



## User's Manual



**SONIC**  **COMPRESSION**

Includes information on **SOLAR** Model Nos. PI5000X, PI10000X, PI15000X and PI20000X

### **WARNING**



Failure to follow instructions may cause damage or explosion, always shield eyes.  
**Read entire instruction manual before use.**

**Warning:** This product contains chemicals, including lead, known to the State of California to cause cancer, birth defects and other reproductive harm.  
**Wash hands after handling.**

Congratulations! You have just purchased the finest quality power inverter on the market. We have taken numerous measures in our quality control and in our manufacturing processes to ensure that your product arrives in top condition and that it will perform to your satisfaction.









Inverters are designed to convert 12 Volt DC power into household AC power. **SOLAR** power inverters, with *Sonic Compression* technology, are designed to provide stable, clean and reliable power with high surge capacity for use in powering a wide variety of powered tools, appliances and electronics. Our technologically advanced, microprocessor controlled power inverters run cooler and more efficiently than competing products. This results in longer operating time and extended battery life when using **SOLAR** power inverters.

In the rare event that your **SOLAR** power inverter contains a damaged item, is missing any specific item or requires warranty service, please call Technical Service at (913) 310-1050. *Save your purchase receipt, it is required for warranty service.*

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# IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS!

 <b>WARNING</b>	
	Read these instructions completely before using the <b>SOLAR</b> Power Inverter and save them for future reference. Before using the <b>SOLAR</b> Power Inverter for powering an appliance, read these instructions and the instruction manual/safety information provided by the car, truck, boat or equipment manufacturer. Following all manufacturers' instructions and safety procedures will reduce the risk of accident.
	Working around lead-acid batteries may be dangerous. Lead-acid batteries release explosive gases during normal operation, charging and jump starting. Carefully read and follow these instructions for safe use. Always follow the specific instructions in this manual and on the <b>SOLAR</b> Power Inverter each time you use the <b>SOLAR</b> Power Inverter. All lead-acid batteries (car, truck and boat) produce hydrogen gas which may violently explode in the presence of fire or sparks. <b>Do not smoke, use matches or a cigarette lighter while near batteries.</b> Do not handle the battery while wearing vinyl clothing because static electricity sparks are generated when vinyl clothing is rubbed. Review all cautionary material on the <b>SOLAR</b> Power Inverter and on all batteries used to power the inverter.
	Do not set an AC power cord plug in water or on wet surfaces. Do not attempt to plug in this unit or operate its controls with wet hands or while standing in water. This unit is intended for indoor use only. Never attempt to plug in or operate equipment with defective or damaged wires, power cord or power cord plug. Have any defective or damaged parts replaced immediately by qualified personnel. Use only properly rated extension cords. Use of an improper extension cord could result in a risk of fire and electric shock.
	Always wear eye protection, appropriate protective clothing and other safety equipment when working near lead-acid batteries. Do not touch eyes while working on or around lead-acid batteries.
	Always keep power source input cables away from each other or common conductors. Improper use or routing of input cables may cause the cables to come in contact with each other, or a common conductor, which could cause a spark, creating an explosion or fire in the presence of battery gases.
	Use extreme care while working within an engine compartment, because moving parts may cause severe injury. Read and follow all safety instructions published in the vehicle's Owner's Manual.
	Power source batteries used to power the inverter likely contain liquid acids which are hazardous if spilled.

**WARNING:** This product contains chemicals, including lead, known to the State of California to cause cancer, birth defects and other reproductive harm. **Wash hands after handling.**

## Personal Precautions

Someone should always be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.

Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes. Protective eyewear should always be worn when working near lead-acid batteries.

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 10 minutes and get medical attention immediately.

Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short circuit the battery or other electrical part that may cause explosion.

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

## Important Safety Instructions

Your power inverter is designed to operate from a 12 Volt DC power source only. **NEVER** attempt to connect your **SOLAR** power inverter to any other power source, including any AC power source.

Do not operate the **SOLAR** power inverter in the vicinity of flammables, such as gasoline, etc. This equipment can produce arcs or sparks. To prevent fire or explosion, do not install or operate the power inverter in compartments containing flammables or batteries, or in any location that requires ignition-protected equipment.

Do not operate the power inverter if you, the inverter, the device being powered or any other surfaces that may come into contact with the 12 Volt power source are wet. Do not expose your power inverter to rain, snow, spray or bilge water.

Keep your **SOLAR** power inverter well ventilated when in operation. When in use, maintain several inches of clearance around the top and sides of the power inverter. Avoid placing the power inverter near sources of heat, such as heat vents and radiators, or in direct sunlight.

Loose connections can result in a severe decrease in voltage, may cause damage to the wires and insulation in the power inverter. Always check that all connections are correct and secure prior to powering the inverter or any device connected to it. Always ensure that all wiring is in good condition and of the proper size – operating the power inverter with damaged or substandard wire could create a risk of fire or electric shock.

Do not operate your power inverter if it has received a sharp blow, been dropped, or similarly damaged until after being inspected and/or repaired by qualified service personnel.

When connecting device/appliance power cords to the inverter, pull on the plug and **never on the wire** when disconnecting. Do not operate a device/appliance with a damaged power cord.

