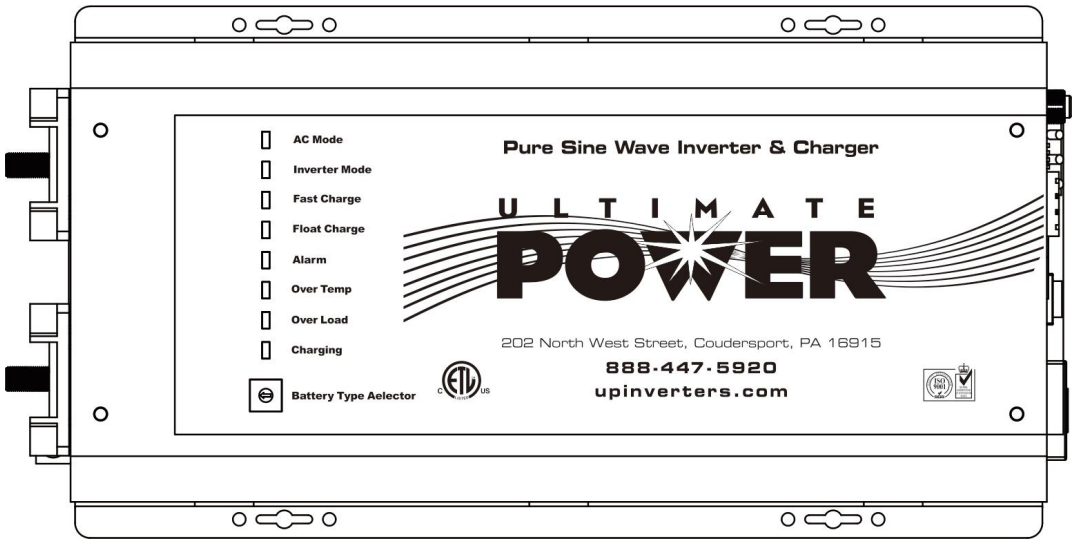
LP Series Pure Sine Wave Inverter/Charger User's Manual

For Models

UP12/600LP-C , UP12/600LP-CG

UP12/1000LP-C , UP12/1000LP-CG , UP12/1500LP-CG



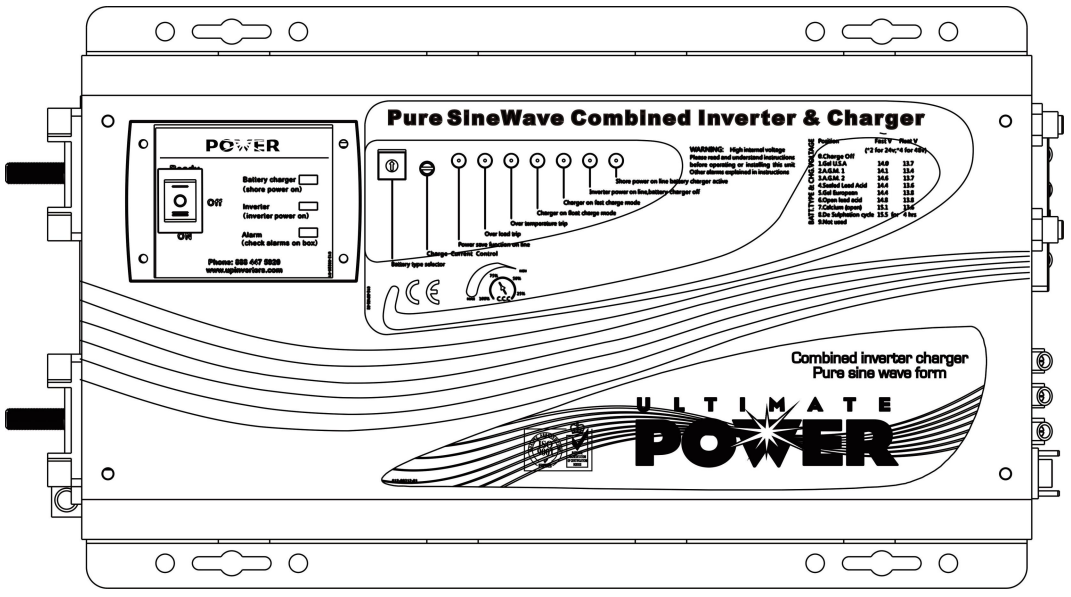


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1 Important Safety Information

Save This Manual! Read this manual before installation, it contains important safety, installation and operating instructions. Keep it in a safe place for future reference.
All wiring must follow the National Electric Code, Provincial or other codes in effect at the time of installation, regardless of suggestions in this manual. All wires should be copper conductors.

1.1 General Safety Precautions

1.1.1 Before installing and using the LP Series Pure Sine Wave Inverter/Charger, read the manual and cautionary markings on the Inverter/Charger enclosure. Be sure to read all instructions and cautionary markings for any equipment attached to this unit. Installers must be certified technicians or electricians.
1.1.2 This product is designed for indoor/compartment installation. Do not expose the inverter/charger 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/charger in a zero-clearance compartment. Overheating may result. Allow at least one inch of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit. A minimum air flow of 145CFM is required.
1.1.3 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.
1.1.4 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.
1.1.5 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.
1.1.6 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 INVERTER/CHARGER SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES. WE MAKE NO WARRANTY OR REPRESENTATION IN CONNECTION WITH THEIR PRODUCTS FOR SUCH USES. USING THE INVERTER/CHARGER WITH THESE PARTICULAR EQUIPMENTS IS AT YOUR OWN RISK.

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 of 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, and NiCad/NiFe or Lithium battery. Other types of batteries may burst, causing personal injury and damage.

