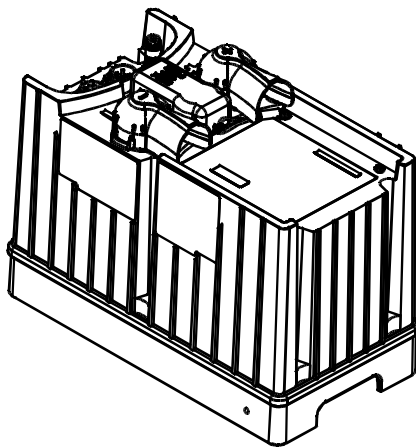


Xantrex™
Heavy Duty Inverter•Charger 1012 with
Ignition Protection



Operation Guide

xantrex™

About Xantrex

Xantrex Technology develops, manufactures, and markets leading advanced power electronic and control products for the Distributed, Mobile, and Programmable Power markets. The company's enabling technology converts raw electrical power from any central, distributed, or backup power source into high-quality power required by electronic and electrical equipment.

Trademarks

Xantrex is a registered trademark of Xantrex International. © 2002 Xantrex International. All rights reserved.

Other trademarks, registered trademarks, and product names are the property of their respective owners and are used herein for identification purposes only.

Notice of Copyright

Xantrex™ Heavy Duty Inverter•Charger 1012 with Ignition Protection Operation Guide © May 2002
Xantrex International.

Disclaimer

Xantrex manufactures its products from parts and components that are new or equivalent to new, in accordance with industry-standard practices.

UNLESS SPECIFICALLY AGREED TO IN WRITING, XANTREX TECHNOLOGY INC.
("XANTREX"):

- (a) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN ITS MANUALS OR OTHER DOCUMENTATION.
- (b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION. THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK.

Date and Revision

May 2002, Revision 1

Part number

445-0172-01-01 Rev 1

Contact information

Telephone: 1-800-670-0707 (toll free in North America)

1-604-420-1585 (outside North America)

Fax: 1-800-994-7828 (toll free in North America)

1-604-420-1591 (outside North America)

Email: customer.service@xantrex.com

Web: www.xantrex.com

Contents

Important Safety Information

General Precautions	v
Precautions When Working With Batteries	vi
Precautions for Using Re-chargeable Appliances	vi

1 Introduction

Inverter•Charger Features	1-2
Operating Features	1-4

2 Operation

Planning for AC Loads	2-2
Type of Loads-	2-2
AC loads	2-2
DC loads	2-3
Problem loads	2-3
Ambient Temperature	2-3
Calculating Size of an AC Load-	2-4
Driving the Truck While Operating AC and DC Loads	2-7
Using the Remote Switch-	2-9
Operating the Inverter•Charger	2-11
Turning the Inverter On and Running Loads	2-11
Running in Extremes Of Hot or Cold Temperatures	2-11
Restarting After a Shutdown	2-11
Battery Charging-	2-12
Using Shorepower-	2-12
Miscellaneous Hints-	2-12

3 Maintenance

Maintaining the Inverter•Charger- - - - -	3-2
Checking Terminals - - - - -	3-2
Disconnecting and Connecting from the Batteries - - - - -	3-3
Disconnecting - - - - -	3-3
Connecting - - - - -	3-4
Replacing the Fuse - - - - -	3-5
Removing and Reconnecting AC Cables - - - - -	3-6

4 Troubleshooting

Troubleshooting - - - - -	4-2
Common Problems - - - - -	4-2
Blinking Lights on the Remote Switch - - - - -	4-3

A Specifications

Physical Specifications - - - - -	A-2
Inverter Specifications - - - - -	A-3
Charger Specifications - - - - -	A-4
Transfer and General Specifications - - - - -	A-5
Rating Curves and Charging Profiles - - - - -	A-6

B Product and System Information

Warranty - - - - -	B-2
Return Material Authorization Policy - - - - -	B-3
Return Material Procedure - - - - -	B-3
Out of Warranty Service - - - - -	B-4
Information About Your System - - - - -	B-5

Index - - - - -	IX-1
------------------------	-------------

Important Safety Information

Important: Save these instructions. This guide contains important safety and operating instructions for the Xantrex Heavy Duty Inverter-Charger 1012 with Ignition Protection (IP1012) .

General Precautions

1. Before using the inverter-charger, read all appropriate sections of this guide and any cautionary markings on the inverter and the batteries.
2. Use only a grounded AC extension cord when connecting to AC input power (shorepower). Do not remove or attempt to defeat the ground connection to any shorepower source in any way.
3. If possible, plug the inverter-charger into an AC source outlet that is protected by a Ground Fault Circuit Interrupting (GFCI) device; either a breaker or outlet.
4. Do not operate the inverter-charger if it has received a sharp blow, been dropped, or otherwise damaged. If the unit is damaged, return it to your authorized Xantrex dealer.
5. Do not dismantle the inverter-charger; it contains no user-serviceable parts. Attempting to service the unit yourself could cause electrical shock or fire. **Internal capacitors remain charged after all power is disconnected.**
6. To reduce the risk of electrical shock, turn off the inverter-charger from the remote switch, then disconnect both AC (shorepower) and DC (battery) power from the unit before working on any circuits connected to it. Turning off the remote On/Off switch alone does not reduce this risk.

Precautions When Working With Batteries

1. Follow all instructions published by the battery manufacturer and the manufacturer of the equipment in which the battery is installed.
2. Make sure the area around the battery is well ventilated.
3. Never smoke or allow a spark or flame near the vehicle engine or a battery.
4. Use caution to reduce the risk of dropping a metal tool on a battery. It could spark or short circuit the battery or other electrical parts and cause an explosion.
5. Remove metal items like rings, bracelets, and watches when working with lead-acid batteries. These batteries produce a short-circuit current high enough to weld a ring, other metal jewellery or tools, thus causing severe burns.
6. If you need to disconnect a battery, always remove the negative terminal from the battery first. Make sure all accessories are off so you don't cause an arc.
7. Before making the final connection to a battery, be sure the polarity is correct; negative-to-negative, and positive-to-positive.
8. When you are making the final connection to a battery, you will see a spark and hear a loud pop. This spark and popping sound is normal.

Precautions for Using Re-chargeable Appliances

Most battery-operated equipment uses a separate charger or transformer that is plugged into an AC receptacle and produces a low voltage output. If the label on the AC adapter or charger states that the adapter or charger produces a low voltage AC or DC output (less than 30 volts), the inverter•charger can power this charger or adapter safely.

Some chargers for small nickel-cadmium batteries can be damaged if connected to the inverter•charger. Do not use the following loads and appliances:

- Small battery-operated appliances like flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.
- Some chargers for battery packs used in hand power tools. These types of chargers display a warning label stating that dangerous voltages are present at the battery terminals.

1

Introduction

[Chapter 1, “Introduction”](#) describes the main performance and protection features of the Xantrex Heavy Duty Inverter•Charger 1012 with Ignition Protection (IP1012).

Inverter•Charger Features

Features

The IP1012 is an ignition-protected, modified sine wave inverter•charger weighing about 30 pounds (13.6 kg). It is sealed, dust and water resistant, and can be mounted where it may be exposed to the elements. [Figure 1-1](#) shows its main features.

