to short-circuit
30、58	Manual Bypass on
32	P.L.L abnormal
34	UPS shutdown due to Inverter Fault
36	UPS shutdown due to Inverter overload
38	Remote shutdown
40、42、44	Inverter output voltage abnormal
46	Shutdown due to EPO event
50	Shutdown due to DC-BUS over-voltage-protect
52、54、56	Inverter fuse open
60、62、64	Inverter over-temperature shutdown
66	Output transformer over-temperature shutdown

sheet 60 to 61

6. UPS Operation Procedure

6-1 Start-up procedures (Single)

Please check the following noticed items before UPS start-up:

1. All circuit breakers and isolators are in off position and battery fuse is out.
2. Ensure that neutral line and grounding are the same voltage level.
3. Apply power to the AC input cables and check that input voltage, frequency and phase sequence are with in the machine specifications.
4. Check the fuse isolators of auxiliary power and fan power (N) whether has closed.

When UPS comply with the above-mentioned conditions, start-up UPS according to the following procedure:

1. Close “RESERVE INPUT” breaker, at the same time LCD display ” Bypass Mode ”.
2. Close “RECTIFIER INPUT“ breaker and wait about 30 seconds, the DC BUS voltage would be built up.
3. Close “BATTERY FUSE ISOLATOR” in battery cabinet.
4. Press the inverter “ON” and “⏎ ” buttons 3 seconds simultaneously, the inverter turn on and voltage build with about 30 seconds. The “Inverter M.C.” close and the load will be transfer to inverter, at the same time LCD display “ Normal Mode”.
5. Measure the voltage on UPS output breaker that would normal or abnormal. If normal, could close the output breaker to supply the load.

After UPS normal with about 30 seconds, UPS will automatic execute battery test to check battery whether normal.

6-2 System Shutdown Procedure (Single)

This operating procedure can turn off power supply to UPS, please first confirm the load has been shutdown, the procedures as follows：

1. Open “UPS OUTPUT” breaker.
2. Press the inverter “OFF” and “⏎ ” buttons 3 seconds simultaneously, when the reserve power normal (the voltage and frequency of reserve power with in the set range), inverter will turn off immediately and open “Inverter M.C.”. Load will be transfer to reserve power, at the same time LCD display “Bypass Mode”.
3. Open “BATTERY FUSE ISOLATOR” in battery cabinet.
4. Open “ RECTIFIER INPUT ” breaker.
5. Wait 5 mins for DC CAP to discharge, and also press “ON” and “OFF” buttons to test inverter for discharge DC CAP, then press “OFF” and “⏎ ” buttons to turn off inverter and confirm that BUS voltage will be safety.
6. Open “RESERVE INPUT” breaker.

6-3 Maintenance Manual Bypass Procedure (Single)

In general, we recommend a frequency of once every half year for conducting regular maintenance on the UPS.
The “MANUAL BYPASS” breaker only close for maintenance UPS that make sure the load not break down during the interval. If close “Manual Bypass” breaker at “Normal Mode”, inverter will be turn off and load transfer to manual bypass.“

6-3-1 Inverter transfer to Manual Bypass (Single)

Operation procedure as follow:

1. Press the inverter “OFF” and “⏎ ” buttons 3 seconds simultaneously, when the reserve power normal (the voltage and frequency of reserve power with in the set range), inverter will turn off immediately and open “Inverter M.C.”. Load will be transfer to reserve power, at the same time LCD display “Bypass Mode”.
2. Open “BATTERY FUSE ISOLATOR” in battery cabinet.
3. Open “ RECTIFIER INPUT ” breaker.
4. Wait 5 mins for DC CAP to discharge, and also press “ON” and “OFF” buttons to test inverter for discharge DC CAP, then press “OFF” and “⏎ ” buttons to turn off inverter and confirm that BUS voltage will be safety.
5. Close “MANUAL BYPASS” breaker, the load transfer to manual bypass and LCD display “Manual Bypass”.
6. Open “UPS OUTPUT” breaker, “RESERVE INPUT” breaker and the fuse isolators of auxiliary power(+) and fan power(N), then LCD go out.
7. When UPS in manual bypass, no high voltage at the UPS internal expect the terminals and “MANUAL BYPASS”, would be maintenance UPS.