**NEVER** connect your **SOLAR** power inverter to a frozen battery.

While some of our smaller units are designed to plug into a 12 Volt vehicle outlet, larger models, including those covered in this manual, must be properly connected to a battery. Extreme care must be taken to follow all applicable codes when working with electricity.

To avoid battery drain, always disconnect your **SOLAR** power inverter when not in use.

## Precautions When Using the Power Inverter to Power Rechargeable Appliances

Many rechargeable appliances and equipment utilize a separate charging system for recharging that is connected to an AC outlet. Such charging systems typically produce a low voltage output for recharging the appliance or equipment. Some such charging systems used to charge small batteries can be damaged if powered by your **SOLAR** power inverter. We suggest not using your **SOLAR** power inverter to charge:

- Power tool battery pack charging systems, such as those found in battery powered drills, saws, etc.
- Small battery charging systems such as those found in razors, flashlights and night lights, which are typically plugged directly into an AC outlet, without the use of an external transformer.

## ***How Power Inverters Work***

Power inverters utilize a two-step method to convert 12 Volt direct current (DC) power into 115 Volt AC power. In the first step, the power inverter uses a DC to DC converter to increase the DC voltage from the original 12 Volts DC to 145 Volts DC. In the second step, the power inverter converts high voltage DC power into 115 Volt AC power using advanced micro-circuitry which we refer to as *Sonic Compression* technology.

It is this *Sonic Compression* technology that enables **SOLAR** power inverters to accommodate strenuous “peak power” and “continuous power” demands, while at the same time, providing the assurance of automatic overload protection.

The modified sine wave produced using our *Sonic Compression* technology has a root mean square (RMS) voltage of 115 Volts. Most AC voltmeters are calibrated to measure the RMS voltage of a pure sine wave. For this reason, most voltmeters will not measure the output voltage of your power inverter correctly, typically showing an output about 20-30 Volts below the actual output. To accurately measure the output voltage of your **SOLAR** power inverter, use only a voltmeter identified as a “True RMS” reading voltmeter.

### **Things to remember when operating your **SOLAR** power inverter:**

Loose connections can result in a severe decrease in voltage and may cause damage to the wires and insulation in the power inverter. Always check that all connections are correct and secure prior to powering the inverter and any device connected to it.

Failure to make a proper connection between the power inverter and the 12 Volt power source can result in a reverse polarity condition. A reverse polarity condition will blow the internal fuse(s) of the inverter and may cause permanent damage to the inverter. Damage caused by a reverse polarity condition is not covered in the warranty.

When making the connection between the Positive terminals of the power inverter and the 12 Volt power source, it is possible that you may create a spark. For this reason, *it is critical* that both the power inverter and the 12 Volt power source not be positioned in the vicinity of flammable fumes or gases.

When attempting to power any device using your inverter, monitor the temperature of the device for approximately 10 minutes. If the device being powered becomes abnormally warm, disconnect it from the power inverter immediately.

When using an automobile or marine battery to power the inverter, start the vehicle's engine every 30 to 60 minutes and let it run for approximately 10 minutes to recharge the vehicle's battery. We recommend that the device being powered by the inverter, as well as the inverter itself, be turned OFF before starting the vehicle's engine.

When your power inverter is not in use and turned OFF, it draws a very low amperage from the 12 Volt power source when connected. As a result, we recommend that you disconnect the power inverter from the 12 Volt power source when not in use.

Use of an extension cord between the **SOLAR** power inverter and the device being powered will not significantly decrease the power generated by the power inverter. For best results, do not use an extension cord longer than 50 ft.

### **SOLAR Power Inverter Safety Features**

Your **SOLAR** power inverter is equipped with automatic shut off protection which will be activated if any of several unsafe operating conditions exist. In the event that any of the following conditions occur, the Fault Indicator light will turn on and the power inverter will shut down:

1. The power input from the 12 Volt power source drops to 10.0 Volts. (When the power from the 12 Volt power source drops to 10.5 Volts, an extended audible alarm will sound, warning you that your power source is low.)
2. The power input from the 12 Volt power source exceeds 15.0 Volts.
3. The “continuous power” demand from powered devices exceed the power rating of your inverter.
4. The “peak power” demand from the powered device exceeds the peak power rating of your power inverter.
5. The circuit temperature within the power inverter exceeds 149°F (65°C).

In the event the automatic shut down protection occurs or the inverter sounds a continuous audible alarm, turn OFF the power inverter immediately. Do not restart the power inverter until the source of the problem has been identified and corrected.

## Installation

### Things to Remember When Planning Your Installation

Please read this section on power inverter installation in its entirety before beginning the installation process. There are many things to consider that will have a bearing on both the safety and performance of your power inverter and power delivery system.

While your power inverter is specified and advertised to deliver a range of continuous power to an upper limit threshold, all aspects of your power system must support the inverter reaching full power. The decisions you make about your power delivery system components and design will directly impact your ability to get the most out of your power inverter, both in the short and long term.

It is important that you consider your specific application and design your power inverter system to meet the needs of your application. It is also important that you ensure that you are in compliance with all local, state and national codes governing your installation (*See Installation Code Compliance*).

Throughout this section, you may want to refer to the Power Inverter Installation Schematic on page 11 for an example of a typical installation.

### Installation Code Compliance

Your power inverter is a serious piece of equipment and should be used only by those competent to install and operate it. In certain applications, installation and operation will be governed by local, state or national codes. These codes will vary based on your locale and on your particular installation location and application. It is your responsibility to ensure that you are compliant with all such codes. Failure to follow these codes may result in personal injury or property damage.

