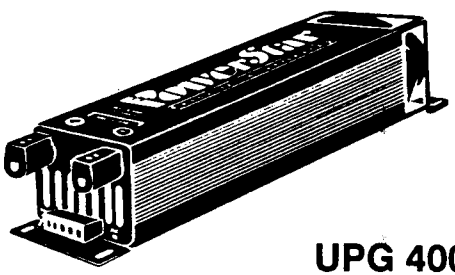
PowerStar™

PRODUCTS • INCORPORATED



UPG 400
UPG 700
UPG 1300

OWNERS MANUAL

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CONGRATULATIONS!

You have made a wise decision in purchasing a PowerStar inverter. It is a quality instrument that will provide you with many years of faithful service.

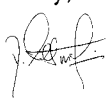
Please try out your PowerStar inverter right away. Make sure it does the job you want it to do. It is important that you be totally satisfied.

A great deal of thought has gone into this product. We have tried to make it dependable, simple to use and safe to operate. In designing it, we have tried to build a "forgiving" machine: one that compensates for the person who doesn't remember or hasn't read the instructions.

You are the ultimate judge of how well we have done our job. If you are unhappy about any aspect of your PowerStar inverter, or if you can think of any improvements we might make in future models, please tell us. If you are delighted with your PowerStar inverter, we'd like to know that, too.

Returning your registration card will insure that we remain in touch, so please send it in right away. Customer communications are very important to us, and you will be hearing from us from time to time. We'd enjoy hearing from you.

Sincerely,



Scott McFadin
President/CEO

PowerStar Products Incorporated

SAFETY

A few common-sense precautions should be observed:

1. The PowerStar inverter delivers 115 volts AC. This is the same kind of electricity as in the wall sockets of most homes and offices. 115 volts AC is potentially lethal and must be treated with respect.
2. The PowerStar inverter is polarity sensitive and will be damaged if connected to the battery incorrectly. If there is any doubt, consult an electrician. (See Installation).
3. A safety hazard will result if inadequate wiring is used to make connection to the inverter. (See Installation).
4. The PowerStar inverter is intended to deliver stand-alone AC power. Its output cannot be safely connected to utility power, another inverter, a generator, or any other power source. Where other power sources are available in the same system, isolating relays should be used to prevent connection of the inverter's output to those other sources of AC.
5. In case of malfunction, immediately turn the power switch OFF and disconnect the inverter from the battery.

INTRODUCTION

Inverter is the proper term for any device that turns DC (direct current) into AC (alternating current). The PowerStar inverter takes 12 volts DC from your battery and converts it to 115 volts AC to run appliances. Just like utility power, the frequency is held constant at 60 Hertz, and the output voltage is regulated between 110 and 120 volts true RMS, despite changes in load and battery voltage.

The energy delivered by the inverter comes from the battery which powers it. And that energy was put into the battery by your battery charger, which might be a vehicle alternator, an electronic power supply or an array of solar cells.

The most appropriate use of an inverter system is for light, long-term loads, such as TVs, VCRs and small computers, or for heavy, short-term loads such as vacuum cleaners, microwave ovens and hair dryers.

Heavy, long-term loads like electric heaters and air conditioners require a great deal of energy. While they won't harm your inverter, they would need an extremely large battery to run continuously overnight, and then a very heavy charger to recharge that battery the following day.

There really aren't a lot of do's and don'ts to remember. Your PowerStar inverter is designed to protect itself and your battery.

NOTE: While the PowerStar inverter does not mistreat your appliances, it cannot protect them. A light bulb can burn out, or an appliance can fail, just as it might when plugged into utility power.

INSTALLATION

When working on the installation, be sure that the inverter power switch is in the OFF position. Note that this is only a control switch which tells the inverter whether or not to run. Even though it may be OFF, the battery will still be connected directly to the inverter's input terminals, so they will always be live. Treat them accordingly.

Please get the polarity right. If you get it wrong, you will damage the inverter and void the warranty. A telltale inside will tell the repair technician what happened, and he will have to charge you for fixing it. It does happen, despite this warning, so please double check before you make that last connection. The positive (+) terminal on the battery should connect to the positive (+) terminal on the inverter, and the negative (-) terminal on the battery should connect to the negative (-) terminal on the inverter.

