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About This Guide

Purpose	
	The purpose of this Installation Guide is to provide procedures for installing Solar Generator which includes 140W solar panel, solar charge controller and PowerHub 1800 with 1800W inverter built-in.
Scope	
	The Guide provides safety guidelines, detailed planning and setup information, and procedures for installing the Solar Generator. 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	
	High-efficiency polycrystalline solar panel is maintenance free and easy to install. 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 four chapters and one appendix. Chapter 1 declares the important safety instructions Chapter 2 describes the features and functions of the Solar Generator. Chapter 3 contains information on planning the installation of this equipment. Chapter 4 contains information on assembling and installing this equipment. Appendix A provides specification of solar panel, solar charge controller and PowerHub 1800.

About This Guide

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



CAUTION

Cautions identify conditions or practices that could result in damage to the unit or other equipment.

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

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 Solar Generator Operator's Guide. You can find more information about Phono Solar at **www.phonosolarusa.com** and service of PowerHub 1800 at **www.xantrex.com**

WARNING



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

General Precautions

1. Before installing and operating the solar generator, read all instructions and cautionary markings on solar panel, solar charge controller and PowerHub 1800, and both Guides of Installation and Operation.

- 2. Keep children away from the Solar Generator.
- 3. For indoors use only excepting for the solar panel.

4. Someone should be within range of your voice or close enough to your aid when assembly.

5. Turn the panel upside down on the floor or cover the surface to isolate the light when installing, wiring and maintaining to avoid electrical hazards. The panel generates DC electricity when exposed to sunlight or other light sources.

6. To avoid a risk of fire or electric shock, make sure that all of the installation wiring is in good condition and that wire is not undersized. Do not operate the solar generator with damaged or substandard wiring.

7. Always connect charge controller to Powerhub1800 first when installing and remove last when disassembling.

8. Observe proper polarity throughout entire power cable wiring route, red is positive and black is negative.

- 9. Never touch the end of panel cables or any other cables with bare hands.
- 10. Use only SEALED batteries with the Solar Generator.
- 11. Follow all instructions published by the battery manufacturer.
- 12. Disconnect all wiring before any maintenance or cleaning.
- 13. Do not attempt to repair the Solar Generator. Call our after service

center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

14. Consult local codes and other applicable laws and statutes concerning required permits, regulations concerning installation and inspection requirements.

Precaution for Solar Danel



K 5FB=B;

 Δ Never touch the end of panel cables or 50' cables with bare hands.

- 1. Keep children away from panel.
- 2. For use in 12-Volt system only.

3. Wear rubber glove when installing, wiring and maintaining. Do not wear jewelry.

4. Turn the panel upside down on the floor or cover the surface to isolate the light when installing, wiring and maintaining to avoid electrical hazards. The panel generates DC electricity when exposed to sunlight or other light sources.

5. Do not expose solar module to sunlight concentrated with mirrors, lenses or similar means.

6. Observe proper polarity throughout entire power cable wiring route, red is positive and black is negative.

7. Do not connect the panel directly to the PowerHub 1800 since the variation of the power will damage the device, using solar charge controller included in solar generator between.

8. Connect charge controller to Powerhub1800 with 8" cable first when installing and remove last when disassembling.

9. Never connect 50' cable to panel cable before connecting 50' cable to charge controller to avoid short circuit and electrical hazards.

10. Do not drop tools or hard objects on the solar panel.

- 11. Do not scratch the back film.
- 12. Do not shadow cells to avoid causing module hot spot.
- 13. Follow all safety precaution of the battery.

14. Consult local codes and other applicable laws and statutes concerning required permits, regulations concerning installation and inspection requirements.

Precaution for Solar Charge Controller

- 1. For use in 12-Volt system only.
- 2. For indoors use only.

