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User's Manual

PowerWalker Inverter 5000 PSW

Contents

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ABOUT THIS MANUAL

Purpose

This 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. **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.
7. **NEVER** charge a frozen battery.
8. 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 and rated for 75^{o}C or higher. Battery cables must be rated for 75^{o}C or higher and should be no less than table 1. Crimped and sealed copper ring terminal lugs with a 5/16 hole should be used to connect the battery cables to the DC terminals of the unit. Soldered cable lugs are also acceptable.

9. 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.
10. 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.
11. No over current protection for the battery supply is provided as an integral part of this unit. Over current protection of the battery cables must be provided as part of the system installation. See INSTALLATION section of this manual.
12. 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.

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 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 a battery. A battery can produce a 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 DC red cable
- 1 DC black cable
- 1 user's manual

Basic Configuration

The following illustrations show basic applications for PowerWalker Inverter 5000 PSW

They include the following configurations:

- Utility Backup. see figure 1-1
- Renewable Energy Source And a Generator, see figure 1-2

Consult with your system design for other possible configurations depending on site or code requirements.

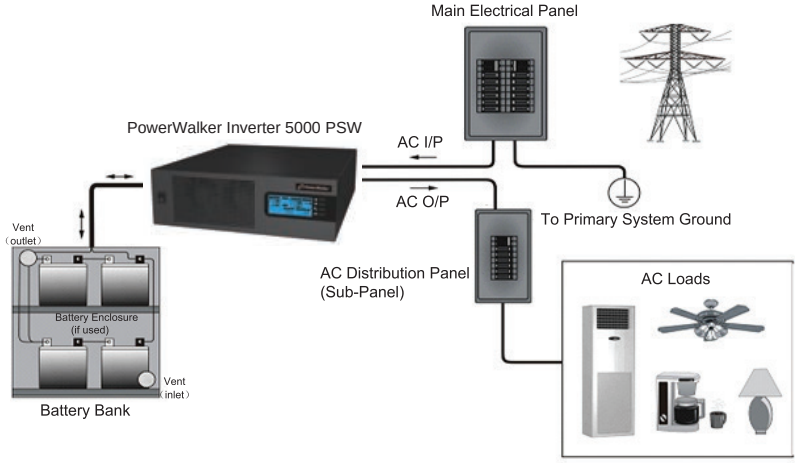


Figure 1-1 Utility Backup

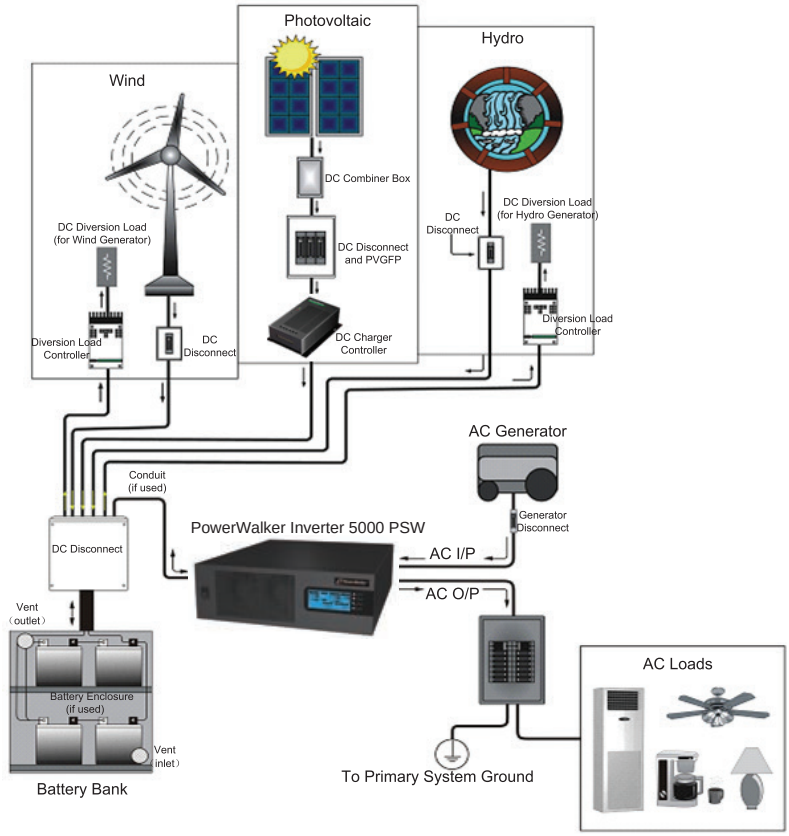


Figure 1-2 Renewable Energy Source

Batteries

The unit support either 48 volt volt battery bank depending on the model. Please refer to figure 2 to 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.

