MAGNIZON
GREEN ENERGY

USER MANUAL

APS Series Solar Hybrid Inverters

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PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLATION

CONTENTS

ABOUT THIS MANUAL

Purpose

The purpose of this manual is to provide explanations and procedures for installing, operating and troubleshooting for the unit. This manual should be read carefully before installations and operations. Please retain this manual for future reference.

Scope

This document defines the functional requirements of the unit, intended for worldwide use in electronic processing equipment. All manuals are applicable under all operating conditions when installed in the End Use system, unless otherwise stated.

IMPORTANT SAFETY INSTRUCTIONS

WARNING: This chapter contains important safety and operating instructions. Read and keep this User Guide for future reference.

General Precautions

1. Before using the unit, read all instructions and cautionary markings on:
   (1) The unit (2) the batteries (3) all appropriate sections of this manual.
2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not expose the unit to rain, snow or liquids of any type. The unit is designed for indoor use only. Protect the unit from splashing if used in vehicle applications.
4. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
5. To reduce risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
6. **CAUTION** --Battery are not already installed by the supplier only a qualified professional (e.g. service person) may install the Inverter.
7. **WARNING: WORKING IN VICINITY OF A LEAD ACID BATTERY IS DANGEROUS.**
   BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION. Provide ventilation to outdoors from the battery compartment. The battery enclosure should be designed to prevent accumulation and concentration of hydrogen gas in “pockets” at the top of the compartment. Vent the battery compartment from the highest point. A sloped lid can also be used to direct the flow to the vent opening location.
8. **NEVER** charge a frozen battery.
9. No terminals or lugs are required for hook-up of the AC wiring. AC wiring must be no less than 10 AWG gauge copper wire details refer to table 2. Battery cables must be rated for 35mm or higher and should be no less than table 1. Crimped and sealed copper ring terminal lugs with a HRNB38-8 hole should be used

to connect the battery cables to the DC terminals of the unit. Soldered cable lugs are also acceptable.

10. Be extra cautious when working with metal tools on, or around batteries. The potential exists to drop a tool and short-circuit the batteries or other electrical parts resulting in sparks that could cause an explosion.
11. No AC or DC disconnects are provided as an integral part of this unit. Both AC and DC disconnects must be provided as part of the system installation. See INSTALLATION section of this manual.
12. Fuses are provided as the over current protection of the battery supply.
13. When PV module or panel is exposed to light, it starts to supply high DC voltage, be sure to turn off DC switch before commencing the maintenance, and make sure the cables from PV panel are properly sealed after disconnection.
14. GROUNDING INSTRUCTIONS -This battery charger should be connected to a grounded permanent wiring system. For most installations, the Ground Lug should be bonded to the grounding system at one (and only one point) in the system. All installations should comply with all national and local codes and ordinances.
15. **AVOID** AC output short-circuit; avoid DC input short-circuit and do not connect the mains while DC input short-circuit.
16. **The input PV1 and PV2 on the terminal block of the APS inverter can not be connected to the same solar panel but should be connected to the separated solar panel of independence.**
17. **Warning:** The maintenance information is only to service persons, If the product is used in a manner which is not covered by the scope of warranty, the protection provided by the product may be impaired.

Personal Precautions

1. Someone should be within range of your voice to come to your aid when you work near batteries.
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near batteries. Wash your hands when done.
4. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eyes, immediately flood eyes with running cool water for at least 15 minutes and get medical attention immediately.
5. Baking soda neutralizes lead acid battery electrolyte. Keep a supply on hand in the area of the batteries.
6. NEVER smoke or allow a spark or flame in vicinity of a battery or generator.
7. Be extra cautious when working with metal tools on, and around batteries. Potential exists to short-circuit the batteries or other electrical parts which may result in a spark which could cause an explosion.
8. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with battery. Battery can produce short-circuit current high enough to weld a ring, or the like, to metal causing severe burns.
9. If a remote or automatic generator start system is used, disable the automatic starting circuit and/or disconnect the generator from its starting battery while servicing to prevent accidental starting during servicing.

INSTALLATION

Unpacking and Inspection

Carefully unpack the inverter/charger from its shipping carton.

Verify all of items list below are present. Please call customer service if any items are missing.

- The unit
- 1 user's manual

Basic Configuration

APS Series hybrid Inverter is designed to serve as a backup power supply for AC loads. The input power of APS Series hybrid Inverter comes from PV system and AC grid which not only supply power to AC loads but also charge the battery bank when the power from AC grid or AC generator is present (also known as Line Mode).
In the event of AC grid (or AC generator) outage, the AC loads can be alternatively powered by PV system (if the illumination is sufficient) and battery bank.
The following illustrations show basic applications for APS Series hybrid Inverter.

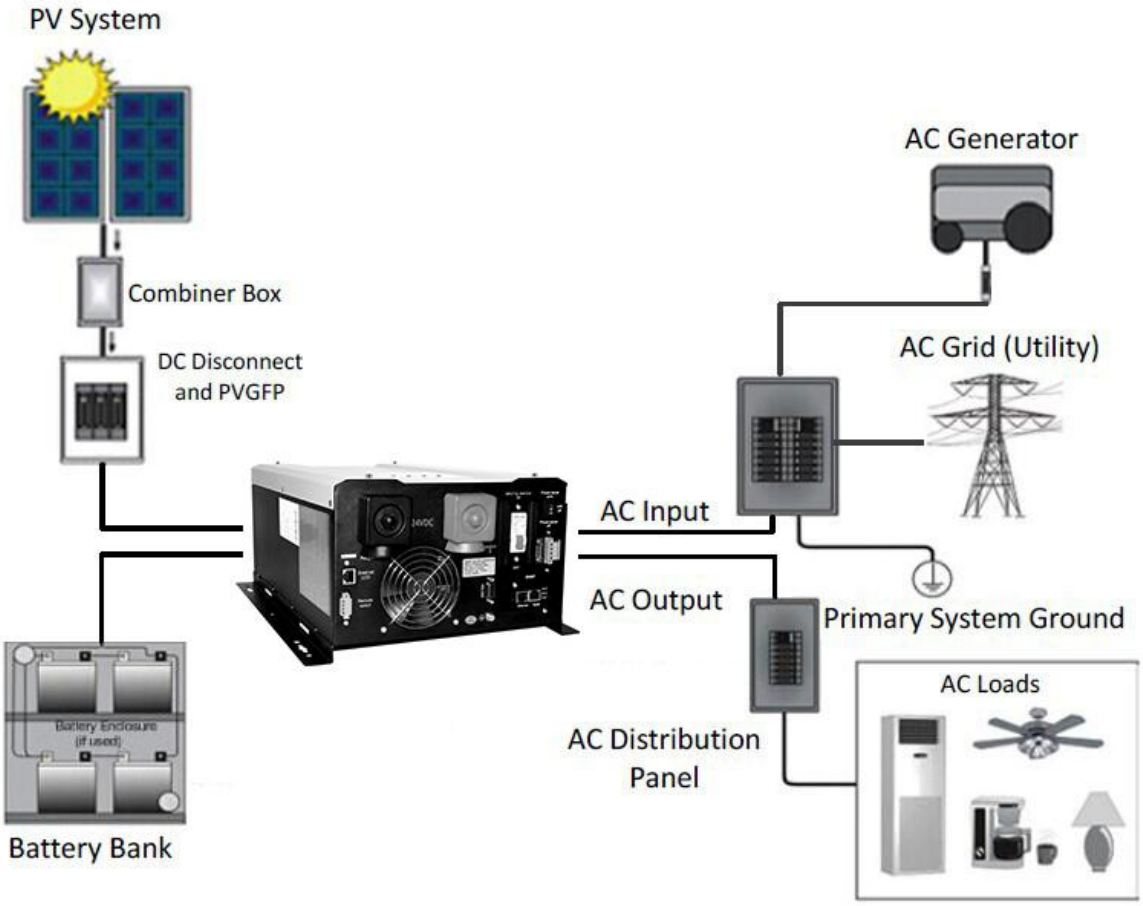


Figure 1. Typical Application of APS series hybrid Inverter

Note: Appliances like Air conditioner needs at least 3 minutes to restart in case of a power shortage occurs in a way that the power turns off then back on again rapidly (time is required to balance the refrigerant gas in inside circuit); so in order to protect your Air conditioner, please consult the Air conditioner manufacturer whether they have already provided time delay function before installing. Otherwise, Inverter will trig overload fault and shut off its output to protect your appliance but sometimes it is not enough and your Air conditioner can be damaged internally beyond repair.

Batteries

The unit support 12volt,24volt or 48vlot battery bank. Please wiring battery correctly. Before proceeding, ensure you have appropriate size batteries for this inverter. The unit can use flooded lead-acid, or sealed GEL/AGM lead-acid batteries so ensure that your batteries are in one of these categories. APS inverter with built-in MPPT solar controller, for the battery and solar panel connection please refer to figure 2,figure3 and figure4. If with the built-in 48 MPPT 40A solar charge controller, then please configure solar panels more than 2350W, otherwise it can not reach the maximum charge current, if with the built-in 48 MPPT 60A solar charge controller, then please configure solar panels more than 3500W, otherwise it can not reach the maximum charge current.

Note: if you are using a gel battery or a deep cycle battery, please do not use ordinary lead-acid batteries for use in solar energy systems. This is likely to damage the lead acid battery or to reach the desired effect.

The battery must be wired to match with the DC input voltage. Recommend to use battery capacity more than 200AH.

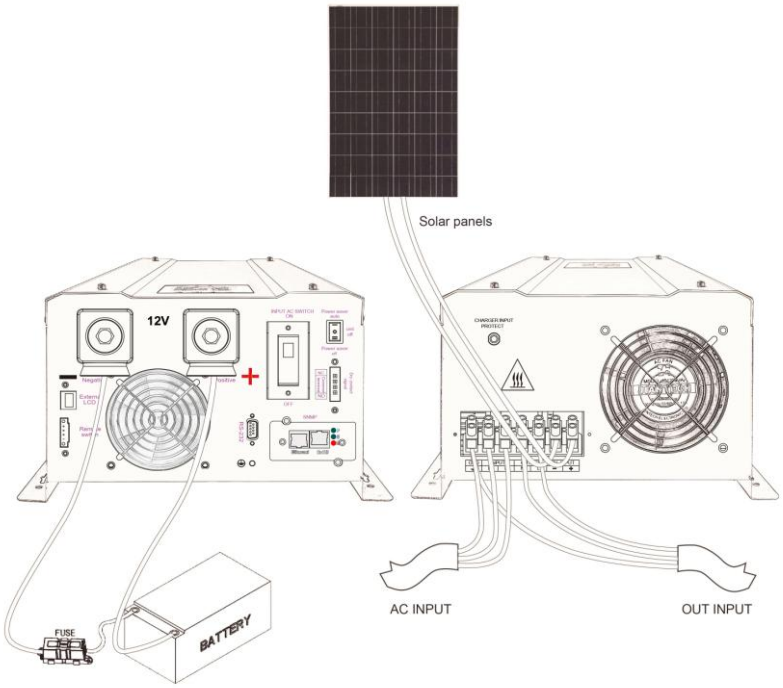


Figure 2. APS 12V solar inverter system- the connection diagram of solar panel and battery

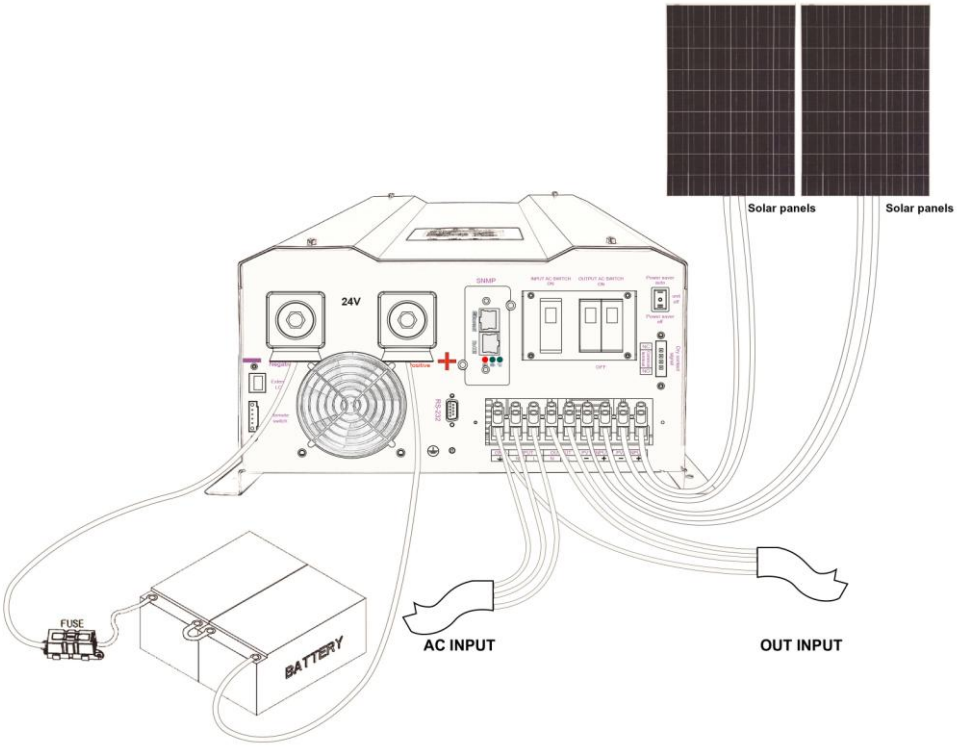


Figure 3. APS 24V solar inverter system- the connection diagram of solar panel and battery