6-3-2 Manual Bypass transfer to Inverter (single)

Operation procedure as follow:

1. Close “UPS OUTPUT” breaker, “RESERVE INPUT” breaker and the fuse isolators of auxiliary power(+) and fan power(N). Load supply from manual bypass and at the same time LCD display “Manual Bypass”.
2. Open “MANUAL BYPASS” breaker, load transfer to reserve power and LCD display “Bypass Mode”.
3. Close “RECTIFIER INPUT” breaker and wait about 30 seconds, the “Battery M.C.” would close.
4. Close “BATTERY FUSE ISOLATOR” in battery cabinet.
5. Press the inverter “ON” and “⏎ ” buttons 3 seconds simultaneously, the inverter turn on and voltage build with about 30 seconds. The “Inverter M.C.” close and the load will be transfer to inverter, at the same time LCD display “Normal Mode”.

6-4 Start-up procedures (Parallel)

Please check the following noticed items before UPS start-up:

1. All circuit breakers and isolators are in off position and battery fuse is unhooked.
2. Ensure the voltages of neutral line and grounding are in the same level.
3. Plug the power cord attached to the UPS into the utility power supply and check the input voltage, frequency and phase order that must be within the rating ranges of the machine specifications.
4. Make sure the fuse isolators of auxiliary power and fan power (N) are on.
5. When many UPS units operation with parallel, have to set ID value via RS-232 with UPS parameter setting software.
   This ID value is different with LCD display.
   Example: (1) when two UPS units operation with parallel, the first UPS ID set to 12 and second UPS ID set to 23.
   (2) when three UPS units operation with parallel, the first UPS ID set to 12, second UPS ID set to 23 and third UPS ID set to 34.
   (3) and so on, can parallel up to 8.

When the condition of UPS complies with the above-mentioned conditions, the following procedures can be accessed to start-up UPS:

1. Install external parallel communication cable (CNQ7 and CNQ8) from the UPS unit to computer and make sure both are locked.
2. Turn on “RESERVE INPUT” breaker of each UPS unit, and “Bypass Mode” would be shown on the LCD display”.
3. Turn on “RECTIFIER INPUT” breaker of each UPS unit, and wait for the “Battery M.C.” capture in 30 seconds.
4. Turn on “BTTERY FUSE ISOLATOR” in every battery cabinet.
5. Press the inverter “ON” and “⏎ ” buttons for 3 seconds simultaneously, the inverter will be active, and voltage builds after 30 seconds. The “Inverter M.C.” will be in a release position, and LCD displays “Bypass Mode”.
6. Repeat step 5 to start-up other UPS units until the last inverter voltage builds, and these “Inverter M.C.” will be active simultaneously, the same as all parallel UPS units. To measure phase output voltage with all parallel UPS units (the voltage must be less than 5V). If above processes are normal, these “UPS OUTPUT” breakers of all UPS units can be turned on. The load would be shared equally among all parallel UPS units and the LCD displays “Normal Mode” on each UPS unit.

After UPS normal with about 30 seconds, UPS will automatic execute battery test to check battery whether normal.

6-5 System Shutdown Procedures (Parallel)

When UPS operate with parallel, one or more UPS units would be shutdown and the operation procedures as follow:

1. Press the inverter “OFF” and “⏎ ” buttons for 3 seconds simultaneously to shut down the UPS. If the load is less than the total rated power of the sum of other UPS units in parallel, the “Inverter M.C.” will be released. As a result, LCD displays “Output Close” and loads would be shared equally among other UPS units in parallel. Those LCD displays “Normal Mode”.
   If the load is greater than the total rating power of the sum of other UPS units in parallel, all UPS units will turn off inverter and release “Inverter M.C.” Load is transferred to reserve power and all LCD displays “Bypass Mode”.
2. Turn off “BATTERY FUSE ISOLATOR” in battery cabinet of the UPS units.
3. Turn off “RECTIFIER INPUT” and “UPS OUTPUT” breakers of the UPS units.
4. Press “ON” and “OFF” buttons to test inverter for DC CAP discharge, then press “OFF” and “⏎ ” buttons to turn off inverter and confirm that BUS voltage complete discharge.
5. Turn off “RESERVE INPUT” breaker of the UPS units for whole unit shutdown.