Consult [Appendix A, “Specifications”](#) for more detailed information about the unit.

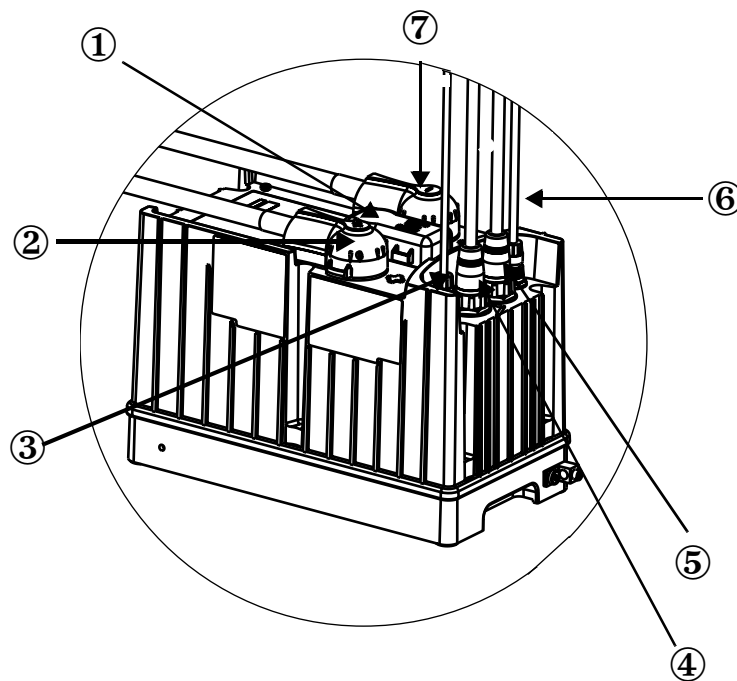


Figure 1-1 Features of the Inverter•Charger

Feature	Description
①	Over-current protection fuse which blows in case of a fault within the unit or if it is connected to the battery with reverse polarity.
②	Positive terminal connecting to positive terminal of battery
③	Battery temperature sensor
④	AC output to vehicle
⑤	AC input from shorepower
⑥	Remote toggle switch connection. The connection must be secure for the inverter to work
⑦	Negative terminal connecting to negative terminal of battery

Location The inverter•charger is generally installed in or near the battery compartment.

Operating Features

Inverter•Charger The inverter•charger functions as an inverter or as a charger depending upon the operational conditions. When the unit is inverting, it is said to be in invert mode and is referred to as an inverter. When the unit is charging, it is in charge mode and is referred to as a charger.

The unit can only operate in charge mode when external AC power referred to as “shorepower” is connected.

**Inverter
features**

The IP1012 offers the following inverter features:

- Ability to run many of the same appliances that you use at home
You can operate TVs, VCRs, satellite receivers, computers, hair dryers, and small power tools for example. You can also run multiple loads up to 1000 watts in total.
- Surge capability
The IP1012 will manage loads up to 3000 watts for short periods of time as long as the peak current is less than 36 amps peak.

Charger
features

- Low voltage shutdown

The inverter shuts off when your batteries reach a predetermined voltage set in the microprocessor to protect batteries from permanent damage. Low voltage shutdown also monitors frequency and voltage, and protects against overload, short circuits and over-temperature.

- Automatic shutdown after 24 hours for loads less than 15 ±5 watts
This feature prevents the inverter from draining the batteries if it is left on without a load.
- Ignition protection for safe operation in engine compartments

The IP1012 offers the following charger features:

- 12 volt, 50 amp charging for the IP1012 when shorepower is connected, to ensure your batteries are always charged
- Automatic transfer to invert mode

When the AC shorepower cord is disconnected, the unit automatically switches to invert mode. When AC shorepower is available again, the inverter automatically switches to charging/pass-through mode.

- Load management capability which temporarily reduces charging current to the batteries when a large AC load is applied to the inverter output. This capability helps reduce the chance of tripping the shorepower breaker.

2

Operation

Chapter 2, “Operation” explains how to calculate the size of the loads you can run from the IP1012. It also provides guidelines to help you run loads safely and efficiently.

Planning for AC Loads

AC load	AC load refers to an AC appliance you want to operate from the inverter-charger. Loads include most appliances that you can plug into a standard 120 volt household electrical outlet.
Variables affecting AC loads	<p>The IP1012 inverter-charger can power a wide range of loads. The size of the load and the length of time you can operate it depends on variables such as</p> <ul style="list-style-type: none">• type of load• ambient temperature• size, state of charge, temperature, and condition of batteries. <p>The larger your battery capacity and the higher the state of charge, the longer the inverter-charger can run your AC loads. Battery capacity is reduced as battery temperature lowers.</p>

Type of Loads

AC loads

	The way in which an AC load draws power may determine how effectively it can be powered from the inverter-charger.
Resistive loads	Toasters, coffee pots, and incandescent lights are examples of resistive loads which do not need a high start-up current to start running. They use a resistive heater element to generate heat or light. They are the simplest and easiest loads for an inverter-charger to run. Large resistive loads, such as electric stoves and water heaters, are impractical since their high power requirements quickly drain the batteries.
Inductive loads	TVs, VCRs, stereos, computers, and electric motors (power tools, vacuum cleaners, for example) are examples of inductive loads which surge on start up. They require a high startup current compared to a resistive load such as a toaster or coffee pot. Depending upon its size, the motor can take as much as six times of its operating current to start than it does to keep it running once it has started. This surge can sometimes exceed the inverter-charger's maximum output rating and the inverter will shut down.

DC loads

DC loads are those that run off a 12 volt electrical system. A few examples of DC loads are:

- marker lights, headlights, vehicle lighting, other lights using DC power
- DC refrigerators
- CB radios
- factory-installed radios or sound systems
- pumps, lights, fans, power vents, LPG leak detector, toilet, and some water heaters.

DC loads and the inverter-charger both rely on the batteries for power. Many DC loads running at one time will shorten the operating times of AC loads.

Problem loads

Problem loads are loads you should not operate from the inverter-charger because they may be damaged or may not operate properly:

- dimmer switches
- some small rechargeable hand-power tools
- small battery-operated appliances such as flashlights, razors, night lights
- variable speed motors

Ambient Temperature

Ambient
temperature

The ambient temperature, that is, the air temperature around the inverter-charger, will affect its output power.

The air temperature around the unit may be much hotter than it is at a distance from the installation. If the vehicle or craft is sitting in the sun, the temperature may be quite high near the inverter.

Temperature
and power

Generally, the output power decreases as the temperature increases. For example, at 77 °F (25 °C) the unit delivers 1000 watts for as long as you have sufficient battery power. At 104 °F (40 °C) it delivers 1000 watts for up to 30 minutes before shutting down, 2000 watts for 2 minutes, or 750 watts continuous.

Figure 2-1 shows the relationship between ambient temperatures and the length of time the unit will supply an output power level. Choose the curve with the temperature range most closely approximating that of the inverter-charger location, then look for the time in minutes. The intersection of the time and temperature will indicate approximately the output power of the unit. For example, between -40°F and 77°F (-40°C to 25°C), you will get 3000 watts for approximately one minute or 2500 watts for 3 minutes. Times shown in this graph may vary with the actual operating conditions.

