PowerBack

PB1000S/PB2000S

WITH SOLAR CHARGE CONTROLLER

INSTALLATION AND OPERATION MANUAL

SAFETY INSTRUCTIONS

	Before using the product, please read carefully the warning messages and instructions on labels and user manual of this product and other components connected to the product.
	The product is designed to be connected with lead-acid battery only. Do not connect the product with other types of batteries.
	In the event flooded batteries are used, regular maintenance on the battery shall be performed.
	The product is design for indoor installation. Please do not expose the product to direct sunlight, rainfall, or snow.
	Before performing any maintenance on the product, please disconnect all power sources (AC mains, batteries, solar panel) to avoid the risk of electrical shock.
	Do not attempt to disassemble or repair the product. Only authorized personnel is allowed to perform repair.
	While performing maintenance or cleaning (especially on the batteries where hazardous liquid might be touched), it's recommended to wear necessary personal protections (e.g. gloves and goggle)
	The product and external batteries shall not be installed anywhere near smoke, spark, and flame.
	In the event a generator with auto-start function is connected with the product, before performing maintenance or cleaning.

SCOPE OF WARRANTY

The product comes with a standard 1-year warranty. This warranty includes all defects of design, components and manufacturing. The Warranty is void and does not cover any defects or damages caused by in any of the following circumstances:

- Seal on the product is broken
- The product has been misused, neglected, or abused
- Improper transportation and delivery
- The product has been used or stored in conditions outside its electrical or environmental specifications
- The product has been used for purposes other than for which it was designed
- The product has been used outside its stated specifications, operating parameters and application
- Acts of third parties, atmospheric discharges, excess voltage, chemical influences, natural wear and tear and for loss and damage in transit
- Improper testing, operation, maintenance, adjustment, repair, or any modification of any kind not authorized in writing by the supplier
- The product has been connected to other equipment with which it is not compatible
- Use and application beyond the definition in this manual
- Application beyond the scope of applicable safety standards or grid codes
- Acts of nature such as lighting, fire, storm, flood, vandalism and etc.

The right to repair and/or replace the defective product is at the supplier's sale discretion. Any warranty claim shall be asserted in writing to the supplier within 5 working days after notice of product failure. The supplier is not responsible for damages beyond the scope of this warranty.

TABLE OF CONTENT

PRODUCT OVERVIEW

This is a DC-to-AC inverter with integrated solar battery charger, which can be used as a long run-time UPS (Uninterruptible Power Supply), an energy-saving solution or an automotive inverter (hereinafter referred to as "**inverter**").

The inverter accepts input power source from AC mains (utility), battery, and PV (solar) string and switches between various operation modes automatically depending on the operational conditions.

When used as an UPS, battery or PV (solar) string act as back-up power source to supply loads during the outage of AC mains.

When used as an energy-saving device, the PV (solar) string can be set as priority to supply the loads without consuming the power from AC mains, as long as sufficient sunlight is present.

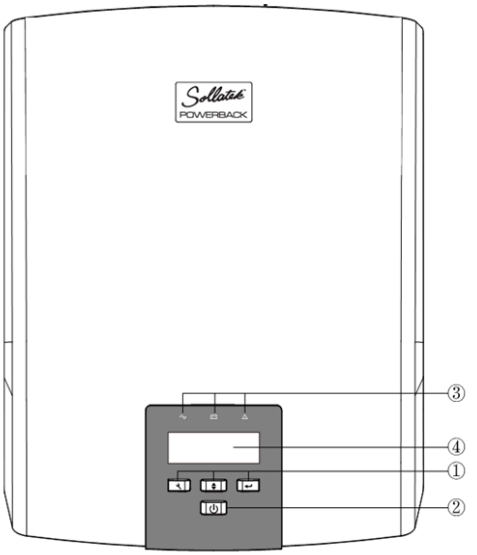
The battery can be charged by both AC mains and PV (solar) string with intelligent charging control.

Key features:

- Automatic line-to-battery switchover
- Built-in enhanced AC charger
- Built-in solar charger controller
- Configurable output source priority, charger source priority, charger current and so on
- High efficient DC-to-AC conversion with minimized energy loss
- Rack design & wall-mounted design for flexible installation
- Intelligent 3-stage charger control for efficient charging and preventing overcharge
- Auto restart upon AC recovery
- User-friendly LCD and LED indications with setting function
- Smart temperature compensation technology to extend battery life
- Multiple protections: low battery alarm, low battery shutdown, over charger protection, overload protection, over temperature protection, short circuit protection