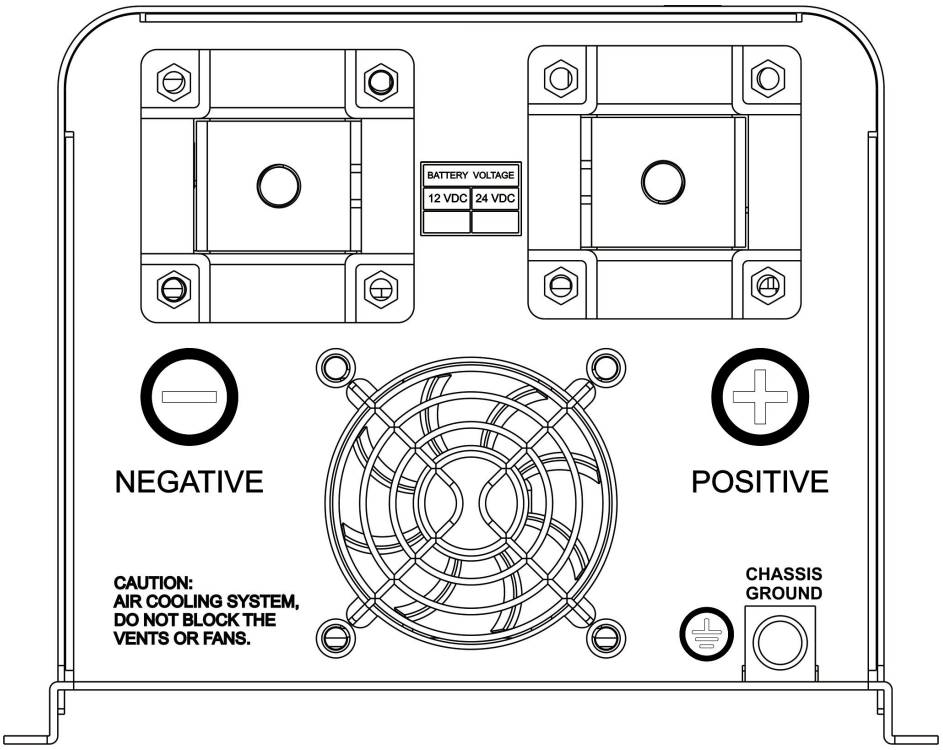
2 Introduction

2.1 General Information

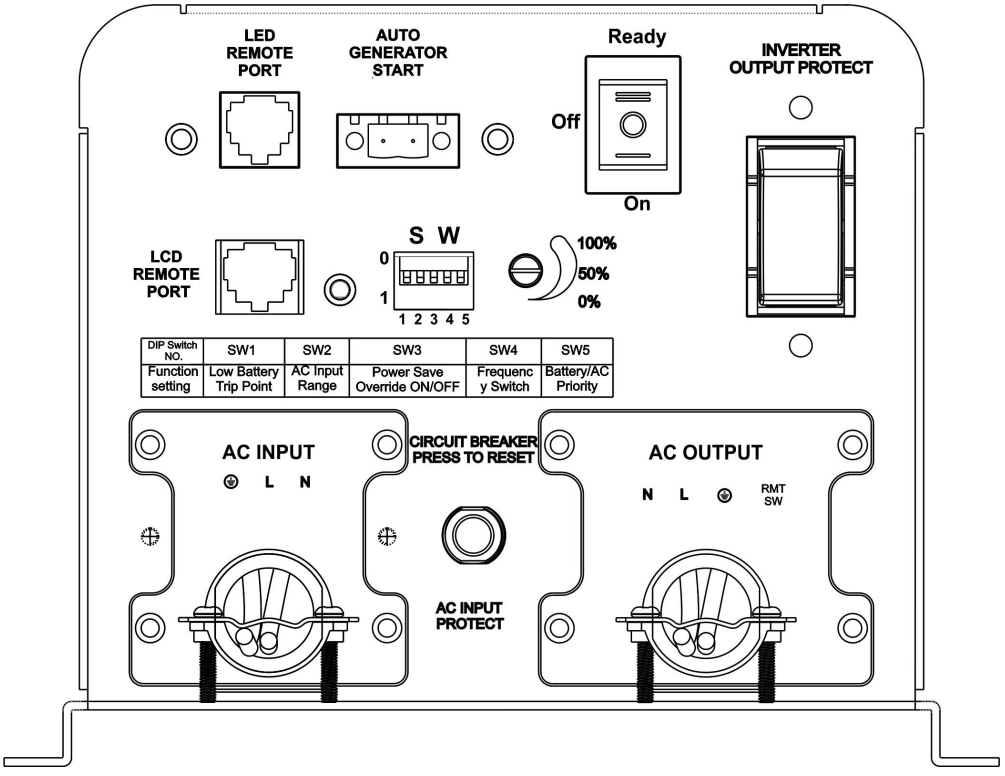
Thank you for purchasing the LP Series Pure Sine Wave Inverter/Charger.
The LP Series Pure Sine Wave Inverter/Charger is a transformer based inverter and battery charger with an unprecedented conversion efficiency of 90%.
It features power factor corrected, sophisticated multi-stage charging control and pure sine wave output with high surge capability to meet power needs of all sorts of demanding loads without putting the equipment at risk.
In response to the increasing demand of more advanced battery charging, our engineering team equipped the inverter with a Battery Temperature Sensing probe for increased charging precision.
The generous 300% surge capacity of 20 seconds makes it possible to support demanding inductive loads.
The AC/Battery priority, auto generator start functionality and optional built-in charger make it ideally suitable to work in backup power or anti-idle applications.
When customized to Battery priority mode via a DIP switch, the inverter will extract maximum power from external power sources and a minimal cycle of battery will be required. With the availability of auto generator start, an electrical generator can be integrated into the system and started when the battery voltage goes low.
With audible buzzer and remote LCD panel, the inverter gives the users comprehensive information of the operation status, making it easier for maintenance and troubleshooting.
Thus the LP Series Pure Sine Wave Inverter/Charger is suitable for applications including renewable energy systems, utility, truck, RV and emergency vehicles etc.
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 Mechanical Drawing

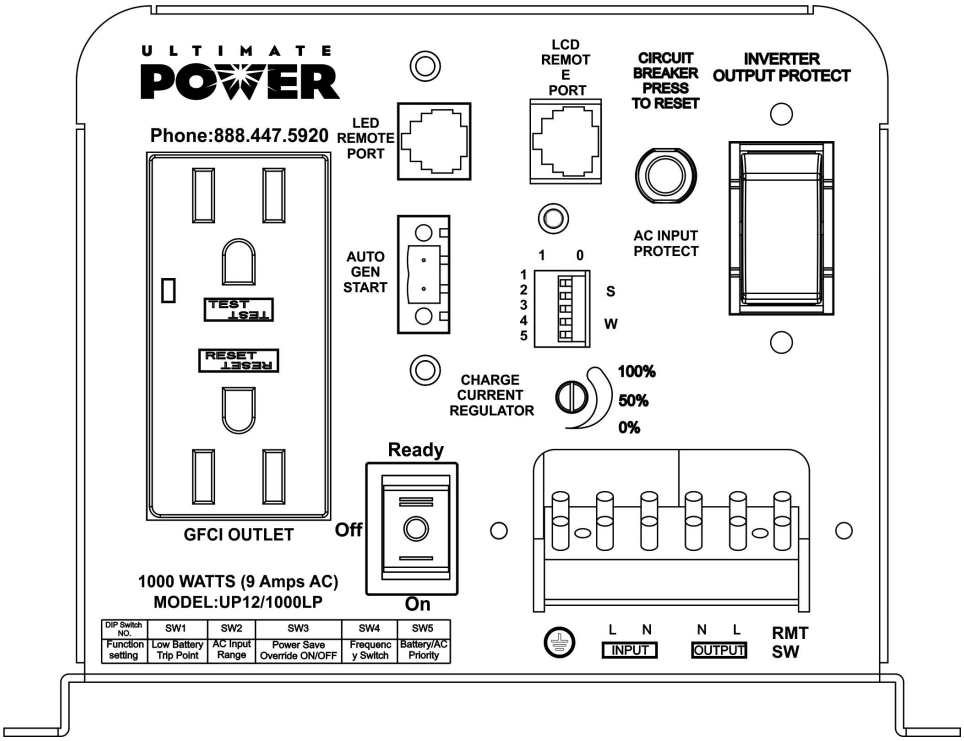
2.2.1 DC SIDE



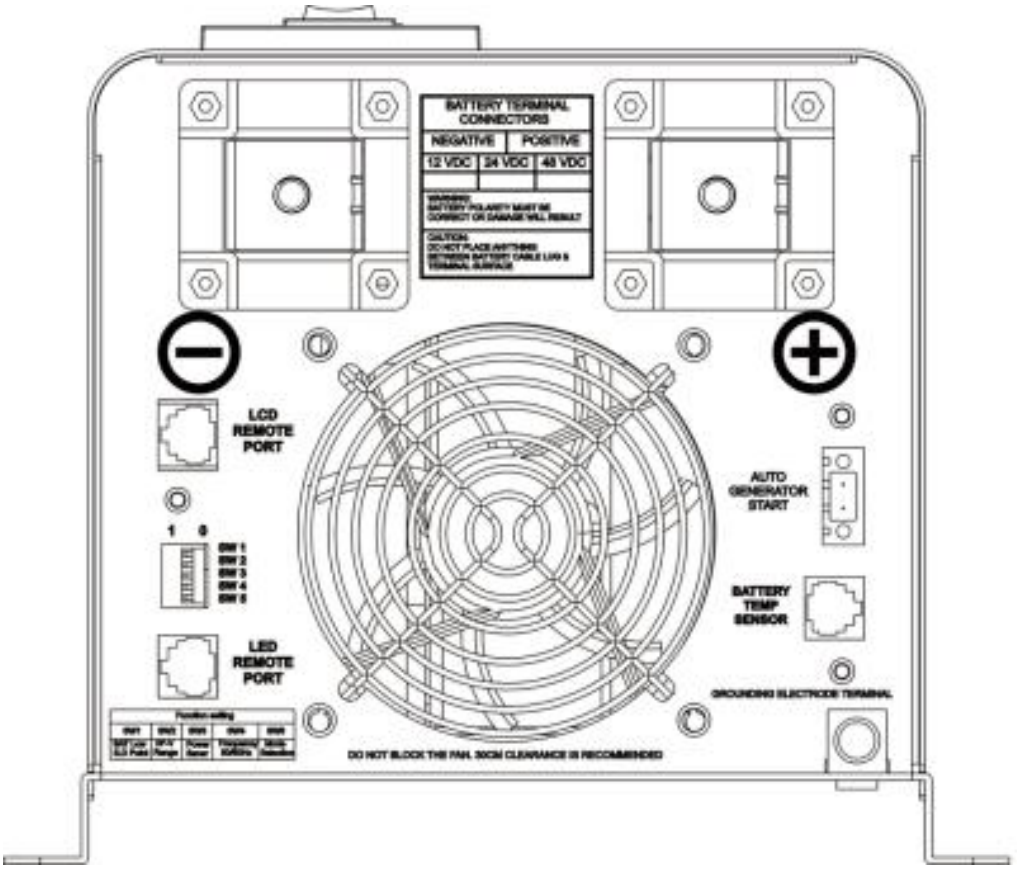
2.2.2 UP12/600LP-C,UP12/1000LP-C AC SIDE