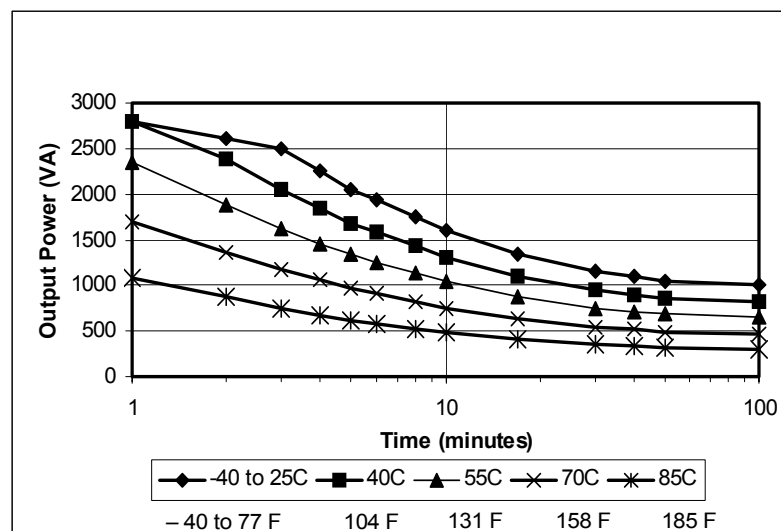


Figure 2-1 Output power versus time and temperature

Calculating Size of an AC Load

Operating time

To determine how long you can run your loads:

1. List all the AC loads you think you will use and determine their power requirement. You can usually find this information on a label near the power cord on the appliance.
2. Look in [Table 2-1 on page 2-6](#) to find the load's operating time or the operating time of a similarly sized appliance. The operating times shown in the table indicate approximately how long a load will run before the inverter-charger shuts down to prevent battery damage.

	<p>3. To find the running time for several loads running simultaneously, add their total wattage and look for an appliance with similar power requirement in Table 2-1.</p>
Battery condition	<p>The information in Table 2-1 assumes:</p> <ul style="list-style-type: none">• there is a properly maintained 12 volt 400 amp-hour battery bank, for example, 4 Group 31 (100Ah) deep-cycle truck batteries or 2 Group 4D batteries• the batteries have not been damaged by deep discharge and are relatively new
Factors affecting load	<p>Consider these factors when you are calculating loads:</p> <ul style="list-style-type: none">• Loads that exceed 1000 watts may be run for a short time (about one minute).• Loads which run continuously such as a reading light, TV or computer should not exceed more than 1000 watts in total.• Poor battery condition, low battery capacity, low battery temperature, and high ambient temperature will shorten the operating times listed in the table.• The presence of DC loads will reduce the operating times of the AC loads.

Table 2-1 Typical operating time with fully-charged 400 Ah deep-cycle batteries †

Appliance	Watts	Hours													
		10	20	2	3	5	10	15	20	30	45	70	85	100	
Electric shaver	15								†						
Table fan	15								†						
Video game	25														
Reading Lamp	40														
Notebook computer	75														
Computer printer	100														
Hand-held vacuum cleaner	100														
19 in TV/VCR combo	100														
3 cu. ft. refrigerator *	180														
Electric blanket	200														
Electric buffer	400														
Electric drill 1/2"	500														
Halogen work light	750														
Coffee maker	800														
Toaster	1000														
Microwave oven	1200														
Hair dryer	1500														

* Average

‡ The inverter-charger shuts down after 24 hours if it does not detect a load (or loads less than 20 watts.)

† Based on four minute operation timeout and shutdown at 10.6 V for loads more than 150 W and 10.8 V timeout and shutdown for loads less than 150 W at 77 °F (25 °C). *

Running the Alternator While Operating AC and DC Loads

Recharging

Running the alternator does not guarantee that the battery is being fully recharged by the alternator if you are running a combination of large AC and DC loads.

The alternator must provide more power than the draw of the combined DC and AC loads for your battery to fully recharge.

Example

This example for a 12 volt battery shows what happens if the alternator is overloaded.

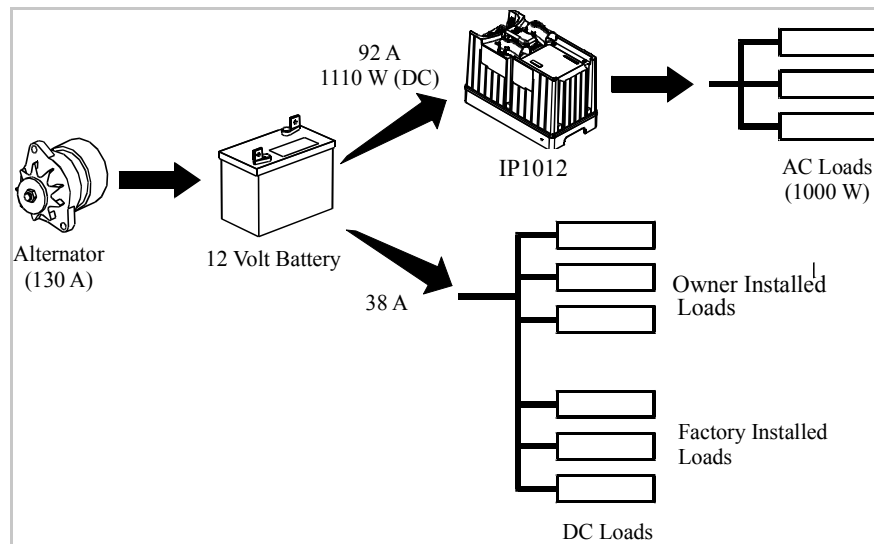


Figure 2-2 AC and DC loads powered by the alternator

The alternator is charging at 130 amps while the engine is running and there is a 1000 W (AC) load.

The efficiency of the inverter•charger is approximately 90%, which means it is drawing about 1100 W (DC) from the battery or 92 amps. This leaves 38 amps for all DC loads. If the DC loads require more than 38 amps, the battery will actually discharge even though the alternator is running.

Operation

Indication	<p>If the alternator is overloaded the:</p> <ul style="list-style-type: none">• battery voltage gauge on the instrument panel begins dropping from approximately 14 volts towards 12 volts.• Battery Power on the remote switch indicator signals a low battery with a slow blink• inverter shuts down at 10.6 volts and AC loads will stop operating <p>The battery voltage gauge will climb again as the alternator now has enough power to charge the battery</p>
Solutions	<p>You can reduce the AC or DC load on the battery or, for continuous operation of large AC and DC loads you can consider installing a larger alternator.</p>
Comment	<p>Small alternator overloads may not be immediately noticeable and can take several hours to discharge the batteries. Large overloads will discharge the battery in a shorter time.</p> <p>At low engine RPMs the alternator current will drop significantly causing alternator overload to occur even with reduced AC and DC loads.</p>

Using the Remote Switch

Switch settings The switch shown in [Figure 2-3](#) is used to disable the inverter. The charger is always on as long as shorepower is connected regardless of the switch position.

If the switch is ...	The inverter is ...
On	Providing AC to the outlets when there is no shorepower and the battery voltage is acceptable.
Off	Providing pass-through AC to the outlets only if there is shorepower. The inverter is disabled and will not provide AC power in the absence of shorepower.

