

Power Pak

Pure Sine Wave Inverter/Charger
A Complete Off-Grid System In A Box

User's Manual

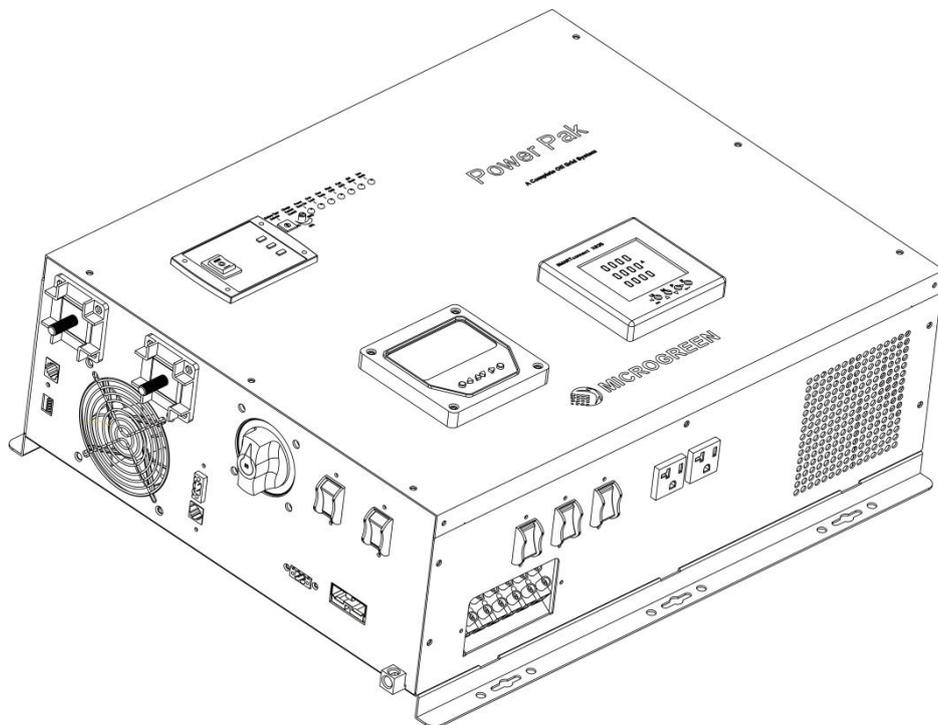


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1. Important Safety Information



WARNING!

This manual contains important instructions for all Power Pak/Charger models that shall be followed during installation and maintenance of the inverter.

1.1 General Safety Precautions

1-1-1. Do not expose the Inverter to rain, snow, spray, bilge or dust. To reduce risk of hazard, do not cover or obstruct the ventilation openings. Do not install the Inverter in a zero-clearance compartment. Overheating may result. Allow at least 30CM (11.81 inches) of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit. A Power Pak min air flow of 145CFM is required.

1-1-2. To avoid a risk of fire and electronic shock. Make sure that existing wiring is in good electrical condition; and that wire size is not undersized. Do not operate the Inverter with damaged or substandard wiring.

1-1-3. This equipment contains components which can produce arcs or sparks. To prevent fire or explosion do not install in compartments containing batteries or flammable materials or in locations which require ignition protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of the fuel system.

See Warranty for instructions on obtaining service.

1-1-4. Do not dis-assemble the Inverter/Charger. It contains no user serviceable parts. Attempting to service the Inverter/Charger yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected and will void the warrantee

1-1-5. To reduce the risk of electrical shock, disconnect both AC and DC power from the Inverter/Charger before attempting any maintenance or cleaning. Turning off controls will not reduce this risk

CAUTION: Equipment damage

The output side of the inverter's AC wiring should at no time be connected to public power or a generator. This condition is far worse than a short circuit. If the unit survives this condition, it will shut down until corrections are made.

Installation should ensure that the inverter's AC output is, at no time, connected to its AC input.

Warning: Limitations on Use

SPECIFICALLY, PLEASE NOTE THAT THE Power Pak INVERTER/CHARGER SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES

1.2 Precautions When Working with Batteries

1-2-1. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 20 minutes and get medical attention immediately.

1-2-2. Never smoke or allow a spark or flame in vicinity of battery or engine.

1-2-3. Do not drop a metal tool on the battery. The resulting spark or short-circuit on the battery or other electrical part may cause an explosion.

1-2-4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery produces a short circuit current high enough to weld a ring or the like to metal, causing a severe burn.

1-2-5. To reduce the risk of injury, charge only rechargeable batteries such as deep-cycle lead acid, lead antimony, lead calcium gel cell, absorbed mat, NiCad/NiFe or Lithium battery. Other types of batteries may burst, causing personal injury and damage.

2. Introduction

2.1 General Information

This Series Pure Sine Wave Inverter is a combination of an inverter, battery charger and AC auto-transfer switch and Solar charge controller into one complete system with a peak conversion efficiency of over 80%.

It is packed with unique features and it is one of the most advanced inverter/chargers in the market today.

It features power factor corrected, sophisticated multi-stage charging and pure sine wave output with unprecedentedly high surge capability to meet demanding power needs of inductive loads without endangering the equipment.

For the regular model, when utility AC power cuts off (or falls out of acceptable range), the transfer relay is de-energized, and the load is automatically transferred to the Inverter output. Once the qualified AC utility is restored, the relay is energized, and the load is automatically reconnected to AC utility.

The Power Pak Inverter is equipped with a powerful charger of up to 110Amps (depending on model).

The overload capacity is 300% of continuous output for up to 20 seconds to reliably support tools and equipment longer

Another important feature is that the inverter can be easily customized to Battery priority via a DIP switch, this helps to extract maximum power from battery in renewable energy systems.

Thus, the Power Pak Pure Sine Wave Inverter is suitable for Renewable energy system, Utility, RV, Marine and Emergency appliances.

To get the most out of the power inverter, it must be installed, used and maintained properly. Please read the instructions in this manual before installing and operating.

2.2 Application

Power tools—circular saws, drills, grinders, sanders, buffers, weed and hedge trimmers, air compressors.

Office equipment – computers, printers, monitors, facsimile machines, scanners.

Household items – vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines.

