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PH1800-GFP

Installation Guide

PowerHub 1800

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PowerHub 1800

Installation Guide

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PH1800-GFP

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About This Guide

Purpose

The purpose of this Installation Guide is to provide procedures for installing the PowerHub 1800.

Scope

The Guide provides safety guidelines, detailed planning and setup information, and procedures for installing the inverter. It does not provide operational or troubleshooting information. It does not provide details about particular brands of batteries. Consult individual battery manufacturers for this information.

Audience

The PowerHub 1800 is an entry-level inverter system. This Guide is intended for anyone who needs to plan for and install the PowerHub 1800. Permanent installations should be done by certified technicians or electricians. Installers should have adequate knowledge of national and local electric code to ensure code-compliance by inspection from the local electric authority.

Organization

This Guide is organized into three chapters and one appendix.

Chapter 1 describes the features and functions of the PowerHub 1800.

Chapter 2 contains information on planning the installation of this equipment.

Chapter 3 contains information on assembling and installing this equipment.

Appendix A provides electrical and physical specifications for the PowerHub 1800.

Abbreviations and Acronyms

Abbreviation or Acronym	Definition
A	Amps
AC	Alternating Current
DC	Direct Current
ft-lbs	Foot-pounds (a measure of torque)
kW	Kilowatts (1000 watts)
LED	Light Emitting Diode
Nm	Newton-meters (a measurement of torque)
PV	Photovoltaic
RE	Renewable Energy
Vac	Volts AC
Vdc	Volts DC
W	Watts

Related Information

You can find more information about this product by seeing the PowerHub 1800 Operator's Guide (part number 975-0288-01-01 Rev A). You can find more information about Xantrex products and services at **www.xantrex.com.**

A French version of the document (part number 975-0290-01-01) and a Spanish version (part number 975-0288-03-01) are available at **www.xantrex.com**.

Important Safety Instructions

IMPORTANT: READ AND SAVE THIS INSTALLATION GUIDE FOR FUTURE REFERENCE.

This guide contains important safety instructions for the PowerHub 1800 that must be followed during installation, operation, and troubleshooting. Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠⚠DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

⚠WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, can result in death or serious injury.

⚠CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, can result in moderate or minor injury.

NOTICE

NOTICE indicates a potentially hazardous situation, which, if not avoided, can result in equipment damage.

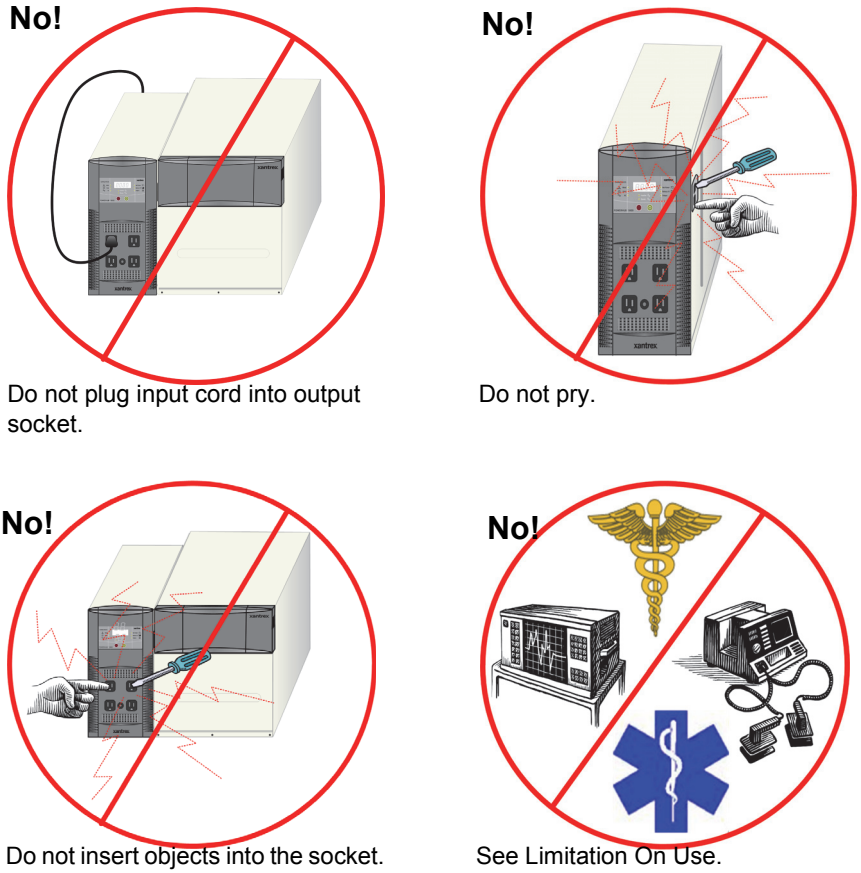
Important: These notes describe things which are important for you to know, however, they are not as serious as a caution or warning.

Safety Information

1. **Before installing and using the PowerHub, read all instructions and cautionary markings on the PowerHub, the batteries, and in both this Installation Guide and the Operator's Guide.**
2. The PowerHub is intended for indoor use only. Do not expose the PowerHub to rain, snow, or spray. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the PowerHub in a zero-clearance compartment. Overheating may result.
3. The PowerHub may connect to as many as three sources of DC Power and one source of AC Power. To reduce the risk of electrical shock, disconnect all sources of AC and DC power from the PowerHub before attempting any maintenance or cleaning or working on any circuits connected to the PowerHub. Turning off controls will not eliminate this risk.
4. Use only attachments that are intended for use with this product. 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 all of the installation wiring is in good condition and that wire is not undersized. Do not operate the PowerHub with damaged or substandard wiring.
6. Do not operate the PowerHub if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the PowerHub is damaged, see the Warranty section.
7. Do not disassemble the PowerHub, except where noted to wire it for a permanent installation. The PowerHub 1800 contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the PowerHub 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. The PowerHub must be provided with an equipment-grounding conductor. Grounding and all other wiring must comply with National and local codes and regulations.
9. The PowerHub is not intended for use as an uninterruptible power supply (UPS).

⚠WARNING
RISK OF CARBON MONOXIDE POISONING Do not use generators indoors. When generators are used outdoors there must be sufficient circulation to vent the carbon monoxide. **Failure to follow these instructions can result in death or serious injury.**

⚠WARNING
LIMITATION ON USE The PowerHub 1800 is not intended for use in connection with life support systems or other medical equipment or devices. **Failure to follow these instructions can result in death or serious injury.**



Do not plug input cord into output socket.

Do not pry.

Do not insert objects into the socket.

See Limitation On Use.

Figure i Basic Safety

Precautions When Working With Batteries

⚠WARNING

BURN FROM HIGH SHORT-CIRCUIT CURRENT, FIRE AND EXPLOSION FROM VENTED GASES HAZARDS

- Always wear proper, non-absorbent gloves, complete eye protection, and clothing protection. Avoid touching your eyes and wiping your forehead while working near batteries. See note #13.
- Remove all personal metal items, like rings, bracelets, and watches when working with batteries. See notes #8 and #9 below.
- Never smoke or allow a spark or flame near the engine or batteries.

Failure to follow these instructions can result on death or serious injury.

NOTES:

1. Use only SEALED batteries with the PowerHub 1800.
2. Follow all instructions published by the battery manufacturer.
3. Working in the vicinity of batteries may be dangerous. Unsealed batteries can generate explosive gases during normal operation. Therefore, you must read this guide and follow the instructions exactly before installing or using the PowerHub.
4. This equipment contains components which tend to produce arcs or sparks. To prevent fire or explosion, do not install the PowerHub 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.
5. To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer.
6. Make sure that nothing is blocking the air vents on the back of the enclosure.
7. Never smoke or allow a spark or flame near the batteries.
8. Use caution to reduce the risk of dropping a metal tool on the batteries. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
9. Remove all personal metal items, like rings, bracelets, and watches when working with batteries. Batteries can produce a short circuit current high enough to weld metal, causing a severe burn.

10. Have someone within range of your voice or close enough to come to your aid when you work near a battery.
11. Wear complete eye protection and clothing protection. Avoid touching your eyes while working near batteries.
12. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
13. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.
14. Use battery overcurrent protection such as a DC fuse or DC breaker.

Precautions for Using Rechargeable Appliances

NOTICE

EQUIPMENT DAMAGE

This equipment produces a modified sine wave output. Equipment damage may occur if the rechargeable appliance is not designed to use modified sine wave output. If you are unsure about using your rechargeable appliance with the modified sine wave, contact the equipment manufacturer.

Failure to follow these instructions can damage connected equipment.

Most rechargeable battery-operated equipment uses a separate charger or transformer that is plugged into an AC receptacle and produces a low voltage charging output.

Some chargers for small rechargeable batteries can be damaged if connected to the PowerHub. Do not use the following with the PowerHub:

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

FCC Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Power Down Procedure

If softwired..... **To Power Down the PowerHub 1800:**

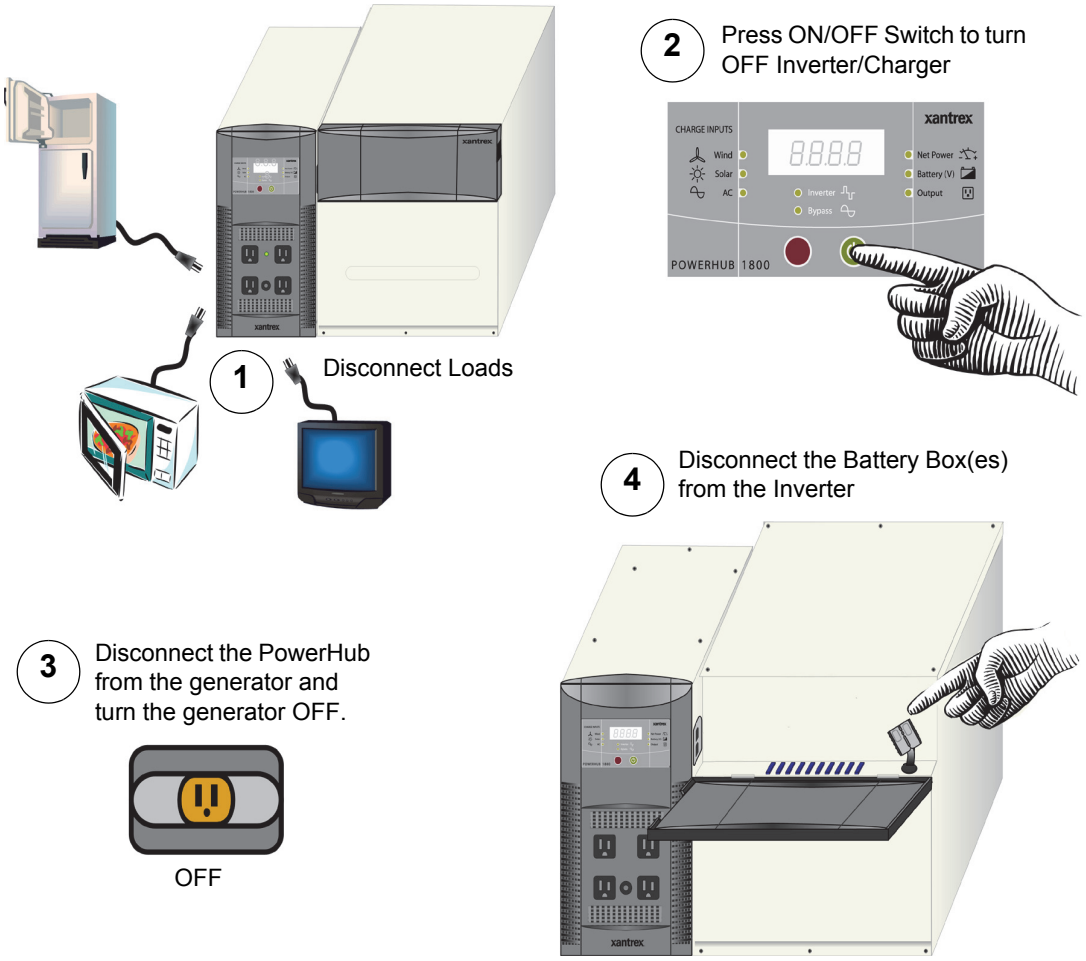


Figure ii Power Down Procedure for Softwired Installations

If hardwired..... **To Power Down the PowerHub 1800:**

⚠WARNING
ELECTRIC SHOCK HAZARD Physically disconnect DC input sources (solar or wind) to ensure that DC power is OFF. **Failure to follow these instructions can result in death or serious injury.**

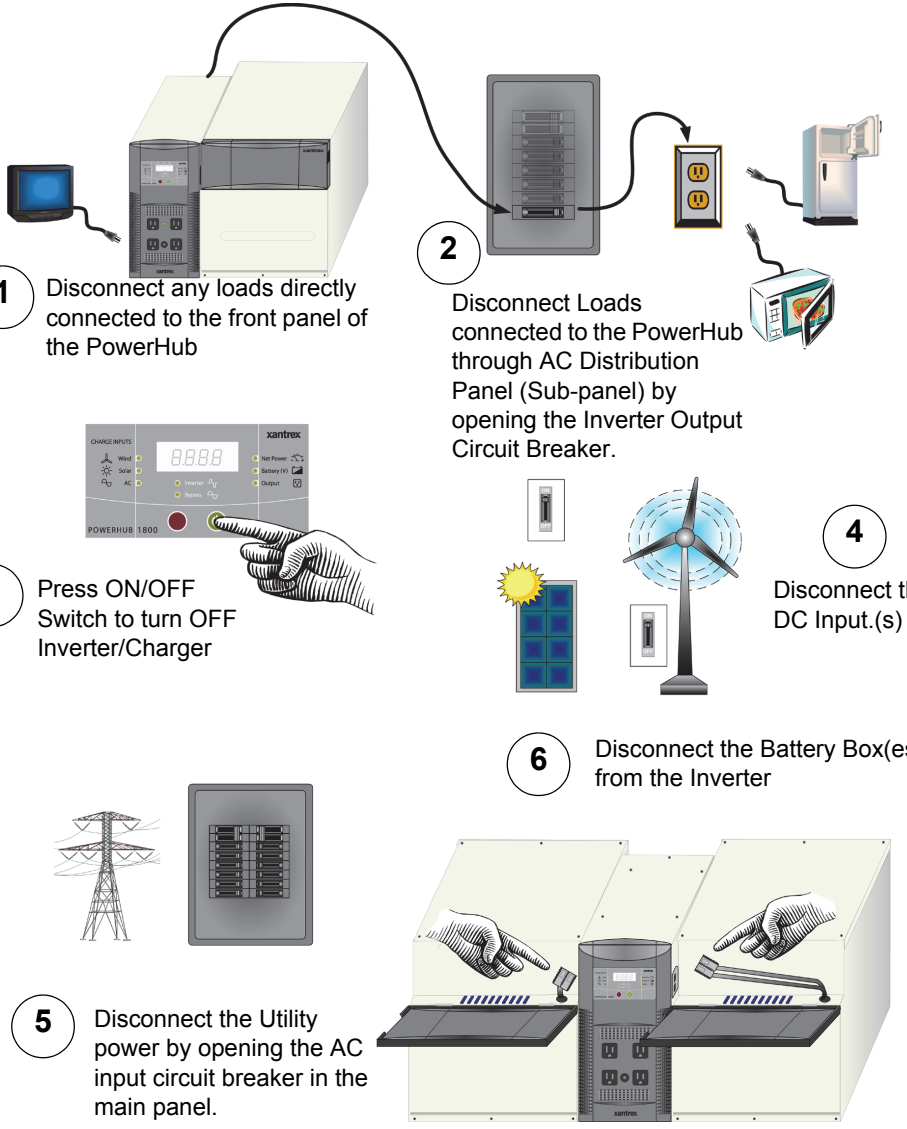


Figure iii Power Down Procedure for Hardwired Installations

Contents

A Specifications

Figures

Tables

1 Introduction

Chapter 1 describes the features and functions of the PowerHub 1800.

Figure 1-1 The PowerHub 1800

Features and Functions

Components

The PowerHub 1800 consists of the following components.