1.1 Product Outlook

Front Panel



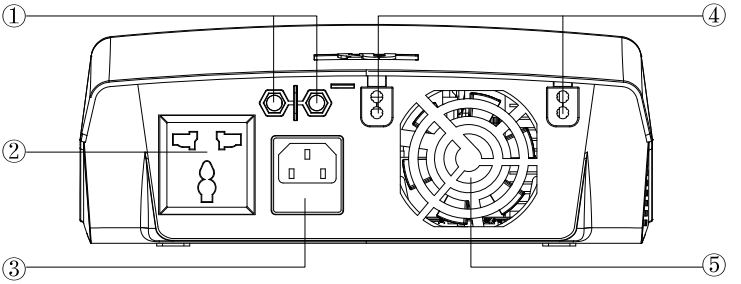
① Setting function button

② Power ON/OFF button

③ LED indicators

④ LCD

Rear Panel



① PV Input terminals

② AC output receptacle

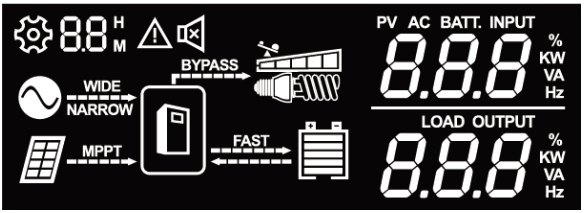
③ AC input receptacle

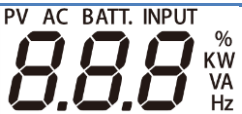
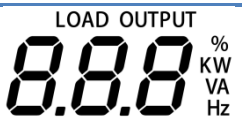
④ Battery terminals

⑤ DC Fan

LCD Display

LCD displays the power flow and input/output readings in a visualized graphic design which allows the user to understand the operation status easily. The backlight of LCD remains on whenever the inverter is working (including Standby Charging Mode and Fault Mode).

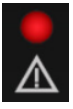


Icon	Description
	This icon is showed when AC input (from AC mains or generator) presents.
	If unit is on wide mode, “WIDE” will be lighted, else “NARROW” will be lighted.
	This icon is showed when PV (solar) system presents.
	The icon indicates level of remaining battery capacity
	The icon indicates battery flow way. If unit is on CC & CV charging stages, “FAST” will be lighted.
	The icon indicates output load level. If unit work on bypass mode, “BYPASS” will be lighted.
	Indicate PV input voltage. PV input current, AC input voltage, Battery voltage.
	Indicate output voltage, output frequency, load percentage, load VA value, load watt value.

	The icon indicates unit is on LCD setting mode.
	The icon indicates unit is on alarm mode or fault mode.
	When unit is on LCD setting mode, it indicates program code. When unit is on fault mode, it indicates the fault code which can be referred to specific fault event (please refer to Section "Troubleshooting").

LED Indicators

The operation mode of the inverter can be easily told by LED indicators. Please see the table below for details.

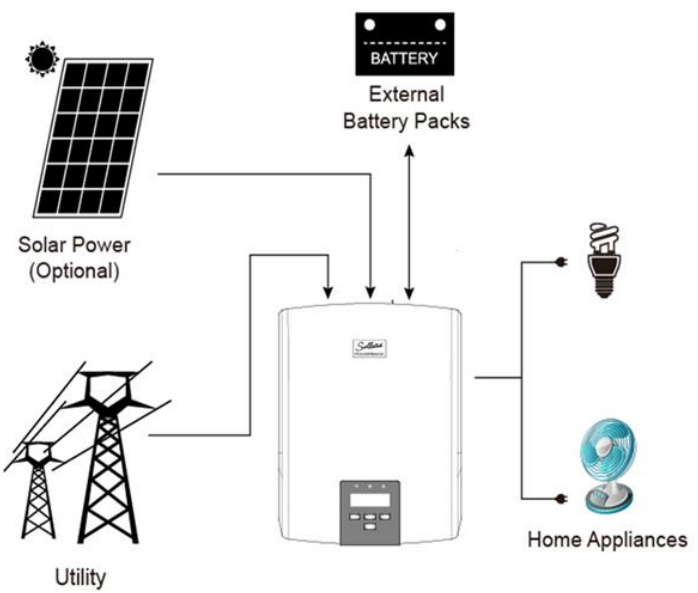
LED indicators			Information
	Green	Line Mode 1 (charge current >3A)	Green flashing every 2 seconds
		Line Mode 2 (charge current ≦ 3A)	Green solid lighting
		Off-charge mode	Green flashing as cycle: 0.5s On→ 0.5s Off → 0.5s On→ 4s Off
	Yellow	Battery mode	Yellow solid lighting
	Red	Overload	Red flashing every 0.5 second
		Fault	Red lighting

Function Keys

Function Keys	Description
⏻	To power on/off
🔧	To enter the setting mode or exit setting mode
▲▼	To go to the next selection page
↵	To confirm the selection in setting mode

1.2 Typical Application

A typical application diagram for home and office applications is as shown below. The inverter can accept AC input from AC mains, and is capable of supply various loads such as fluorescent lamp, fan.