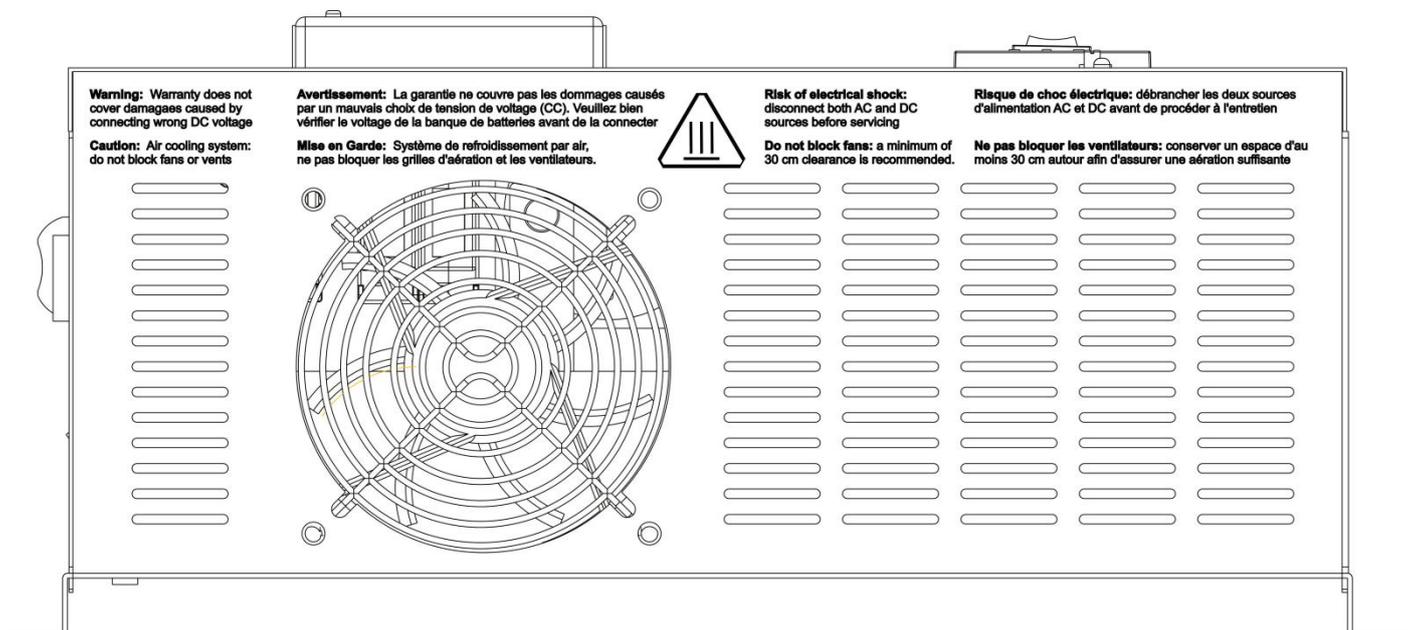
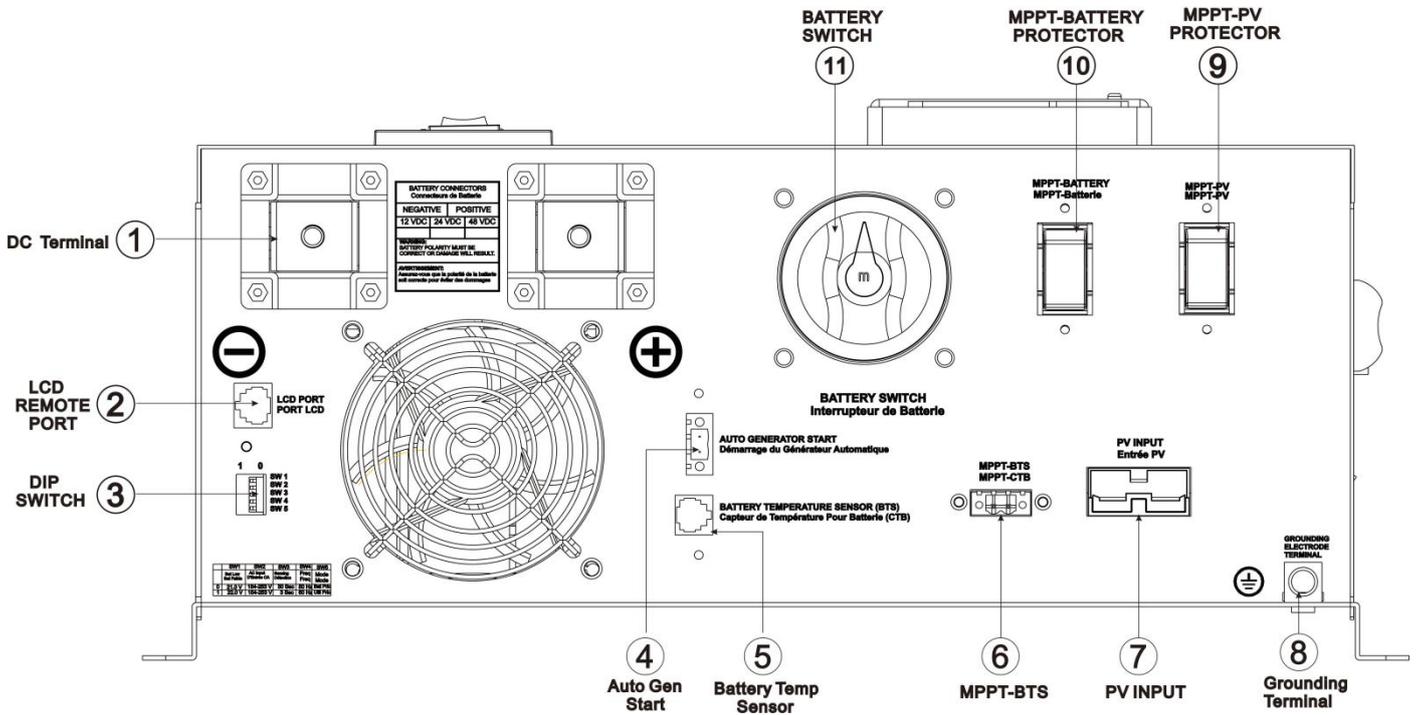
Kitchen appliances – coffee makers, blenders, ice makers, toasters.