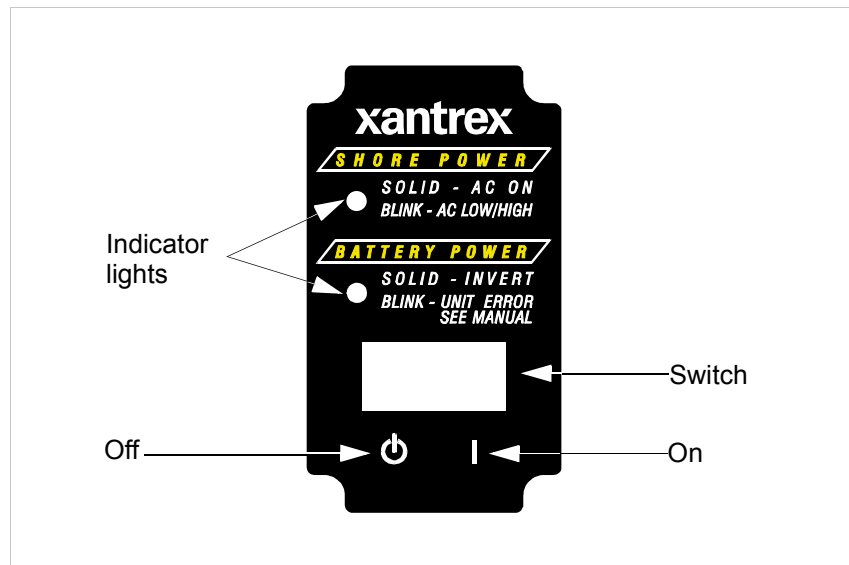


Figure 2-3 Remote switch with indicator lights

Operation

Switch indicators lights	The switch indicator lights provide information about the operating state of the inverter•charger. Under normal operating conditions the lights will behave like this:	
	Shore Power indicator:	Illuminated when there is shorepower. Blinks slowly (once per second) when first connecting to shorepower then lights steadily or it will continue to blink if the AC voltage is not within range (100 volts to 130 volts).
	Battery Power indicator:	Illuminated when the unit is inverting and there is no shorepower. If the indicator is blinking once every two seconds (very slow blink), it means the unit has shut down to avoid draining the batteries. A fast-blinking Battery Power indicator light indicates a unit fault. Refer to Chapter 4, “Troubleshooting” for more information.

Operating the Inverter•Charger

This section provides guidelines for operating the IP1012.

Turning the Inverter On and Running Loads

To run loads:

1. Turn the remote switch on by pressing to the right.
2. Check that the Battery Power indicator is illuminated and Shore Power indicator is off if you are not connected to shorepower.
3. Connect appliances one at a time to the inverter•charger. Don't connect too many high-surge appliances at once. Some appliances may halt or dim momentarily while another is starting up.

Running in Extremes Of Hot or Cold Temperatures

Hot	<p>In extremely hot conditions, the inverter may shut down sooner than it would in normal or cold temperatures.</p> <p>When the ambient temperature is high, reduce the number of loads.</p>
Cold	<p>In extreme cold temperatures, your batteries may have less stored energy. At 0 °F (– 18 °C) your battery has only half the standby power than it has at 77 °F (25 °C).</p>

Restarting After a Shutdown

If the loads stop operating suddenly, it usually means that the battery voltage is too low or you have drawn too much power for too long. Try restarting the inverter by turning the switch off, then on again. If you are running several loads, try disconnecting one or two of them before restarting. If the load doesn't start right away, let the inverter rest a few minutes, then try again. The sudden stoppage means your batteries should be recharged as soon as possible. If the inverter still refuses to power your loads, start the vehicle to charge the batteries.

Note: Turning the switch off, then on again to restart after a shutdown should only be considered a temporary measure. The batteries likely need to be recharged.

Battery Charging

Connection cord	When you are connected to shorepower, the Shore Power indicator is illuminated and the unit is both passing power through to the appliances and charging the batteries. To avoid low voltage problems, make sure your connection cord to shorepower is not too long or too light to support the loads you are running. A 14 or 12 gauge extension cord is recommended.
AC voltage	If the Shore Power indicator flashes slowly (about twice per second), this means the AC voltage is out of range and your batteries are not charging.

Using Shorepower

If you are running too many loads you may either trip the AC system breaker if one is installed, or the shorepower breaker. Reduce the load and reset the affected breaker.

The charger will automatically reduce battery charging if other AC loads are connected. This feature helps to prevent nuisance tripping of the shorepower breaker.

Miscellaneous Hints

Automatic shutdown	The inverter automatically turns off if it has not detected any AC loads for 24 hours or the loads are so small the inverter cannot detect them, such as an alarm clock or a small television (less than 10-20 watts).
Output power	The total output of the inverter•charger is 1000 watts and not 1000 watts per outlet (if there is more than one).

Note: The IP1012 does not provide any warning before it shuts down. If you need to operate a critical AC load, be sure there are no heavy loads connected and that the batteries have been recently charged.

Connect delay to AC power	If you are connected to shorepower, the Shore Power indicator should be on and the Battery Power indicator off. The Shore Power indicator may blink slowly when you first apply shorepower because of a connect delay (about 30 seconds), but then will illuminate steadily.
Load failure	If any loads fail to operate, or the inverter shuts down, refer to Chapter 4, “Troubleshooting” for suggestions.

3

Maintenance

[Chapter 3, “Maintenance”](#) provides procedures for

- checking the terminal connections on the inverter-charger
- disconnecting the IP1012 from the batteries
- changing the overcurrent protection fuse
- removing or connecting the AC input and output cables.

Maintaining the Inverter-Charger

Before doing any maintenance on the IP1012, review all safety instructions in [“Important Safety Information”](#) on [page v](#).



WARNING

The metal base of the IP1012 may be hot when operating in high ambient temperatures. Do not touch the metal until the unit has cooled down.

Checking Terminals

To check that the battery cables are firmly connected, you will need to remove the terminal caps.

To remove the terminal cap:

1. Using a flathead screwdriver as shown in [Figure 3-1](#), place the blade in the lip of the cap and push it gently against the cap until it lifts off.
2. To replace the cap, place it over the terminal and push down until it snaps into place.

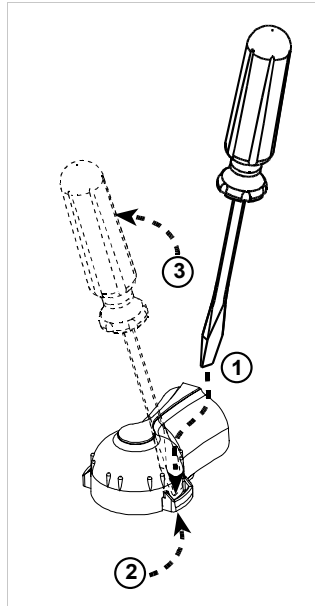


Figure 3-1 Removing the terminal cap

Disconnecting and Connecting from the Batteries

Disconnecting



WARNING: Explosion or Fire

Make sure the battery compartment is well ventilated. Flammable fumes are often present when working with batteries.