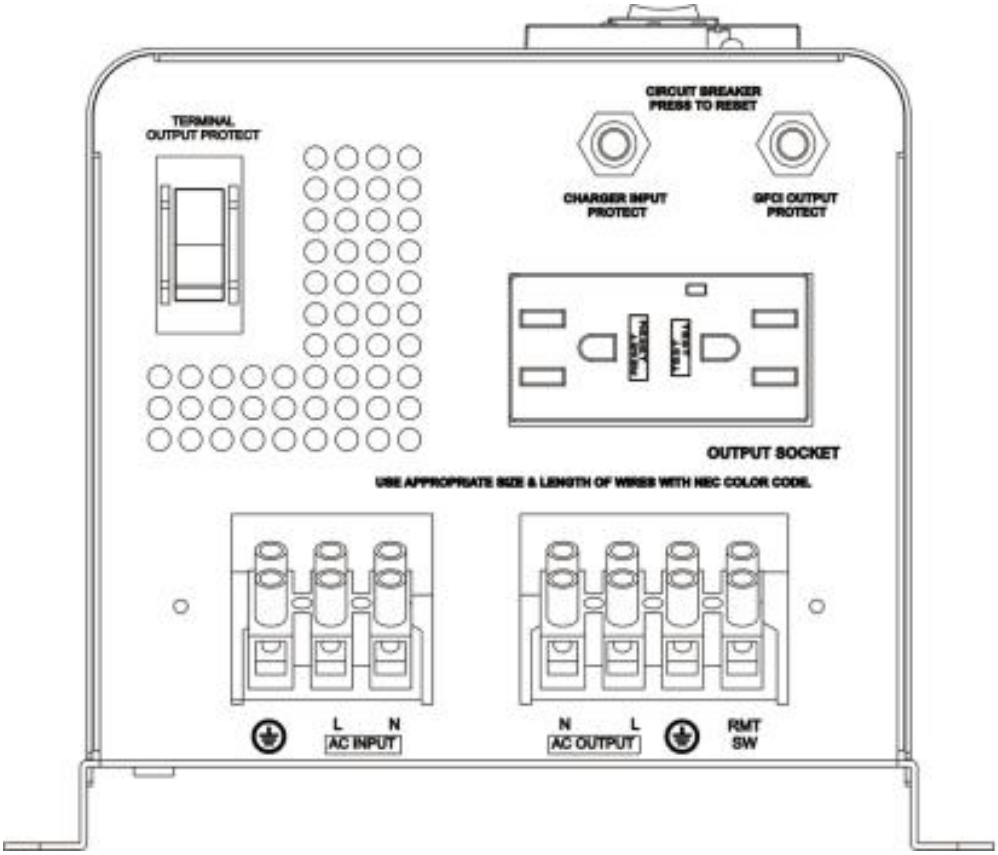
2.2.3 UP12/600LP-CG,UP12/1000LP-CG AC SIDE



2.2.4 UP12/1500LP-CG DC SIDE



2.2.5 UP12/1500LP-CG AC SIDE



2.3 Features

- Smart remote LCD control
- 12.8Vdc Remote Start
- Auto Generator Start
- Battery Temperature Sensing for increased charging precision
- Manual 50Hz/60Hz output frequency switch
- Maximum 90% conversion efficiency
- High surge output capability, 300% peak load for 20 seconds
- Low quiescent current
- Battery type selector for 8 types of batteries and de-sulphation for completely drained batteries
- 10ms transfer time from AC to battery for continuous load operation
- 15 sec DC to AC transfer delay, improved protection for generator driven loads
- Thermally controlled variable speed fan for more efficient cooling
- Extensive protections against various harsh situations
- New functionality (Battery priority mode and Low battery recover)

2.4 Electrical Performance

2.4.1 Invert

Topology

The LP series pure sine wave inverter/charger is built according to the following topology.
Invert: Full Bridge Topology.
Charge: Isolated Boost Topology
When operating in invert mode, the direct current (DC) that enters the inverter from the batteries is filtered by a large input capacitor and switched "On" and "Off" by the Metal Oxide Silicon Field Effect Transistors (MOSFET) at a rate of 50 Hz or 60Hz, and directed into the transformer which steps the voltage up to 120 volts. The unit has a 16bit, 4.9MHZ microprocessor to control the output voltage and frequency as the DC input voltage and/or output load varies.
Because of high efficiency MOSFETs and the heavy transformers, it outputs PURE SINE WAVE AC.
The peak invert efficiency of LP series is 90%.

Overload Capacity

The LP series inverter/charger has different overload capacities, making it ideal to handle demanding loads.
1 For 110%<Load<125% (±10%), no audible alarm in 14 minutes, beeps 0.5s every 1s in the 15th minute, and Fault (Turn off) after the 15th minute.
2 For 125%< Load<150% (±10%), beeps 0.5s every 1s and Fault (Turn off) after the 1 minute.
3 For 300%≧Load>150% (±10%), beeps 0.5s every 1s and Fault (Turn off) after 20s.

Caution:

After the inverter is switched on, it takes 3-5 seconds for it to self diagnose and get ready to deliver full power. Hence, always switch on the load(s) after a few seconds of switching on the inverter. Avoid switching on the inverter with the load already switched on. This may prematurely trigger the overload protection. When a load is switched on, it may require initial higher power surge to start. Hence, if multiple loads are being powered, they should be switched on one by one so that the inverter is not overloaded by the higher starting surge if all the loads are switched on at once.

2.4.2 AC Charger

The LP Series pure sine wave inverter/charger 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, LP series pure sine wave inverter/charger is able to output max charge current as long as input AC voltage is in the range of 95-127VAC, and AC freq is in the range of 48-54Hz(58-64Hz for 60Hz model).
The LP series pure sine wave inverter/charger has a very rapid charge current available, and the max charge current can be adjusted from 0%-100% via a liner switch on the DC side of the inverter. This will be helpful if this powerful charger apply charging on a small capacity battery bank.
Choosing "0" in the battery type selector will disable charging function.
There are three main charging 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 charger start until the battery charger reaches 0.3V below the boost voltage, then take this time as T0 and T0×10 = T1.

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.

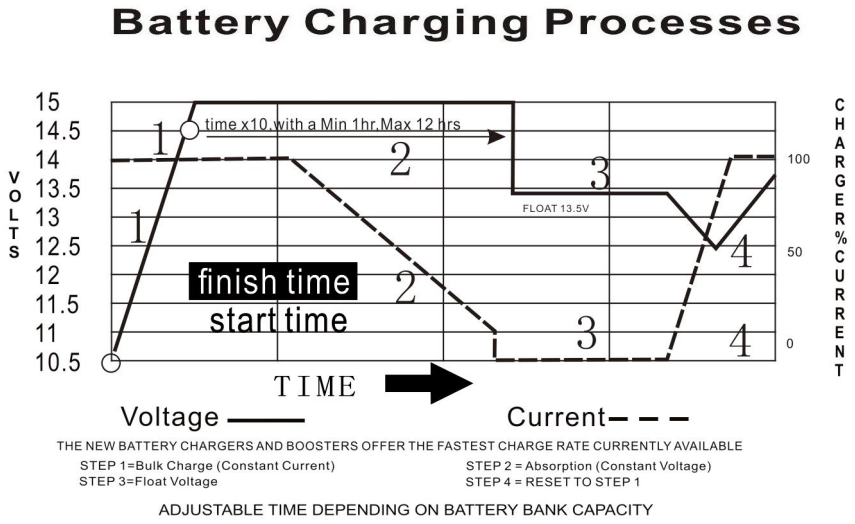
In this period, the inverter will start a T1 timer; the charger will keep the boost voltage in Boost CV mode until the T1 timer has run out. Then drop the voltage down to the float voltage. The timer has a minimum time of 1 hour and a maximum time of 12 hours.