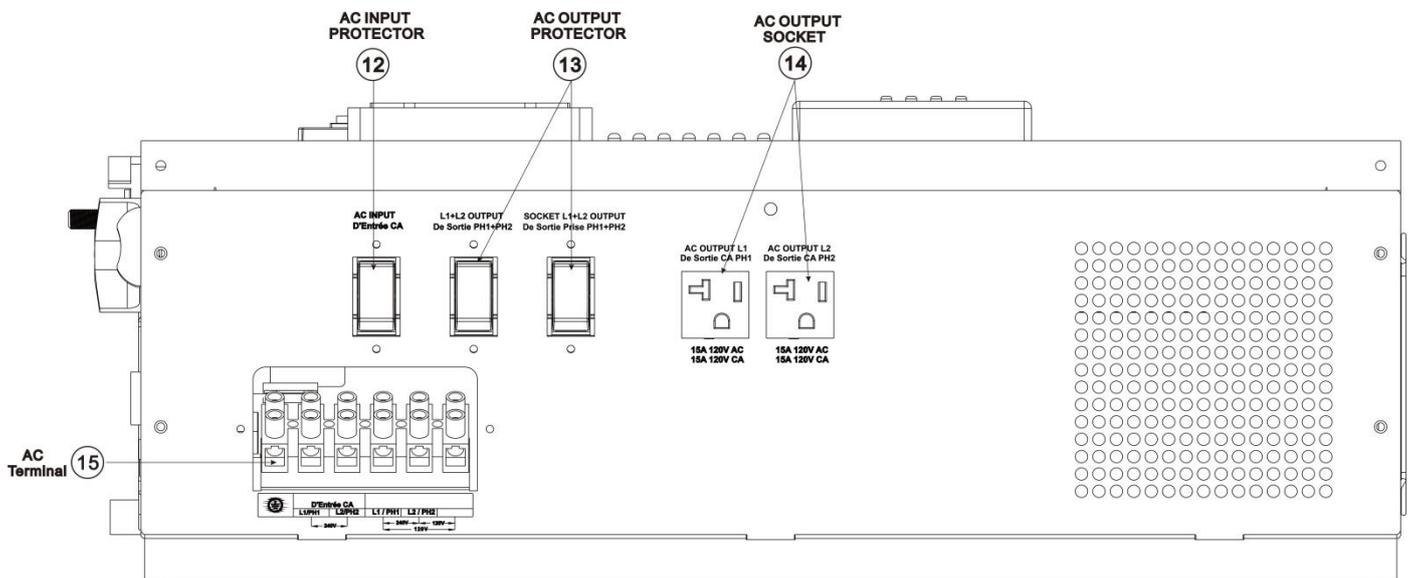
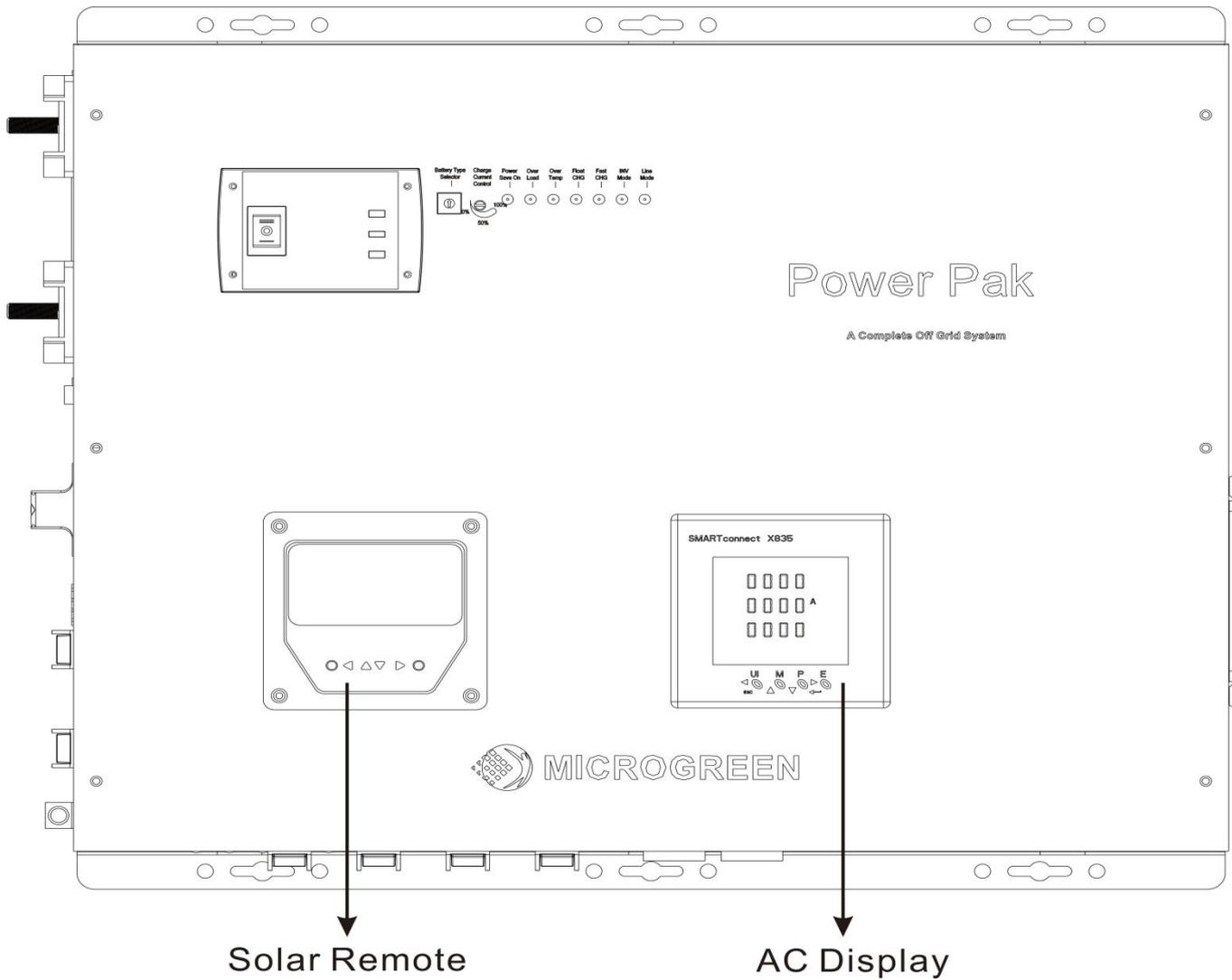
Industrial equipment – metal halide lamp, high – pressure sodium lamp.

Home entertainment electronics – Television, VCRs, video games, stereos, musical instruments, satellite equipment.