INSTALLATION

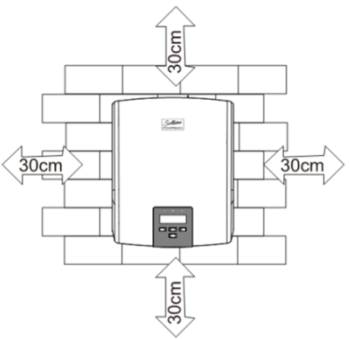
2.1 Safety Clearance

The minimum clearance to the wall shall be larger than 30cm in order to ensure proper ventilation.
In the event the ambient temperature is high, it's recommended to increase the distance of safety clearance to improve the heat dissipation.

2.2 Mounting Inverter on the Wall

The inverter is designed to either be placed on horizontal surface or be mounted on the wall with various ways (as shown below). When mounting the inverter on the wall,

1） The wall shall be solid and strong enough to carry the inverter;
2） The location of installation shall allow the user to read the LCD easily;
3） Two screws shall be firstly fixed on the wall (distance as shown below) so that the inverter can be hung on the screws, recommended screw size is M4*50~65mm.
4） After mounting the inverter, make sure it's firmly mounted and won't easily fall off in the event of unexpected earthquake or vibration.



2.3 Batteries

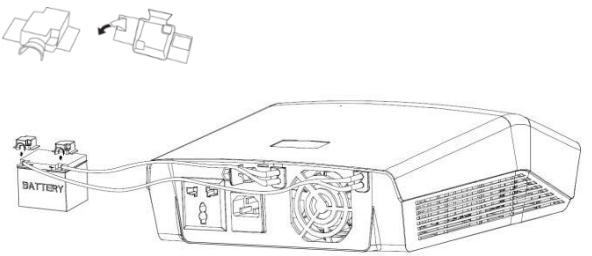
Determine the size of battery

The inverter is designed with pre-set charging current and voltage. Given a fixed charging current, under-sized batteries may shorten the battery life while over-sized batteries may result in unreasonable recharging time.

It's recommended the batteries capacity shall be no less than 100Ah.

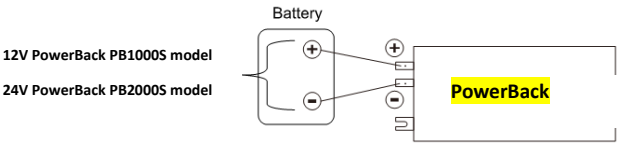
Connect the battery cables

- The gauge of battery cables shall be no less than 6 AWG with 105˚C rating.
- No matter how the batteries are connected (in series or in parallel), make sure the cables' terminal voltage is consistent with the inverter's specification(12V for POWERBACK PB1000S model and 24V for POWERBACK PB2000S model).
- It's recommended to cover the battery terminals during the connection.
- Check the polarity of cables before connecting to the inverter.
- Connect the battery cables to the inverter's battery terminals as shown below.



Connect with single battery

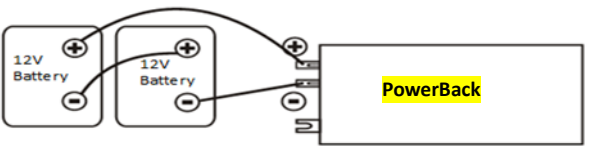
Make sure the battery voltage meets the inverter's specification



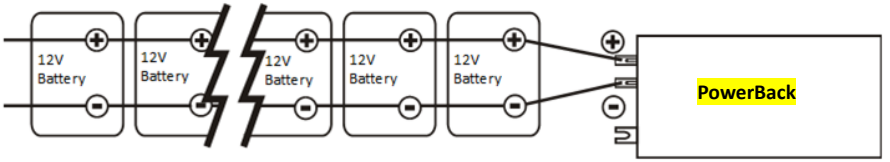
Connect with multiple batteries

While connecting multiple batteries, use the same brand/type for all batteries. Do not mix the battery bank with different brand/type of batteries.

The user may connect the batteries in series in order to double the voltage connected to inverter. The diagram below illustrate how to connect two 12V batteries in series to make up 24V (for PowerBack PB2000S)



The user may connect the batteries in parallel in order to increase the total battery capacity without changing the battery voltage. The example below shows parallel connection of multiple 12V batteries. While the total capacity is times by the number of battery, the terminal voltage remains 12V.



2.4 PV (solar) string

Selection of PV panel

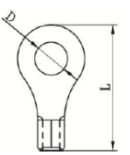
PV string is a connection of PV panels whose output voltage and current vary under different illumination. And just like battery, the PV panel can be connected in either series or parallel as per needed. Please consult the supplier of PV panel so that the operational voltage and current fall within the allowed range of the inverter as set out in the specification.

Please do not use PV panel which requires one terminal connected to ground (e.g. thin-film panel).