To disconnect from the battery:

1. Disconnect the shorepower cable and turn the inverter-charger off from the remote switch.
2. Remove the inverter-charger cables from the battery by first disconnecting the negative cable first at the inverter-charger. Then disconnect the positive and negative cables at the battery.

3. If you are replacing batteries, make sure they are flooded, lead-acid batteries and that they are all the same capacity and age as the others in the bank.
4. Disconnect the ground wire if the unit must be removed from its mounting bracket.

Connecting

To connect to the batteries:

1. Ensure shorepower is disconnected and the inverter-charger is off.
2. Connect the ground wire if it was previously removed.



CAUTION: Reverse Polarity

Do not connect cables in reverse polarity. If you do, the fuse will blow and the unit could be damaged.



WARNING: Explosion or Fire

Do not complete the next step if flammable fumes are present. Explosion or fire may result. Thoroughly ventilate the battery compartment before making this connection.

3. To reconnect the cables:
 - a) Connect the positive battery cable on the battery.
 - b) Connect the negative battery cable on the battery.
 - c) Connect the other end of the negative cable to the negative terminal on the IP1012. You may hear a “pop” and see a spark when you make the last connection.
4. Tighten to a torque of 12 to 15 ft-lbs (+/-10%).
5. Check that the inverter is operating by enabling it from the remote switch as explained in [“Using the Remote Switch” on page 2-9](#).

Replacing the Fuse



WARNING: Correct fuse type

To reduce the risk of fire and electrical hazards, replace the fuse only with a fuse of the same type and rating.

Using the wrong fuse type can damage the unit and void your warranty.

The inverter-charger over-current protection fuse, shown in [Figure 1-1](#), protects the unit from internal failure or reverse polarity when connecting it to the battery. If the fuse blows for any reason, replace it with *only* the fuse types listed below.

- Littelfuse Mega® Fast Blow, 250 A, 32 V; part number 298250
- Bussmann® 250 A 48 V; part number AMG-250

To replace the fuse:

1. Lift the fuse cover off as shown in [Figure 3-2](#).

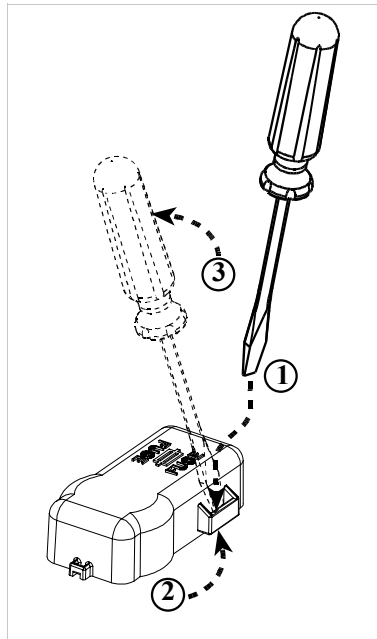


Figure 3-2 Removing the fuse cover

2. Remove the blown fuse and install the new fuse.

Be sure to use a lock washer when replacing the nuts. Tighten to a torque of 4 to 5.5 ft-lb (5.5 to 7.5 Nm).



CAUTION: Do not overtighten fuse nuts!

-
3. Replace the fuse cover by placing it over the fuse and pressing down until it snaps into place.

If the fuse blows a second time without being able to operate the unit, do not change the fuse again. Call your authorized Xantrex dealer.

Removing and Reconnecting AC Cables

To remove the AC cables:

- Grasp the knurled surface of the connector housing as shown in [Figure 3-3](#) and turn counter clockwise approximately one-half turn. Gently pull the cable out by grasping the connector.

To reconnect:

1. Align the key of the connector with the slot on the terminal of the IP1012.
2. Insert the connector firmly. Turn the connector housing clockwise 1/2 turn until you feel resistance, then another 1/8 turn until it locks into place.

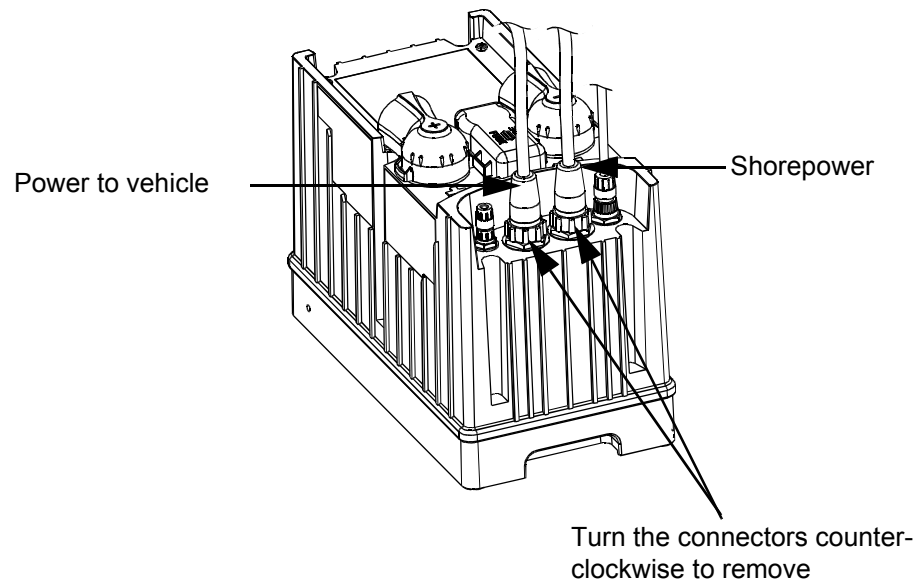


Figure 3-3 AC input and output cables

4

Troubleshooting

Chapter 4, “[Troubleshooting](#)” provides information to help you identify common problems which may occur. Read this chapter before calling your authorized Xantrex dealer. If you cannot solve the problem, record the details as suggested on “[Information About Your System](#)” on page B–7, then call your dealer.

Troubleshooting

Common Problems

The unit shuts down during operation for four main reasons:

- low battery—when the battery reaches approximately 10.6 VDC for more than four minutes with loads greater than 150 watts , or 10.8 VDC for loads less than 150 watts.
- high battery—when the battery voltage exceeds 16 VDC
- overload—when the AC load connected to the inverter exceeds the rated load
- over temperature—when the internal temperature thresholds are reached

Table 4-1 lists problems you may encounter and offers suggestions to fix them.

Table 4-1 Troubleshooting reference

Symptom	Possible Problem	Remedy
Loads will not start when there is no shorepower.	Inverter is not turned on.	Turn the inverter on.
	Batteries are at low voltage.	Recharge the batteries by running the engine or connecting to shorepower.
	Inverter is too hot	Wait until the inverter has cooled down.
Loads stop running almost as soon as they start.	Load is too heavy.	Reduce the load.
	Batteries are at low voltage level.	Recharge the batteries by running the engine or connecting to shorepower.
	Bad battery cable or corroded battery terminals.	Check the cable and connectors.
	Batteries are in poor condition.	Test and replace, if necessary

Table 4-1 Troubleshooting reference (Continued)

Symptom	Possible Problem	Remedy
Loads stop operating without warning after they have been running. Shorepower is not connected.	Too many appliances have reduced the battery voltage to shutdown level.	Reduce the number of loads. Allow the inverter to cool and restart. Recharge the batteries.
	Ambient temperature is too high.	Disconnect appliances and let the unit cool down.
The inverter will not work even after toggling the switch, charging the batteries, and letting the unit cool down.	Remote switch may be disconnected at the unit	Check that the remote switch is firmly connected.
	Fuse on the unit (shown in Figure 1-1) may have blown	Replace the fuse or return the unit to an authorized Xantrex dealer.
AC voltage at receptacles reads low.	Wrong type of voltmeter being used.	Use a true RMS meter
In inverter mode, times to shutdown are getting shorter for the same kind of AC load	Bad battery cable or corroded battery terminals.	Check the cables and connectors
	Batteries too old or damaged.	Replace the batteries.