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.

Battery type selector			
Switch setting	Description	Boost / Vdc	Float / 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)	
9	Not used		

If the A/C is reconnected or the battery voltage drops below 12Vdc, 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.



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 occurs with infrequent use of the batteries, nor 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 especially designed to try to break down the sulphated crust that is preventing the plates from taking a charge and thus allow the plates to clean up and accept a charge once again.

Warning!

The de-sulphation charging should not be carried out on batteries with good conditions.

Charging depleted batteries

The LP series pure sine wave inverter/charger allows start up and through power with depleted batteries. For 12.8VDC models, after the battery voltage goes below 11V, if the switch is still(and always) kept in "ON" position, the inverter is always connected with battery whose voltage doesn't drop below 2V, the inverter will be able to charge the battery once qualified AC inputs.

Before the battery voltage going below 9VDC, the charging can activated when the switch is turned to "Off", then to "ON".

When the voltage goes below 9VDC, and the power switch is turned to "OFF" or disconnect the inverter from battery, the inverter will not be able to charge the battery once again, because the CPU lose memory during this process.

Charging current for each model

Model Wattage	Battery Voltage	Charging Current
600W	12 .8Vdc	25± 5 Amps
1000W	12.8 Vdc	45± 5 Amps
1500W	12 .8Vdc	60± 5 Amps

The charging capacity will go to peak in around 3 seconds; this may probably 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.

Caution:	**Please use a small jeweler's style flat-head screwdriver to turn the charge current control switch gently to avoid breakage due to over-turning.** **To guarantee the best performance of AC charger when the AC input is from a generator, the standby generator should be of at least 150% higher capacity than the inverter.** **Warning! Operation with an under-rated generator or generator with unqualified wave form may cause premature failure which is not under warranty.**

2.4.3 Transfer

While in the Standby Mode, the AC input is continually monitored. Whenever AC power falls below the VAC Trip voltage (80VAC, default setting), the inverter automatically transfers back to the Invert Mode with minimum interruption to your appliances - as long as the inverter is turned on. The transfer from Standby mode to Inverter mode occurs in approximately 10 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 hold them 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 switch when input utility is unstable.

2.4.4 Remote Operation

There are three different working statuses for LP inverter: "Power On", "Power Off" and "Ready".

1. When power switch is in "Off" position, the inverter is powered off.
2. When power switch is turned to "ON" position, the inverter is powered on.
3. When power switch is turned to "READY" position, the inverter is ready to be started by the 12.8Vdc remote control or qualified shore power. Once the 12.8Vdc remote control terminal is connected to a positive 12.8Vdc source, the inverter will be powered on. Once qualified shore power inputs, the inverter will charge and bypass power to the loads.

The 12.8Vdc remote control will operate in parallel with the power switch, the two will be connected and whichever first switches from "Off" to "Power on", will power the inverter on.

If the commands from the two conflicts, the inverter will accept commands according to the following priority:

Power on (power switch or 12.8V remote control) > Power off (power switch)

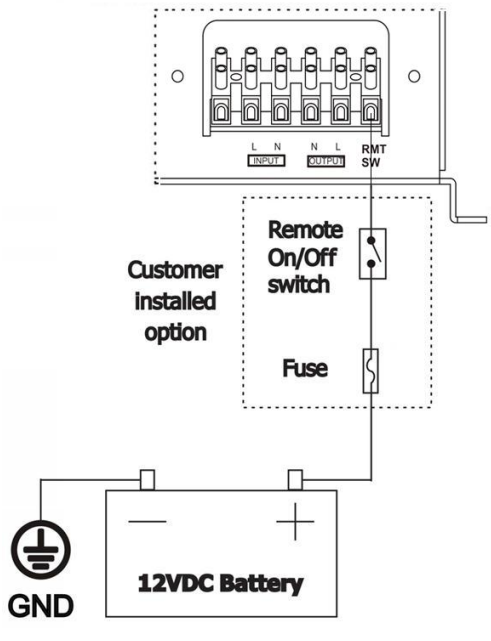
12.8Vdc Remote Control Wiring Diagram

WARNING

The rated current of remote control terminal is 0.5Amp, the max current is 10A. Over current will damage the inverter, thus it must be protected with an appropriate DC fuse, the suggested value is 3 or 5 Amps.

WARNING

Connecting this wire to chassis ground will cause damage not covered under warranty!



The remote switch should be single pole, single throw with at least a 1 Amp rating. The wire used should be a minimum of 18 gauge in size.

The inverter can also be connected to an external LCD display through the REMOTE LCD PORT.

The whole LP Series inverter is designed with extraordinarily low idle power consumption which is approximately 1.5% of its rated power.

LP Series Inverter/Charger Idle Power Consumption (in Watts)

Model	Power Saver Off	Power Saver Auto	
	Idle(Max)	3Secs(Max)	Unit Off Charging
600W	18W	7.5W	3W
1KW	22W	9W	
1.5KW	24W		5W

For more detailed technical information, please contact us.