Connect the PV strings

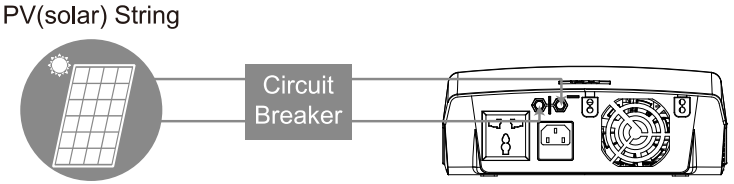
As the PV string generates power as long as illumination exists, a circuit breaker shall be installed between the PV string and inverter so that the power from PV string can be switched off when needed (e.g. regular maintenance).

To ensure better contact and reliability, ring terminal shall be fit on the cables from PV string before connecting to the inverter. The recommended size of ring terminal is



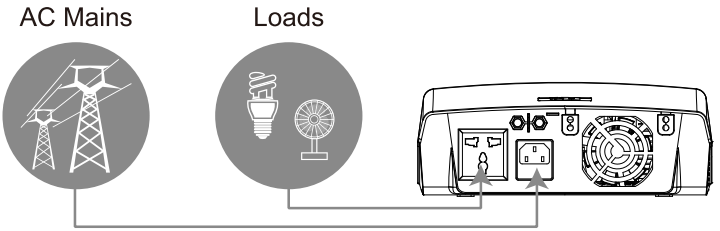
Model	Wire Gauge	Ring Terminal		
		Cable mm^2	Dimensions	
			D(mm)	L(mm)
POWERBACK PB1000S/2000S	1*10AWG	5.16	5.3	19.8

Connect the cables from PV string to PV input terminals as shown below. a circuit breaker with 80A rating shall be installed as shown below, Please check the polarity before connection.



2.5 Connect AC Input Cables and Loads

Connect the AC input cables and loads to the receptacles as shown below.



2.6 AC Input Voltage Range Selector

A. “NARROW” setting:

Set the selector to “NARROW” when connected with loads which are more sensitive on voltage range. With this setting, the inverter is more sensitive to the voltage disturbance on the AC input and the input voltage range is set at 170~280VAC while output voltage follows input voltage.

B. “WIDE” setting:

Set the selector to “WIDE” when connected with loads which are less sensitive on voltage range (e.g. light bulb, fan, fluorescent tube). With this setting, the inverter’s input voltage range is extended to 90~280VAC while output voltage follows input voltage.

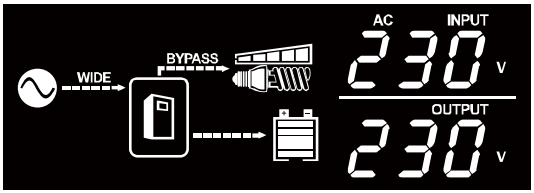
Please note that the inverter’s transfer time switching from Line Mode to Backup Mode gets longer as the input voltage gets low. Under the circumstance, connecting the inverter with loads which are sensitive to transfer time (e.g. computer) might result in power interruption.

OPERATION

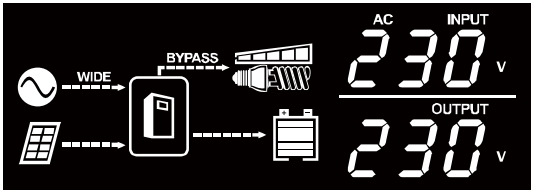
After connecting batteries, AC input cables, and loads, the inverter is now ready to work.

3.1 Standby Charging Mode

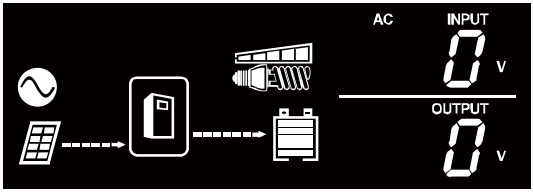
The battery can be charged without switching on the inverter, and such operation is called Standby Charging Mode. When AC input cable and battery is connected, the inverter will enter into Standby Charging Mode and LCD will be turned on with the following display.



If PV string is also connected with enough voltage, the display will be as shown below to indicate the power flow from PV string.



Even if AC input is absent, PV power can still charge the battery and the display will be as shown below.



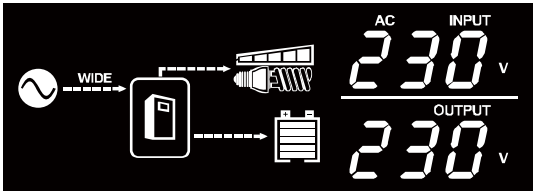
3.2 Operation Modes (after powered on)

Press the Power ON/OFF button to power on the inverter and the inverter will automatically enter into either of the operation mode according to the condition of AC input and PV input as shown in the table below,

	PV Power present	Less PV Power	No PV Power
AC Input Power Present	LINE MODE 2		LINE MODE 1
AC Input Power Absent	BACKUP MODE 3	BACKUP MODE 2	BACKUP MODE 1

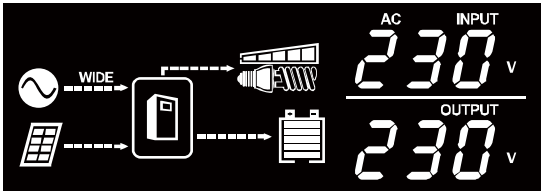
LINE MODE 1

AC input power is present but there is no PV power (e.g. night time). Load is supplied by AC input power directly.