### Battery Types, Sizes and Inverter Power Requirements

**Note:** *Your power inverter is designed to be connected to a 12 Volt Power Source (12 Volt battery or batteries). Do not connect your power inverter to either a 6 Volt battery or a 24 Volt battery configuration. Doing so will damage the power inverter and could cause personal injury or property damage!*

#### *Choosing the Right Battery Type*

One of the most important determinants of the success of your installation is your choice of DC power source. What types of batteries should be used? How large should they be? How many are needed? Your choice of battery type and total battery capacity can have a serious impact on your system performance and ability to successfully and repeatedly perform the desired applications.

The most common battery type is the standard, or conventional, flooded acid starting battery, which is used in most of today's passenger vehicles. While this type of battery could be successfully used in certain power inverter systems, it is not the recommended battery for this application. This is because most power inverter system applications will cause the battery(ies) used to undergo deep discharge/recharge cycles in the course of normal operation. Standard flooded acid starting batteries do not last long under such use, as they are typically designed to deliver a very fast "starting" burst of power (which does not result in a deep discharge) to start a vehicle and are then immediately recharged by the vehicle's charging system.

The preferred battery type for a power inverter system application is a cycling battery, sometimes referred to as a deep cycle battery, marine battery or RV battery. Cycling batteries are designed to be used in deep discharge/recharge cycling applications without affecting their longevity or performance.

Please note that, when you are using more than one battery to meet your power source needs to power the inverter (see Determining Battery Capacity Needs), you should take care to ensure that all of the batteries used are matching in terms of manufacturer, battery type, capacity, state of charge, etc. This ensures the system will perform in a stable manner and that recharging will distribute the charge equally among the batteries being used. In situations where multiple batteries are connected in series, parallel or series/parallel, replacement batteries should be the same size, type and manufacturer (if possible). Age and usage level should be the same as the companion batteries. Do not put a new battery in a group that is more than 3 months old or has more than 75 cycles. Either replace with all new or use a good used battery.

*Determining Your Battery Capacity Needs*

Another very important determinant of the success of your installation is the battery capacity allocated to your power inverter system. It is only by providing the necessary 12 Volt input power that you can achieve the maximum rated output of the power inverter.

There are many different ratings used to value the energy stored in a battery. Most starting batteries rate their power using "Cranking Amps" or "Cold Cranking Amps". While these ratings are a very good way to determine a battery's viability in a specific starting application, they are of little use when determining if a specific battery is suitable for a power inverter system application.

Deep Cycle batteries are usually rated in either Reserve Capacity (expressed in minutes) or Amp Hours. Both of these measures provide a rating of how long the battery can provide power, either expressed as how long a battery can provide a certain power output (Reserve Capacity Minutes) or how much power can be delivered over a certain timespan (Amp Hours).

To determine your power requirement, and therefore your battery capacity requirement, you will need to combine the power needs of all of your typical daily applications, or uses, of the power inverter system.

First, determine the wattage requirement of each tool, electronic item or appliance that you will use, which is usually listed on the item. To determine the power draw in watts of an item that is listed only in amps, multiply the amp draw times 120. Then, for each item, determine the length of time each item will be powered. Multiply the wattage requirement times the hours for each item, which yields the watt-hours required for each.

Add the watt-hours for all items to get a total watt-hour requirement. Then, multiply the total watt-hour requirement (for all items) times the number of days between charging your battery(ies). (**Note:** *This step is unnecessary if you plan to recharge your battery(ies) nightly.*) Divide your total watt-hour days by 10 to derive your amp hour requirement.

Here is an example of the calculation that you might perform:

<b>Item to be Powered</b>	<b>Draw</b>	<b>Expected Run Time</b>	<b>Watt-Hour Requirement</b>
Computer	180 Watts	4 hours	720
3/8" Drill	840 Watts	1 hour	840
Recip Saw	1440 Watts	.5 hours	720
Shop Vac	960 Watts	1 hour	960

*Total Watt-Hour Requirement: 3240*

*Battery Amp Hour Requirement (total Watt-Hours Divided by 10): 325*

**Note:** *If a battery you are considering is rated in Reserve Capacity, use the following formula to convert reserve capacity to amp hours: (Reserve Capacity/2) + 15.5 = Amp-Hour Rating*

We recommend that you create an installation with a total capacity at 1.75-2.5 times your derived amp hour requirement. This will allow you to perform unanticipated applications or delay your normal charging cycle without detriment to the system (by over-discharging the system's batteries) or your planned applications. In the above example, you should plan to provide between 700 and 1100 total Amp Hours in battery capacity, depending on the variability of your application needs or the sureness of your recharging schedule.

*Batteries Connected to a Vehicle System*

We recommend that, when using batteries that are connected to a vehicle's charging system, you use auxiliary batteries to supply power to your inverter, rather than the vehicle's starting battery. In addition, we recommend that you utilize a battery isolator in order to avoid draining your vehicle's starting battery while powering your inverter. A battery isolator allows you to recharge your auxiliary power batteries from the vehicle's charging system, while protecting the vehicle's starting battery. Battery isolators can be found at most auto parts stores. Please see Charging System Requirements for more details.