The battery must be wired to match the units DC input voltage specifications. Suggest battery capacity not smaller than 100AH.

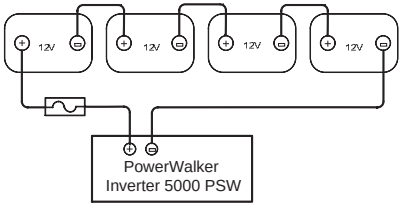


Figure 2-1 batteries string wiring

Battery Cable Size

Below table 1 you can find information for minimum recommended battery cable size. Be sure the cable you select no smaller than this.

Model Number	Typical Amperage	1~3 m one-way	Torque value
PowerWalker Inverter 5000 PSW	100 A	4 AWG	10~15 Nm

Table 1 Minimum recommended battery cable size

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 to 5-8 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!!**

Figure 3 illustrates the proper method to connect the battery cables to the unit terminals.

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 (10~15 Nm).

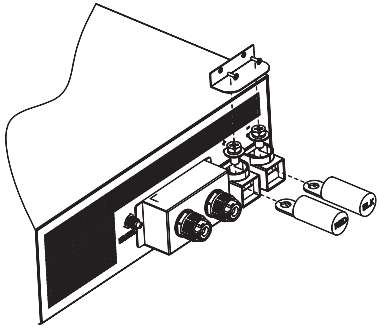


Figure 3 Battery Cable Connections to unit

AC Cable Size

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

Model Number	AC Input	AC Output	Torque value
PowerWalker Inverter 5000 PSW	10 AWG	10 AWG	1.2~1.8 Nm

Table 2 Min recommended cable size, torque value for AC wiring

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. A six-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.

Step 1- Disconnect the unit from the battery either by turning off the battery switch or removing the battery cables from the battery. Turning off the unit does not constitute disconnecting from the battery.

Step 2- Feed the wires through cable clamp and AC cover. See Figure 4.

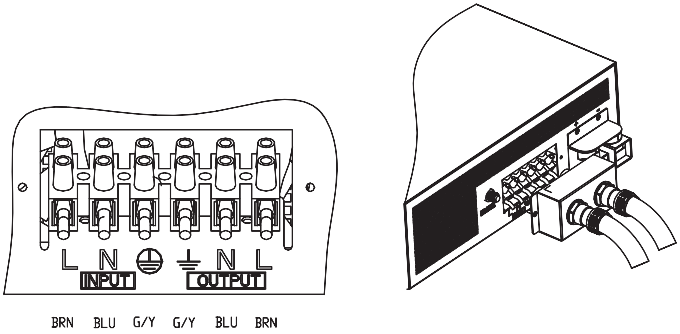


Figure 4 AC Cable Connections to unit

Step 3- Following the wiring guide located in the AC wiring compartment as Figure 4, 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 4- Connect the AC Line output wiring to the terminal marked AC Line (output) following the wiring guide inside the compartment. Connect the AC neutral out to the AC neutral out terminal. Torque the wires into the terminal block.

Step 5- Use the two M3 screws to lock the AC cover.

Step 6-Tighten the clamps on the AC cable jackets (not the individual wires) to provide strain relief for the connections.

OPERATION

Front Panel Controls and LCD Indicators

Shown below figure 5 are the controls and indicator lights on the front of the unit. They control and provide information in either inverter or battery charging mode of operation.

Figure 5 Front Panel

Power ON/OFF

Located on the left of the panel is the **POWER ON/OFF** Switch. Once the unit has been properly installed and the batteries are connected, press this switch to on position will turn on the unit.

Configuration Switch

On the right of panel is the 4 configuration switches which setup unit operation parameter. See table 3 for details

Switch	Function	Description
	up	Move up to pre-select
	down	Move down to pre-select
	configuration	Enter configuration mode, and turn page
	enter	Enter to confirm

Table 3 configuration button function

After you press configuration button and enter configuration mode, there are 4 configuration pages totally. Turn page by press configuration button again.