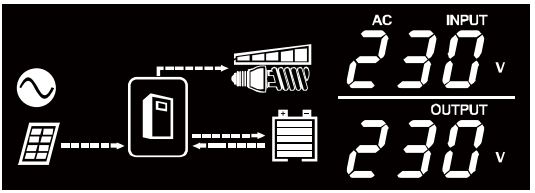
LINE MODE 2

Both AC input and PV input are present. Load is supplied by either AC input or PV input depending on the priority switch's setting.



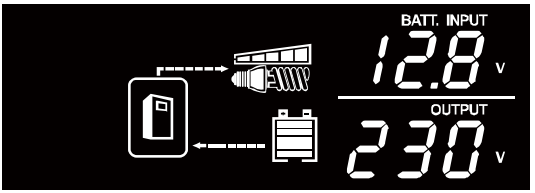
3.3 Priority Setting Switch

In LINE MODE 2, if priority setting switch is set to give PV priority and PV power is also strong enough to support load, the AC input will not be consumed even though it is present. This is deemed an energy-saving operation.



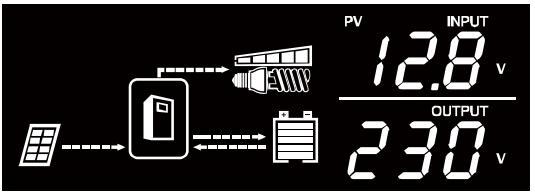
BACKUP MODE 1

Both AC input and PV input are absent. The backup power to load comes only from battery. The backup time is determined by the capacity of battery.



BACKUP MODE 2

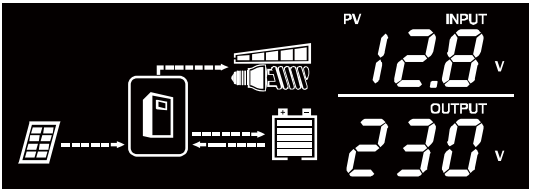
AC input is absent and PV power is not enough to support loads completely. The insufficient power is covered by battery.



The larger the PV power, the less consumption from battery and therefore the longer backup time.

BACKUP MODE 3

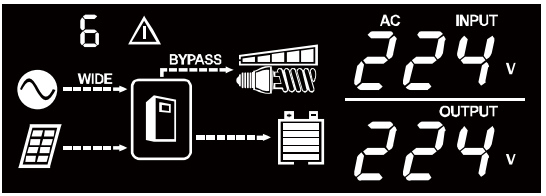
AC input is absent and PV power is strong enough to not only support the load but also charge the battery.



As long as the PV power persists, the load can be powered continuously without consuming power from battery.

3.4 Fault Mode

Inverter enters into Fault Mode when there is a fault event. The fault icon will be shown with a fault code. Please refer to fault code table in "Troubleshooting" section.



3.5 LCD Setting

(1) Display Menus

The LCD display content will be changed in turns by pressing ▲▼ button. The selectable information is switched as below order: PV input voltage, PV input current, AC input voltage, battery voltage, output voltage, output frequency, load percentage, load VA value, load watt value. LCD will return to default LCD display after 1 minute. IF users want to return to default LCD display immediately, please press ↵ button.

(2) Setting Menus

After pressing and holding 🔧 button for more 2 seconds to enter setting mode, press 🔧 button for 1 second to select setting programs, then press ▲▼ button to select program option, then press ↵ button to confirm the selection.

Program	Description	Selectable option & behavior	LCD setting display
1	AC input voltage range	**Wide** (default): If selected, acceptable AC input voltage range will be within 90-280VAC	
		Narrow: If selected, acceptable AC input voltage range will be within 170-280VAC	
2	Output source priority: To configure load power source priority	**Solar first** (default): Solar energy provide power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power the load at the same time. Utility provides power to the loads only when any below condition happens: -Solar energy is not available -Battery voltage drop to either low-level warning voltage or the setting point in program 5.	
		Utility first: Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the load only when utility power is not available.	
		SbU: Solar energy provide power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power the load at the same time. Utility provides power to the loads only when battery voltage drop to either low-level warning voltage or the setting point in program 5.	
3	Charger source priority: To configure charger source priority	Solar first: Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.	
		Utility first: Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.	
		Solar and Utility(default): Solar energy and utility will charge battery at the same time.	
		Only solar: Solar energy will be the only charger source no matter utility is available or not.	