## Charging System Requirements

Just as it is important to use the right type of battery and have adequate battery capacity for your application, it is also important that you utilize a charging system appropriate for your situation. Having an inadequate charging system could result in undercharging your power supply battery(ies), which could drastically reduce their lifespan. It could also result in inadequate power capacity in the battery(ies) when you need them to perform a specific application. For these reasons, it is critical that the charging system chosen is properly matched to the power inverter and battery(ies) used. Throughout this manual, we refer to your complete installation as your power inverter system and it is important that all components in the system are matched to provide optimal performance.

### *Charging Batteries Using a Vehicle Charging System*

Your charging system must sufficiently charge your battery(ies) such that enough charging current is delivered to avoid draining the power source battery(ies) while the power inverter is in use. Most standard vehicle alternators do not output enough current to maintain large batteries when used as an inverter power source.

In this type of installation, a high current alternator is preferred, as it is more likely to be able to provide the necessary power. It is important that you calculate your specific alternator output requirement prior to purchasing a high current alternator for this purpose to be sure that the product you purchase meets your needs. High current alternators can be found at most auto parts stores.

### *Charging Batteries Independent of a Vehicle Charging System*

Like charging from a vehicle system, it is important that you consider your specific application and needs when designing your charging system. Consider all factors involved, including the total battery capacity that will need to be charged, the amount of time that you have to charge the battery(ies) and the best way to deliver the charge. The key to a successful charging system is that your battery(ies) are fully charged and ready for service when you need them next.

## Testing Batteries to Ensure Readiness

It is good practice to periodically check the condition of your battery(ies) when discharged and at the completion of the charging process to ensure that your charging system is functioning properly and keeping your battery(ies) in good health. To do so, we recommend using an electronic battery tester. Follow all procedures outlined by the battery tester manufacturer and those from the battery manufacturer.

If your battery(ies) are of the Conventional Flooded Acid type (not Maintenance-Free), it is important to check the electrolyte level regularly and ensure that the proper level is maintained. Use only distilled water when replenishing the electrolyte. Follow all procedures outlined by the battery manufacturer when replenishing the electrolyte.

## Cable Requirements

**Warning: Failure to use proper DC input cables (size, length and composition) could result in excessive heat generation, possibly resulting in poor system performance, damage to equipment, fire and personal injury!**

**Note:** We recommend consulting a qualified electrician and reviewing the National Electrical Codes when determining the best method of connecting your power source battery(ies) to your power inverter.

### *DC Input and Grounding Cable Requirements*

As with all other power inverter system components, it is critical that your DC input cables (positive and negative) be properly matched to ensure peak performance and safe operation. Because your 12 Volt power source will generate extremely high current, it is important that you use high quality, low resistance stranded copper cable. In addition, always permanently connect cables using properly rated connections and make sure that the cable connections are tight.

Your DC input cables should be as short as possible, yet still allowing the inverter to be placed in a separate compartment than the power source battery(ies) (see *Choosing an Installation Location*). We recommend NEVER exceeding 5 ft. in length (one side) and following the table below for DC Input Cable Size.



<b>Model No.</b>	<b>Cable Gauge</b>	<b>Preferred Length</b>	<b>Max Length</b>
PI5000X	#2 AWG	3'	5'
PI10000X	#2 AWG	3'	5'
PI15000X	2/0	3'	5'
PI20000X	4/0	3'	5'

The greater your DC input cable length, the greater your power loss will be between the power supply battery(ies) and the power inverter. Exceeding recommended cable lengths could result in poor power inverter performance and an inability to meet the rated output of the power inverter.

Your DC input cables should be weather rated to stand up to your local conditions and oil-resistant to provide safe operation over time. Because cables are often passed through sheet metal, firewalls and other areas potentially having rough edges, it is very important that all wires be protected from chaffing.

### *Chassis Grounding Cable Requirements*

For certain applications, you are required to properly ground the inverter chassis. Your power inverter has a ground screw for grounding the power inverter chassis. On Model PI10000X, the ground screw is located at the bottom right of the DC Input Panel. On Model Nos. PI15000X and PI20000X, the ground screw is located on the bottom panel and is marked by a ground label.

We recommend using 14 gauge insulated ground wire. Just as with DC input cables, the chassis ground wire should be as short as possible, preferably not exceeding 10 feet. Always be sure that you are connecting to a proper ground. For vehicle installations, you should never connect to sheet metal, fuel lines, fuel injector, carburetor or a moving part as a grounding device – for this purpose, the best grounding points are the engine block or vehicle frame. Always ensure that cables are not in the path of moving engine parts.

### **Fuse/Circuit Breaker Requirements**

Because the short circuit current from your 12 volt power source can be extremely high, it is important to install a fuse or circuit breaker between your power source battery(ies) and the power inverter. Each power inverter identifies its maximum power draw from the DC power source battery(ies) on the DC input panel. Choose a fuse or circuit breaker rated at 125%-150% above the maximum DC power draw from the power inverter. The fuse or circuit breaker should always be installed on the positive lead.