Page	Description	Selectable option
1	Input range	Normal/generator/wide range
2	Output range	220v/230v/240v
3	Battery type	AGM/GEL/FLOODED
4	Charger current	25A/20A
5	Saver mode	ON/OFF

Note: Turn page by press “Configuration”

Table 4 configuration button function

LCD Indicator

Comprehensive LCD display provides system status, and user-friendly panel eases program settings

AC Mode Indicator

The line mode symbol will show up and the indicator present input voltage, output voltage, load information.

Inverter Mode Indicator

The inverter mode symbol will show up and the indicator present input voltage, output voltage, load information.

The battery capacity segment indicate the battery capacity depend on the battery voltage level.

Charging Indicator

When line mode and input within range, the charging symbol will show up. And battery capacity segment will roll flashing in turn basing on capacity.

Battery Charger

Inverter to Charger Transition

The internal battery charger and automatic transfer relay allow the unit to operate as either a battery charger or inverter (but not both at the same time). The unit automatically becomes a battery charger whenever AC power is supplied to its AC input. The unit's AC input is internally connected to the inverter's AC output while in the battery charger mode.

Charger Terminology

1. **Constant Current Stage-** During this charge cycle, the batteries are charged at a constant current.
2. **Constant Voltage Stage-** During this charge cycle, the batteries are held at the constant voltage (14.1V/battery AGM&GEL, 14.6v/battery FLOODED) and accept whatever current (less than the current in CC stage) is required to maintain this voltage. This ensures fully charging.
3. **Floating Stage-** During this charge cycle, the batteries are held at the float voltage (13.5V/battery).
   If the A/C is reconnected, the charger will reset the cycle above.
   If the charge maintain the float state for 21 days, the charger will reset the cycle.

Circuit Breaker

The unit contains one input circuit breakers located on the rear panel of the chassis, which close to the AC input terminal block. The INPUT PROTECT circuit breaker protects the charger circuit and bypass circuit. The circuit breaker will trig out once input over current. Reset the circuit breaker by press the handspike.

SPECIFICATIONS

Table 5 Line Mode Specifications

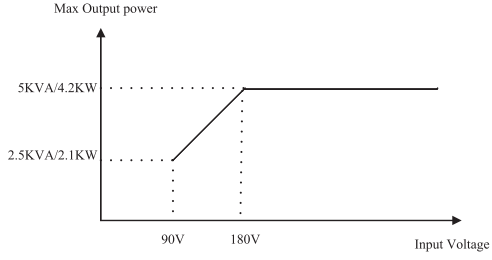
MODEL	PowerWalker Inverter 5000 PSW
Input Voltage Waveform	Sinusoidal (utility or generator)
Nominal Input Voltage	230Vac
Low Line Disconnect	170Vac (Normal) 90Vac (generator/Wide range)
Low Line Re-connect	180Vac (Normal) 100Vac (generator/Wide range)
High Line Disconnect	280Vac
High Line Re-connect	270Vac
Max AC Input Voltage	300Vac rms
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Line Frequency Disconnect	40±1Hz
Low Line Frequency Re-connect	42±1Hz
High Line Frequency Disconnect	65±1Hz
High Line Frequency Re-connect	63±1Hz
Output Voltage Waveform	As same as Input Waveform
Output Short Circuit Protection	Circuit Breaker 40A
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)
Transfer Switch Rating	40A
Transfer Time (AC to DC)	10ms (typical) 20ms (typical)
Transfer Time (DC to AC)	10ms (typical) 20ms (typical)
Power Limitation	

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Table 6 Inverter Mode Specifications