3. Observe Polarity – positive to positive and negative to negative when wiring.

4. Connect charge controller to Powerhub1800 with 8" cable first when installing and remove last when disassembling.

5. Assemble 50' cable to charge controller before connecting to panel cable.

6. No terminals or lugs required for connecting wire which should be no less than 14AWG/2.1mm² and be rated for 90°.

7. Do not attempt to repair the controller. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

- 8. Disconnect all wiring before any maintenance or cleaning.
- 9. NEVER charge a frozen battery.
- 10. Follow all safety precaution of the battery.

Precaution for PowerHub 1800



WARNING: Limitations on use

The PowerHub 1800 is not intended for use in connection with life support systems or other medical equipment or devices.



WARNING

To avoid the risk of carbon monoxide poisoning, generators are not to be used indoors. When generators are used outdoors there must be sufficient circulation to vent the carbon monoxide.

1. Before installing and using the PowerHub 1800, read all instructions and cautionary markings on the PowerHub, the batteries, and in both the 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 "Return Procedure" on page 58(Operator's Guide).

7. Do not disassemble the PowerHub, except where noted to wire it for a permanent installation or to install batteries. The PowerHub 1800 contains no user-serviceable parts. See "Warranty" on page 56 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 1800 is not intended for use as an uninterruptible power supply (UPS).



Figure 1 Basic Safety

- 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



Figure 2 Power Down Procedure for Softwired Installations

About This Guide



Figure 3 Power Down Procedure for Hardwired Installations

2 Introduction

Chapter 2 describes the features and functions of the Solar Generator.



Figure 4 The PowerHub 1800

Features and Functions

Components The Solar Generator consists of the following components.



140W Polycrystalline panel



Solar Charge Controller



1 set 50' 12AWG cable

- Connect Solar Panel and solar charge controller
- Red-Positive
- Black-Negative

1 set 8" 12AWG cable

- Connect solar charge controller and PowerHub 1800
- Red-Positive
- Black-Negative



Solar Generator Installation Guide(English and Spanish)

Note: Above components are packed in Box 2 of 2

Introduction



Note: Above components are packed in Box 1 of 2

Purpose	The Solar Generator could be a home backup power, an emergency power or a small/home office backup power which could run a fridge, freezer, sump pump and 1000 W microwave, fish tank light and air pump, home alarm system and garage door for a limited time, up to 1440W combination (1800W on a 5 minutes surge) but could not be used as an uninterruptible power source (UPS) As an emergency power, it will run essential electronics such as a 20" TV, radio, fan, mobile and cordless phone, and a 40W emergency light. As a small/home office backup power, it will run a laptop, desktop and 20" LCD or CRT monitor, 600W office lamp, ink jet printer, 4-in-1 copier/printer/fax/scanner, internet modem, VolP phone, mobile phone and cordless phone. As a backup power, our product can last a long time. For example, laptop, printer, modem – up to 53 hours, 13" TV, table lamp, radio – up to 21 hours, 18.8 cu. Ft. fridge and alarm system – up to 13 hours.
Function	The Solar Generator is specially designed to use renewable energy (12V solar panel or small 12V wind turbines) or AC source (generator or utility grid) to charge the batteries (not provided) in battery box and to power AC loads such as fridge, 20" TV and rechargeable appliance by 1800W charger/inverter.

Introduction

Inverter Features	 The inverter consists of the following Inverter Control Panel Four 120 Vac outlets on the front One supplementary protector to p overload. Two Battery Box Connection Port 	g user features: panel. protect the 120 Vac outlets from ts (one on each side)
AC O	Inverter Control Panel utlets (x4)	Input/Output terminals are located under top panel. See Figure 23 on page 41 for a detailed illustration of these terminals. Battery Box Connection Ports for Anderson-type Connector Plus (x2-one on each side) AC Indicator LED Supplementary Protector
Figure 5 1800W inverter/charger Features		
Input/Output Terminals	 The inverter has the following input/o Two DC Anderson ports for 12 V Battery Box; one on each side. 	output terminals: battery connections from the

- 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 23 on page 41 for a detailed illustration of the Input/Output and ground terminals.
Regulatory	The PowerHub 1800 complies with CSA 107.1-01 and UL1741and is certified fora permanent installation that is compliant with national electrical codes.

