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XW4024-230-50  
XW4548-230-50  
XW6048-230-50

**Installation Guide**

# XW Hybrid Inverter/Charger

This manual for use by qualified personnel only.

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The Xantrex logo consists of the word "xantrex" in a bold, lowercase, sans-serif font. To the right of the text is a vertical orange bar.

# XW Power System

## Installation Guide

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## Date and Revision

April 2008, Revision A

## Part Number

975-0384-01-01

## Product Numbers

865-1035 (XW6048-230-50)

865-1040 (XW4548-230-50)

865-1045 (XW4024-230-50)

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# About This Guide

## Purpose

The purpose of this Installation Guide is to provide explanations and procedures for installing the XW Power System.

## Scope

The Guide provides safety guidelines, detailed planning and procedures for installing the XW Inverter/Charger and related system components (the “XW Power System”). It does not provide details about configuration, operation, maintenance or troubleshooting. See the Operation Guide or Owner’s Manual of each device for this information. This Guide also does not provide details about particular brands of batteries. You need to consult individual battery manufacturers for this information.

## Audience

The Guide is intended for anyone who needs to install the XW Power System. Installers should be certified technicians or electricians.

## Organization

This guide is organized into two chapters and one appendix.

Chapter 1, “Introduction” lists and describes the components and basic features of the XW Power System.

Chapter 2, “Inverter/Charger Installation” describes how to mount and install the XW Inverter/Charger.

Appendix A, “Specifications” provides the electrical and mechanical specifications for the XW Power System.

## Conventions Used

The following conventions are used in this guide.



### WARNING

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

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### CAUTION

Cautions identify conditions or practices that could result in damage to the XW Power System components or other equipment.

---

## Related Information

For additional information about operating the XW Inverter/Charger, see the XW Inverter/Charger Operation Guide (975-0385-01-01).

For more information about related components, refer to:

- XW Power System Installation Overview (975-0238-01-01)
- XW System Control Panel Owner's Guide (975-0298-01-01)
- XW Solar Charge Controller Owner's Guide (975-0283-01-01)
- XW Automatic Generator Start Owner's Guide (975-0307-01-01)

These guides are available at [www.xantrex.com](http://www.xantrex.com). Printed copies should be included with the components.

For more information about Xantrex Technology, Inc. as well as its products and services, visit [www.xantrex.com](http://www.xantrex.com).

# Important Safety Instructions

## SAVE THESE INSTRUCTIONS

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### WARNING

This chapter contains important safety and operating instructions. Read and keep this Installation Guide for future reference.

---



### WARNING: Limitations on use

The XW Power System is not intended for use in connection with life support systems or other medical equipment or devices.

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1. Before using the XW Series, read all instructions and cautionary markings on the XW Series, the batteries, and all appropriate sections of this guide.
2. Ensure the XW Series is installed according to the guidelines and procedures in the separate Installation Guide.
3. Do not expose the XW Series to rain, snow, or spray. To reduce risk of fire, do not cover or obstruct the ventilation openings.
4. Use only attachments recommended or sold by Xantrex Technology. Doing otherwise may result in a risk of fire, electric shock, or injury to persons.
5. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the XW Series with damaged or substandard wiring.
6. Do not operate the XW Series if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the XW Series is damaged, see the Warranty section.
7. Do not disassemble the XW Series. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the XW Series yourself may result in a risk of electrical shock or fire and will void your warranty. Internal capacitors remain charged after all power is disconnected.
8. To reduce the risk of electrical shock, authorized service personnel must disconnect both AC and DC power from the XW Series before attempting any maintenance or cleaning or working on any circuits connected to the XW Series. Turning off controls will not reduce this risk.
9. To reduce the chance of short-circuits, authorized service personnel must use insulated tools when installing or working with this equipment.





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# 1

## Introduction

Chapter 1, “Introduction” lists and describes the components and basic features of the XW Power System.

<b>For this Topic</b>	<b>See....</b>
“System Overview”	page 1–2
“System Components and Accessories”	page 1–4

# System Overview

The XW Power System consists of several devices, components, and optional accessories that, when installed together, create a renewable energy power system that can be customized to suit nearly any application—off grid, grid tied, or backup.

## System Diagram

### Single-Inverter System (Backup Only)

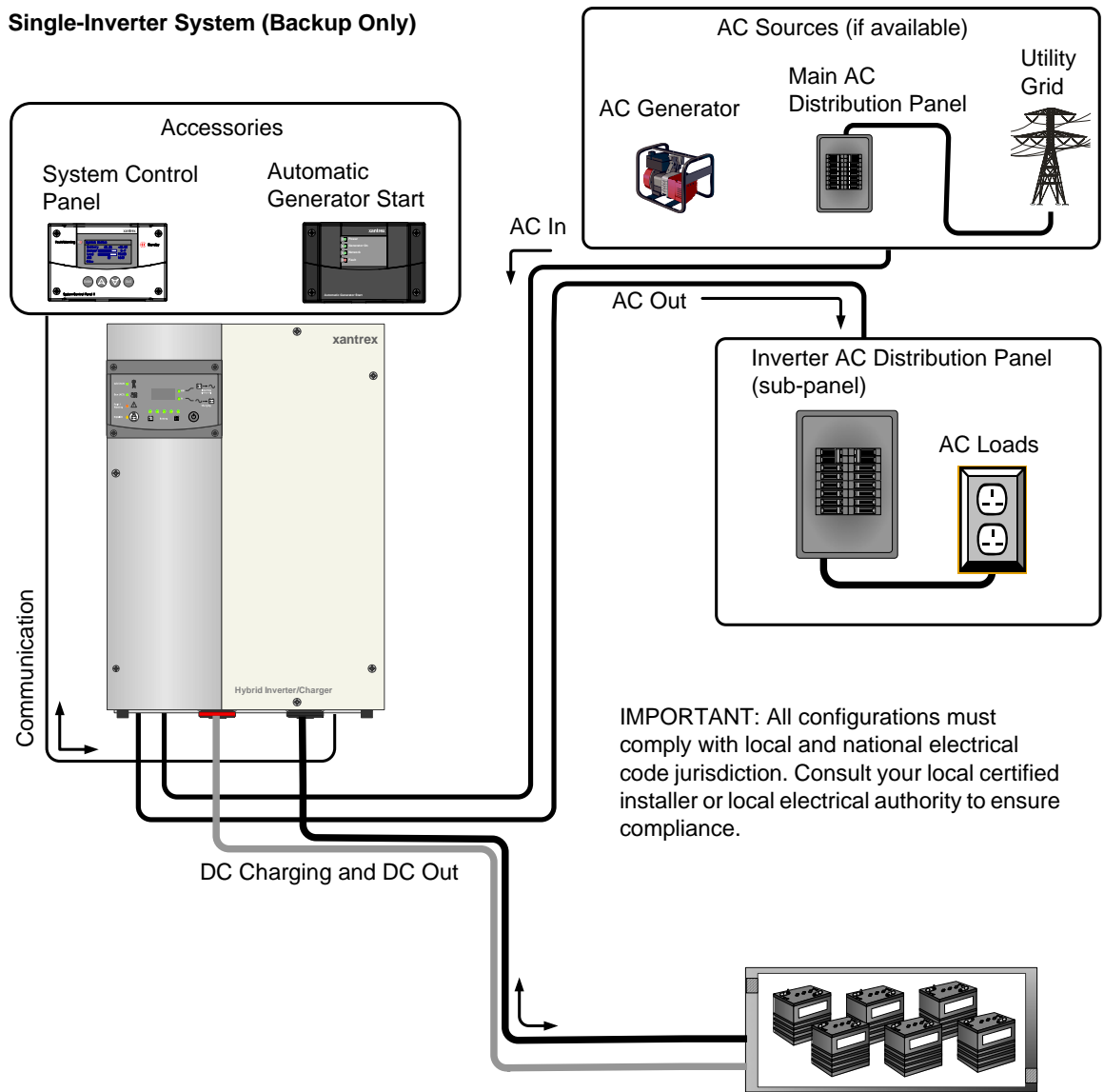


Figure 1-1 XW Power System Installation with Backup Only Example

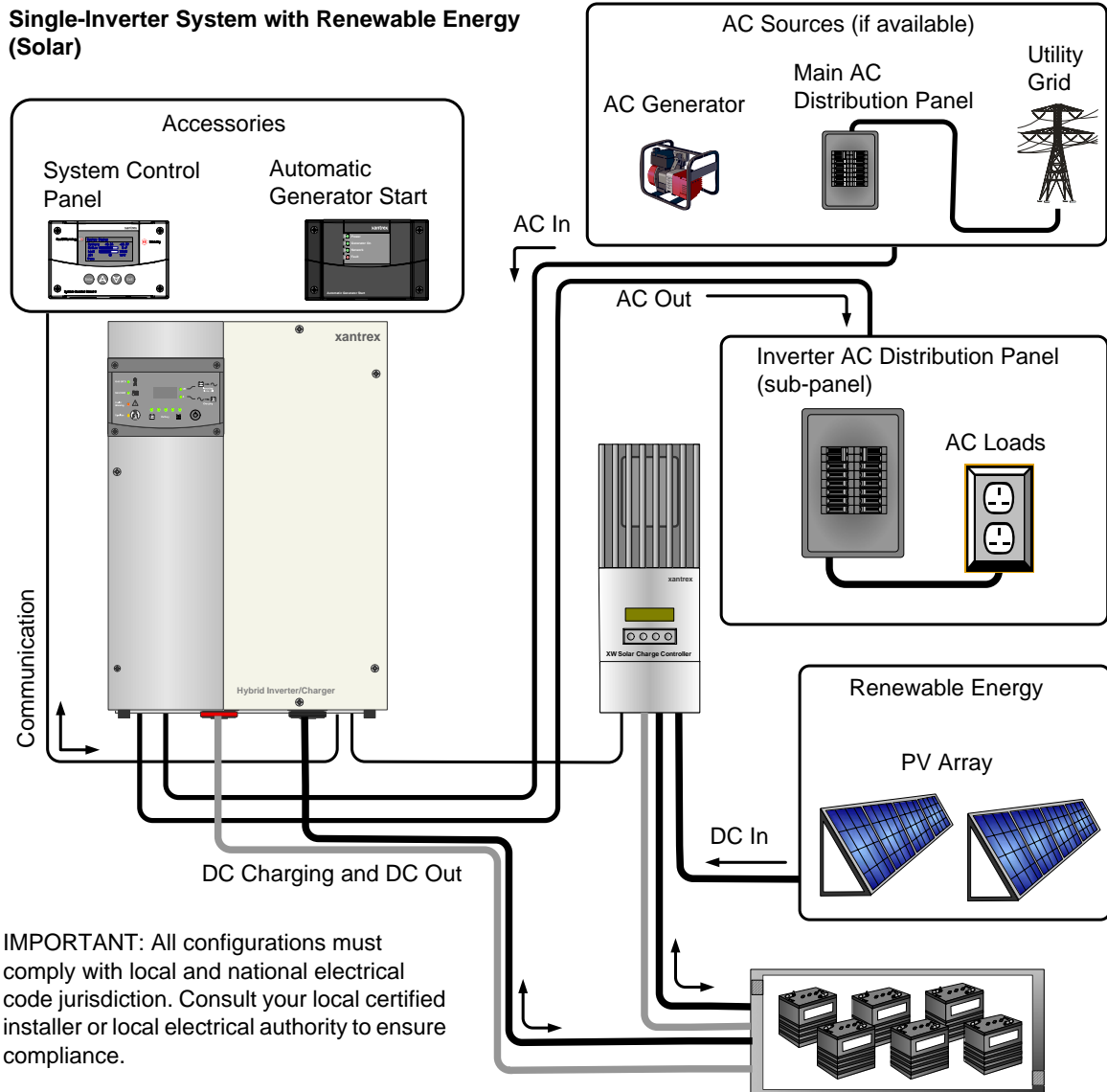


Figure 1-2 XW Power System Installation with Renewable Energy Example

## System Components and Accessories

### XW Inverter/Charger

The XW Inverter/Charger is a modular “building block” sine-wave inverter/charger that can be used for both residential and commercial stand-alone, grid-backup, and grid-tie applications with battery energy storage. The XW Series is a self-contained DC to AC inverter, battery charger, and AC transfer switch.

Up to three inverters can be installed in parallel to create larger 230-volt, single-phase systems, allowing for increased capacity. Multiple XW Inverter/Chargers can also be connected to create a three-phase system. One inverter per phase is required, and up to two inverters can be connected in parallel on each phase.



**Figure 1-3** XW Inverter/Charger

A Battery Temperature Sensor (FGA # 808-0232-02) is also included with the XW Inverter/Charger. The Battery Temperature Sensor monitors the temperature of the battery bank and adjusts the charging accordingly. See page 2–17 for installation instructions for this accessory.

## XW Conduit Box

A conduit box (FGA # 865-1025) is available to enclose the bottom of the XW Inverter/Charger and protect the cabling. Use of the conduit box may be required depending on the local electrical code. Consult the local electrical authority to ensure the installation is code-compliant.



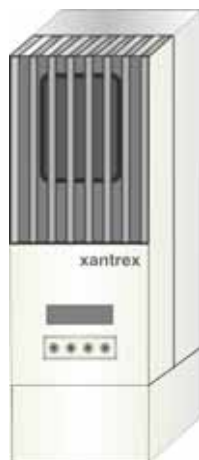
**Figure 1-4** XW Conduit Box

The XW Conduit Box comes in two pieces and mounts directly to the bottom of the inverter/charger with keyhole slots and screws. It is secured to the inverter by two #10-32 screws on the bottom of the inverter and is secured to the wall by two screws (not provided).

Internal wire barriers (or raceways) are included to keep communications wires separate from AC and DC power wires. The XW Conduit Box also includes multiple cable strap points.

## XW Solar Charge Controller

The XW Solar Charge Controller (FGA # 865-1030-1) is a 60 amp charge controller with integrated PVGFP and separate Battery Temperature Sensor. The XW Solar Charge Controller can be used with 12-, 24-, 36-, 48-, and 60-volt battery systems. When the XW Solar Charge Controller is used with the XW Inverter/Charger, it is limited to 24- or 48-volt battery banks. The XW Solar Charge Controller automatically detects the 24- or 48-volt settings.



**Figure 1-5** XW Solar Charge Controller

## XW System Control Panel

The XW System Control Panel (FGA # 865-1050) features a graphical, backlit liquid crystal display that displays system configuration and diagnostic information for all devices connected to the network. When installed as an XW Power System accessory, the XW System Control Panel eliminates the need for separate control panels for each device and gives a single point of control to set up and monitor an entire XW Power System.