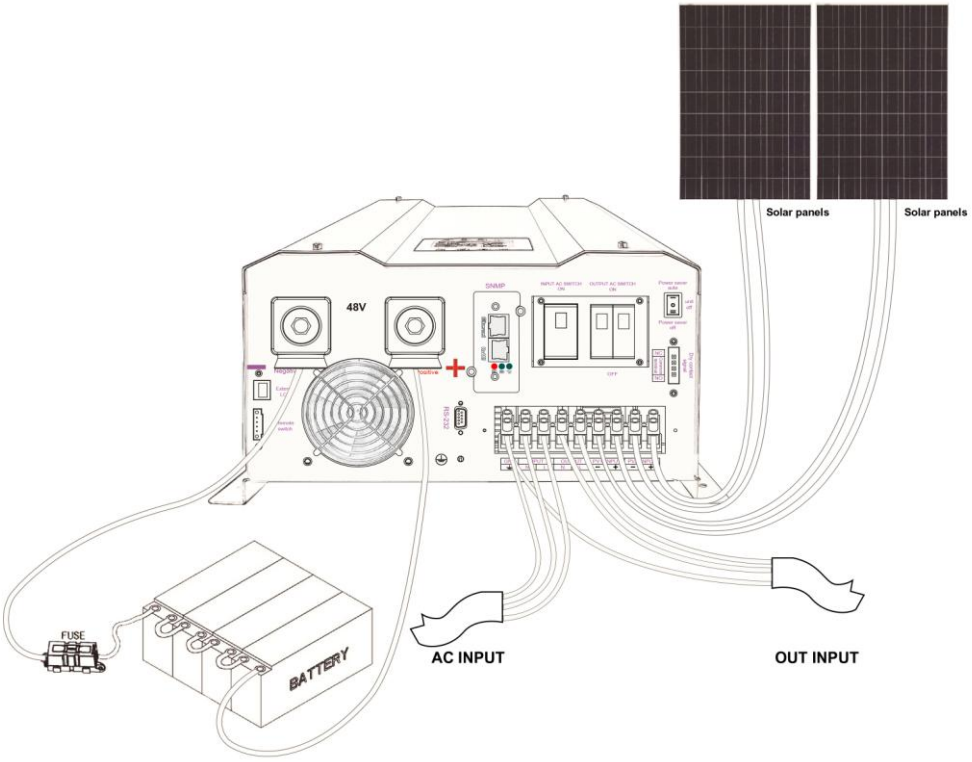


Figure 4. APS 48V solar inverter system- the connection diagram of solar panel and battery

Battery Cable Size

Below table 1 you can find information for recommended battery cable and terminal.

Table 1. Recommended battery cable and terminal size

Model Number	DC Voltage	Typical Amperage	Battery Capacity	1~3 m one-way	0.5 m one-way	Cable Terminal
APS1000W APS2000W APS4000W	12V 24V 48V	120A	200AH	25mm^2	25mm^2	RNBS38-8
APS5000W	48V	150A	200AH	35mm^2	25mm^2	RNBS38-8
APS1500W APS3000W APS6000W	12V 24V 48V	175A	200AH	50mm^2	35mm^2	RNB60-8/RNBS38-8
APS2000W APS4000W APS8000W	12V 24V 48V	225A	200AH	50mm^2	35mm^2	RNB60-8/RNBS38-8
APS5000W APS10KW	24V 48V	275A	200AH	75mm^2	50mm^2	RNB80-8/RNB60-8
APS3000W APS6000W APS12KW	12V 24V 48V	315A	200AH	75mm^2	50mm^2	RNB80-8/RNB60-8

DC Disconnect and Over-Current Protection

For safety and to comply with regulations, battery over-current protection and disconnect devices are required. Fuses and disconnects must be sized to protect the DC cable size used, and must be rated for DC operation. Do not use devices rated only for AC service – they will not function properly.

Note that some installation requirements may not require a disconnect device, although over-current protection is still required.

Battery Cable Connection

Observe Battery Polarity! Place the ring terminal of DC cable over the bolt and directly against the unit's battery terminal. Tighten the M8 screw with 6-10 Nm. Do not place anything between the flat part of the Backup System terminal and the battery cable ring terminal or overheating may occur.

DO NOT APPLY ANY TYPE OF ANTI-OXIDANT PASTE TO TERMINALS UNTIL AFTER THE BATTERY CABLE WIRING IS TORQUED!!

WARNING: Shock Hazard

Installation must be performed with care for the high battery voltage in series.

⚠ **Caution!!** Do NOT place anything between battery cable ring terminals and terminals on the inverter. The terminal screw is not designed to carry current.

Apply Anti-oxidant paste to terminals AFTER terminals have been screwed.

Verify that cable lugs are flush with the battery terminals. Tighten battery cables to terminals (6-10 Nm).

AC Cable Size

Before wiring the input and output of inverter, refer to table 2 for minimum recommended cable size and torque value

Table 2. Recommended cable size and torque value for AC wire

Model Number	Typical Amperage	AC Input	AC Output	Torque value
APS1000W 230Vac	10A	12AWG	14AWG	1.5~2.0 Nm
APS1500W 230Vac	12A	12AWG	14AWG	1.5~2.0 Nm
APS2000W 230Vac APS1000W 110Vac	15A	12AWG	12AWG	1.5~2.0 Nm
APS3000W 230Vac APS1500W 110Vac	20A	12AWG	12AWG	1.5~2.0 Nm
APS4000W 230Vac APS2000W 110Vac	32A	12AWG	12AWG	1.5~2.0 Nm
APS5000W 230Vac	40A	12AWG	12AWG	1.5~2.0 Nm
APS6000W 230Vac APS3000W 110Vac	50A	10AWG	12AWG	1.5~2.0 Nm
APS8000W 230Vac APS4000W 110Vac	60A	10AWG	10 AWG	2.0~2.5 Nm
APS10KW 230Vac APS5000W 110Vac	70A	8AWG	10 AWG	2.0~2.5 Nm
APS12KW 230Vac APS6000W 110Vac	80A	6AWG	8AWG	2.0~2.5 Nm

AC Connections

Installation should be done by a qualified electrician. Consult local code for the proper wire sizes, connectors and conduit requirements.

On the left of rear chassis is the AC hardwire cover. Two three-station terminal block is provided to make the AC connections. The terminal block is used to hardwire the AC input, AC output, and ground. The National Electrical Code requires that an external disconnect switch be used in the AC input wiring circuit. The AC breakers in a sub panel will meet this requirement.

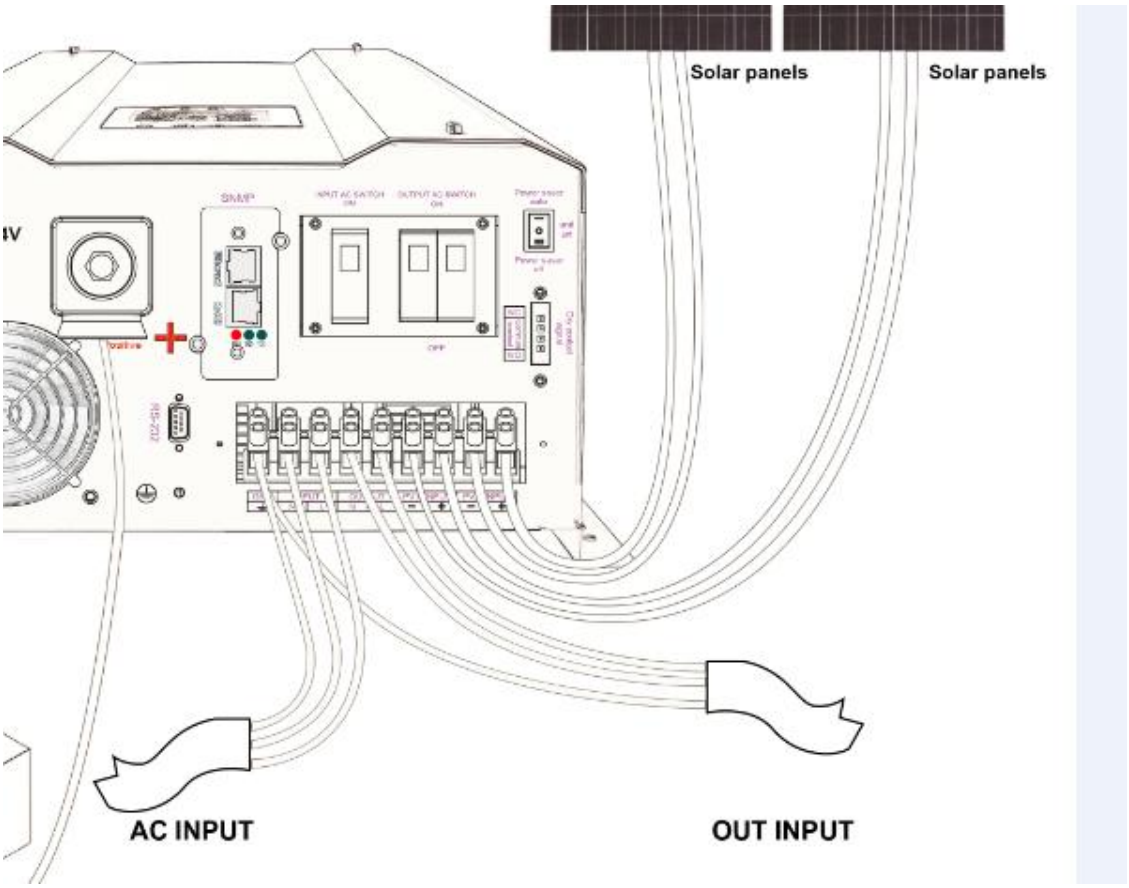


Figure 5. AC Cable Connect to unit

Step 1: Disconnect the unit from the battery by removing the battery cables. Turning off the unit before disconnect from the battery.

Step 2: Following the wiring guide located in the AC input wiring compartment as figure 5, connect the GND (green/yellow), Line (brown), and neutral (blue) wires from the AC input (utility, generator, etc) to the terminal block.

Caution!! Be sure that AC source is disconnected before attempting to hardwire it to the unit.

Step 3: Connect the AC Line output wiring to the terminal marked AC Line (output), following the wiring guide inside the compartment. Torque the wires into the terminal block.

Step 4: Lock the AC covers.

