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PH1800

Operator's Guide

PowerHub 1800

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PowerHub 1800

Operator's Guide

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About This Guide

Purpose

The purpose of this Operator's 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 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 operational features and functions of the PowerHub 1800. This section details how the unit functions as an inverter, provides information on the control panel, and describes operating limits for inverter operation.

Chapter 2 contains information on operating the PowerHub 1800.

Chapter 3 explains how to troubleshoot the PowerHub 1800 and describes the error codes that may be displayed on the LCD.

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

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 PowerHub 1800 Installation Guide (part number 975-0289-01-01). You can find more information about Xantrex Technology Inc. as well as its products and services at **www.xantrex.com**.

A French version of this document is available at **www.xantrex.com**.

Important Safety Instructions



WARNING

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



WARNING: Limitations on use

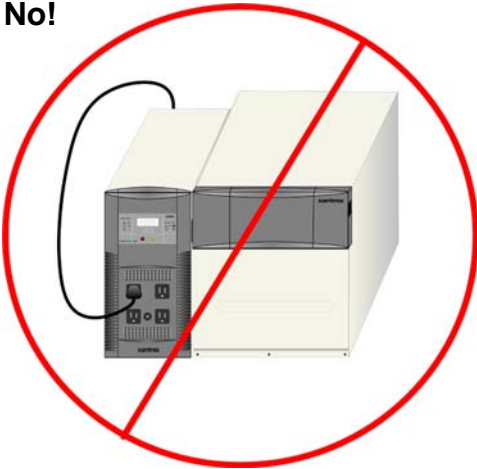
The PowerHub 1800 is not intended for use in connection with life support systems or other medical equipment or devices.

1. **Before installing and using the PowerHub 1800, 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 "Return Procedure" on page WA-3.
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 WA-1 for instructions on obtaining service. Attempting to service the

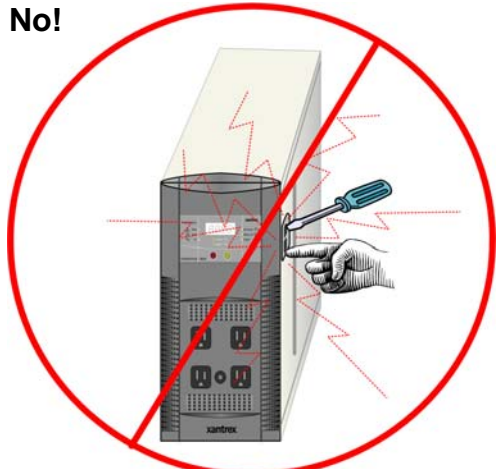
PowerHub yourself may result in a risk of electrical shock or fire and will void your warranty. Internal capacitors remain charged after all power is disconnected.

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).

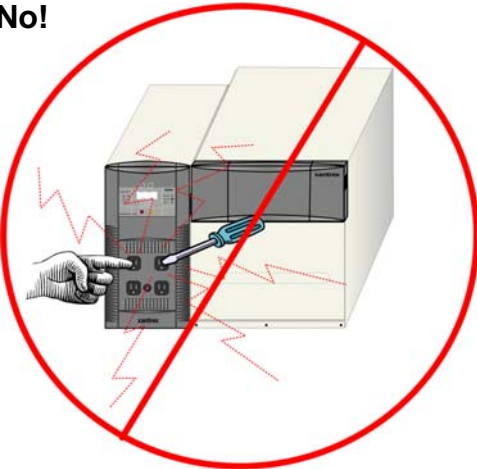
No!



No!



No!



No!

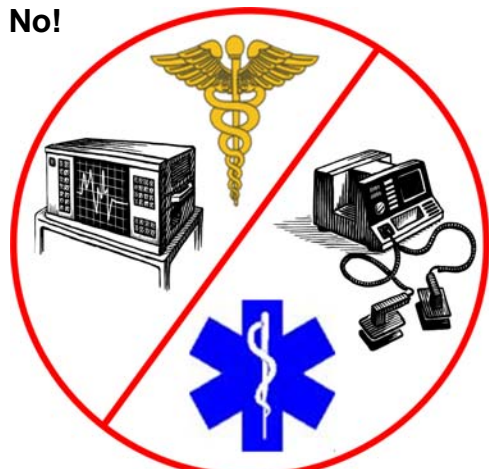


Figure i Basic Safety

Precautions When Working With Batteries



WARNING: Fire or Explosion Hazard

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.

Precautions for Using Rechargeable Appliances



CAUTION: 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.

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/ICES 003 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

The power down procedure will be depend on how the unit has been installed. If using the AC cord to plug the PowerHub directly into a generator, this is referred to as “softwiring” or “plug-and-go”. If installing in a permanent location, that is referred to as “hardwiring”.

If softwired.....

To Power Down the PowerHub 1800:

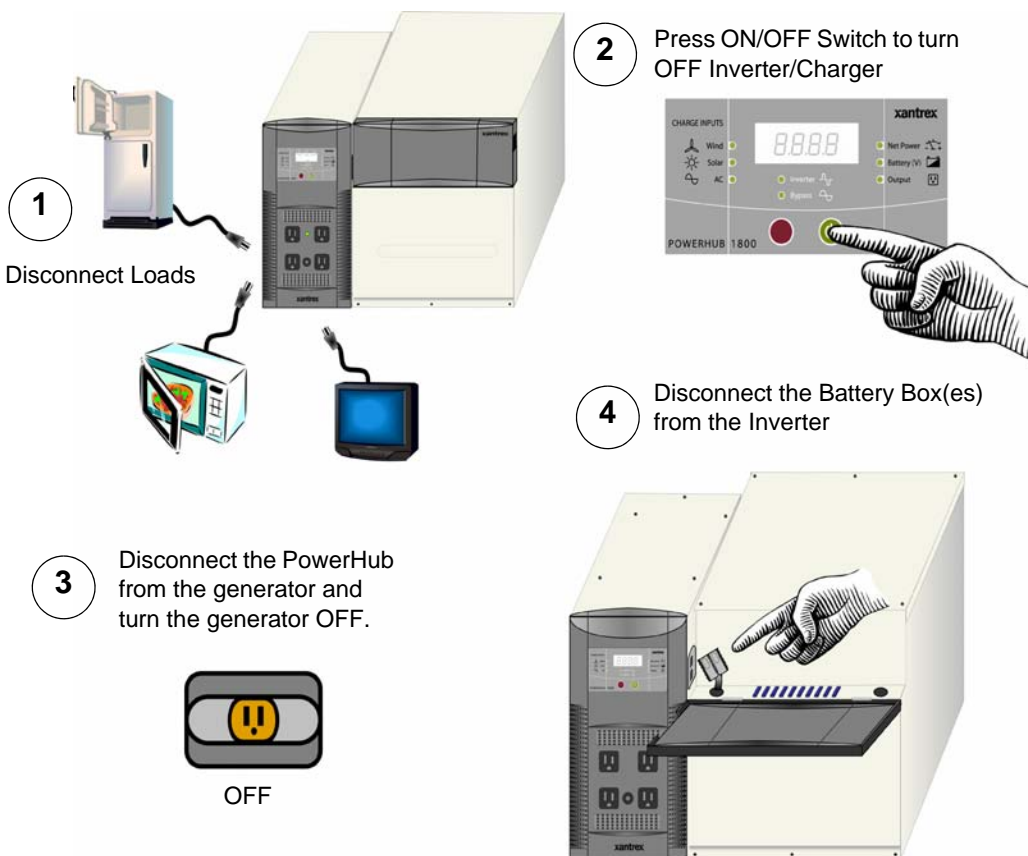


Figure ii Power Down Procedure for Softwired Installations

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



WARNING: Shock Hazard

If no DC Disconnect is used, then the DC input generators (solar or wind) will have to be physically disconnected to ensure power is OFF.