### **Choosing an Installation Location**

***Warning: Working around lead-acid batteries may be dangerous. Lead-acid batteries release explosive gases during normal operation, charging and jump starting. Carefully read and follow these instructions for safe use. Always follow the specific instructions in this manual and on the SOLAR power inverter each time you use the SOLAR power inverter.***

***All lead-acid batteries (car, truck and boat) produce hydrogen gas which may violently explode in the presence of fire or sparks. Do not smoke, use matches or a cigarette lighter while near batteries. Do not handle the battery while wearing vinyl clothing because static electricity sparks are generated when vinyl clothing is rubbed. Review all cautionary material provided with your batter(ies) and on the SOLAR power inverter.***

The power inverter must be installed in a location that is dry and free from exposure to rain, snow, spray or condensation. It should be installed in a location that has an ambient temperature during operation between -5°C and 40°C (23°F and 104°F) and an ambient temperature during storage between -15°C and 50°C (-5°F and 122°F). Because engine compartments reach temperatures exceeding both the operating and storage temperature range of the power inverter, it should not be installed in an engine compartment.

The power inverter should not be located in the same compartment with your power source battery(ies) nor should it be located near flammable liquids or gases of any kind. The power inverter is capable of producing arcs or sparks. To prevent fire or explosion, do not install or operate the power inverter in compartments containing flammables or batteries, or in any location that requires ignition-protected equipment.

The inverter should have several inches (3"-5") of space around all sides and the top for air circulation, with particular care not to obstruct the vents found on the bottom and ends of the inverter. In addition, do not mount the inverter such that it could become exposed to gases produced by batteries, as these gases are corrosive and could damage the power inverter.

## Installing Your Power Inverter

Before installing your power inverter, review the warning section at the beginning of this manual and this Installation section in its entirety. As previously noted, the power inverter should be installed and operated only by those competent to install and operate it. (Refer to the Power Inverter Installation Schematic on page 11 for an example of a typical installation.

### *Mount the Power Inverter*

Do not mount the power inverter in the engine compartment (under the hood) of a vehicle (see Choosing an Installation Location). Make sure that the power inverter is in the OFF position during the installation process.

The power inverter can be mounted in one of three orientations: 1.) horizontally on a vertical surface, such that the ends are parallel (fan not facing up or down); 2.) on top of a horizontal surface; 3.) underneath a horizontal surface. Care must be taken during the mounting process not to damage the power inverter in any way.

### *Connect the Chassis Ground*

See Chassis Grounding Cable Requirements for details regarding ground cable requirements and connecting to vehicle grounding points.

For certain applications, you are required to properly ground the inverter chassis. Your power inverter has a ground screw for grounding the power inverter chassis. On model PI10000X, the ground screw is located at the bottom right of the DC Input Panel. On Model Nos. PI15000X and PI20000X, the ground screw is located on the bottom panel and is marked by a ground label.

When installing the ground connection to the power inverter, the power inverter should be turned OFF. For the ground connection, permanently connect cables using properly rated connections and make sure that the cable connections are tight.

### *Connect the DC Input Cables*

See DC Input Cable Requirements for details regarding DC input cable requirements. Because the short circuit current from your 12 volt power source battery(ies) can be extremely high, it is important to install a fuse or circuit breaker between your power source battery(ies) and the power inverter (See Fuse/Circuit Breaker Requirements).

In preparation for making the DC connection, cut DC Input Cables to the appropriate length. Permanently connect cables using properly rated connections and make sure that the cable connections are tight. The connection sequence should be as follows:

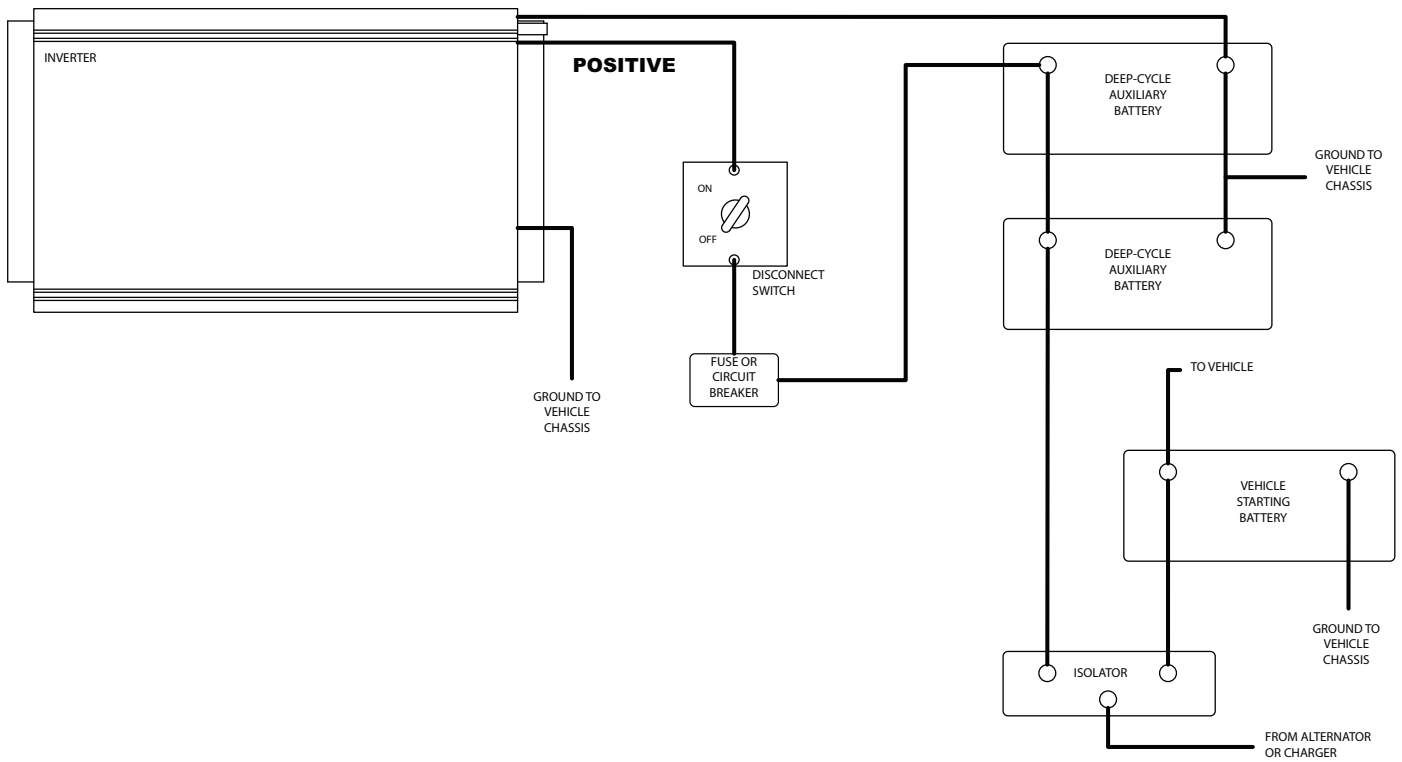
**Note:** *Take extra care to ensure that the polarities are properly matched throughout the connection process. Positive always connects to positive, negative always to negative. Reversing the connection could result in personal injury or property damage.*