PowerHub 1800 Installation Guide and User's Guide

Accessory Plate for Hardwired Installations

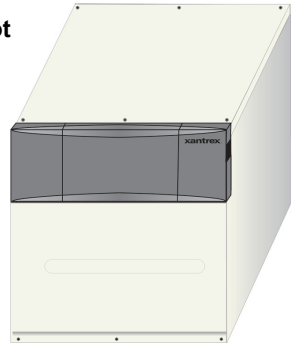
1 set #1/0 AWG Battery Cables

1800 W Inverter/Charger

Includes:

- 1800 W modified sine wave inverter
- 40 A charger
- Seven 20-amp/32 Vdc Regulatory approved automotive-type fuses for circuitry protection
- One supplementary protector

Batteries not included.



Battery Box

Includes:

- Battery Cables(positive-red, negative-black) (#1/0 AWG 11" long)
- CSA/UL Approved Anderson connector inside the front panel for connecting enclosure to inverter.
- 10 Regulatory approved 20 A/32 Vdc automotive-type fuses for circuitry protection.

Figure 1-2 PowerHub 1800 Components

Purpose

The PowerHub 1800 is intended to be an entry-level inverter system for use in support of AC loads up to1440 W continuous, (1800 W on a 5-minute surge). It can be used as a stand-alone power source (softwired) or be permanently installed on site (hardwired). It is not intended to be used as an uninterruptible power source (UPS).

Function

The PowerHub 1800 is specifically designed to use power stored in two battery boxes that hold up to four 12 Vdc sealed, lead-acid batteries (not provided) to power AC loads and to recharge those batteries when an AC source (generator or utility grid) is available. Run-time on batteries will vary depending on the size of the loads using the power.

Renewable Energy Input

It can also use renewable energy, such as 12 V solar panels and small 12 V wind turbines, to recharge the batteries. Using renewable energy sources require a permanent “hardwired” installation and will require additional equipment and structural enhancement to be code-compliant.

Inverter Features

The inverter consists of the following user features:

- Inverter Control Panel
- Four 120 Vac outlets on the front panel.
- One supplementary protector to protect the 120 Vac outlets from overload.
- Two Battery Box Connection Ports (one on each side)

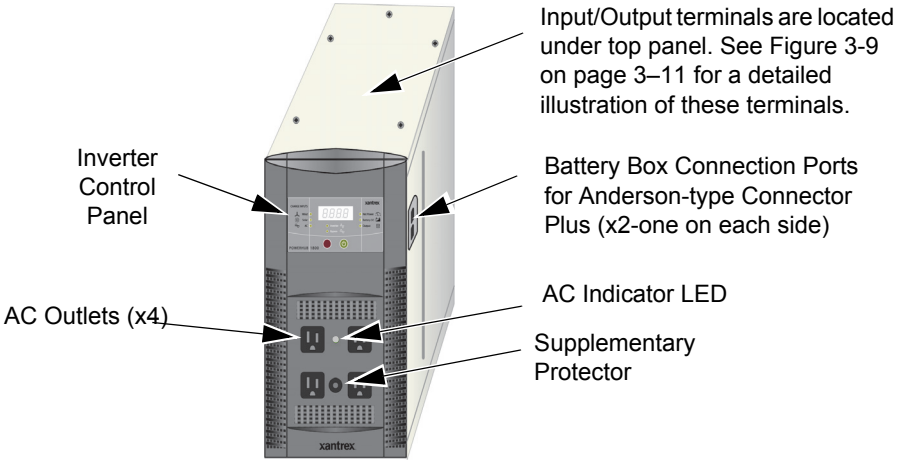


Figure 1-3 PowerHub 1800 Features

Input/Output Terminals

The inverter has the following input/output terminals:

- Two DC Anderson ports for 12 V battery connections from the Battery Box; one on each side.
- Two pairs of DC input terminals for renewable energy connections: one 32 A input terminal and one 80 A input terminal. ***External inputs to these terminals must be externally regulated.*** Solar panels must use charge controllers and wind turbines must be self-regulated.
  - The 32 A terminals can be used for 12 Vdc input up to 400 W maximum.
  - The 80 A terminals can be used for 12 Vdc input up to 1000 W maximum.
- AC input terminal (for grid or generator input)
- AC output terminal (for AC output in hardwired installations)

Grounding	The inverter has two AC Ground terminals and one equipment ground terminal. In addition, there are ground fault protection terminals for solar and wind renewable energy inputs (a 32 A and an 80 A). See Figure 3-9 on page 3–11 for a detailed illustration of the Input/Output and ground terminals.
Regulatory	This system complies with CSA 107.1-01 and UL1741and is certified for a permanent installation that is compliant with national electrical codes.

Applications

The PowerHub 1800 can be used for the following entry-level applications.

Softwired Generator Applications (Plug-and-go)

The PowerHub 1800 comes assembled with an AC input cord. This AC cord can be plugged into a 120 Vac outlet on a generator to charge the batteries.

Important: The input cord is intended to allow connection to portable generators in non-permanent installations. For fixed permanent installations, use electrical code-compliant wiring methods.

Important: The total amount of output power available to power the loads is 1440 watts, due to the 15 A supplementary protector which protects the circuitry.

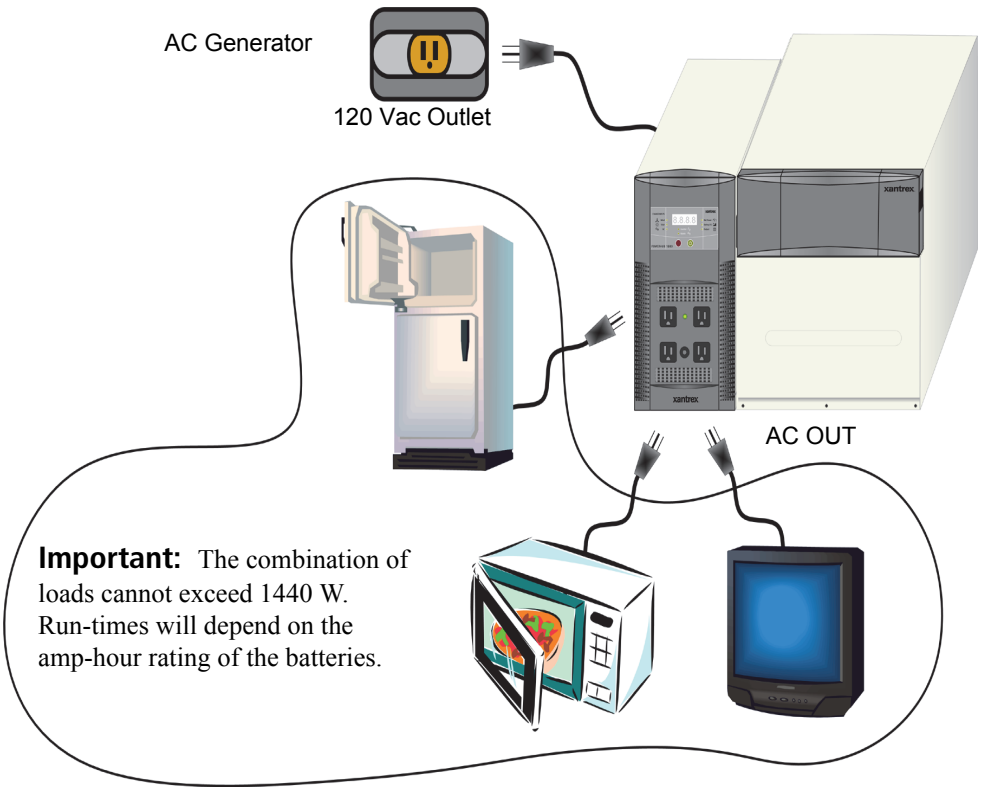


Figure 1-4 Softwired Utility or Generator Applications

Hardwired Permanent Applications

Utility Backup Applications

Important: Installations of this kind must be certified/approved as "code-compliant" to the national and local building and electrical codes. Installers should have adequate knowledge of national and local code to ensure the installation passes inspection by the local electric authority.

Example only.
Actual installation may vary.

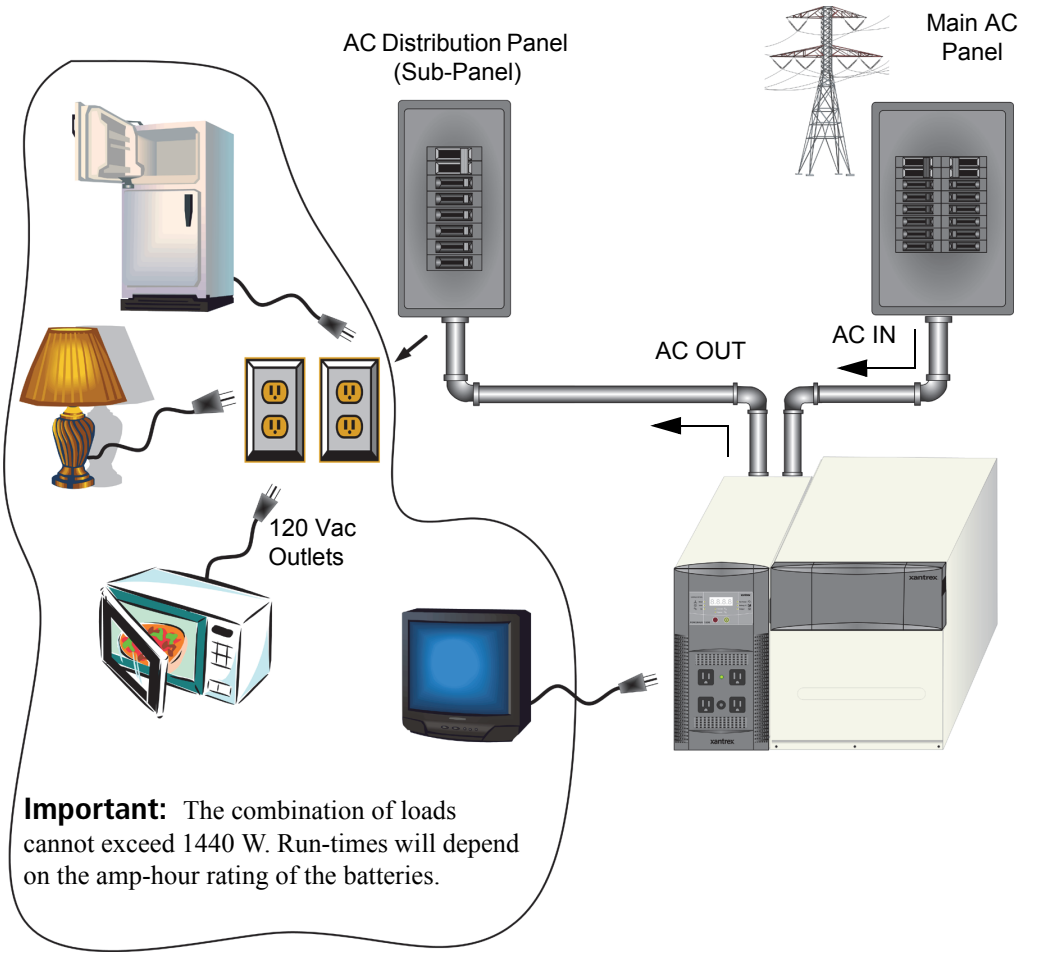


Figure 1-5 Hardwired Utility Applications

Solar Applications

Important: Installations of this kind must be certified/approved as "code-compliant" to the national and local building and electrical codes. Installers should have adequate knowledge of national and local code to ensure the installation passes inspection by the local electric authority.

Maximum size of PV array depends on the DC input terminals used:

- 400 W Maximum on 32 A DC terminal
- 1000 W Maximum on 80 A DC terminal
- Additional charge controllers and other hardware may be required.

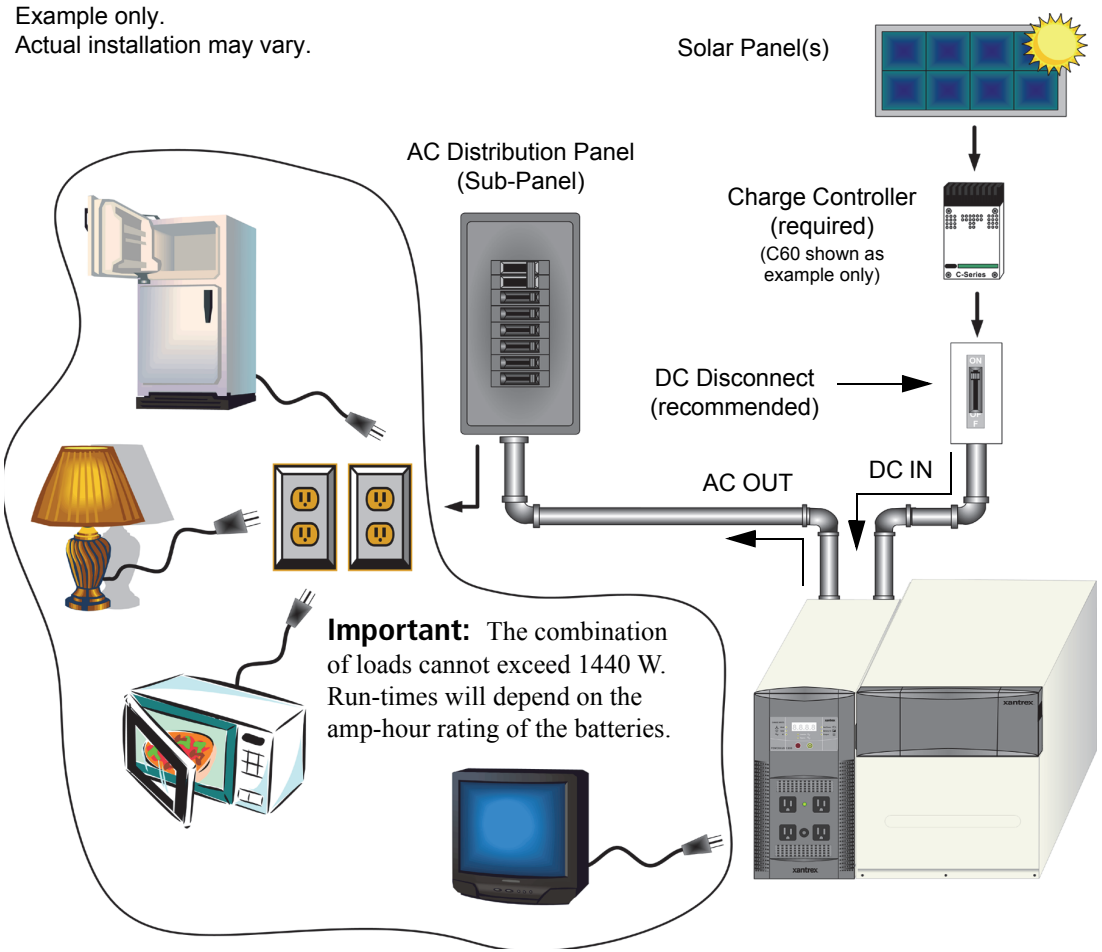


Figure 1-6 Hardwired Solar Applications

Wind Applications

Important: Installations of this kind must be certified/approved as "code-compliant" to the national and local building and electrical codes. Installers should have adequate knowledge of national and local code to ensure the installation passes inspection by the local electric authority.