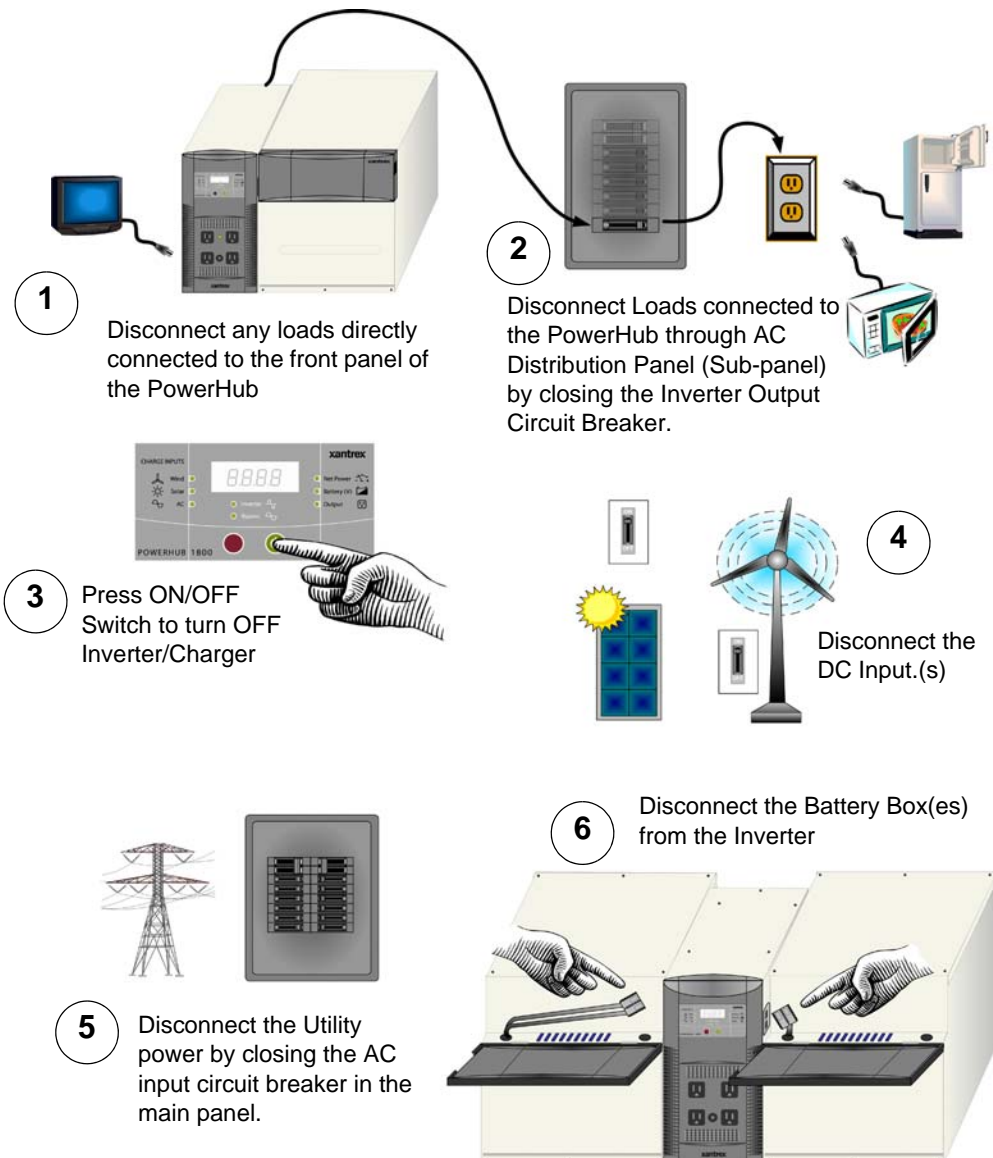


Figure iii Power Down Procedure for Hardwired Installations

Contents

Important Safety Instructions -----v

Precautions When Working With Batteries -----	vii
Precautions for Using Rechargeable Appliances -----	viii
FCC/ICES 003 Information to the User -----	viii
Shutdown Procedure -----	ix

1 Introduction

Introduction -----	1-2
Principles of Inverter Operation -----	1-2
Basic Functions of the PowerHub 1800 -----	1-3
Inverter Features -----	1-4
Battery Charger Features -----	1-5

2 Operation

Inverter Control Panel -----	2-2
User Controls and Display -----	2-3
Operating Mode LEDs -----	2-4
Status LEDs -----	2-4
Input LEDs -----	2-4
Output LEDs -----	2-5
Selecting Charger Settings -----	2-5
Basic Operation -----	2-6
Power On and Off -----	2-6
Changing the Display -----	2-7
Changing Charging Settings -----	2-9
Connecting AC Loads -----	2-10
Typical Loads that might be used with the PowerHub 1800 -----	2-12
Loads That Might Not Work Well With the PowerHub 1800 -----	2-12
Loads that should NOT be used with the PowerHub 1800 -----	2-12

3 Troubleshooting

How to Troubleshoot the PowerHub 1800 ----- 3-2

Error Codes----- 3-2

If Utility Power is NOT Available----- 3-4

If Utility Power is Available----- 3-6

Possible Problem Loads ----- 3-7

 Ceiling Fans ----- 3-7

 Cell Phones ----- 3-7

 Clocks ----- 3-7

 Dimmer Switches ----- 3-7

 Heavy Loads ----- 3-7

 Microwave Ovens ----- 3-8

 Printers ----- 3-8

 Rechargeable Devices ----- 3-8

A Specifications

Electrical Specifications -----A-2

Physical Specifications -----A-3

Battery Charger Specifications -----A-3

 Charging Profiles -----A-5

 40-amp Charging Profile -----A-5

 10-amp Charging Profile -----A-6

 0-amp Charging Profile -----A-6

Figures

Figure i	Basic Safety - - - - -	1-vi
Figure ii	Shutdown Procedure for Softwired Installations - - - - -	1-ix
Figure iii	Shutdown Procedure for Hardwired Installations - - - - -	1-x
Figure 1-1	Principals of Inverter Operation- - - - -	1-2
Figure 1-2	PowerHub 1800 Features - - - - -	1-4
Figure 1-3	Three-Stage Charging Process- - - - -	1-6
Figure 2-1	The PowerHub 1800 Inverter Control Panel - - - - -	2-2
Figure 2-2	Basic Startup Screens- - - - -	2-6
Figure 2-3	Input Displays - - - - -	2-7
Figure 2-4	Output Displays - - - - -	2-8
Figure 2-5	Input Displays - - - - -	2-9
Figure 2-6	Connecting AC Loads - - - - -	2-11
Figure 2-7	Loads That Should Never Be Used With the PowerHub 1800- - - - -	2-12
Figure A-1	Three-Stage Charging Process- - - - -	A-4

Tables

Table 3-1	Error Codes for Troubleshooting the PowerHub 1800 - - - - -	3-2
Table 3-2	Possible Problems if Utility Power is Not Available - - - - -	3-4
Table 3-3	Possible Problems if Utility Power is Available - - - - -	3-6
Table A-1	Electrical Specifications for the Inverter - - - - -	A-2
Table A-2	Electrical Specifications for the Battery Box - - - - -	A-2
Table A-3	Physical Specifications of the Inverter - - - - -	A-3
Table A-4	Physical Specifications of the Battery Box - - - - -	A-3
Table A-5	40-amp Charging Profile (Default)- - - - -	A-5
Table A-6	10-amp Charging Profile (Default)- - - - -	A-6

1

Introduction

Chapter 1 describes the operational features and functions of the PowerHub 1800. This section details how the unit functions as an inverter, provides information on the control panel, and describes operating limits for inverter operation.