2.3 Mechanical Drawing

Power Pak 4-6KW 120/240VAC SIDE





2.4 Features

- ❖ Smart Remote Control (RMT)
- ❖ 2 separate 15 amp fused AC output receptacles
- ❖ Designed to Operate under Harsh Environment
- ❖ DC Start & Automatic Self-Diagnostic Function
- ❖ Compatible with Both Linear & Non-Linear Load
- ❖ Easy to Install & Easy to Operate & Easy to understand
- ❖ Powerful Charge Rate, Selectable From 0%-100%
- ❖ High Efficiency Design & “Power Saving Mode” to Conserve Energy
- ❖ Battery Priority Mode, Designates the Inverter-Preferred UPS Configuration
- ❖ 19 Vdc Battery Recover Point, Dedicated for Renewable Energy Systems
- ❖ 8 pre Set Battery Type Selector plus De-sulphation for Totally Flat Batteries
- ❖ 4-step Intelligent Battery Charging, PFC (Power Factor Correction) for Charger
- ❖ 8ms Typical Transfer Time Between Utility & Battery, Guarantees Power Continuity
- ❖ 15s Delay Before Transfer when AC Resumes, Protection for Load when Used with Generator

2.5 Electrical Performance

2.5.1 Inverter

Topology

The Power Pak is built according to the following topology.

Inverter: Full Bridge Topology.

AC Charger: Isolate Boost Topology

Because of high efficiency Mosfets and 16bit, 4.9MHz microprocessor and heavy transformers, it outputs PURE SINE WAVE AC with an average THD of 10% (Min5%, Max 15%) depending of load connected and battery voltage.

The peak efficiency of Power Pak is 80%.

Overload Capacity

The Power Pak inverters have different overload capacities, making it ideal to handle demanding loads.

1 For $110% < \text{Load} < 125% (\pm 10\%)$, no audible alarm in 14 minutes, be Power Pak 0.5s every 1s in the 15th minute, and Fault (Turn off) after the 15th minute.

2 For $125% < \text{Load} < 150% (\pm 10\%)$, beeps 0.5s every 1s and Fault (Turn off) after the 1 minute.

3 For $300\% \cong \text{Load} > 150% (\pm 10\%)$, beeps 0.5s every 1s and Fault (Turn off) after 20s.

2.5.2 AC Charger

Power Pak is equipped with an active PFC (Power Factor Corrected) multistage battery charger. The PFC feature is used to control the amount of power used to charge the batteries in order to obtain a power factor as close as possible to 1.

Unlike other inverters whose max charging current decreases according to the input AC voltage, Power Pak charger is able to output max current as long as input AC voltage is in the range of 164-243VAC (95-127VAC for 120V model), and AC freq is in the range of 48-54Hz(58-64Hz for 60Hz model).

The Power Pak inverter has a strong charging current of 40Amp(for 3KW,24V), and the max charge current can be adjusted from 0%-100% via a liner switch at the right of the battery type selector. This will be helpful if you are using our powerful charger on a small capacity battery bank. Fortunately, the liner switch can effectively reduce the max charging current to 20% of its peak.

Choosing “0” in the battery type selector will disable charging function.

There are mainly 3 stages:

Bulk Charging: This is the initial stage of charging. While Bulk Charging, the charger supplies the battery with controlled constant current. The charger will remain in Bulk charge until the Absorption charge voltage (determined by the Battery Type selection) is achieved.

Software timer will measure the time from A/C start until the battery charger reaches 0.3V below the boost voltage, then take this time as T_0 and $T_0 \times 2 = T_1$.

Absorb Charging: This is the second charging stage and begins after the absorb voltage has been reached. Absorb Charging provides the batteries with a constant voltage and reduces the DC charging current in order to maintain the absorb voltage setting.

In this period, the inverter will start a T_1 timer; the charger will keep the boost voltage in Boost CV mode until the T_1 timer has run out. Then drop the voltage down to the float voltage. The timer has a Power Pak min time of 1 hour and a maximum time of 12 hours.

Float Charging: The third charging stage occurs at the end of the Absorb Charging time. While Float charging, the charge voltage is reduced to the float charge voltage (determined by the Battery Type selection*). In this stage, the batteries are kept fully charged and ready if needed by the inverter.

If the A/C is reconnected or the battery voltage drops below 12Vdc/24Vdc/48Vdc, the charger will reset the cycle above.

If the charge maintains the float state for 10 days, the charger will deliberately reset the cycle to protect the battery.

Table 2.5.1 Battery Charging Processes

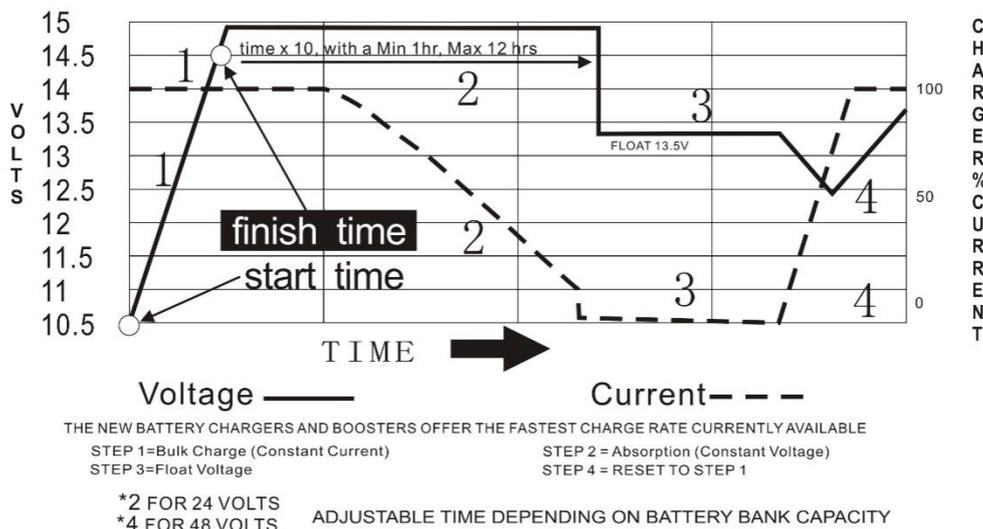


Table 2.5.2 Battery Type Selector

Switch Setting	Description	Fast Mode / VDC	Float Mode / VDC
0	Charger Off		
1	Gel USA	14.0	13.7
2	AGM 1	14.1	13.4
3	AGM 2	14.6	13.7
4	Sealed Lead Acid	14.4	13.6
5	Gel EURO	14.4	13.8
6	Open Lead Acid	14.8	13.3
7	Calcium	15.1	13.6
8	De-sulphation	15.5 (4 Hours then Off)	
For 24 Vdc Mode Series (*2 for 48 Vdc Mode)			

De-sulphation

The de-sulphation cycle on switch position 8 is marked in red because this is a very dangerous setting if you do not know what you are doing. Before ever attempting to use this cycle you must clearly understand what it does and when and how you would use it.

What causes sulphation? This can occur with infrequent use of the batteries(nor), or if the batteries have been left discharged so low that they will not accept a charge. This cycle is a very high voltage charge cycle designed to try to break down the sulphated crust that is preventing the plates taking a charge and thus allow the plates to clean up and so accept charge once again.