The Solar Generator could be a home backup power, an emergency power or a small/home office backup power.



:][$i f Y^*$ Home back-up power



Figure 7 Emergency power



Figure 8 Office back-up power

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 9 Hardwired Utility Applications

Introduction

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 10 Hardwired Wind Applications

Combination Applications

The PowerHub 1800 can be used for the other entry-level applications as well.



Figure 11 Hardwired Combination 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, Xantrex recommends using 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 12 Softwired Utility or Generator Applications

3

Planning

Chapter 3 contains information on planning the installation of this system

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 panels 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 which is hardwired.

- 2. For other application, 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 Solar Panel and PowerHub from their 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.

- □ 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 2 on page 42.
- **C** 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 Solar Charge Controller and PowerHub 1800 is to be installed is indoors and 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. <i>Be sure to leave adequate room to access the</i> <i>terminals if the unit is to be hardwired. Twelve inches may not be</i> <i>adequate for access purposes to hardwire the unit.</i>

Sunlight Choose an appropriate location that provides the most direct sunlight and can support the solar panel, and is free from shade. Be aware of surrounding objects which may obscure the sun from the panel. This solar panel is weatherproof including UV protection and protecting from rain, snow, storm and anyzweather effects of $-35^{\circ}F-175^{\circ}F$ ($-37^{\circ}C - 79^{\circ}C$).





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 \times 6.75" D \times 9" H (including terminal posts)

Terminal Location Top (required)

Terminal Type L-type or screw-in terminal



WARNING: Shock hazard

Terminal adaptors are not acceptable as they may short circuit to the battery box, and cause an energy hazard.

Battery Box Internal dimensions 12.75" W x 16"D





Battery Box holds 2 Standard Sealed Lead-acid 12 Vdc Batteries* sized 12" W × 6.75" D × 9" H



Planning

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.



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.

See "Preparing the Battery Bank" on page 35 for instructions on how to cable two batteries together.

Average run-
timesTable 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.

		Run Time PowerHub	Run Time PowerHub
AC Appliance	Watts ^a	1 battery box ^b (hours)	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

 Table 1
 Typical AC Appliances and Run Times

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**.

Other Renewable Energy

The PowerHub 1800 supports the following renewable energy sources as well.

- Solar Panels
- Wind turbines

These kinds of 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 turbines

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.

Planning

4 Installation

Chapter 4 contains information on assembling and installing this equipment.

Installation Overview

- 1. Assemble the battery box(es) to the inverter.
- 2. Prepare the battery bank.
- 3. Assemble and prepare the Solar Panel.
- 4. Connect the battery bank to the inverter.
- 5. Connect the Solar charge controller to the inverter
- 6. Connect the Solar Panel to Solar Charge Controler.
- 7. Connect the AC sources:

a) if hardwired: close utility input breaker, or b)if softwired: plug AC cord into generator

- 8. If hardwired, close the disconnect in the AC Distribution Panel to feed hardwired outlets.
- 9. Turn on power to the PowerHub.
- 10. 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.



Figure 15 Preparing the Components for Assembly

Installation



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

Figure 16 Connecting the Battery Box to the Inverter

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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 one battery.....

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

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

DISCONNECT FIRST:

Positive (+) (red) 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 17 Preparing the Battery Bank

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

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

Installation

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*

Figure 18 Battery Cabling for Two Batteries

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

Connecting the Battery Bank to the Inverter

WARNING: 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.

CAUTION: 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.

Battery Connection Port (x2)

Insert the Anderson connectors into the Battery Connection Port on the Inverter.

Ensure the connector is inserted completely. This may require some force as the connectors are tight.

Figure 19 Connecting the Battery Bank to the Inverter

Replacing the Top to the Battery Box

Knockout Panel (one on each side)

Figure 20 Replacing the Top to the Battery Box

Wiring Of Solar Panel

Example only. Actual installation may vary.