4	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 2.	Options in POWERBACK PB1000S model: Full/12.5V/13V/13.5V(default)/14.0V Options in POWERBACK PB2000S model: Full/25V/25.5V/26V/26.5V/27V(default)/27.5V/28V.	
5	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 2.	Options in POWERBACK PB1000S model: 10.5V/11.0V(default)/11.5V/12.0V Options in POWERBACK PB2000S model: 21V/21.5V/22V(default)/22.5V/ 23V/23.5V/24V/24.5V.	
6	Max charging current: To configure total charging current for solar and utility chargers: (Max. charging current=utility charging current +solar charging current)	Options in POWERBACK PB1000S model: 20A/30A/40/50A/60A(default)/70A/80A Options in POWERBACK PB2000S model: 20A/30A/40/50A/60A(default)/75A	
7	Max utility charging current	Options in POWERBACK PB1000S model: 0A/5A/10A/15A/20A (default) Options in POWERBACK PB2000S model: 0A/5A/10A/15A (default)	
8	Auto restart when overload occurs	Restart disable(default): when unit is overload, unit will release overload alarm, then turn off output & release fault alarm, unit won't restart again until end-user reduce load & press unit's on/off power switch.	
		Restart enable: When unit is overload, overload alarm 5 seconds and turn off output for 15 seconds, then restart unit again. The restart cycle is 5 times.	

9	Low DC cut off voltage	Auto(default): If setting auto, low DC cut off voltage will be relate to load percent. 10.0V for 12V model @ >=60%load 10.5V for 12V model @ <60%load 20.0V for 24V model @ >=60%load 21.0V for 24V model @ <60%load	
		Setting range is from 10.0V to 12.0V for 12V model; 20.0V to 24.0V for 24V model. Increment of each click is 0.2V per step.	
10	LED light control	LED light off	
		LED light on(default)	
11	Recover manufactory setting	Recover enable	
		Recover disable(default)	

A. The GRAND PLUS models not have the mood LED

SPECIFICATION

MODEL		POWERBACK PB1000S	POWERBACK PB2000S
CAPACITY	VA/W	1200VA/900W	2000VA/1600W
NOMINAL BATTERY VOLTAGE		$12V_{DC}$	$24V_{DC}$
LINE MODE			
INPUT	Nominal Voltage	$230V_{AC}$	
	Voltage Range	170-$280V_{AC}$ (Narrow Range)	
		90-$280V_{AC}$ (Wide Range)	
	Normal Frequency	50Hz or 60Hz	
OUTPUT	Voltage	$230V_{AC}$	
	Frequency	Following the Utility	
	Output Waveform	Following the Utility	
EFFICIENCY		>95% (full R load, battery full charged)	
TRANSFER TIME		23ms Typical	
BACKUP MODE			
OUTPUT	Voltage	230VAC (+10% / -18%)	
	Frequency	50Hz or 60Hz (Auto detection)	
	Output Waveform	Modified Sine-wave	
EFFICIENCY		>80%	
OVERLOAD PROTECTION		1min@>110%,20s@>120%,0s@>150%	
PROTECTION		Discharge, over-charged, over-loading, over-temperature, short-circuit protection	
BATTERY CHARGER (powered by AC)			
CHARGING ALGORITHM		3-step charging	
AC CHARGING MODE		0A/5A/10A/20A selectable	0A/5A/10A/15A selectable
FLOATING CHARGING VOLTAGE		13.7V	27.4V
OVERCHARGING VOLTAGE		16V	32V
SOLAR BATTERY CHARGER			
MAX. PV PANEL ARRAY POWER		1050W	1750W
MAX PV MODE POWER RATING TO SUPPORT LOAD		600W	1200W
MAX CHARGING CURRENT		60Amp	60Amp
NOMINAL BATERY VOLTAGE		12V	24V
OPTIMAL WORK VOLTAGE RANGE		16V~18V	30V~32V
MAX. PV INPUT VOLTAGE		55V	

MAX. PV INPUT CURRENT		65 Amp	
GENERAL			
PHYSICAL	Dimension (DxWxH)	308*244*95mm	
	Net Weight (kg)	2.44	2.35
ENVIRONMENT	Operating Environment	0°C to 50°C, 5% to 90 % relative humidity (non-condensing)	
	Storage Environment	-15°C to 55°C, 5% to 95% humidity (non-condensing)	
	Noise Level	Less than 50dB	

TROUBLESHOOTING

Problem	Possible Cause	Remedial Action
No LCD display	Battery voltage is low	Re-charge the battery and check if the battery cables are well-connected
	Battery is defective	Replace the batteries
	Power button is not pressed	Press and hold the power button
Mains are normal but works in backup mode	AC input is absent	Check the connection of AC input
Backup time is short	Overloading	Disconnect non-critical loads
	Battery voltage is too low	Re-charge battery for at least 8 hours
Alarm buzzer beeps continuously	Inverter entered into fault mode. The buzzer beeps continuously for one minute, and then beeps according to the table below.	1. Refer to table below to identify the fault 2. Record and report the fault to service representative for further assistance
Solar are normal but Solar charger doesn't work	P.V reverse polarity protection	Re- connect the P.V terminals