Charging depleted batteries

The Power Pak inverter allows start up and through power with depleted batteries.

For 24 VDC model, after the battery voltage goes below 20 V, if the switch is still (and always) kept in "ON" position, the inverter is always connected with battery, and the battery voltage does not drop below 2V, the inverter will be able to charge the battery once qualified AC inputs are present.

Before the battery voltage goes below 18 VDC, the charging can be activated when the switch is turned to "Off", then to "ON".

When the voltage goes below 18 VDC, and you accidentally turn the switch to OFF or disconnect the inverter from battery, the inverter will not be able to charge the battery once again, because the CPU loses memory during this process.

Model Watt	Battery Voltage	AC Charger Current
		Max
3000	24 Vdc	35 ± 5 Amp
4000	24 Vdc	50 ± 5 Amp
6000	24 Vdc	80 ± 5 Amp

Table 2.5.3 AC Charging Current for Power Pak model

The charging capacity will go to peak in around 3 seconds. This may cause a generator to drop frequency, making inverter transfer to battery mode.

It is suggested to gradually put charging load on the generator by switching the charging switch from min to max, together with the 15s switch delay, our inverter gives the generator enough time to spin up. This will depend on the size of the generator and rate of charge.

2.5.3 Transfer

While in the Standby Mode, the AC input is continually monitored. Whenever AC power falls below the VAC Trip voltage (154 VAC, default setting for 230VAC, 90VAC for 120VAC), the inverter automatically transfers back to the Invert Mode with Power Pak min interruption to your appliances - as long as the inverter is turned on. The transfer from Standby mode to Inverter mode occurs in approximately 8 milliseconds. And it is the same time from Inverter mode to Standby mode.

Though it is not designed as a computer UPS system, this transfer time is usually fast enough to keep your equipment powered up.

There is a 15-second delay from the time the inverter senses that continuously qualified AC is present at the input terminals to when the transfer is made. This delay is built in to provide time for a generator to spin-up to a stable voltage and avoid relay chattering. The inverter will not transfer to generator until it has locked onto the generator's output. This delay is also designed to avoid frequent switching when input utility is unstable.

2.5.4 Auto frequency adjust

The inverter is with Auto Frequency adjusts function.

The factory default configuration for 220/230/240VAC inverter is 50 Hz, and 60Hz for 100/110/120VAC inverter. While the output freq. can be easily changed once a qualified freq. is applied to the inverter.

If you want to get 60Hz from a 50Hz inverter, just input 60Hz power, and the inverter will automatically adjust the output freq. to 60Hz and vice versa.

2.5.5 Protections

The Power Pak inverter is equipped with extensive protections against various harsh situations/faults.

These protections include:

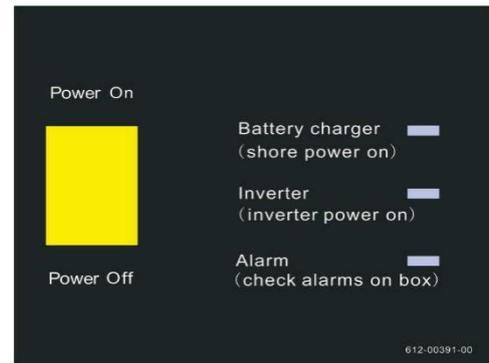
AC Input over voltage protection/AC Input low voltage protection

Low battery alarm/High battery alarm

Over temperature protection/Over load protection

Short Circuit protection (1s after fault)

Back feeding protection



When Over temperature /Over load occur, after the fault is cleared, the master switch has to be reset to restart the inverter.

The Low batter voltage trip point can be customized from defaulted value 20VDC to 21 VDC thru the SW1 on DIP switch.

The inverter will go to Over temp protection when heat sink temp. $\geq 105^{\circ}\text{C}$, and go to Fault (shutdown Output) after 30 seconds. The switch has to be reset to activate the inverter.

The Power Pak Inverter has back feeding protection which avoids presenting an AC voltage on the AC input terminal in Invert mode.

After the reason for fault is cleared, the inverter has to be reset to start working.



Never cut the telephone cable when the cable is attached to inverter and battery is connected to the inverter. Even if the inverter is turned off. It will damage the remote PCB inside if the cable is short circuited during cutting.

2.5.6 LED Indicator

SHORE POWER ON	GREEN LED lit in AC Mode
INVERTER ON	GREEN LED lit in Inverter Mode
FAST CHARGE	Yellow LED lit in Fast Charging Mode
FLOAT CHARGE	GREEN LED lit in Float Charging Mode
OVER TEMP TRIP	RED LED lit in Over Temperature
OVER LOAD TRIP	RED LED lit in Over Load
POWER SAVER ON	GREEN LED lit in Power Saver Mode (Power Saver Load $\leq 25W$)

2.5.7 Audible Alarm

Table 2.5.6 Power Pak Audible Alarm Spec

Battery Voltage Low	Inverter green LED lit, and the buzzer beeps 0.5s every 5s.
Battery Voltage High	Inverter green LED lit, and the buzzer beeps 0.5s every 1s and Fault after 60s.
Invert Mode Over-Load	(1) $110% < \text{load} < 125% (\pm 10\%)$, No audible alarm in 14 minutes, Beeps 0.5s every 1s in 15th minute and Fault after 15 minutes; (2) $125% < \text{load} < 150% (\pm 10\%)$, Beeps 0.5s every 1s and Fault after 60s; (3) $\text{Load} > 150% (\pm 10\%)$, Beeps 0.5s every 1s and Fault after 20s;
Over Temperature	Heat sink temp. $\geq 105^{\circ}C$, Over temp red LED Lighting, beeps 0.5s every 1s;

2.5.8 FAN Operation

For 3KW, there is one multiple controlled DC fan which starts to work according to the following logic.

as the one on 3KW, while the AC fan will work once there is AC output from the inverter.

So when the inverter is in power saver mode, the AC fan will work from time to time in response to the pulse sent by the inverter in power saver mode.