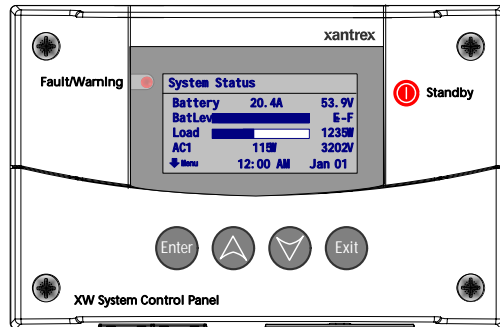


Figure 1-6 XW System Control Panel

## XW Automatic Generator Start

The XW Automatic Generator Start (FGA # 865-1060) can automatically activate a generator to provide an XW Series Inverter/Charger with power to recharge depleted batteries or assist with heavy loads.

The XW Automatic Generator Start is compatible with popular generators, and can be configured to start the generator in response to low battery voltage, thermostat operation, or load size on the inverter battery. A quiet time setting prevents the generator from starting at inconvenient times. LEDs display the status of the XW Automatic Generator Start, while all settings are programmed through the XW System Control Panel.

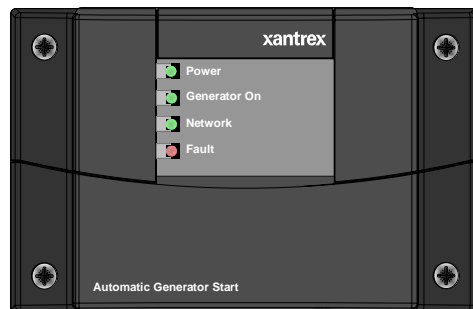


Figure 1-7 Automatic Generator Start



Generator	The generator should be a 230V, single-phase generator with Auto Start capability.
Generator Compatibility	The XW Automatic Generator Start supports most two and three-wire generator starters. Some manufacturers include, but are not limited to, Onan (Quiet Diesel, gasoline, and LP), Power Tech, Generac, Northern Lights, Fisher Panda, Westerbeke, Kohler, Honda, and Yamaha. Check with the generator manufacturer to ensure your generator has automatic starting capabilities and is compatible with the XW Automatic Generator Start. For more information, see the Automatic Generator Start Owner's Guide.
XW System Control Panel	A XW System Control Panel is required to configure the XW Automatic Generator Start and monitor generator starting and stopping activity.



# 2

## Inverter/Charger Installation

Chapter 2, “Inverter/Charger Installation” describes how to mount and install the XW Inverter/Charger.

For this Topic	See...
“Pre-Installation”	page 2–2
“Step 1: Installing the Mounting Plate”	page 2–4
“Step 2: Mounting the Inverter”	page 2–6
“Step 3: Installing Communications Cables”	page 2–7
“Step 4: Wiring the Inverter”	page 2–11
“Step 5: Installing Additional Inverters”	page 2–32

## Pre-Installation

Before installing the XW Inverter/Charger, read all instructions and cautionary markings located in this manual.

---

**Important:** Be sure to obtain the appropriate permits, if necessary, prior to starting this installation. *Installations must meet all local codes and standards.* Installations of this equipment should only be performed by skilled personnel such as qualified electricians and certified renewable energy system installers.

---



### **WARNING: Personal Injury**

The XW Inverter/Charger weighs approximately 54 kg. To prevent personal injury, always use proper lifting techniques and have someone available to assist with lifting during installation.

---

## Location

The XW Inverter/Charger is certified for indoor (heated or unheated) installations only.

Close to battery bank

Locate the inverter as close to the batteries as possible in order to keep the battery cable length short. The maximum recommended battery cable length is 3 meters.

---



### **WARNING: Explosion and Corrosion Hazard**

Do not locate the inverter directly above the batteries or in the same compartment as vented batteries.

---

Locate any electronic equipment susceptible to radio frequency and electromagnetic interference as far away from the inverter as possible.

Fire safety

Do not locate the inverter near readily flammable materials such as cloth, paper, straw, or plastic sheeting. Flammable materials should be kept a minimum distance of 600 mm from the top surface and 300 mm from either side surface and the front of the XW Inverter/Charger.

---

## Knockout Preparation

Remove your choice of knockouts from the chassis to facilitate conduit installation for wire runs. Ensure no debris from this procedure remains inside the inverter enclosure.

---

**Important:** Do not drill, cut, or punch holes into the XW Inverter/Charger. Use only the knockouts provided for conduit entry.

---

## Clearance Requirements

Provide a minimum clearance of 150 mm (300 mm is preferred) around the top and 150 mm at the bottom of the inverter for ventilation. There must be at least one meter of clearance in front of the inverter. Ensure that the vents are not obstructed with foreign objects and that the minimum clearances are met.

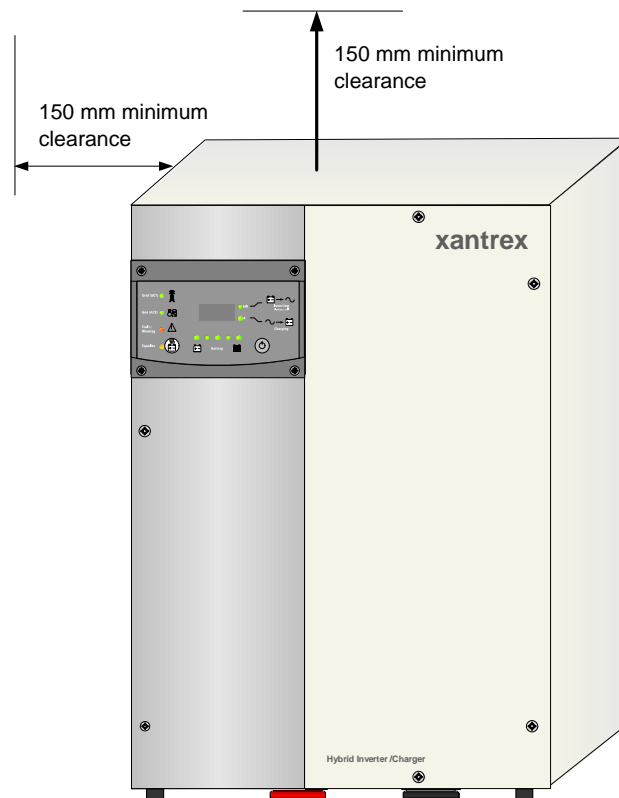


Figure 2-1 Clearance Requirements

## Mounting

The XW Power System is designed to be mounted on a vertical surface. The supporting surface must be strong enough to support a minimum of 60 kg for a single inverter/charger. To facilitate installation, a wall mounting plate (Xantrex part number 210-0462-01-01) is provided for each XW Inverter/Charger. The mounting plate and hardware on the XW Inverter/Charger are designed to meet standards for structural and seismic stability.

## Step 1: Installing the Mounting Plate

Each XW Inverter/Charger requires a separate mounting plate. This bracket is first attached to the wall, then the inverter/charger is attached to the wall bracket.

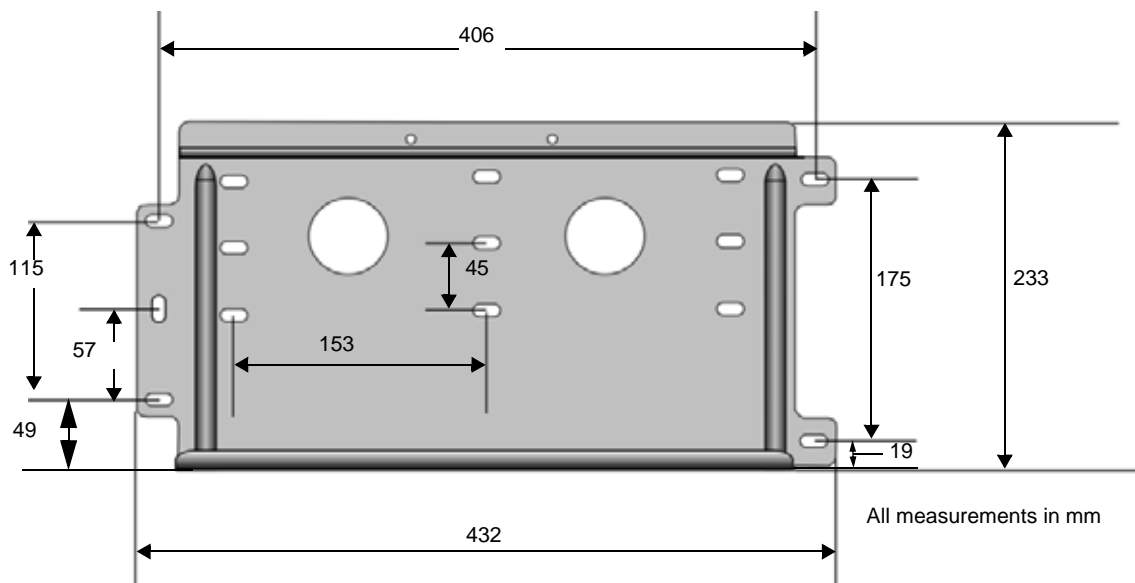
The wall bracket is attached to the wall with lag bolts or other fasteners, provided by the installer. A minimum of four 6 mm diameter fasteners are required. The fasteners must be sufficiently strong to support the weight of the inverter/charger. The type of fastener required to secure the mounting plate varies according to the vertical surface and wall structure of your installation location.

The wall bracket has mounting holes spaced 400 mm apart and is designed to span two wall studs spaced 400 mm on-center. Additional mounting holes are also provided for flexibility in mounting options. If the wall does not have 400-mm on-center studs, the installer will need to provide adequate supports for the brackets. For example, a sheet of plywood can be attached to the wall, and the wall brackets can then be attached to plywood.

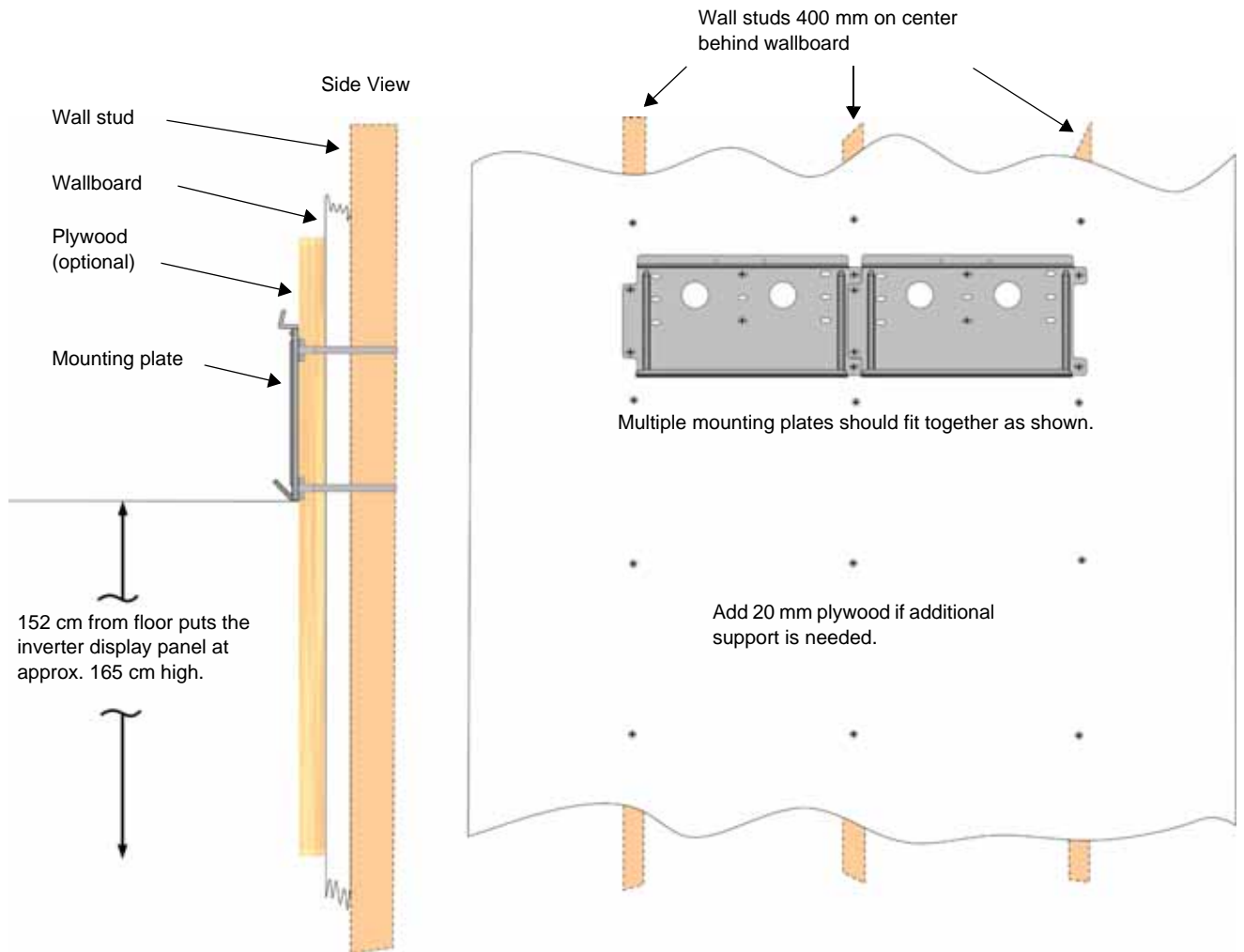
The brackets are designed to interlock (as shown in Figure 2-3), so that additional mounting plates are easily installed without additional measuring or levelling.

**Table 2-1** Mounting Plate Fastener Recommendations

Structure	Required Fastener	Number of Screws Per Bracket
Wood studs at 400 mm (on center - O.C.)	6 mm Ø × 89 mm long lag screw	Four
Wood studs not at 400 mm O.C. (20 mm minimum plywood panel required)	6 mm Ø × 25mm long wood screw	Six
Steel studs at 400 mm O.C. (minimum 18 gauge)	6 mm Ø self-drilling screw	Four



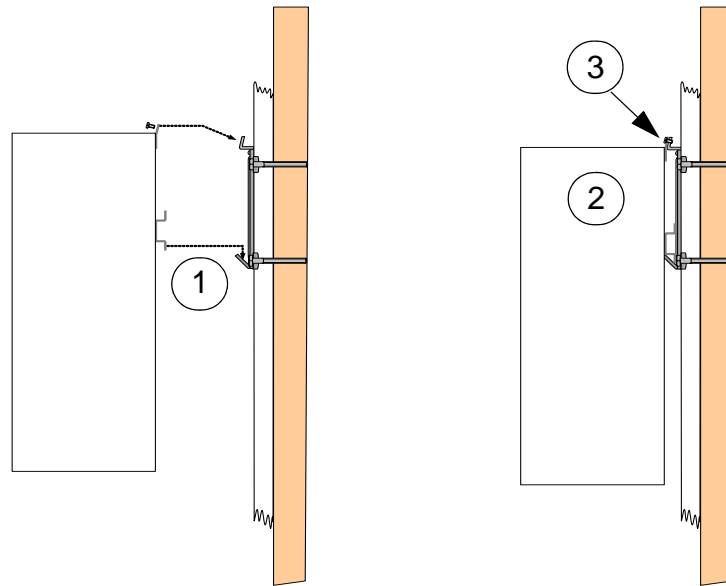
**Figure 2-2** Mounting Plate Dimensions



- 1 Locate the wall studs.
- 2 If necessary, enhance the support surface with a 20 mm plywood panel secured to the wall studs. Plywood should span at least three wall studs.
- 3 Use hardware (not provided) sized to support the weight of the equipment to secure the plywood to the wall.
- 4 Using a level, secure the first mounting bracket to the wall. Use recommended anchoring hardware to secure the plate (see Table 2-1).
- 5 Mount the next bracket adjacent to the first one. The brackets are designed to interlock, so additional mounting brackets are easily installed without additional measuring or levelling.