Blinking Lights on the Remote Switch

You may encounter different sequences of blinking lights when the inverter is enabled (switch is on) or the unit is charging (switch is off). Light sequences are described as follows:

Fast blink	Light is on for 1/4 second and off for 1/4 second
Slow blink	Light is on for 1/2 second and off for 1/2 second
Very slow blink	Light is on for one second and off for one second

Table 4-2 explains the blinking pattern of the Shore Power indicator when the inverter is connected to shorepower.

Table 4-2 Shore Power indicator blink patterns

Battery Power Indicator	Shore Power indicator	Condition
Off	On	Connected to shorepower within 100 to 130 VAC range and battery charger is operational
Off	Very slow blink	<ul style="list-style-type: none"> • Delay on transfer from the inverter to shorepower • AC power is not in range (outside 100 to 130 VAC range) • Battery is not being charged. AC output load may be too great • Extension cord to shorepower may be too long or not of sufficient conductor size, resulting in voltage drop

Table 4-3 explains the Battery Power indicator flashing pattern when the unit is in invert mode or in charge mode.

Table 4-3 Battery Power indicator blink patterns

Unit in invert mode	Unit in charge mode	Condition
Slow blink	N/A	Low battery
Fast blink	Fast blink	High battery
Fast blink	Slow blink	Unit over temperature and has shut down
Fast blink	Slow blink	Ambient temperature too high and unit has shut down
Slow blink	N/A	Over current
Very slow blink	N/A	Auto shutdown. Inverter has shut down because no load has been detected in 24 hours or the load is too small to detect

A

Specifications

[Appendix A](#) contains the inverter, charger, and transfer specifications for the IP1012. The specifications show rating curves for output surge, current versus temperature, and pass-through current. Appendix A also illustrates the three-stage charging profile used by the unit.

All specifications are subject to change without notice.

Physical Specifications

Physical specifications	
Enclosure	Sealed; dust and water-resistant; ignition protected
Dimensions	Approximately. 8.5" (21.8 cm) H x 7" (17.7 cm) W x 13.0"(33.0 cm) D, excluding DC ground connector (similar to Group 31 battery dimensions)
Net weight	30 lbs. (13.6 kg) maximum without mounting brackets or external cables
External finish	Base - Clear anodized aluminium. Cover -Black polycarbonate/ABS plastic
Mounting Orientation	Upright only
Mounting method	Four M8x1.25 threaded holes accessible from bottom only, one in each corner, and/or battery hold-down bar over center top of cover. Recommended torque: 5-6 ft-lb (7-8 Nm)
Battery cable	#2/0 AWG Minimum, maximum 6 feet long, each way
Battery size 12 volt	225 Ah minimum to prevent overstress of battery in charge mode; 400 Ah recommended

Inverter Specifications

All inverter specifications are at nominal conditions; 77 °F (25 °C), 1000 W resistive load, 12 VDC inverting on the IP1012, 120 VAC, unless otherwise specified.

Inverter specifications	
Output wave form	Modified sine wave
Output power continuous	1000 VA continuous at 77 °F (25 °C)
Surge rating	3000 VA for 30 seconds at –40 °F to 77 °F (–40 °C to 25 °C) See Figure A-1 for output at different temperatures.
Operating voltage range	10.4 VDC to 16.0 VDC
Input DC voltage rating	12 VDC
Output voltage	120 VAC RMS
Output voltage regulation	108 to 125 VAC under steady state 0 to 1000 W load with 10.6 to 14.5 VDC input at 25 °C (77 °F) 108 to 132 VAC up to 1000 W, 10.6 to 16 VDC input at –40 °F to 185 °F (–40 °C to 85 °C)
Output frequency	60.0 ± 0.1 Hz from –40 °F to 185 °F (–40 °C to 85 °C) ambient temperature
Power factor allowed	All (0 to 1, leading or lagging)
Peak efficiency	Greater than 93% at 12.6 VDC input at 77 °F (25 °C)
Idle power consumption	Less than 15 W (inverting with 120 VAC output and no load)
Auto-shutdown mode	Inverter output is less than 15 ± 5 W and battery is less than 13 VDC for 24 hours

Inverter specifications (Continued)	
Shutdowns and Restarts	
DC low voltage shutdown	<ol style="list-style-type: none"> 1. Battery voltage drops below 10.6 ± 0.15 VDC at heavy loads (more than 150 W) or 10.8 VDC at light loads (less than 150 W) for more than 4 min and 10 sec (± 30 s) 2. Battery voltage is below 10.4 ± 0.2 VDC for 3 seconds
DC low voltage restart	12.5 ± 0.15 VDC
DC high voltage shutdown	16.0 ± 0.2 VDC
DC high voltage restart	Less than 16.0 VDC same as DC high voltage shutdown. There is no hysteresis.

Charger Specifications

All charging specifications are at nominal conditions: 77 °F (25 °C), 14.0 VDC at 50 A charging, 120 VAC, 60 Hz unless otherwise specified.

Charger specifications	
Charging method	<ul style="list-style-type: none"> • Three-stage charging with battery temperature compensation. See Figure A-3. • Algorithm for generic flooded batteries only • No equalization mode
AC input voltage	100–130 VAC
AC input frequency	54–66 Hz
Minimum battery voltage	7 VDC The charger does not operate below this level
Maximum charger input current	13.0 Aac _{rms}
Maximum charge rate	50 ± 5 ADC. See Figure A-2 on page A-6
Charger efficiency	Greater than 80%
Absorption charge voltage	14.3 ± 0.3 VDC at 77 °F (25 °C)

Charger specifications (Continued)	
Float charge voltage	13.4 ± 0.3 VDC at 77 °F (25 °C)
Temperature compensation	– 0.023 VDC from –2 °C to 85 °C (28.4 °F to 185 °F). Below –2 °C, the charger voltage defaults to the – 2 °C voltage
Overvoltage shutdown	Greater than or equal to 15.3 ± 0.3 VDC

Transfer and General Specifications

Transfer and general specifications	
AC input/bypass current	15 AAC maximum continuous at 122 °F (50 °C) Derates to 5 AAC at 185 °F (85 °C)
Transfer speed	10–40 ms typical
AC low voltage transfer	90 ± 5 VAC
AC low voltage restart	95 ± 5 VAC, 30 second delay
AC high voltage transfer	None
Standby/off consumption	< 0.7 watts at 12.5 VDC with charger and inverter both off
Operating temperature range	– 40 °F to +185 °F (– 40 °C to +85 °C)
Storage temperature range	– 40 °F to +185 °F (– 40 °C to +85 °C)
Altitude limit	15 000 feet (5000 metres)
AC neutral to ground bonding	Invert mode: AC output neutral is connected to AC ground (chassis). Charge mode: AC output neutral is connected to AC input neutral. AC input neutral is always isolated from AC ground.