For this topic...	See...
"Principles of Inverter Operation"	page 1–2
"Basic Functions of the PowerHub 1800"	page 1–3
"Inverter Features"	page 1–3
"Battery Charger Features"	page 1–5

Introduction

Thank you for your purchase of this Xantrex Home Power System. The modified sine wave AC output from the inverter ensures AC loads operating from the unit perform efficiently and correctly.

To get the most out of your PowerHub 1800, carefully read and follow the instructions in this guide. Pay special attention to the ***Important Safety Instructions*** and to the **CAUTION** and **WARNING** statements found throughout this manual and on the product. Please retain all packaging.

Should you have any questions before, during, or after the installation, please contact Xantrex Customer Support. Please see “How do you get service?” on page WA-1 in this Guide for contact information.

Principles of Inverter Operation

The PowerHub 1800 converts power from the batteries in two stages. The first stage is a DC-to-DC converter, used to raise the low voltage DC input to high voltage DC. The second stage is the actual inverter stage, taking the high voltage DC and converting it to a modified sine wave AC output.

The DC-to-DC converter stage uses modern high frequency power conversion technology that eliminates the bulky, low frequency (50/60 Hz) based transformers found in inverters using older technology. The inverter stage uses advanced power semiconductors that provide excellent overload capabilities.

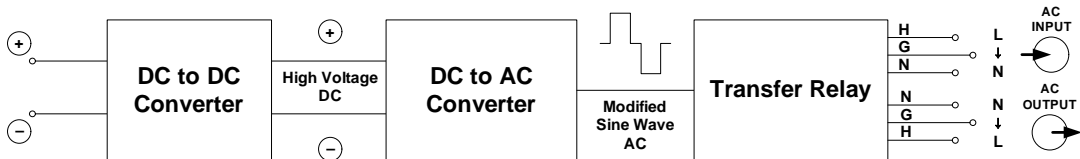


Figure 1-1 Principles of Inverter Operation

Output
Waveform

The AC output waveform of the PowerHub 1800 is a “modified sine wave”.

Basic Functions of the PowerHub 1800

Bypass Function

When AC power is available from a generator or utility grid, the PowerHub will function as an automatic backup power unit. It will sit in Bypass mode and will pass the power through to support the loads and/or the battery charger. When the AC input fails, the PowerHub's Automatic Transfer Relay de-energizes and will switch the unit to Inverter Mode within 40 milliseconds.

Once AC input is restored, after a 20-second delay the relay energizes and qualifies the AC input and the load is automatically reconnected to the primary AC source.



WARNING: Shock Hazard

If any AC power is available to the PowerHub 1800, the unit will pass through that power to any loads connected to it whether or not the unit is turned ON or OFF. Power *will be* available at the four outlets on the front of the unit as well as at any outlets hardwired to the unit through the AC distribution panel. There is a blue LED above the 15 A supplemental protector on the front of the inverter panel that will illuminate if AC power is available to the outlets.

To completely disable this feature, the PowerHub must be completely disconnected from all input sources. *Turning off the display will not eliminate this risk.*

Inverter Function

When no AC power is available from a generator or utility grid, the inverter draws power from the battery bank and delivers a modified-sine wave AC output voltage. This output voltage can be accessed by using the four outlets on the front of the unit or by hardwiring the unit to the AC Distribution Panel which provides AC power to AC outlets at the site.

Charger Function

The PowerHub 1800 uses any single source of AC power such as a generator or utility grid to keep the batteries charged and ready for use. The PowerHub 1800 can also use renewable energy sources to keep the batteries charged.

Important: Additional hardware, such as charge controllers, may be required for installations using renewable energy sources. Installations using renewable energy input must be hardwired into the installation for code-compliance.

Operational Voltage Range

As long as the battery voltage is within 11.0 Vdc to 15.0 Vdc, the inverter will continue to deliver AC power to the loads connected to it.

When the battery voltage falls below 11.0 Vdc or rises above 15.0 Vdc, the PowerHub 1800 High or Low Battery Protection will engage and shut the inverter off, stopping all output voltage to the loads.

Inverter Features

User Features

The inverter consists of the following user features.

- The Inverter Control Panel provides a user interface for monitoring power levels, battery levels, and controlling the inverter functions and displays.
- Four 120 Vac outlets on the front panel provide up to 1440 W (continuous) output power.
- One 15 A supplemental protector provides over-load protection to the four AC outlets on the front panel.
- One AC Indicator LED. This LED will illuminate whenever AC power is available, whether or not the unit is ON or OFF. See page 2–4 for additional information about this LED.



WARNING: Shock Hazard

The 15 A circuit breaker on the front panel is only connected to the four outlets on the front of the panel and only disconnects power to these outlets when activated. It does not disable output through the output terminals used for hardwiring. Therefore, power can still be available to loads connected through a hardwired installation.

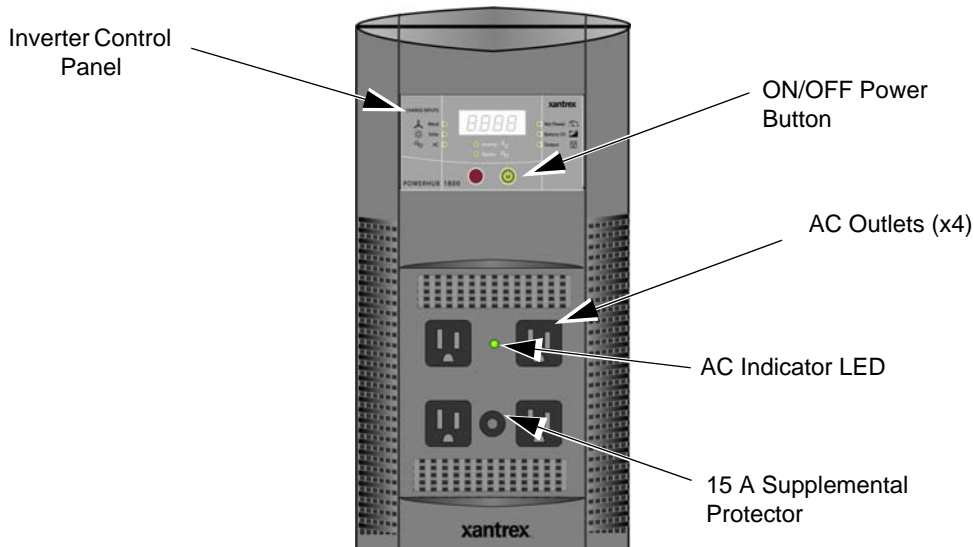


Figure 1-2 PowerHub 1800 Features

Battery Charger Features

Charging Settings	<p>The Battery Charger in the PowerHub 1800 has three pre-set charging profiles.</p> <ul style="list-style-type: none"> • 40 A Profile (Default Setting). With the 40-amp Charging Profile, the maximum bypass power for AC output to loads is approximately 600 W (4 A) with a 15 A input breaker. Use this mode to minimize battery charging time. • 10 A Profile. With the 10-amp Charging Profile, the maximum bypass power for AC output to loads is approximately 1400 W (12 A) with a 15 A input breaker. Use this mode when other DC charging sources are available, or if there is a high demand on AC output with battery charging a low priority. • 0 A 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. <p>See “Battery Charger Specifications” on page A–3 for details on the specific profile parameters.</p>
Charging Process	<p>The Battery Charger uses a three-stage charging process to maintain the battery (or batteries) in operational condition. This process is illustrated in Figure 1-3, “Three-Stage Charging Process” on page 1–6.</p>
Bulk Stage	<p>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.</p>
Absorption Stage	<p>In the Absorption Stage, the constant voltage mode is limited to 14.2 Vdc. The current will drop as the batteries charge. Upon dropping to 4 A, the unit will transition to the Float charge. This stage will not exceed 4 hours maximum.</p>
Float Stage	<p>In the Float stage, the constant voltage mode limited to 13.7 Vdc. An 8-hour timer is started at this point.</p> <p>If during this time the current rises to 6 A, the unit transitions back to the Bulk Stage and starts over.</p> <p>If during this stage, the unit stays at 4 A or less, it will transition to Standby Mode.</p>

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.