Figure 2-3 Mounting the Bracket for the XW Inverter/Charger or Distribution Panel

## Step 2: Mounting the Inverter



- ① Align the flange on the back of the XW Inverter/Charger with the bottom edge of the mounting plate.
- ② Lower the flange on the inverter onto the mounting plate.  
**CAUTION:** Before releasing the full weight of the unit, ensure the inverter is seated properly on the mounting plate.
- ③ Secure the top of inverter with two #10 self-tapping screws (supplied).

Figure 2-4 Mounting the XW Inverter/Charger



## Step 3: Installing Communications Cables

Two types of communication cables must be installed, depending on your installation requirements:

1. Xanbus network cables—to connect the XW Inverter/Charger to other Xanbus-enabled devices. Connecting XW Inverter/Chargers and other network components with Xanbus network cables simplifies and automates configuration, control, and monitoring of the XW Power System.
2. AC Sync cables—to connect the XW Inverter/Charger to other XW Inverter/Chargers in multiple-unit installations. The AC Sync cables provide communication and AC control between multiple XW Inverter/Chargers.

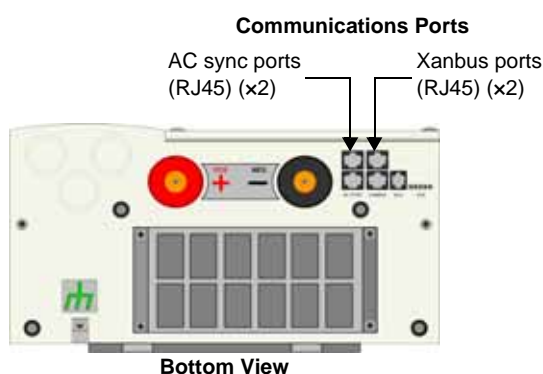


Figure 2-5 XW Inverter/Charger Communications Ports

### Guidelines for Routing the Communications Cables



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

Do not route the Xanbus or AC Sync cables in the same conduit or panel as the AC and DC power cabling.

To ensure maximum performance of your network, follow these guidelines when routing the communications cables.

- Route the cables away from sharp edges that might damage the insulation. Avoid sharp bends in the cable—no less than a 100 mm radius.
- Allow for some slack in the cable tension.
- Keep the alignment of wire pairs inside the sheath as straight as possible.
- Allow separation between communications and power cables (communications cables should only cross a power cable at right angles).
- Do not staple the cable with metal cable staples. Use appropriate hardware fasteners to avoid damage to the cable.
- Support horizontal cables using J hooks or cable trays.

The total length of the network, including all connected Xanbus-enabled devices and the XW Inverter/Charger, cannot exceed 40 m.

## Xanbus Network Components

A Xanbus network consists of the following components:

- Xanbus-enabled devices—these include the XW System Control Panel, the XW Inverter/Charger, XW Automatic Generator Start, and XW Charge Controller. The maximum number of Xanbus-enabled devices in an XW Power System should not exceed eight.
- Xanbus power supply—the network must have at least one device with a power supply to run the network. The total network current supplied by all the power-sourcing devices must be greater than or equal to the total current drawn by the power consuming devices. The power supply must be capable of providing 15 Vdc/200 mA to each device. The XW Inverter/Charger can provide sufficient network power.

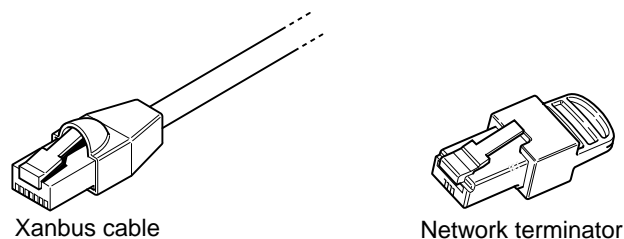
For example, in a system with an inverter/charger, a XW System Control Panel and an Automatic Generator Start, the inverter/charger is a power-sourcing device capable of providing 800 mA at 15 Vdc while the two other devices each consume a maximum of 200 mA for a total maximum consumption of 400 mA. In this example, the network is properly configured from a power perspective because the power source is capable of providing more current than is needed: 800 mA > 400 mA.

- Xanbus cables—each Xanbus-enabled device is connected by a Category 5 (CAT 5 or CAT 5e) cable, a standard cable available from Xantrex or any computer supply store. The cable consists of eight conductors in four twisted pairs with an RJ45 modular connector wired to the T568A standard.



### CAUTION: Equipment Damage

Do not use crossover cable.



**Figure 2-6** Xanbus Cable and Network Terminators

- Network terminators—the Xanbus network must be properly terminated at each end to ensure the communication signal quality on the network. If the network is not properly terminated, signal quality is degraded and performance on the network is reduced. Permanent configuration without terminators is not supported by Xantrex. The XW Series and other Xanbus-enabled devices ship with one terminator. Depending on your network layout, this terminator may need to be inserted into another device elsewhere in the network.

## Network Layout

Each device on the network is linked with separate lengths of Xanbus cable, as shown in Figure 2-7.



### CAUTION: Unpredictable device behavior

Do not connect one end of the network to the other to make a ring.

Two terminators are required to ensure the communication signal quality on the network. The Xanbus-enabled devices at each end of the chain must have a terminator inserted into their open network ports.

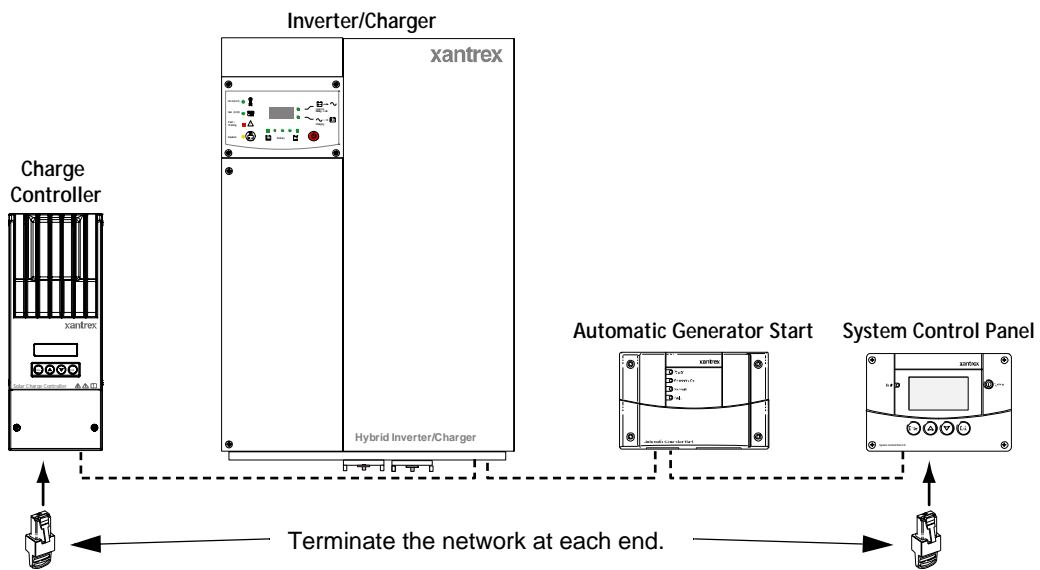


Figure 2-7 Xanbus Network Layout

## Connecting Xanbus-Enabled Devices

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**Important:** Installing and replacing Xanbus-enabled devices in an existing system must be performed with the XW Power System in Standby mode. For more information about Standby mode, see the XW System Control Panel Owner's Guide.

---



### **CAUTION: Equipment Damage**

Connect only to other Xanbus compatible devices.

Although the cabling and connectors used in this network system are the same as Ethernet connectors, **this network is not an Ethernet system**. Equipment damage may result from attempting to connect Xanbus to different systems.

---

#### **To connect the Xanbus-enabled devices:**

1. Determine and prepare the location for each device. Refer to the installation instructions for each device.
2. Determine and measure the required cable length, taking into consideration your network layout, the routing, and strain relief requirements. Do not exceed the total recommended cable length of 40 meters.
3. Mount the devices according to the installation instructions for each device.
4. Use an appropriate length of Xanbus cable to connect each device.
5. Insert a terminator into the open network port of the Xanbus-enabled device at each end of the network. See Figure 2-7.

## Connecting AC Sync Cables

Connect AC Sync cables in the same daisy-chain layout as Xanbus network cables (see Figure 2-7). Network terminators are not required for AC Sync connections.

#### **To install the AC Sync cables:**

1. Insert the cable into one of the two AC Sync ports in inverter #1.
2. In a two-inverter system, connect the AC Sync cable between inverter #1 and inverter #2.

In a three-inverter system, connect an AC Sync cable between inverter #1 and inverter #2, then connect an AC Sync cable between the second AC Sync port in inverter #2 and an AC Sync port in inverter #3.

---

## Step 4: Wiring the Inverter

This section provides procedures for making AC and DC connections between the XW Inverter/Charger, the batteries, and the AC distribution sub-panel.

### Batteries

See the FAQs section of the Xantrex Web site for information on determining battery bank requirements.

Consider the following recommendations for battery use:

- Use only the deep discharge types for inverter applications.
- Use the same battery type for all batteries in the bank.
- Use only batteries from the same lot and date in your battery bank. This information is usually printed on a label located on the battery.



#### **CAUTION: Damage to Equipment**

The XW Inverter/Charger is intended to operate with batteries as its source of DC power. **Do not** connect DC power sources, such as PV arrays, wind turbines, or micro-hydro turbines, directly to the XW Inverter/Charger without a battery. Connect DC power sources to a charge controller such as the XW Solar Charge Controller instead. If DC power sources are connected directly to the inverter, the DC rating of the inverter can be exceeded and the inverter can be damaged.

---

### Battery Bank Requirements

The DC voltage of the inverter must match the nominal voltage of the system and all battery-connected devices. If the inverter is a 24-volt inverter, then the battery bank and all battery-connected devices in the system need to be configured for 24 volts.

---

**Important:** The minimum recommended battery bank is 100 Ah. The inverter is designed to operate with batteries and should not be operated without them. Also, do not allow the battery bank to become completely discharged. If the voltage of the battery bank falls below 10 volts, the XW Power System will not operate.

---

### Battery Cable Requirements



#### **WARNING: Fire Hazard**

Undersized cables can overheat and melt, creating a fire hazard when subjected to heavy (peak) loads. Always use a cable of proper size and length, rated for the amperage of the inverter and batteries.

---

**Important:** Use only fine-stranded copper cables for battery and inverter DC connections. Do not use coarse-stranded wire, as the lack of flexibility may damage battery and inverter terminals.

---

Battery cable length	Runs should be kept as short as practical. Length should not exceed 3 meters. For best performance, the positive and negative cables should run alongside each other. Avoid cable loops.
Battery cable lugs	Battery cables must have crimped copper compression lugs or crimped and soldered copper compression lugs. Soldered connections alone are not acceptable. Lugs must be rated for use with fine-stranded cable.
Overcurrent protection	For safety and compliance with regulations, battery overcurrent protection is required. Fuses and disconnects must be sized to protect the wiring in the system and are required to open before the wire reaches its maximum current carrying capability.
Terminal covers	Color-coded snap-on DC terminal covers are provided to prevent accidental contact with the terminals. Terminal covers are required for all installations. It is also recommended that the shank of the ring terminals (cable lugs) be covered with heat shrink or some other form of insulation.

**Table 2-2** Recommended Battery Cable Size Versus Length

Inverter Model	Up to 1.5m (90°C wire)	Up to 3 m (90°C wire)
XW4024	120 mm <sup>2</sup> (#4/0 AWG)	120 mm <sup>2</sup> (#4/0 AWG)
XW4548	70 mm <sup>2</sup> (#2/0 AWG)	120 mm <sup>2</sup> (#4/0 AWG)
XW6048	120 mm <sup>2</sup> (#4/0 AWG)	120 mm <sup>2</sup> (#4/0 AWG)

**Important:** Your local electrical code may require both overcurrent protection and a disconnect switch for residential and commercial electrical systems. These items are not supplied with the inverter.

**Table 2-3** Battery Cable (in conduit) to Maximum Breaker/Fuse Size

Cable Size Required	Maximum Breaker/Fuse Size
70 mm <sup>2</sup> (#2/0 AWG)	175 amps
120 mm <sup>2</sup> (#4/0 AWG)	250 amps

## Torque Values for the XW Series Inverter/Charger

**Table 2-4** Torque Values for AC Wiring (AC Terminals and Ground Bar)

Wire Size		Torque Value	
AWG	mm <sup>2</sup>	In-lb	N-m
14–10	2.5–6	35	4
8	10	40	4.5
6–4	16–25	45	5.1

**Table 2-5** Torque Values for the Chassis Ground Lug

Wire Size		Torque Value	
AWG	mm <sup>2</sup>	In-lb	N-m
6–4	16–25	45	5.1
3–2	25–35	50	5.6

**Table 2-6** Torque Values for the Inverter Battery Terminals

Torque Value	
Ft-lbs	N-m
15	20.4

## Inverter Grounding

---

**Important:** The grounding requirements vary by country and by application. All installations must comply with national and local codes. Consult local and national codes for specific grounding and bonding requirements for the desired installation.

---

## Backfeed Protection Requirements

---

**Important:** Installers must make allowance for the amount of power that can be fed into a distribution panel and the means and location for feed-in, in accordance with your local electrical code.

---

## Making DC Connections

This section describes how to make DC connections between the inverter/charger and the batteries. Battery cables must be provided by the installer—see Table 2-2 on page 2-12. This section also provides procedures for installing the battery temperature sensor.

### Grounding the DC System

The inverter’s chassis ground lug is located along the rear edge of the unit (see Figure 2-8) and is used to connect the chassis of the inverter to the DC grounding system. The terminal accepts wires from #14 AWG to #2 AWG (2.5 mm<sup>2</sup> to 35 mm<sup>2</sup>).