- Install the fuse/circuit breaker to the power inverter DC terminals (See Fuse/Circuit Breaker Requirements), making sure the disconnect switch or circuit breaker is turned OFF prior to installing
- Make the positive (POS, +) battery connection to the fuse/circuit breaker, starting at the battery
- Make the negative (NEG, -) battery connection to the power inverter, starting at the power inverter
- We recommend coating battery connections in fixed applications with Dielectric Grease to maintain a good electrical connection and prevent corrosion on terminals.
- Recheck the polarity of all cables to ensure that the correct connections have been made
- Turn on the disconnect switch or circuit breaker
- Turn the power inverter ON. Set the display to show Input Voltage. The display should provide a detailed reading of your power source battery(ies) voltage
- If the power inverter does not turn ON or does not display input voltage, check your battery condition and all connections and repeat.

*Connect the AC Cables*

Before connecting any device to be powered by the power inverter to an AC receptacle on the power inverter, ensure that both the device and the power inverter are turned OFF. Plug the device into the power inverter's AC receptacle. If you run the AC cable of any device through a wall or other barrier, or near any sharp or rough edges, always be sure to protect the AC cable from chaffing. When disconnecting any device powered by the power inverter, always pull on the plug and never on the wire. NEVER operate a device with a damaged power cord.

**Power Inverter Installation Schematic**



## **Operation**

Your power inverter has been designed to provide reliable service, ease of use and safe operation. Please read this section in its entirety, as well as the entire Installation section, prior to operating your power inverter.

Your power inverter is designed for use in a wide variety of vehicle-installed and independent applications. Key aspects of your power inverter's operation include:

- The power inverter provides continuous operating power of 500W (PI5000X), 1000W (PI10000X), 1500W (PI15000X) or 2000W (PI20000X) to operate a wide variety of powered tools, appliances and electronics.
- The power inverter provides a peak power capability of twice the continuous power rating to meet the initial surge demand of tools and appliances during start-up.
- The power inverter features a convenient display (PI15000X and PI20000X only) that provides detailed information regarding the voltage of the power source battery(ies) and the output wattage drawn from connected appliances and equipment.
- The power inverter places only a small load on the power source battery(ies) when the inverter is powered but not in use. Despite this, eventually even a minor load such as this will drain your power source battery(ies). For this reason, when possible, turn the power inverter OFF when not in use.
- The power inverter utilizes a fan for cooling purposes, which turns ON only when a specific temperature is reached and then turns OFF when the unit has cooled down. This limits the power draw of the power inverter both when idle and during operation.
- The power inverter incorporates a wide variety of features designed to ensure safe operation and to protect the power source battery(ies) from damage due to excessively deep cycling.

## **Connecting and Powering AC Equipment**

Always ensure that both the power inverter and the equipment to be powered are OFF when connecting the equipment to the power inverter. Always remember to pull on the plug and never on the wire when disconnecting equipment from the power inverter.

Once the equipment to be powered has been properly connected to the power inverter (and is in the OFF position), turn the power inverter ON by switching the ON/OFF switch on the output panel to the ON position. Then, turn on the equipment to be powered. Once the application is completed, turn the power OFF on the equipment being powered and then turn OFF the power inverter by switching the ON/OFF switch on the output panel to the OFF position.

When powering more than one piece of equipment with the power inverter, turn each piece of equipment ON in succession and not at the same time. This avoids the increased peak power demand that would be caused by turning multiple pieces of equipment ON at the same time. This will help prevent overloads and unnecessary shut down.