Machine panel introduction

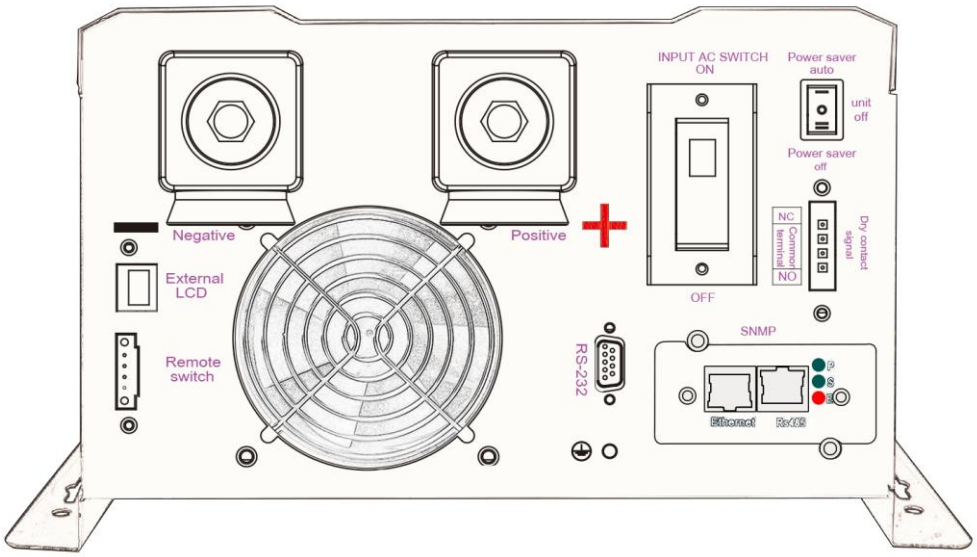


Figure 6. APS 1-**3**KW Front panel

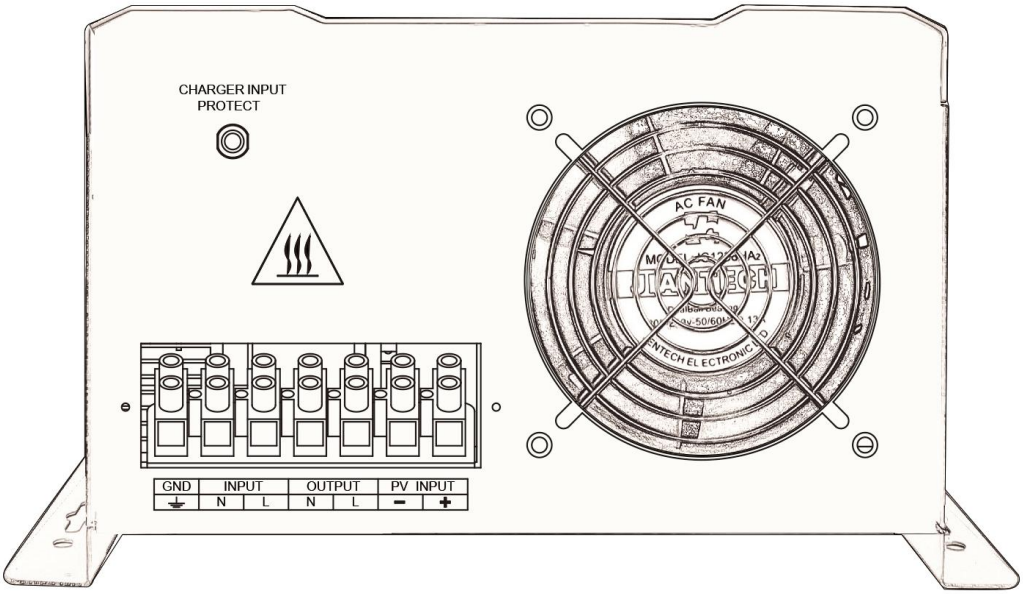


Figure 7. APS 1-3KW Back panel

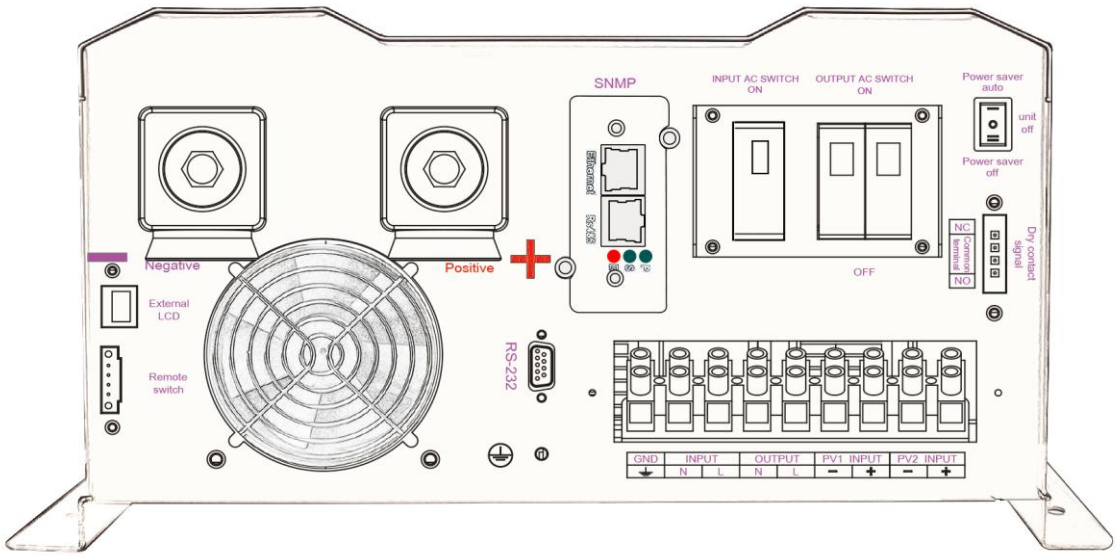


Figure 8. APS 4-6KW Front panel

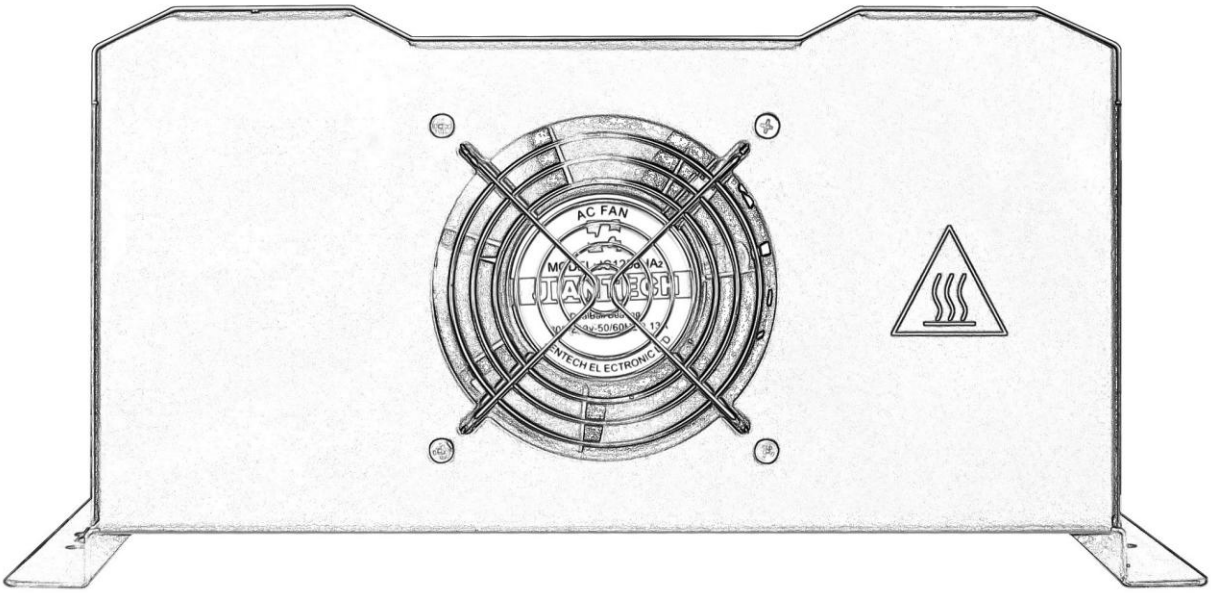


Figure 9. APS 4-6KW Back panel

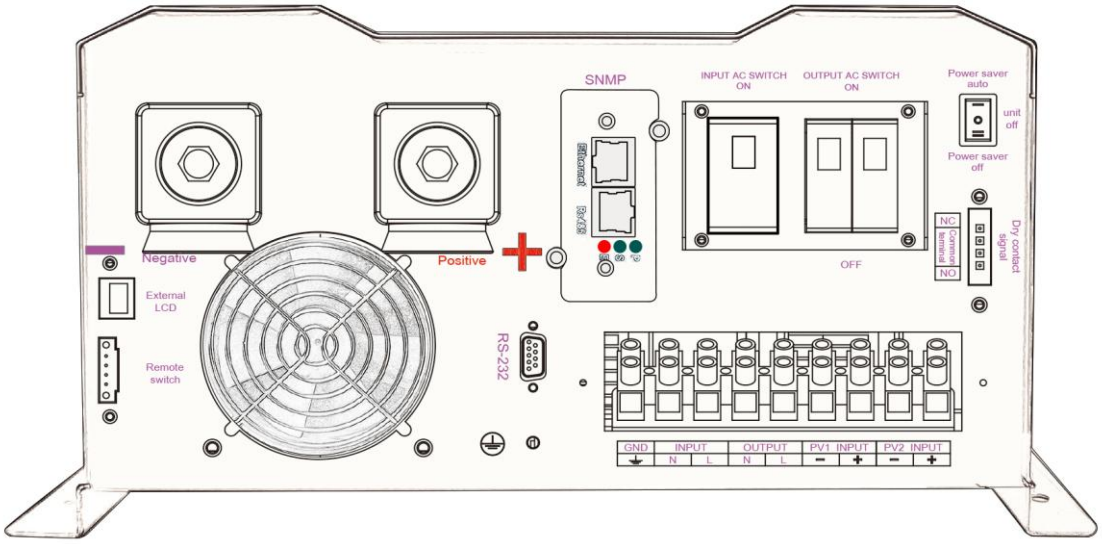


Figure 10. APS 8-12KW Front panel

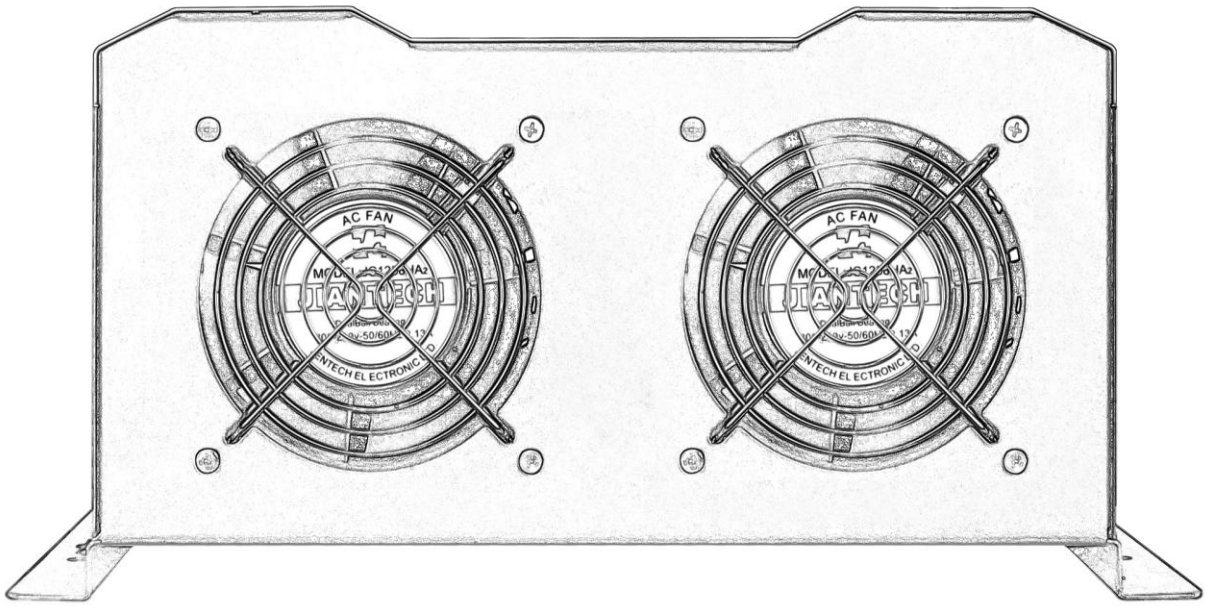


Figure 11. APS 8-12KW Back panel

OPERATION

Front Panel and Configuration Switch

Table 3. configuration button function

Switch	Description
CONF	long press "1S" button to enter the setting interface
Left – right SELECT	Left-right SELECT button can be used for selecting different contents(Voltage, frequency, charging current...)

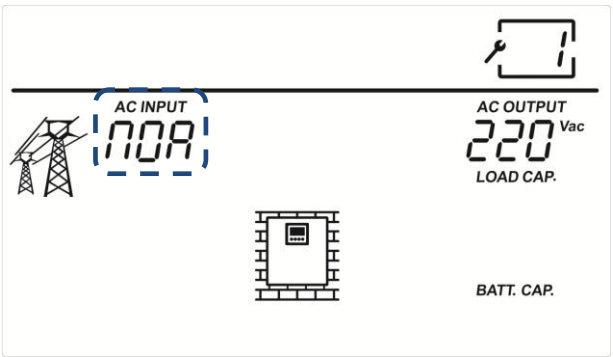
Up – down SELECT	Up – down SELECT button can be used for selecting parameter on the function setting mode
ENTER	Confirm, data save function
LED Indicator	
LED	**Description**
PV-LED	GREEN LED Lighting on PV normal
AC-LED	GREEN LED lighting on AC Line Mode
Battery-LED	YELLOW LED lighting on Battery Inverter Mode
Alarm-LED	RED LED lighting on Alarm

Setting Indicators

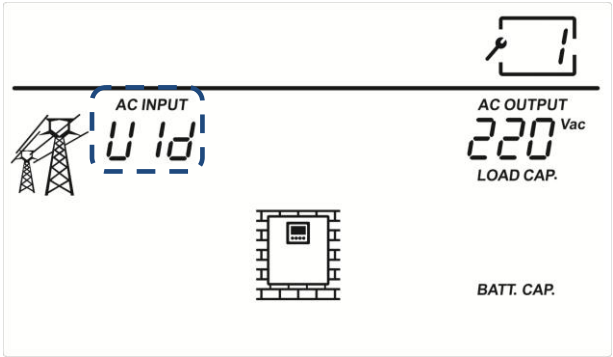
Table 4. configuration option

NO.	Description	Selectable option
1	Input voltage setting	Wide/Normal.
2	Output voltage setting	208/220/230/240Vac.
3	Output frequency setting	50/60Hz/Automatic.
4	AC charge on, off	AC charge on/AC charge off.
5	AC Charger current setting	20A/35A/50A/70A/90A
6	DC/AC/	DC mode priority / AC mode priority.
7	DC conversion voltage point setting	11.0Vdc/11.5Vdc/12.0Vdc.