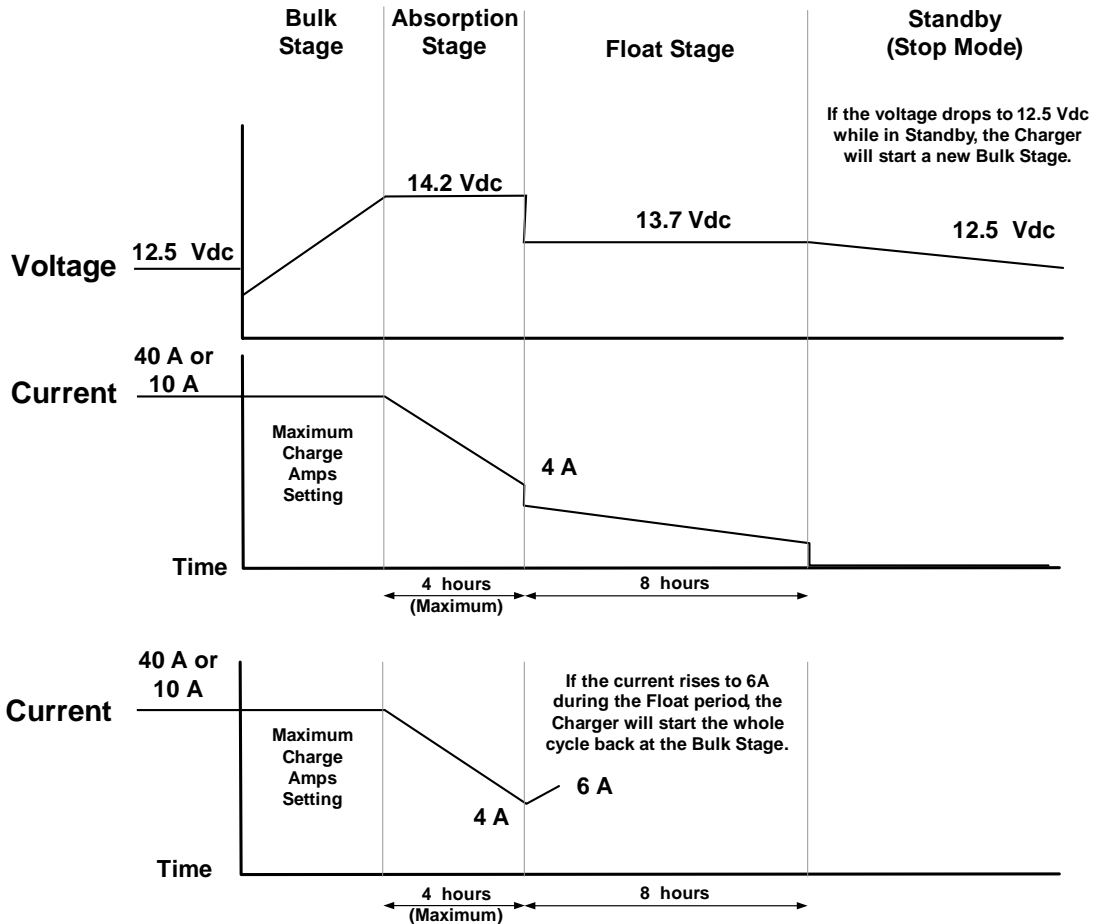


Figure 1-3 Three-Stage Charging Process

The PowerHub 1800 will reset to the default setting of 40 A whenever one of the following occurs.

1. The unit is turned OFF by the ON/OFF Button.
2. All DC input sources (solar panels or wind generators) are removed and utility AC is not available.

2

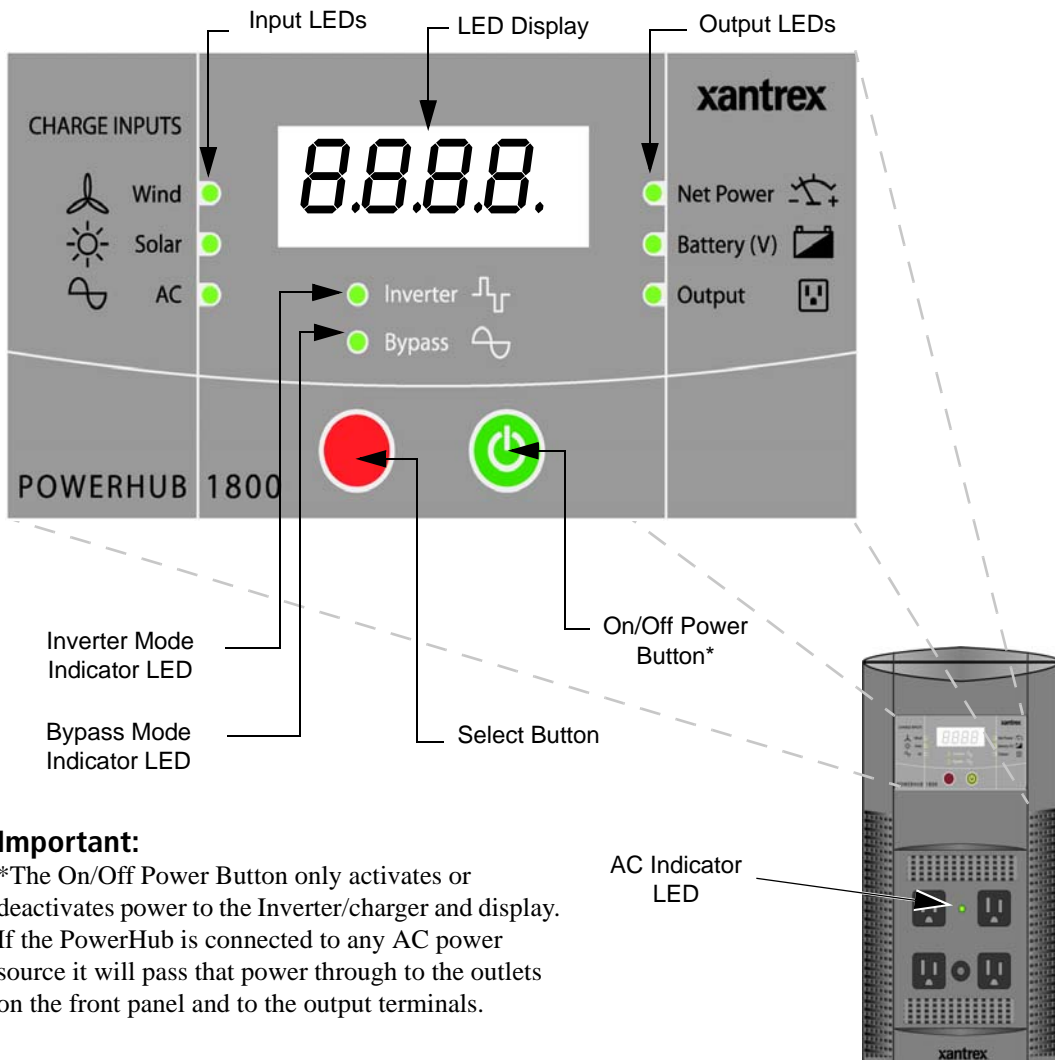
Operation

Chapter 2 contains information on operating the PowerHub 1800.