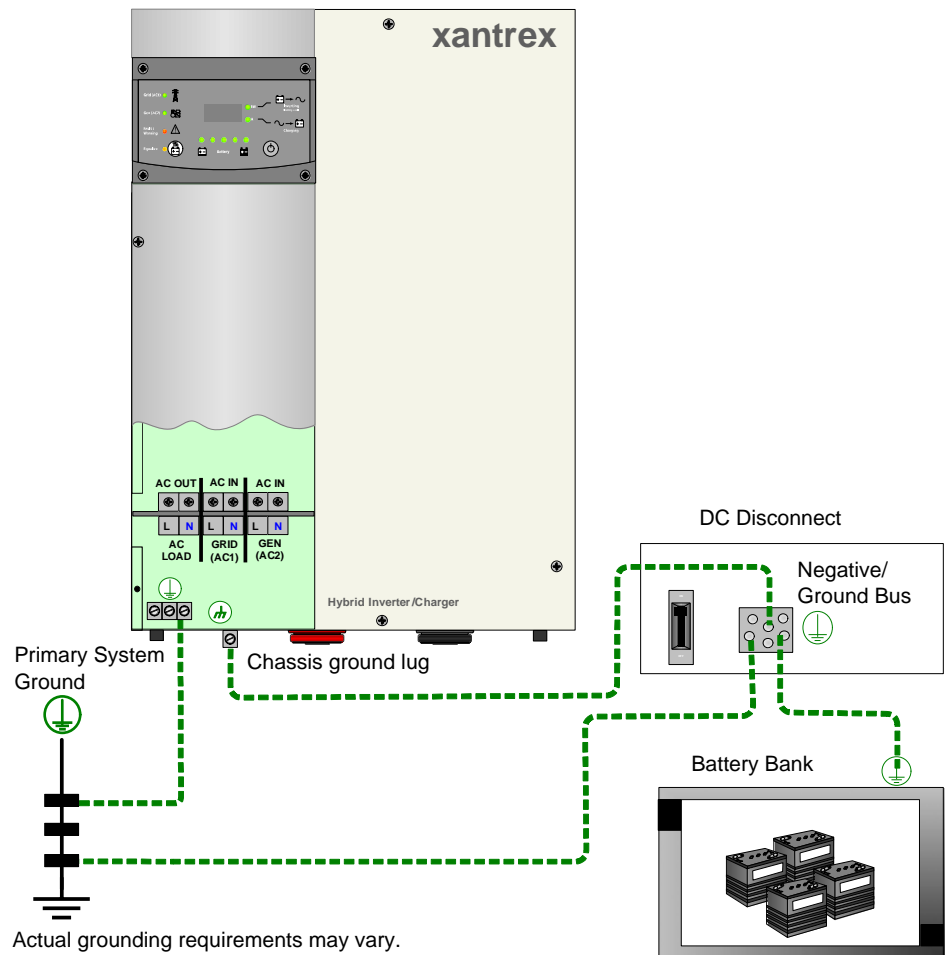


Figure 2-8 DC Grounding Using a Power Distribution Panel



## Connecting the Batteries



### WARNING: Shock Hazard

Ensure that all AC and DC breakers are switched OFF before connecting or disconnecting the battery cables and that all sources of power (both AC and DC) are disconnected from the inverter.

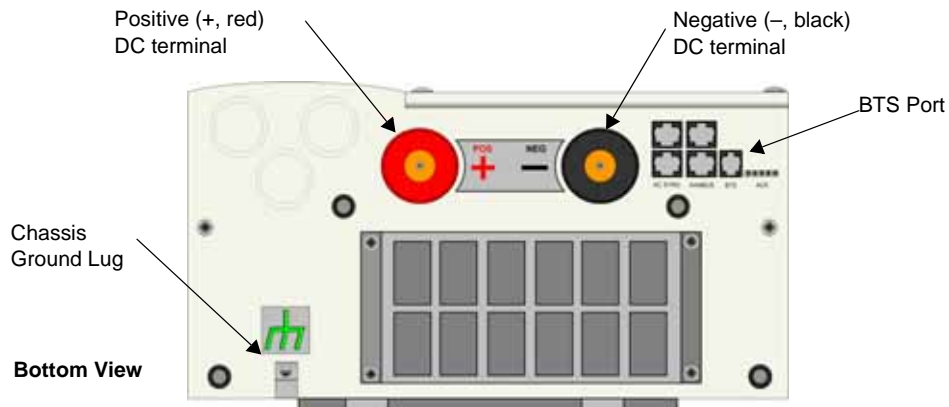


Figure 2-9 XW Inverter/Charger DC Connections

#### To connect DC cables to the XW Inverter/Charger:

1. Route the DC cables from the battery bank to the inverter/charger.
2. Install a DC fuse and disconnect switch or a DC circuit breaker between the inverter/charger and the battery. They must be installed in the positive side of the DC circuit, as close as possible to the battery. See Figure 2-9, “XW Inverter/Charger DC Connections” on page 2–15.

This protects your battery and wiring in case of accidental shorting. Before proceeding, ensure the DC disconnect switch is open or that the DC circuit breaker is turned off.

3. Connect one connector on the POSITIVE (+) cable to the POSITIVE DC terminal on the inverter/charger. Be careful to observe proper polarity. Figure 2-10 shows the proper stacking order of hardware. Use a wrench to tighten the bolt to the required torque.
4. Connect the other connector to the POSITIVE (+) terminal on the fuse or breaker. Observe polarity carefully while completing the installation.  
Follow the fuseholder or breaker manufacturer’s torque recommendation.
5. Connect the NEGATIVE (–) battery cable to the NEGATIVE (–) DC terminal on the inverter/charger. Be careful to observe proper polarity. Figure 2-10 shows the proper stacking order of hardware. Use a wrench to tighten the bolt to the required torque.
6. Before proceeding, check that the cable polarity is correct: POSITIVE (+) on the inverter/charger is connected to the POSITIVE (+) on the battery, and NEGATIVE (–) cable is connected to the NEGATIVE (–) terminal on the inverter/charger.

**Important:** The next step is the last cable connection you need to make. A spark is normal when this connection is made.

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7. Connect the other end of the cable to the NEGATIVE (–) terminal on the battery.
8. Use a wrench to tighten the bolt to the required torque.
9. Attach the DC terminal covers.

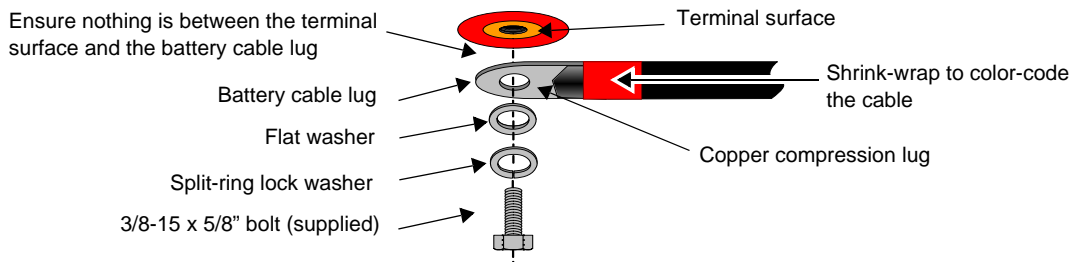


Figure 2-10 Battery Cable Connection



**CAUTION: Damage to Equipment**

Do not put anything between the battery cable lug and the terminal surface. Overheating of the terminal may occur. Do not apply any type of antioxidant paste until after the battery cable wiring is tightened. The same applies for all DC connections. Do not over-tighten; observe all recommended torque values.

---



**CAUTION: Reverse Polarity Damage**

Before making the final DC connection or closing the DC breaker or disconnect, check cable polarity at both the battery and the inverter/charger. Positive (+) must be connected to positive (+). Negative (–) must be connected to negative (–).

Reverse polarity damage is not covered by warranty.

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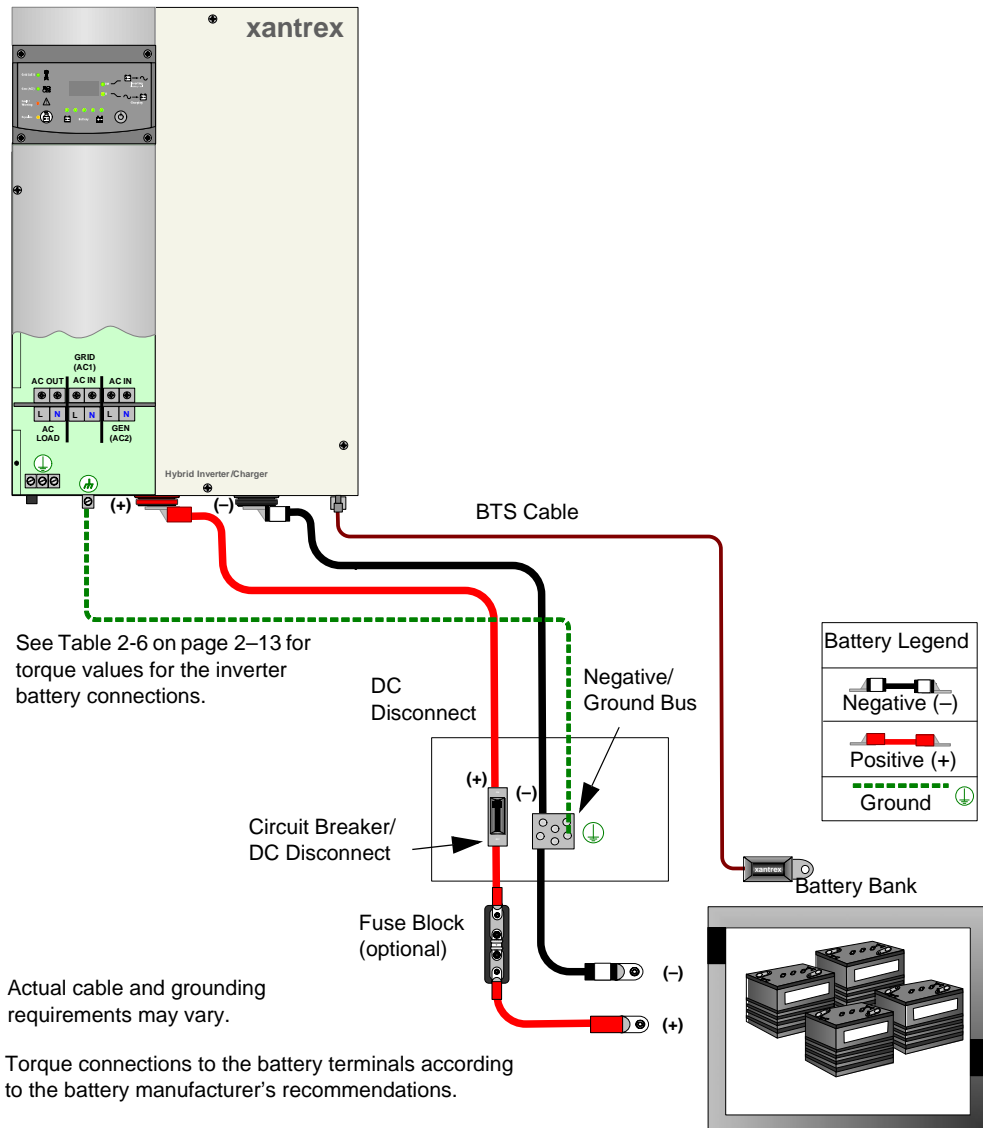


Figure 2-11 DC Connections to a Single Inverter

### Installing the Battery Temperature Sensor

The Battery Temperature Sensor (BTS) regulates battery charging based on battery temperature. Installing a sensor extends battery life by preventing overcharging in warm temperatures and undercharging in cold temperatures. The BTS is supplied with the XW Inverter/Charger. The replacement part number is #808-0232-02.

**To install the Battery Temperature Sensor:**

1. Insert the Battery Temperature Sensor plug into the BTS port. See Figure 2-9 and Figure 2-11.
2. Route the cable to the battery enclosure and connect the ring terminal on the BTS directly to a battery terminal (recommended), or use the adhesive backing on the sensor back to attach the sensor to any side of the battery to be monitored.

If using the adhesive backing, install the BTS on the side of the battery below the electrolyte level. It is best to place the sensor between batteries and place the batteries in an insulated box to reduce the influence of the ambient temperature outside the battery enclosure.

---

**Note:** If other Xanbus-connected components supply a BTS or are BTS enabled, it is not necessary to install all of them at once. Only one BTS needs to be installed.

However, if multiple battery banks are being used, multiple sensors can be installed. In this case, the system uses the highest temperature from all the input as its operational parameter.

---

## Making AC Connections

This section describes how to make AC connections between the XW Inverter/Charger and the utility grid AC distribution panel and the inverter AC distributions panel (or sub-panel). All wiring must be provided by the installer.

---



**CAUTION: Damage to the Inverter**

The inverter's AC output must never be wired to the utility or generator output. This will cause severe damage to the inverter which is not covered under warranty.

---

Do not use a RCD-equipped AC source to power the XW Inverter/Charger grid or generator inputs. The AC input filters on the XW Inverter/Charger may cause nuisance tripping of ground fault-protected outputs.

## Accessing the AC Terminal Block

The AC terminal block includes two terminals each (L and Neutral) for AC Grid input, AC Generator input, and AC Load connections. The neutrals are connected to each other, requiring only one neutral connection when the installation uses an XW Power Distribution Panel. Without the XW Power Distribution Panel, additional neutral connections may be required at the input sources.

The AC terminal block is located on the left-hand side of the inverter beneath the AC access cover. See Figure 2-12.

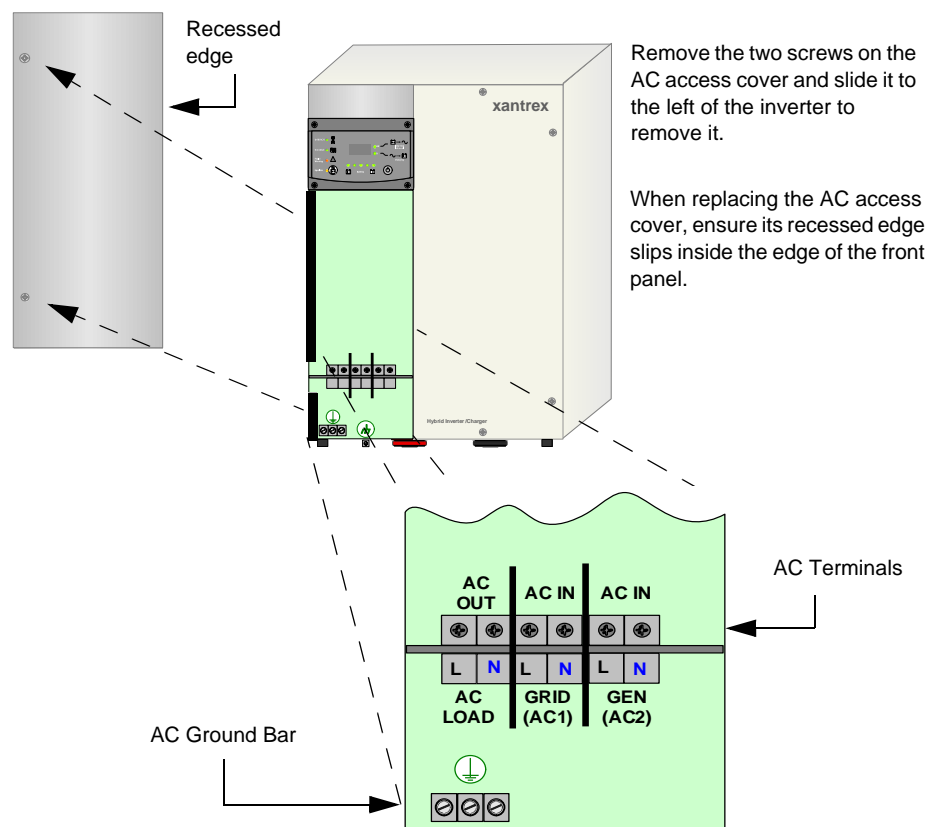


Figure 2-12 AC Terminal Block and Ground Bar

## Grounding the AC System

**Important:** Place the Neutral-to-ground bond in a permanently installed AC distribution panel that is part of the system. This may be a main panel or a sub-panel.