1. Input voltage range Setting

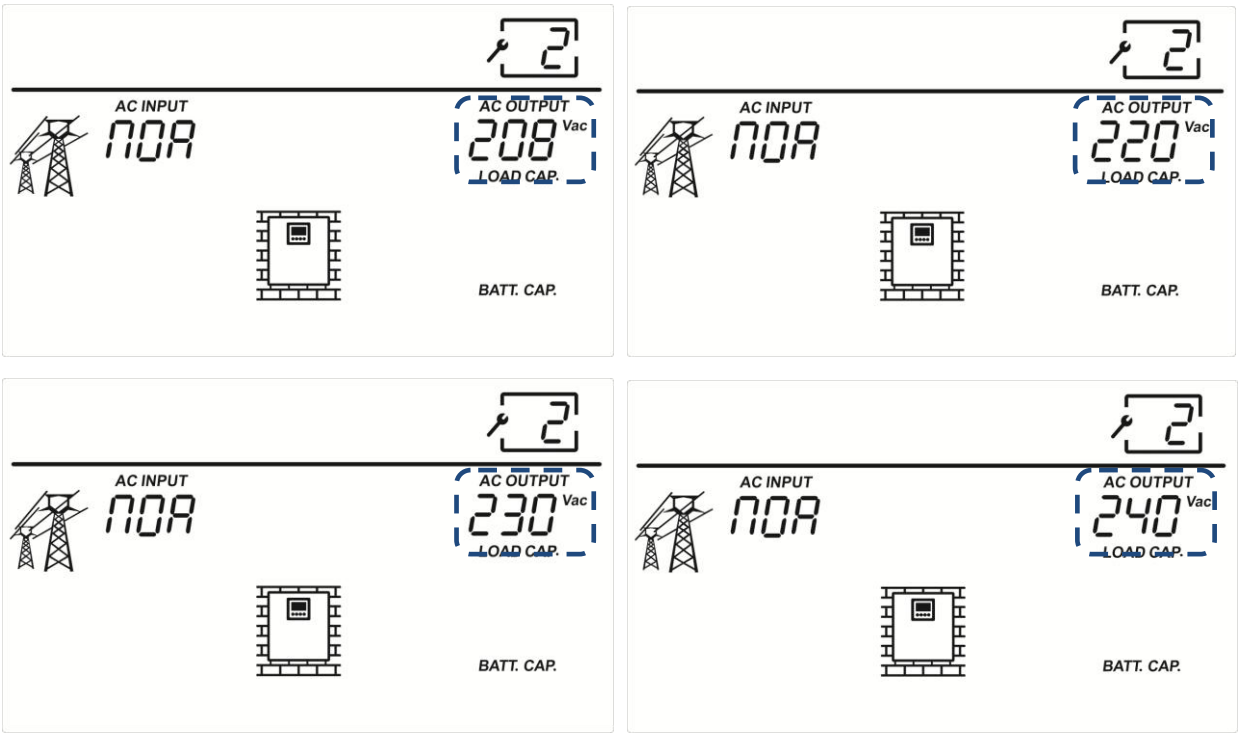


Narrow range mode



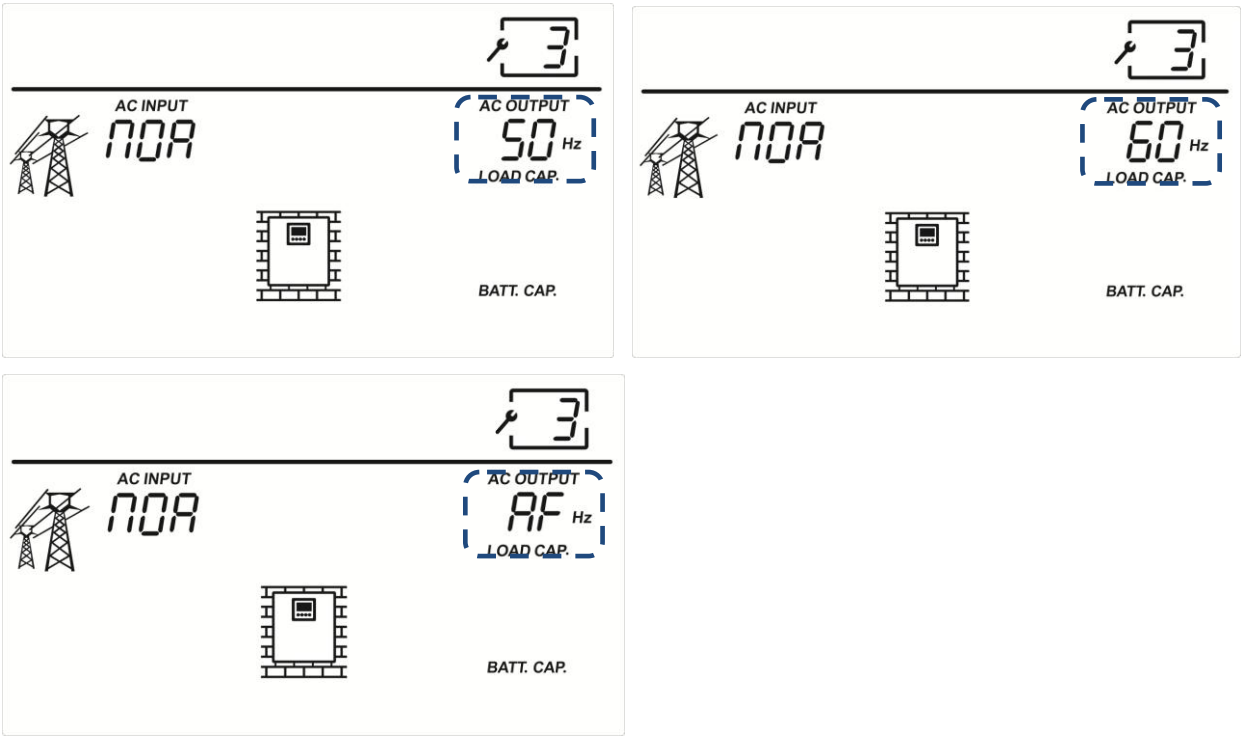
Wide range mode

2. Output voltage Setting



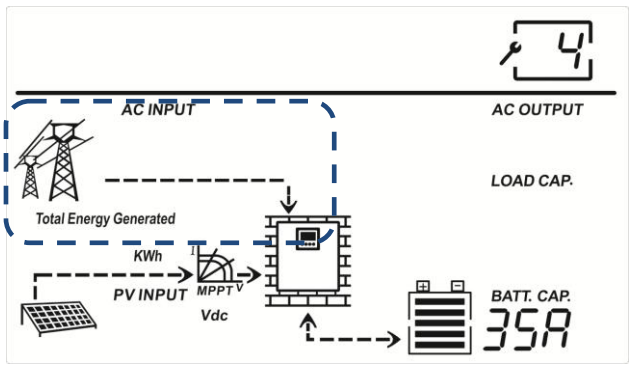
208Vac/220Vac/230Vac/240Vac four kinds of output voltage can be set.

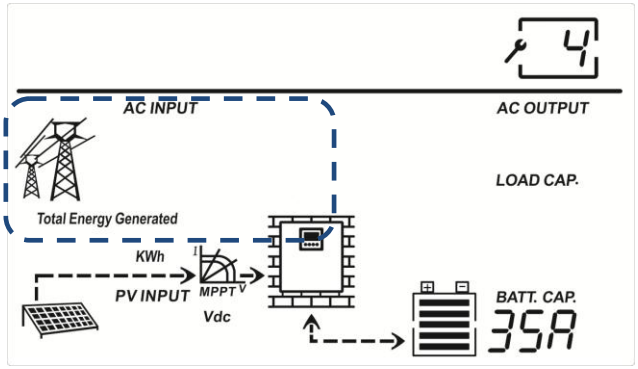
3. Output frequency Setting



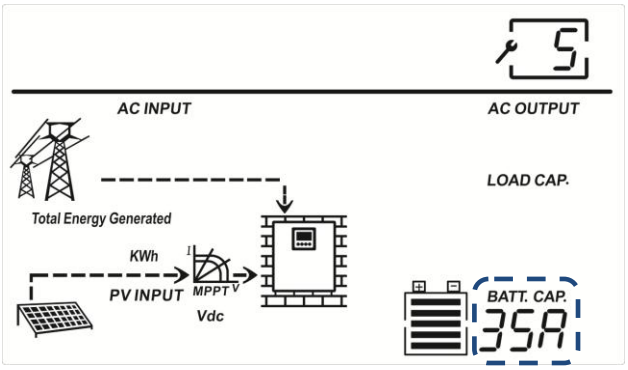
50/60Hz frequency output can be adjusted, as well as the adaptive AC input frequency.

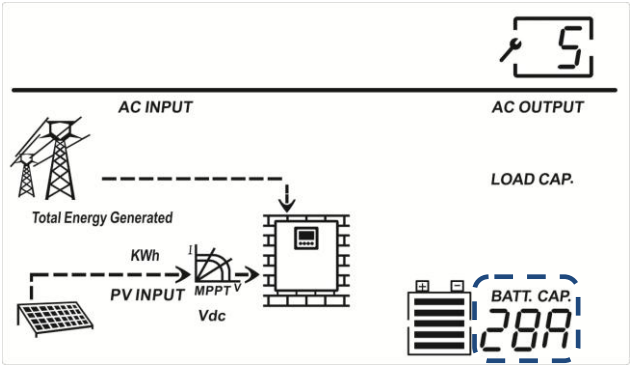
4. AC charger ON/OFF Setting

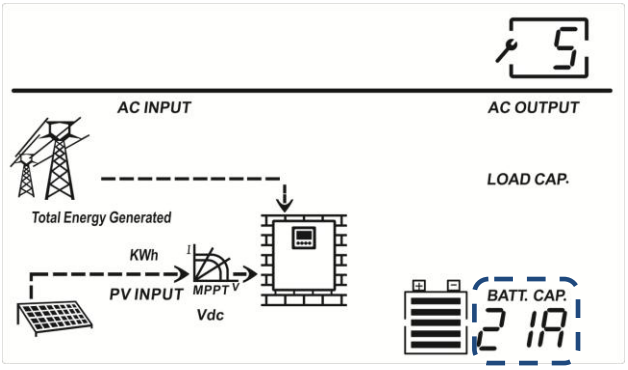


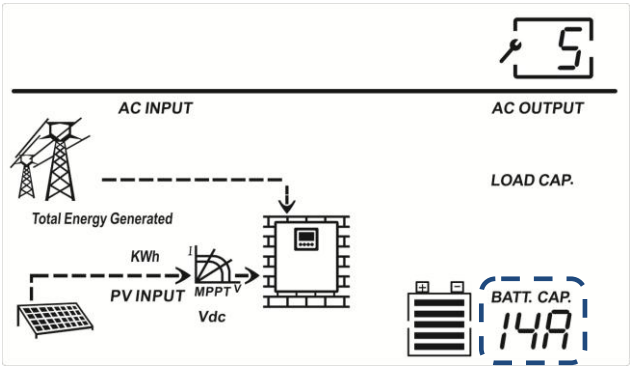


.5. AC Charger current Setting









Maximum rated charge current can be divided into 5 different stall for adjusting

20A charger can be adjusted into 4A/8A/12A/16A/20A

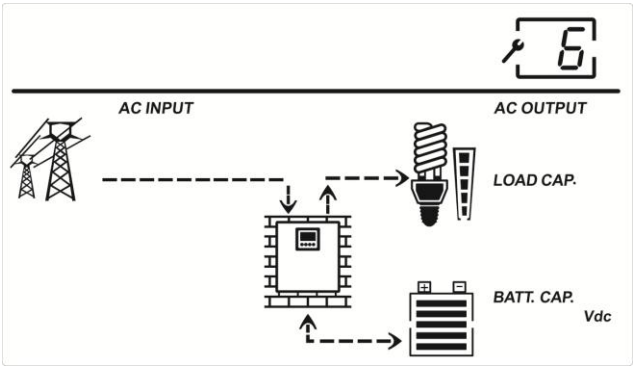
35A charger can be adjusted into 7A/14A/21/28A/35A.

50A charger can be adjusted into 10A/20A/30A/40A/50A.

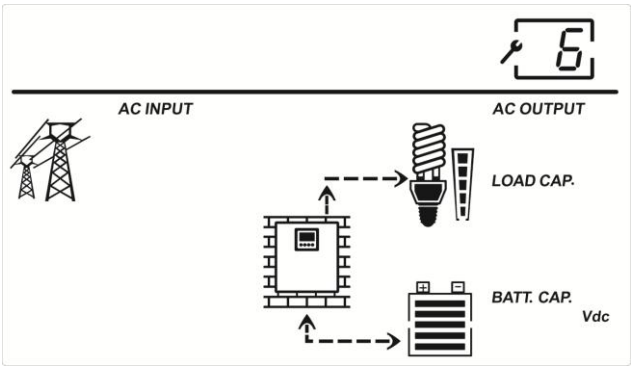
70A charger can be adjusted into 14A/28A/42A/56A/70A.

90A charger can be adjusted into 18A/36A/54A/72A/90A.

