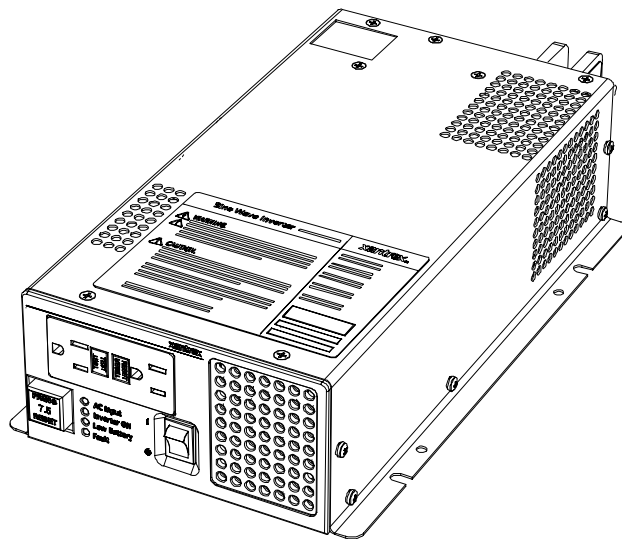


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## Owner's Guide

### XS400 Sine Wave Inverter

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# XS400 Sine Wave Inverter

## Owner's Guide

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Xantrex Technology Inc. is a world-leading supplier of advanced power electronics and controls with products from 50 watt mobile units to one MW utility-scale systems for wind, solar, batteries, fuel cells, microturbines, and backup power applications in both grid-connected and stand-alone systems. Xantrex products include inverters, battery chargers, programmable power supplies, and variable speed drives that convert, supply, control, clean, and distribute electrical power.

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# About This Guide

## Purpose

The XS400 Sine Wave Inverter Owner's Guide contains information for installing, operating, and troubleshooting the XS400 Sine Wave Inverter (XS400) and the S400 Remote Switch.

## Scope

This Guide provides safety guidelines, installation, operation, troubleshooting, and warranty information for the XS400 and S400 Remote Switch.

Basic information on battery types and sizes is provided in Appendix B, "Battery Types and Sizes". For comprehensive information about your battery, refer to the battery manufacturer's guide.

Service information is not included as the unit does not contain user-serviceable parts.

## Audience

This Guide is intended for anyone who needs to install and operate the XS400 Sine Wave Inverter and S400 Remote Switch. Installers should be certified technicians or electricians.

## Organization

The Owner's Guide is organized into four chapters and two appendixes.

Chapter 1, "Introduction", outlines the main performance and safety features of the XS400. Reading this chapter will give you a clear understanding of the inverter's capabilities.

Chapter 2, "Installation", provides detailed information for installing the XS400 and the S400 Remote Switch.

Chapter 3, “Operation”, provides information about operating the XS400 and S400 Remote Switch. Details are provided on how to read the front panel indicators to monitor the XS400.

Chapter 4, “Troubleshooting”, explains how to identify and solve problems that can occur with the XS400 and S400 Remote Switch.

Appendix A, “Specifications”, provides the electrical and physical specifications of the XS400.

Appendix B, “Battery Types and Sizes”, provides information that will help you to select, connect, and maintain batteries that are most appropriate for your application.

“Warranty and Product Information”, contains the product warranty, explains how to return a product for service, and describes how to prepare for a call to Xantrex Customer Service.

## Conventions Used

The following conventions are used in this guide.



### **WARNING**

Warnings identify conditions that could result in personal injury or loss of life.

---



### **CAUTION**

Cautions identify conditions or practices that could result in damage to the XS400 Sine Wave Inverter or to other equipment.

---

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**Note:** Notes describe additional information which may add to your understanding of how to use the XS400.

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**Important:** These notes describe an important action item or an item that you must pay attention to.

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## Acronyms and Terminology

AC	Alternating current
DC	Direct current
CSA	Canadian Standards Association
FCC	Federal Communications Commission
GFCI	Ground fault circuit interrupter
UL	Underwriters Laboratories Inc.
Hardwiring	to make a permanent electrical connection
Shore power	refers to the AC input power from a utility grid, generator, or other external AC source.

## Related Information

You can find more information about Xantrex Technology Inc. as well as its products and services at **[www.xantrex.com](http://www.xantrex.com)**





# Important Safety Instructions



## WARNING

This Owner's Guide contains important safety and operating instructions.

Before using your XS400 Sine Wave Inverter, be sure to read, understand, and save these safety instructions.

---



## WARNING: Restrictions on Use

The XS400 Sine Wave Inverter shall not be used in connection with life support systems or other medical equipment or devices.

---



## WARNING: Shock hazard

The XS400 has On/Standby mode only. It does not have an Off mode, that is, DC power is permanently connected to the unit.

---

## General Precautions

1. Before installing and using the inverter, read all appropriate sections of this guide and any cautionary markings on the inverter and the batteries.
2. Do not operate the inverter if it has received a sharp blow, been dropped, or otherwise damaged. If the unit is damaged, see "Warranty and Product Information" on page WA-1.
3. Do not dismantle the inverter; 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.** See "Warranty" on page WA-1 for instructions on obtaining service.

4. To reduce the risk of electrical shock, disconnect both AC and DC power from the inverter before working on any circuits connected to the inverter. Turning the On/Standby switch to Standby (⏻) will not reduce this risk.
5. Protect the inverter from rain, snow, spray, and water.
6. To reduce the risk of overheating, keep the ventilation openings clear, and do not install the inverter in a compartment with limited airflow.

## Precautions When Working With Batteries



### **WARNING: Explosion and Fire Hazard**

---

1. To reduce the risk of battery explosion, 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 engine or batteries.
4. Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.

## Explosive Gas Precautions

1. Batteries generate explosive gases during normal operation. Be sure you follow all relevant instructions exactly before installing or using your inverter.
2. This equipment contains components which tend to produce arcs or sparks. To prevent fire or explosion, do not install the inverter in compartments containing batteries or flammable materials or in locations that require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, as well as joints, fittings, or other connections between components of the fuel system.

## FCC Information to the User

This Class B device complies with Part 15 of the FCC Rules and all requirements of the Canadian Interference-Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



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# 1

## Introduction

Congratulations on your purchase of the Xantrex XS400 Sine Wave Inverter!

The XS400 has been designed to give you premium power, ease of use, and outstanding reliability. The XS400 is bundled with the convenient S400 Remote Switch.

Please read this chapter to familiarize yourself with the main performance and protection features of the XS400.

To ensure quality customer service for your inverter, be sure to keep your proof of purchase. Also, take a few minutes at this time to complete the form, “Information About Your System” on page WA-4.

## How XS400 Works

XS400 is a sine wave inverter which converts 12 volts direct-current (DC) power from your battery to 120 volts alternating current (AC) power. This AC power is the same as the electricity you get from your utility. In terms of output, XS400 provides 400 watts of sine wave power for operating your appliances.

## Premium Power and Ease of Use

XS400 provides premium power for your entertainment system and other home electronics. The inverter's sine wave output provides clean power for your TV, VCR, DVD, satellite receiver, stereo, lights, fans, and computers.

Superior features and rugged durability have been combined with ease of use:

- 400 watt inverter with 800 watt surge provides sufficient power for two entertainment systems
- Filtered sine wave output will not cause distortion on sensitive entertainment electronics
- Built-in transfer switch automatically transfers between inverter power and incoming AC power
- DSP control technology starts complex loads with ease
- Two GFCI outlets and hardwire AC connections
- Easy-to-read indicator lights on the front panel
- S400 Remote Switch provides On/Standby control from a convenient location
- Automatic cooling fan

## Comprehensive Protection

XS400 is designed to meet UL 458 and CSA C22.2 No. 107.1 safety standards and it is compliant with FCC Class B.

XS400 comes equipped with numerous protection features to guarantee you safe and worry-free operation.

Protection feature	This protection feature...
Low voltage indication and shutdown	Protects the battery from becoming completely discharged. The Low Battery light indicates that input voltage is low (10.7 volts). If the input voltage drops below 10.3 volts, the XS400 shuts down automatically and the Inverter ON light turns off. The XS400 recovers automatically when the input voltage comes up to about 12.6 volts.
High voltage shutdown	Protects the XS400 by disabling the AC output when the input voltage rises to 15.3 volts or more. The AC output is enabled when the input voltage drops to 14.5 volts.
Over-temperature shutdown	Disables the AC output of the XS400 when the internal temperature rises to unacceptable levels due to higher ambient temperature or overloading. The XS400 recovers automatically when it cools down.
Overload protection	Disables the AC output of the XS400 if the appliance connected to the inverter exceeds the 400 watt rating of the inverter. The XS400 will have to be reset. (See “Resetting After a Fault or Shutdown” on page 3–9.)
Supplemental circuit protection	Trips and disables the AC output when a current in excess of 7.5 amps is drawn from the XS400. The supplemental circuit protector can be reset to enable the unit to operate again after clearing the overload condition. (See “If there is a short circuit, the Supplemental Circuit Protection button trips.” on page 3–9.)
Short circuit protection	Disables the AC output of the XS400 when a short circuit is applied on the AC output. Once the short circuit is cleared, the XS400 will have to be reset. (See “Resetting After a Fault or Shutdown” on page 3–9.)
Ground fault circuit interrupter (GFCI)	Trips and disables the output of the XS400 when a ground fault current is detected. The output can be enabled again by resetting the GFCI, once the ground fault is cleared. (See “Ground Fault” on page 3–9.)