See Table 2-4 on page 2–12 for torque values for the AC terminal and AC Ground bar.

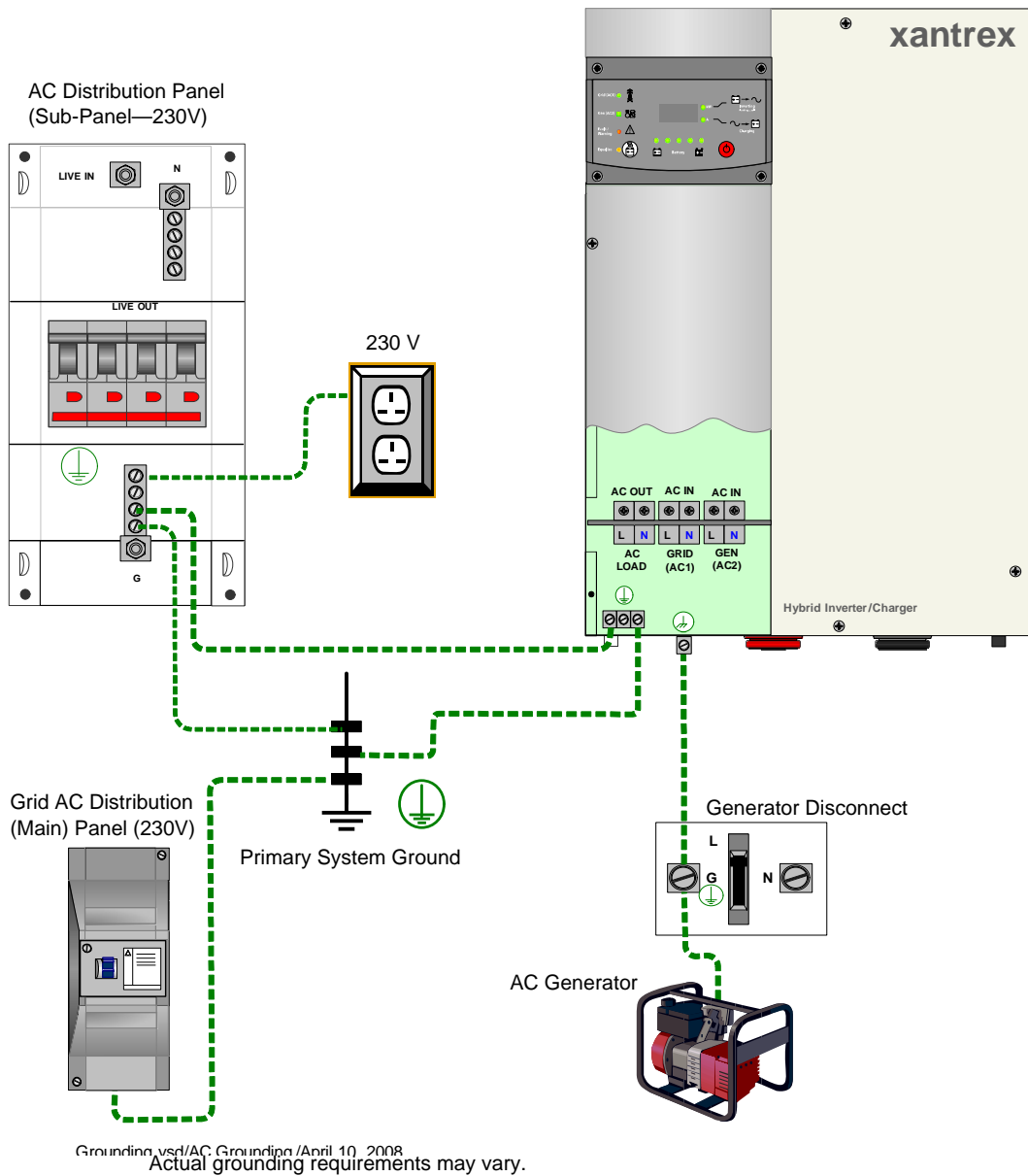


Figure 2-13 Grounding the AC System

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## AC Wiring to the Inverter AC Distribution Panel (sub-panel)

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**WARNING: Shock Hazard**

Before making any electrical connections, ensure both the AC and DC disconnect devices are in the OPEN (disconnect) position.

**CAUTION: Equipment Damage**

Verify that only one neutral-to-ground bond exists in the system. Having more than one neutral-to-ground bond in a system violates local electrical codes, may create a shock or fire hazard, and may cause some sensitive equipment to malfunction.

**CAUTION: Damage to the Inverter**

The inverter's AC output must never be wired to the utility or generator output. This will cause severe damage to the inverter which is not covered under warranty.

---

An inverter AC distribution panel (also known as a sub-panel or inverter load panel) and AC conduit must be installed before AC wiring is connected to the inverter.

**Install the inverter AC distribution panel and conduit as follows:**

1. Determine the location for the inverter AC distribution panel and install it according to the manufacturer's directions.
2. Install an AC conduit between the XW Inverter/Charger and the inverter AC distribution panel.
3. Determine which circuits the inverter will power and install the appropriate circuit breakers into the inverter panel.
4. For On-Grid systems:
  - a) Disconnect all power to the main utility panel.
  - b) Determine which circuits will be supplied by the inverter(s) and remove their wires from the main panel.
  - c) Reroute these wires to the new inverter subpanel.
5. Remove unused breakers from utility panel.
6. Install a 60-amp maximum (disconnect) main circuit breaker in the inverter panel. This will later be wired to the inverter's output.

## AC Wiring to the XW Inverter/Charger

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### **WARNING: Shock Hazard**

Before making any electrical connections, ensure both the AC and DC disconnect devices are in the OPEN (disconnect) position.

---

Ensure the AC system, including the XW Inverter/Charger and generator, is correctly grounded according to local electrical codes. See “Grounding the AC System” on page 2–20.

#### **To connect the inverter to the inverter AC distribution panel:**

1. See Figure 2-14. Connect the neutral wire from the inverter panel neutral bus to the N-LOAD terminal on the inverter.
2. Connect the L (LIVE) wire from the input terminal on the inverter panel to the AC Load (L-LOAD) terminal on the inverter.

#### **To connect the inverter to the Utility Grid AC Distribution Panel:**

1. See Figure 2-14. Connect the neutral wire from the utility grid AC distribution panel to the inverter GRID (AC1) neutral terminal.
2. Connect the AC LIVE wire from the utility grid AC distribution panel to the inverter GRID (AC1) L terminal.

#### **To connect the inverter to the AC generator:**

1. See Figure 2-15. Connect the neutral wire from the generator breaker or disconnect to the inverter GEN (AC2) neutral terminal.
2. Connect the AC LIVE wire from the generator breaker or disconnect to the inverter GEN (AC2) L terminal.



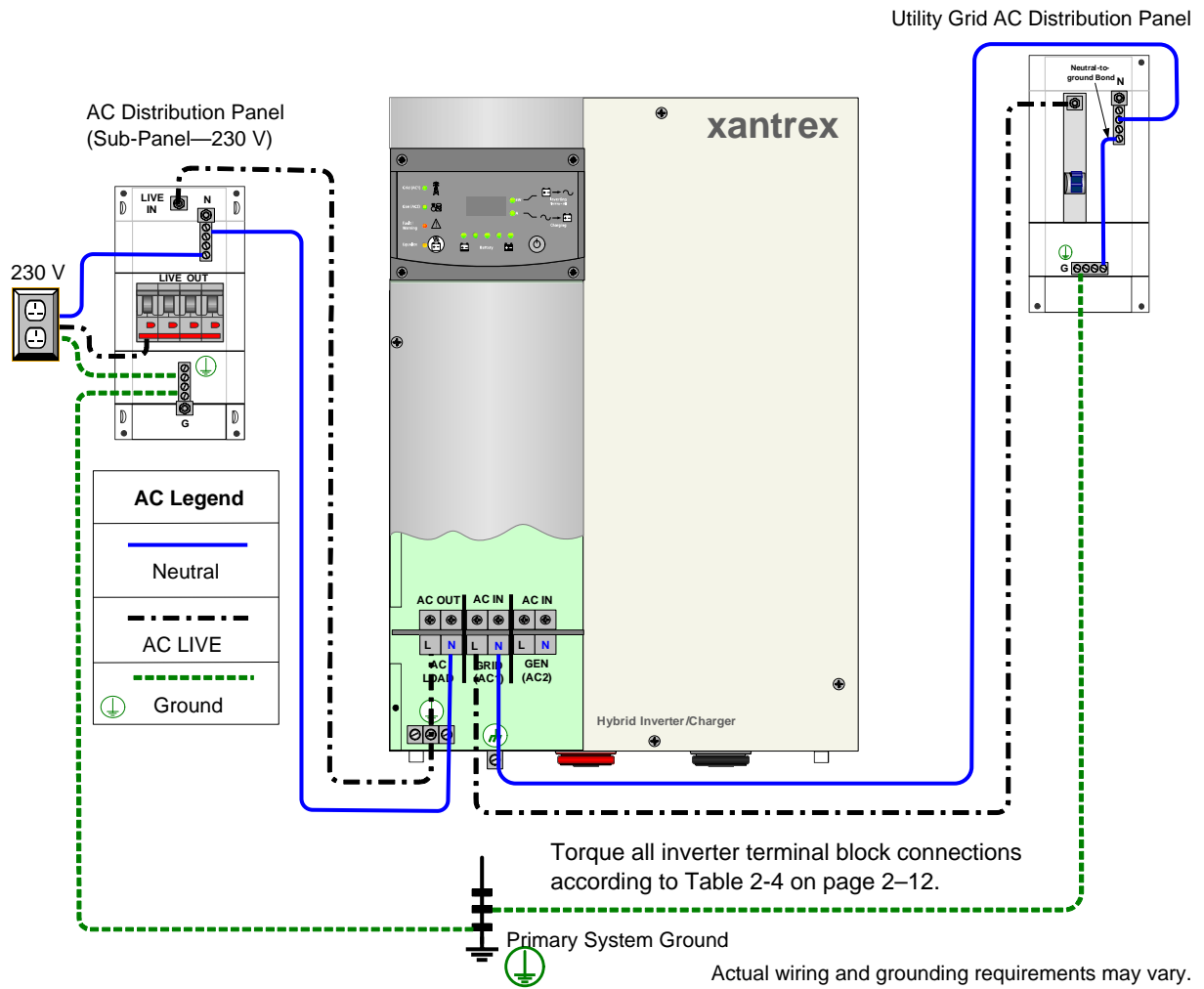


Figure 2-14 Wiring the XW Inverter/Charger to the Sub-panel and Utility Grid

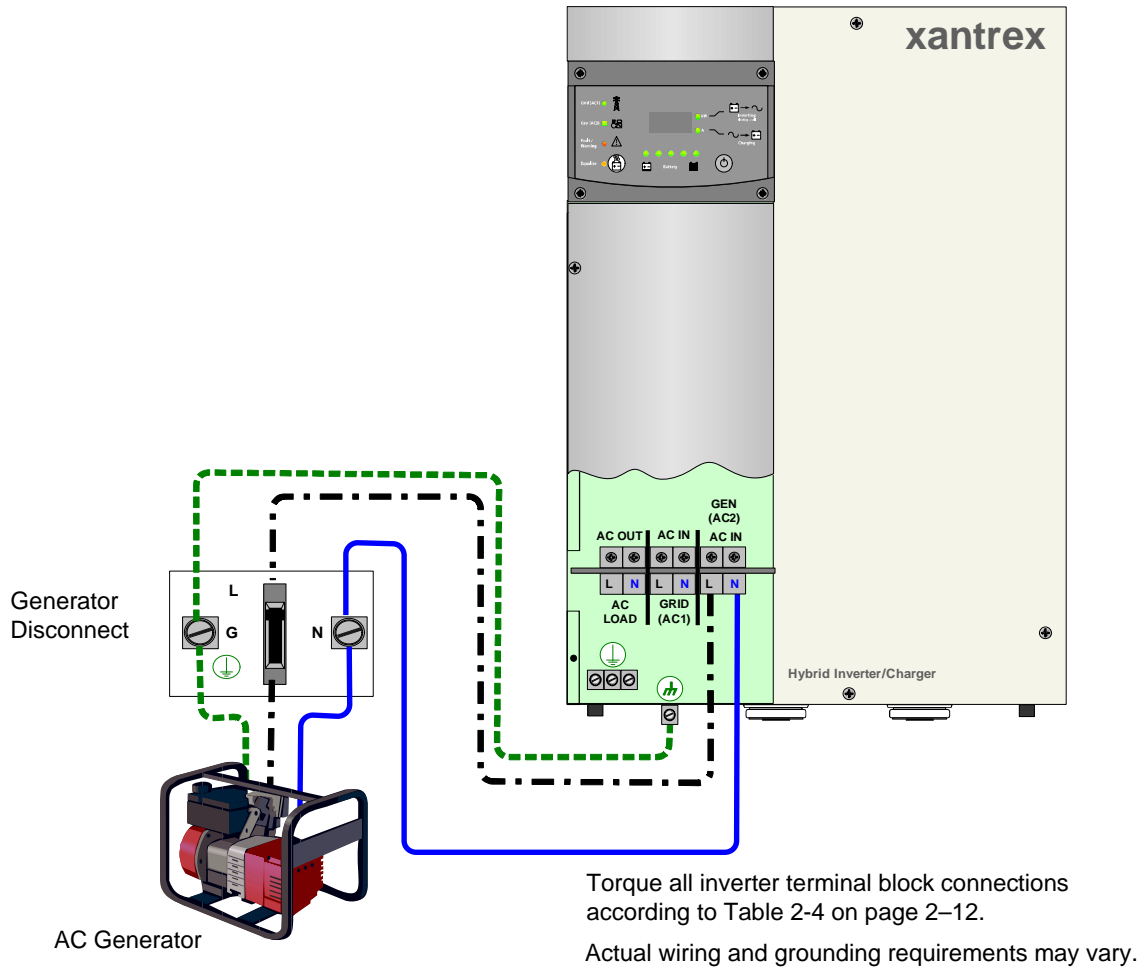


Figure 2-15 Generator Wiring to the Inverter

## AUX Port

The auxiliary output is designed to provide the following functions:

- Auxiliary 12 Vdc power supply
- Remote Power Off

The AUX port provides 12 Vdc/250 mA output to control a relay, fan, indicator light or other device. The auxiliary output can be configured (using an XW System Control Panel) to trigger in response to:

- low battery voltage
- high battery voltage
- low battery temperature
- high battery temperature
- any device fault

The auxiliary output can also be triggered manually using an XW System Control Panel.