Alarm Behavior Table

Fault Description	Line Mode		Backup Mode		Fault Code
	No. of Beeps	AC Output	No. of Beeps	AC Output	
Overload 1 (V_{out}<195V)	/	/	0	OFF	0
Output RMS voltage low	/	/	2	OFF	2
Over temperature/Short-circuited	/	/	3	OFF	3
Fan locked	4	ON	4	OFF	4
Battery voltage high	5	ON	/	/	5
Overload 2 (V_{out} ≧195V; P_{out} > 80% rated half-wave load)	6	ON	6	OFF	6
AC output abnormal	/	/	7	OFF	7
Output voltage RMS high	/	/	8	OFF	8
Peak output voltage high	/	/	8	OFF	8
Utility connection error	9	OFF	9	OFF	9
PV current high	1BP/s	ON	1BP/s	ON	11
Solar charger over-temperature	1BP/s	ON	1BP/s	ON	12
Battery voltage high for Solar charger	1BP/s	ON	1BP/s	OFF	13
PV over-voltage	1BP/s	ON	1BP/s	ON	14
NTC opened	1BP/s	ON	1BP/s	ON	15
Solar charger MOSFETs /Relay damaged	1BP/s	/	1BP/s	/	16

Note: please contact your service representative in the event the alarm behavior is not included in the table above.

APPENDIX A

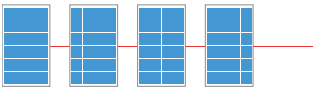
How to Select and Configure PV Panels

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.

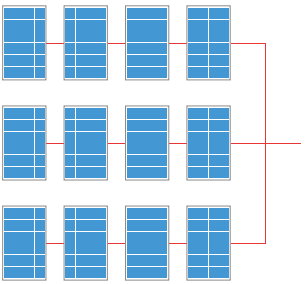
When connecting PV panels in series, the max voltage and current of the string is



$V_{string} = V_1+V_2+V_3+V_4...$

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

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



$V_{total} = V_{string1}=V_{string2}=V_{string3}=V_{string4}...$

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

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

- I_{total} shall be equal or slightly larger than the max. capacity of solar battery charger. Surplus capacity of PV string does not help the solar charger's capacity and only result in higher installation cost.

Model	PV panels invested(I_{total})	Max. PV module to support load
POWERBACK PB1000S	60A	600W
POWERBACK PB2000S	60A	1200W

- Total V_{mp} of the string shall be within the operating voltage range of solar battery charger (16~18V for POWERBACK PB1000S model and 30~32V for POWERBACK PB2000S model are recommended).
- Total I_{mp} of the string shall be less than the max. charging current of the solar battery charger
- Total V_{oc} of the string shall be less than the max. PV input voltage of the solar battery charger (55V for all model).
- Total I_{sc} of the string shall be less than the max. PV input current of the solar battery charger (65A for all model).

Example 1 - How to connect POWERBACK PB1000S model to PV panels with the following parameters?

- P_{max}: 150W
- V_{oc}: 21.6V
- I_{sc}: 8.75A
- V_{mp}: 18V
- I_{mp}: 8.2A

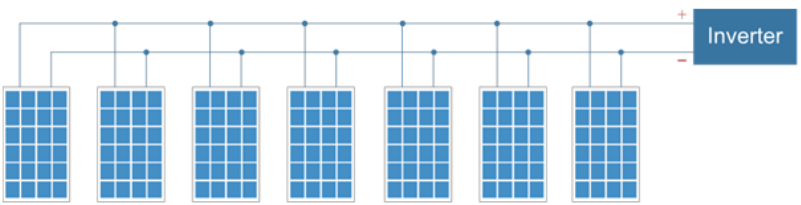
(1) Max. charging current is 60A,

60A/8.2A = 7.31 ⇒max. number of PV panel in parallel is 7.

(2) Operating Voltage Range is 16~18V,

One PV panel V_{mp} 18V is between 16~18V ⇒max. number of PV panel in series is 1.

(3) Taking (1)~(2) into consideration, and the optimized configuration is 7 PV panels in parallel, as shown below



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

V_{oc} of string is 21.6V < 55V (Max. PV Input Voltage) ⇒ OK

I_{sc} of string is 7x 8.75A = 61.25A < 65A (Max. PV Input Current) ⇒ OK

Example 2 - How to connect POWERBACK PB2000S model to PV panels with the following parameters?

- Pmax: 250W
- Vmp: 30.96V
- Voc: 36.6V
- Imp: 8.07A
- Isc: 8.75A

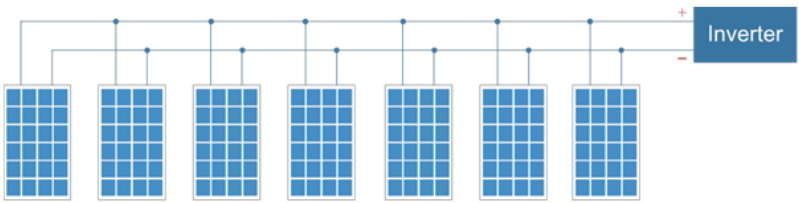
(1) Max. charging current is 60A,

60A/8.07A = 7.43 ⇒max. number of PV panel in parallel is 7.