Maximum size of wind turbine:

- 1000 W maximum on 80 A DC terminal only
- Self-regulation required.
- Disconnect recommended

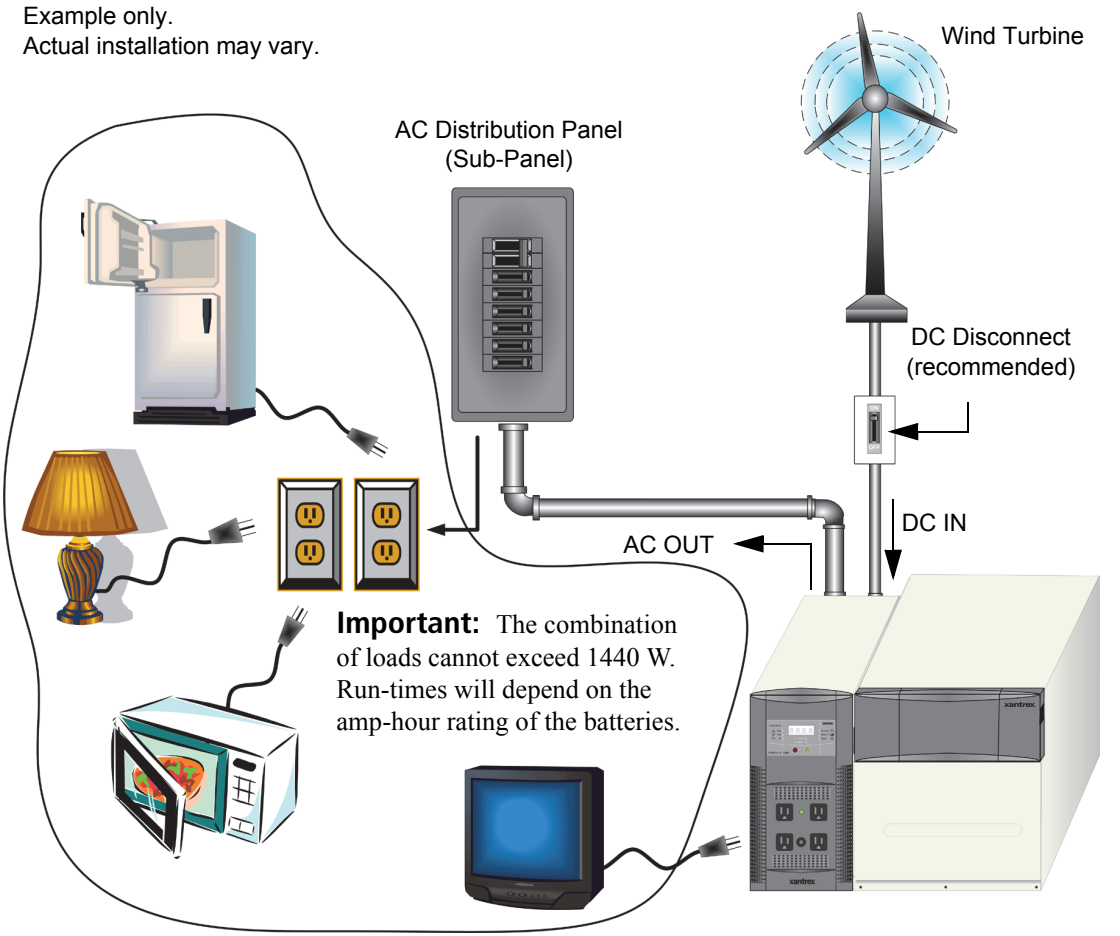


Figure 1-7 Hardwired Wind Applications

Combination Applications

Important: Installations of this kind must be certified/approved as "code-compliant" to the national and local building and electrical codes. Installers should have adequate knowledge of national and local code to ensure the installation passes inspection by the local electric authority.

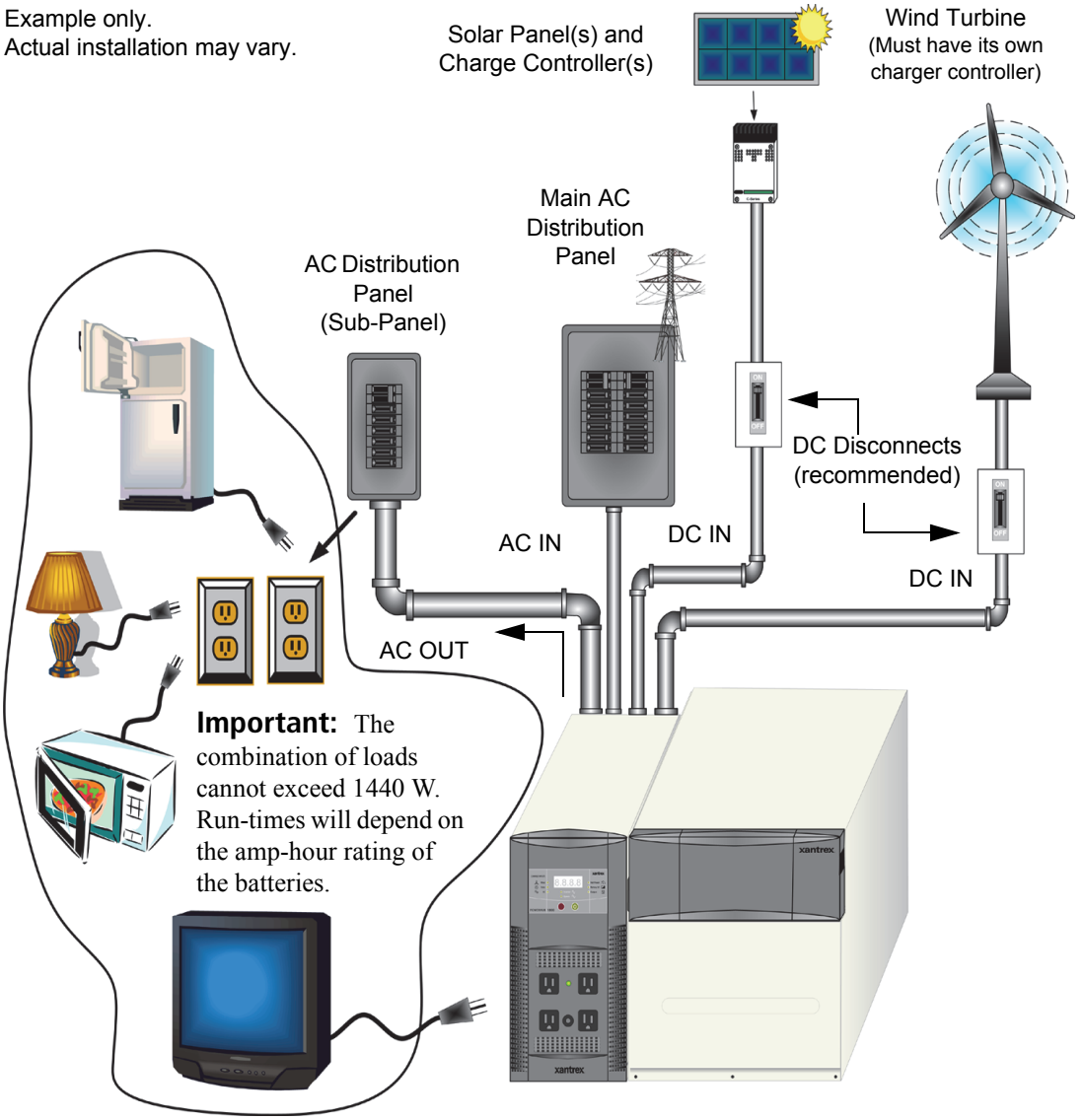


Figure 1-8 Hardwired Combination Applications

2 Planning

Chapter 2 contains information on planning the installation of this equipment.

Planning Overview

Important: This unit is intended as an entry-level inverter/charger backup system. To use it as a stand-alone power source, it is not required to do any special installation procedures.

However, if your installation involves renewable energy (solar or wind generators) or requires hardwiring for any reason, if you do not have adequate knowledge of national and local building and electrical codes, do not attempt to install this unit in a permanent installation. Consult your local renewable energy dealer or qualified electrician for assistance.

1. ***Plan your installation carefully!***
2. Determine if the installation will be softwired (plug-and-go) or hardwired.
   - If hardwired, are there any special permits required.
3. Know your limits.
   - Know the limits of the loads to be attached to the system.
   - Know the limits of the input and output to the inverter and the batteries.
   - Know the electrical and building code requirements for the desired location.
   - Analyze the location for the PowerHub for access and adequate structural support.
   - Measure the distances for the cabling and wiring.
4. Extract the PowerHub from its packaging material and inventory all parts to ensure there is nothing missing.
5. Review all instructions and materials provided with all the equipment.
6. Review all material provided with the batteries.
7. Review any material related to the installation of the renewable energy components.
8. Collect all necessary tools and materials for the installation.
9. Prepare the location for the installation and position the components.

Tools Required

The following tools may be required for installing this equipment:

- ❒ #2 Phillips screwdriver(s)
- ❒ Slotted screwdriver(s)
- ❒ Wire strippers
- ❒ Torque wrench
- ❒ Socket wrench and sockets (½ in. for the wind DC input terminal, and 10 mm for the solar DC input terminal)
- ❒ Electrical tape

Hardware / Materials Required

The following customer supplied items are required to use the PowerHub 1800.

- ❒ One or two 12 Vdc SEALED (100 amp-hour), lead-acid batteries.
- ❒ 1 ground cable #3 AWG copper (length to be determined by the location of the installation)

The following items may be required for completing this installation.

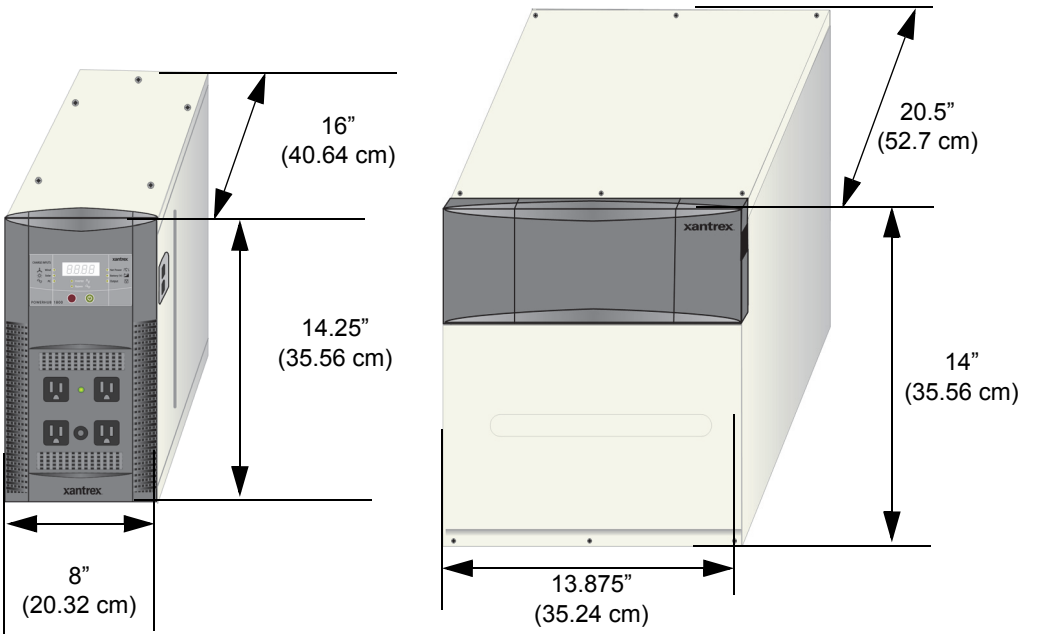
- ❒ Electrical wire of appropriate gauge and length for AC input, AC output, and AC ground (length to be determined by the location of the installation). See Table 3-1 on page 3–11.
- ❒ Conduits and appropriate fittings for wire runs (e.g., wire nuts)
- ❒ Breaker panels, 15 A circuit breakers and appropriately sized DC disconnects
- ❒ Wire connectors and crimp tool for the wind and solar DC cables

Environmental Requirements

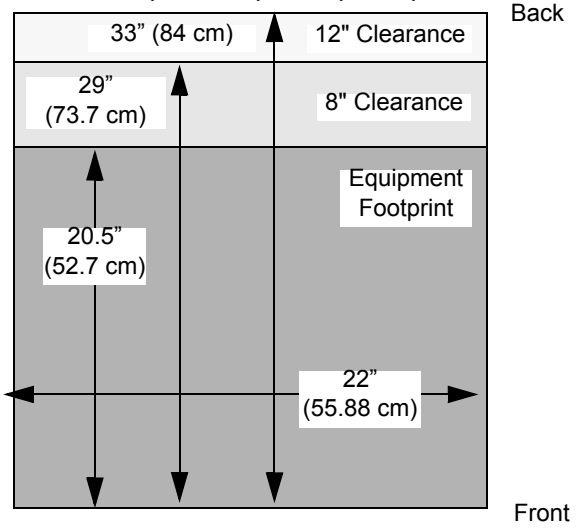
Ventilation — Ensure the environment where the PowerHub is to be installed is properly ventilated, free of dust, dirt, etc. and where the temperature will not fall below 0°C (32°F) or rise above 40°C (104°F).

Clearance — Ensure there is a minimum of 8 inches (preferably 12 inches) of clearance around all ventilation holes and vents. Ensure nothing flammable is stored anywhere near this unit. *Be sure to leave adequate room to access the terminals if the unit is to be hardwired. Twelve inches may not be adequate for access purposes to hardwire the unit.*

Dimensions



Recommended Minimum Required Floor Space = 22" (55.88 cm) x 33" (84 cm)



IMPORTANT:
The Powerhub should be mounted on concrete floors or on floors designed to support a minimum load of 100 pounds per square foot.

IMPORTANT:
Allow 8" minimum clearance around the back of this unit for ventilation. (12" preferable). Be sure to leave adequate space for access if the unit is to be hardwired. 12" may not be adequate.

Figure 2-1 Dimensions (not to scale)

Batteries

Important: The PowerHub 1800 is designed to be permanently connected to a small 12-volt battery bank. Do not operate this equipment without connecting a battery or battery bank.

The PowerHub will use the power stored in the batteries to run AC loads up to 1440 W (continuously). Run times for the AC loads will depend on the amp-hour capacity of the batteries and the total of the loads drawing power through the unit.

Types to use

The following battery types are recommended for use with the PowerHub 1800:

Voltage 12 Vdc (required) (100 Ah minimum)

Chemistry SEALED, lead-acid batteries (required), Gel-type (recommended), AGM (acceptable)

Size Standard Group 27. Maximum dimension of battery to be 12" W × 6.75" D × 9" H (including terminal posts)

Terminal Location Top (required)

Terminal Type L-type or screw-in terminal

⚠WARNING

ELECTRIC SHOCK HAZARD

Do not use terminal adaptors in the battery box they may short circuit the battery.

Failure to follow these instructions can result in death or serious injury.

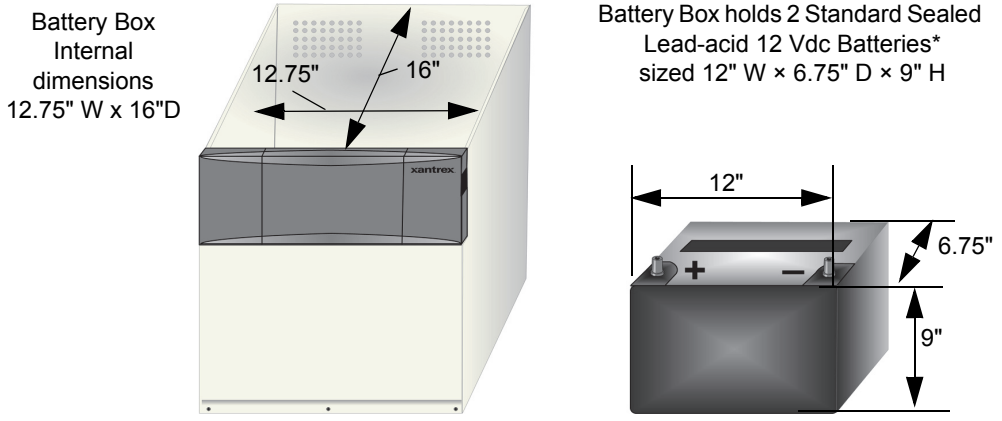


Figure 2-2 Battery Box and Battery Size

Important: All batteries used for this system should be identical. Do not mix battery types or sizes. Do not mix old batteries with new batteries. Performance and charging anomalies can occur if types, sizes, or age of batteries are not identical.

NOTICE

EQUIPMENT DAMAGE

Keep the weight of the batteries in mind when installing dual battery boxes. Ensure the structure floor where the battery boxes are to be installed is strong enough to support the additional weight. Do not try to move the system once batteries have been installed as damage could occur to the enclosure.

Failure to follow these instructions can damage the battery box.

See “Preparing the Battery Bank” on page 3–4 for instructions on how to cable two batteries together.

Average run-times

Table 2-1 provides typical AC appliance run times. These values are examples only. Run times will vary depending on the amp-hour rating of the batteries.