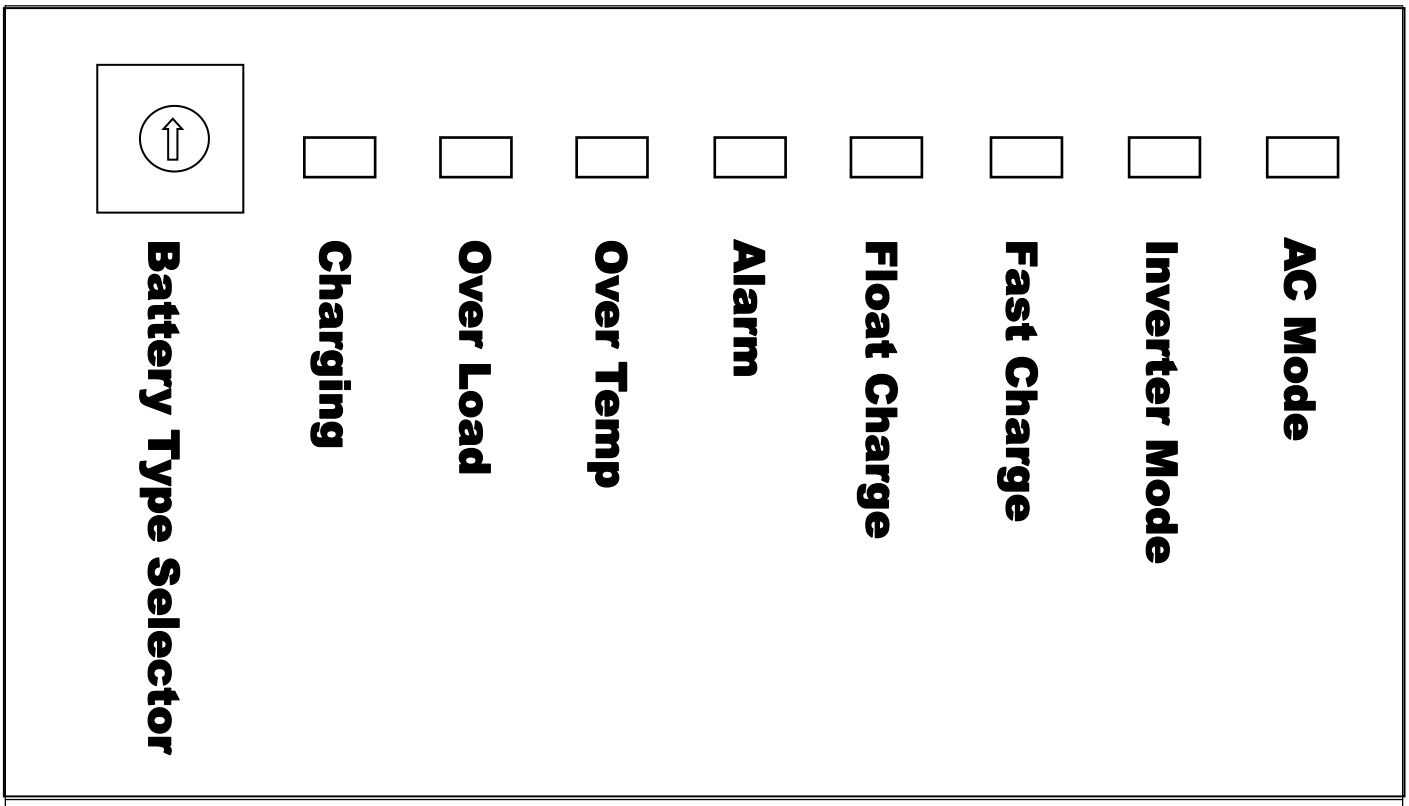
2.4.5 Protections

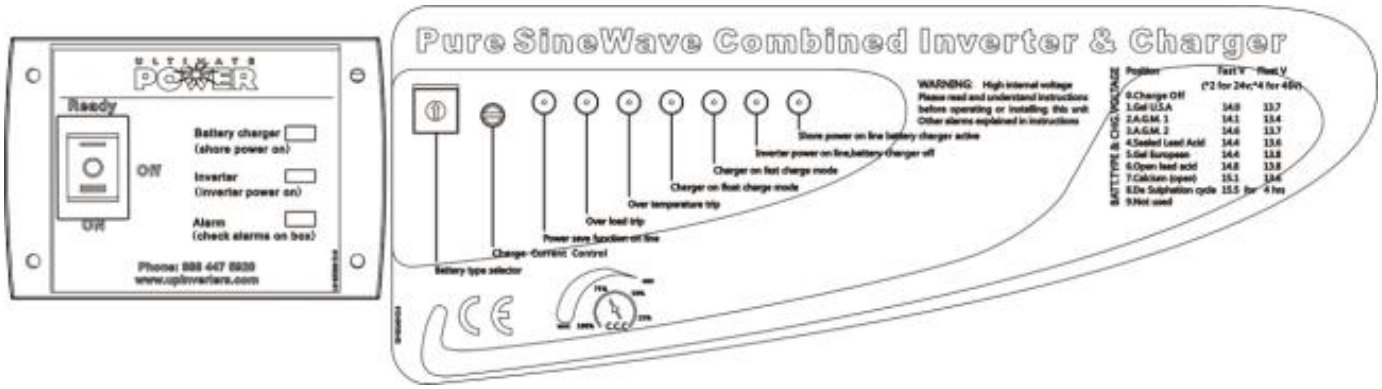
The LP series inverter/charger is equipped with extensive protections against various harsh situations/faults. These protections include:

- 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 on the AC output

When Over temperature /Over load occur, after the fault is cleared, the master switch has to be reset to restart the inverter.
The Low battery voltage trip point can be customized from defaulted value of 11VDC to 11.9VDC through the SW1 on the DIP switch.
The inverter will go to Over-temp protection when the heat sink temps. ≥105ºC (221℉), and will go to Fault (shutdown Output) after 30 seconds. After temp drops to 90ºC (194℉), the switch has to be reset to activate the inverter.
The LP series 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.

2.4.6 LED Indicator





AC MODE	GREEN LED on “AC Input Mode”
INVERTER ON	GREEN LED on “Invert Mode”
FAST CHARGE	Yellow LED on “Fast CHG”
FLOAT CHARGE	GREEN LED on “Float CHG”
OVER TEMP TRIP	RED LED on “Over Temp”
OVER LOAD TRIP	RED LED on “Over Load”
CHARGING	GREEN LED on “Ready Position”

Please refer to ‘Indicator and Buzzer’ for the detailed information.

2.4.7 Audible Alarm

The inverter also gives audible alarms when the following situations occur.

Battery Voltage Low	Inverter green LED Lighting, and the buzzer beep 0.5s every 5s.
Battery Voltage High	Inverter green LED Lighting, and the buzzer beep 0.5s every 1s, and Fault after 60s.
Invert Mode Over-Load	(1)110%<load<125%(±10%), No audible alarm in 14 minutes, Beeps 0.5s every 1s in 15th minute and Fault after 15 minutes; (2)125% <load<150%(±10%), Beeps 0.5s every 1s and Fault after 60s; (3)Load>150%(±10%), Beeps 0.5s every 1s and Fault after 20s;
Over Temperature	Heat sink temp. ≥105ºC(221℉), Over temp red LED Lighting, beeps 0.5s every 1s;

2.4.8 FAN Operation

For 600W-1KW models, there is one multiple controlled DC fan.
The DC fans are designed to operate according to the following logic:

Condition	Enter Condition	Leave condition	Speed
HEAT SINK TEMPERATURE	T ≤ 60℃(140℉)	T > 65℃(149℉)	OFF
	65℃(149℉)≤ T < 85 ℃(185℉)	T ≤ 60℃(140℉) or T ≥ 85℃(185℉)	50%
	T > 85℃(185℉)	T ≤ 80℃(176℉)	100%
CHARGER CURRENT	I ≤ 15%	I ≥ 20%	OFF
	20%< I ≤ 50%Max	I≤ 15% or I > 50%Max	50%
	I > 50%Max	I ≤ 40%Max	100%
LOAD Percentage (INV MODE)	Load < 30%	Load ≥ 30%	OFF
	30% ≤ Load < 50%	Load ≤ 20% or Load ≥ 50%	50%
	Load ≥ 50%	Load ≤ 40%	100%

Allow at least 1 inch of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit.
Fan noise level <60db at a distance of 1m

2.4.9 DIP Switches

On the DC end of inverter, there are 5 DIP switches which enable users to customize the performance of the device to suit the specific configuration.

Switch NO	Switch Function	Position: 0	Position: 1	Standard Settings
SW1	Low Battery Trip Volt	11.0VDC	11.9VDC	1
SW2	AC Input Range	100-135VAC	90-135VAC(40Hz+)	0
SW3	Power Saver & READY	READY	Power Saver	0
SW4	Output Frequency	50Hz	60Hz	1
SW5	Battery/AC Priority	Utility Priority	Battery Priority	0

Low Battery Trip Volt:
Deep discharge of the lead acid battery leads to high losses in capacity and early aging. In different

applications, different low voltage disconnection level is preferred. For example, for solar application, user intended to have less DOD (Depth of Discharge) to prolong the battery cycle life (mobile application, users intend to have more DOD to reduce battery capacity and on board weight).
For 12.8VDC model, the Low Battery Trip Volt is set at 11.0VDC by default. It can be customized to 11.9VDC using SW1 (this is to prevent batteries from over-discharging while there is only a small load applied on the inverter).

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 100-135V 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 90-135V , 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 higher voltage(90-135Vac for 120Vac model) and wider frequency (40Hz plus for 50Hz/60Hz). Accordingly, the AC charger will also work in a higher voltage (95-127Vac for 120Vac model) wider freq range (43Hz plus 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.

Power Saver & READY
Under the Battery Priority Mode (SW5 in position "1"), the inverter can be switched between two modes: Power Saver Mode (SW3 in position "1") and READY (SW3 in position "0"). The power Switch should be in "READY" position all the time for using these functions.
In Power Saver Mode, 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 invert electricity from the battery bank to supply the load. As this function is under Battery Priority, the inverter will always prefer to invert electricity from battery first even there is a qualified AC input present. Only when the battery voltage is lower than the low voltage alarm point, will the inverter switch to AC input power to charge the battery and supply the load at the same time.
This Power Saver Mode can be changed to READY mode via SW3 by switching it to "0" position. (SW5 still in "1")
In READY mode, the inverter will stay in standby mode without sensing loads. It won't output any power even if a load is turned on or a qualified AC input is present. The inverter will not perform any function and only stay idle in this mode, unless the battery voltage is low. Then it will start charging the battery. This feature is ideally suitable for applications where energy conservation is required to avoid discharging batteries.

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

AC/Battery Priority:

Our inverter is designed 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 days will the inverter start a battery inverting cycle to protect the battery. After 1 normal charging cycle ac through put will be restored. For more info, please refer to our manual at AC Charging Section.

The AC Priority and Battery Priority switch is SW5. When set in battery priority, the inverter will invert from battery despite the AC input. Only when the battery voltage reaches the low voltage alarm point(11.5Vdc for 12Vdc) will the inverter transfer to AC Input, charge battery, and switch back to battery when the battery is fully charged. This function is mainly for wind/solar systems using utility power as back up.