(2) Operating Voltage Range is 30~32V,

One PV panel V_{mp} 30.96V is between 30~32V ⇒max. number of PV panel in series is 1.

(3) Taking (1)~(2) into consideration, the optimized configuration is 7 PV panels in in parallel , as shown below.



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

V_{oc} of string is 1 x 36.6V = 36.6V < 55V (Max. PV Input Voltage) ⇒ OK

I_{sc} of string is 7 x 8.75A = 61.25A < 65A (Max. PV Input Current) ⇒ OK

APPENDIX B

HOW TO DETERMINE THE OUTPUT SOURCE PRIORITY SETTING AND CHARGER SOURCE PRIORITY SETTING?

Please read this document carefully if you intend to manually set the priority setting of the product. Improper setting might compromise the function and performance of the product.

The product is designed to accept both utility and solar (PV) power as input source, and it also provides a function allowing the user to determine the priority between utility and solar input power. The priority is to be set via LCD and control buttons on the front panel (please refer to user manual for more details). This document explains how the product's behavior will be at each setting and what should be considered while determine the priority.

A. Output source priority setting

1. Setting Utility as output source priority

1.1 When utility is normal

The loads connected to the product are supplied by utility power only, even when solar power presents.

1.2 When utility is down

As soon as the utility is down, the inverter enters into "Backup Mode" and checks both solar power and battery's status. If solar power is strong enough, it will supply the loads. If solar power becomes weak, the loads will then be supplied by battery until it's too low. The longer the solar power lasts, the less consumption from the battery and hence the longer backup time.

Advantages	Disadvantages/Risk
Better chance to keep the battery fully-charged so that the backup function won't be compromised when the utility is down. Good for batteries life as batteries are less chance to work on discharging mode.	The solar power cannot be fully utilized by supporting the loads, especially when battery if fully charged.

2. Setting Solar as Priority

2.1 When utility is normal

As long as solar power is strong enough to support the, utility power will not be consumed even though it's available. If solar power is not enough, battery will firstly come up to support the loads, and after battery is low or the setting point in program

5, utility will then take over to support the loads. If solar is absent, utility will then take over to support the load too.

2.2 When utility is down

The behavior is the same as 1.2.

Advantages	Disadvantages
The good utilization of solar power. Save electricity bill by reducing the consumption of utility	Battery will experience more frequent charge and discharge cycles and therefore battery's service life will be shorter. If both solar power and battery is low, and utility outage occurs before the battery can fully-charged by utility, the backup function of the product might be compromised or void.

3. Setting Solar as Priority

3.1 When utility is normal

As long as solar power is strong enough to support the loads, utility power will not be consumed even though it's available. If solar power is not enough, battery will firstly come up to support the loads, and after battery is low or the setting point in program 5, utility will then take over to support the loads and charge the battery.

3.2 When utility is down

The behavior is the same as 1.2.

Advantages	Disadvantages
The utilization of solar power is maximized. Save electricity bill by reducing the consumption of utility	Battery will experience most frequent charge and discharge cycles and therefore battery's service life will be shorter. If both solar power and battery is low, and utility outage occurs before the battery can fully-charged by utility, the backup function of the product might be compromised or void.

Summary

Whether setting utility as priority or setting solar or SbU as priority is subject to purpose of installing the product. In the event the product is to be installed in areas where the utility power is unstable and backup function is much important than energy saving, utility shall be set as priority.

If the product is to be installed in areas with stable utility power and strong sunlight, and energy saving is more concerned than backup function, solar power shall be set as priority or SbU.

B. Charger source priority setting

1. Setting Utility as charger source priority

Utility first: Utility will charge battery as first priority.

Solar energy will charge battery only when utility power is not available.

2. Setting Solar as charger source priority

Solar energy will charge battery as first priority.

Utility will charge battery only when solar energy is not available.

3. Setting only Solar as charger source priority.

Solar energy will be the only charger source no matter utility is available or not.

4. Setting only Solar and Utility as charger source priority.

4.1 When utility is normal

Solar energy and utility will charge battery at the same time.

4.2 When utility is down

Solar energy and utility will charge battery.

Summary

Whether setting which option as charger source priority subject to purpose of installing the product. In the event the product is to be installed in areas where the utility power is unstable and backup function is much important than energy saving, Solar and Utility or Utility shall be set as charger source priority.

If the product is to be installed in areas with stable utility power and strong sunlight, and energy saving is more concerned than backup function, solar first or only solar shall be set as priority, and set the maximum utility charging current as small current as possible (program 7), for example: 5A.