## XS400 Features

### Front Panel

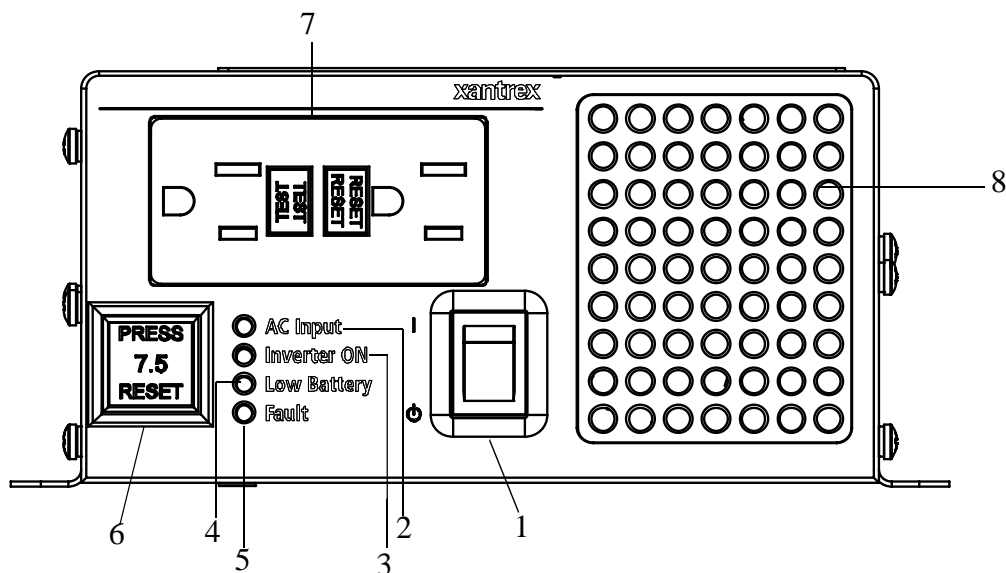
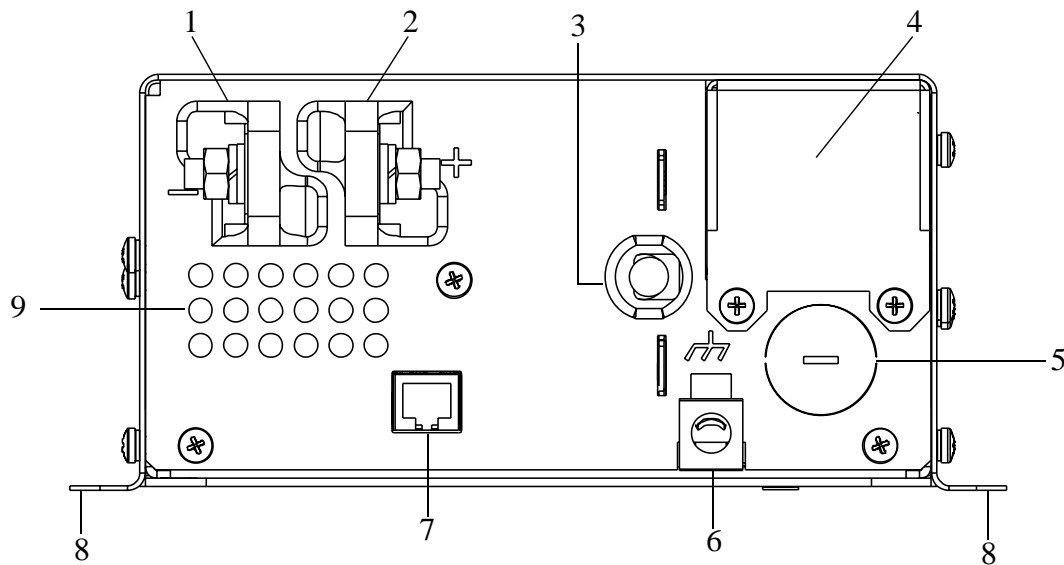


Figure 1-1 Front Panel of the XS400

Table 1-1 Front Panel Features

Feature	Description
1	<b>On/Standby Switch</b> turns the inverter to On (I) or to Standby (Φ).
2	<b>AC Input light</b> illuminates when you are connected to shore power. (Shore power refers to the AC input power from a utility grid, generator or external AC source.)
3	<b>Inverter ON light</b> illuminates only when the XS400 is operating in inverter mode.
4	<b>Low Battery light</b> illuminates when your battery voltage is lower than 10.7 volts.
5	<b>Fault light</b> illuminates for fault conditions such as over temperature, output overload, or battery over voltage.
6	<b>Supplemental Circuit Protection button</b> trips if there is an over-current (over 7.5 amps) or a short circuit.
7	<b>GFCI outlets</b> for connecting your appliances.
8	<b>Ventilation openings</b> provide air circulation for peak performance.

## Back Panel



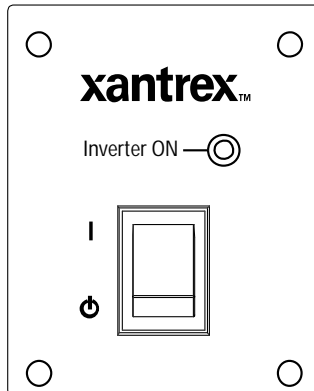
**Figure 1-2** Back Panel of the XS400

**Table 1-2** Back Panel Features

Feature	Description
1	DC terminal, negative
2	DC terminal, positive
3	AC input cord for shore power
4	Wiring box access panel (For a view with the panel removed, see “Completing the Hardwiring” on page 2–21.)
5	Knockout for AC output hardwiring
6	Chassis ground lug
7	Remote switch jack
8	Mounting flanges
9	Ventilation openings provide air circulation.

## S400 Remote Switch

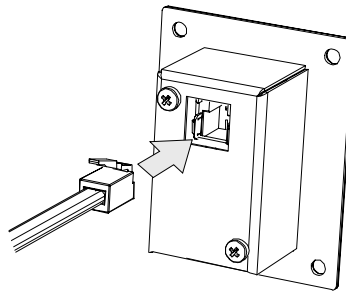
### Front Panel



**Figure 1-3** S400 Remote Switch

The On/Standby switch provides remote control when the XS400 is operating in invert mode.

### Back Panel



**Figure 1-4** Connecting Cable to the S400 Remote Switch

The telephone cable connects to the remote switch jack in the back.

# 2

## Installation

Chapter 2, “Installation”, provides detailed information for installing the XS400 and the S400 Remote Switch. This chapter provides:

- a system diagram
- safety instructions and installation codes that must be observed during installation
- a list of installation tools and materials
- detailed installation procedures
- chassis ground and DC cabling information
- procedures for hardwiring the AC output
- an illustration of inverter dimensions



### CAUTION

Be sure to read all instructions before installing and operating the XS400.

---

## Introduction

The system diagram shown in Figure 2-1 is the basic installation. Review this diagram carefully before installing the XS400.

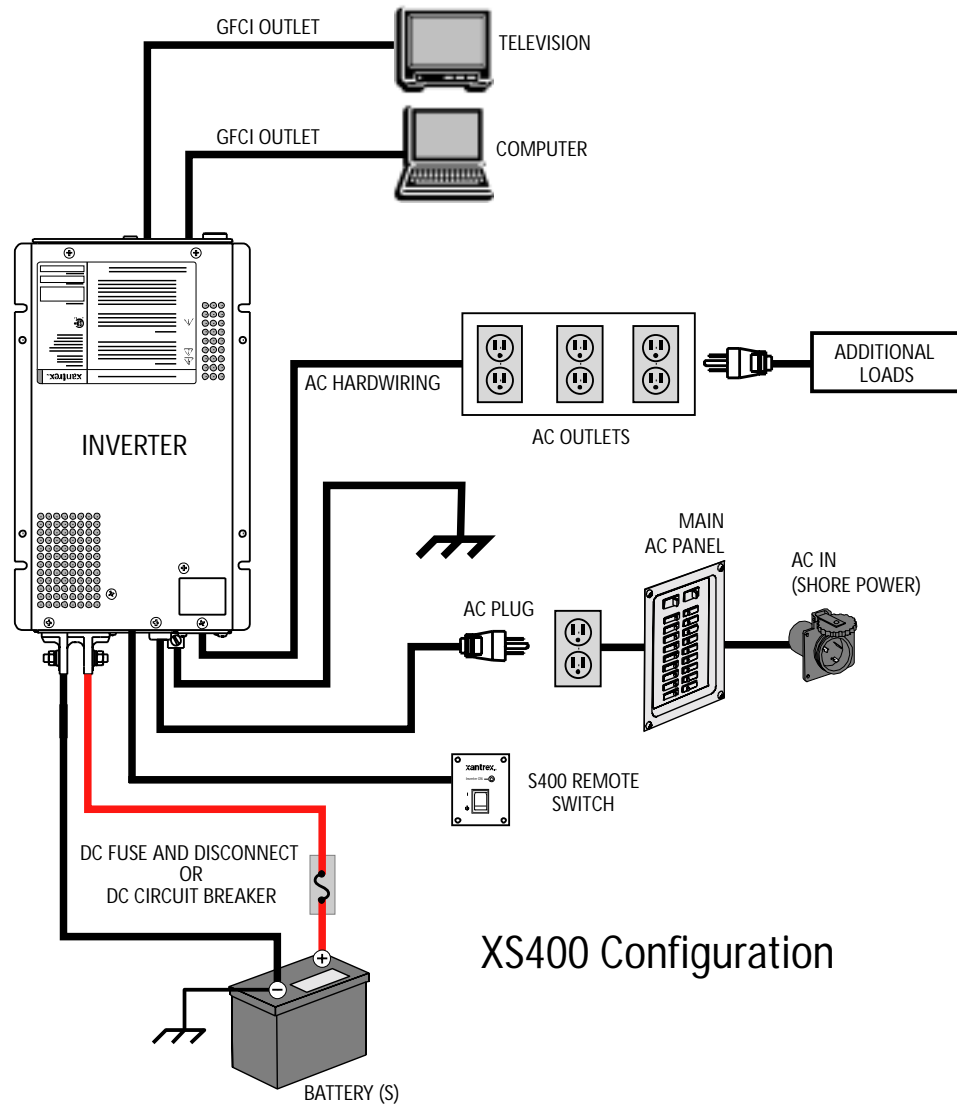


Figure 2-1 System Diagram



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## Preparing for Installation

Read this entire installation chapter so you can plan the installation from beginning to end. Prior to beginning your installation, review the “Important Safety Instructions” on page vii.



### **WARNING: Electrical shock and fire hazards**

Xantrex recommends all wiring be done by qualified personnel. Disconnect all AC and DC power sources to prevent accidental shock. Disable and secure all AC and DC disconnect devices and automatic generator starting devices.

It is the installer’s responsibility to ensure compliance with all applicable installation codes and regulations.

---



### **WARNING: Fire hazard**

To meet regulatory requirements, the XS400 must be mounted on a flat horizontal surface with the front panel in the upright position.

---

## Installation Codes

It is the installer’s responsibility to determine which codes apply and to ensure that all applicable installation requirements are met.

Applicable installation codes vary depending on the specific location and application of the installation. Some examples are:

- The U.S. National Electrical Code (NEC)
- The Canadian Electrical Code (CEC)
- Canadian Standards Association (CSA), and RV Industry Association (RVIA) requirements for installation in RVs.



### **WARNING: Restrictions on Use**

The XS400 Sine Wave Inverter shall not be used in connection with life support systems or other medical equipment or devices.

---

## Materials List

Your XS400 Sine Wave Inverter package includes:

- One XS400 Sine Wave Inverter
- One S400 Remote Switch
- 25 ft. (7.5 m) telephone cable
- XS400 Sine Wave Inverter Owner's Guide

After you unpack your XS400, be sure to record the product information in the form "Information About Your System" on page WA-4.

If any of these materials are missing or unsatisfactory, please contact Customer Service.