Table 2-1 Typical AC Appliances and Run Times

AC Appliance	Watts[a]	Run Time PowerHub 1 battery box[b] (hours)	Run Time PowerHub 2 battery boxes[c] (hours)
Cordless telephone (stand by)	5	396.0	792.0
Home security system	5	396.0	792.0
Clock Radio	8	217.8	435.6
Inkjet Printer	8	217.8	435.6
Stereo	14	145.0	290.4
Fireplace fan	20	64.35	128.7
Laptop computer	20	64.35	128.7
Table lamp (25W)	25	54.45	108.90
17" LCD Monitor	35	49.5	99.0
Table Light (40W)	40	43.0	86.0
Color TV – 13"	50	20.80	50.4
Table lamp (60 W)	60	26.4	53.0
8.8 cu. ft. freezer	80	19.8	39.6
18 cu ft. fridge	120	14.8	29.7
Sump Pump 300 W	300	4.29	8.58
20" LCD TV	370	2.8	5.5
Microwave	1000	1.43	2.86
Coffee Maker	1200	1.00	2.86

a. Represents actual power consumption as measured on sample appliances.
b. Operating times assume a fully charged 200 Ah battery bank and may vary based on model/brand of appliance.
c. Operating times assume a fully charged 400 Ah battery bank and may vary based on model/brand of appliance.

For more detailed information about batteries and battery banks, see the *Battery Banks for Inverter Systems Application Note*, available at **www.xantrex.com**.

Renewable Energy (RE)

The PowerHub 1800 supports the following renewable energy sources.

- Photovoltaic (Solar)
- Wind

Renewable energy generators are required by code to be hardwired into a permanent installation. Permanent installations required inspection and approval by the local electric authority.

Some additional components may be required for code-compliance, such as charge controllers, a DC combiner box, and/or DC disconnect switches.

In some cases, additional structural support may be required.

Be sure to consult with a qualified RE installer *BEFORE THE INSTALLATION* if renewable energy generators are to be used.

Solar Panels

The PowerHub 1800 can be connected to photovoltaic (solar) panels that meet the following requirements.

- 12 V solar panels (up to 400 W maximum on 32 A DC input terminal or 1000 W maximum on 80 A DC input terminal).
- Solar panels require additional equipment such as charge controllers or possibly a DC combiner box.
- A DC disconnect switch is recommended.
- Solar panels may require additional structural support for code compliance. Be sure to consult local code for any additional requirements.
- PVGFP (Ground Fault Protection)

Wind

The PowerHub 1800 can be connected to wind turbines that meet the following requirements.

- Supports 12 V wind turbines (up to 1000 W maximum.)
- Wind turbines must be self-regulated.
- A DC disconnect switch is recommended.
- Wind turbines may require additional structural support for code compliance. Be sure to consult local code for any additional requirements.

Solar and Wind Combination

- PowerHub 1800's battery enclosure accommodates up to two 100 Ah batteries for a total of 200 Ah. Solar input can accept up to 32 A and wind input can accept up to another 80 A for a combined total of 112 A. The total maximum input charge current (112 A) may be too high for one 100 Ah battery. Two batteries may be required. However, to ensure that the maximum charge rate of solar and/or wind does not exceed the battery bank capacity, always consult with a renewable system installer and a battery expert for optimum system design of solar versus wind versus battery bank size.

Notes

Notes

3 Installation

Chapter 3 contains information on assembling and installing this equipment.

⚠⚠DANGER

ELECTRICAL SHOCK AND FIRE HAZARDS

All wiring should be done by qualified personnel to ensure compliance with all applicable installation codes and regulations.

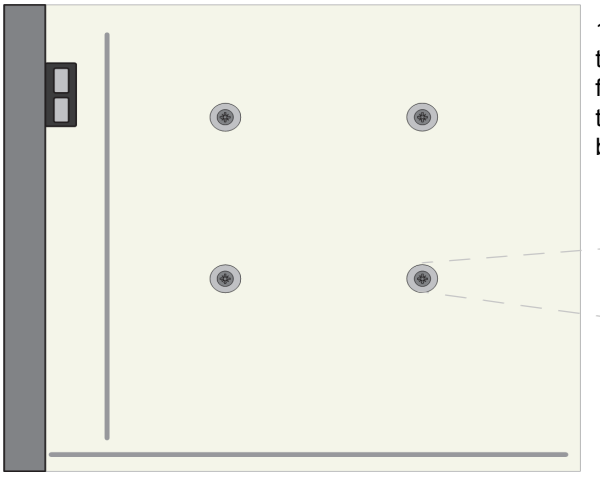
Failure to follow these instructions will result in death or serious injury.

Installation Overview

1. Assemble the battery box(es) to the inverter.
2. Prepare the battery bank.
3. Assemble and prepare the renewable energy components (if used).
4. Connect the battery bank to the inverter.
5. Connect the DC sources (if used).
6. Connect the AC sources:
   a) if hardwired: close utility input breaker, or
   b) if softwired: plug AC cord into generator
7. If hardwired, close the disconnect in the AC Distribution Panel to feed hardwired outlets.
8. Turn on power to the PowerHub.
9. Plug in the desired AC appliances.

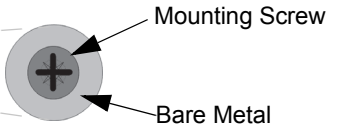
Assembling the Components

Important: Ensure that the location chosen for the inverter allows 8 to 12 inches (15.2 to 30.5 cm) clearance behind both the inverter and the Battery Box(es). Additional room may be needed for access.

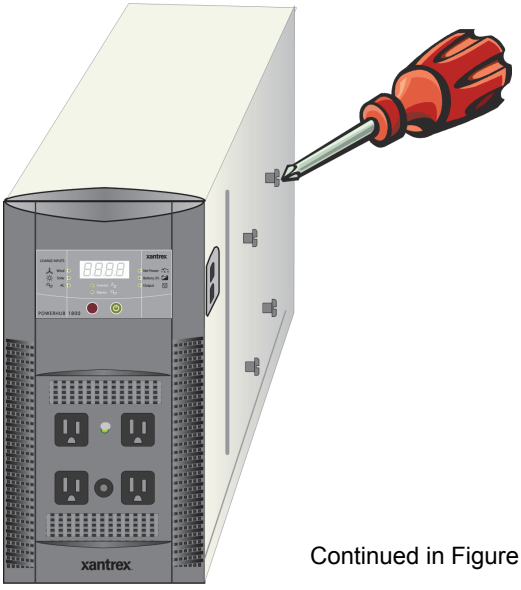


Inverter Side View

1. Decide on which side of the inverter box the Battery Box will be placed and locate the four #6-32 mounting screws on that side(s) of the inverter. These screws can be identified by the small ring of bare metal around them.



2. Loosen these screws just enough to allow the keyhole slots on the side of the battery Box to slip over the top of them. Do NOT remove these screws completely.

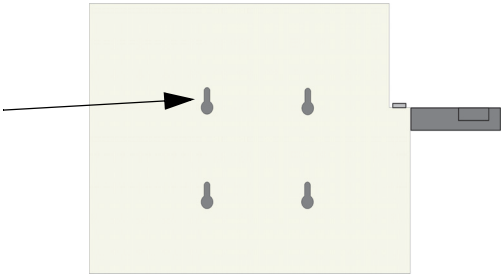


Continued in Figure 3-2.

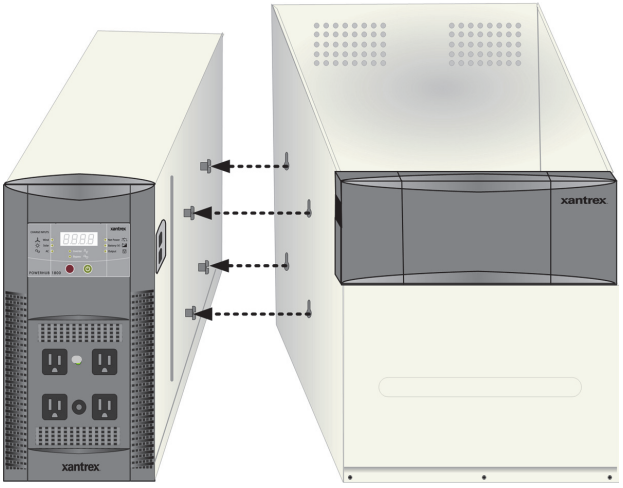
Figure 3-1 Preparing the Components for Assembly

Continued from Figure 3-1.

3. Locate the four keyhole shaped slots on the side of the battery box that is to be attached to the inverter.

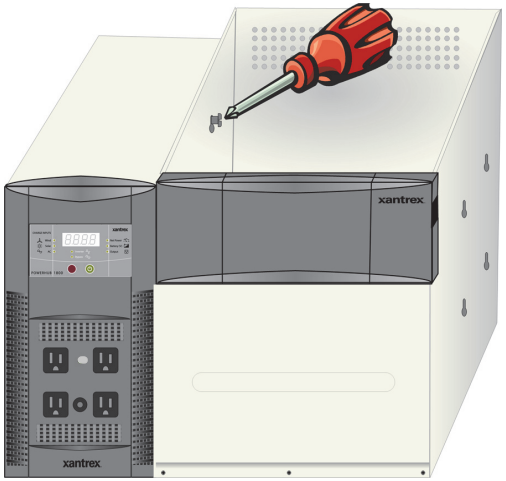


Battery Box Side View



4. Align the Battery Box keyhole slots with the mounting screws on the inverter box. Place the keyhole slots over the screws and lower into place, so that the head of the screw interlocks with the top of the keyhole slot inside the Battery Box.
Also ensure that the washers on the mounting screws end up on the inside of the battery box and not between the battery box and the inverter.

5. Secure the Battery Box to the Inverter box by tightening the mounting screws.
Torque to 1.3 nm (11.5 in-lb).



Important: Attaching the battery box(es) to the inverter grounds the chassis' of the two components and is required, not optional.

Figure 3-2 Connecting the Battery Box to the Inverter

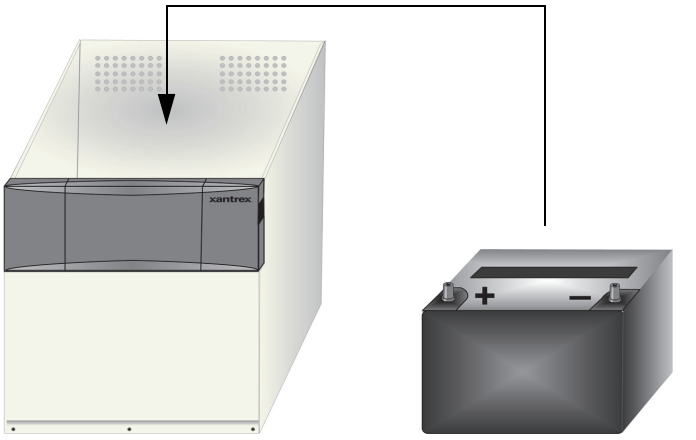
Preparing the Battery Bank

1. Insert the batteries into the compartment.

2. Connect the batteries as shown below depending on the battery configuration used.

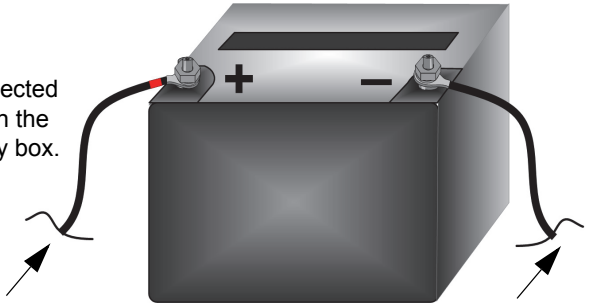
3. Tighten the Hex nut on the battery terminal to the battery manufacturer's torque requirement.

If using two batteries, see Figure 3-6 for additional cabling instructions.



If using one battery.....

*These cables are connected to the Anderson Plugs in the front panel of the battery box.



CONNECT SECOND:
Positive (+) (red) Cable from the Battery Box to the Inverter*

DISCONNECT FIRST:
Positive (+) (red) Cable from the Battery Box to the Inverter*

CONNECT FIRST:
Negative (–) (black) Cable from the Battery Box to the Inverter*

DISCONNECT LAST:
Negative (–) (black) Cable from the Battery Box to the Inverter*

Important: When disconnecting batteries, ensure all incoming power has been disconnected.
Then remove the Positive (+) (red) cable FIRST , and the negative (–) (black) cable LAST.

Cable Connection Order:

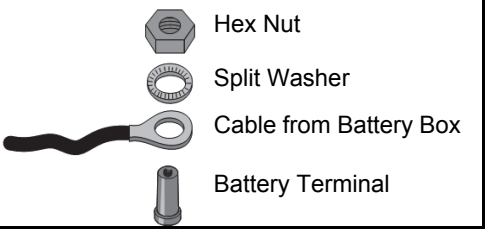
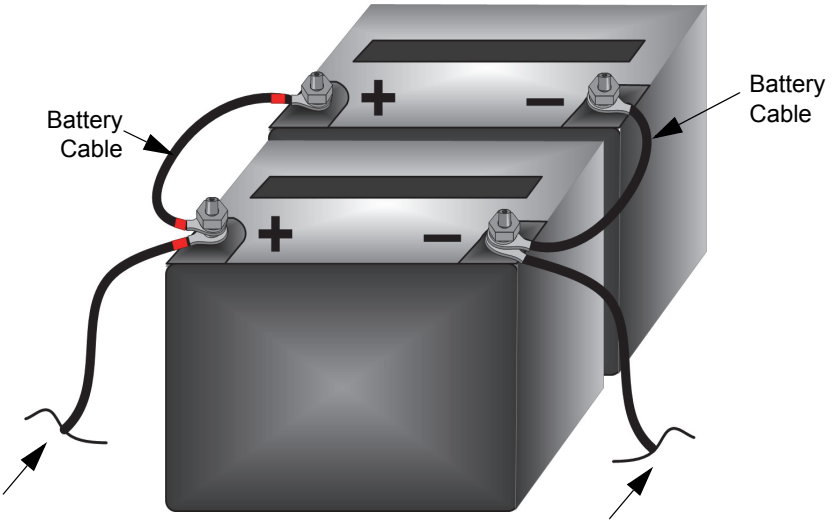


Figure 3-3 Preparing the Battery Bank

If using two 12 Vdc batteries, connect the cables in "parallel".
Positive (+) to Positive (+)
Negative (–) to Negative (–)

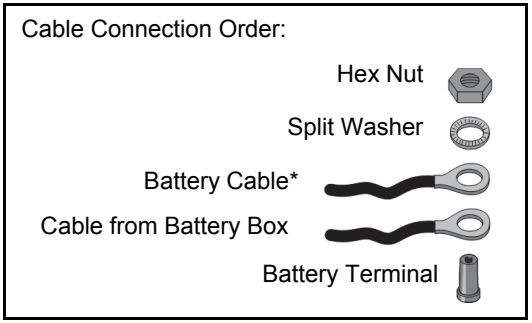


CONNECT SECOND:
Positive (+) (red) Cable from the Battery Box to the Inverter*

DISCONNECT FIRST:
Positive (+) (red) Cable from the Battery Box to the Inverter*

CONNECT FIRST:
Negative (–) (black) Cable from the Battery Box to the Inverter*

DISCONNECT LAST:
Negative (–) (black) Cable from the Battery Box to the Inverter*



Important: When disconnecting batteries, ensure all incoming power has been disconnected.
Then remove the Positive (+) (red) cable FIRST , and the negative (–) (black) cable LAST.

Figure 3-4 Battery Cabling for Two Batteries

Connecting the Battery Bank to the Inverter

⚠WARNING

ELECTRIC SHOCK HAZARD

Once the battery bank is connected to the inverter, if the batteries are charged, the inverter outlets may become "live". **If the PowerHub is to be hardwired, wait until all wiring is complete BEFORE connecting the battery bank.**

Failure to follow these instructions can result in death or serious injury.

NOTICE

EQUIPMENT DAMAGE

Double-check the cabling of the batteries to ensure proper polarity BEFORE connecting the battery box to the inverter. Damage caused to the inverter due to improper battery cabling is not covered by the limited warranty.

Failure to follow these instructions can result in inverter damage.

Figure 3-5 Connecting the Battery Bank to the Inverter

Connecting Two Battery Boxes to the Inverter

Up to two Battery Boxes can be used with the PowerHub 1800 at one time for a maximum of four 12-volt batteries only.

Connect dual Battery Boxes as follows:

1. Prepare the opposite side of the inverter as described in Figure 3-1 on page 3–2.
2. Connect the second Battery Box to the inverter as described in Figure 3-2 on page 3–3
3. Prepare the battery bank for the second battery box as described in “Preparing the Battery Bank” on page 3–4
4. Route the cables with the Anderson connectors from the second Battery box over the top of the fuses in the front of the second battery box.
5. If the unit is going to be softwired, connect the Anderson cables to the inverter as shown in Figure 3-5 on page 3–6.
6. If the unit is going to be hardwired, make the AC IN and AC OUT connections prior to connecting the Anderson Connectors to the inverter.