6. DC/AC/ Intelligent mode selection setting

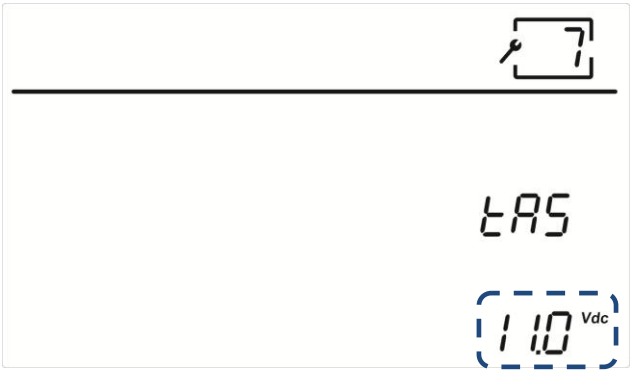


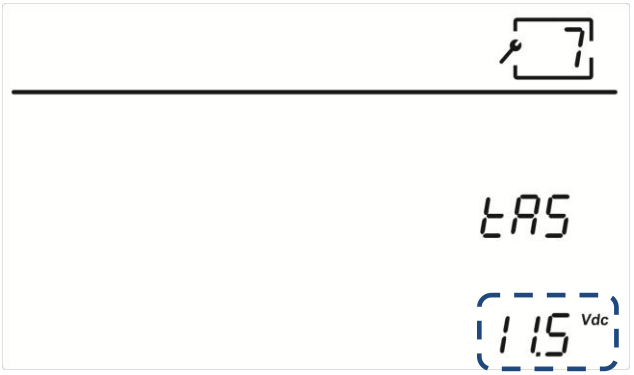
AC mode priority

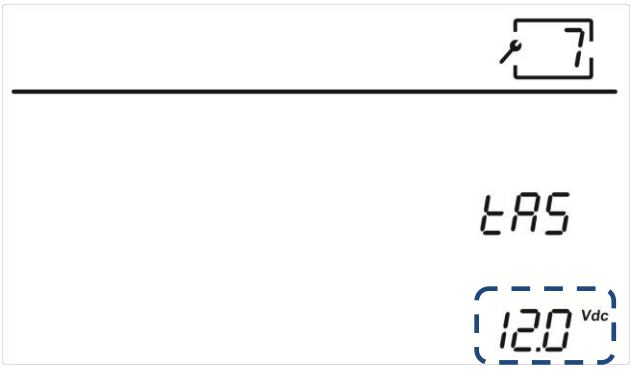


DC mode priority

7. DC conversion voltage point setting



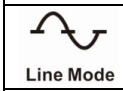
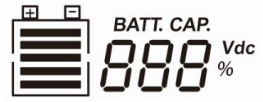




DC voltage automatic transfer point setting, 11.0Vdc/11.5Vdc/12.0Vdc three voltages conversion gear.

LCD display meaning

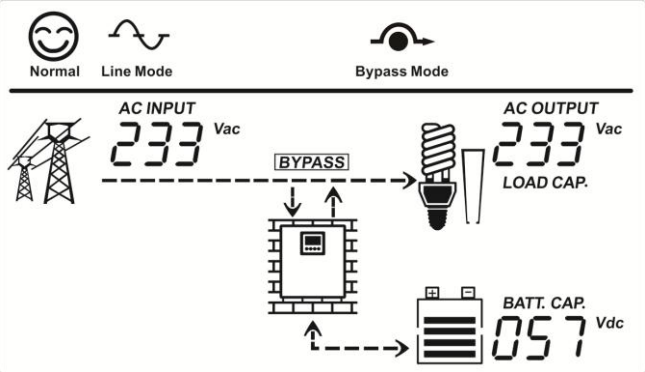
Table 5. display meaning

	Inverter Normal work
	Line Mode is enabled
	Backup Mode is enabled
	Bypass Mode is enabled
	This icon is showed when there is a fault event. The number is the fault code which can be referred to specific fault event (please refer to Section “Table 6 Fault code meaning”).
	AC Icon
	Bypass Icon
	AC Voltage and Frequency display
	The load icon and level bar indicates the loading level (0~100%), Loading display
	Level of remaining battery capacity, Battery voltage
	Inverter

Operating Indicators

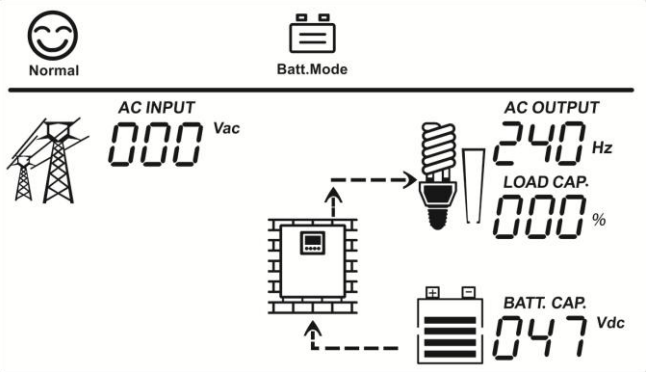
AC Mode:

Voltage and Frequency exchange every 5 seconds.



DC Mode:

Voltage and Frequency exchange every 5 seconds.



Fault Mode:

The upper left corner of the LCD shows the fault code and buzzer ringing.

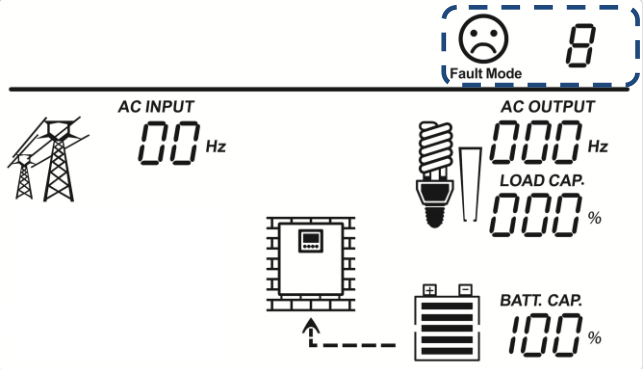


Table 6 Fault code meaning

Fault code	Fault	Reason and Solution
1	Over temperature, fan fault (alarm light on)	Inverter operate environment is very bad, insufficient ventilation and indoor temperature is very high. Close the inverter and wait for 10 minutes, after inverter cool, start again, if fan fault, please replace with a new fan.
2	Overload (alarm light on)	Connecting load power is over than inverter's rated power, if reduce the load equipments quantity, inverter will work again.
3	Output short circuit (alarm light on)	Close the inverter and disconnect all load equipment, inspect load equipments if any of them had fault or internal short circuit, then start the inverter again. If still fault, please consult with manufacture.
4	Over temperature (alarm light on)	Inverter operate environment is very bad, insufficient ventilation and indoor temperature is very high. Close the inverter and wait for 10 minutes, after inverter cool, start again.
5	Low battery voltage (alarm light on)	Battery damage; Battery deeply discharged, so need to charge again; battery problem, please replaces the battery. Inverter charger no work, please consult manufacture.
6	Reverse input (alarm light on)	Connect input and output again in correct way.
7	Semi-wave short circuit (unusual load)	The connecting load power is over than inverter's rated power, after reduce load equipments quantity, inverter will work again.
8	Over charge (alarm light on)	Battery type selection incorrect; Charger damage, please consult manufacture for help.
9	Battery over voltage (alarm light on)	**C**heck if battery bank dc voltage is corresponding to this inverter requested dc voltage.

SPECIFICATIONS

Table 7. Line Mode Specifications

MODEL	APS 1~12KW	
Rated power	1 ~ 12KW(230VAC)	1 ~ 6KW(120VAC)
Input Voltage Waveform	Sine wave(Utility or Generator)	
Nominal Input Voltage	230Vac	120Vac
Low Line Disconnect	184Vac±4%(NOR)	85Vac±4%(NOR)
	135Vac±4%(WID)	80Vac±4%(WID)
Low Line Re-connect	194Vac±4%(NOR)	95Vac±4%(NOR)
	145Vac±4%(WID)	85Vac±4%(WID)
	Note: 1.NOR setting can be used for general electrical appliance 2. WID setting can be used only for some special load, Such as lamp, fan.	
High Line Disconnect	263Vac±4%(NOR)	136Vac±4%(NOR)
	263Vac±4%(WID)	140Vac±4%(WID)
High Line Re-connect	253Vac±4%(NOR)	131Vac±4%(NOR)
	253Vac±4%(WID)	135Vac±4%(WID)
Max AC Input Voltage	270VAC	150VAC
Nominal Input Frequency	50Hz / 60Hz (Auto detection)	
Low Line Frequency Disconnect	40+0.3Hz for 50Hz, 50+0.3Hz for 60Hz	
Low Line Frequency Re-connect	41+0.3Hz for 50Hz, 51+0.3Hz for 60Hz	
High Line Frequency Disconnect	55+0.3Hz for 50Hz, 65+0.3Hz for 60Hz	
High Line Frequency Re-connect	54+0.3Hz for 50Hz, 64+0.3Hz for 60Hz	
Output Voltage Waveform	As same as Input Waveform	
Output Short Circuit Protection	Air switch	
Efficiency (Line Mode)	>97%	
Transfer Time	15ms (typical) 20ms max(WID)	
Bypass charger enable in off mode	Yes	

Note: NOR – Normal range; WID-Wide range

Table 8. Invert Mode Specifications

MODEL	**HV Model: APS 1-12KW** **LV Model: APS 1-6KW**	
Output Voltage Waveform	Pure Sine Wave	
Rated Output Power	1 ~ 12KW(230VAC)	1 ~ 6KW(120VAC)
Power Factor	0.9 - 1.0	
Nominal Output voltage	230Vac	120Vac
Minimum Peak Output Voltage at Rated Power	>200V	>100V
Output Frequency(Hz)	50Hz / 60Hz ± 0.3Hz	
Output Voltage Regulation	±10%	
Nominal Efficiency	>87% (@Normal DC Input; >60% R load)	
Over-Load Protection	105% <load<150%, beeps 0.5s every 1s, and Fault after 60s. Load>150%, beeps 0.5s every 1s, and Fault after 20s.	
Capable of starting electric motor	YES	
Output Short Circuit Protection	Current limit (Fault after 10s), Air switch	
Power saver	Load ≦25 ±5W (Enabled on “P/S auto” setting of Remote control	
DC voltage		
Nominal DC Input Voltage	12VDC	24VDC	48VDC
Min DC start voltage	10.5Vdc	21Vdc	42Vdc
Low DC Alarm	10.5Vdc ± 0.2Vdc	21Vdc ± 0.4Vdc	42.0 ± 0.8Vdc
Low DC Shut-down	10.0Vdc ± 0.2Vdc	20Vdc ± 0.4Vdc	40.0 ± 0.8Vdc
Low DC Shut-down Recovery	11.0Vdc ± 0.2Vdc	22Vdc ± 0.4Vdc	44.0 ± 0.8Vdc
High DC Shut-down	16.0Vdc ± 0.2Vdc	32Vdc ± 0.4Vdc	64.0 ± 0.8Vdc
High DC Shut-down Recovery	15.5Vdc ± 0.2Vdc	31Vdc ± 0.4Vdc	62.0 ± 0.8Vdc

Table 9. AC Charger Mode Specifications

Nominal Input Voltage	230Vac	120Vac
Input Voltage Range	194V - 253Vac(NOR) 160V - 253Vac(WID)	95V - 131Vac(NOR) 85V - 135Vac(WID)
High Voltage Disconnect	253Vac±4%(NOR) 253Vac±4%(WID)	131Vac±4%(NOR) 135Vac±4%(WID)
High Line Re-connect	248Vac±4%(NOR) 248Vac±4%(WID)	128Vac±4%(NOR) 132Vac±4%(WID)
Low Voltage Disconnect	194Vac±4%(NOR) 160Vac±4%(WID)	95Vac±4%(NOR) 85Vac±4%(WID)
Low Line Re-connect	200Vac±4%(NOR) 165Vac±4%(WID)	98Vac±4%(NOR) 88Vac±4%(WID)
Nominal Output Voltage	According to the battery type	
Nominal Charge Current	12VDC 1KW model: Max 35A; 12VDC 2KW model: Max 70A; 12VDC 3KW model: Max 90A;	12VDC 1KW model: Max 35A; 12VDC 2KW model: Max 70A; 12VDC 3KW model: Max 90A;
	24VDC 1KW model: Max 20A; 24VDC 2KW model: Max 35A; 24VDC 3KW model: Max 70A; 24VDC 4KW model: Max 70A; 24VDC 5KW model: Max 70A; 24VDC 6KW model: Max 70A;	24VDC 1KW model: Max 20A; 24VDC 2KW model: Max 35A; 24VDC 3KW model: Max 70A; 24VDC 4KW model: Max 70A; 24VDC 5KW model: Max 50A; 24VDC 6KW model: Max 50A;
	48VDC 1KW model: Max 15A; 48VDC 2KW model: Max 20A; 48VDC 3KW model: Max 35A; 48VDC 4KW model: Max 50A; 48VDC 5KW model: Max 50A; 48VDC 6KW model: Max 35A; 48VDC 8KW model: Max 35A; 48VDC 10KW model: Max 35A; 48VDC 12KW model: Max 35A;	48VDC 1KW model: Max 15A; 48VDC 2KW model: Max 20A; 48VDC 3KW model: Max 35A; 48VDC 4KW model: Max 35A; 48VDC 5KW model: Max 35A; 48VDC 6KW model: Max 20A;
Charge current tolerance	±5A	
Over Charge Protection	Bat. V ≥15.5Vdc, Fault, Buzzer alarm for 12Vdc Bat. V ≥31.0Vdc, Fault, Buzzer alarm for 24Vdc Bat. V ≥61.0Vdc, Fault, Buzzer alarm for 48Vdc (beeps 0.5s every 1s & fault after 60s)	
Charge Algorithm	**Three stage:** **Boost CC** (constant current stage) → **Boost CV** (constant voltage stage) → **Float** (constant voltage stage)	