Rating Curves and Charging Profiles

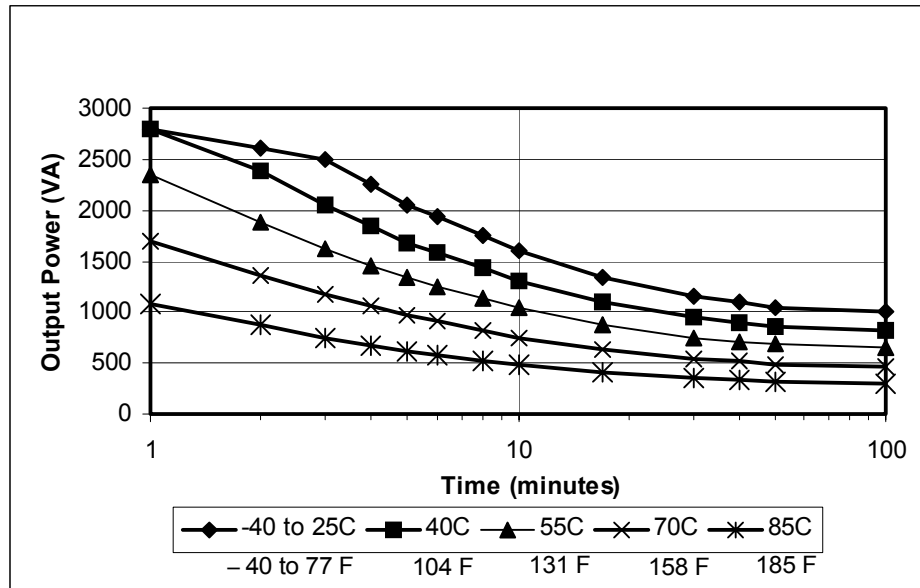


Figure A-1 Output surge rating

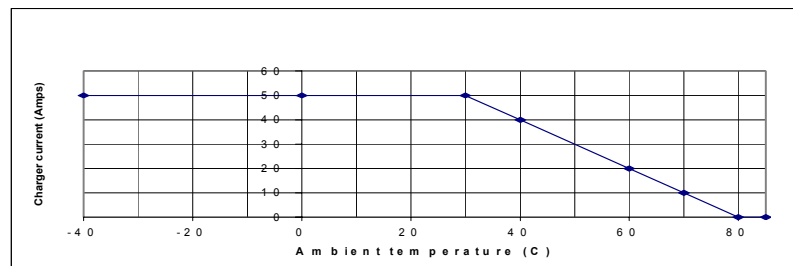


Figure A-2 Charging current versus temperature derating curve

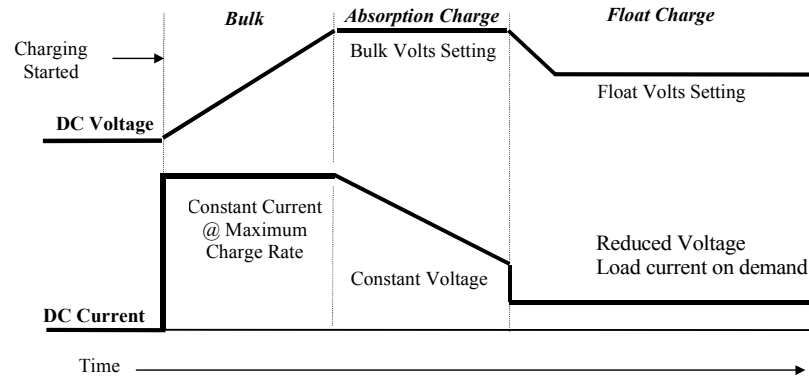


Figure A-3 Three-stage charging profile

B

Product and System Information

[Appendix B](#) contains the warranty for your IP1012 as well as instructions for returning the product for servicing.

[Appendix B](#) also has a form where you can record information about your system in case you need to contact Customer Service.

Warranty

What does this warranty cover? This Limited Warranty is provided by Xantrex Technology, Inc. ("Xantrex") and covers defects in workmanship and materials in your IP1012. This warranty lasts for a Warranty Period of one year from the date of purchase at point of sale to you, the original end user customer.

This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period.

What will Xantrex do? Xantrex will, at its option, repair or replace the defective product free of charge, provided that you notify Xantrex of the product defect within the Warranty Period, and provided that Xantrex through inspection establishes the existence of such a defect and that it is covered by this Limited Warranty.

Xantrex will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Xantrex reserves the right to use parts or products of original or improved design in the repair or replacement. If Xantrex repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater. All replaced products and all parts removed from repaired products become the property of Xantrex.

Xantrex covers both parts and labor necessary to repair the product, and return shipment to the customer via a Xantrex-selected non-expedited surface freight within the contiguous United States and Canada. Alaska and Hawaii are excluded. Contact Xantrex Customer Service for details on freight policy for return shipments outside of the contiguous United States and Canada.

How do you get service? If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Xantrex directly at:

Phone: 1-800-670-0707

Fax: 1-800-994-7828

Email: CustomerService@xantrex.com

Direct returns may be performed according to the Xantrex Return Material Authorization Policy described in your product manual. For some products, Xantrex maintains a network of regional Authorized Service Centers. Call Xantrex or check our website to see if your product can be repaired at one of these facilities.

In any warranty claim, dated proof of purchase must accompany the product and the product must not have been disassembled or modified without prior written authorization by Xantrex.

Proof of purchase may be in any one of the following forms:

- The dated purchase receipt from the original purchase of the product at point of sale to the end user, or
- The dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status, or
- The dated invoice or purchase receipt showing the product exchanged under warranty

What does this warranty not cover? This Limited Warranty does not cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. This warranty does not apply to and Xantrex will not be responsible for any defect in or damage to:

- the product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment;
- the product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Xantrex product specifications including high input voltage from generators and lightning strikes;
- the product if repairs have been done to it other than by Xantrex or its authorized service centers (hereafter "ASCs");
- the product if it is used as a component part of a product expressly warranted by another manufacturer;
- the product if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed.

DISCLAIMER

Product

THIS LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY PROVIDED BY XANTREX IN CONNECTION WITH YOUR XANTREX PRODUCT AND IS, WHERE PERMITTED BY LAW, IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS, GUARANTEES, REPRESENTATIONS, OBLIGATIONS AND LIABILITIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE IN CONNECTION WITH THE PRODUCT, HOWEVER ARISING (WHETHER BY CONTRACT, TORT, NEGLIGENCE, PRINCIPLES OF MANUFACTURER'S LIABILITY, OPERATION OF LAW, CONDUCT, STATEMENT OR OTHERWISE), INCLUDING WITHOUT RESTRICTION ANY IMPLIED WARRANTY OR CONDITION OF QUALITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE TO THE EXTENT REQUIRED UNDER APPLICABLE LAW TO APPLY TO THE PRODUCT SHALL BE LIMITED IN DURATION TO THE PERIOD STIPULATED UNDER THIS LIMITED WARRANTY.