The AC/Battery Priority function can be activated by sliding the switch even when the inverter is in operation.

Note: In battery priority mode, when qualified AC inputs for the first time and the battery voltage is below 12.5Vdc, the inverter will go into battery priority mode only after a cycle of bulk charging and absorb charging is finished. The inverter will not go into float charging mode.

2.4.10 Auto Generator Start

The inverter can 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 which have automatic starting capability. The generator must have start and stop controls [i.e., an electric starter and electric choke (for gasoline units)], and the safety sensors to be able to start and stop automatically. There is an open/close relay, that will short circuit the positive and negative cables from a generator start control. The input DC voltage can vary, but the max current the relay can carry is 16Amp. The Auto Generator Start terminal pins are not polarized.

2.4.11 Battery Temperature Sensing

Applying the proper charge voltage is critical for achieving optimum battery performance and longevity. The ideal charge voltage required by batteries changes with battery temperature.

When the battery voltage is over 40℃ (104℉), it will reduce the charging voltage by 0.1Vdc with every degree of temperature rise.

We recommend that you install Battery Temperature Sensors on all banks to protect your batteries and to provide optimal charging of each bank.

The battery temperature sensor mounts on the side of a battery or any other location where the precise temperature of battery can be detected such as battery mounting racks.

The following table describes approximately how much the voltage may vary depending on the temperature of the batteries.

Inverter Condition	Temperature on BTS	Charger Operation
Charger Mode	BTS ≥ 50℃(122℉)	Automatically turns off charger
	BTS ≤ 40℃(104℉)	Automatically turns on charger
Inverter Mode	40℃(104℉) ≤ BTS ≤ 50℃(122℉)	Increases the low voltage shut down point by 0.5Vdc
	BTS ≥ 50℃(122℉)	Over Temp Fault

2.4.12 Other Features

Battery voltage recovery start

After low battery voltage shut off (11V for 12V model), the inverter is able to restore to work after the battery voltage recovers to 13V (with power switch still in "On" position). This function helps to save the users extra labor to reactivate the inverter when the low battery voltage returns to acceptable range in renewable energy systems.

WARNING

Never leave the loads unattended, some loads (like a Heater) may cause accidents in such cases.
It is better to shut everything off after low voltage trip than to leave your load in the risk of fire.

3 Installation

3.1 Location

Follow all the local regulations to install the inverter.
Please install the equipment in a location of Dry, Clean, Cool with good ventilation.
Working temperature: ﹣10℃ to 50℃ (-14℉to 122℉)
Storage temperature: ﹣40℃ to 70℃ (-40℉to 158℉)
Relative Humidity: 0% to 95%，non-condensing
Cooling: Forced air
Warning! Operation in a condensing environment will void the warranty.

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 DC cable with length from 1 meter to 5 meters.

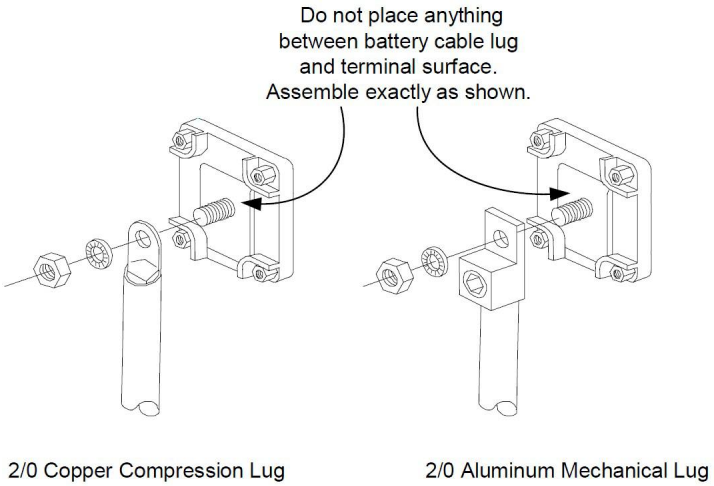
Model Watt	Battery Voltage	Minimum Wire Gage		Model Watt	Battery Voltage	Minimum Wire Gage	
		0~15ft	15~20ft			0~15ft	15~20ft
600W	12.8 Vdc	8ga	6ga	1000W	12.8 Vdc	4ga	2ga
Model Watt	Battery Voltage	Minimum Wire Gage					
		0~15ft	15~20ft				
1500W	12.8 Vdc	3	1				

Please follow the above minimum wire size requirement.
One cable is always best, but if there is a problem obtaining for example 100mm²cable, use 2*50mm²or

3*35mm² instead, 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).

Battery cables must have crimped (or preferably, soldered and crimped) copper compression lugs unless aluminum mechanical lugs are used. Soldered connections alone are not acceptable.

Battery terminal must be clean to reduce the resistance between the DC terminal and cable connection. A buildup of dirt or oxidation may eventually lead to the cable terminal overheating during periods of high current draw. Use a stiff wire brush and remove all dirt and corrosion from the battery terminals and cables.



Reducing RF interference

To reduce the effect of radiated interference, twist the DC cables. To further reduce RF interference, shield the cables with sheathing /copper foil / braiding.

Taping battery cables together to reduce inductance

Do not keep the battery cables far apart. In case it is not convenient to twist the cables, keep them taped together to reduce their inductance. Reduced inductance of the battery cables helps to reduce induced es. This reduces ripple in the battery cables and improves rmance and efficiency.

WARNING	The torque rating range for DC terminal is 12.5NM-20.5NM (9.25-15.19 ft. lbs.), and the suggested torque rating is 17NM (12.6 ft. lbs.). Over torquing may cause the bolt to break.
	Equipment Damage The inverter is not reverse polarity protected. Reversing the battery polarity on the DC input connections will cause permanent damage to the inverter which is not covered under warranty, thus it must be protected with an appropriate DC fuse. Always check polarity before making connections to the inverter.
	The inverter contains capacitors that may produce a spark when first connected to battery. Do not mount in a confined a battery or gas compartment.
	Ensure the inverter is off before disconnecting the battery cables, and that AC power is disconnected from the inverter input.

3.3 AC Wiring Recommendations

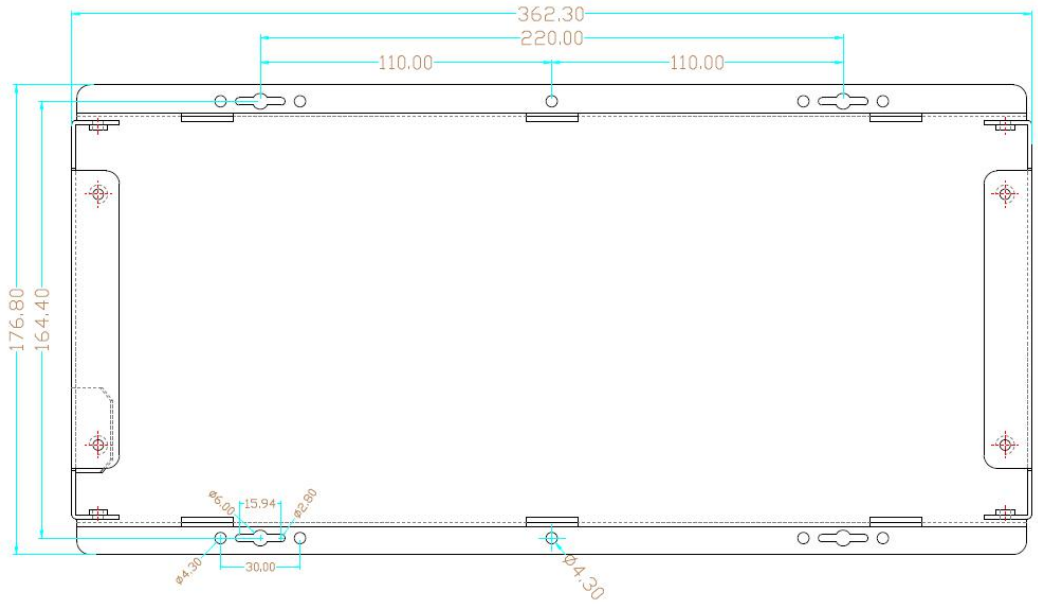
We recommend using 12 to 14 AWG wire to connect to the ac terminal block.
When in AC mode the AC input power will supply both the loads and AC charger, a thicker wire gauge for AC Input is required. Please consult a qualified electrician about the specific wire gauge required in terms of wire material and inverter power.
Please do the wiring according to local regulations, call our tech support if you are not sure about how to wire any part of your inverter.