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

1-604-422-2777 (direct)

Fax 1-604-420-2145

Email [CustomerService@xantrex.com](mailto:CustomerService@xantrex.com)

Web [www.xantrex.com](http://www.xantrex.com)

## Installation Tools and Materials

You will need the following tools and materials to install the XS400 and the S400 Remote Switch:

### Tools

To install the XS400, you need:

- ☐ Phillips screwdriver: #2
- ☐ Slot screwdrivers: 1/8 inch and 1/4 inch
- ☐ Wrench for DC terminals: 10 mm or adjustable
- ☐ Wire stripper

To install the S400 Remote Switch, you need:

- ☐ Power drill with 1/8-inch bit
- ☐ Jigsaw (optional)
- ☐ Feed wire (optional)

---

## Materials for XS400 and S400 Remote Switch

To install the XS400 and S400 Remote Switch, you require:

- ☐ DC cables (See Table 2-1 on page 2–9.)
- ☐ Appropriately sized connectors. Two DC connectors suitable for ¼ inch (6 mm) that go on the DC input cable terminals. The other cable connectors will depend on your installation.
- ☐ Crimping tool for fastening lugs and terminals on DC cables (You may find it more convenient to have the crimp connectors attached by the company that sells you the cable.)
- ☐ DC fuse and Disconnect or DC circuit breaker (See page 2–9.)
- ☐ Four #10 hardware fasteners to mount the XS400
- ☐ Four #6 self-tapping screws to mount the S400 Remote Switch

## Materials for AC output hardwiring

- ☐ Cable requirements:
  - within the range of No. 14 to No. 18 AWG (minimum size)
  - 3 conductors
  - solid or stranded
- ☐ 1/2 inch cable clamp

# Installing the XS400

## Overview

This chapter provides detailed information on installing the XS400. The overall procedure is divided into twelve steps:

1. Designing your installation (page 2–6)
2. Mounting your inverter (page 2–10)
3. Connecting the chassis ground (page 2–11)
4. Installing the S400 Remote Switch (page 2–12)
5. Getting ready to connect the DC cables (page 2–14)
6. Routing the DC cables (page 2–15)
7. Connecting the DC cables (page 2–16)
8. Connecting your appliances to the GFCI outlets (page 2–18)
9. Hardwiring the AC output (page 2–19)
10. Performing checks prior to initial start-up (page 2–22)
11. Connecting the AC input cord (page 2–22)
12. Testing your installation (page 2–23)

## Step 1: Designing Your Installation

Before doing anything else, you need to determine how you are going to use your XS400, and then design a power system that will give you maximum performance. The more thorough your planning, the better your power needs will be met. In particular, you will need to:

- Be aware of installation codes
- Choose an appropriate location
- Calculate your battery requirements and appropriate battery size
- Calculate the DC cable size
- Select the correct DC fuse and Disconnect or the DC circuit breaker

## Installation Codes

See “Installation Codes” on page 2–3 for more information.

## Choosing a Location



### **WARNING: Risk of fire or explosion**

This equipment contains components that could produce arcs or sparks. To reduce the risk of fire or explosion, do not install this equipment in compartments containing batteries or flammable materials, or in locations that require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connections between components of the fuel system.



### **WARNING: Fire hazard**

Do not cover or obstruct the ventilation openings. Do not install this equipment in a compartment with limited airflow. Overheating may result.

The inverter should only be installed in a location that meets the following requirements:

Dry	Choose a dry location. Do not allow water or other fluids to drip or splash on the inverter. Do not expose to rain, snow or splashing water.
Cool	Normal air temperature should be between 32 °F (0 °C) and 104 °F (40 °C) — the cooler the better within this range.
Ventilated	The inverter requires air circulation to maintain optimum operating temperature and provide best performance. If the unit has inadequate ventilation, it may shut down due to overheating. Allow as much space around the ventilation openings as possible. Xantrex recommends that other objects be at least 3 inches (76 mm) away from the ventilation openings for best performance. The air vented through the openings should also have a path to circulate away from the inverter.
Safe	Do not install the inverter in the same compartment as batteries or in any compartment containing flammable liquids like gasoline.

## Installation

---

Close to battery compartment	Long DC cables must be very large (and expensive), so they should be kept short (see Table 2-1 on page 2-9). However, the unit should NOT be installed in the battery compartment due to the possible presence of explosive hydrogen gas from the batteries.
Protected from battery acid and gases	Never allow battery acid to drip on the inverter or its wiring when filling the batteries or reading their specific gravity. Do not mount the unit where it will be exposed to gases produced by the batteries. These gases are corrosive and prolonged exposure will damage the inverter.
Orientation	To meet regulatory requirements, the XS400 must be mounted on a flat horizontal surface with the front panel in the upright position.

## Battery Requirements



### CAUTION

The XS400 Sine Wave Inverter must only be connected to batteries with a nominal output voltage of 12 volts. The XS400 Sine Wave Inverter will not operate from a 6 volt battery and will be damaged if connected to a 24 volt battery.

---

The batteries that you use strongly affect the performance of the XS400. It is important to connect the inverter to the correct size and type of battery. See Appendix B, “Battery Types and Sizes” on page B-1 for more information.

---

## DC Cables

For the best load starting performance, the DC cables should be as short and large as possible. See Table 2-1 for minimum recommended cable size. Using a smaller cable may cause the inverter to shut down under heavy load. A larger cable may be used.

**Table 2-1** Minimum Recommended DC Input Cable (copper) — AWG

Cable Length: Battery to Inverter (each cable)	Minimum Recommended Cable Size — AWG
0–10 feet (0–3 meters)	No. 6
10–15 feet (3–4.5 meters)	No. 4
15–30 feet (4.5–9 meters)	No. 2
30–40 feet (9–12 meters)	No. 0

## DC Fuse and Disconnect or DC Circuit Breaker

If you are using a DC fuse and Disconnect, a maximum 80 amp Class T fuse shall be used for the DC fuse. A fuse of lower rating can be used, but it shall not be lower than 60 amp Class T. The Disconnect shall be rated at least 50 amps.

Alternately, a DC circuit breaker rated 50 amps can be used.

## Step 2: Mounting Your Inverter

Mount your inverter before you connect any wires or cables.

For your convenience, the inverter dimensions are provided in Figure 2-9 on page 2–25.



### **WARNING: Fire hazard**

To meet regulatory requirements, the XS400 must be mounted on a flat horizontal surface with the front panel in the upright position.

---

#### **To mount your XS400:**

1. Turn the On/Standby switch on the front panel of the inverter to Standby (⏻) position.
2. Select an appropriate mounting location and orientation.  
See “Choosing a Location” on page 2–7.
3. Hold the inverter against the mounting surface, mark the position of the mounting screws, and then remove the inverter.

OR

Use “Inverter Dimensions” on page 2–25 to mark the position of the mounting screws.

You can also download a full scale version of the mounting template from [www.xantrex.com](http://www.xantrex.com)

4. Pilot drill the four mounting holes.
5. Fasten the inverter to the mounting surface with four #10 hardware fasteners.



---

## Step 3: Connecting the Chassis Ground

The chassis ground lug is used to connect the chassis of the inverter to your system's chassis grounding point, as required by installation codes.

Use copper cable that is either bare or provided with green insulation. Do not use the chassis ground lug for your AC output grounding wire.

### To connect the chassis ground:

Refer to Figure 2-2.

1. Using the 1/4 inch slot screwdriver, loosen the screw on the chassis ground lug.
2. Connect a No. 8 AWG copper cable between the inverter's chassis ground lug and the DC grounding point for your system.

In an RV or vehicle installation, this will usually be the vehicle chassis or a dedicated chassis ground bus.

3. Tighten the screw to a torque of 6–7 lbf-in (0.68–0.79 Nm).

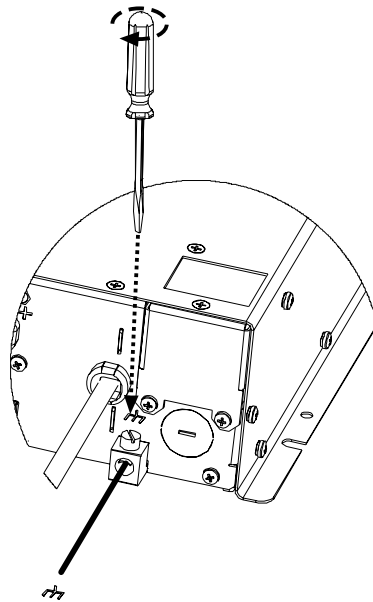


Figure 2-2 Connecting the Chassis Ground

---

## Step 4: Installing the S400 Remote Switch

---



### **WARNING: Shock hazard**

Before making an opening in a wall, bulkhead or panel, ensure there is no wiring or other obstruction within the wall.

---



### **WARNING: Shock hazard**

Ensure both the S400 Remote Switch and the XS400 are in Standby (Φ) mode before installing.

---

Installing the S400 Remote Switch is optional. The XS400 operates normally without the remote switch.

The S400 Remote Switch is designed to be flush mounted on a wall, bulkhead or panel. A 25 foot (7.5 meter) telephone cable is supplied with the remote switch.

If you want to extend the cable, use a high quality, 4-wire telephone extension cable with 6-position, 4-contact connectors. The maximum recommended cable length is 50 feet (15 meters).

For your convenience, a full scale mounting template is provided. See “S400 Remote Switch Mounting Template (Scale approximately 1:1)” on page 2-27.

---

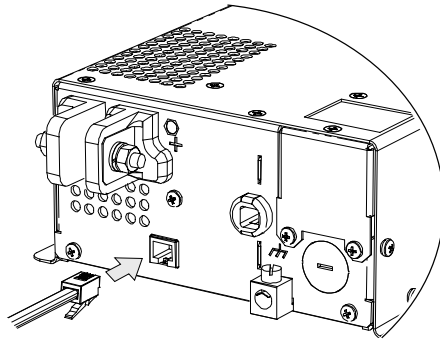
**Note:** The S400 Remote Switch connects to a jack at the back of the inverter. See “System Diagram” on page 2-2.

---

### **To install the remote switch:**

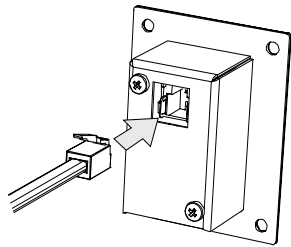
1. Choose a location that is dry, free from corrosive or explosive fumes, and otherwise appropriate for installing an electronic device.
2. Using the template, pilot-drill the mounting holes. Cut an opening about 2 inches x 1.2 inches (50 mm x 30 mm) and 1.4 inches (35 mm) deep.
3. Route the telephone cable inside the wall and through the opening to the inverter.

4. Connect one end of the telephone cable to the back of the inverter as shown in Figure 2-3.



**Figure 2-3** Connecting Cable to the XS400

5. Connect the other end of the telephone cable to the remote switch as shown in Figure 2-4.



**Figure 2-4** Connecting Cable to the S400 Remote Switch

6. Place the remote switch in the opening and secure it with the four #6 fasteners.

## Step 5: Getting Ready to Connect the DC Cables

The DC cables should be as short as possible and large enough to handle the required current, in accordance with the electrical codes or regulations applicable to your installation. The minimum recommended DC cable size is specified in Table 2-1 on page 2-9. For the recommended DC fuse and Disconnect or DC circuit breaker, see page 2-9.