For this topic...	See...
“Inverter Control Panel”	page 2–2
“User Controls and Display”	page 2–3
“Selecting Charger Settings”	page 2–5
“Basic Operation”	page 2–6
“Power On and Off”	page 2–6
“Changing the Display”	page 2–7
“Changing Charging Settings”	page 2–9
“Connecting AC Loads”	page 2–10
“Typical Loads that might be used with the PowerHub 1800”	page 2–12
“Loads That Might Not Work Well With the PowerHub 1800”	page 2–12
“Loads that should NOT be used with the PowerHub 1800”	page 2–12

Inverter Control Panel

The Inverter Control Panel has nine LEDs; six Status LEDs (three for input/charge levels and three for output power levels), two Mode Indication LEDs, one AC Indicator LED. Two push buttons provide ON/OFF control and Display Select features. An LED Display communicates input and output power levels, battery voltage, and error codes.



Important:

*The On/Off Power Button only activates or deactivates power to the Inverter/charger and display. If the PowerHub is connected to any AC power source it will pass that power through to the outlets on the front panel and to the output terminals.

Figure 2-1 The PowerHub 1800 Inverter Control Panel

User Controls and Display

The following provides a detailed description of the user controls and LED display function. For operating instructions, see “Basic Operation” on page 2–6.

On/Off Power Button (Green) To turn the power ON or OFF, press and hold the green ON/OFF Power Button for approximately 1 second.



WARNING: Shock Hazard

The ON/OFF Button controls the output of the inverter/charger and the displays only. It does not control or turn off the AC output in Bypass Mode. Therefore, if any power is available to the unit, the unit will function in Bypass Mode and power will be available at all outlets or output terminals even if the PowerHub is turned OFF. The blue AC Indicator LED between the top two AC outlets on the front panel will illuminate if AC power is available at any of the outlets.

LED Display The LED Display consists of a 4-digit numerical display (e.g., **8888**). (Note: 1.0 kW = 1000 watts)

- Negative numbers (e.g., **-1.00**) represent Output Power in kilowatts (kW). This number represents the power being removed from the batteries to power the loads. This can only occur when displaying Net Power using the Select button while in Inverter Mode.
- Positive numbers (e.g., **0.56**) represent Input Power in kilowatts. This number represents the power being used to charge the batteries and power the loads.
- Battery Level information is displayed in volts DC. The Battery Level LED will illuminate when this value is being displayed. (e.g., **12.8**)
- AC charger information is displayed in kilowatts. This value indicates the amount of power available to charge the batteries. The AC LED will illuminate when this value is being displayed. This value indicates the amount of power being used to charge the batteries.

The Display by default will display the Net Power value.

Fault Condition Display If a fault occurs, the error code will immediately be displayed as a flashing, 3-digit alpha/numeric code (e.g., **E01**). An audible beep will sound to draw attention to the fault condition.

For a complete list of Error Codes, see Chapter 3, “How to Troubleshoot the PowerHub 1800”).

Operation

AC Indicator LED The AC Indicator LED indicates that AC power is available at all outputs. If AC power is available, this LED will illuminate whether or not the PowerHub 1800 inverter is turned on or not.

Operating Mode LEDs

Bypass LED When AC power source is available, the PowerHub 1800 will pass the power through to the loads and will also keep the battery bank charged and usable. The Bypass LED will illuminate when the unit is in this mode.



WARNING: Shock Hazard

The ON/OFF Button controls the output of the *inverter only*. It does not control or turn off the AC output in Bypass Mode. Therefore, if any power is available to the unit, the unit will function in Bypass Mode and power will be available at all outlet or output terminals even if the PowerHub is turned OFF. The blue AC Indicator LED between the top two AC outlets on the front panel will illuminate if power is available at any of the outlets or output terminals.

On initial power up or if transferring from Inverter Mode back to Bypass Mode, the PowerHub takes approximately 20 seconds to identify if an AC source is available and stable. If the AC source is within the acceptable voltage range, the PowerHub will automatically enter Bypass Mode. During this time, the Bypass Mode LED will flash and power will still be provided by the inverter. When the AC source has been qualified, the Bypass Mode LED will stop flashing and illuminates solid and the loads will be powered by the AC source.

Inverter LED If the ON/OFF Power Button has been pressed to turn on the inverter, when the AC source fails, the PowerHub 1800 automatically switches to Inverter Mode within 40 milliseconds. When in Inverter mode, the inverter is using the power stored in the battery bank to provide power to the loads and the Inverter LED will illuminate.

Status LEDs

Input LEDs

Select Button (Red) Pressing the red Select Button cycles the output on the display through the available Input/Output power levels.

If the Select button is not pushed within 10 seconds, the display will automatically return to the Net Power value.

Wind LED When the Select Button is pressed until the Wind LED is illuminated, the Wind Input wattage levels are displayed in kilowatts. These values are the inputs on the 80 A DC input terminals.

Solar LED	When the Select Button is pressed again within 10 seconds and the Solar LED is illuminated, the Solar Input wattage levels are displayed in kilowatts. These values are the inputs on the 32 A DC input terminals.
AC LED	If the unit is in Bypass Mode, when the Select Button is pressed again within 10 seconds and the AC LED is illuminated, the battery charger power level is displayed in kilowatts.

Output LEDs

Net Power LED	<p>By default the Net Power LED represents the difference between the input and the output power levels. This value is shown on startup and will return to this display if the Select button is not pressed for 10 seconds.</p> <p>When using the Select Button to cycle through the displays and the Net Power LED is illuminated, the power level displayed will depend on whether the unit is in Bypass Mode or Inverter Mode.</p> <p>In Bypass Mode, the value displayed represents the power, in kilowatts, that is available to charge the battery and to power the loads. This will be a positive number.</p> <p>In Inverter Mode, this value displayed represents the total amount of power in kilowatts that is being drawn from the battery bank (negative numbers) or is available to charge the battery by the DC source while the inverter is running (positive numbers).</p>
Battery LED	When the Select Button is pressed again within 10 seconds and the Battery Level LED is illuminated, the battery voltage level is displayed in DC volts. It will also show “FUL” when the battery is charged through the AC charger and reaches float and standby mode.
Output LED	When the Select Button is pressed again within 10 seconds and the Inverter LED is illuminated, the Inverter Output power is displayed in kilowatts. This only displays if the unit is in Invert Mode.

Selecting Charger Settings

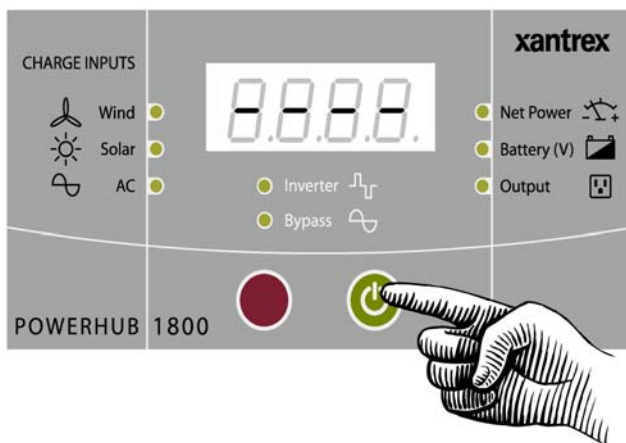
Charger Settings	<p>Pressing and holding the Select Button for 3-5 seconds will change the display to show the AC charger current setting and the AC LED will flash.</p> <p>See “Battery Charger Features” on page 1–5 for more information regarding setting parameters. See “Changing Charging Settings” on page 2–9 for instructions on changing this setting.</p>
------------------	--

Basic Operation

The following figures show what the Inverter Control Panel will look like when the user controls are used.