The 12 Vdc output can trigger a relay to disconnect batteries from the inverter/charger when battery voltage or temperature are out of the ideal range.



Figure 2-16 AUX Port Location

### AUX+12V Voltage Supply

DC voltage is available between JU-1 (AUX +12 V) and JU-3 (AUX-COM, signal return). The power available at these terminals is 12 Vdc and maximum current is 0.25 Adc (3 watts).

The AUX+12 V and AUX-COM terminals can be used to power a relay (3 watts maximum). Additional fuses are not required, but may be required for some installations. The default status of AUX+12 V is OFF.

### AUX-RPO: User Remote Power Off (RPO)

Connecting JU-2 (AUX-RPO) and JU-3 (AUX-COM) terminals together through an external switch (normal open contact) provides the system shut off function if the switch is closed.

The external switch, if pressed, overrides the control provided from the front panel.

If the external switch is cleared (not pressed), the system can be enabled back from the front panel.

Select an external switch with normal open contact. Consult your system designer or qualified technician for specific installation instructions.

### User Line Wiring

Use twisted pairs of #24 AWG to #12 AWG (0.5 mm<sup>2</sup> to 2.5 mm<sup>2</sup>) for connections. Carefully route the wires away from high power load cables to minimize noise effects on signal integrity.

### AUX Port Terminal Assignments

**Table 2-7** User Connector Terminals and Functions

Pin	Reference	Name	Function
JU-1	AUX+12V	+12 V User Voltage Supply	+12 Vdc Voltage source: 0.25 Adc maximum
JU-2	AUX-RPO	Remote Power Off	Remote Power Off Logic Level: Active Low. Connecting this signal shuts down system operation.
JU-3	AUX-COM	Common Ground Reference	Return Common Ground Reference for 12V, Remote Power Off signals.
JU-4	Not Operational	Not Operational	Not Operational
JU-5	Not Operational	Not Operational	Not Operational

## Basic Functional Test - Single Inverter

The following steps are a basic functional test of the XW Inverter/Charger. If any test fails, please refer to the Troubleshooting section in the XW Inverter/Charger Operation Guide for assistance.

### Confirm All Connections

Once the AC and DC wiring have been installed and connected, take a moment to go back over all connections and make sure they are secure and have been installed correctly.

### Applying DC Power to the Inverter



#### CAUTION: Reverse Polarity Damage

Before making the final DC connection or closing the DC breaker or disconnect, check cable polarity at both the battery and the inverter/charger. Positive (+) must be connected to positive (+). Negative (-) must be connected to negative (-).

Reverse polarity damage is not covered by warranty.

#### To apply DC power to the inverter:

1. Before applying DC power to the inverter, measure the voltage and polarity of the battery cables (measure at the battery side of the disconnect or breaker).

**Important:** Voltage should be between 40 to 60 volts for a 48-volt system, and 20 to 30 volts for a 24-volt system. If the DC voltage is low, the battery bank needs to be charged externally. Charge the battery bank and restart the functional test.

2. Apply battery power to the inverter by closing the battery bank DC disconnect.

The inverter will power up, the display will illuminate, but the inverter will remain in the Standby Mode (as shown in Figure 2-17).



Note: If the inverter was previously powered up then it will power-up in the last operating state (Operating or standby)

All LEDs temporarily illuminate.

ON/OFF Button

Figure 2-17 Power-up Display

## Enable the Inverter



### CAUTION: Equipment Damage

Prior to activating the inverter, ensure that all AC loads are disconnected from the output of the inverter.

By default, Invert Mode is enabled and the unit should start inverting upon transitioning from Standby Mode. If Invert Mode is disabled, the display will show (---) once out of Standby Mode. If the unit powers up in Standby Mode, press the ON/OFF button momentarily to change the mode from Standby to Operating.

#### To enable the inverter:

- ◆ Press the inverter ON/OFF button and the Equalize button at the same time. “En” is briefly displayed on the inverter panel to indicate the inverter is enabled.

#### To disable the inverter:

- ◆ Press the inverter ON/OFF button and the Equalize button at the same time. “diS” is briefly displayed on the inverter panel to indicate the inverter is disabled.

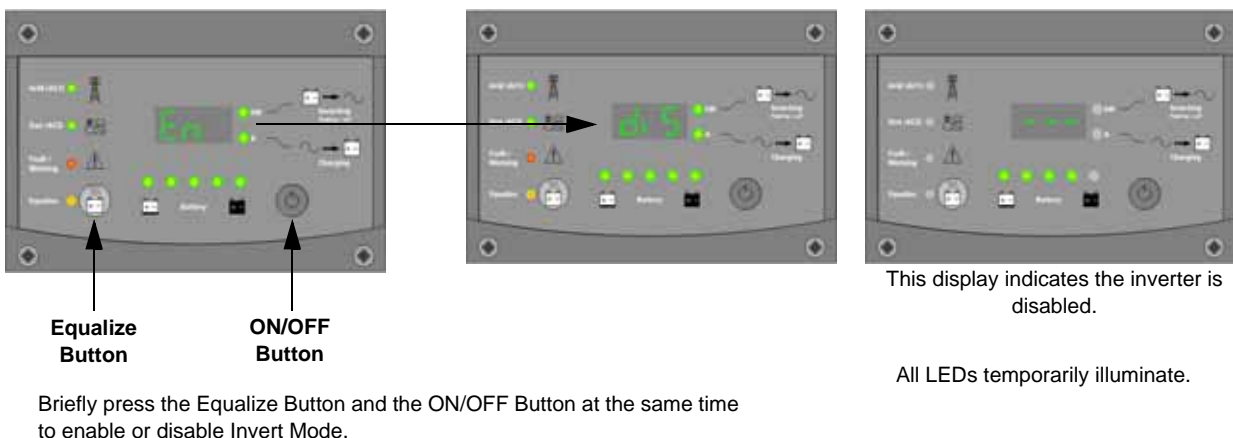


Figure 2-18 Enable the Inverter

3. Monitor the INVERT (Green kW) LED to confirm which mode the inverter is in:
  - LED Off—Invert Mode is disabled. The inverter/charger is not powering the AC loads. However, if qualified AC is present from the utility or a generator, it is passed through to the loads.
  - One blink/sec—The inverter/charger is in the Search Mode and is looking for an AC load greater than the Search Watts setting (default = 25 watts). The Display shows Sch (Search) when this mode has been enabled.
  - LED On—The inverter/charger is on. The inverter is operating and is able to provide power to the AC loads. This is the default mode on initial power-up once the unit is taken out of Standby Mode.

If the inverter is not operating or the INVERT LED (kW) does not illuminate, check all connections. Check the inverter’s DC voltage on the positive (+) and negative (-) terminals. Check the Fault LED. If the fault LED is illuminated, check for a fault code on the information panel. Correct the reported fault if possible and clear the fault. If the DC voltage is low, the battery bank needs to be charged externally. Charge the battery bank and restart the functional test.

### AC Voltage Check

**Important:** This test requires the use of a voltmeter.

**To perform an AC voltage check:**

1. With the inverter on (INVERT [green, kW] LED on solid), verify the AC voltage at the AC Loads block terminal L-Load to N-Load.
2. Verify that neutral is bonded to ground in the system by measuring the live and neutral voltages relative to ground. Neutral-to-ground should equal zero (0) volts.
3. After confirming the correct AC voltage, turn on your AC output breaker and place a load on the inverter (plug in a light or other load to an outlet the inverter is powering).
4. Confirm that the AC load that was just applied works properly.

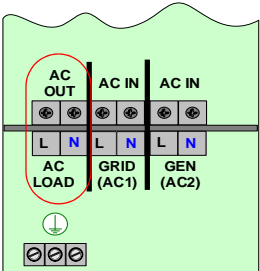


Figure 2-19 Checking AC Voltage

## Confirming Battery Charger Operation

### To confirm battery charger operation:

1. Apply AC from grid or generator, confirm voltage.
2. Check LEDs (AC1 or AC2) on the front panel. One of them must be illuminated for the unit to charge. Check the “A” LED. If the “A” LED is illuminated, the unit is charging and the battery current is displayed on the information panel.

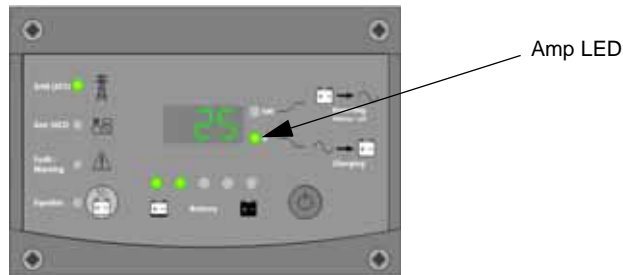


Figure 2-20 Checking Charging Operation

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**Important:** Unless the inverter/charger settings have been changed, the inverter will charge as if it has a large (> 440 Ah) flooded battery bank (factory default setting). Therefore, ALL systems may need to have the battery charging set points configured to avoid damage to the batteries.

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This completes the functional test. If all tests pass, the inverter is ready for use. If any of the inverter’s internal set points need to be adjusted, consult the configuration chapter of the operation guide.



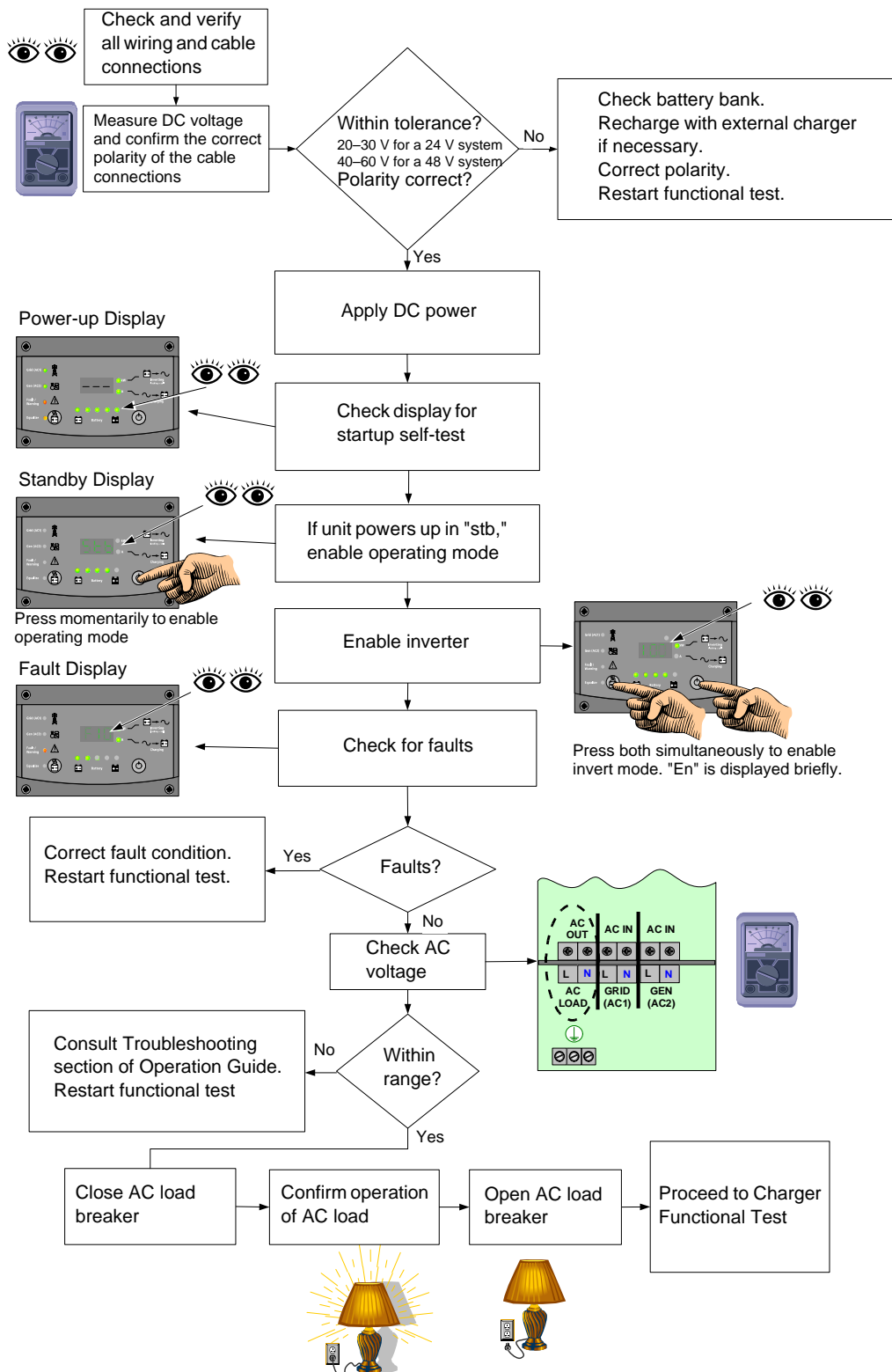


Figure 2-21 Functional Test for Single Inverter Systems

## Step 5: Installing Additional Inverters

### Installation Steps

**To install multiple inverters:**

1. Disconnect all power from the system.
2. Mount additional inverter(s). See “Step 1: Installing the Mounting Plate” on page 2–4 and “Step 2: Mounting the Inverter” on page 2–6.
3. Install conduit and cable clamps for DC cables, AC wiring, and AC Sync cables in accordance with local electrical codes.
4. Install Xanbus and AC Sync cable(s) as required. See “Step 3: Installing Communications Cables” on page 2–7.
5. Install a XW System Control Panel. When installing more than one inverter at a location, an XW System Control Panel is required to give each inverter (and other Xanbus-enabled devices) a unique name and to modify the factory-installed default settings to match and support the installation.
6. Install additional breakers and components in the inverter AC distribution panel and the utility grid AC distribution panel to accommodate the extra inverter(s).
7. Connect DC wiring.
8. Connect AC wiring.