MODEL	PowerWalker Inverter 5000 PSW
Output Voltage Waveform	Pure Sine Wave
Rated Output Power(VA)	5000
Power Factor	0.84
Nominal Output Voltage(V)	230Vac
Minimum Peak Output Voltage at Rated Power	>200V
Output Frequency(Hz)	50Hz / 60Hz ± 1Hz (follow first connect to grid)
Output Voltage Regulation	±10% rms
Nominal Efficiency	>90%
Over-Load Protection	fault after 5s@≥150% load, fault after 10s@110%~150% load,
Surge rating(5s)	10000VA
Capable of starting electric motor	2.5HP
Output Short Circuit Protection	Current limit (Fault after 4 cycles max)
Bypass Breaker Size	40A
Nominal DC Input Voltage	48V
Min DC start voltage	40V
Low DC Alarm	42.0 ± 1.2Vdc
Low DC Alarm Recovery	43.2 ± 1.2Vdc
Low DC Shut-down	40.0±1.2Vdc
Low DC Shut-down Recovery	44.0±1.2Vdc
High DC Shut-down	60.0±1.2Vdc
High DC Shut-down Recovery	58.0±1.2Vdc
Power saver setting	0W (Set “OFF” at LCD) 10±5W enter 5+/-2w leave (Set “ON” at LCD)
Tare loss(nominal)	Saver OFF:<50w Saver ON:<10w
DC component of AC output	<100mv
Half wave load detection	Yes(when unbalance current>35A)

Table 7 Charge Mode Specifications

<table>
<tr><td>MODEL</td><td>PowerWalker Inverter 5000 PSW</td></tr>
<tr><td>Nominal Input Voltage</td><td>230Vac</td></tr>
<tr><td>Input Voltage Range</td><td>180V~ 270Vac(Normal range)
100V~ 270Vac(generator/wide range)</td></tr>
<tr><td>Nominal Output Voltage</td><td>According to the battery type</td></tr>
<tr><td>Nominal Charge Current</td><td>25A(175-275v)
20A(175v-275v)</td></tr>
<tr><td>Charge current tolerance</td><td>±10%</td></tr>
<tr><td>Battery initial voltage(sps setup)</td><td>>35Vdc</td></tr>
<tr><td>Charger Short Circuit Protection</td><td>Unit shutdown automatic</td></tr>
<tr><td>Over Charge Protection</td><td>Bat. V ≥60Vdc, Fault, Buzzer alarm</td></tr>
<tr><td colspan="2">Charge Algorithm</td></tr>
<tr><td>Algorithm</td><td>Three stage:
Boost CC (constant current stage) → Boost CV (constant voltage stage) → Float (constant voltage stage)</td></tr>
<tr><td>Battery Type Setting(±0.3v/bat)</td><td>
<table>
<tr><td rowspan="2">Battery Type</td><td>Boost CC/CV</td><td>Float</td></tr>
<tr><td>Voltage(V)</td><td>Voltage(V)</td></tr>
<tr><td></td><td>48</td><td>48</td></tr>
<tr><td>Flooded</td><td>58.4</td><td>53.6</td></tr>
<tr><td>AGM/Gel</td><td>56.4</td><td>54</td></tr>
</table>
</td></tr>
</table>

Table 8 Front Panel Specifications

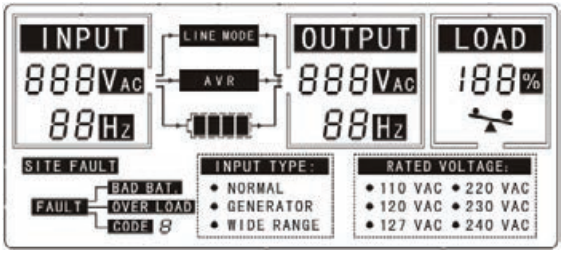
Switch	Function	Description
▲	up	Move up to pre-select
▼	down	Move down to pre-select
🔧	configuration	Enter configuration mode, and turn page
↵	enter	Enter to confirm

There are 5 configuration page totally:

Page	Description	Selectable option
1	Input range	Normal/generator/wide range
2	Output range	220v/230v/240v
3	Battery type	AGN/GEL/FLOODED
4	Charger current	25A/20A
5	Saver mode	ON/OFF

Remark: change only active by enter button pressed within current page.

Indicator & Alarm



Line mode:
The input segment should indicate the input voltage and frequency. If bypass, the main LINE MODE segment should lighting. And within charge range the battery charging path ⌞ and battery label should lighting.