6-6 Maintenance Manual Bypass Procedures (Parallel)

The “MANUAL BYPASS” breaker only can be turned on for maintenance reason to make sure an uninterruptible power delivering to the load during the interval. If turn on “Manual Bypass” breaker at “Normal Mode”, inverter will be turned off, and load will be transferred to manual bypass.

6-6-1 Inverter transfer to Manual Bypass (Parallel)

Operation procedure as follow:

1. Press the inverter “OFF” and “⏎ ” buttons for 3 seconds simultaneously for the UPS shutdown. If the load is less than the total rated power of the sum of other UPS units in parallel, the “Inverter M.C.” releases for UPS shutdown and LCD displays “Output Close”. The load would be shared equally among the rest of UPS units in parallel, and LCD displays “Normal Mode”.
   If the load is greater than the rated load of the sum of other UPS units in parallel, all UPS units will turn off inverter and release “Inverter M.C.”. The load transfers to reserve power, and all LCD displays “Bypass Mode”.

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2. Repeat step 1 to transfer to “Bypass Mode” of all UPS units with parallel.
3. Open “BATTERY FUSE ISOLATOR” in battery cabinet of all UPS units.
4. Open “RECTIFIER INPUT” breaker of all UPS units.
5. Wait for 5 minutes for DC CAP complete discharged; user also can press “ON” and “OFF” buttons to test inverter for DC CAP discharged. Then press “OFF” and “⏎ ” buttons to turn off inverter and confirm that no BUS voltage is remained.
6. Turn on “MANUAL BYPASS” breaker of each UPS unit, the load is transferred to manual bypass and LCD displays “Manual Bypass”.
7. Turn off “UPS OUTPUT” breaker, “RESERVE INPUT” breaker, the fuse isolators of auxiliary power (+), and fan power (N) of each UPS unit. Then LCD shuts down.
8. When UPS in manual bypass, no high internal voltage in the UPS units expect the terminals and “MANUAL BYPASS”, ready for UPS maintenance.

6-6-2 Manual Bypass transfer to Inverter

Operation procedures as follow:

1. Turn on “UPS OUTPUT” breaker, “RESERVE INPUT” breaker and fuse isolators of auxiliary power (+), and fan power (N) of each UPS units. Under that condition, load supply is from manual bypass and LCD displays “Manual Bypass”.
2. Turn off “MANUAL BYPASS” breaker of each UPS units, load is transferred to reserve power and LCD displays “Bypass Mode”.
3. Turn on “RECTIFIER INPUT” breaker of each UPS unit and wait about 30 seconds, the DC BUS voltage would be built up.
4. Turn on “BATTERY FUSE ISOLATOR” in every battery cabinet.
5. Press the inverter “ON” and “⏎ ” buttons for 3 seconds simultaneously. The inverter will be active and voltage build within 30 seconds, but the “Inverter M.C.” is still in off position. Power delivering to the load is provided by reserve power and the LCD displays “Bypass Mode”.
6. Repeat step 5 to start-up other UPS units until the inverter voltage build on the final UPS unit. As a result, “Inverter M.C.” will be captured simultaneously in all parallel UPS units. To measure phase output voltage with all parallel UPS units (must less than 5V). If all in normal condition, these “UPS OUTPUT” breakers of all UPS units could be turned off. The load would be shared equally among all parallel UPS units and the LCD displays “Normal Mode” on every UPS units.

7. Options

7-1 12-pulse Rectifier

The 12-pulse Rectifier considerably reduces the input current harmonic reinjected into the distribution system. The basic principle is bring two power source with phase-shifting 30^{o} to the two rectifiers, could reduce the 5^{th} and 7^{th} of input current harmonics to reach the request for reduce input current total harmonic distortion. The two power sources would be made by three phase star-delta transformer. In general, the input current total harmonic distortion was about 32~34% with 6-pulse rectifier, but the 12-pulse rectifier could reduce to 12~14%.