## Basic Functional Test—Multiple Inverters

The following steps will complete a basic functional test of multiple XW Inverter/Chargers. If any test fails, please refer to the Troubleshooting section in the XW Inverter/Charger Operation Guide for assistance.

### To perform a functional test on multiple inverters:

1. Check/verify all wiring and cable connections.
2. Measure DC voltage at the DC terminals on the inverter and confirm that it is within range and has correct polarity. The acceptable range is >20 Vdc for 24 V systems or >40 Vdc for 48 V systems.
3. Connect DC power to the first inverter.
4. Check the inverter display for startup self-test during which all LEDs will flash momentarily. Once the self-test is complete, the inverter displays "Stb". (The Fault/Warning LED may flash for a few seconds but eventually will turn off. If the Fault/Warning LED persists, check to ensure the battery temperature sensor is connected. Also, if the inverter has been pre-configured, it may go straight into normal operating mode.)
5. Using the XW System Control Panel, set the first (Master) inverter's Device Number.
  - a) Go to the inverter's Advanced Settings menu by pressing Down arrow then Enter from System Status screen and then simultaneously pressing Enter + Up arrow + Down arrow.
  - b) Select the Multi Unit Config menu.
  - c) Change Dev Number from "00" to "01". The inverter will now appear as XW6048 01 (or XW4548 01 or XW4024 01) on the System Control Panel.
  - d) If performing a test on a three-phase installation, change the Invtr Mode to "3Ph L1Master." For more information, see "Three Phase Configuration" in the XW Inverter/Charger Operation Guide.
  - e) Press Exit until the System Control Panel displays the System Status screen again.
6. Connect DC power to the next inverter.
7. Check the inverter display for startup self-test during which all LEDs will flash momentarily. Once the self-test is complete, the inverter displays "Stb". (If the inverter has been pre-configured, it may go straight into normal operating mode or display F66 warning.)
8. Using the XW System Control Panel, set the second (Slave) Inverter Device Number and Inverter Mode.
  - a) Select new inverter XW6048 00 (or XW4548 00 or XW4024 00) from the Select Device menu. You can also press the Down arrow from the System Status screen until the home screen for XW Inverter/Charger 00 is displayed, then press Enter.
  - b) Go to the inverter's Advanced Settings>Multi-Unit Config menu.
  - c) Change Dev Number from "00" to "02" (or the next number that hasn't been used). The inverter will now appear as XW6048 02 (or XW4548 02 or XW4024 02) on the System Control Panel.

- d) Change Invtr Mode from “1Ph Master” to “1Ph Slave”. If performing a test in a three-phase installation, change the Invtr Mode to “3Ph L1Slave” or “3Ph L2Slave” or “3Ph L3Slave,” depending on the line to which the unit is connected.
  - e) Press Exit until you see the System Status screen.
9. Check for faults. If fault condition(s) exist, correct them and restart the Functional Test.
10. If a third inverter is installed, repeat steps to configure it as a Slave.
11. Using the XW System Control Panel, enable the System.
  - a) Go to System Settings menu.
  - b) Change System Mode to “Operating.”
  - c) Press Exit until you see the System Status screen.
12. Confirm that the Master inverter displays “0.00” and the Slave(s) display(s) “--” on their front panels.
13. Check for faults. If fault condition(s) exist, correct and restart Functional Test.
14. Check voltage at AC LOAD terminals of the Master Inverter.
15. Switch the AC Load breakers ON.
16. Confirm operation of connected AC loads.
17. Disconnect AC LOAD breakers.
18. Using the XW System Control Panel, reduce the Maximum Charge Rate.
  - a) From System Status screen, go to the Select Device menu, select System Settings and enable Cascading (if not enabled). With Cascading enabled, a change to a setting in one inverter will automatically apply to the other inverter(s) in the system.
  - b) Go to Advanced Settings>Charger Settings in one of the inverters.
  - c) Set Max Chg Rate to 10%.
  - d) Press Exit until you see the System Status screen.
19. Switch AC Input breakers ON. Note: all inverters in the system must be connected to the same AC Input source before they will qualify the source.
20. Confirm both inverters start charging. Note: With the Max Chg Rate set to 10% the maximum charge rate is limited to 10 A on each inverter. Depending on the battery bank’s state of charge, the output from one or more inverters may quickly drop to zero. This is considered normal operation.
21. Check for faults. If fault condition(s) exist, correct and restart Functional Test.

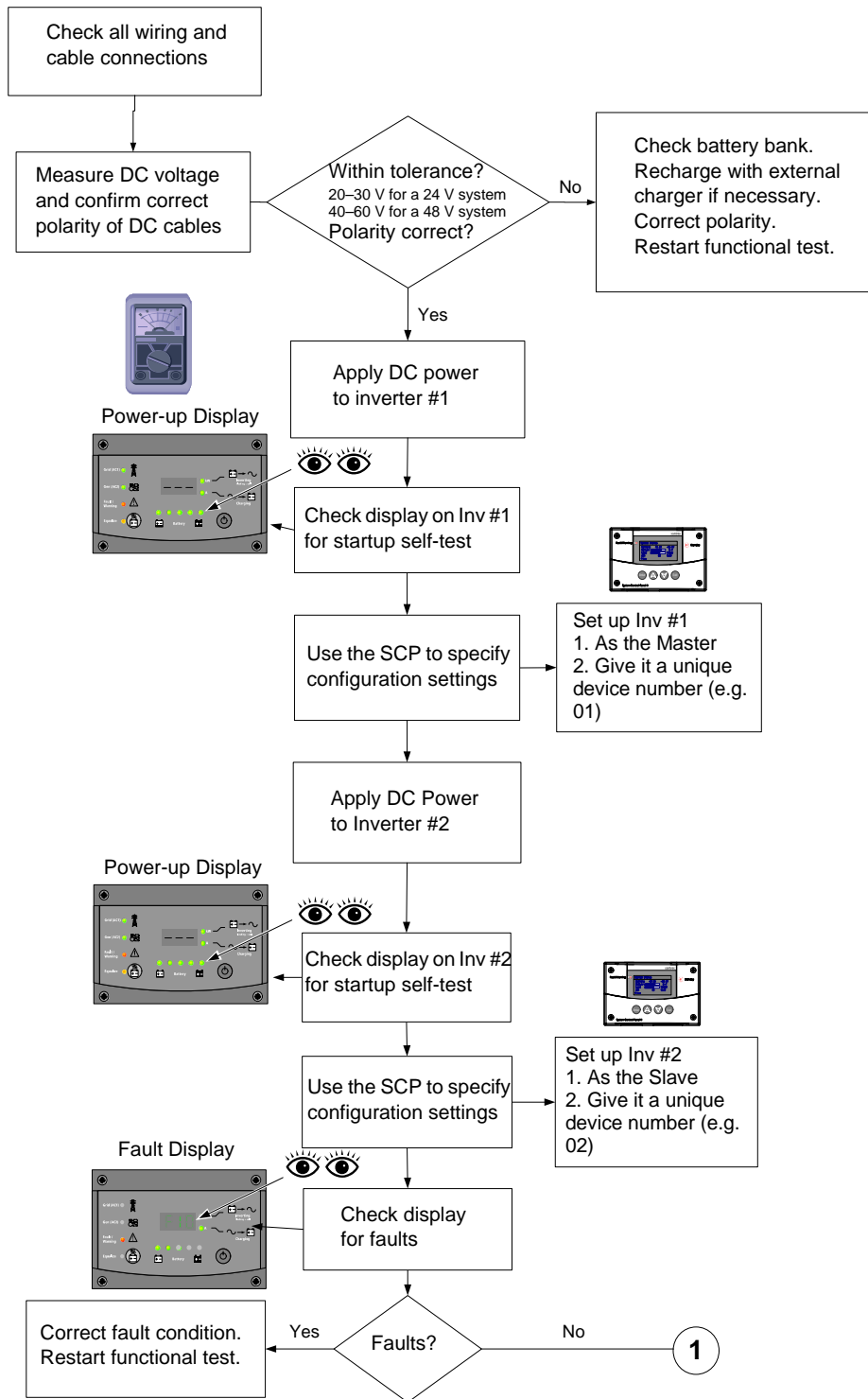


Figure 2-22 Functional Test for Multiple Inverters - Page 1 of 2

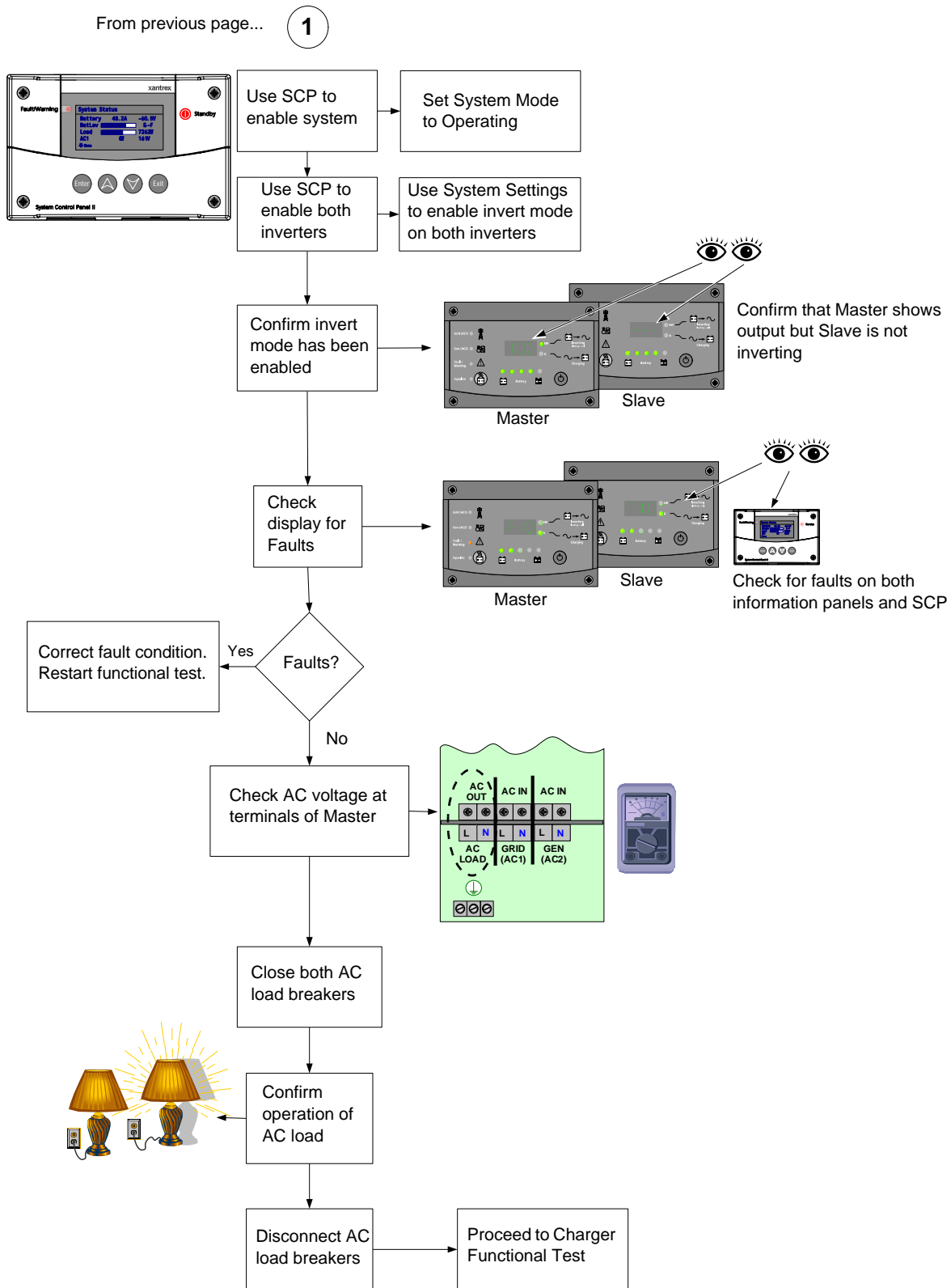


Figure 2-23 Functional Test for Multiple Inverters - Page 2 of 2

# A

# Specifications

Appendix A, “Specifications” provides the electrical and mechanical specifications for the XW Power System.

## Electrical Specifications

**Table A-1** XW Power System Electrical Specifications

	XW6048	XW4548	XW4024
Continuous Output Power	6,000 W	4,500 W	4,000 W
Surge Rating	12,000 W (15 s)	9,000 W (20 s)	8,000 W (20 s)
Surge Current	53 A <sub>rms</sub> (15 s)	40 A <sub>rms</sub> (20 s)	35 A <sub>rms</sub> (20 s)
Peak Efficiency	95.4 %	95.6 %	94.0 %
Full Load Efficiency	92 %	93.0 %	89 %
Waveform	True Sine Wave		
Idle Consumption—invert mode, no load	28 W	26 W	24 W
Idle Consumption—search mode	< 7 W		
AC Output Voltage	230 Vac $\pm$ 3%		
AC Input Voltage Range (Bypass/Charge Mode)	156–280 Vac		
AC Input Breaker	60 A		
AC Input Frequency Range (Bypass/Charge Mode)	45–55 Hz (default) 40–68 Hz (allowable)		
AC Output Continuous Current	26.1 A	19.6 A	17.4 A
AC Output Frequency	50.0 $\pm$ 0.1 Hz		
Total Harmonic Distortion	< 5% at rated power		
Automatic Transfer Relay	56 A		
Auxiliary Relay Output	0–12 Vdc, maximum 250 mA DC		
DC Input Voltage (Nominal)	50.4 Vdc	50.4 Vdc	25.2 Vdc
DC Input Voltage Range	44–64 Vdc	44–64 Vdc	22–32 Vdc
DC Current at Nominal Power	131 A	96 A	178 A
Continuous Charge Rate at Nominal Voltage	100 A	85 A	150 A
Power Factor Corrected Charging	PF (0.98)		



## XW Series Overload Capability

Loads connected to the inverter are seldom constant, and large loads are often operated for short periods. To accommodate larger loads, the XW can temporarily exceed its continuous output power rating. The graphs below illustrate approximate operation time versus load.

Inverter operation time during overload is limited by both inverter internal temperature protection and by the product of AC output current and elapsed time.