Figure 21 Wiring of Solar Panel

Wiring of Solar Charge Controller

IMPORTANT: Please make sure "+" and "-" tags are connected correctly.

Figure 22 Wing of Solar Charge Controller

General testing requirements before final connecting Always test outdoors under good sunlight conditions.

1. Test solar panel for voltage

Use solar voltage tester or Voltmeter to test the panel, positive to positive and negative to negative, and observe open voltage which could range from 16 Volts to 24 Volts.

2. Test connection to solar charge controller for voltage

Connect solar panel to solar charge controller, measure the open circuit voltage at the battery side of the charge controller which is 5-10% lower then solar panel and range from 15 Volts to 23.5 Volts.

3. Connect charge controller to PowerHub 1800

Disconnect solar panel to solar charge controller and switch off the PowerHub 1800 with battery inside if switched on. Connect solar charge controller to PowerHub 1800 and make sure the correct polarity connection, positive to positive and negative to negative. Always connect charge controller to battery first and remove last.

4. Connect charge controller to solar panel

Connect the charge controller to solar panel and switch on the PowerHub 1800, the charge indicator, green light, of solar charge controller would be on and the battery capacity indicator of solar charge controller would light as per the batter capacity. If all testing results could be within the above ranges, the solar system could be normal and charge the battery. If anything wrong, repeat above connections and retest. Finally, It's common to have 12 battery issues such as dead cells or non-chargeable battery problems.

Permanent Wiring (Hardwiring)

WARNING: 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.

Terminal Access

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.

Figure 23	Terminal	Access for	Hardwiring
-----------	----------	------------	------------

Installation

Table 2	Recommended	Wire	Gauges fo	or Input	and Out	tout Termina	əls
	necommenaca	VVIIC	Guuges it	n mput	and ou	iput icinina	JIJ

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)
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 24 Removing the AC Cord

Installation

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 25 Preparing the Knockouts

sources, see Figure 29, "Connecting

the DC Input (Renewable Energy

Solar Panel)" on page 47.

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, Xantrex recommends using electrical code-compliant wiring methods. See "Permanent Wiring (Hardwiring)" on page 42 for instructions.

Figure 26 Plug-n-Go Wiring (Softwired)

AC Input and Output Wiring from a Generator

Figure 27 Connecting the AC Input and Output from a Generator

AC Input and Output Wiring from the Utility Grid

Figure 28 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.

:][i fY & 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 30 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 31 Connecting the DC Input (Renewable Energy Wind)

Replacing the Top Cover

Figure 32 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?

Installation

Figure 33 Power Up Procedure

Installation

To Power Down the PowerHub 1800:

Power Up Procedure

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

Figure 35 Power Up Procedure for Softwired Installations

Figure 36 Power Up Procedure for Hardwired Installations

Power Down Procedure

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

Figure 37 Power Down Procedure for Softwired Installations

Installation

Figure 38 Power Down Procedure for Hardwired Installations

Ground Fault Protection

WARNING: Shock hazard

• Troubleshooting a grounding fault should be performed by qualified personnel, such as a certified electrician or technician.

Ground fault protection is required when using either solar panels (array) or wind turbines renewable energy input. Figure 39 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: Energy and fire hazard

For continued protection against risk of fire, replace the ground fault protection fuse only with the same type and ratings of fuse.

WARNING: Shock hazard

After disconnection both AC and DC power for the 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.

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 39.
- 2. Locate the PV ground fault protection fuse.
- 3. Using a slot blade screwdriver, remove the blown fuse and replace it with a new Littelfuse 5mm×20mm fuse rated 1A 250 Vac slow blow (or equivalent).
- 4. Replace the panel on the top of the inverter and tighten all five screws securely.

Figure 39 Replacing Ground Fault Protection Fuse

A Specifications

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Appendix A provides specifications for Solar Panel Solar Charge controller and PowerHub 1800.