IN NO EVENT WILL XANTREX BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING WHETHER IN CONTRACT OR TORT INCLUDING WITHOUT RESTRICTION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, ANY PERSONAL INJURY, ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE, OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.

Exclusions

If this product is a consumer product, federal law does not allow an exclusion of implied warranties. To the extent you are entitled to implied warranties under federal law, to the extent permitted by applicable law they are limited to the duration of this Limited Warranty. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply to you. This Limited Warranty gives you specific legal rights. You may have other rights which may vary from state to state or province to province.

WARNING: LIMITATIONS ON USE

Please refer to your product user manual for limitations on uses of the product. Specifically, please note that the IP1012 is not intended for use in connection with life support systems and Xantrex makes no warranty or representation in connection with any use of the product for such purposes.

Return Material Authorization Policy

Before returning a product directly to Xantrex you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

When you contact Xantrex to obtain service, please have your instruction manual ready for reference and be prepared to supply:

- The serial number of your product
- Information about the installation and use of the unit
- Information about the failure and/or reason for the return
- A copy of your dated proof of purchase

Return Procedure

1. Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging.
2. Include the following:
 - The RMA number supplied by Xantrex Technology Inc clearly marked on the outside of the box.
 - A return address where the unit can be shipped. Post office boxes are not acceptable.
 - A contact telephone number where you can be reached during work hours

- A brief description of the problem

Record these details in [“Information About Your System”](#) on page B–7

3. Ship the unit prepaid to the address provided by your Xantrex customer service representative.

If you are returning a product from outside of the USA or Canada

In addition to the above, you **MUST** include return freight funds and are fully responsible for all documents, duties, tariffs, and deposits.

If you are returning a product to a Xantrex Authorized Service Center (ASC) A Xantrex return material authorization (RMA) number is not required. However, you must contact the ASC prior to returning the product or presenting the unit to verify any return procedures that may apply to that particular facility.

Out of Warranty Service

If the warranty period for your IP1012 has expired, if the unit was damaged by misuse or incorrect installation, if other conditions of the warranty have not been met, or if no dated proof of purchase is available, your inverter•charger may be serviced or replaced for a flat fee.

To return your IP1012 for out of warranty service, contact Xantrex Customer Service for a Return Material Authorization (RMA) number and follow the other steps outlined in [“Warranty”](#) on page B–2.

Payment options such as credit card or money order will be explained by the Customer Service Representative. In cases where the minimum flat fee does not apply, as with incomplete units or units with excessive damage, an additional fee will be charged. If applicable, you will be contacted by Customer Service once your unit has been received.

Information About Your System

As soon as you open your IP1012 package, record the following information and be sure to keep your proof of purchase.

- ☐ Serial Number (top of cover on the product label) _____
- ☐ Purchased From _____
- ☐ Purchase Date _____

If you need to contact Customer Service, please record the following details before calling. This information will help our representatives give you better service.

- ☐ Type of installation (e.g. RV, boat, home) _____
- ☐ Length of time inverter-charger has been installed _____
- ☐ Battery/battery bank size _____
- ☐ DC wiring size and length _____
- ☐ Blinking pattern of Battery Power indicator? _____
- ☐ Appliances operating when problem occurred _____
- ☐ Description of problem _____

Index

A

- AC cables, removing or connecting 3–6
- AC load
 - calculating size 2–4
 - definition 2–2
 - factors affecting 2–2
 - types of 2–2
- AC power, connect delay 2–12
- ambient temperature
 - effect on operation 2–2, 2–11
 - effect on output power 2–3
- appliances
 - see AC load*
 - battery-operated vi
- auto shutdown feature 1–4
- automatic shutdown 2–12
- automatic transfer between
 - AC and DC 1–4

B

- batteries
 - disconnecting from 3–3
 - nickel-cadmium vi
 - precautions for working with vi
- battery charging 2–12
- battery condition, effect on AC loads 2–5
- battery operated appliances *see problem loads*
- battery packs vi
- Battery Power indicator
 - blink patterns 4–4

- breaker switch
 - resetting 2–12

C

- charger features 1–4
- charger specifications A–4
- charging batteries 2–12
- charging current 1–4
- cold temperatures, running in 2–11
- connect delay to AC power 2–12
- connection cord, recommended size 2–12
- current vs temperature derating curve A–6
- Customer Service
 - email B–2
 - fax number B–2
 - phone number B–2
 - preparing to call B–5

D

- DC loads
 - effect on operating times
 - of AC loads 2–3
- derating curves, current vs temperature
 - A–6
- dimmer switch *see problem loads*
- disconnecting from batteries 3–3

E

email, contacting Customer Service by B-2
explosive fumes 3-4
extension cord *see* connection cord
extension cord, length of 4-4

F

fax number for Customer Service B-2
Features of inverter•charger 1-2
flashlights *see problem loads*
fuse, over-current protection 1-3
fuse, replacing 3-5

H

high battery shutdown 4-2
hot temperatures, running in 2-11

I

indicator lights
 blinking patterns 4-2
inductive load *see AC loads*
inverter
 date of purchase B-3
 proof of purchase B-2
 purchase date B-5
 serial number B-3
inverter features 1-4
inverter specifications A-3

L

load management capability 1-5
low AC, causes of 4-4
low battery shutdown 4-2
low voltage shutdown 1-4

M

maintenance
 checking terminal connections 3-2
 replacing the fuse 3-5

N

nickel-cadmium batteries vi

O

operating time of AC loads (table) 2-6
output power of IP 1012 2-12
over temperature shutdown 4-2
overload shutdown 4-2

P

packaging product for return B-3
physical specifications A-2
problem loads 2-3
problems causing shutdown 4-2
proof of purchase B-2, B-5
purchase date B-5

R

rating curves
 output surge rating A-5
razors *see problem loads*
rechargeable tools *see problem loads*
recording information about your system B-5
remote switch
 blinking lights on the 4-3
remote switch to disable inverter 2-9
resistive load *see AC load, type of*
resistive loads, examples of 2-2
restarting after shutdown 2-11
Return Material Authorization number B-3
returning products, how to B-3

S

- safety information v
- safety monitoring feature 1–4
- serial number, providing to Customer Service B–3
- servicing, no user-serviceable parts v
- Shore Power indicator blink patterns 4–4
- shorepower, definition 1–4
- shutdown
 - automatic 2–12
 - restarting after 2–11
- shutdown, reasons for 4–2
- size of AC load, calculating 2–4
- surge capability 1–4
- surge loads, examples of 2–2

T

- telephone number for Customer Service B–2
- temperature *see ambient temperature*
- temperature and power, relationship of 2–3
- temperature and time derating curve (figure) 2–4
- terminals caps, removing 3–2
- three-stage charging profile A–6
- time, running time of AC loads 2–4
- transfer specifications A–5
- troubleshooting reference 4–2
- turning on unit with the remote switch 2–11

U

- using, guidelines for 2–11

V

- variable speed motor *see problem loads*

W

- warranty
 - obtaining service B–2
 - out of warranty service B–4
 - period of coverage B–2
 - terms and conditions B–2