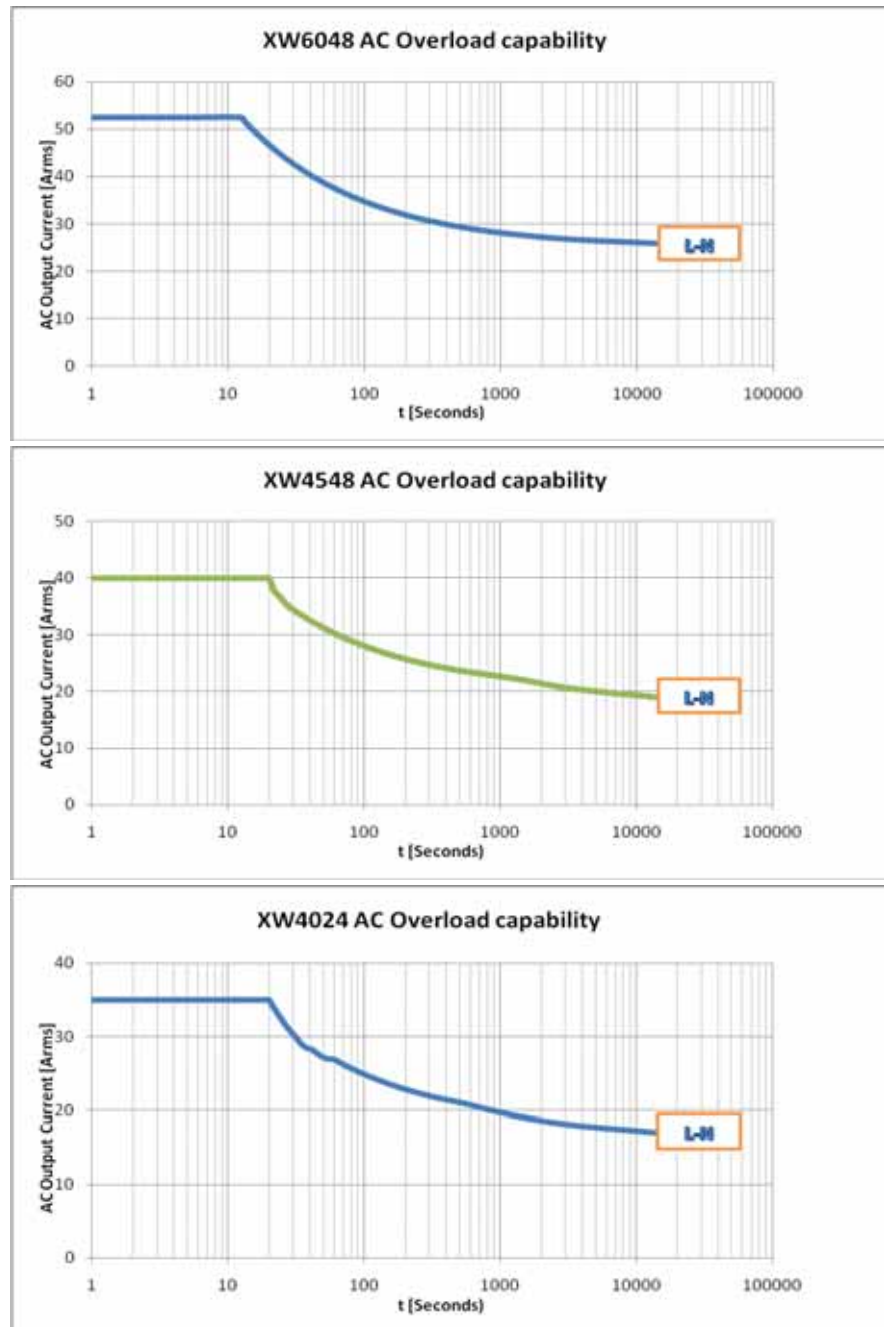


Figure A-1 XW Series AC Overload Capability

## Output Power Versus Ambient Temperature

When the internal temperature of the XW Series exceeds a preset limit, it begins to limit output power automatically to ensure maximum internal temperatures are not exceeded.

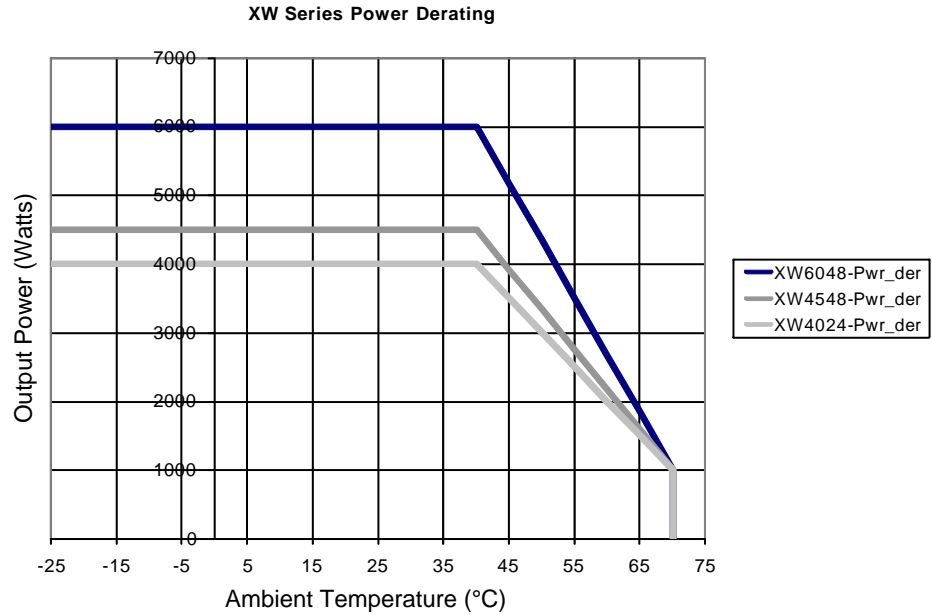
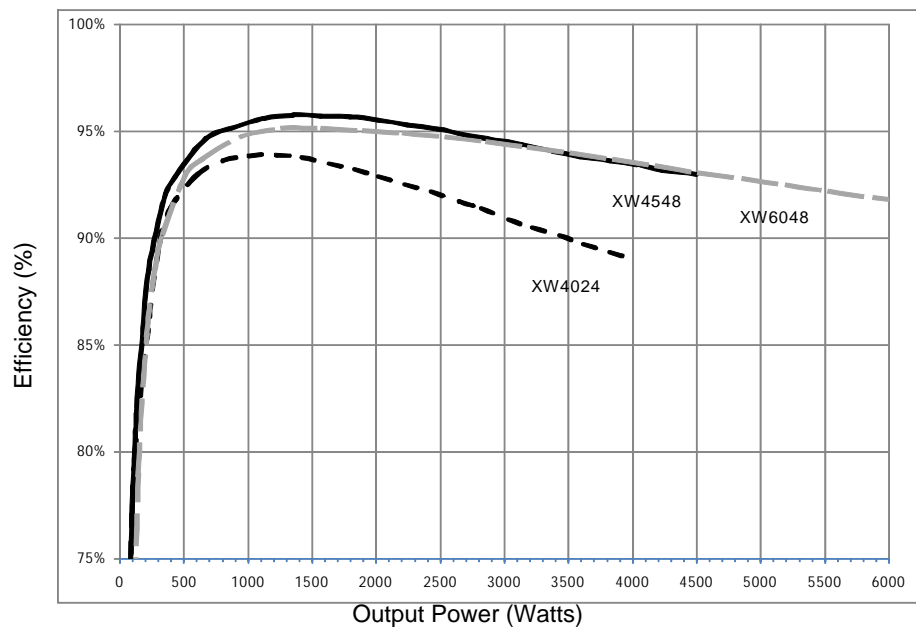


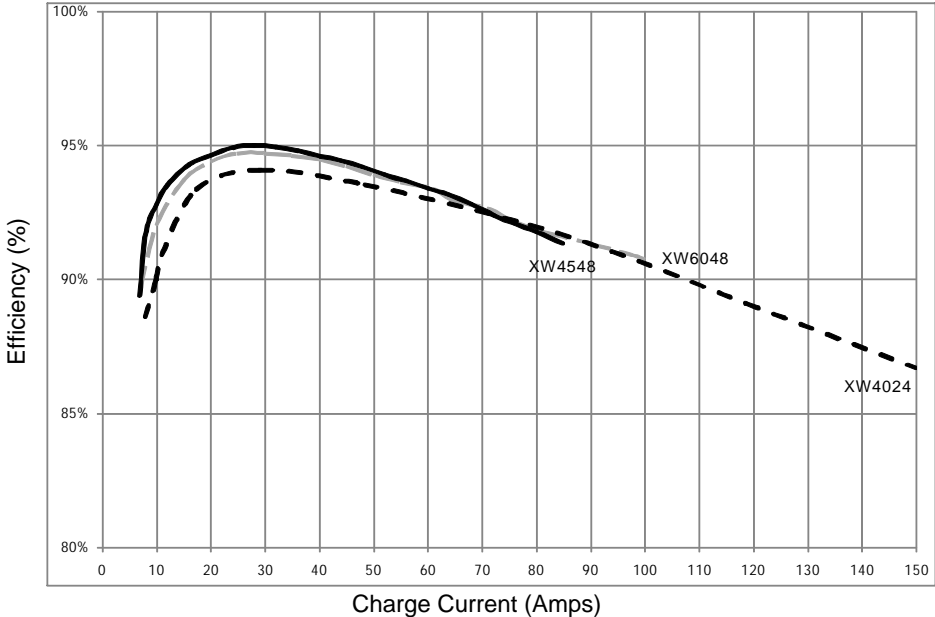
Figure A-2 Output Power Versus Ambient Temperature

## XW Series Efficiency

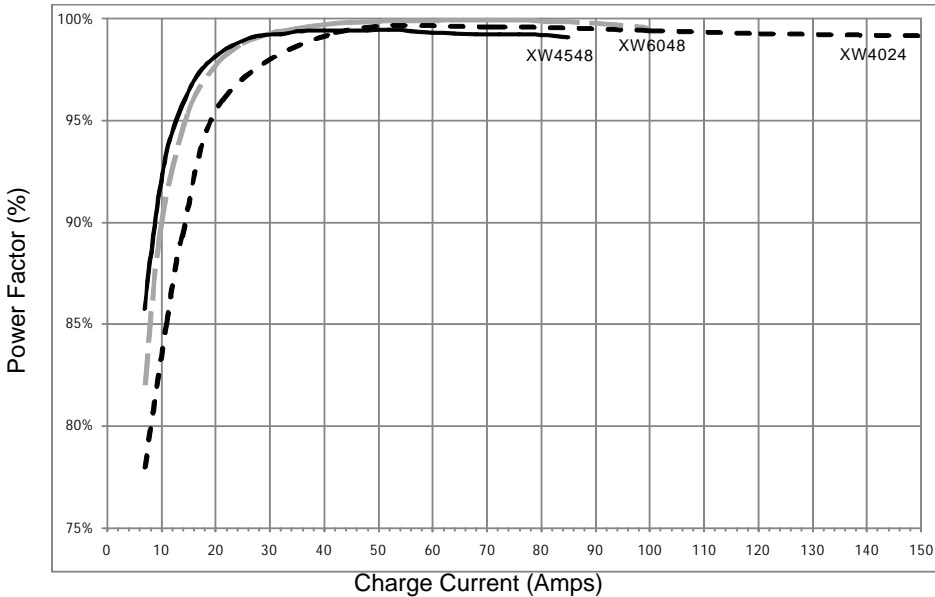
### Inverting Efficiency (Typical)



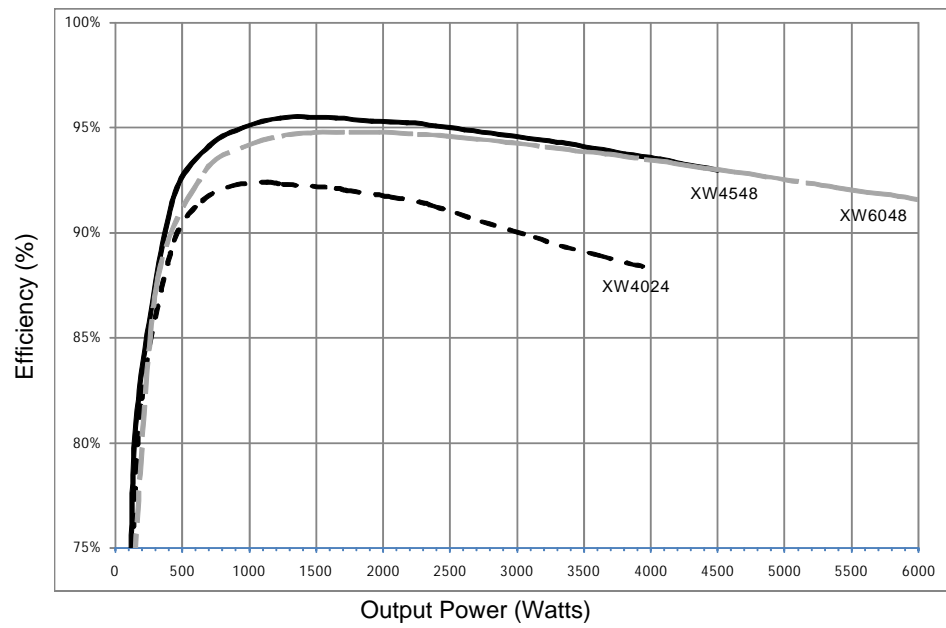
Charging Efficiency (Typical)



Charging Efficiency (Power Factor Corrected)



### Grid-Tie Sell Mode Efficiency (Typical)



## Mechanical Specifications

**Table A-2** XW Power System Mechanical Specifications

Model	XW6048	XW4548	XW4024
Supported Battery Types	Flooded (default), Gel, AGM, Custom		
Battery bank size	100–10000 Ah		
Non Volatile Memory	Yes		
Display Panel	Status LEDs indicate AC In status, faults/warnings, equalize mode, battery level. Three-character display indicates output power or charge current, fault/warning codes. On/Off and equalize button		
System Network	Xanbus (publish-subscribe network, no need for hubs or special cards)		
Enclosure Type	IP 20, indoor, unheated		
Rated Temperature Range (meets all specifications)	0–40 °C		
Operational Temperature Range	-25–70 °C		
Storage Temperature Range	-40–85 °C		
Inverter Dimensions (H × W × D)	580 × 410 × 230 mm		
Shipping Dimensions (H × W × D)	711 × 572 × 394 mm		
Inverter Weight	57 kg	52 kg	52 kg
Shipping Weight	60 kg	55 kg	55 kg

## Accessories

Accessory	Part Number
Power Distribution Panel	865-1015
Conduit Box	865-1025
Inverter #2 Connection Kit	865-1020
XW-MPPT60-150 Solar Charge Controller	865-1030-1
XW System Control Panel	865-1050
XW Automatic Generator Start	865-1060
Network cables	3 ft (0.9 m): 809-0935 25 ft (7.6 m): 809-0940 50 ft (15.2 m): 809-0941 75 ft (22.9 m): 809-0942
Network terminators	Male (2 per pack): 809-0901

## Regulatory Approvals

CE Marked and complies with the following:

Low Voltage Directive 2006/95/EC, per:

- EN50178 “Electronic Equipment for Use in Power Installations”.

EMC Directive 2004/108/EC, per:

- EN61000-6-3 “Emission Standard for Residential, Commercial, and Light-Industrial Environments”
- EN61000-6-1 “Immunity for Residential, Commercial, and Light-Industrial Environments”

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