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Charger mode battery indicator:

Status	Battery Capacity					
		5	4	3	2	1
CC/CV	75%~100%	ON	Flash1	Solid on	Solid on	Solid on
	50%~75%	ON	Flash2	Flash1	Solid on	Solid on
	25%~50%	ON	Flash3	Flash2	Flash1	Solid on
	0%~25%	ON	Flash4	Flash3	Flash2	Flash1
	Low battery	flash	Flash4	Flash3	Flash2	Flash1
Floating	Full	ON	Solid on	Solid on	Solid on	Solid on

Inverter mode battery indicator:

Battery Capacity						
	5	4	3	2	1	ALARM
Full	ON	ON	ON	ON	ON	--
75% left	ON	OFF	ON	ON	ON	--
50% left	ON	OFF	OFF	ON	ON	--
25% left	ON	OFF	OFF	OFF	ON	--
0% left	ON	OFF	OFF	OFF	OFF	--
Low battery alarm	flash	OFF	OFF	OFF	OFF	1beep/2s
Low battery off	flash	OFF	OFF	OFF	OFF	--

Load indicator:

The load indicate the load percentage comply with load VA or W(show the bigger value)，the overload label will flash when overload exist.

Fault code/ Audible alarm:

Fault Code	Protect Function	Active Mode	Condition	Warning (O/P=ON)	Fault (O/P=OFF)	Restart	
						Operate	Condition
--	Low DC Voltage Alarm	Inverter	DC voltage<Low DC Alarm	1beep/2s	--	--	--
0	Low DC Voltage Protection	Inverter	DC Voltage<Low DC Shut-down	--	--	Auto	1.DC Voltage>Low DC Alarm Recovery 2.Mains is normal
1	Over Charge Protection	Line	DC Voltage>High DC input Shut-down	Beep continuous	--	Manual	--
1	Over Voltage Protection	Standby	DC Voltage>High DC input Shut-down	--	Beep continuous	Auto	DC Voltage<High DC input Shut-down Recovery
2	Over Load Protection	Line/ Inverter	110%~150% load	1beep/0.5s,and continuous 10s	Beep continuous	Manual	--
		Line/ Inverter	>150% load	1beep/0.5s,and continuous 5s	Beep continuous	Manual	--
3	Output Short Circuit Protection	Inverter	Output Voltage<20Vrms	--	Beep continuous	Manual	--
4	Fan Fault Protection	Line/ Inverter	Fan Locked Fan Defected	2beep/2s,and continous 1min	Beep continuous	Manual	--
5	Over Temp Protection	Line/ Inverter	HEAT SINK Temp≥ 100℃	--	Beep continuous	Auto	HEAT SINK Temp≤ 55 ℃
6	Back-EMF Protection	Standby	Reverse input and output	--	Beep continuous	Manual	--

Table 9 General Specifications

Safety Certification	CE(EN60950)
EMI Classification	EN62040-2, CLASS A
Operating Temperature Range	0°C to 45°C
Storage temperature	-15°C ～ 60°C
Altitude, operational	Elevation: 0 – 1500 Meters
Relative humidity	5% to 95% non-condensing
Audible Noise	60dB max
Cooling	Forced air, variable speed fan
Dimension	350mm（W）*110mm（H）*407mm（D）
Net Weight	9KG

TROUBLESHOOTING

Problem	Possible Causes	Remedy
No LCD display	1. Battery Weak (<35V)	1. Re-charge battery
	2. Battery defective (can't be charged)	2. Battery replacement
	3. Power switch is not pressed	3. Press and hold power switch
Mains normal but works in inverter mode	1. AC Input missing	1. Check AC input connection
	2. Input protector is effective	2. Reset the input protector
Alarm buzzer beeps continuously	1. Overload	1. Verify that the load matches the capability specified in the specs
	2. Output short circuit	2. Check wiring or remove abnormal load
	3. Over temp	3. Move away barrier in front of airflow inlet
	4. Over charger	4. Restart the unit
	5. Over voltage	5. lower the DC input voltage under the high DC input shut-down recovery (58.0±1.2Vdc)
	6. Fan fault	6. Check if something block the fan, if not replace the fan
	7. Back-EMF	7. Check the AC Input and output wire connection
Back up time is shortened	1. Overload	1. Remove some non-critical load
	2. Battery voltage is too low	2. Charge battery for 8 hours or more
	3. Battery bank is too small	3. Increase battery bank capacity