### **To prepare the DC cables:**

Refer to Figure 2-5, “Connection Order for DC Cables” on page 2-16.

1. Cut the negative cable to the recommended length. (See Table 2-1 on page 2-9 for DC cable size.) Strip off enough insulation so you can install the terminal you will be using.

Xantrex recommends the use of crimp connectors such as a ring lug type. The connector should be designed for a 6 mm or 1/4 inch stud size to connect to the XS400 Sine Wave Inverter. If a crimp connector is used, it should be crimped using the tool indicated by the connector manufacturer.

2. Cut two lengths of positive cable. One cable (maximum 18 inches) goes from the battery to the DC fuse and Disconnect or to the DC circuit breaker. The other cable goes from the DC fuse and Disconnect or to the DC circuit breaker to the positive DC terminal.
3. Attach the connectors to the ends of both cables. Make sure no stray wire strands protrude from the terminals.

---

## Step 6: Routing the DC Cables



### **WARNING: Fire and shock hazard**

Route the cables away from sharp edges which might damage the insulation. Avoid sharp bends in the cable.

---

### Guidelines for Routing the DC Cables

- Do not attempt to use the chassis in place of the battery negative connection for grounding. The inverter requires a reliable return path directly to the battery.
- To reduce the chance of interference, keep the positive and negative cables close together—ideally, tied together at regular intervals as shown in Figure 2-5, “Connection Order for DC Cables” on page 2–16.
- To ensure maximum performance from the inverter, do not route your DC cables through a DC distribution panel, battery isolator, or other device that will cause additional voltage drops. The exception is the DC fuse and Disconnect or the DC circuit breaker which is required to protect the DC wiring.

## Step 7: Connecting the DC Cables

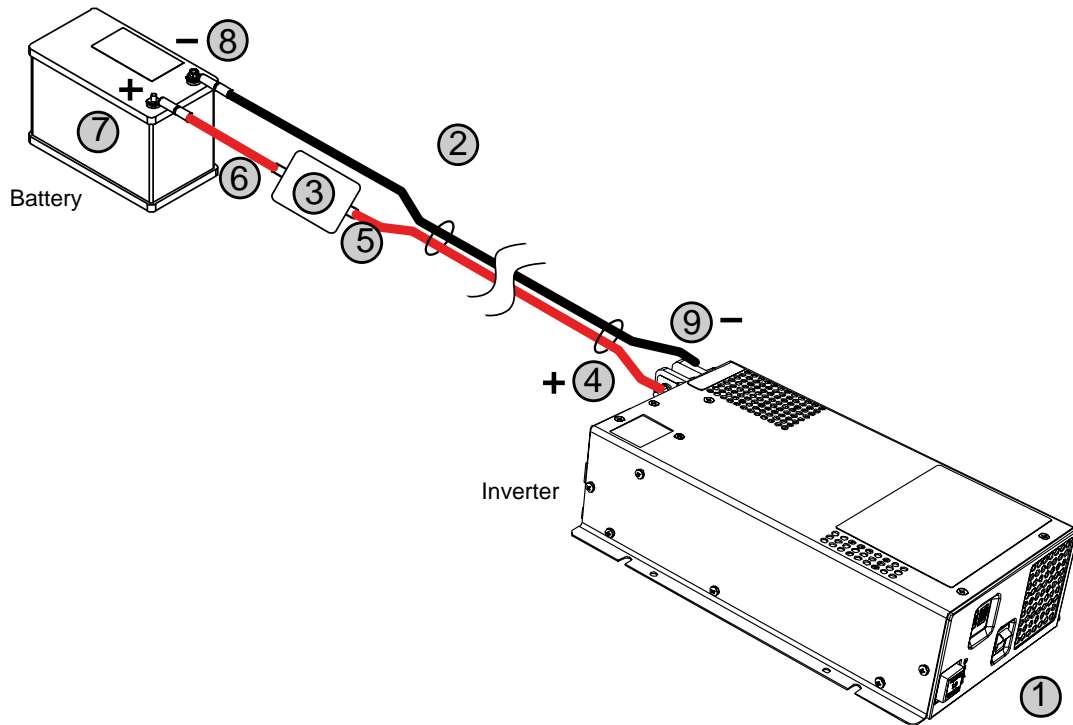


Figure 2-5 Connection Order for DC Cables



### CAUTION: Reverse polarity

Before making the final DC connection, check cable polarity at both the battery and the inverter. Positive (+) must be connected to positive (+); negative (-) must be connected to negative (-).

Reversing the positive (+) and negative (-) battery cables will damage the inverter and void your warranty.



### WARNING: Fire hazard

Use only appropriately sized copper cable. Make sure all DC connections are tightened to a torque of 2.2–2.6 lbf-ft (3.0–3.5 Nm). Loose connections will overheat.

---

**To connect the DC cables:**

Connect the DC cables as shown in Figure 2-5, in the order shown by the numbers.

1. Switch the On/Standby switch to the Standby ( $\Phi$ ) position.
2. Route the DC cables from the battery bank to the inverter. See “Step 6: Routing the DC Cables” on page 2-15.
3. Install a DC fuse and Disconnect or a DC circuit breaker in the positive side of the circuit within 18 inches of the battery.  
This protects your battery and wiring in case of accidental shorting. (See “DC Fuse and Disconnect or DC Circuit Breaker” on page 2-9 for recommended fuse size and type.) Open the DC fuse and Disconnect or turn off the DC circuit breaker.
4. Connect one connector on the POSITIVE (+) cable to the POSITIVE DC terminal on the inverter. Tighten the nut to a torque of 2.2–2.6 lbf-ft (3.0–3.5 Nm).
5. Connect the other connector to the positive (+) terminal DC fuse and Disconnect or to the DC circuit breaker. Use a wrench to tighten the connection according to the manufacturer’s recommendations. Test that the cable is secure.
6. Attach a short DC cable from the unconnected end of the DC fuse and Disconnect or DC circuit breaker. Tighten appropriately.
7. Observing polarity carefully, connect the other end of the fused cable to the POSITIVE (+) terminal of the battery. Tighten this connection to the battery manufacturer’s recommended torque.
8. Connect one connector on the NEGATIVE (–) cable to the NEGATIVE (–) battery terminal. Tighten the connection according to the battery manufacturer’s recommended torque.
9. Check that the polarity of the DC connections is correct: positive (+) on the inverter is connected to the positive (+) on the battery, and negative (–) is connected to the negative (–).
10. Connect the other connector of the NEGATIVE (–) cable onto the NEGATIVE (–) terminal on the XS400 Sine Wave Inverter.
11. Use a wrench to tighten the nut to a torque of 2.2–2.6 lbf-ft (3.0–3.5 Nm). Test that the cable is secure.

## Step 8: Connecting Your Appliances to the GFCI Outlets

**To connect your AC appliances to the GFCI outlets:**

1. Turn the inverter's On/Standby switch to Standby (⏻).
2. Turn your AC appliances off.
3. Connect your AC appliances to the GFCI outlets in the front panel.
4. If you wish to connect more appliances, use a multiple-outlet extension cord. Ensure that the total power drawn does not exceed 400 watts.

---

**Note:** Ensure that the Reset button on the GFCI outlets is not tripped.

---

---

**Important:** If you have more permanent loads to connect to the inverter, Xantrex recommends that they be hardwired. See "Step 9: Hardwiring the AC Output" on page 2-19.

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## Step 9: Hardwiring the AC Output

If you wish to permanently connect additional AC outlets, Xantrex recommends hardwiring the AC output connections.



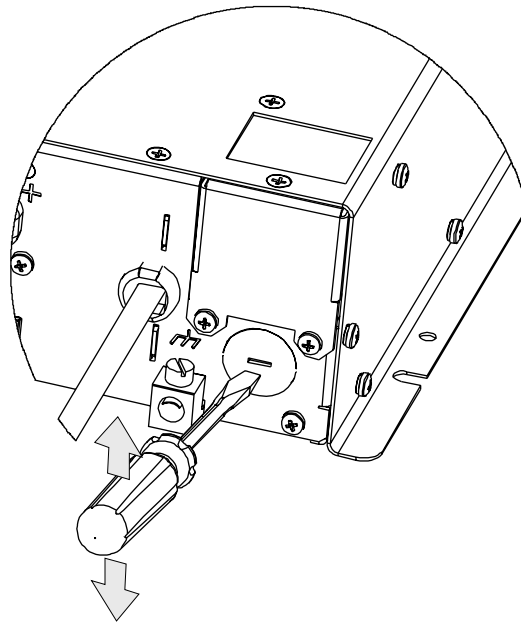
### **WARNING: Fire, shock, and energy hazards**

Make sure wiring is disconnected from all electrical sources before handling. All wiring must be done in accordance with local and national electrical wiring codes. Do not connect the output leads of the inverter to any incoming AC source.

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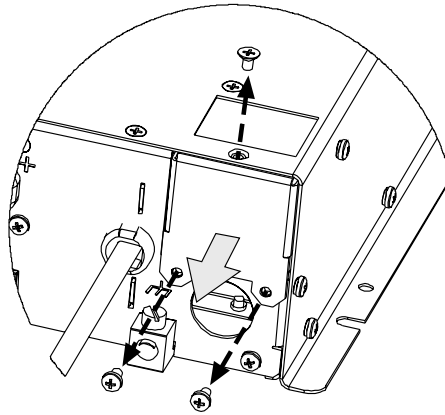
#### **To hardwire the AC output connections:**

1. Turn the On/Standby switch to Standby (⏻).
2. Remove the knockout using a slot screwdriver as shown in Figure 2-6. Do not leave the knockout inside the wiring box.



**Figure 2-6** Removing the Knockout

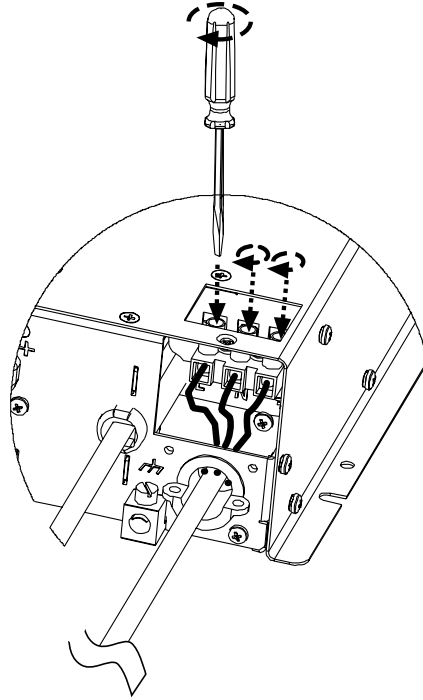
3. Locate the wiring box access panel, and remove the three screws to access the wiring box as shown in Figure 2-7.