The Operation of the DC fan at the DC terminal side is controlled by the following logic

(Refer to Table 2.5.7):

Table 2.5.7 Power Pak Fan Operation Logic

Condition	Enter condition	Leave condition	Speed
HEAT SINK TEMPERATURE	$T \leq 60^{\circ}\text{C}$	$T > 65^{\circ}\text{C}$	OFF
	$65^{\circ}\text{C} \leq T < 85^{\circ}\text{C}$	$T \leq 60^{\circ}\text{C} / T \geq 85^{\circ}\text{C}$	50%
	$T > 85^{\circ}\text{C}$	$T \leq 80^{\circ}\text{C}$	100%
CHARGER CURRENT	$I \leq 15\%$	$I \geq 20\%$	OFF
	$20\% < I \leq 50\%$	$I \leq 15\% / I \geq 50\%$	50%
	$I > 50\%$	$I \leq 40\%$	100%
LOAD% (INV MODE)	Load $< 30\%$	Load $\geq 30\%$	OFF
	$30\% \leq \text{Load} < 50\%$	Load $\leq 20\% / \text{Load} \geq 50\%$	50%
	Load $\geq 50\%$	Load $\leq 40\%$	100%

Allow at least 30CM of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit.

Variable speed fan operation is required in invert and charge mode. This is to be implemented in such a way as to ensure high reliability and safe unit and component operating temperatures in an operating ambient temperature up to 50°C.

- Speed to be controlled in a smooth manner as a function of internal temperature and/or current.
- Fan should not start/stop suddenly.
- Fan should run at Power Pak min speed needed to cool unit.
- Fan noise level target $< 60\text{db}$ at a distance of 1m.

2.5.9 DIP Switches

On the rear panel of inverter, there are 5 DIP switches which enable users to customize the performance of the device.

Table 2.5.8 Power Pak Dip Switch Function Setting

DIP Switch NO.	Switch Function	Position: 0	Position: 1
SW1	Low Battery Trip Volt	20.0 Vdc For Deep-Cycle Battery	21 Vdc For Starting Battery
		*2 for 48 Vdc,	
SW2	AC Input Range / (AVR)	AC Source For Utility Mode	For Generator Mode
		230Vac HV 184-253Vac / (176-276Vac)	140-270Vac / (150-276Vac)
		120Vac LV 100-135Vac / (92-144Vac)	90-135Vac / (78-144Vac)
SW3	Power Saver Auto Setting	Night Charger Function	Detect Load Per 3Secs
SW4	O/P Frequency Setting	50Hz	60Hz
SW5	Solar/AC Priority Setting	Utility Priority	Battery Priority

SW1: Low Battery Trip Volt:

For 24VDC model, the Low Battery Trip Volt is set at 20.0Vdc by typical deep cycle lead acid battery. It can be customized to 21 Vdc using SW1 for sealed car battery, this is to prevent batteries from over-discharging while there is only a small load applied on the inverter. (*2 for 24VDC, *4 for 48VDC)

SW2: AC Input Range:

There are different acceptable AC input ranges for different kinds of loads.

For some relatively sensitive electronic devices, a narrow input range of 184-253VAC (100-135V for 120VAC model) is required to protect them.

While for some resistive loads which work in a wide voltage range, the input AC range can be customized to 140-270VAC (90-135V for 120VAC model), this helps to power loads with the most AC input power without frequent switches to the battery bank.

In order to make the inverter accept dirty power from a generator, when the SW2 is switched to position “1”, the inverter will bypass an AC input with a wide voltage and frequency(40Hz-70Hz for 50Hz/60Hz).

Accordingly, the AC charger will also work in a wide voltage and frequency range (43Hz-67Hz for 50Hz/60Hz). This will avoid frequent switches between battery and generator. But some sensitive loads will suffer from the low-quality power. The pros and cons should be clearly realized.

SW3: Power Saver Auto Setting:

In Power Saver Mode, when the SW3 is switched to position “0”, inverter will work in Unit Off Charging mode, it will stay in standby mode without sensing loads. It won’t output any power even if a load is turned on. The inverter will not perform any function and only stay idle in this mode. When a qualified AC input present, it will switch to AC input power to charge the battery and supply the load at the same time.

When the SW3 is switched to position “0”, the inverter is initially in standby mode and sends a pulse to detect the presence of a load every 3 seconds. Each pulse lasts for 250ms. The inverter will remain in standby mode until a load has been detected. Then it will wake up from standby mode and start to inverter electricity from the battery bank to supply the load.

SW4: Frequency Switch:

The output frequency of the inverter can be set at either 50Hz or 60Hz by SW4.

SW5: Solar Mode/AC Mode Priority:

Our inverter is designed with AC priority by default. This means, when AC input is present, the battery will be charged first, and the inverter will transfer the input AC to power the load. Only when the AC input is stable for a continuous period of 15 seconds, the inverter will start a battery inverting cycle to protect the battery. After 1 normal charging cycle ac through put will be restored.

The AC Priority and Battery Priority switch is SW5. When you choose battery priority, the inverter will be inverting from battery despite the AC input. Only when the battery voltage is reaches low voltage alarm point (10.5V for 12V), the inverter transfers to AC Input, charge battery, and switch back to battery when battery is charged full. This function is mainly for wind/solar systems taking utility power as back up.

2.5.10 Other features

Battery voltage recovers start

After low battery voltage shut off(10V for 12V model/20V for 24V model/40V for 48V model), the inverter is able to restore operation after the battery voltage recovers to 13Vdc/26Vdc/52Vdc(with power switch still in the“On” position). This function helps to save the users extra labor to reactivate the inverter when the low battery voltage returns to an acceptable range in the renewable energy systems. The built-in battery charger will automatically reactivate as soon as city/generator ac has been stable for 15 seconds.



WARNING

Never leave the loads unattended, some loads (like a Heater) may cause accident in such cases.

It is better to shut everything down after low voltage trip than to leave your load on, due to the risk of fire.

Auto Gen Start (optional)

The inverter can be customized to start up a generator when battery voltage goes low.

When the inverter goes to low battery alarm, it can send a signal to start a generator, and turn the generator off after battery charging is finished.

The auto gen start feature will only work with generators designed to work with this feature. There is an open/close relay that will short circuit the positive and negative cable from a generator. The input DC voltage can vary, but the Max current the relay can carry is 16Amp.

Conformal Coating

The entire line of inverters has been processed with a conformal coating on the PCB, making it water, rust, and dust resistant.

While these units are designed to withstand corrosion from the salty air, they are not splash proof.

3. Installation

3.1 Location

Follow all the local regulations to install the inverter.

Please install the equipment in a location that is Dry, Clean, Cool and that has good ventilation.

Working temperature: - 10°C - 40°C

Storage temperature: - 40 - 70°C

Relative Humidity: 0% - 95%, non-condensing

Cooling: Forced air

3.2 DC Wiring recommendation

It is suggested the battery bank be kept as close as possible to the inverter. The following table is a suggested wiring option for 1 meter DC cable.

Please find the following Power Pak min wire size. In case of DC cable longer than 1m, please increase the cross section of cable to reduce the loss.