The 12-pulse rectifier block as show in fig. 7-1.

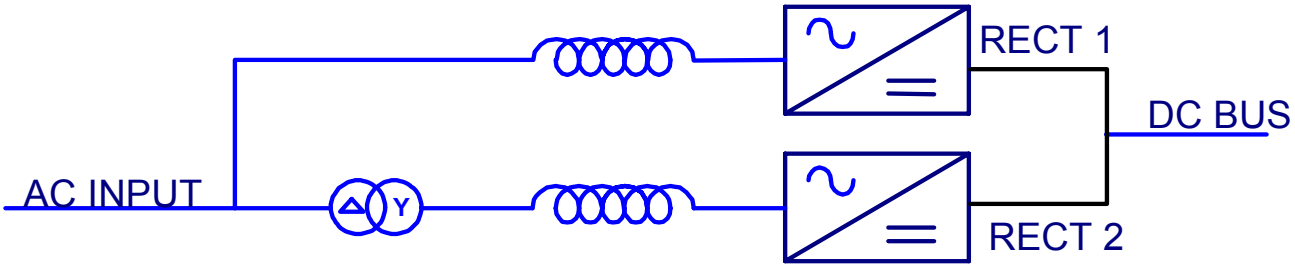


Fig. 7-1 12-pulse rectifier block

7-2 Harmonic Filter

The passive filter (L-C filter) offers another solution for reduce input current harmonics. It is also a means to increase the input power factor of UPS. In the UPS with 6-pulse rectifier, could choose to install 5^{th} filter.

7-3 Remote Monitor

Remote monitor connects to UPS with RS232-toRS485 adapter. The UPS operate status could sent to the remote control room.

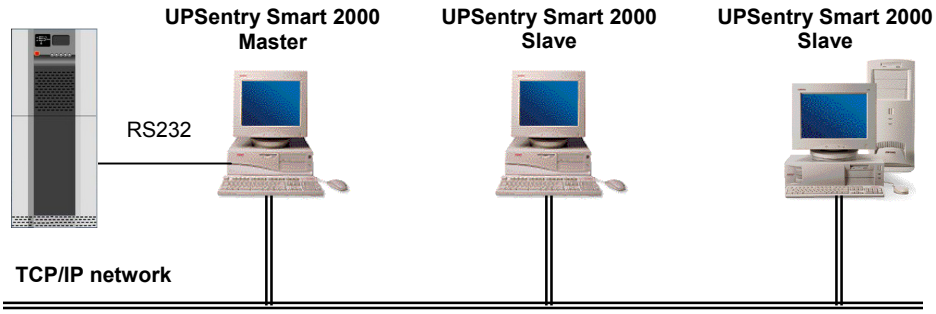
7-4 Monitor Software

7-4-1 UPSentry Smart 2000

UPSentry Smart 2000 is designed to provide end users the ability to take proactive steps to protect their computers from power related damages. UPSentry Smart 2000 allows for automatic shutdowns, scheduled shutdowns and a variety of other features that help you manage your system and its peripheral components.

UPSentry Smart 2000 provides detailed information about the UPS and its protected equipment. It is easy to install and program, yet has the necessary features to handle all of one's power requirements. Included is the capability for network management protocol (SNMP, HTTP and DMI). UPSentry Smart 2000 will disseminate UPS information into SNMP protocol and project it to the appropriate Network Management Station (NMS), such as HP OpenView. To make use of resources on the Internet, UPSentry Smart 2000 also supports HTTP protocol. This enables end-users to monitor their UPS anywhere, anytime, by simply utilizing their web browser.

UPSentry Smart 2000 runs in the background as a Windows service, and communicates with the UPS in order to ensure that your computer and attached components are protected from any power problems.