## **Managing Your Power Demand**

Your power inverter has several elements on the output panel to assist you in managing your power demand and the operation of the inverter. A *Power* LED indicates that the inverter is powered when the unit is turned ON and is properly connected to a 12 Volt power source. A *Fault* LED indicates if a fault condition exists that is resulting in the shut down of the unit to protect the power inverter, the power source battery(ies), powered equipment or the operator.

In addition, some models (PI15000X and PI20000X) feature a power display that shows both the voltage condition of your power source battery(ies) and the output wattage demand of any powered equipment. This display is very helpful in managing your power demands.

To display the input voltage from your power source batteries, set the display switch to *VOLTS*. The display will show the DC voltage at the input terminals of the power inverter. This value can, and most often will, be different from the DC voltage at the battery, due to the voltage drop over the length of the DC input cables. The input voltage information provided in this display mode is very useful in determining the charge status of your power source battery(ies) and the amount of time remaining to power connected equipment prior to reaching a low voltage shut down condition.

To display the output wattage demand from all equipment connected to the power inverter, set the display switch to *WATTS*. The output wattage draw information provided in this display mode is very useful in determining if an additional piece of equipment can be powered by the inverter without exceeding the rated output of the inverter.

## **Assessing the Capacity of Your Power Inverter to Power a Specific Device**

When you first switch on a powered tool or appliance that utilizes a motor, that device requires an initial surge of power. This initial surge of power required to start the device is referred to as the “peak power”. After initial start-up, the device then requires less power to operate, which is referred to as its “continuous power”.

It is important that you determine both the “peak power” and “continuous power” demands of any device you plan to operate using your power inverter. The power demands of any particular device are usually stamped or printed on the device and are usually expressed in either Wattage (Watts) or Amperes (Amps). If this information is not indicated on the device, reference that device's owner's manual or contact the manufacturer to ensure that it is compatible with a modified sine wave power source.

To determine the power needs of a particular device, use the following formulas:

Amps Indicated x 110 (AC Voltage) = Watts

(This Wattage amount is roughly equivalent to the “continuous power” demand

Watts x 2 = “Peak Power”

(This is roughly equivalent to the initial “peak power” demand of the device at start-up)

In most cases, the “peak power” demand of the device is the determining factor in whether your power inverter has the capacity to power that device. To determine whether your inverter has the capacity to power a specific device, test that device using your power inverter. Your **SOLAR** power inverter is designed to automatically shut down in the event of a power overload. This feature protects the inverter in the event that you attempt to power a device with a power demand exceeding the inverter's capacity.

In the event the automatic shut down protection occurs or the inverter sounds a continuous audible alarm, turn off the power inverter immediately. Do not restart the power inverter until the source of the problem has been identified and corrected.

### *Powering High Surge Loads*

Some types of equipment that utilize an induction motor require extremely high peak power to meet the initial surge demand of that motor. In some cases, this equipment cannot be powered by the inverter even though the power requirement of that equipment falls within the operating range of the power inverter.

If a specific piece of equipment that utilizes an induction motor is unable to be started when connected to the power inverter, set the power display to Voltage Mode and observe the input voltage to the power inverter while trying to start the equipment. If the voltage indicator nears or goes below 10.5 Volts, this explains why the equipment is failing to start. Check the state of charge of your power source battery(ies) and all connections to ensure power is being properly delivered to the inverter. If such a check does not reveal any problems, you may need to upgrade to a larger battery or group of batteries.

*Suggestions When Using Your SOLAR Power Inverter to Power Television and Audio Devices:*

Although your **SOLAR** power inverter is shielded and filtered to minimize signal interference, some interference with your television and audio equipment may be unavoidable, particularly when they have weak signals. Here are a few suggestions to improve your reception under these circumstances:

1. Make sure the television/audio antenna on the device produces a clear signal under normal operating conditions (when plugged into a standard 110 Volt AC outlet). Also, ensure that the antenna is properly shielded and of good quality.
2. Change the positions of the power inverter, antenna, and tv/audio power cord to see if a change in their relative positions improves your reception.
3. Isolate the television/audio device, its power cord and antenna cables from the power inverter and 12 Volt power source by running an extension cord from the television/audio device power cord to the inverter.
4. Coil the television power cord and the power cables running from the 12 Volt power source to the power inverter.
5. Attach a "Ferrite Data Line Filter", available at most electronic supply stores, to the television/audio device power cord. More than one filter may be required.

## **Maintenance**

### **Maintenance and Care**

A minimum amount of care can keep your power inverter working and looking good for years:

- Check your battery and DC input connections regularly to ensure that they are tight and free of corrosion.
- Wipe off any battery fluid at the battery connection. Battery fluid may be neutralized with a solution of water and baking soda.
- Ensure that the inverter has several inches of space around all sides and the top for air circulation.
- Ensure that any cables (DC or AC) that are routed through partitions or other obstructions are free from abrasion.
- If needed, wipe the case clean with a soft cloth.

### **Replacing Blown Fuses**

Your **SOLAR** power inverter is equipped with fuses of specific amperage rating and physical design. In most cases, the fuses should not need to be replaced. If replacement is necessary, it is important that you purchase and install the correct replacement fuse(s). Please reference the chart below to determine the correct fuse(s) for your product.