Please note that if there is a problem obtaining for example 90mm² cable, use 2*50mm² or 3*35mm².

One cable is always best, but cable is simply copper and all you require is the copper, so it does not matter if it is one cable or 10 cables as long as the square area adds up. Performance of any product can be improved by thicker cable and shorter runs, so if in doubt round up and keep the length as short as possible.

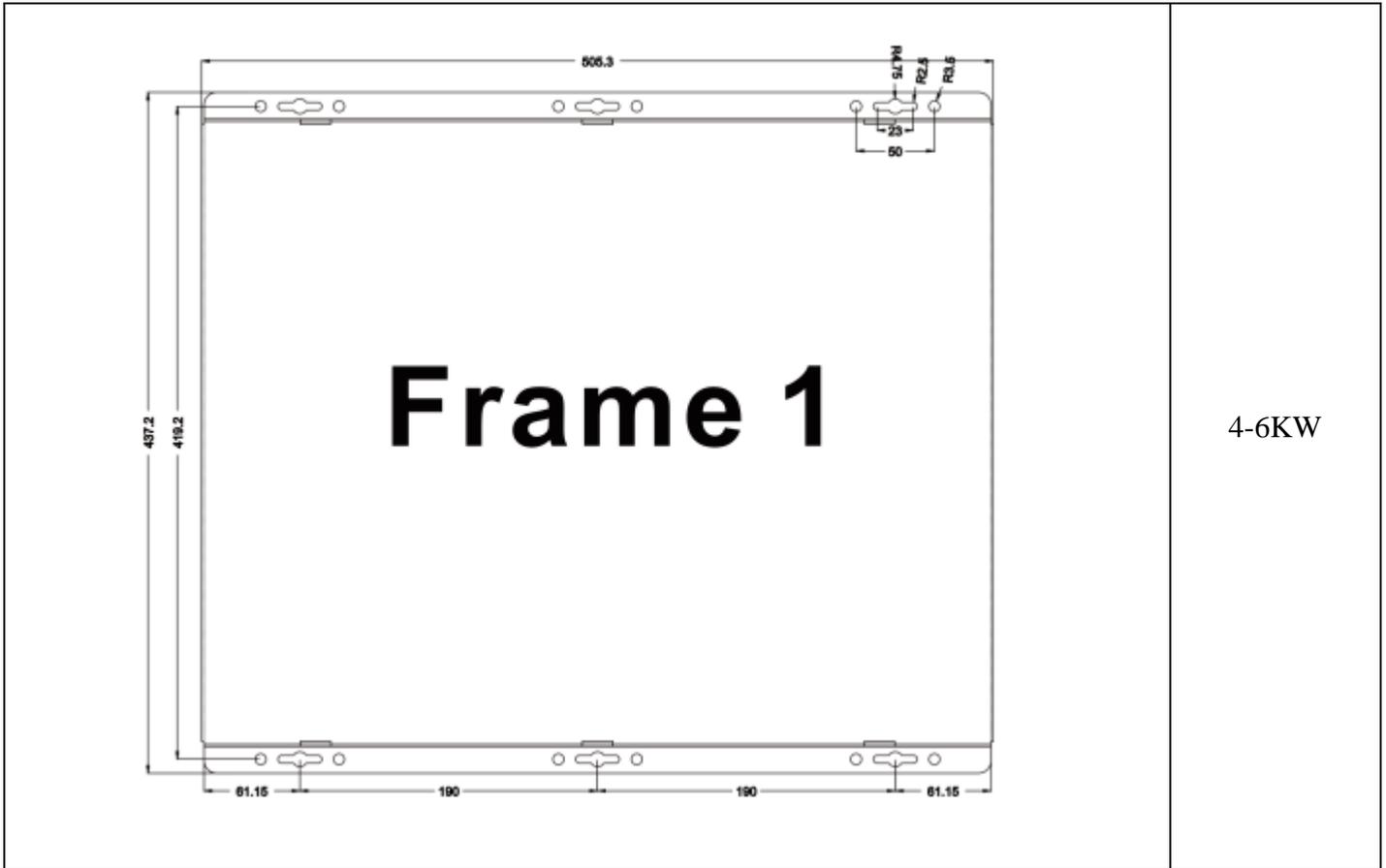


WARNING

The output voltage of this unit must never be connected in its input AC terminal, overload or damage may result.

Always switch on the inverter before plugging in any appliance.

3.3 Install Flange



4. Troubleshooting Guide

Troubleshooting contains information about how to troubleshoot possible error conditions while using the Power Pak Inverter & Charger.

The following chart is designed to help you quickly pinpoint the most common inverter failures.

Indicator and Buzzer for Power Pak

Status	Item	Indicator on top cover							LED on Remote Switch			Buzzer
		POWER SAVER ON	OVER LOAD	OVER TEMP	FLOAT CHG	FAST CHD	INVERTER MODE	LINE MODE	BATT CHG	INVERTER	Alarm	
		1	2	3	4	5	6	7	1	2	3	
Line Mode	CC					√		√	√			
	CV					√, Flash		√	√			
	Float				√			√	√			
	Standby							√				
Inverter Mode	Inverter On						√			√		
	Power Saver	√										
Inverter Mode	Battery Low						√			√	√	Beep 0.5s every 5s
	Battery High						√			√	√	Beep 0.5s every 1s
	Overload On Invert Mode		√				√			√	√	Refer to "Audible alarm"
	Over-Temp On Invert Mode			√			√			√	√	Beep 0.5s every 1s
	Over-Temp On Line Mode			√		√		√	√		√	Beep 0.5s every 1s
	Over Charge					√		√	√		√	Beep 0.5s every 1s
Fault Mode	Fan Lock											Beep continuous
	Battery High						√			√		Beep continuous
	Inverter		√									Beep continuous

Mode Overload												
Output Short												Beep continuous
Over-Temp			√									Beep continuous
Over Charge					√			√				Beep continuous
Back Feed Short												Beep continuous

Symptom	Possible Cause	Recommended Solution
Inverter will not turn on during initial power up.	Batteries are not connected, loose Battery-side connections. Low battery voltage.	Check the batteries and cable connections. Check DC fuse and breaker. Charge the battery.
No AC output voltage and no indicator lights ON.	Inverter has been manually transitioned to OFF mode.	Press the switch to Power saver on or Power saver off position.
AC output voltage is low and the inverter turns loads OFF in a short time.	Low battery.	Check the condition of the batteries and recharge if possible.
Charger is inoperative, and unit will not accept AC.	AC voltage has dropped out-of-tolerance	Check the AC voltage for proper voltage and frequency.
Charger is supplying a lower charge rate.	Charger controls are improperly set. Low AC input voltage. Loose battery or AC input connections.	Refer to the section on adjusting the “Charger Rate”. Source qualified AC power.. Check all DC /AC connections.
Charger turns OFF while charging from a generator.	High AC input voltages from the generator.	Load the generator down with a heavy load. Turn the generator output voltage down.
Sensitive loads turn off temporarily when transferring between grid and inverting.	Inverter's Low voltage trip voltage may be too low to sustain certain loads.	Choose narrow AC voltage in the DIP switch or Install a UPS if possible.