**Figure 2-7** Removing the 3 Screws on the Wiring Box Access Panel

4. Remove the wiring box access panel from the unit.
5. Install a 1/2 inch cable clamp.
6. Locate the terminal block.  
The three terminals are labelled as follows:
  - **L** Line
  - **N** Neutral
  - $\perp$  Ground
7. Strip about 2 inches (50 mm) off the jacket of the AC output cable.  
The AC output cable must be either solid or stranded, within the range of No. 14 to No. 18 AWG, and have three conductors.
8. Strip approximately 3/8 inch (10 mm) off the insulation of the cable.
9. Run the AC cable through the cable clamp and into the wiring box.
10. Using the 1/8 inch slot screwdriver, loosen the wire attachment screws on the terminals by five turns.
11. Insert and fasten the Ground wire into the corresponding terminal.
12. Insert the Line and Neutral wires into the corresponding terminals.

13. Tighten the wire attachment screws to a torque of 1.3–1.8 lbf-ft (1.76–2.44 Nm) as shown in Figure 2-8. Leave some slack inside the output wiring box.
14. Secure the cable clamp on the cable jacket.
15. Attach the wiring box access panel and tighten the three screws.



**Figure 2-8** Completing the Hardwiring

---

## Step 10: Performing Checks Prior to Initial Start-up

Before starting up your inverter, ensure these conditions are met:

- ☐ Chassis ground is properly installed
- ☐ On/Standby switch is in the Standby ( $\Phi$ ) position on both the XS400 and S400 Remote Switch
- ☐ Positive (+) battery cable is connected to the positive (+) battery terminal through the DC fuse and Disconnect or DC circuit breaker
- ☐ Negative (–) battery cable is connected to the negative (–) battery terminal
- ☐ Battery voltage is within the proper range for this unit (10.3–15.3 volts DC)
- ☐ DC Fuse is intact (not blown)

## Step 11: Connecting the AC Input Cord



### WARNING: Shock hazard

Connect the AC input cord only to a properly grounded standard 120 volts AC, 15 or 20 amp receptacle. If the correct type of receptacle is not available, have an electrician install one.

---



### WARNING: Shock hazard

When the On/Standby switch is in the Standby ( $\Phi$ ) position and the XS400 is connected to shore power, AC voltage will be present at the output of the inverter.

---

### To connect the AC input cord:

- ◆ Plug the AC input cord into a properly grounded 120 volts AC, 15 or 20 amp receptacle, connected to an external shore power source such as a utility grid or a generator.

---

## Step 12: Testing Your Installation



### **WARNING: Shock hazard**

The On/Standby switches on the XS400 and the S400 Remote Switch do not disconnect DC or AC input power to the XS400.

There are two tests to be performed. The first test verifies that the XS400 operates in invert mode. The second test verifies that the XS400 operates in shore power mode.

When you are ready to test your installation and operate the XS400, close the DC fuse and Disconnect or the DC circuit breaker to supply DC power to the XS400.

### Testing in Invert Mode

#### **To test the XS400 in invert mode:**

1. Ensure that shore power is disconnected.
2. Turn the inverter's On/Standby switch to the On (I) position. Turn the On/Standby switch on the S400 Remote Switch to the On (I) position. The green Inverter On indicator illuminates.
3. Plug an appliance of 400 watts or less into one of the GFCI outlets.
4. Turn the appliance on to verify that it operates.
5. If the appliance operates, your installation is successful.
6. If the red Fault light illuminates, see "Troubleshooting" on page 4–1.

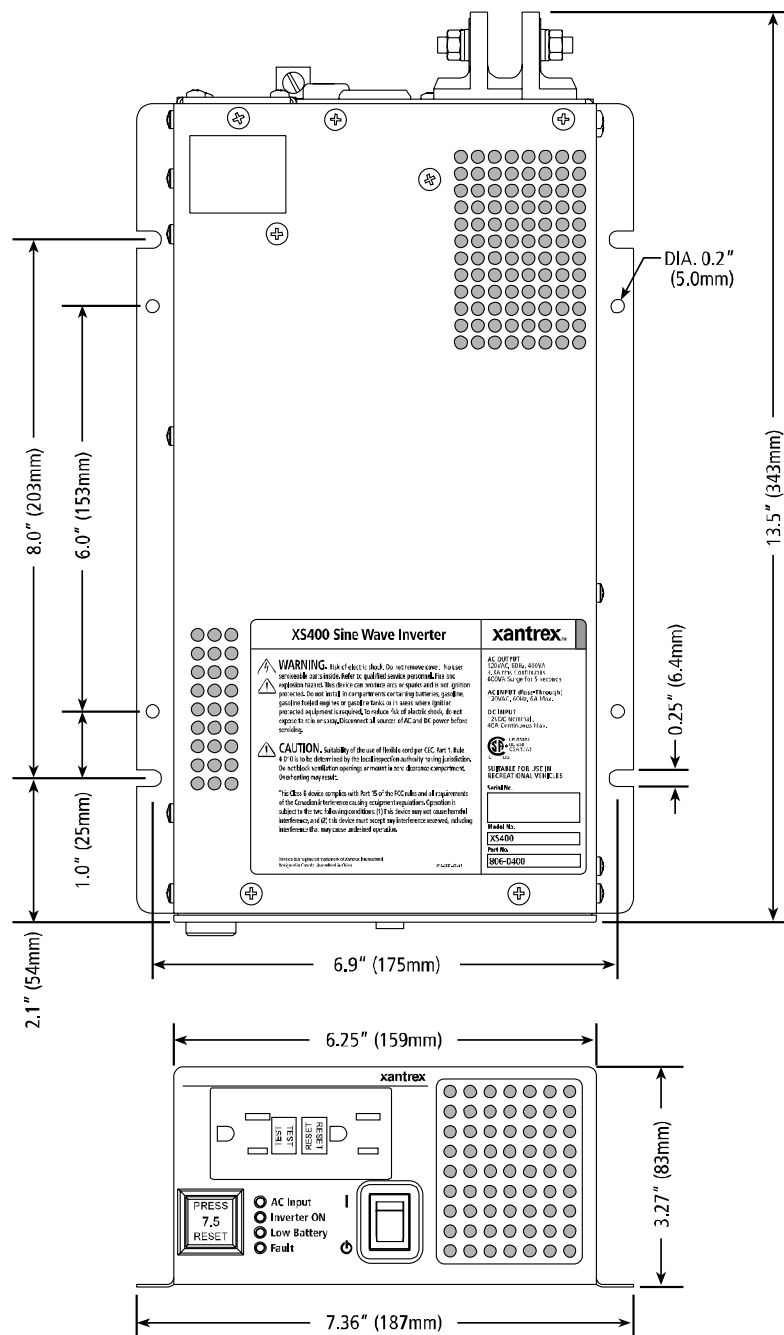
### Testing in Shore Power Mode

#### **To test the XS400 in shore power mode:**

**Note:** Shore power (pass-through) refers to the AC input power from a utility grid, generator or external AC source.

1. Connect to the shore power source.  
The XS400 transfers the appliances to shore power with the On/Standby switch of the inverter or the S400 Remote Switch in either the On (I) or Standby (⏻) position. The green AC Input light illuminates.
2. Plug an appliance of 400 watts or less into one of the GFCI outlets.
3. Turn the appliance on to verify that it operates.

4. If the appliance operates, your installation is successful.
5. If your appliance doesn't operate, refer to "Troubleshooting" on page 4-1.



### Figure 2-9 Inverter Dimensions





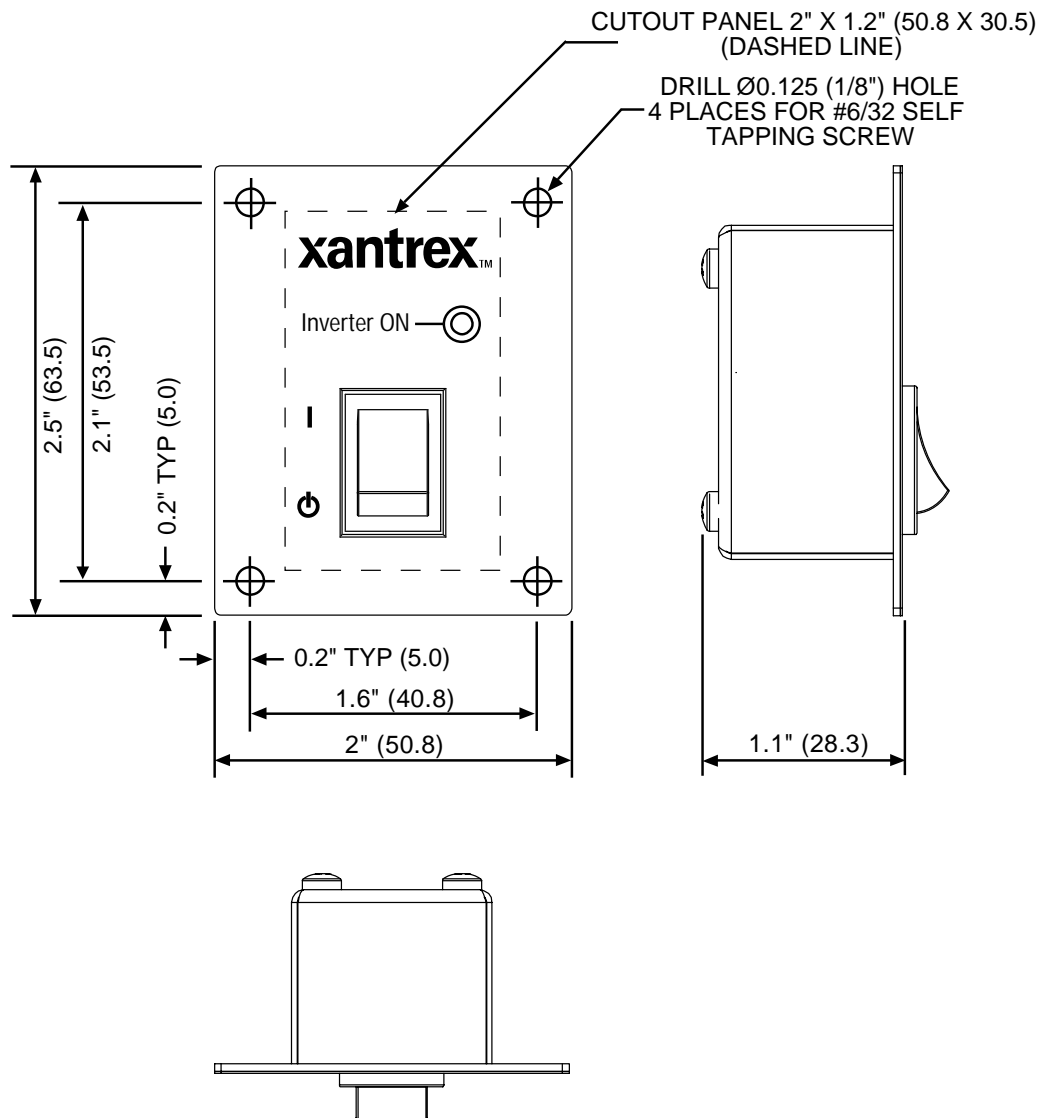


Figure 2-10 S400 Remote Switch Mounting Template (Scale approximately 1:1)



# 3

## Operation

Chapter 3, “Operation” explains how to use your XS400 effectively. This chapter explains how to turn the XS400 to On (I) or Standby (⏻) from the front panel or from the S400 Remote Switch, monitor the status of the XS400, and reset the inverter.