Important: The values shown in the displays of the following illustrations are examples only. Actual values may vary based on what is connected to the unit.

Power On and Off



To turn the power to the PowerHub ON or OFF:

- ◆ Press and hold the green ON/OFF Power Button for approximately 1 second.

If any input power is available, the Inverter Control panel will display as shown below. The value shown on the display defaults to indicate Net Power.
 $\text{Net Power} = \text{Input} - \text{Output}$



Default Screen Example
 Example indicates 540 watts.

If no input power is available and no loads are connected to the unit, the Inverter Control panel will display as shown below.

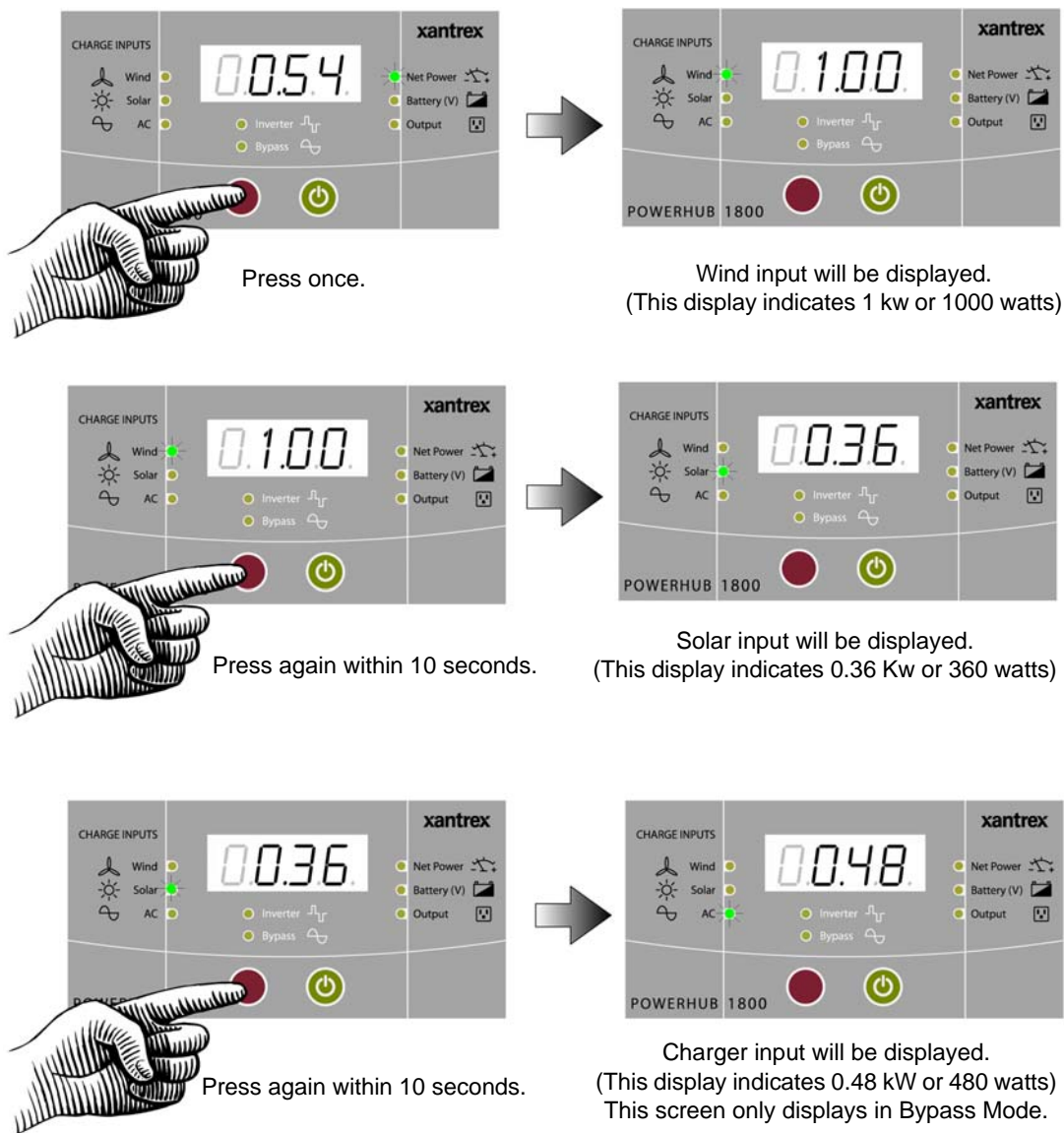


Default Screen Example

Figure 2-2 Basic Startup Screens

Changing the Display

Press the red Select button to cycle the display through the input and output power values.



Continued in Figure 2-4...

Figure 2-3 Input Displays

Continued from Figure 2-3...