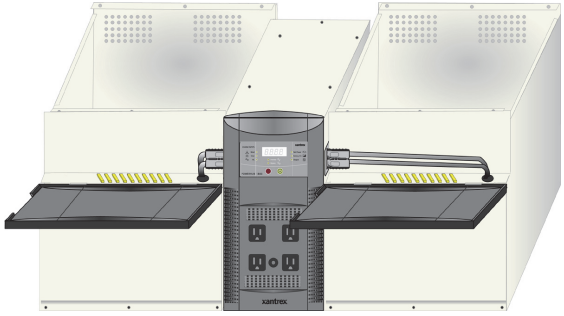


Figure 3-6 Connecting Two Battery Boxes to the Inverter

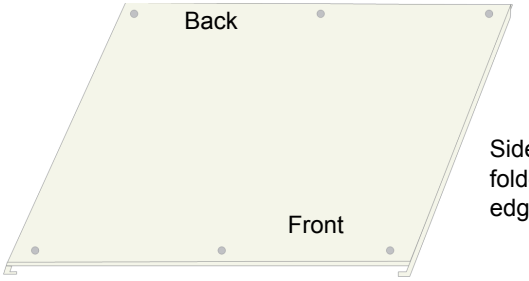
⚠WARNING

ELECTRIC SHOCK HAZARD

Once the battery bank is connected to the inverter, if the batteries are charged, the inverter outlets may become "live". **If the PowerHub is to be hardwired, wait until all wiring is complete BEFORE connecting the battery bank.**

Failure to follow these instructions can result in death or serious injury.

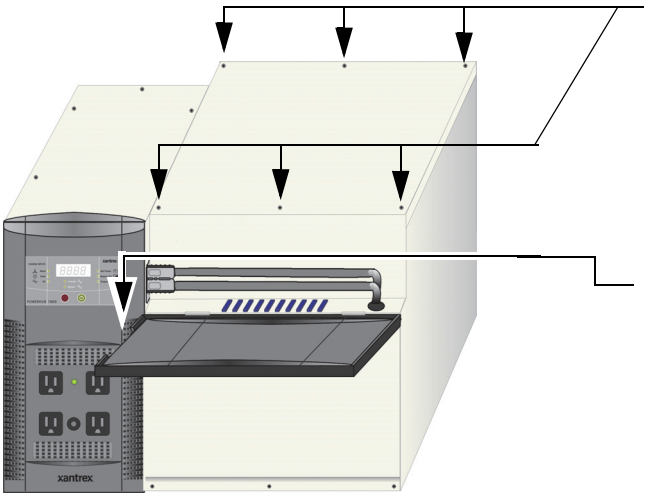
Replacing the Top to the Battery Box



Sides with folded down edges

1. Place the top to the battery box on the enclosure, back edge first so that the back edge of the enclosure is inserted into the folded down edges of the sides of the top.

There is a label on the underside of the top to indicate front from back.



2. Align the screw holes from the top to the enclosure.

3. Use the 6 6x32 Phillips screws in the plastic bag provided to secure the top in place.

Torque to 1.3 nm (11.5 in-lb).

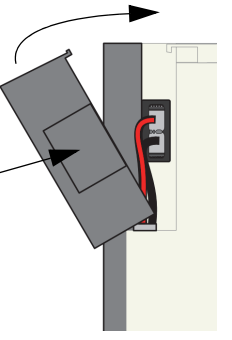
4. Remove the knockout panel on the side of the front panel on the battery box to accommodate the battery connections to the inverter.

Repeat this procedure for the second battery box if used.

To close the front panel on the battery box:

Lift the front panel into place.

Knockout Panel (one on each side)



Gently push the lip on the front panel under the lip on the top of the battery box enclosure.

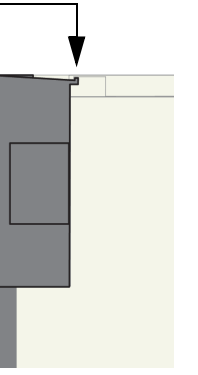


Figure 3-7 Replacing the Top to the Battery Box

Wiring

Plug-and-go (Softwiring)

The PowerHub 1800 comes assembled with an AC input cord. This AC cord can be plugged into a 120 Vac outlet on a 120 Vac generator to charge the batteries.

Important: The input cord is intended to allow connection to portable generators in non-permanent installations. For fixed permanent installations, use electrical code-compliant wiring methods. See “Permanent Wiring (Hardwiring)” on page 3–10 for instructions.

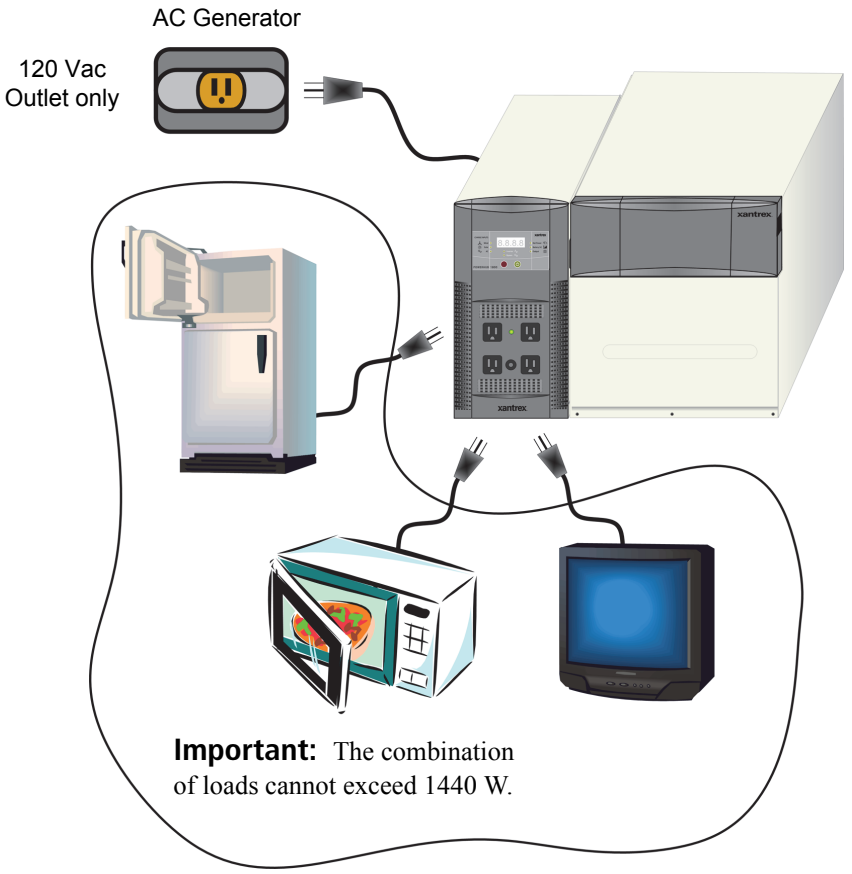


Figure 3-8 Plug-n-Go Wiring (Softwired)

Permanent Wiring (Hardwiring)

⚠WARNING

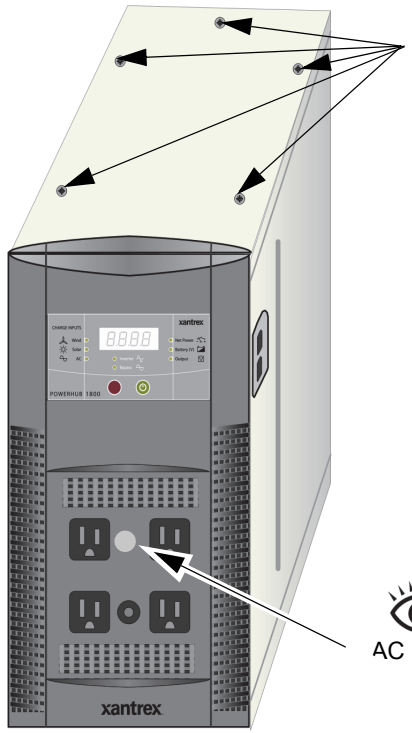
ELECTRIC SHOCK HAZARD

Hardwiring this equipment should be done by a person with adequate knowledge of electrical and building code requirements. Failure to follow safe installation practices could result in a significant, and possibly lethal, shock hazard.

Failure to follow these instructions can result in death or serious injury.

Terminal Access

BEFORE REMOVING INVERTER COVER: Check to ensure the AC Indicator LED is NOT illuminated and that there are absolutely no sources of power connected to the PowerHub.



Once hardwiring is complete 120 Vac power will be available at the outlets on the front panel as well as the outlets directly connected to the PowerHub through the AC Distribution Panel.

Wiring Terminals Enlargement

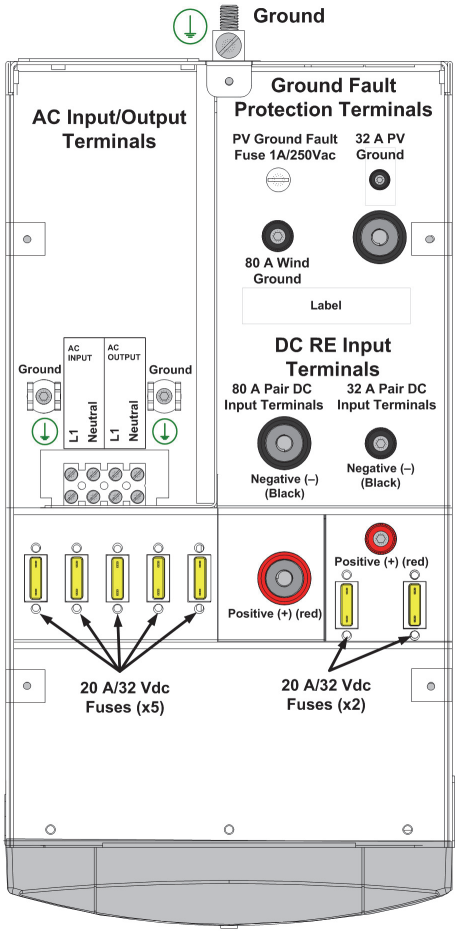


Figure 3-9 Terminal Access for Hardwiring

Table 3-1 Recommended Wire Gauges for Input and Output Terminals

Terminal	Acceptable Wire Gauge	Torque to.....
AC Input (Neutral and Line)	#14 AWG	1.3 Nm (11.5 in-lbs)
AC Output (Neutral and Line)	#14 AWG	1.3 Nm (11.5 in-lbs)
AC Ground	#14 AWG	1.8 Nm (16.0 in-lbs)
DC Input (32 A DC Input/40 A fused)	Manufacturer's recommendation.	20.3 Nm (180 in-lbs)

Table 3-1 Recommended Wire Gauges for Input and Output Terminals

Terminal	Acceptable Wire Gauge	Torque to.....
DC Input (80 A DC Input/100 A fused)	Manufacturer's recommendation.	20.3 Nm (180 in-lbs)
DC Ground	Manufacturer's recommendation.	20.3 Nm (180 in-lbs)
System Ground	#3 AWG	

Removing the Factory-installed AC Cord and Knockouts

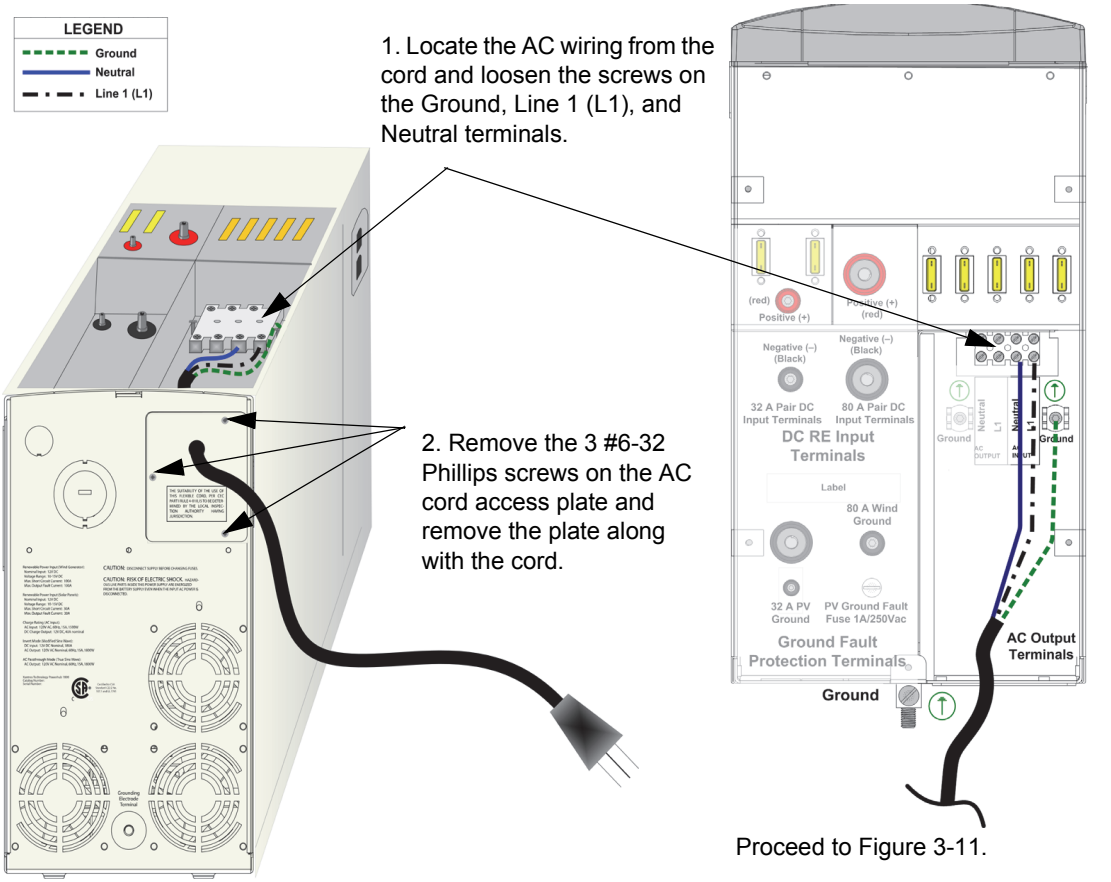
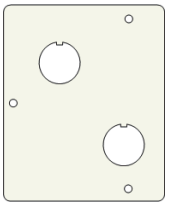


Figure 3-10 Removing the AC Cord

Continued from Figure 3-10.



3. Locate the AC Accessory Plate and remove one or the two of the knockouts depending on whether both input and output wiring will be needed.
If only input is needed, then only remove one knockout.

4. Secure the AC Accessory Plate to the opening where you removed the AC cord and with the 3 Phillips screws removed with the other plate.

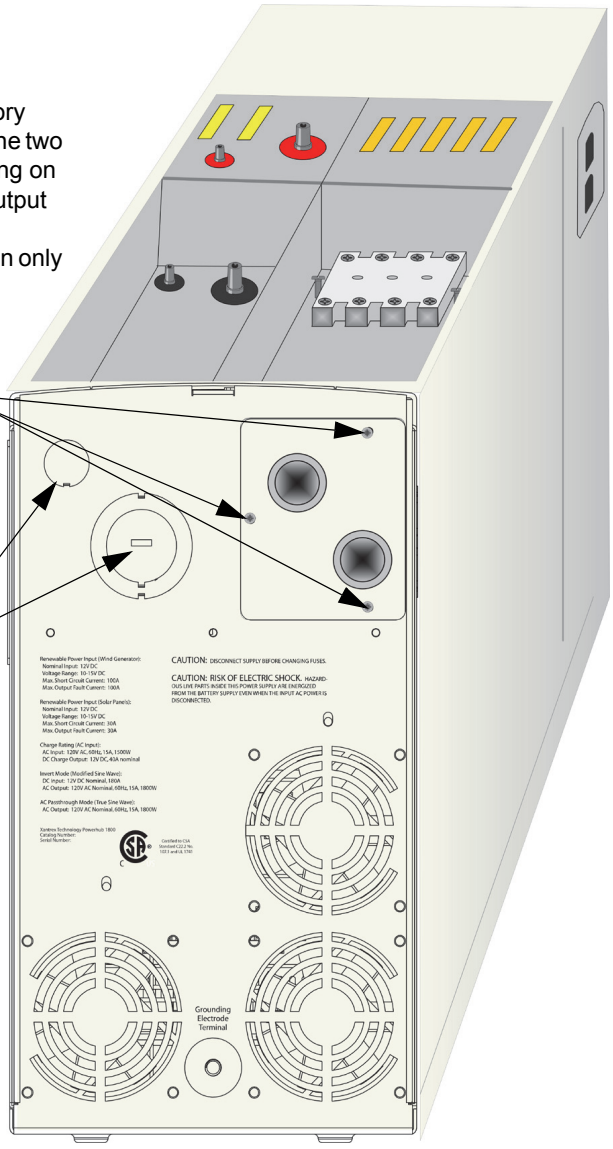
5. Remove any DC knockouts required for installing DC input from Renewable Energy Sources.