SUGGESTION: Before making the last connection, brush the cable lightly against the terminal. There should be no spark, or at most a very slight one. Heavy sparking indicates a problem.

The inverter may be mounted in any position on any flat surface: wall, ceiling or floor. It should be bolted or screwed down using a #6 screw in each of the four mounting holes. In

choosing a location, look for a dry, cool, dust-free, well-ventilated spot, as close to the battery as possible, but clear of battery acid and fumes. Under the hood of a vehicle is a harsh environment which should be avoided.

The battery cables are the key to a successful installation. They must be at least AWG (American Wire Gauge) #4 and should be as heavy and as short as practical. To be extremely conservative, just use 2 guage wire which is as large as the inverter terminal will accept. Otherwise, the minimum acceptable sizes are shown below. The wire and the appropriate battery terminals are usually available from auto supply stores. If you cannot find the right wire there, try an electrical distributor or a welding supply house.

INVERTER WATTAGE

DISTANCE TO BATTERY	INVERTER SIZE		
	400	700	1300
5 FEET	AWG 4	AWG 4	AWG 3
10 FEET	AWG 4	AWG 3	AWG 2
15 FEET	AWG 4	AWG 2	NOT RECOMMENDED

Note that the heavier the wire, the smaller the wire gauge number. The wire sizes called out in the table will keep the voltage drop between the battery and the terminals down to 0.4 volt or less. More voltage drop than this would impair performance.

REMOTE CONTROL

Each inverter comes with a removable connector for remote ON-OFF control plus a hard-wired output. The remote connector has five terminals, each of which will accept a wire as heavy as AWG 12. The terminals, viewed end-on, left to right are: (1) (2) (3) (4) (5).

The first two, (1) and (2), are connected internally to the two terminals of the built-in switch. Connecting (1) and (2) together will turn on the inverter. Therefore, a pair of wires may be run from these terminals to any kind of switch within, say, 50 feet, and that switch will

control the inverter, so long as the built-in switch is left OFF. The switch voltage is 12 volts DC and the current is less than 1/2 ampere.

To summarize, for remote control:

1. Leave the built-in switch OFF.
2. Install a SPST (single-pole, single-throw) or other switch in the desired location.

   NOTE: This switch cannot have a pilot light associated with it, as it will damage the inverter.
3. Run a pair of wires, AWG #16 or heavier, from (1) and (2) to the new switch terminals.

For a vehicle installation, it may be desirable to control the inverter with the ignition switch. That way, there is less likelihood of inadvertently leaving the inverter running overnight; removing the keys will turn it off. To do this, find a terminal that's hot (+12 volts) only when the ignition is in ACCESSORIES or ON. In the fuse box, after the fuse that feeds the radio would be a good spot. Connect a #16 wire from this point to terminal (2). No connection to (1) should be made. Tape the built-in switch in the OFF position and don't use it while the above connection is present. The key will then control the inverter.

HARD-WIRED OUTPUT

If it is desired to permanently connect the inverter's output to a string of outlets or to a load, the remote connector should be used. The three right-hand terminals correspond to (3) White: neutral; (4) Black: hot; and (5) Green: ground or chassis. Any three-wire electrical cable will have these colors (although the ground wire may be bare copper instead of green), and the wires should be connected to their corresponding terminals. For a wire run of 50 feet or less, AWG 14 can be used. If it's longer, use AWG 12.

CAUTION: When making a permanent installation, be sure that these same lines being fed by the inverter will NEVER be fed by shore power, a generator, another inverter or any other source of AC; once again, that would cause damage and void the warranty. If you wish to use another source of AC on the same lines, it is necessary to disconnect the inverter first. To do this automatically, install a DPDT (double-pole, double-throw) relay in the White and Black lines.

NORMAL OPERATION

Using your PowerStar inverter is quite simple. Just turn the switch ON, and observe that the AC light comes on, indicating there is 115 volt AC power at the output. Any appliance connected to the inverter will operate, if it is within the inverter's power capability.

If your model has a fan, that fan will run only when the inverter is loaded beyond 120 watts.