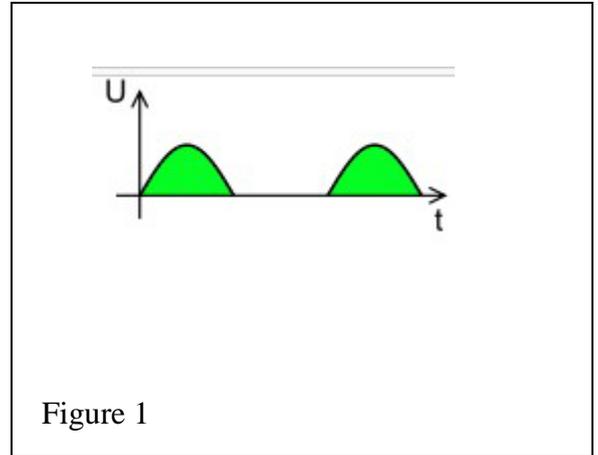
Noise from Transformer/case*	Applying specific loads such as hair drier	Remove the loads
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***The reason for the noise from transformer and/or case**

When in inverter mode and the transformer and/or case of the inverter sometimes may vibrate and make noise.

The noise may come from transformer.

According to the characteristics of our inverter, there is one type of load which will most likely to cause rattles of transformer, that is a half-wave load, load that uses only a half cycle of the power(see figure 1). This trends to cause imbalance of magnetic field of transformer, reducing its rated working freq from 20KHz to, say, maybe 15KHz (it varies according to different loads). This way, the freq of noise falls exactly into the range(200Hz-20KHz) that human ear can sense.



The most common load of such kind is hair drier.

If the noise comes from case.

Normally when loaded with inductive loads, the magnetic field generated by transformer keeps attracting or releasing the steel case at a specific freq, this may also cause noise.

Reducing the load power or using an inverter with bigger capacity will normally solve this problem.

The noise will not do any harm to the inverter or the loads.

5.Warranty

We offer a 1 year limited warranty.

The following cases are not covered under warranty.

1. DC polarity reverses.
2. The inverter is designed without DC polarity reverse protection. A polarity reverse may severely damage the inverter.
3. Wrong AC wiring
4. Operating in a wet environment.
5. Operating with an undersized generator or generator with unqualified wave form.

Appendix 1-Power Pak Specifications

Functions	Attributes	Model		
		Mini	Compact	Grande
Inverter Output	Continuous Output Power	3 kW	4 kW	10 kW
	Surge Rating (20Secs)	9 kW	12 kW	30 kW
	Output Waveform	Pure Sine wave/Same as input(Bypass Mode)		
	Nominal Efficiency	>88%(Peak)		
	Line Mode Efficiency	>95%		
	Power Factor	0.9-1.0		
	Nominal Output Voltage rms	100-110-120Vac / 220-230-240Vac		
	Output Voltage Regulation	±10% RMS		
	Output Frequency	50Hz ± 0.3Hz/60Hz ± 0.3Hz		
	Short Circuit Protection	Yes(1sec after fault)		
	Typical transfer Time	10ms(Max)		
	THD	< 10%		
DC Input	Nominal Input Voltage	12VDC	24VDC	48.0Vdc
	Minimum Start Voltage	10.0Vdc/ 10.5Vdc for 12Vdc Mode		
	Low Battery Alarm	10.5Vdc/ 11.0Vdc for 12Vdc Mode		
	Low Battery Trip	10.0Vdc/ 10.5Vdc for 12Vdc Mode		
	High Voltage Alarm	16.0Vdc for 12Vdc Mode		
	Low Battery Voltage Recover	15.5Vdc for 12Vdc Mode		
	Idle Consumption-Search Mode	< 25 W when Power Saver On.		
Charger	Output Voltage	Depends on battery type		
	Charger Breaker Rating	25A	32A	80A
	Max Charge Power Rate	1/3 Rating Power		
	Battery Initial Voltage for Start	10-15.7Vdc for 12Vdc Mode		
	Over Charge Protection Shutdown	15.7Vdc for 12Vdc Mode		
Bypass & Protection	Input Voltage Waveform	Sine wave (Grid or Generator)		
	Nominal Voltage	100-110-120Vac / 220-230-240Vac		
	Max Input AC Voltage	150VAC For 120Vac LV Mode; 300VAC For 230Vac HV Mode;		
	Nominal Input Frequency	50Hz or 60Hz (Auto detect)		
	Low Freq Trip	47±0.3Hz for 50Hz, 57±0.3Hz for 60Hz		
	High Freq Trip	55±0.3Hz for 50Hz, 65±0.3Hz for 60Hz		
	Overload protection (SMPS load)	Circuit Breaker		
	Output Short circuit protection	Circuit Breaker		
	Bypass Breaker Rating	25A	30A	80A
	Transfer switch Rating	30A for UL & TUV	40A for UL	80A for UL
	Bypass Without Battery Connected	Yes (Optional)		
	Max Bypass Current	30A	30A	80A

Functions	Attributes	Model		
		Mini	Compact	Grande
Solar Charger	Rated Voltage	12v/24V	12v/24V	12V/24V/48V
	Solar Input Voltage Range	15-150Vdc		
	Rated Charge Current	40A	40A	60A
	Self Consumption	< 10mA		
AVR Function	Input AC Voltage Range	78-144V±4%	150-276V±4%	150-276V±4%
	Stabilized Output Voltage RMS	120VAC ±10% RMS	120/240VAC ±10% RMS	120/240VAC ±10% RMS
Mechanical Specifications	Mounting	Wall Mount		
	Inverter Dimensions (L*W*H)	484*328.2*192.2mm	505*447*178mm	588*415*200mm
	Inverter Weight (Solar Chg) KG	26	35	68
	Shipping Dimensions (L*W*H) (mm)	530*390*330	630*525*265	850*600*310
	Shipping Weight (Solar Chg) (KG)	28	37	71
	Display	Status LEDs / Status LEDs + LCD		
	Standard Warranty	2 Year		

※Specifications in this manual are subject to change without prior notice.

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