3.4 Grounding

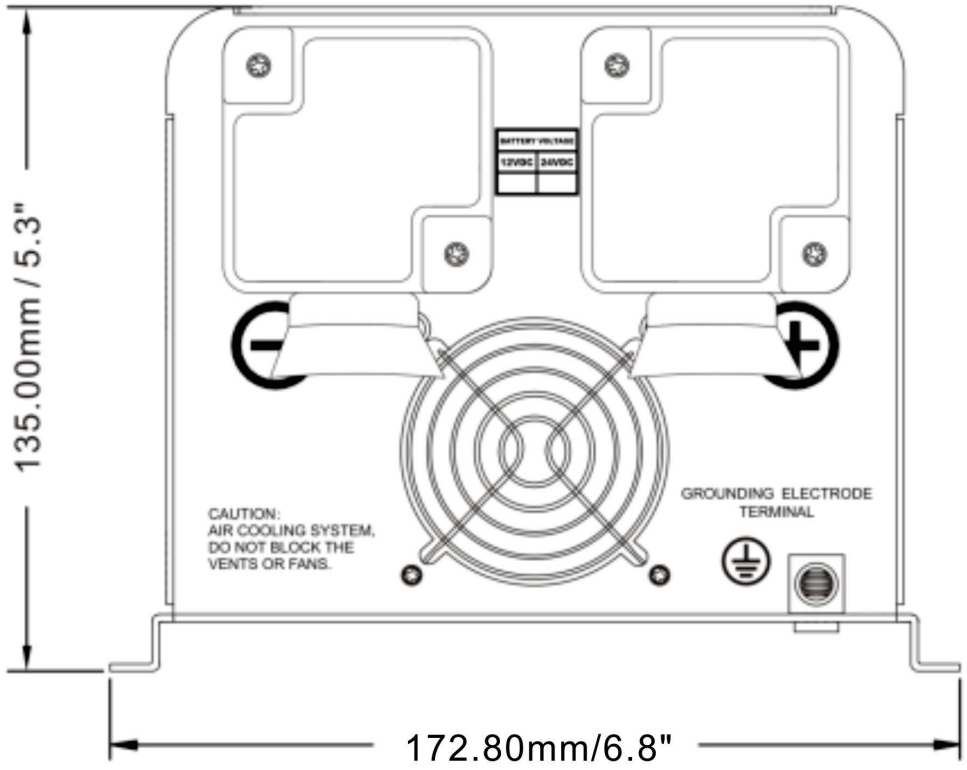
Connect an AWG 8 gauge or greater copper wire between the grounding terminal on the inverter and the earth grounding system or the vehicle chassis.

3.5 Mounting Flange

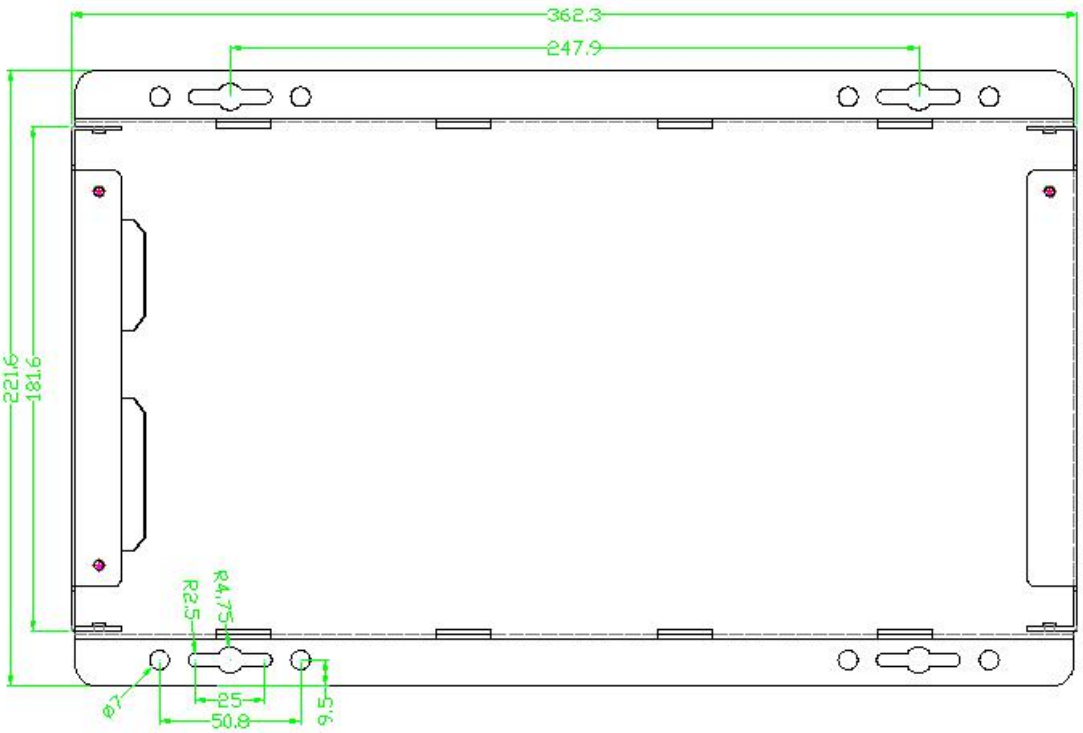
1000W Model



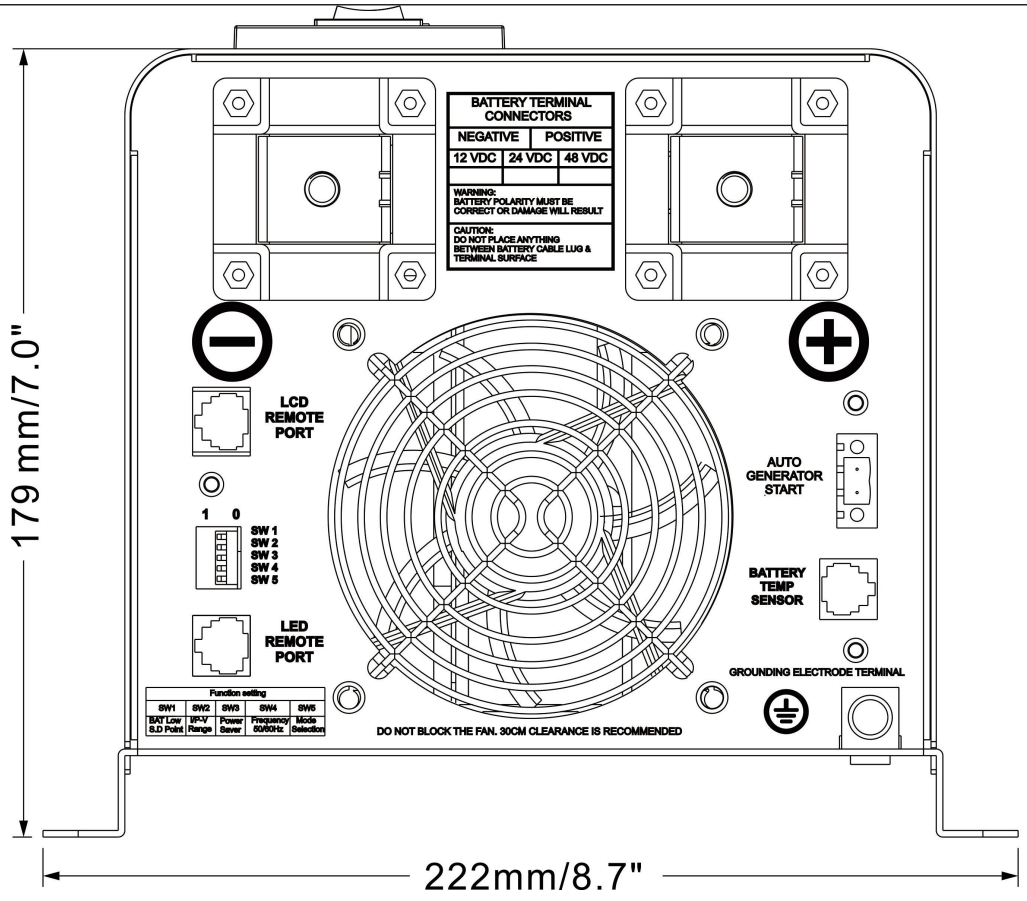
End View



1500W Model



End View



4 Maintenance & Troubleshooting

This troubleshooting guide contains information about how to troubleshoot possible error conditions while using the LP Pure Sine Wave Inverter/Charger.