Specification of Solar Panel

(Measurement conditions under irradiance level of 1000W/m 2 , Air mass 1.5 Spectrums, cell temperature of 25°C)

SPECIFICATION			TOLERANCE						
	_				Parameter		V	alues	Unit
Cells	Po 6.14"x(ly crystal Si 5.14" square		Оре	Operating temperature		-40 +85		r
Number of cells	4x9 p	ieces in serie	s	Hail diameter @ 49.7mph		Up to 1		inch	
Typical application		12V DC		Surface	urface maximum load capacity		Up to 2400		Ра
Maximum voltage		1000V DC			CONNECT		ERMI	NALS	
Size	58.35"(L)	x26.61"(W) x	1.77"(H)						
Weight		28.66 lbs			Cable	35.43"wir		'wire (ø 0.0	062in ²)
Front glass	3.2 mm	toughened gl	ass	Diod	le's amount		2	pieces	
	ELEC	TRICAL	TYPIC	AL VAL	UES				
Model	Rated Power (Pm)	Tolerance	Rated ((Ir	Current n)	Rated Voltage (Vm)	Short C Curren	Circuit t (Isc)	Open Voltaç	Circuit ge (Voc)
PS140P—12/G	140W	±3%	8.0	5A	17.4V	8.2	5A	22	.0V
NOCT: 45℃±2℃ NOCT: Nominal Operation Cell Temperature			Voltage Temperature coefficient: -0.35%/C Current Temperature coefficient: 0.05%/C Power Temperature coefficient: -0.48%/C						
Note: defined as s	standard deviatior They	n of thousands can differ by ⊣	s measurer ŀ/- 5% from	nents. Abs one meas	olute power value uring system to a	es depen nother.	d on the	e measuring	g system.
	Characteri	stic curves					DIME	NSION	S
1 (A) 8. 400 7. 000 5. 600 4. 200 2. 800 1. 400 0. 000 0. 00 2. 95 5. 5	I (A) Cell Temperature:25°C 1000W/m2 140.0 120.0 120.0 100.0 80.0 60.0 60.0 40.0 20.0 00 2.95 5.90 8.85 11.80 14.75 17.70 20.65 U(Y)					2-26			

Specification of Solar Charge Controller

Parameter Name	Default Value
Rated charging current	10 A
Rated load current	10 A
System voltage	12V/24V Automatic identification
Overload and short circuit protections	Short circuit protection will act at ≥ 3 times rated current.
Max. current in solar panel	10 A
Max. load current	10 A
Operating temperature range	-35°C ~ +55°C
Equalizing charging voltage	14.8V/29.6V(25°C), 2hours
Forced charging voltage	14.50V/29.0V(25°C), 2hours
Floating charging voltage	13.7V/27.4V(25°C)
Cutoff at load undervoltage	11.4-11.9V/22.8-23.8V(SOC); 11.0V/22.0V (Voltage control)
Load reconnection voltage	12.8V/25.6V
Temperature compensation	-4mv/°C/2V
Weight	0.66 lb
Environmental protection degree	IP32
Max. wire diameter	0.0248 in. sq.
Dimensions	5.1"x3.5"x1.1" (LxWxH)

Electrical Specifications

Table 3 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 4 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 Xantrex Part Number: PH1800-BBX

Physical Specifications

Table 5	Physical	Specifications	of the	Inverter
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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)

$H\!V\!\,\bar{}\, Y^{\cdot *}\,$ 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 Xantrex 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 40, "Three-Stage Charging Process" on page 64.
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	

Figure 40 Three-Stage Charging Process

Bulk stage.

Charging Profiles

40-amp Charging Profile

Table 7 provides the specific charging parameters for the 40 Charging Profile.

Table 7 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 8 provides the specific charging parameters for the 10 Charging Profile.

Table 8	10-amp Chard	aina Profile
	i o amp charg	Jung i roune

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.