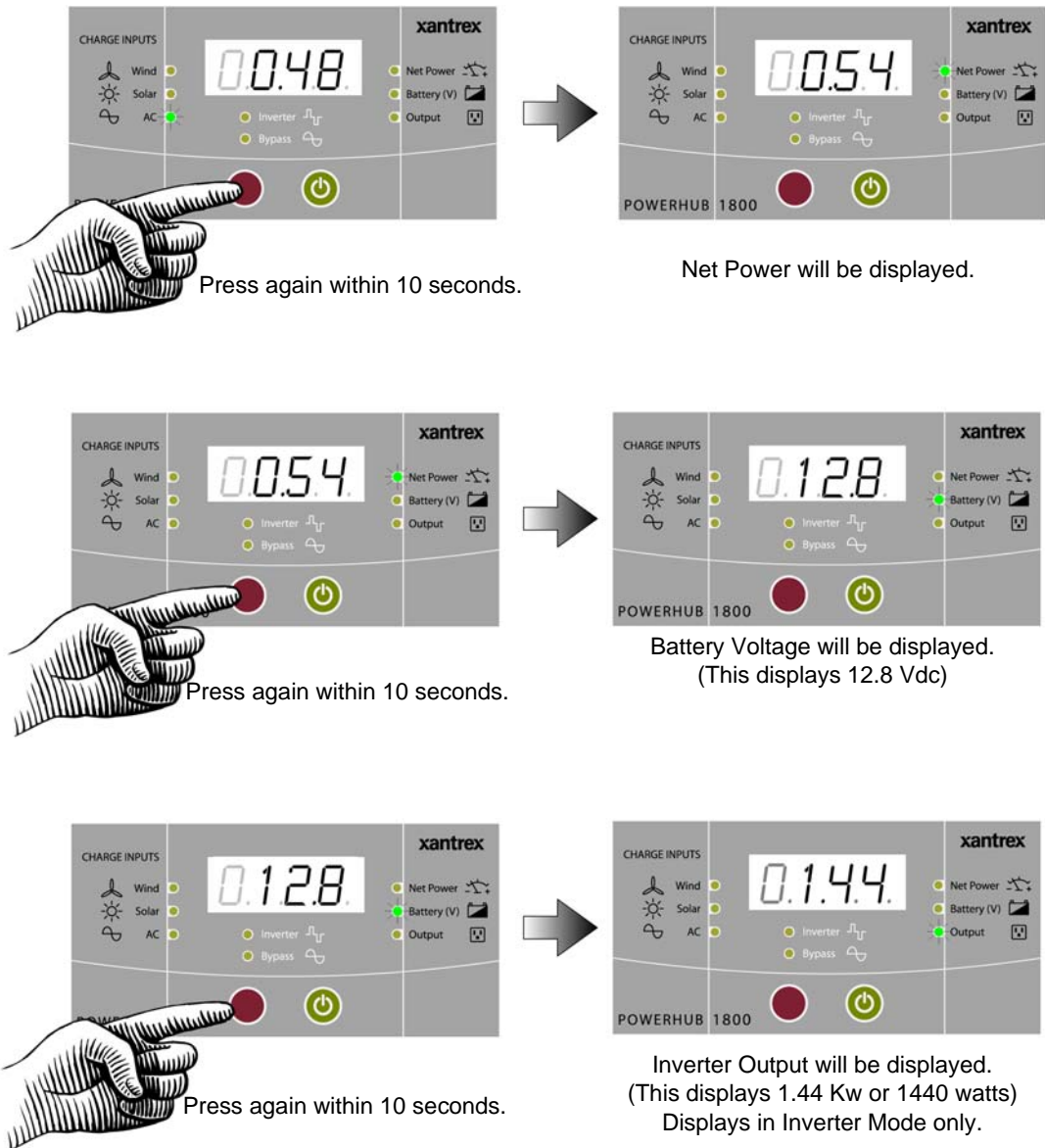


Figure 2-4 Output Displays

Changing Charging Settings

Default Setting	The PowerHub 1800 is set at the factory to default to the 40 A Charging Profile. In the event that one of the other profiles are required, follow the instructions below to change the setting.
Setting the Selection	To set the selection to the desired profile, stop pressing the Select Button when the desired profile is displayed. The unit will set the profile shown in the display, then will return to the default screen within 10 seconds.
Returns to Default	The charging setting will revert to the 40 A default setting whenever the ON/OFF Button is pressed or all DC input sources are removed and utility AC is not available.

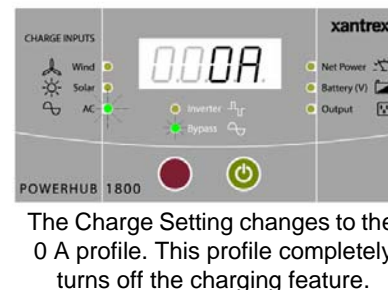
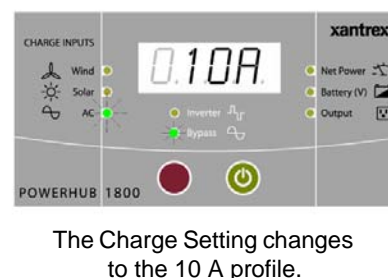
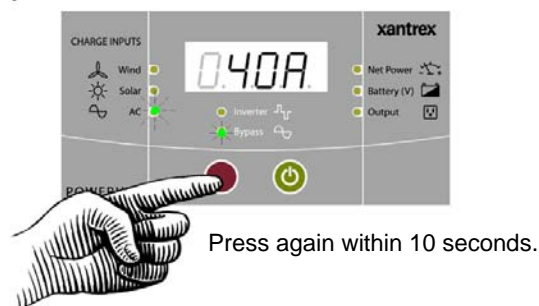
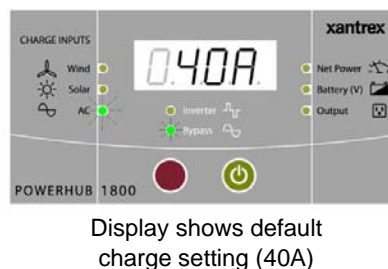
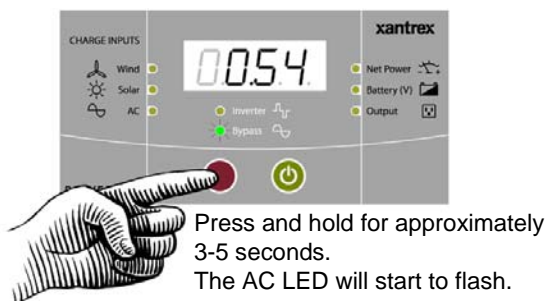


Figure 2-5 Input Displays

If the AC Charger goes into an over temperature shutdown condition, the 40 A setting will automatically change to 10 A to reduce the charging current. The charging current will change back to 40 A when the unit cools to an acceptable temperature.

Important:

When Charger is set to 40 A or 10 A, Battery Level will flash between battery voltage and 'FUL' when it reaches Float or Off Mode otherwise it shows measured battery voltage.

When AC Charger is set to 0 A, Battery Level shows measured battery voltage.

Connecting AC Loads



CAUTION: Equipment Damage

Never insert the AC input cord into the AC outlets on the front of the PowerHub 1800 when the batteries are connected. This can damage the unit and will void the warranty.

Continuous AC loads of 1440 watts (12 A) can be connected and run from the PowerHub 1800 through the four AC outlets on the front panel.

Important: Know your loads. Use the formula below to help determine the watts of the load if only amp ratings are provided with the appliance.

$$\text{Volts} \times \text{Amps} = \text{Watts}$$

Maximum watts available for continuous use on the PowerHub 1800 = 1440 W

Maximum amperage available for AC loads is 12 A.

$$120 \text{ V} \times 12 \text{ A} = 1440 \text{ W}$$

In case of an
Overload
Shutdown....

Exceeding 1800 watts will cause the unit to display an overload error code and the unit will shut down.

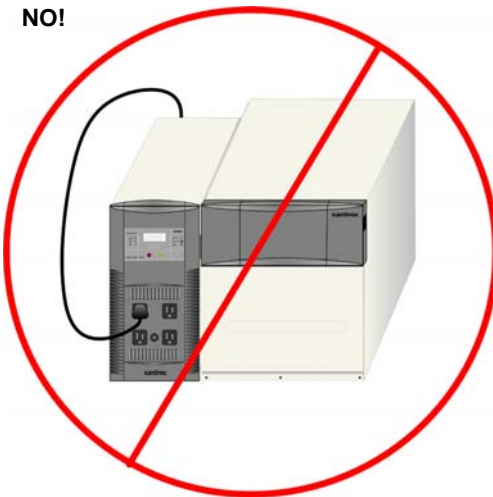
In the event of an overload shutdown, remove the loads that are connected to the PowerHub and turn the power OFF, then back ON.

If the unit is hardwired to a sub-panel, it will also be necessary to check the circuit breaker in the sub-panel.

In the event of an overload shutdown, if charge settings had been changed to 10 A or 0 A prior to the shutdown, the charging parameters will have to be reset. Otherwise, the unit will default back to the 40 A profile.



NO!



NO!

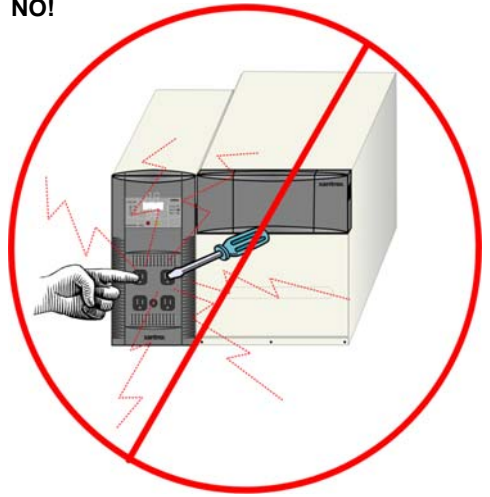


Figure 2-6 Connecting AC Loads



WARNING: Shock Hazard

Do not insert objects *not intended for use with an electric appliance* into the AC power outlets on the PowerHub (e.g., fingers, tools, jewelry). Not intended for use by small children,

Typical Loads that might be used with the PowerHub 1800

The following types of appliances can be used with the PowerHub 1800 providing.