Note: NOR – Normal range; WID-Wide range

Table 10. Solar Charger Mode Specifications

Rated Battery voltage	**12VDC**	**24VDC**	**48VDC**
Rated charge current	40A	40A	40A
Input voltage range	15-40Vdc	25-75Vdc	55-145Vdc
Max. PV open circuit array voltage	40Vdc	75Vdc	145Vdc
Max. recommended input power (W)	600W	1200W	2350W

Rated Battery voltage	**12VDC**	**24VDC**	**48VDC**
Rated charge current	80A	80A	80A
Input voltage range	15-40Vdc	25-75Vdc	55-145Vdc
Max. PV open circuit array voltage	40Vdc	75Vdc	145Vdc
Max. recommended input power (W)	1200W	2400W	4700W

Rated Battery voltage	**12VDC**	**24VDC**	**48VDC**
Rated charge current	60A	60A	60A
Input voltage range	15-40Vdc	25-75Vdc	55-145Vdc
Max. PV open circuit array voltage	40Vdc	75Vdc	145Vdc
Max. recommended input power (W)	900W	1750W	3500W

Rated Battery voltage	**12VDC**	**24VDC**	**48VDC**
Rated charge current	120A	120A	120A
Input voltage range	15-40Vdc	25-75Vdc	55-145Vdc
Max. PV open circuit array voltage	40Vdc	75Vdc	145Vdc
Max. recommended input power (W)	1800W	3500W	7000W

Table 11. General Specifications

MODEL	APS 1-3KW				APS 4-6KW			APS 8-12KW		
Indicators	LED+LCD Display									
Protections	Low battery, over charging, over load , over temp.									
Remote control	YES									
Operating Temperature Range	0°C ~ 40°C									
Storage temperature	-15° C ~ 60° C									
Operation humidity	5% ~ 95% (non-condensing)									
Earthing(ABYC standard)	Follow customer requirement: Inverter mode: the neutral and the earth joined ; Line mode: the neutral and the earth separated. Use a Relay to realize the function.									
Audible Noise	65dB max									
Cooling	Forced air, variable speed fan									
Size (L*W*H mm)	490.3*336.4*189.4				574.6*440.7*204.4			644.6*448.4*204.4		
MODEL	1K	1.5K	2K	3K	4K	5K	6K	8K	10K	12K
Net weight (Kg)	19.0	22.0	23.5	27.5	34.0	38.0	43.0	56.0	63.0	69.5

Product specifications are subject to change without further notice.

APPENDIX A

How to Select and Configure PV Panels

The following parameters can be found in each PV panel's specification:（

- P_{max}: Max output power (W)
- V_{oc}: open-circuit voltage (V)
- I_{sc}: short-circuit current (A)
- V_{mp}: max power voltage (V)
- I_{mp}: max power current (A)

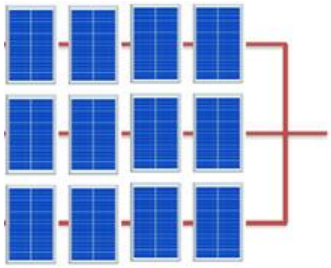
PV panels can be connected in series or parallel in order to obtain the desired output voltage and current which meets the inverter's allowed range.

When connecting PV panels in series, the max voltage and current of the string is

$V_{string} = V_1+V_2+V_3+V_4\ldots$

$I_{string} = I_1=I_2=I_3=I_4$

When connecting the above PV string in parallel, the max voltage and current of the total string is



$V_{total} = V_{string1}=V_{string2}=V_{string3}=V_{string4}\ldots$

$I_{total} = I_{string1}+I_{string2}+I_{string3}+I_{string4}$

In either case, the total output power is $P_{total} = P_{panel}$ X Number of PV panel

The guideline to select and configure PV string is

- P_{total} shall be equal or slightly larger than the max. capacity of solar battery charger (600W for 12V 40A model and 900W for 12V 60A model and 1200W for 24V 40A model and 1750W for 24V 60A model and 2350W for 48V 40A model and 3500W for 48V 60A model). Surplus capacity of PV string does not help the solar charger's capacity and only result in higher installation cost.
- Total $_{Vmp}$ of the string shall be within the operating voltage range of solar battery charger (15~40V for 12V battery model and 30~55V for 24V battery model and 60-110V for 48V battery model are recommended).
- Tota$_{l\ Imp}$ of the string shall be less than the max. input charging current of the solar battery charger (40A for 1000W~1500W and 60A for 2000W~12000W model**)**
- Total $_{Voc}$ of the string shall be less than the max. PV input voltage of the solar battery charger (40V for 12V battery and 55V for 24V battery and 110V for 48V battery model)**.**
- Total I_{sc} of the string shall be less than the max. PV input current of the solar battery charger (40A for 1000W~1500W and 60A for 2000W~12000W model).

Example 1 - How to connect 12V 2000W model to PV panels with the following parameters?

- P_{max}: 120W
- V_{oc}: 21.7V
- I_{sc}: 8.76A
- V_{mp}: 17.45V
- I_{mp}: 7.01A

(1) The max. PV input power for 12V 2000W model is 900W,

900W / 120W = 7.5⇒ min. 8 PV panels shall be connected

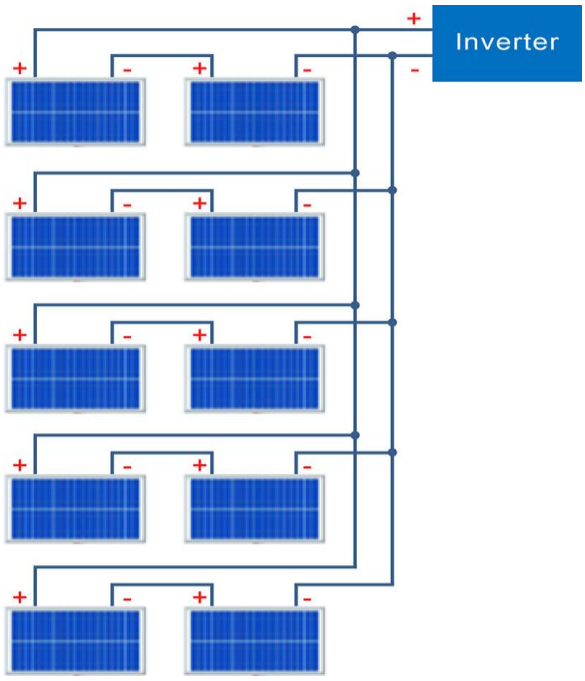
(2) Best Operating Voltage Range is 15~40V,

40V/17.45V =2.29 ⇒ max. number of PV panel in series is 2.

(3) Max. input charging current is 60A,

60A/7.01A = 8.56 ⇒ max. number of PV panel in parallel is 8.

(4) Taking (1)~(3) into consideration, the optimized configuration is 2 PV panels in series as a string and 5 strings in parallel, as shown below.



(5) Check again the V_{oc} and I_{sc} of PV string,

V_{oc} of string is 34.9V < 40V (Max. PV Input Voltage) ⇒ OK

I_{sc} of string is 5 x 8.76A = 43.8A < 60A (Max. PV Input Current) ⇒ OK

Example 2 - How to connect 48V 5000W model to PV panels with the following parameters?

- P_{max}: 260W
- V_{oc}: 37.7V
- I_{sc}: 8.89A
- V_{mp}: 30.9V
- I_{mp}: 8.42A

(1) The max. PV input power for 48V 5000VA model is 3500W,

3500W / 260W = 13.46⇒min. 10 PV panels shall be connected13.

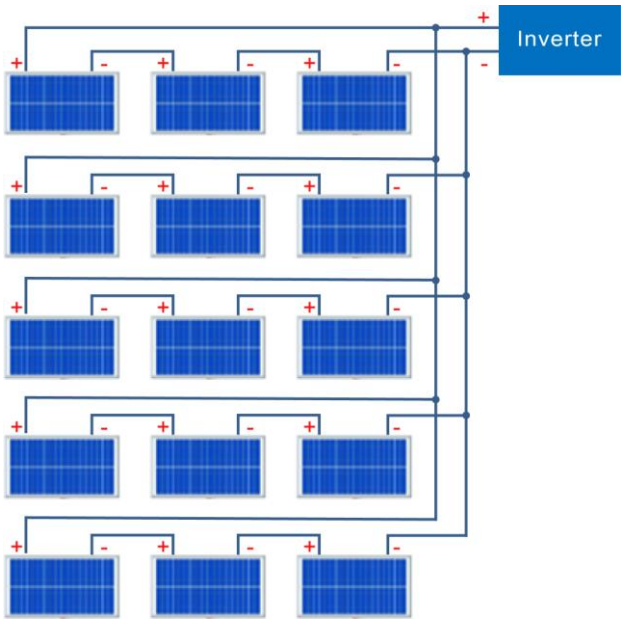
(2) Best Operating Voltage Range is 60~110V,

110V/30.9V = 3.56 ⇒ max. number of PV panel in series is 3.

(3) Max. input charging current is 60A,

60A/8.42A = 7.13 ⇒ max. number of PV panel in parallel is 7.

(4) Taking (1)~(3) into consideration, the optimized configuration is 3 PV panels in series as a string, and 5 strings in parallel (as shown below).



(5) Check again the V_{oc} and I_{sc} of PV string,

V_{oc} of string is 3 x 30.9V = 92.7V < 110V (Max. PV Input Voltage) ⇒ OK

I_{sc} of string is 5 x 8.89A =44.45A < 60A (Max. PV Input Current) ⇒ OK

APPENDIX B

COMMUNICATION INTERFACE

1. **Computer Interface(RS232)**

APS Series Inverter provide a standard DB9 port on front panel. the port provides several signals, assigned as below:

Lead Foot	Assigned signals
1	NC
2	PCRXD
3	PCTXD
4	NC
5	GND
6	NC
7	NC
8	NC
9	Wake

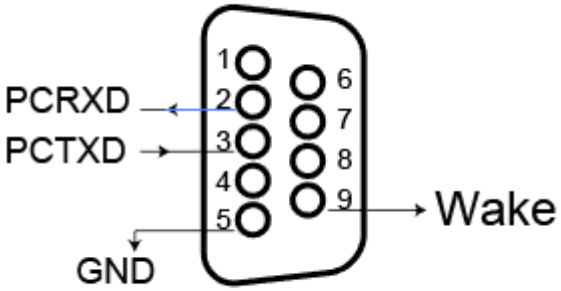


Figure B.1.1

1) RS232 communication cable connection: Connect the RS232 port of the inverter to the computer's RS232 or USB via the RS232 cable or the USB/Rs232 cable.

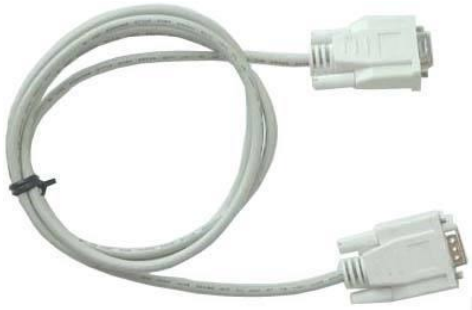


Figure B.1.2
RS232 cable(optional)

Figure B.1.3
USB to RS232 DB9 cable(optional)

2) RS232 software installation; Download a debugging assistant SComAssistant V2.1 or higher version. After installation, open the serial assistant as show below:

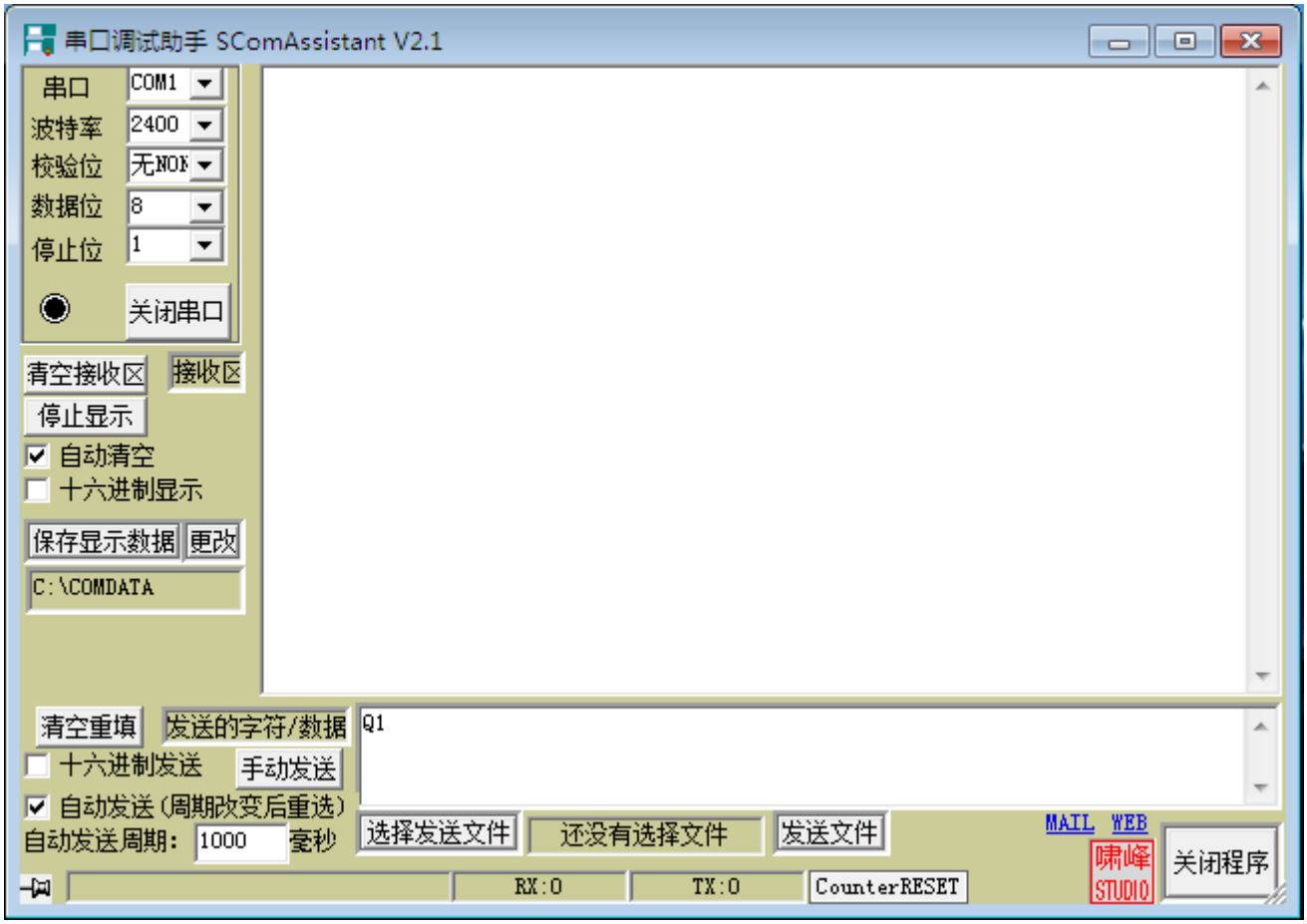


Figure B.1.4

3) Make the setting as below;

Serial port; Select the available serial port ;

Baud rate: set into 2400;

Check digit: NONE;

Date bit: 8;

Stop bit: 1;

Enter the serial port command in the send box and press Enter. The Data returned by the machine will be displayed in the data display box.

4) RS232 Serial port instructions as below:

Serial NO	Instruction name	x/m/n	x/m/n represents	Representing the parameter	Instruction feedback	Function description
1	Q1				-------	Check timely data.
2	F				-------	Check Mode.
3	BLx	x	?		ACK	Check the battery capacity.
4	CBx	x	1	11.0VDC	ACK	Check or set the low voltage point of the battery while transfer to the AC main power in DC priority mode.
			2	11.5VDC		
			3	12.0VDC		
			?	Check		
5	CCx	x	0	Off	ACK	Check or set the AC charger on and off.
			1	On		
			?	Check		
6	CEmn	m	1	208VAC	-------	Set the invert AC voltage (after the setting please restart the inverter to take effect).
			2	220VAC		
			3	230VAC		
			4	240VAC		
		n	1	50VAC		Set the invert AC frequency (after the setting please restart the inverter to take effect).
			2	60VAC		
			3	RF		
7	CINx	x	0	Wide	ACK	Set the AC input voltage range.
			1	Normal		
			?	Check		
8	CGx	x	1	1/5A of the max charge current	ACK	Check or set the AC charger current.
			2	2/5A of the max charge current		
			3	3/5A of the max charge current		
			4	4/5A of the max charge current		
			5	5/5A of the max charge current		
			?	Check		
9	CMx	x	0	DC priority	ACK	Check or set into DC/AC priority mode.
			1	AC priority		
			?	Check		

2.Network Communication(SNMP)

APS Series Inverter provide an intelligent slot for intelligent network card on front panel(optional part). The port provides several signals, assigned as below:

Lead Foot	Assigned signals
1	GND
2	SNMPPOW
3	SNMPRXD
4	SNMPTXD
5	PCRXD
6	PCTXD
7	-VCC
8	SNMPSIG
9	GND
10	VCC

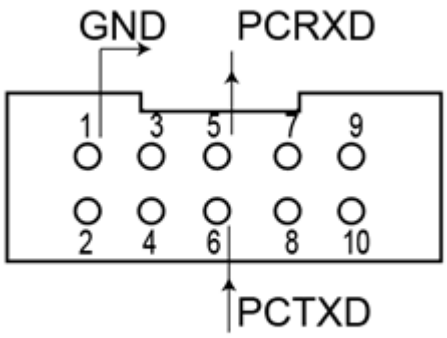


Figure B.2.1

The specified intelligent network card is compatible with software, hardware and internet operating system which is popular in Internet nowadays. It can support HP Openview, IBM nEXview, SUN nEXmanager and other operating systems, which ensure Inverter to get the direct Internet access immediately and provide timely information of Inverter and power, in order to communicate and manage by kinds of network management systems.

1) Appearance and interface of the SNMP card definitions:

Figure B.2.2 SNMP card Appearance(optional)

SNMP card interface:

P: Power indicator light, remain lit in normal operation;

S: Running lights during normal operation, the flashing frequency of 1Hz,lit or not lit, said the program is not running or the system crashes;

E: Inverter communication indicator light said the card with the inverter normal communication, the flashing frequency of 2Hz means inverter communication disconnection;

Ethernet: UTP 10/100M RJ45 Ethernet interface;

Rs485: RS485 communication port, expansion control environment or other equipment;

2) Install the SNMP card

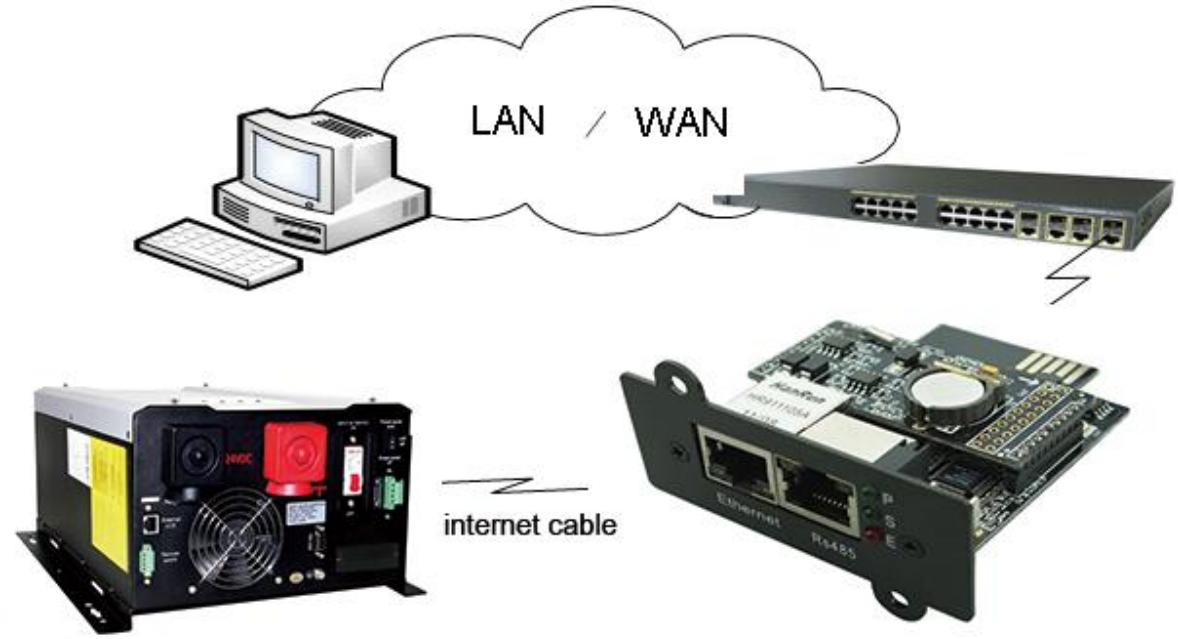


Figure B.2.3 Connection Diagram

Install the SNMP card into the SNMP slot when the inverter off.

- Connect the network cable to the Ethernet of the inverter and another terminal to the computer netting port, then turn on the inverter.
- Install the SNMP card setting assistant ConfigAssist from the CD of the SNMP card kits, open the SNMP card setting assistant on the computer to set the IP address, the interface show in Figure B.2.4

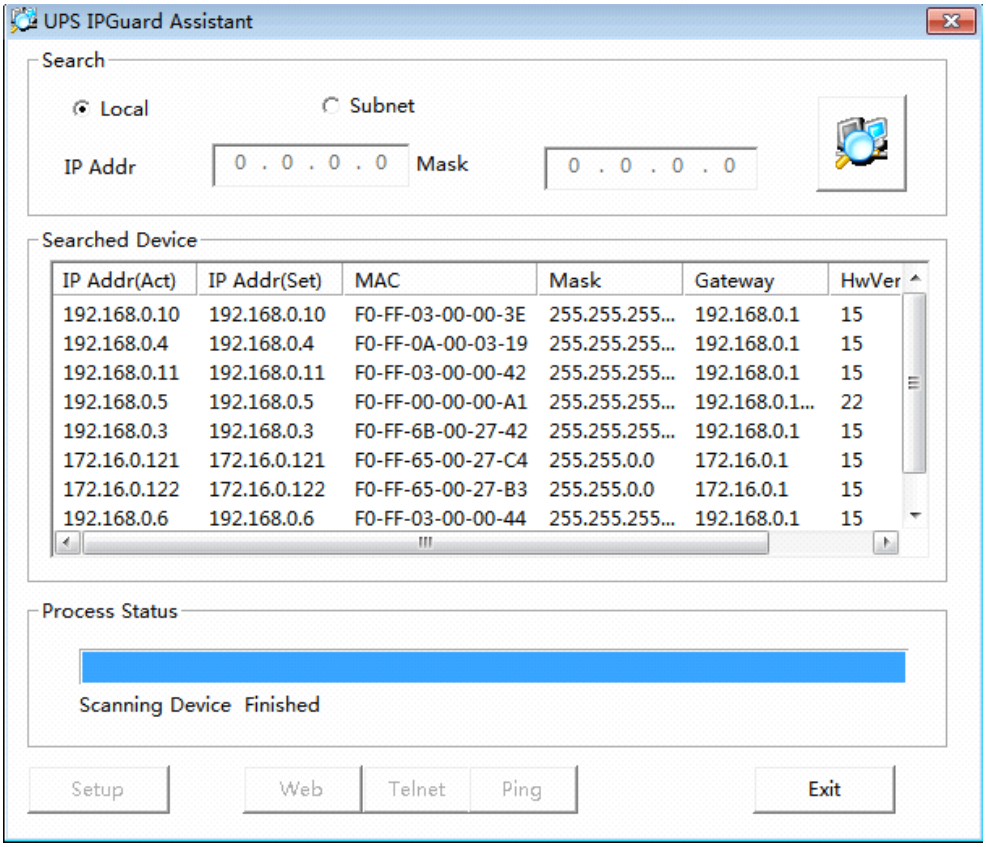


Figure B.2.4

- Click the Find button to  ,Find current network SNMP card.
- Searched the Device list will list all the discovered devices, select the entry you want to set, double-click to edit, shown in Figure B.2.5