### CAUTION

Read this chapter before operating the XS400 Sine Wave Inverter.

---



### WARNING: Restrictions on use

The XS400 Sine Wave Inverter shall not be used in connection with life support systems or other medical equipment or devices.

---

## Front Panel Features

Before you begin to operate the XS400, review the front panel features in Figure 3-1.

For a detailed description of each of the different features, see “Front Panel of the XS400” on page 1–4 in the “Introduction” chapter.

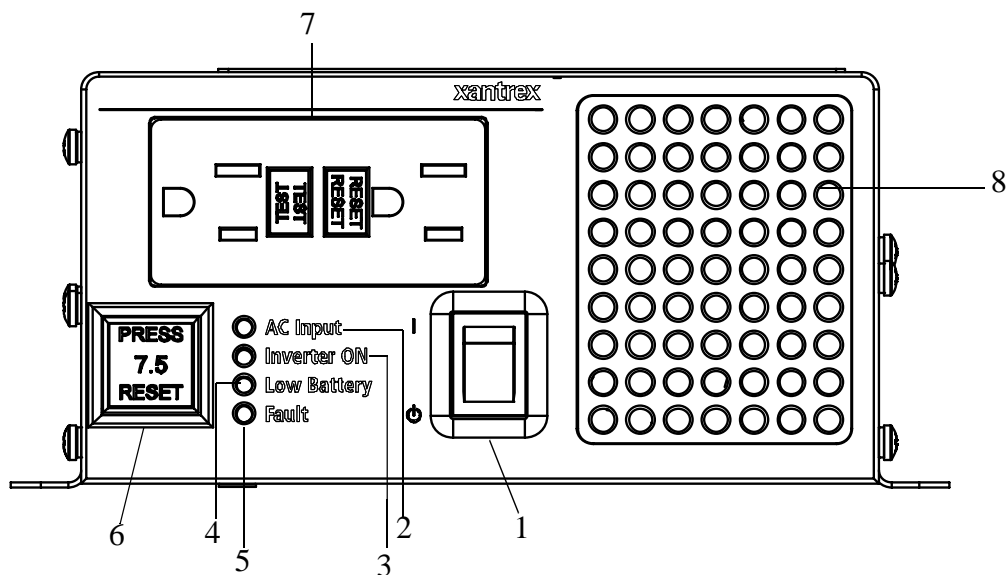


Figure 3-1 Front Panel of the XS400

Table 3-1 Front Panel Features

Feature	Description
1	On/Standby Switch
2	AC Input light
3	Inverter ON light
4	Low Battery light
5	Fault light
6	Supplemental Circuit Protection button
7	Two GFCI outlets
8	Ventilation openings

---

## Operating the XS400

	The XS400 operates in either invert mode or shore power mode.
Invert mode	In invert mode, the XS400 powers your appliances from the battery. See “Operating in Invert Mode” on page 3–5.
Shore power mode	<p>In shore power mode, the XS400 is connected to shore power and your appliances are powered from the AC input power. See “Operating in Shore Power Mode” on page 3–7.</p> <p>Shore power (pass-through) refers to the AC input power from a utility grid, generator or external AC source.</p>

### Turning the XS400 to On or to Standby



---

#### **WARNING: Shock hazard**

When the On/Standby switch is in the Standby (⏻) position and the XS400 is connected to shore power, AC voltage will be present at the output of the inverter.

---

The On/Standby switch on the XS400 turns the inverter to On (⏻) or to Standby (⏻) when operating in invert mode.

If you have installed the S400 Remote Switch, you can also use the remote switch to turn the XS400 to On (⏻) or to Standby (⏻). See “Using the S400 Remote Switch” on page 3–4.

The On/Standby switch on the XS400 or the S400 Remote Switch is also used to reset the inverter after a Fault condition. See “Resetting After a Fault or Shutdown” on page 3–9.

---

**Important:** The XS400 operates normally without the S400 Remote Switch installed.

---

### Turning the XS400 to Standby When Not in Use

If you won't be using the XS400 for an extended period of time, turn the inverter's On/Standby switch to the Standby (⏻) position. Turning the switch to Standby ensures that the XS400 draws no current from the battery.

If you are disconnected from shore power with the XS400 On/Standby switch in the On (⏻) position and the S400 Remote Switch in the Standby (⏻) position, the XS400 draws very little current (about 1 mA) from the battery.

---

## Using the S400 Remote Switch

	<p>The S400 Remote Switch performs the same function as the On/Standby switch on the XS400.</p>
Invert mode use only	<p>The S400 Remote Switch provides On/Standby control only when the XS400 is operating in invert mode.</p> <p>To use the S400 Remote Switch, the On/Standby switch on the XS400 must be turned to the On (I) position. See “Operating in Invert Mode” on page 3–5.</p>
Purpose	<p><b>Important:</b> When shore power is present, the S400 Remote Switch will not change the operation of the inverter.</p> <p>The S400 Remote Switch provides remote control of the XS400 from a convenient location of up to 25 feet (7.5 meters) away using the supplied telephone cable.</p>
Cable length	<p>You can use a longer cable up to a maximum recommended length of 50 feet (15 meters). Xantrex recommends using a high quality 4-wire telephone cable with 6-position, 4-contact connectors.</p>

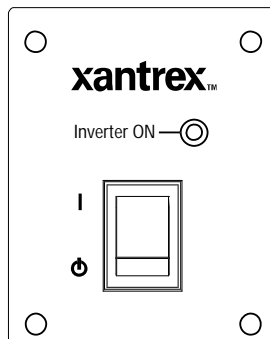


Figure 3-2 S400 Remote Switch

## Operating in Invert Mode

In invert mode, the XS400 powers your appliances from the battery. If the On/Standby switch on both the XS400 and the S400 Remote Switch are turned to On (I), the XS400 automatically supplies your appliances with inverter power if the shore power source fails or becomes disconnected.

**To operate the XS400 in invert mode:**

1. Disconnect the XS400 from shore power.
2. Turn the On/Standby switch on the XS400 to the On (I) position.

The Inverter ON light illuminates on the XS400.

AND

If you have installed the S400 Remote Switch, turn the S400 Remote Switch to On (I).

The Inverter ON light illuminates on the S400 Remote Switch.

3. Operate your appliances.

---

**Important:** The XS400 operates normally without the S400 Remote Switch installed.

---

If you are not using the XS400, see “Turning the XS400 to Standby When Not in Use” on page 3–3.

## Recharging Your Batteries When Low Battery Light Illuminates

Low battery	<p>If the Low Battery light illuminates on the XS400 while it is operating, your battery level is low (less than 10.7 volts). As long as the Inverter ON light is illuminated on the XS400, the unit will continue to supply inverter power to your appliances.</p> <p>However, Xantrex highly recommends that you recharge your batteries. Turn off your appliances and recharge your battery. When the Low Battery light turns off (12.6 volts), you can restart your appliances. See “Restarting or Operating Multiple Appliances”.</p>
Importance of recharging	<p>Xantrex recommends that you recharge your batteries before they are 50% discharged. This gives them a much longer life cycle than recharging them when they are almost completely discharged. See “Battery State of Charge” on page B-8.</p>
More information	<p>For more information about battery chargers and battery monitors, see the Xantrex web site at <b><a href="http://www.xantrex.com">www.xantrex.com</a></b></p>

## Recovering from Low Battery Voltage Shutdown

If the Low Battery light illuminates and the Inverter ON light on the XS400 turns off when you are operating the unit, the XS400 has shut down due to low battery voltage (10.3 volts). Output power is interrupted.

### **To recover from a low battery voltage shutdown:**

1. Turn off your appliances and recharge your battery.
2. When the Low Battery light turns off (12.6 volts) and the Inverter ON light illuminates, you can restart your appliances.

## Restarting or Operating Multiple Appliances

The XS400 can handle several appliances simultaneously as long as they do not draw more than 400 watts in total.

### **To restart or operate several appliances:**

- ◆ Turn them on separately after the XS400 has started.

This action ensures that the XS400 does not have to deliver the starting current for all the loads at once and helps to prevent an overload shutdown.



---

## Operating in Shore Power Mode

Definition	Shore power (pass-through) refers to the AC input power from a utility grid, generator, or external AC source.
Shore power mode	In shore power mode, the XS400 is connected to shore power and your appliances are powered from the AC input power.
Transfer to invert mode	The transfer to inverter power will occur if shore power is present, but either the shore power voltage is too low (less than 85 volts AC) or too high (greater than 140 volts AC). In this case, the transfer from shore power to inverter power prevents damage to your appliances.
S400 Remote Switch	You cannot use the S400 Remote Switch to control the XS400 when it is operating in shore power mode.

---

**Important:** The XS400 transfers the appliances to shore power whenever shore power is connected, regardless of the position of the On/Standby switches.

---

**To operate in shore power mode:**

1. Connect the XS400 to shore power.  
The AC Input light on the XS400 illuminates. The On/Standby switch on both the S400 Remote Switch and the XS400 can be either On (I) or in Standby (⦿) position.
2. Operate your appliances.

## Monitoring the Indicator Lights

The four indicator lights on the front panel show you the operating status of the XS400. See Table 3-2.

For an illustration of the indicator lights on the front panel, see “Front Panel of the XS400” on page 3-2.

If none of the front panel lights are on, see “Troubleshooting Reference” on page 4-2.

**Table 3-2** Status of Indicator Lights

Light	Color	Status	Action
<b>AC Input</b>	Green	When the XS400 is connected to shore power, the AC Input light illuminates.	You can run all your appliances from shore power.
<b>Inverter ON</b>	Green	When the XS400 is on, the Inverter ON light illuminates.	You can run your appliances from the battery.
<b>Low Battery &amp; Inverter ON</b>	Yellow & Green	When both lights illuminate, your battery level is low. (The battery voltage has dropped below 10.7 volts DC.)	You can run your appliances but your battery level is low. Charge your battery or connect to shore power.
<b>Low Battery</b>	Yellow	When the Low Battery light illuminates, your battery level is critically low. (The battery voltage has dropped below 10.3 volts DC.)	You cannot run appliances. Charge your battery or connect to shore power.
<b>Fault</b>	Red	The Fault light illuminates whenever there is a battery over-voltage fault condition (exceeds 15.3 volts), output overload fault condition or over-temperature fault condition.	You cannot run appliances as the AC output is disabled in invert mode. Clear the fault condition. Reset the XS400 by turning the On/Standby switch on the XS400 or the S400 Remote Switch to Standby (⏻) and then to On (⏻), or connect to shore power.