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

Indicator and Buzzer

		Indicator on top cover							LED on Remote Switch			
Status	**Item**	AC Line Mode ON	INVERTER ON	FAST CHG	FLOAT CHG	OVER TEMP TRIP	OVER LOAD TRIP	READY ON	BATT CHG	INVERTER	Alarm	Buzzer
Line Mode	CC	√		√					√			
	CV	√		√, blink					√			
	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 Mode Overload						√					Beep continuous
	Output Short						√				√	Beep continuous
	Over-Temp					√						Beep continuous
	Over Charge			√					√			Beep continuous
	Back Feed Short											Beep continuous

Symptom	Possible Cause(s)	Recommended Solution(s)
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.
Inverter overload indicator on	Excessive AC output load or AC output short Defective inverter	Check AC output loads and wiring
Inverter high temperature indicator on	Excessive ambient temperature or AC output load	Check AC output loads, increase ventilation, derate the inverter if ambient temperature is excessive.
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

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

The most common load of such kind is hair drier.
If the noise is coming from the 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.
This noise may also be generated the moment a load is detected in the power saver mode.
Reducing the load power or using an inverter with bigger capacity will normally solve this problem.
The noise won't do any harm to the inverter or the loads.

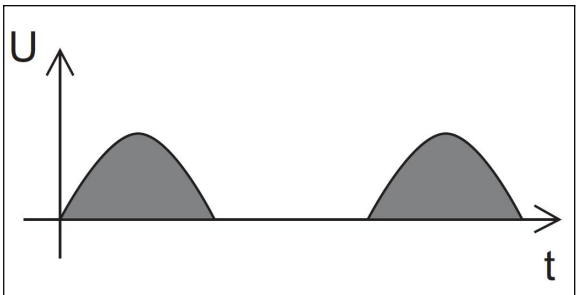


Figure 1
Half Cycle Load Waveform

Limited Warranty Plan

Ultimate Power extends the following warranty to the original purchaser of those goods subject to the qualification indicated:

1) Ultimate Power warrants to the original purchaser for use that the goods or any component thereof manufactured by Ultimate Power will be free from defects in workmanship from date of purchase, provided that such goods are installed, maintained and used in accordance with manufacturer's written instructions. See product specification sheet(s) for warranty period.

2) Components not manufactured by Ultimate Power, but used within the assembly provided by Ultimate Power, are subject to the warranty period as specified by the individual manufacture of said component, provided such goods are installed, maintained and used in accordance with Ultimate Power and the manufacturer's written instructions.

3) Ultimate Powers sole liability and the purchaser's sole remedy for the failure of goods under this limited warranty and for any and all claims arising out of the purchase and use of the goods shall be limited to the repair or replacement of goods that do not conform to the warranty.

Ultimate Powers advance replacement policy: If an Ultimate Power employee and/or an authorized distributor's service technician deems that a problem exist with an Ultimate Power manufactured product, then Ultimate Power will ship a replacement part to match that of the defective product. Ultimate Power will pay the ground service shipping cost to the customer and provide a return shipping label for its return. Customer must put the defective product in the box the replacement product came in and ship back to Ultimate Power.

The customer will be charged for the replacement product at the original purchase price if:

- Ultimate Power does not receive the defective product within 30 days
- The product is damaged from improper packaging for return shipping
- The product is found not to have any problems

Appendix 1 : LP Series Inverter/Charger Spec Sheet

Electrical Specifications				
	Model	UP12/600LP-C UP12/600LP-CG	UP12/1000LP-C UP12/1000LP-CG	UP12/1500LP-CG
	Power Rating	600W	1000W	1500W
Inverter Output	Continuous Output Power	600W	1000W	1500W
	Surge Rating(20s)	1800W	3000W	4500W
	Output Waveform	Pure Sine wave/Same as input(Bypass mode)		
	Nominal Efficiency	90%(Peak)		85%(Peak)
	Line Mode Efficiency	>95%		
	Power Factor	0.9-1.0		
	Nominal Output Voltage RMS	120Vac		
	Output Voltage Regulation	±5% RMS		±10% RMS
	Output Frequency	50/60Hz ± 0.3Hz		
	Short Circuit Protection	Yes, Current Limit Function (Fault after 1sec)		
	Typical transfer Time	10ms(Max)		
	THD	Pure sine wave, less than 5% THD Typical		
DC Input	Nominal Input Voltage	12.8Vdc		12.0Vdc
	Minimum Start Voltage	11.0Vdc		11.5/11.9Vdc
	Low Battery Alarm	11.5Vdc / 12.4Vdc (Dependent on switch setting)		12.0/12.4Vdc
	Low Battery Trip	11.0Vdc / 11.9Vdc (Dependent on switch setting)		11.5/11.9Vdc
	High Voltage Alarm & Fault	16.0Vdc		
	High DC Input Recovery	15.5Vdc		
	Low Battery Voltage Recover	13.0Vdc		12.5Vdc
	Idle Consumption-Search Mode	< 25 W when Power Saver On		
AC Charge	Input Voltage Range	Narrow: 100~135VAC;		
		Wide: 90~135VAC ;		
	Input Frequency Range	Narrow: 47-55±0.3Hz for 50Hz, 57-65±0.3Hz for 60Hz		
		Wide:43±0.3Hz plus for 50Hz/60Hz		
	Output Voltage	Depends on battery type		
	Charger Breaker Rating(120Vac)	10A	10A	15A
	Max Charge Rate	25A +/-5A	45A +/-5A	60A +/-5A
	Over Charge Protection Shutdown	15.7V for 12Vdc		
	Battery type	Fast Vdc		Float Vdc
	Gel U.S.A	14		13.7
	A.G.M 1	14.1		13.4
	A.G.M 2	14.6		13.7
	Sealed Lead Acid	14.4		13.6
	Gel Euro	14.4		13.8

	Open Lead Acid	14.8	13.3	
	Calcium	15.1	13.6	
	De-sulphation	15.5 for 4hrs		
	Remote Control	Yes. Optional		
Bypass & Protection	Input Voltage Waveform	Sine wave (Grid or Generator)		
	Nominal Voltage	120Vac		
	Low Voltage Trip	80V/90V±4%		
	Low Voltage re engage	90V/100V±4%		
	High Voltage Trip	140V±4%		
	High Voltage re engage	135V±4%		
	Max Input AC Voltage	150VAC		
	Nominal Input Frequency	50Hz or 60Hz (Auto detect)		
	Low Frequency Trip	Narrow: 47±0.3Hz for 50Hz, 57±0.3Hz for 60Hz		
		Wide:40±0.3Hz for 50Hz/60Hz		
	Low Frequency re-engage	Narrow: 48±0.3Hz for 50Hz, 58±0.3Hz for 60Hz		
		Wide:45±0.3Hz for 50Hz/60Hz		
	High Frequency Trip	Narrow: 55±0.3Hz for 50Hz, 65±0.3Hz for 60Hz		
		Wide: No up limit for 50Hz/60Hz		
	High Frequency re-engage	Narrow: 54±0.3Hz for 50Hz, 64±0.3Hz for 60Hz		
		Wide: No up limit for 50Hz/60Hz		
Mechanical Specification	Mounting	Wall mount		
	Inverter Dimensions(L*W*H)	362x173x135mm/ 14.3x6.8x5.3"		362x222x179mm/ 14.3x8.7x7.0"
	Inverter Weight	7.5KG/16.5lb	11KG/24.3lb	18KG/39.7lb
	Shipping Dimensions(L*W*H)	475x230x205mm/ 18.7x9x8"		520x320x310mm/ 20.5x12.6x12.2"
	Shipping Weight	8.5KG/18.7lb	12KG/26.5lb	20.5KG/45.2lb
	Display	Status LED		
	Standard Warranty	3 Year		



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