<b>Model No.</b>	<b>No. of Fuses</b>	<b>Fuse Rating</b>	<b>Fuse Type</b>
PI5000X	2	30 Amp	Mini Blade
PI10000X	4	30 Amp	Mini Blade
PI15000X	6	30 Amp	Mini Blade
PI20000X	8	30 Amp	Mini Blade

ALWAYS disconnect your **SOLAR** power inverter from the 12 Volt power source and disconnect any equipment powered prior to opening the inverter cabinet attempting to replace the fuse(s). ALWAYS use the proper replacement fuse(s) as indicated in the chart above. Make sure to address the root source of the overload that caused the blown fuse prior to using your power inverter again.

### **Replacement Parts and Accessories**

<b>Part No.</b>	<b>Description</b>
248-040-666	Connection cables for 1000 W inverter, Model Nos. PI5000X and PI10000X (5ft, #2 AWG)
248-053-666	Connection cables for 1500 W inverter, Model No. PI15000X (5ft, 2/0)
248-054-666	Connection cables for 2000 W inverter, Model No. PI20000X (5ft, 4/0)

## **Troubleshooting**

**Problem:** Low or no output voltage from the power inverter

**Answer:** Check connections between the 12 Volt power source and the power inverter as detailed in “Connect the DC Input Cables.”

**Answer:** Check that the power inverter is turned ON and that the device to be powered is turned ON.

**Answer:** Check polarity of DC connection to ensure it is correct. If a reverse connection has been made, most likely the inverter fuses have been blown. Replace fuses. Damage to the inverter caused by a reverse polarity condition is not covered under the warranty.

**Answer:** Using the incorrect type of voltmeter to test the output voltage. To accurately measure the the output voltage of your **SOLAR** Power Inverter, use only a voltmeter identified as a “True RMS” reading voltmeter.

**Problem:** Fault LED ON

**Answer:** The voltage of the 12 Volt power source may have dropped below 10 Volts – check 12 Volt power source voltage and recharge as needed.

**Answer:** The device being powered is placing a power demand on the inverter that is beyond its operating capacity – use a higher capacity power inverter or cease powering that device using your power inverter.

**Answer:** The inverter is too hot – allow the inverter to cool. Check for adequate ventilation. If problem persists, reduce the the load on the power inverter to the rated continuous power.

**Problem:** Low Battery Alarm on Continuously

**Answer:** The voltage of the 12 Volt power source may have dropped below 10.5 Volts – check 12 Volt power source voltage and recharge as needed.

**Answer:** Poor or weak 12 Volt power source – recharge or replace the battery.

**Answer:** Inadequate power delivery from the 12 Volt power source – check the connections between the 12 Volt power source and the power inverter (see “Connect the DC Input Cables”).

**Problem:** Poor Television/Audio Device Reception

**Answer:** Refer to “Suggestions When Using Your Power Inverter to Power Television and Audio Devices” section within this Operator’s Manual.

## **Specifications**

<b>Model No.</b>	<b>PI5000X</b>	<b>PI10000X</b>	<b>PI15000X</b>	<b>PI20000X</b>
<b>Electrical Specifications</b>				
Nominal DC Input	12VDC	12VDC	12VDC	12VDC
Input Voltage Range	10 - 15VDC	10 - 15VDC	10 - 15VDC	10 - 15VDC
Low Voltage Alarm (10.5V)	YES	YES	YES	YES
Low Voltage Shut-Down (10V)	YES	YES	YES	YES
Over Voltage Shut-Down (15V)	YES	YES	YES	YES
Over Heat Protection (149°F)	YES	YES	YES	YES
Cooling Fan	YES	YES	YES	YES
Overload Protection	YES	YES	YES	YES
Short Circuit Protection	YES	YES	YES	YES
No Load Current Draw	<0.5 A	<0.4 A	<0.8 A	<0.8 A
DC Fuse	2 x 30A	4 x 30A	6 x 30A	8 x 30A
AC Output Voltage	115VAC (RMS) +/-10%	115VAC (RMS) +/-10%	115VAC (RMS) +/-10%	115VAC (RMS) +/-10%
AC Output Frequency	60 Hz +/-3 Hz	60 Hz +/-3 Hz	60 Hz +/-3	60 Hz +/-3
Output Waveform	Modified sine wave	Modified sine wave	Modified sine wave	Modified sine wave
Maximum continuous AC Power	500W	1000W	1500W	2000W
Maximum peak AC Power	1000W	2000W	3000W	4000W
Peak Capacity (Seconds)	1	1	1	1
Efficiency	>86%	>86%	>85%	>85%
Operating Temp. Range	23°-104°F (-5°-40°C)	23°-104°F (-5°-40°C)	23°-104°F (-5°-40°C)	23°-104°F (-5°-40°C)
LED Indicators	Power, Fault	Power, Fault	Power, Fault	Power, Fault
Power Display	No	No	Yes	Yes
AC Receptacle	Dual	Dual	Triple	Triple
USB Outlet	Yes	No	No	No
DC Connection	Hardwire or 12V Socket	Hardwire	Hardwire	Hardwire
Dimensions (H x W x L)	8" x 4.75" x 2"	10.6" x 5.7" x 3"	14.6" x 8.7" x 3.2"	14.6" x 8.7" x 3.2"
Weight	1.925 lbs. (0.87 kg)	4.08 lbs. (1.85 kg)	8.12 lbs. (3.7 kg)	9.92 lbs. (4.5 kg)
Warranty	One year limited	One year limited	One year limited	One year limited