## Resetting After a Fault or Shutdown

This section provides explanations and procedures for resetting the XS400 after a fault or shutdown.

If you are unable to resolve the problem after referring to Table 3-3, refer to the “Troubleshooting” section on page 4-2.

Table 3-3 Resetting After A Fault or Shutdown

Fault	Status	Action
<b>Shutdown</b>	The XS400 needs to be reset.	Turn the On/Standby switch on either the inverter’s front panel or the S400 Remote Switch to Standby (⏻) and then to On (⏻).
<b>Short circuit</b>	If there is a short circuit, the Supplemental Circuit Protection button trips.	Remove the short circuit then press the Supplemental Circuit Protection button.
<b>Ground Fault</b>	When a fault condition is detected, the Reset button on the GFCI outlet trips and power to the appliances is interrupted.	<p><b>Reset:</b> To resume normal operation, determine and correct the ground fault, then press the Reset button.</p> <p><b>Test:</b> Press the Test button on the GFCI outlet with either shore power and/or the XS400 turned to On (⏻). The Reset button should trip. Press the Reset button to reset the GFCI and to continue with normal operation. This test should be performed on a monthly basis.</p> <p>If the Reset button does not trip, the GFCI may have failed. Contact your dealer to have a qualified service person examine the XS400.</p>
<b>Overload</b>	The XS400 is designed to provide 400 watts continuously and 800 watts surge capability for five seconds. If the connected appliances draw more than the rated power, the XS400 will shut down and the red Fault light illuminates.	<p>Disconnect the appliances connected to the inverter and then turn the On/Standby switch on either the inverter’s front panel or the S400 Remote Switch to Standby (⏻) and then to On (⏻).</p> <p>See also “Recharging Your Batteries When Low Battery Light Illuminates” on page 3-6.</p>



# 4

## Troubleshooting

The XS400 is designed for high reliability and has a number of protection features for trouble free operation. If, however, you have any problems operating your inverter or S400 Remote Switch, refer to the “Troubleshooting Reference for the XS400” on page 4–3.

Read this troubleshooting chapter before calling your dealer or Xantrex Customer Service on page ii.

If you cannot resolve the problem, record the information asked for on the form, “Information About Your System” on page WA–4. Providing this information to our Customer Service Representatives will help them to assist you better.

## Troubleshooting Reference



### WARNING: Electrical Shock and Fire Hazard

Do not disassemble the XS400. It does not contain any user-serviceable parts. Attempting to service the unit yourself could result in electrical shock or fire.

This section provides you with troubleshooting tips to identify and solve most problems that can occur with the XS400 and S400 Remote Switch.

Before contacting your dealer or customer service, please refer to the tables, “Troubleshooting Reference for the XS400” and “Troubleshooting Reference for the S400 Remote Switch”.

If you are unable to resolve the problem after referring to the Troubleshooting Reference tables, contact your dealer or Xantrex Customer Service.

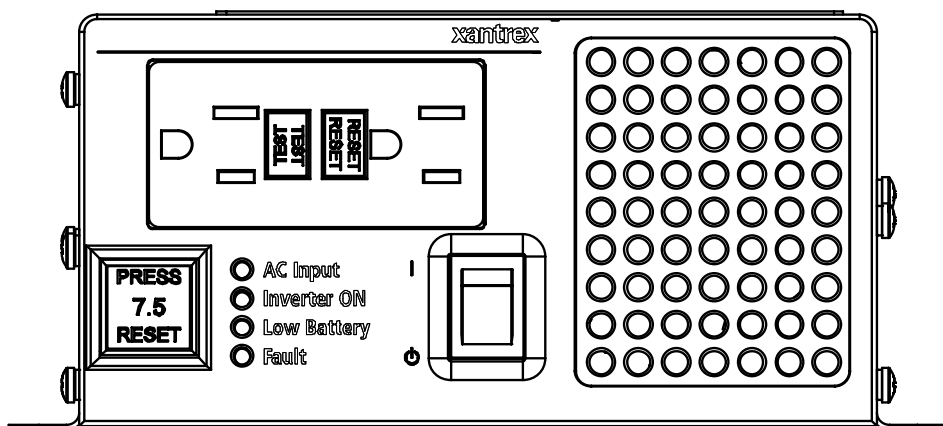


Figure 4-1 Front Panel

For a detailed description of the different features, see “XS400 Features” on page 1–4.

**Table 4-1** Troubleshooting Reference for the XS400

Problem	Possible Cause	Solution
No output voltage. No indicator lights are illuminated.	The On/Standby switch is in Standby (⏻) mode.	Turn the On/Standby switch on the inverter to On (⏻).
	The S400 Remote Switch is in Standby (⏻) mode.	Turn the On/Standby switch on the S400 Remote Switch to On (⏻).
	No input power to the inverter.	Check the DC wiring to the inverter for loose connections, frayed wiring or an open DC Disconnect.
	DC fuse open (external)	Have a qualified service technician check and replace the fuse.
No output voltage. Inverter ON light is illuminated.	Supplemental Circuit Protection button has tripped.	Disconnect all appliances to reduce the overload. Check the AC wiring and reset the Supplemental Circuit Protection button.
	GFCI has tripped.	Clear the ground fault, and reset the GFCI by pressing the Reset button on the GFCI.
No output voltage. Fault light is illuminated.	The inverter may be overloaded.	Disconnect all appliances connected to the inverter, and reset the inverter by turning the On/Standby switch on either the XS400 or S400 Remote Switch to Standby (⏻) and then to On (⏻).
	Battery voltage may be too high.	The inverter will restart if the battery voltage drops below 14.5 volts DC.
	Over temperature.	Allow the inverter to cool down. The inverter will restart automatically.

**Table 4-1** Troubleshooting Reference for the XS400

Problem	Possible Cause	Solution
No output voltage. Low Battery light is illuminated.	Battery voltage is too low.	Recharge the battery to more than 12.6 volts DC. The inverter will restart automatically.
	Poor DC wiring.	Turn the inverter to Standby (⏻). Disconnect the DC wiring. Use proper wiring and ensure all connections are tight.
Output voltage is present. Inverter ON light and Low Battery light are illuminated.	Battery voltage is low.	Disconnect all appliances. Charge the batteries.
AC input cord is connected to shore power and the AC Input light is off. The appliances are not powered.	The shore power voltage is out of range (less than 85 volts AC or greater than 140 volts AC).	Turn the On/Standby switch to On (I), and the appliance will be powered from the inverter.
	External breaker has tripped.	Reset the external breaker.
AC input cord is connected to shore power and the AC Input light is illuminated. The appliances are not being powered from shore power.	Supplemental circuit breaker has tripped.	Disconnect all appliances. Check the AC wiring and press the Supplemental Circuit Protection button to reset it.
	GFCI has tripped.	Clear the ground fault and reset the GFCI.
AC input cord is connected to shore power. AC Input light illuminates intermittently.	The shore power voltage is close to being out of range (less than 85 volts AC or greater than 140 volts AC).	Turn On/Standby switch to On (I), and the appliance will be powered from the inverter or shore power.
Fan does not turn on.	The internal components of the inverter are not warm.	No action. The fan will run automatically when necessary to cool the internal components of the inverter.



**Table 4-1** Troubleshooting Reference for the XS400

Problem	Possible Cause	Solution
Fan runs all the time.	The amount of power being consumed by the appliances is high.	No action. The fan will run at lower speeds and stop automatically when the internal temperature of the inverter falls.
	The ambient temperature is high.	No action. The fan will run at lower speeds and stop automatically when the ambient temperature falls.
		For more information on the “Fan Cooling System”, refer to page A-3.

**Table 4-2** Troubleshooting Reference for the S400 Remote Switch

Problem	Possible Cause	Solution
The S400 Remote Switch is On (I), but its Inverter ON light is off.	The On/Standby switch on the inverter is in Standby (⏻) mode.	Switch the inverter to On (I).
	The cable connection is loose or faulty.	Check the cable.
The S400 Remote Switch is On (I) and the Inverter ON light is illuminated, but appliances do not operate.	The inverter is in fault/protection mode.	Check the lights on the front panel of the inverter. If the Fault light is illuminated, see Table 4-1, “Troubleshooting Reference for the XS400” on page 4-3.





# Specifications

Appendix A, “Specifications”, contains the electrical and physical specifications for the XS400 and physical specifications for the S400 Remote Switch.

All specifications are subject to change without notice.

## Electrical Specifications of XS400

Output power at 12 VDC input	
• Continuous	400 VA <sup>1</sup> , 32 °F to 104 °F (0 °C to 40 °C), derated linearly to 300 VA at 122 °F (50 °C)
• Surge capacity for 5 seconds	800 VA
Input voltage	12 VDC nominal 10.3 to 15.3 VDC
Output voltage	120 VAC RMS $\pm$ 3 VAC
Output frequency	60 Hz $\pm$ 0.05 Hz
Output wave form	Sine wave
Total harmonic distortion of output waveform	<3%
High battery shutdown	15.3 $\pm$ 0.3 VDC
Low battery indication	10.7 $\pm$ 0.3 VDC
Low battery shutdown	10.3 $\pm$ 0.3 VDC
Maximum efficiency	88%
No load current draw with switch turned to On (I)	1.25 ADC maximum
No load current draw with switch set to Standby (Ⓟ)	0 ADC
Supplemental circuit protector	7.5 AAC

<sup>1</sup>The term “watts” has been used throughout the guide to refer to output power. More correctly, the actual unit of power used is “VA”.

## Physical Specifications of XS400 with Projections

Length	13.5 inches (343 mm)
Width	7.36 inches (187 mm)
Height	3.27 inches (83 mm)
Weight	10 lb (4.54 kg)

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## Regulatory Approvals

CSA/NRTL approved to CSA C22.2 No. 107.1 and UL 458
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FCC Class B
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## Transfer Circuit

Transfer circuit
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6 Amps, 85 to 140 VAC
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## Fan Cooling System

A fan cools the internal heat generating components of the inverter. The fan begins to operate when the internal temperature rises. The speed of the fan increases with internal temperature.

The fan turns off if the internal temperature of the inverter drops.

## Physical Specifications of S400 Remote Switch

Height	2.5 inches (63.5 mm)
Width	2 inches (50.8 mm)
Depth	1.1 inches (28.3 mm)
Cable length	25 feet (7.5 m)



# B

## Battery Types and Sizes

The batteries that you use strongly affect the performance of the XS400. It is important to connect the inverter to the correct size and type of battery.