6. Proceed to wiring instructions:

If installing AC from a generator, see Figure 3-12, “Connecting the AC Input and Output from a Generator” on page 3–14.

If installing AC from a utility grid, see Figure 3-13, “Connecting the AC Input and Output from the Utility” on page 3–15.

If installing DC from renewable energy sources, see Figure 3-14, “Connecting the DC Input (Renewable Energy Solar Panel)” on page 3–16.



IMPORTANT:
Be sure to install approved conduit and strain relief in the knockout holes to protect the wiring from being damaged by any sharp edges along the hole openings.

Figure 3-11 Preparing the Knockouts

AC Input and Output Wiring from a Generator

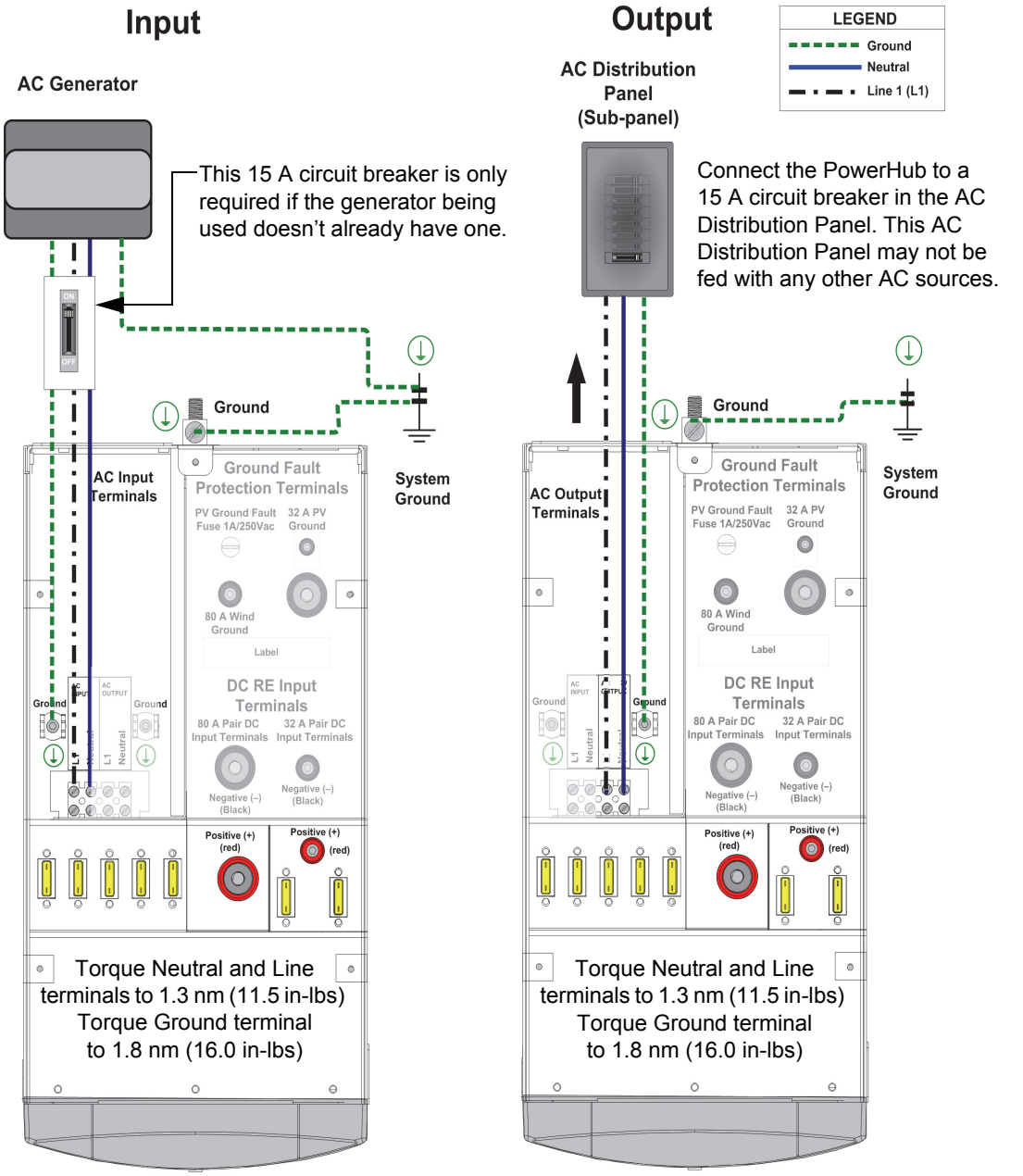


Figure 3-12 Connecting the AC Input and Output from a Generator

AC Input and Output Wiring from the Utility Grid

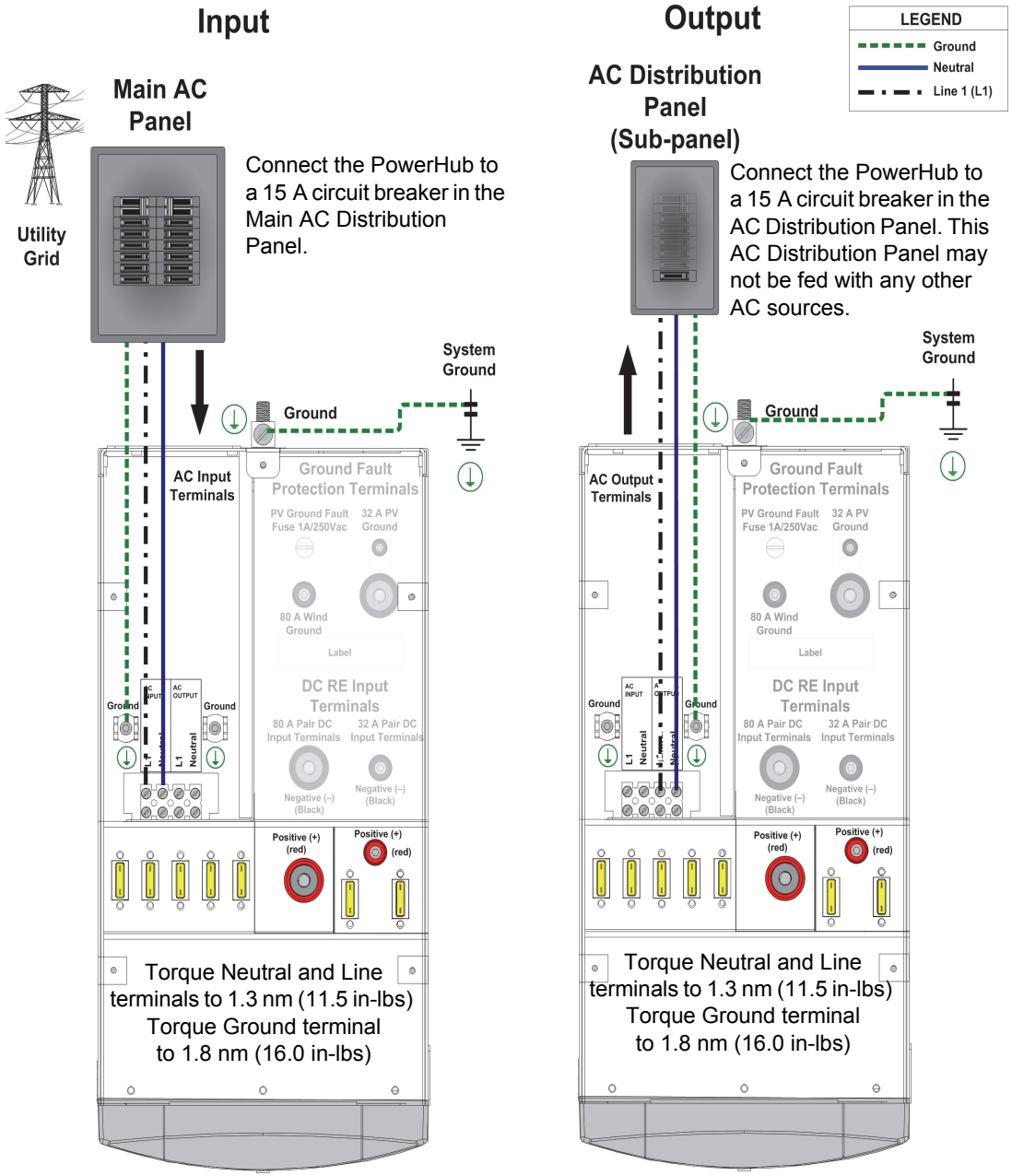


Figure 3-13 Connecting the AC Input and Output from the Utility

DC Wiring with Ground Fault Protection (Renewable Energy Solar Panel; Maximum 400 W)

Important: Renewable energy input may require additional hardware to be code-compliant. There may also be additional grounding requirements. Be sure to consult your local electric authority for additional requirements.

Example only. Actual installation may vary.

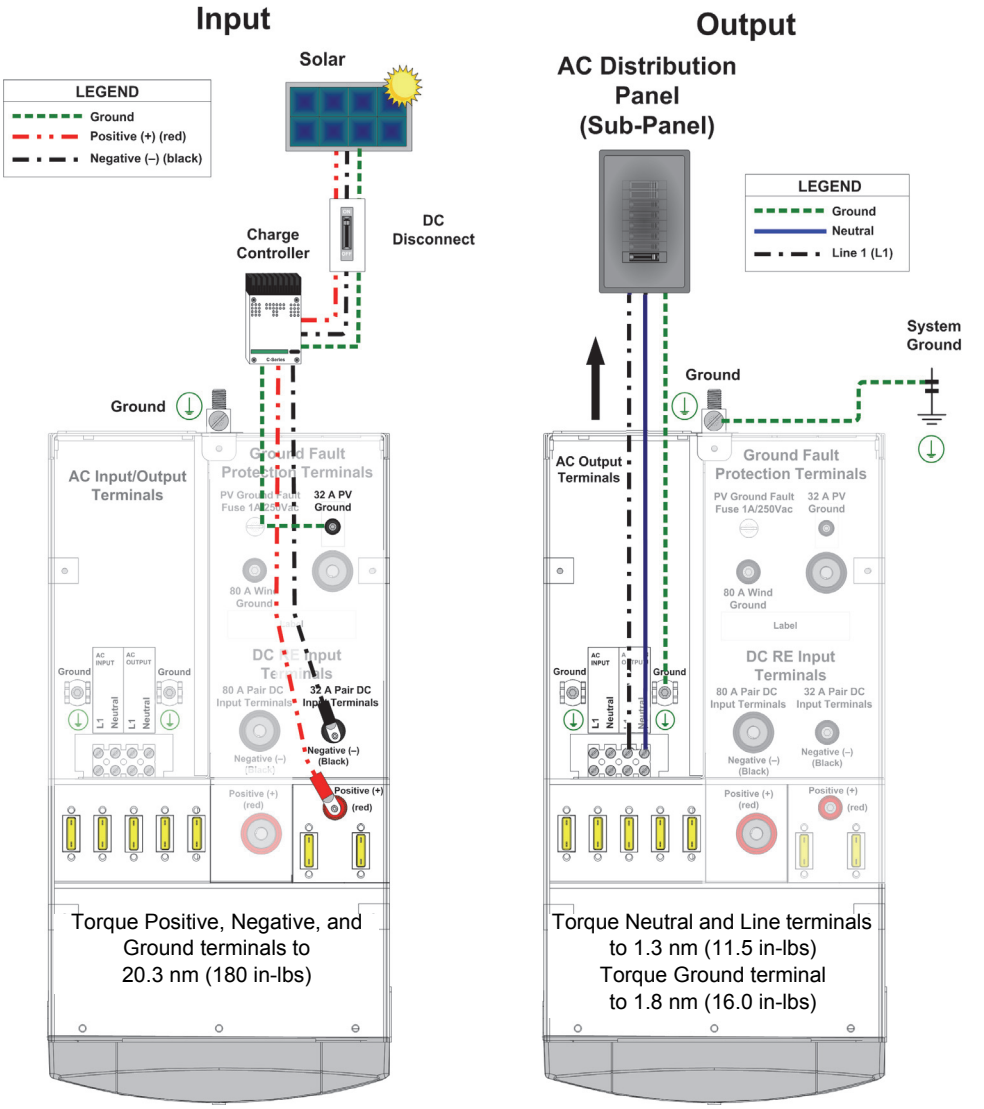


Figure 3-14 Connecting the DC Input (Renewable Energy Solar Panel)

DC Wiring with Ground Fault Protection (Renewable Energy Solar Array; Maximum 1000 W)

Important: Renewable energy input may require additional hardware to be code-compliant. There may also be additional grounding requirements. Be sure to consult your local electric authority for additional requirements.

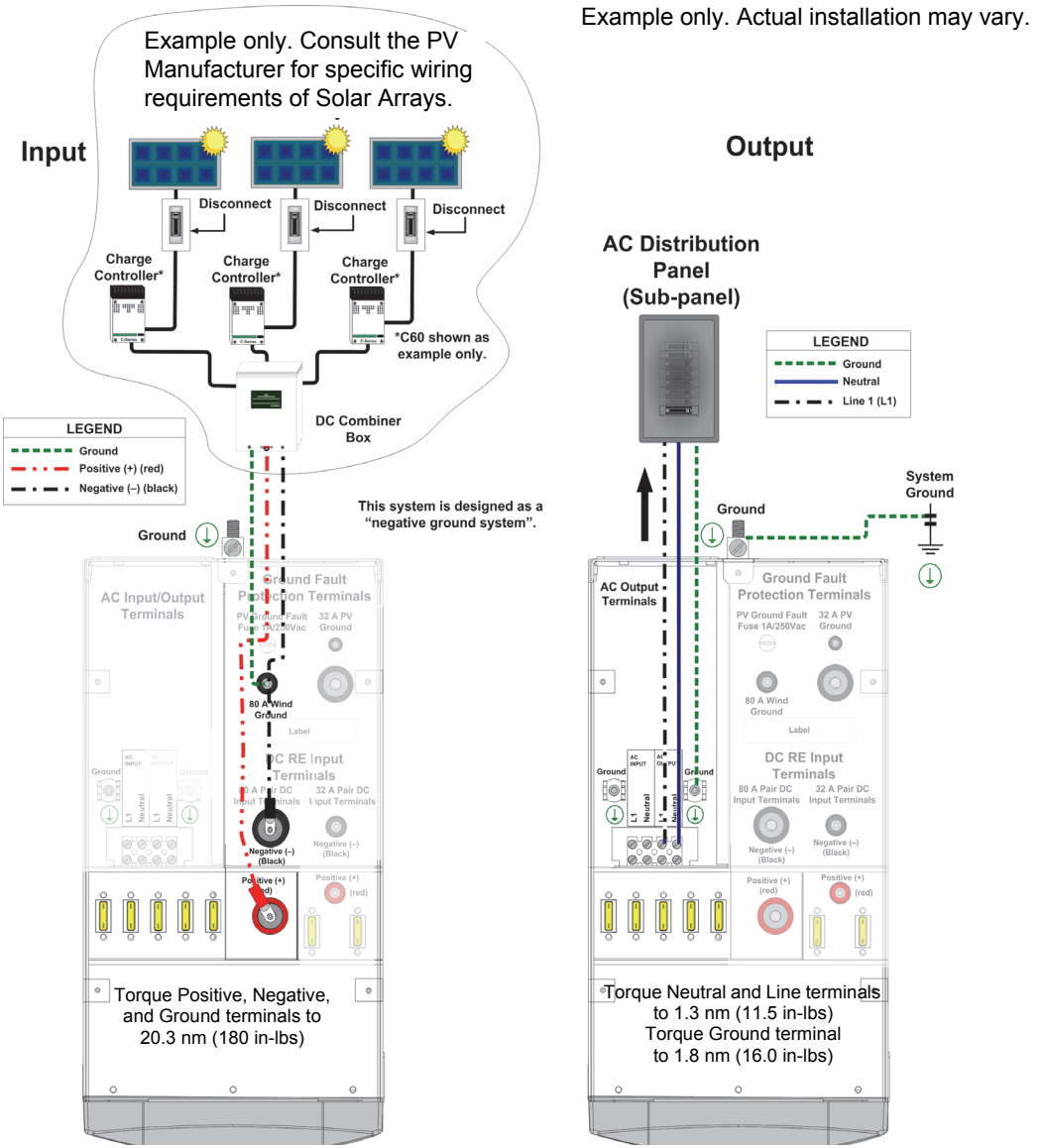


Figure 3-15 Connecting the DC Input (Renewable Energy Solar Array)

DC Wiring (Renewable Energy Wind, Maximum 1000 W)

Important: Renewable energy input may require additional hardware to be code-compliant. There may also be additional grounding requirements. Be sure to consult your local electric authority for additional requirements.