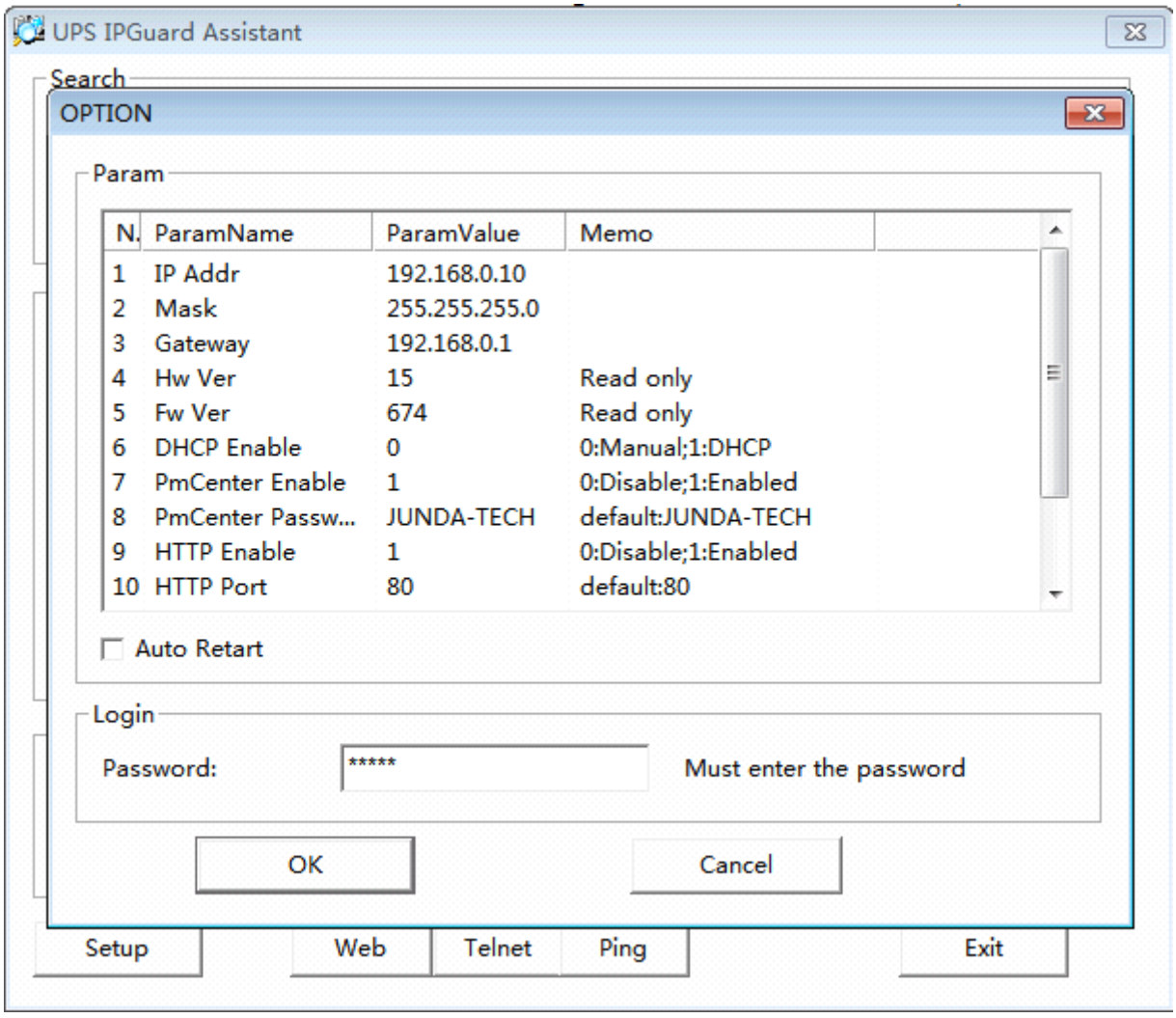


Figure B.2.5

- OPTION dialog box, double-click the IP address of the pop-up the IP address of the parameter modification dialog box, enter new data you want to set the IP address, and click OK.
- Subnet mask an gateway to modify the same so operating.

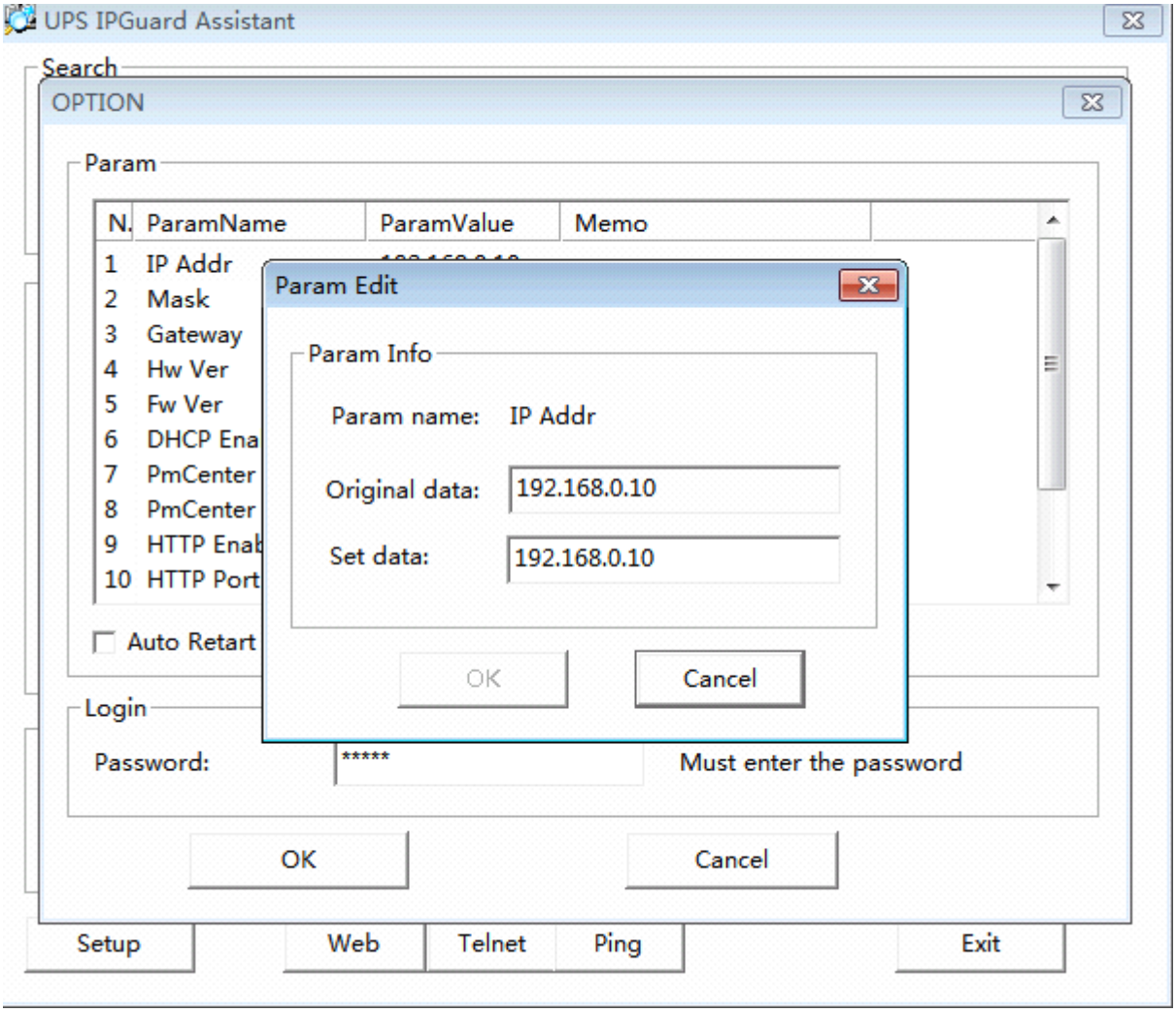


Figure B.2.6

- The setup is complete, return to the OPTION dialog box appears that the modified parameters(not in force); selected automatically reboot the device, enter the admin password(default is admin),click OK.
- When the device reboots, the new set of IP to take effect. Search again to display the new IP address.

3) LOG In through the WEB

Input current SNMP card IP address in the browser address bar, carriage return after the browser to prompt for user name(default admin) and password(default admin)dialog box. Enter your user name and password to enter the current SNMP card control interface, the interface displays the inverter input voltage and output voltage status information, setup is complete!

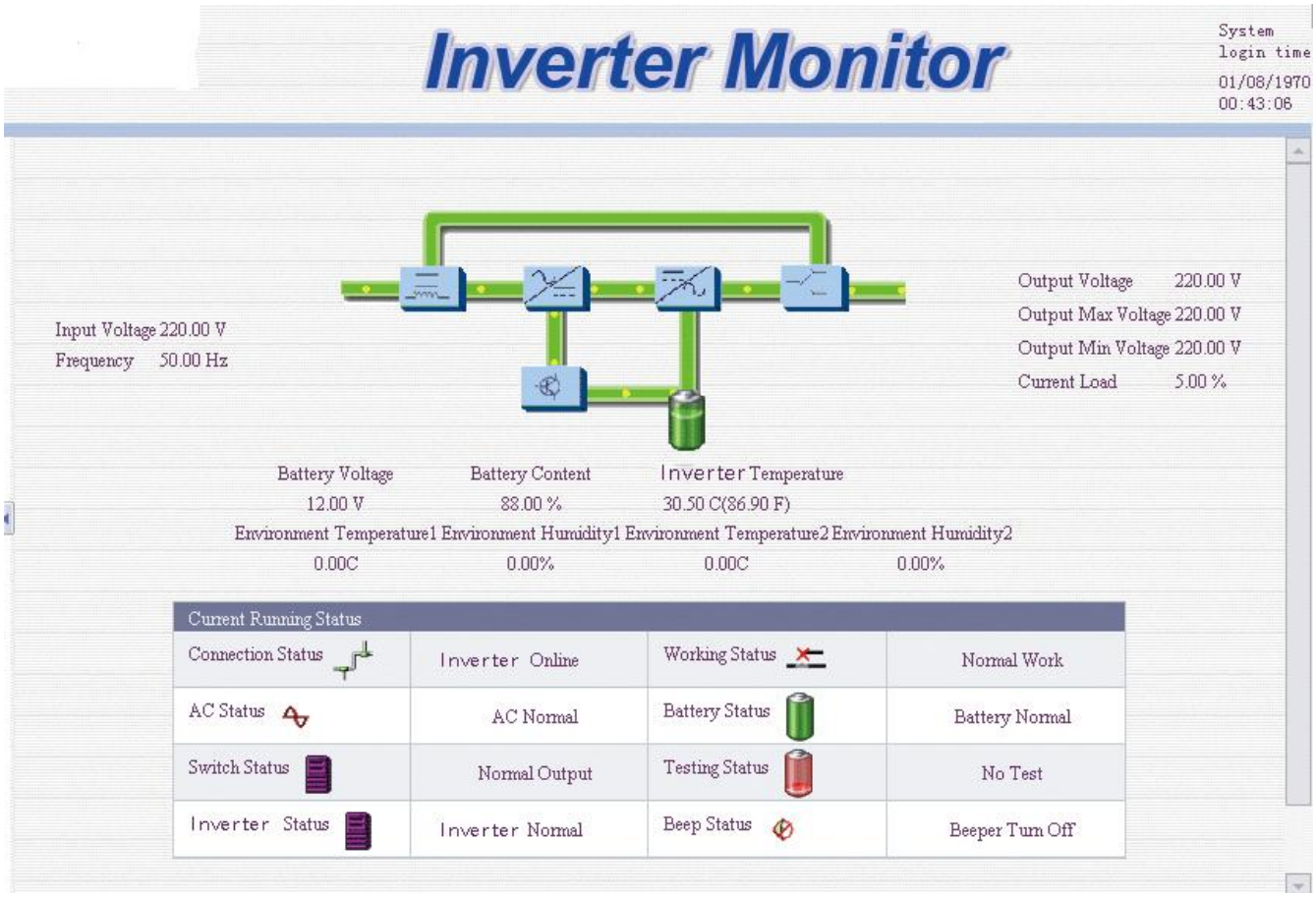


Figure B.2.7

Connect the outer net wire to the SNMP card, then the computers with internet can access this inverter via WEB browser by putting the IP address of the SNMP into the visitor's address bar (URL),so as to visit the inverter by the browser. If still unclear about the installation, please contact our local dealers for more details.

APPENDIX C

The External LCD screen, remote control and Dry contact description

1) The Definitions of the interface port：

External LCD :Connection to the external LCD screen

Romote Switch:1 PIN and 2 Pin is the remote control Pin, when the inverter switch is on the middle position which means the inverter is off, The Connection for Pin 1 and Pin 2 can get the same function as the switch on Power saver off(During the Operation please note that either the inverter switch or the remote switch should in off status, neither of them can be on)

The Pin 3 and Pin 4 must be connected together, when the remote control LCD turn on the inverter LCD is off(them could not be lighting in the same time)

Dry Contact Signal: 1Pin is normal closed Pin, Pin 2 and Pin3 are common pin, Pin 4 is normal open pin.

Figure C.1.1 External LCD and remote control switch

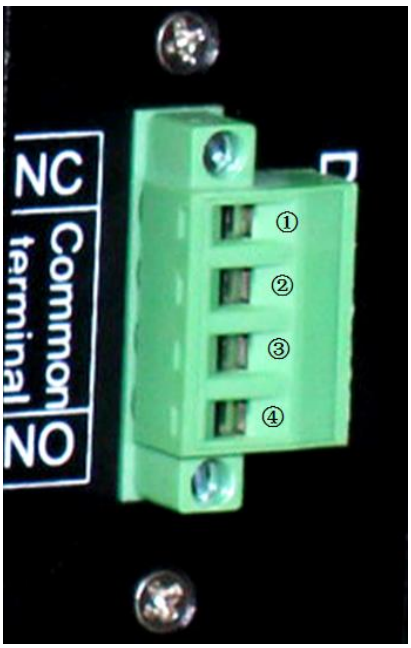


Figure C.1.2dry contact port

2) External LCD connect port and remote switch function

Users can access the remote control the inverter on or off, to read and set the parameter by connection the external LCD to the inverter by communication cables.(The external LCd is optional)

3) Dry contact function

Unit Status	Condition	NC&COM	NO&COM
Power off	Unit is off and no output powered.	close	open
Power on	Output is powered from battery.	open	close
	Output is powered from mains.	close	open

DISPOSAL

In the event the product reaches the end of its service life, please contact the local dealer for disposal instructions.

The product must not be disposed of with the household waste.

Disposal of the product at the end of its service life shall be done in accordance with applicable disposal regulations for electronic waste.

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