UPSentry Smart 2000 provides the following features:

1. Graceful operating system shutdown
2. Scheduled tests, shutdown/restarts of the UPS, turn on/off receptacles
3. Flexible events
4. Notification: Pager, e-mail and audible alarm, network broadcasting and SNMP
5. Real-time values of voltage, current, frequency and loading...
6. Historical data & graph
2. Network monitoring
3. Multi-server shutdown/restart
4. Support Simple Network Management Protocol (SNMP)
5. Support Desktop Management Interface (DMI)
6. Support HTTP, remote monitor and control using Internet browser

computers proceed shutdown procedure.

7-4-2 3Phase UPSentry

3Phase UPSentry is used to collect all of the UPSs information through RS485 in one application, it also provides the ability to monitor and control these UPSs remotely through network or modem. When UPS discharge to the battery stop voltage with mains absent, UPS sent a message to those computers on network and these

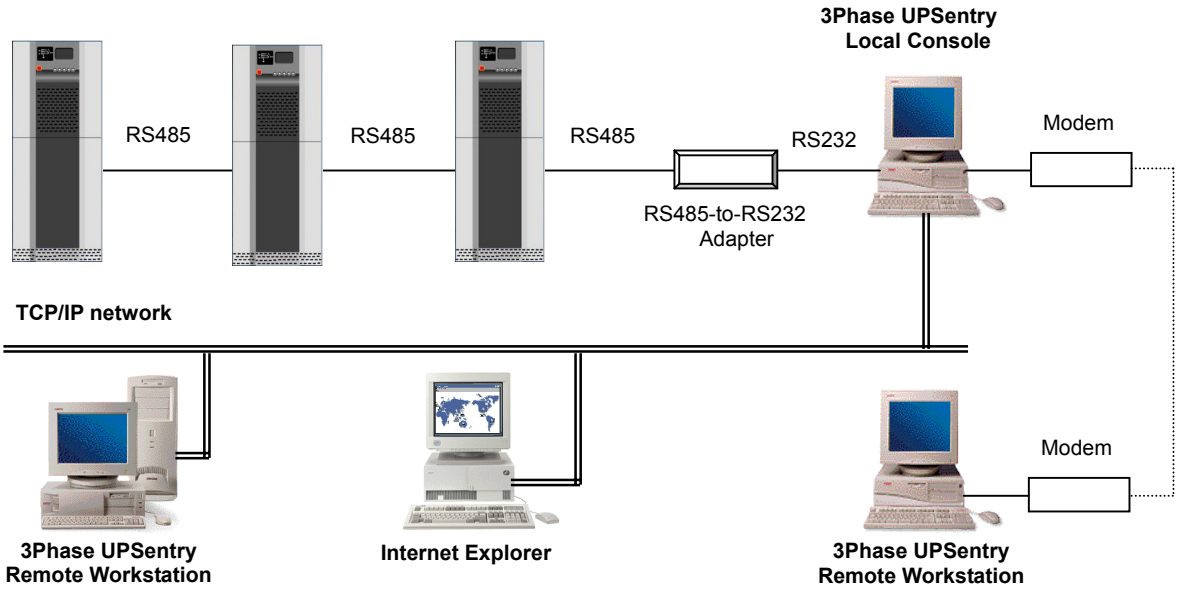


Fig. 7-4

3Phase UPSentry provides the following features:

1. One PC monitors up to 31 UPSs
2. Remote monitoring and control through TCP/IP network or modem
3. Support HTTP, remote monitor and control using Internet browser
4. Real-time values of voltage, current and frequency...
5. Historical data & graph
6. Notification: Pager, e-mail, audible alarm and network broadcasting
7. Flexible events
8. Download UPS SRAM & event log

7-5 Battery start-up

When mains absent, want to start-up UPS could close the fuse-isolator in battery cabinet, then press “battery start” switch and press ”ON” and ”⏎ ” buttons simultaneously. The load would on battery, if battery voltage reaches the stop voltage and mains still absent, the UPS would be shutdown.

7-6 UPS Economical (ECO) Mode UPS

When choose UPS economical Mode from control panel, UPS supplies the load from reserve power with normal, but when reserve power abnormal, the load would transfer to inverter. (During the transfer, output power would cutoff with some interval.

DELTA ELECTRONIC, INC.

P/N:5011326200

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