When operated at full load for extended periods, it is normal for the inverter to be HOT to the touch.

The output is factory pre-set to 115 volts AC at 60 Hertz. The waveform, a "modified sinewave", has been found satisfactory for running virtually all loads. The output voltage can only be measured accurately with a "true RMS" voltmeter. Because of the special waveform, all other voltmeters, analog or digital, will read 10 to 20 volts low.

ABNORMAL OPERATION

LOW BATTERY

If the voltage at the input terminals of the inverter drops below 10.3 volts, the LOW BATTERY ALARM will emit a high-pitched warning tone, and the inverter will continue to operate. The tone will stop if the voltage is raised back above 12.0 volts.

If the battery voltage continues downward, the tone stays on and the inverter keeps running until the voltage drops below 10.0 volts. At this point the inverter locks itself off to protect your battery, but the warning tone stays on.

To reset:

Manually: Turn the power switch OFF for one second and then back ON.

Automatically: Recharge the battery above 13.0 volts.

OVERVOLTAGE

If the input voltage goes above 16.5 volts, the inverter will shut down to protect itself. When the voltage returns to less than 16.5 volts, the inverter will turn back on automatically.

CAUTION: Voltages above 18 volts can cause permanent damage.

OVERLOAD

When the inverter is loaded beyond its capacity, its output voltage will drop in proportion to the overload. If a heavy overload is sustained for more than a few seconds, the inverter will shut down. To reset, turn the power switch OFF for one second and then back ON.

TEMPERATURE

A cold inverter can deliver more power than a hot one. The wattage rating for each model is based on a free air "room temperature" environment. If it's in a hot location, or if air isn't available for cooling, the inverter will protect itself by lowering its overload trip point and will not deliver full rated power.

UPGRADING

A 400 watt model can be upgraded to 700 watts or 1300 watts, and a 700 watt model can be upgraded to 1300 watts. This can be accomplished by returning your inverter to the PowerStar Service Center for upgrading, a process which only takes a few days. If necessary, loaners are available to substitute for the absent inverter.

To arrange for an upgrade, call:
(408) 774-6800 or write to:

Powerstar
Products Incorporated
1050 East Duane Avenue, Suite D
Sunnyvale, CA 94086

CUSTOMER SERVICE

If you have any problems with your PowerStar inverter or any questions regarding its use, call the PowerStar Service Center at (408) 774-6800.

You may void the warranty if you try to fix a problem yourself. Send it to us. We'll inspect your PowerStar inverter, and if there's a problem that's covered by the warranty, we'll fix it and send it back to you as quickly as possible, and at no cost to you. If it's not covered by the warranty, we'll call you and tell you what the repairs will cost. When we receive a check or a credit card authorization for that amount, we'll get it fixed and sent back.

When returning an inverter for repair:

1. Be sure the fault is in the inverter and not elsewhere in the system. We sometimes receive inverters in good working condition, and we have to make a service charge just to cover the cost of inspection and return shipment.
2. Include your name, address, telephone number and proof of purchase.
3. It is helpful if you include a note describing the symptoms you saw and the operating conditions at the time the problem arose.

Send your inverter to:

Powerstar
Products Incorporated
1050 East Duane Avenue, Suite D
Sunnyvale, CA 94086
(408) 774 - 6800

WARRANTY

This product is warranted against defects in material and workmanship for a period of two years from the date of shipment to the first user. During the warranty period, PowerStar Products Incorporated will, at its option, either repair or replace products which prove to be defective. However, if no defect is found in a returned item, a service charge will be made.

This warranty shall not apply to defects resulting from improper use, physical damage or inadequate maintenance by Buyer.

No other warranty is expressed or implied. PowerStar Products Incorporated specifically disclaims the implied warranty of fitness for a particular purpose.

The remedies provided herein are Buyer's sole and exclusive remedies. PowerStar Products Incorporated shall not be liable for any direct, indirect, special, incidental or consequential damages, whether based on contract, tort, or any other legal theory.

A FINAL WORD

This manual is intended to answer the questions you might have about your PowerStar inverter. If it falls short, or if you can think of any way it might be improved, please write and let us know. Thank you.

PowerStar™
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