The information in Appendix B will help you to select, connect, and maintain batteries that are most appropriate for your application.

## Battery Types

### Automotive Starting Batteries

The lead-acid battery you are most familiar with is probably the starting battery in your vehicle. An automotive starting battery is designed to deliver a large amount of current for a short period of time (so it can start your engine). Only a small portion of the battery's capacity is used when starting the engine, and the spent capacity is quickly recharged by the running engine.

The starting battery in your vehicle is not designed for repeated deep-discharge cycles where the battery is almost completely discharged and then recharged. If a starting battery is used in this kind of deep discharge service, it will wear out very rapidly.

### Deep-Cycle Batteries

Deep-cycle batteries are designed for deep discharge service where they will be repeatedly discharged and recharged. They are marketed for use in recreational vehicles, boats, and electric golf carts—so you may see them referred to as RV batteries, marine batteries, or golf cart batteries.

For most applications of the XS400, Xantrex recommends that you use one or more deep-cycle batteries that are separated from the vehicle's starting battery by a battery isolator.

A battery isolator is a solid-state electronic circuit that allows equipment to be operated from an auxiliary battery without danger of discharging the vehicle's starting battery. During vehicle operation, the battery isolator automatically directs the charge from the alternator to the battery requiring the charge.

Battery isolators are available at marine and RV dealers and most auto parts stores.



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## Battery Size



### CAUTION

The XS400 Sine Wave Inverter must only be connected to batteries with a nominal output voltage of 12 volts. The XS400 Sine Wave Inverter will not operate from a 6 volt battery and will be damaged if connected to a 24 volt battery.

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Battery size or capacity is as important as the battery type for efficient operation of your loads. Xantrex recommends that you purchase as much battery capacity as you need.

A number of different standards are used to rate battery energy storage capacity. Automotive and marine starting batteries are normally rated in cranking amps. This is not a relevant rating for continuous loads like an inverter. Deep-cycle batteries use a more suitable rating system, either “amp-hours” (“Ah”) or “reserve capacity” in minutes.

**Battery Reserve Capacity** Battery reserve capacity is a measure of how long a battery can deliver a certain amount of current—usually 25 amps. For example, a battery with a reserve capacity of 180 minutes can deliver 25 amps for 180 minutes before it is completely discharged.

**Amp-hour (Ah) Capacity** Amp-hour capacity is a measure of how many amps a battery can deliver for a specified length of time—usually 20 hours. For example, a typical marine or RV battery rated for 100 Ah can deliver 5 amps for 20 hours ( $5\text{ A} \times 20\text{ hours} = 100\text{ Ah}$ ).

This same battery can deliver a higher or lower current for less or more time, limited approximately by the 100 Ah figure (for example, 50 A for 2 hours, or 200 A for 1/2 hour), but usually the capacity figure given is only accurate at the specified rate (20 hours).

To calculate the battery capacity you require, read “Estimating Battery Requirements” on page B-4 and “Battery Sizing Example” on page B-4, and then complete the “Battery Sizing Worksheet” on page B-5.

## Estimating Battery Requirements

### To determine how much battery capacity you need:

1. Determine how many watts are consumed by each appliance that you will operate from the XS400. You can normally find the watt rating labelled on the product. If only the current draw is given, multiply it by 115 to get the power consumption in watts.
2. Estimate how many hours each appliance will be operating each day.
3. Calculate the daily watt-hours needed for each appliance.
4. Add the total number of watt-hours needed for all the appliances and multiply it by the number of days between charges.
5. Divide the total watt-hours of AC load between charges by 10. This gives the battery Ah used between charges.
6. Double the total Ah used between charges to get the recommended battery size in Ah.

See the battery sizing example that follows.

### Battery Sizing Example

This battery sizing example illustrates a typical calculation, assuming an opportunity to charge the batteries every three days:

Appliance	(A) Power Consumption (Watts)	(B) Operating Time per Day (Hours)	Daily watt-hours needed for this appliance (= A x B)
TV	100 W	4 hours	400 Wh
VCR	100 W	4 hours	400 Wh
3 lamps, 60 W each	180 W	4 hours	720 Wh
Audio system	60 W	4 hours	240 Wh
DVD player	100 W	2 hours	200 Wh
Other loads	100 W	3 hours	300 Wh
Total daily watt-hours of AC load			2260 Wh
x Number of days between charges			2
= Total watt-hours of AC load between charges			4520 Wh
Battery Ah used between charges (divide by 10)			452 Ah
Recommended Battery Bank Size in Ah (multiply by 2)			904 Ah

This example illustrates how quickly your battery needs can escalate. To reduce the required battery size, you can conserve energy by eliminating or reducing the use of some loads or by re-charging more frequently.

When sizing your battery, resist the temptation to skip the last step of this calculation (multiplying by 2). More capacity is better since you will have more reserve capacity, be better able to handle large loads and surge loads, and your battery won't be discharged as deeply. Battery life is directly dependent on how deeply the battery is discharged. The deeper the discharge, the shorter the battery life.

## Battery Sizing Worksheet

Use the following worksheet to calculate your battery needs. To ensure sufficient battery capacity, be generous when estimating the operating time per day for each of the loads you will run.

Appliance	(A) Power Consumption (Watts)	(B) Operating Time per Day (Hours)	Daily watt-hours needed for this appliance (= A x B)
	W	hours	Wh
	W	hour	Wh
	W	hours	Wh
	W	hours	Wh
	W	hours	Wh
	W	hours	Wh
Total daily watt-hours of AC load			Wh
x Number of days between charges			
= Total watt-hours of AC load between charges			Wh
Battery Ah used between charges (divide by 10)			Ah
Recommended Battery Bank Size in Ah (multiply by 2)			Ah

## Using Multiple Batteries

As your power requirements increase, you may need to use more than one battery to obtain sufficient capacity. Read “Two Batteries Connected In Parallel” on page B–6 and “Two Separate Battery Banks” on page B–6 to determine whether two batteries or two battery banks are more appropriate for your applications.

### Two Batteries Connected In Parallel

Two identical batteries can be connected positive (+) to positive (+) and negative (–) to negative (–) in a parallel system. A parallel system doubles capacity and maintains the voltage of a single battery.



#### CAUTION

Do not connect the following in parallel:

- batteries made by different manufacturers
- different types of batteries
- batteries that have different Ah ratings

Decreased battery life and improper charging will result.

---

### Two Separate Battery Banks

If you need more than two batteries (or are using different makes or models of batteries), Xantrex recommends that you install two separate battery banks and a battery selector switch.

By installing a battery selector switch, you can select between the two battery banks, use both banks in parallel, or disconnect both banks from the load. Battery selector switches are available at marine and RV dealers.

---

## Battery Tips



### **WARNING: Explosion and fire hazard**

Review “Precautions When Working With Batteries” on page viii before you work with the batteries in your system.

**Explosive/Corrosive Gases** Lead-acid batteries may emit hydrogen gases, oxygen, and sulfuric acid fumes when recharging. To reduce the risk of explosion:

- Vent the battery compartment to prevent the accumulation of gases.
- Do not install electronic or electrical equipment in the battery compartment.
- Do not smoke or use an open flame when working around batteries.

**Temperature Sensitivity** The capacity of lead-acid batteries is temperature sensitive. Battery capacity is rated at 77 °F (25 °C). At 0 °F (–20 °C), the Ah capacity is about half the rated capacity. You should consider temperature when designing your system.

- **Low Temperatures** If extremely low temperatures are expected where the inverter is going to be located, you should consider a heated equipment room. If the system is located in an unheated space, an insulated battery enclosure is recommended.
- **High Temperatures** The batteries should also be protected from high temperatures. These can be caused by high ambient temperatures, solar heating of the battery enclosure, or heat released by a nearby engine or generator. High battery temperatures shorten battery life and therefore you should ventilate the enclosure and use shade and insulation as appropriate.

**Discharged Batteries** Do not leave batteries in a discharged state for more than a day or two. They will undergo a chemical process (sulfation) that can permanently damage the battery. As well, batteries self-discharge over a period of three to six months, and they should be recharged periodically even if they are not being used.

**Electrolyte Level** If your batteries are not the “maintenance-free” type, check the electrolyte level at least once a month. Excessive fluid loss is a sign of overcharging. Replenish the electrolyte using only distilled water.

**Battery Connections** Connections to battery posts must be made with permanent connectors that provide a reliable, low-resistance connection. Do not use alligator clips. Clean the connections regularly and prevent corrosion by using a protective spray coating or Vaseline.

**Battery State of Charge** You can measure battery state of charge with a hydrometer or approximate state of charge with a voltmeter. Use a digital voltmeter that can display tenths or hundredths of a volt when measuring 10 to 30 volts. Make your measurements when the battery has not been charged or discharged for several hours. For a deep-cycle battery at 77 °F (25 °C), use the following table:

Battery Voltage	State of Charge
12.7–13.0	100%
12.5–12.6	80%
12.3–12.4	60%
12.1–12.2	40%
11.9–12.0	20%

# Warranty and Product Information

## 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 XS400 Sine Wave Inverter and S400 Remote Switch. This warranty lasts for a Warranty Period of 12 months from the date of purchase at point of sale to you, the original end user customer.

**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 (toll free)

1-604-422-2777 (direct)

Fax: 1-604-420-2145

Email: [CustomerService@xantrex.com](mailto: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

## Warranty

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**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:

- a) 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;
- b) 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;
- c) the product if repairs have been done to it other than by Xantrex or its authorized service centers (hereafter "ASCs");
- d) the product if it is used as a component part of a product expressly warranted by another manufacturer;
- e) 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 manual for limitations on uses of the product.

SPECIFICALLY, PLEASE NOTE THAT THE XS400 Sine Wave Inverter SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, XANTREX MAKES NO REPRESENTATIONS OR WARRANTIES REGARDING THE USE OF THE XANTREX XS400 Sine Wave Inverter IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

Please note that the XS400 Sine Wave Inverter is not intended for use as an uninterruptible power supply 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

Record these details in "Information About Your System" on page WA-4.

## 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.
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 XS400 Sine Wave Inverter 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 may be serviced or replaced for a flat fee.

To return your XS400 Sine Wave Inverter for out of warranty service, contact Xantrex Customer Service for a Return Material Authorization (RMA) number and follow the other steps outlined in “Return Procedure” on page WA-3.

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 XS400 Sine Wave Inverter package, record the following information and be sure to keep your proof of purchase.

- ☐ Serial Number \_\_\_\_\_
- ☐ 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, truck) \_\_\_\_\_
- ☐ Length of time inverter has been installed \_\_\_\_\_
- ☐ Battery/battery bank size \_\_\_\_\_
- ☐ Battery type (e.g. flooded, sealed gel cell, AGM) \_\_\_\_\_
- ☐ DC wiring size and length \_\_\_\_\_
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