Example only. Actual installation may vary.

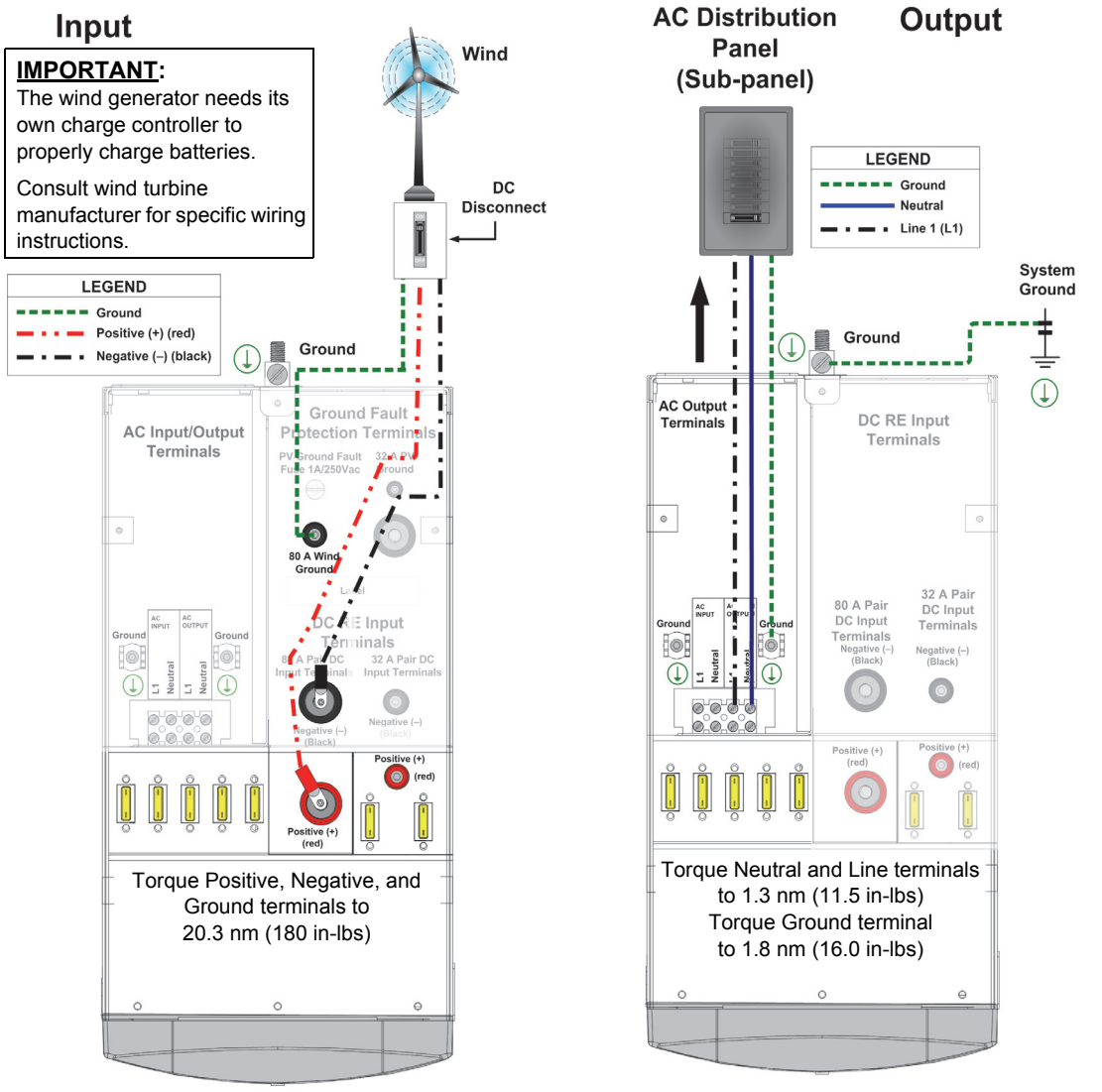


Figure 3-16 Connecting the DC Input (Renewable Energy Wind)

Replacing the Top Cover

1. Place the top cover back on the inverter and align the holes.

2. Replace the 5 #6-32 Phillips screws on the top of the inverter.

3. Torque to 1.3 nm (11.5 in-lbs)

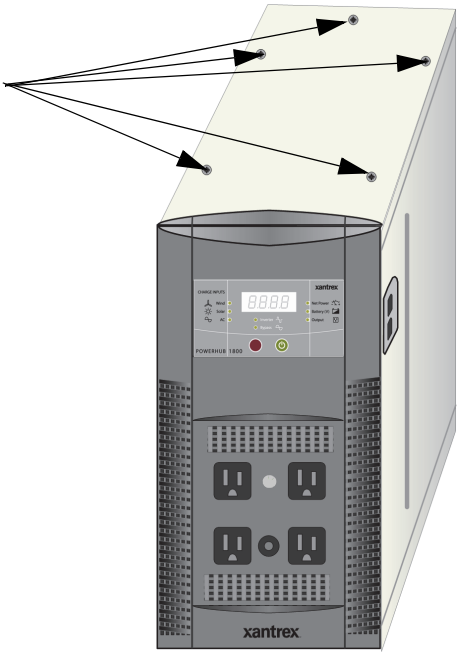


Figure 3-17 Replacing the Top Cover on the Inverter

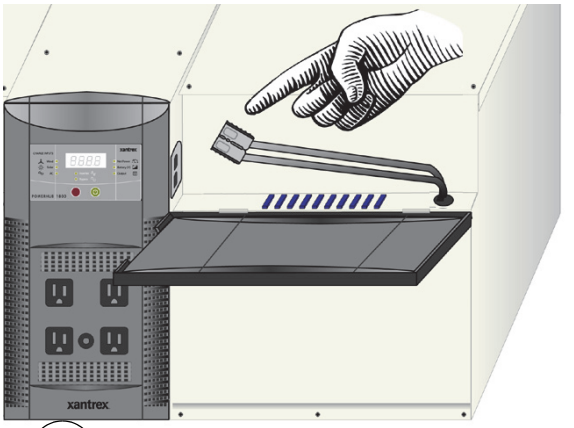
Double-check

Before applying power, double-check the following connections.

- ❒ Are the batteries cabled properly? No reverse polarity!
- ❒ Battery Box to Inverter Connections - Are the Anderson connectors securely in place?
- ❒ Are the solar panels wired properly?
- ❒ Are the wind generators cabled properly?
- ❒ Are the appropriate disconnects, circuit breakers, etc. in place?
- ❒ Is all the wiring and cabling in undamaged condition?

Power Up Procedure

If softwired..... **To Power Up the PowerHub 1800:**



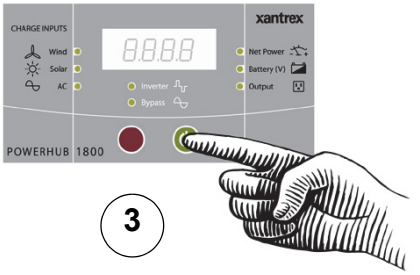
1 Connect the Battery Box(es) to the Inverter.

AC Generator

2

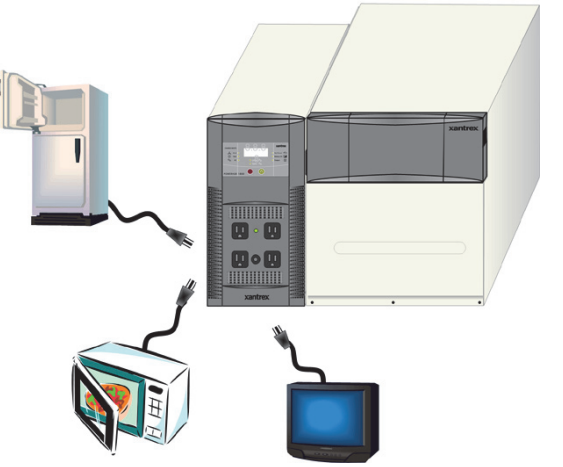
120 Vac Outlet

Connect the PowerHub to the generator and turn the generator ON (if required).



3

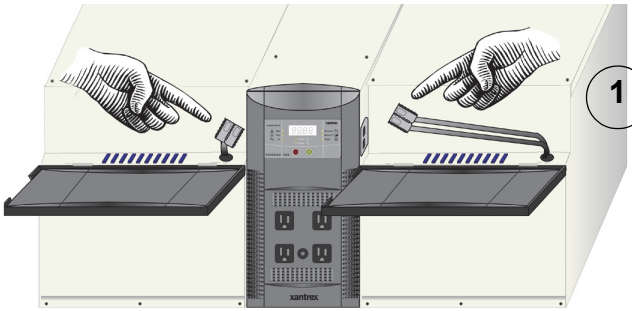
Press ON/OFF Switch to turn ON Inverter/Charger.



4 Connect the Loads.

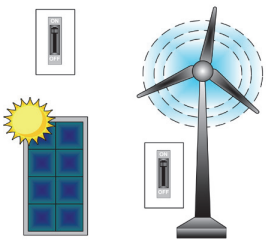
Figure 3-18 Power Up Procedure for Softwired Installations

If hardwired..... **To Power Up the PowerHub 1800:**



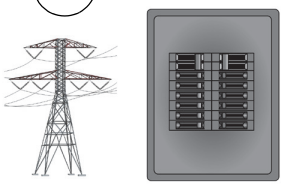
1 Connect the Battery Box(es) to the Inverter

2 Connect the DC Input



Apply DC Input power by closing the DC Disconnect Input Breaker or disconnect from the Renewable Energy inputs.

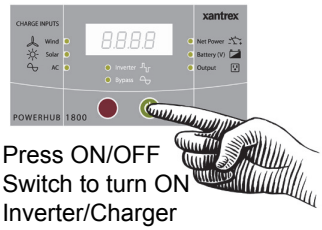
3 Connect the AC Input



Main Panel

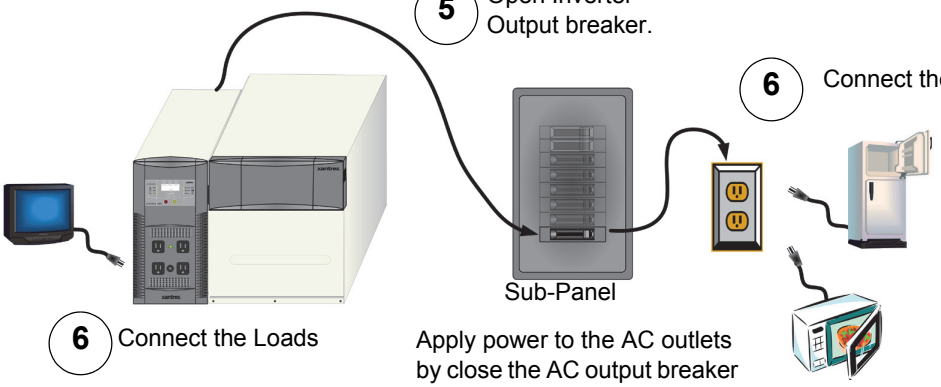
Apply Utility power (if available) from the Main AC Distribution Panel by closing the Main AC Input Circuit Breaker.

4



Press ON/OFF Switch to turn ON Inverter/Charger

5 Open Inverter Output breaker.



Sub-Panel

6 Connect the Loads

6 Connect the Loads

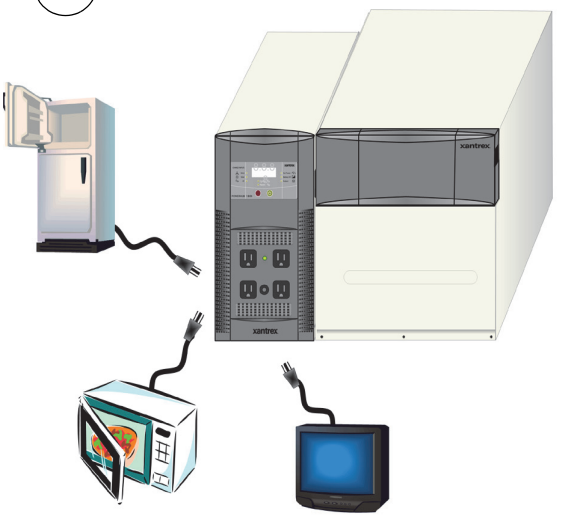
Apply power to the AC outlets by close the AC output breaker in the AC Distribution Panel to the connected outlets.

Figure 3-19 Power Up Procedure for Hardwired Installations

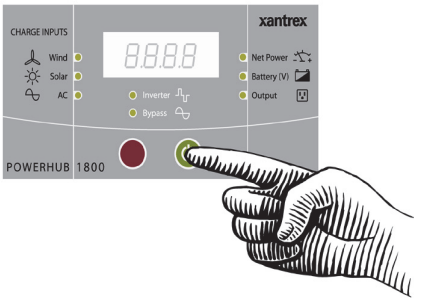
Power Down Procedure

If softwired..... **To Power Down the PowerHub 1800:**

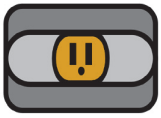
1 Disconnect Loads.



2 Press ON/OFF Switch to turn OFF Inverter/Charger.



3 Disconnect the PowerHub from the generator and turn the generator OFF.



OFF

4 Disconnect the Battery Box(es) from the Inverter.

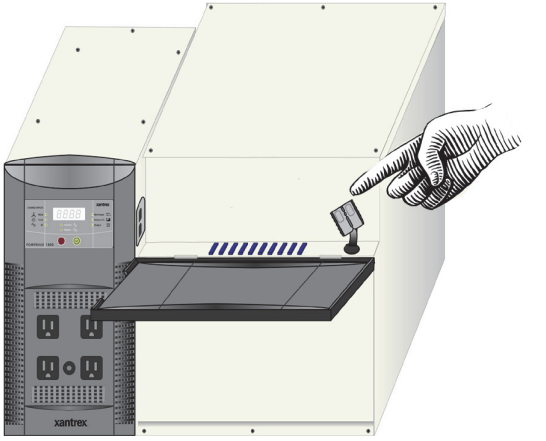


Figure 3-20 Power Down Procedure for Softwired Installations

If hardwired..... **To Power Down the PowerHub 1800:**

⚠WARNING
ELECTRIC SHOCK HAZARD Physically disconnect DC input sources (solar or wind) to ensure that DC power is OFF. **Failure to follow these instructions can result in death or serious injury.**

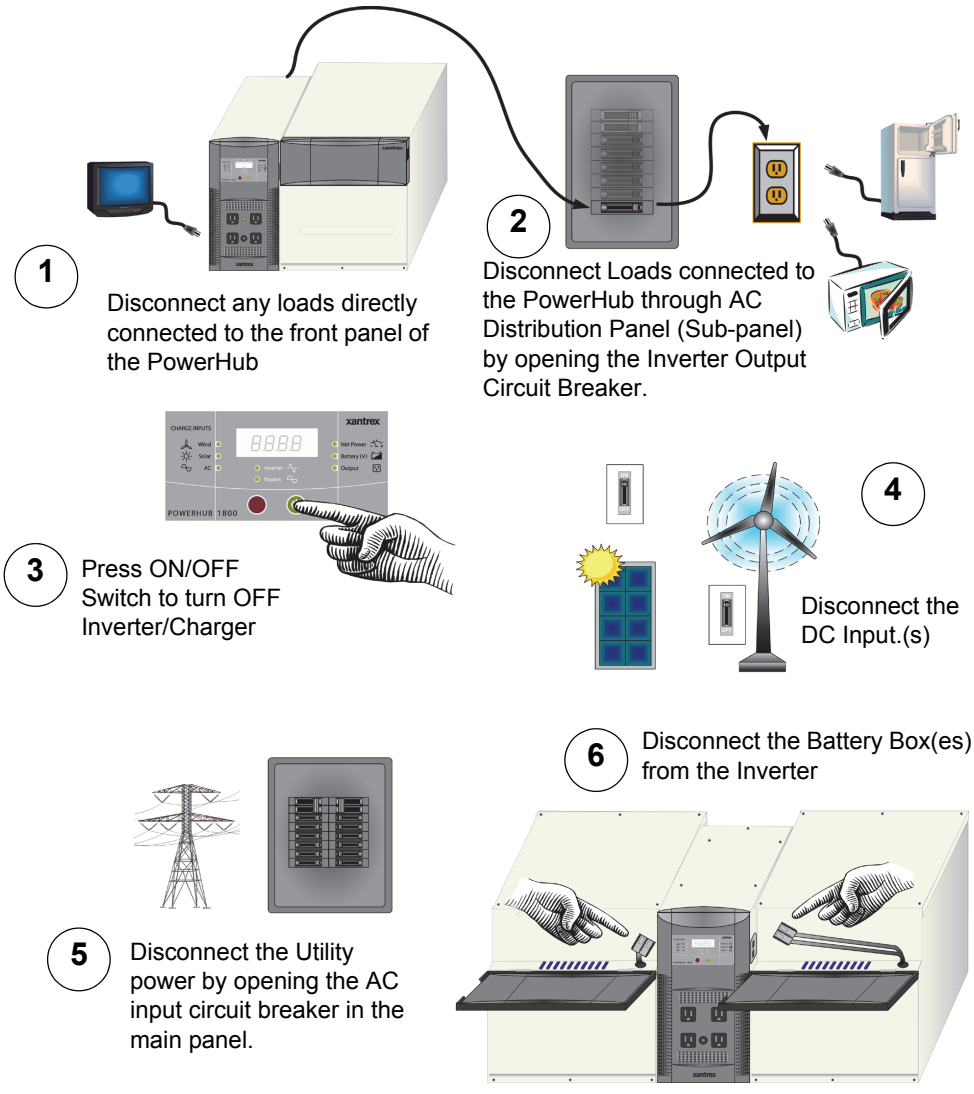


Figure 3-21 Power Down Procedure for Hardwired Installations

Ground Fault Protection

⚠⚠DANGER

ELECTRICAL SHOCK AND FIRE HAZARDS

- All wiring should be done by qualified personnel to ensure compliance with all applicable installation codes and regulations.
- Disconnect all AC and DC power sources.

Failure to follow these instructions will result in death or serious injury.

Ground fault protection is required when using either solar or wind renewable energy input. Figure 3-22 shows the location of the ground fault protection terminals and replaceable fuse.

When a grounding fault is detected, the ground fault protection fuse will blow. The system must be shut down completely, the fault corrected, the fuse replaced (see "Replacing the Ground Fault Protection Fuse") and then the system restarted.

If an error is made on the installation or if the installer is called in to help repair the installation after damage that caused the ground fault protection fuse to open, the main symptom is that the unit will be shut down and will not invert or charge. The error that is shown on the front panel is E09.

Replacing the Ground Fault Protection Fuse

⚠WARNING

ELECTRICAL SHOCK AND FIRE HAZARDS

- Replace the ground fault protection fuse only with the same type and ratings of fuse.
- After disconnection both AC and DC power for the system, wait five minutes before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Internal capacitors remain charged for five minutes after disconnecting all sources of power.

Failure to follow these instructions can result in death or serious injury.

The ground fault protection fuse will blow when severe leakage occurs between the PV array and earth ground, or when the system has been installed with faulty DC wiring. Before replacing the fuse, it is important to have qualified service personnel, such as a certified electrician or technician, to determine the cause of the ground fault.

To replace the ground fault protection fuse:

1. Remove the five Phillips screws on the top of the inverter and lift off the panel to expose the terminals, as shown in Figure 3-22.
2. Locate the PV ground fault protection fuse.
3. Using a slot blade screwdriver, carefully remove the blown fuse by pushing the fuse cap, turning it counter clockwise (a quarter turn only), and pulling out the fuse holder from the receptacle.
4. Replace the fuse with a new Littelfuse 5mm×20mm fuse rated 1A 250 Vac slow blow (or equivalent).
5. Return the fuse holder with the new fuse back into the receptacle and using a slot blade screwdriver, carefully push the fuse cap while turning it clockwise (a quarter turn only).
6. Replace the panel on the top of the inverter and tighten all five screws securely.

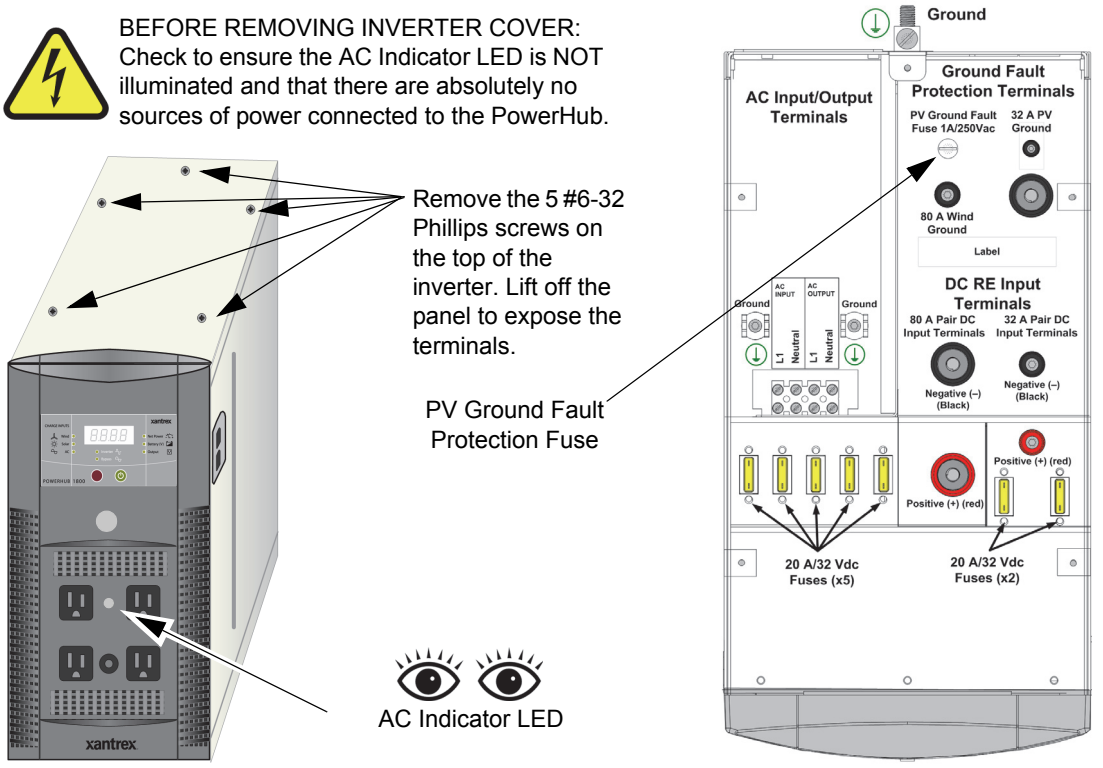


Figure 3-22 Replacing Ground Fault Protection Fuse

A Specifications

Appendix A provides electrical and physical specifications for the PowerHub 1800.

Electrical Specifications

Table A-1 Electrical Specifications for the Inverter

Parameter	PowerHub 1800 Inverter
Maximum Output Power	1800 W (15A) (5 minutes maximum)
Continuous Output Power	1440 W (12 A)
Surge Rating	2880 W (24 A)
Input Voltage Range	10.5 to 15.0 Vdc
Input Frequency Range	60 Hz
Peak Efficiency	88%
System Shutdown Mode (Display On)	< 12 W
Idle Mode	<1.5 W
Output Frequency	60 Hz / ±1 Hz
Output Waveform (resistive load)	Modified sine wave (>30% THD)
Output Voltage (at no load)	110 to 125 Vac
Low Battery Cutout	10.5 Vdc with < 240 W load and 11.0 V with > 240 W load
High Battery Cutout	15.0 Vdc
Transfer Relay Rating	20 A
Transfer Time AC to Inverter	< 40 ms
AC Qualification Time	~ 20 seconds
Protection	• Five 20 A/32 Vdc fuses protecting the 80A/1000 W DC input terminal. • Two 20 A/32 Vdc fuses protecting 32A/ 400 W DC input terminal. • One 15 Aac supplemental protector. • One 1 A/250 Vac fuse for system ground fault protection.

Table A-2 Electrical Specifications for the Battery Box

Parameter	Battery Box[1]
Protection	Ten 20 A/32 Vdc Fuses for short circuit and reverse polarity conditions.

1.Stand-alone battery box Product Part Number: PH1800-BBX

Physical Specifications

Table A-3 Physical Specifications of the Inverter

Parameter	PowerHub 1800
Dimensions (H x W x L)	14.75" × 8.0" × 16.0" (37.5 cm × 20 cm × 41 cm)
Weight	28.6 lb (13.0 kg)
Operating Temperature	0 °C (32 °F) to 40 °C (104 °F)
Storage Temperature	-30 °C (-22 °F) to 70 °C (158 °F)

Table A-4 Physical Specifications of the Battery Box

Parameter	Battery Box[1]
Dimensions (H x W x L)	14.0" × 13.875" × 20.5" (35.6 cm × 35.2 cm × 52.7 cm)
Weight	29 lb (13.2 kg)
Operating Temperature	0 °C (32 °F) to 40 °C (104 °F)
Storage Temperature	-30 °C (-22 °F) to 70 °C (158 °F)

1.Stand-alone battery box Product Part Number: PH1800-BBX

Battery Charger Specifications

Charging Process — The Battery Charger uses a three-stage charging process to maintain the battery (or batteries) in operational condition. This process is illustrated in Figure A-1, “Three-Stage Charging Process” on page A–4.

Bulk Stage — The bulk stage will start upon connection of AC and the unit turned on. The constant current mode is limited to 40 A or 10 A depending on setting. The voltage setpoint for this stage is 14.2 Vdc. The Charger will transition to the Absorption Stage upon reaching the bulk voltage setpoint.

Absorption Stage — In the Absorption Stage, the constant voltage mode is limited to 14.2 Vdc. The current will drop as batteries voltage rises. Upon dropping to 4 A, the unit will transition to the Float charge. This stage will not exceed 4 hours maximum.

Float Stage — In the Float stage, the constant voltage mode limited to 13.7 Vdc. An 8-hour timer is started at this point.

If, during the 8-hour timer, the current rises to 6 A, the unit transitions back to the Bulk Stage and starts over.

If the unit stays at 4A or less for the 8 hour timer, it will transition to Standby Mode.

Standby Mode — In the Standby Mode, the Charger is OFF but monitors the battery voltage. If battery voltage drops below 12.5 Vdc, the unit will start a new Bulk stage.

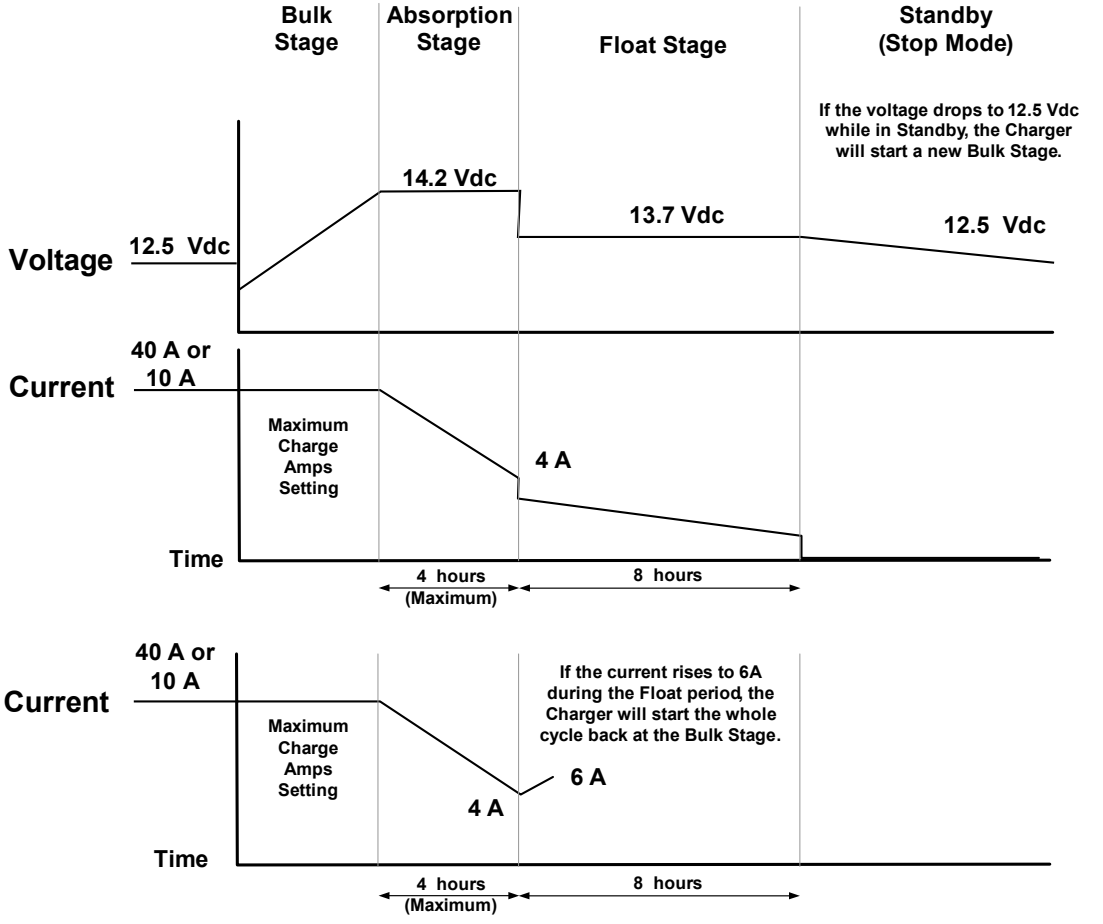


Figure A-1 Three-Stage Charging Process

Charging Profiles

40-amp Charging Profile

Table A-5 provides the specific charging parameters for the 40 Charging Profile.

Table A-5 40-amp Charging Profile

Parameter Name	Default Value
Charger Setting	40 A
Maximum Bypass Current	500 W (4 A)
Bulk Mode	40 A
Absorption Mode	14.2 Vdc (4 hours maximum)
Float Mode	13.7 Vdc (8 hours)
Switches from Absorption to Float Mode	4 A
Switches from Float Mode back to Bulk Mode within the 8-hour limit, if the Float current increases to 6 A.	6 A
Standby Mode (Off Mode)	12.5 Vdc
Estimated charging time	8 hours based on a single battery box with two 100 Ah, 12 Vdc batteries and no other DC charging sources

10-amp Charging Profile

Table A-6 provides the specific charging parameters for the 10 Charging Profile.

Table A-6 10-amp Charging Profile

Parameter Name	Default Value
Charger Setting	10 A
Maximum Bypass Current	1200 W (10 A)
Bulk Mode	10 A
Absorption Mode	14.2 Vdc (4 hours maximum)
Float Mode	13.7 Vdc (8 hours)
Switches from Absorption to Float Mode	4 A
Switches from Float Mode back to Bulk Mode within the 8-hour limit, if the Float current increases to 6 A.	6 A
Standby Mode (Off Mode)	12.5 Vdc
Estimated charging time	32 hours based on a single battery box with two 100 Ah, 12 Vdc batteries and no other DC charging sources

0-amp Charging Profile

When Charger Setting 0 A is selected, the Battery Charger is disabled and will not charge the batteries. Use this mode if other DC charging sources are available or if it is necessary to temporarily disconnect the AC charging system.

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