- ☐ Sump pumps
- ☐ Microwaves
- ☐ Refrigerators
- ☐ Freezers
- ☐ Lighting
- ☐ Television or Audio Equipment
- ☐ Most power tools

Loads That Might Not Work Well With the PowerHub 1800

The following types of appliances might not work as expected with the PowerHub 1800. See “Possible Problem Loads” on page 3–7 for additional information.

- ☐ Some pellet stoves that have an auger for pellet feeding
- ☐ Some electronic furnace controls
- ☐ Some rechargeable devices
- ☐ Variable speed fans or lights with dimmer switches

Loads that should NOT be used with the PowerHub 1800

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



Figure 2-7 Loads That Should Never Be Used With the PowerHub 1800

3

Troubleshooting

Chapter 3 explains how to troubleshoot the PowerHub 1800 and describes the error codes that may be displayed on the LCD.

For this topic...	See...
"How to Troubleshoot the PowerHub 1800"	page 3-2
"Error Codes"	page 3-2
"If Utility Power is NOT Available"	page 3-4
"If Utility Power is Available"	page 3-6
"Possible Problem Loads"	page 3-7

How to Troubleshoot the PowerHub 1800

Important: If the unit is not performing as expected, BEFORE returning the unit to the retailer, please review this information carefully.

The following information is provided to assist in the troubleshooting of the PowerHub 1800. Please review this information carefully.

- Check First....

Check the following tables for information specific to your unit.

Table 3-1 provides information on the Error Codes that may be seen on the Display. Table 3-2 describes possible issues that may arise when utility power is NOT available. Table 3-3 describes possible issues that may arise when utility power is available.
- Check Next....

Visit www.xantrex.com/support.asp and check the FAQs (Frequently Asked Questions) for your product. Many additional questions are addressed at this website.
- Finally....

If the FAQs don't address the problem you're experiencing, then see "Warranty" on page WA-1 for contact information for Xantrex Customer Service. Contact a Xantrex Customer Support representative for assistance.

Error Codes

The following error codes may be displayed on the LED display if the described fault conditions occur.

Table 3-1 Error Codes for Troubleshooting the PowerHub 1800

Error Code Displayed on LCD	Description of Error	Description of Condition	Resolution
E01	DC Input Under Voltage Shutdown	Unit shuts down. The input voltage has dropped to below the operation voltage limit of 11.0 to 10.5 V. An alarm continues to beep once every second until input/output voltage drops to 10.3 V. The alarm will continue to beep once every 30 seconds until battery voltage reaches 10.0 V . If the battery reaches 10.0 V, the display turns OFF and the unit powers down completely.	The unit will automatically reset once the fault condition is removed. If this condition is not corrected and the unit powers down completely, it will be necessary to press the ON/OFF Button to turn the unit ON again.

Table 3-1 Error Codes for Troubleshooting the PowerHub 1800

Error Code Displayed on LCD	Description of Error	Description of Condition	Resolution
E02	DC Input Over Voltage Shutdown	Unit shutdown due to input voltage provided is above 15 Vdc. The alarm will continue to beep once every second.	The unit will automatically reset once the fault condition is removed.
E03	AC Output Overload Shutdown	Unit shutdown due to AC load applied to the system on inverter mode is above operation limit.	Reset of unit is required. To reset the unit, turn it OFF and back ON.
E04	System Over Temperature Shutdown	Unit shutdown due to system internal temperature is above operation limit. The alarm will continue to beep once every second.	The unit will automatically reset once the unit cools down and reaches a safe operating temperature.
E05	DC Input Under Voltage Alarm	System is still operating but input voltage has dropped too close to the shutdown limit (11.0 to 10.5 Vdc). Alarm will beep once every two seconds until the warning condition is removed.	Unit continues to run. If the warning is ignored, the unit will eventually go to the E01 fault condition.
E06	AC Output Overload Warning	System is still operating but AC load applied to the system on inverter mode is close to shutdown limit. Alarm will beep once every two seconds until the warning condition is removed.	Unit continues to run. If the warning is ignored, the unit will eventually go to the E03 fault condition.
E07	System Over Temperature Warning	System is still operating but system internal temperature is close to shutdown limit. Alarm will beep once every two seconds until the warning condition is removed.	Unit continues to run. If the warning is ignored, unit will eventually go to the E04 fault condition.

If Utility Power is NOT Available

The following fault conditions may arise when utility power is not available.

Table 3-2 Possible Problems if Utility Power is Not Available

Problem	Probable Cause	Solution
Low output voltage. (96 Vac to 104 Vac)	Voltmeter used cannot accurately read the RMS voltage of a modified sine wave.	Use a true RMS voltmeter.
Display is OFF, AC is not available on both hardwired and units AC sockets.	<p>The unit is OFF.</p> <p>The inverter has no output.</p> <p>The unit might have been connected with reverse DC input polarity.</p>	<p>Turn the unit ON.</p> <ul style="list-style-type: none"> •Check battery box connection. •Check battery box fuses. •Check wind or solar connections. •Check battery box fuses (all 10 of them) and check battery polarity. •Correct the cabling if connected improperly. •Replace the fuses in the battery box. <p>If the unit still does not start, it may be damaged. Damage caused by reverse polarity is not covered by the warranty.</p>
AC is available but alarm beeps.	<p>Low Voltage Warning (error code E05)</p> <p>Over Load Warning (error code E06)</p> <p>Over Temperature Warning (error code E07)</p>	<p>Charge battery immediately or unit will be under voltage shutdown shortly.</p> <p>Load applied to unit is close to overload shutdown, reduce the load immediately or overload or over temp may occur shortly.</p> <p>Check unit ventilation and reduce the load applied to the unit or unit will run into over temperature shutdown shortly.</p>
Display is ON, AC is available on hardwire but not on unit AC socket	15 A supplementary protector has tripped.	Press reset button on the front panel to reset the protector.

Table 3-2 Possible Problems if Utility Power is Not Available

Problem	Probable Cause	Solution
Display is ON, AC is not available on both hardwired and unit AC socket.	Low input voltage (error code E01)	Recharge the battery; check the connections and cable.
	High input voltage (error code E02)	Make sure the unit is connected to a 12 V battery. Check battery is not overcharged.
	Unit is overload protected (error code E03)	Reduce the amount of loads connected to the unit or the start up surge on the load exceed surge limit of the unit.
	Unit is thermal protected (error code E04)	Allow the unit to cool off. Reduce the load if continuous operation is required. Improve ventilation. Make sure the inverter's ventilation openings are not obstructed. Reduce the ambient temperature.
Digital display or LED is flickering especially in a dark environment.	Display is normal	N/A
Inadequate run time.	Battery is not fully charged.	Charge the battery by leaving the charger backup power system plugged into a wall outlet at least 20 hours.
	Battery has aged past its warranted shelf life, the available run time decreases.	Replace battery. The internal battery also ages prematurely if the system is installed in a hot environment.
Products connected to unit malfunction or overheat.	Products connected to backup power system do not accept modified sine wave form.	Your application is not compatible with backup power system modified sine wave output. See “Rechargeable Devices” on page 3–8.

If Utility Power is Available

The following fault conditions may arise when utility power is available.

Table 3-3 Possible Problems if Utility Power is Available

Problem	Probable Cause	Solution
Display is OFF, AC is available on both hardwire and unit AC socket	Inverter is turned OFF.	AC output is always available when AC input is available. Under this condition, the inverter will not back up the power when utility power is OFF.
Display is OFF, AC is not available on both hardwire and unit AC socket	Main AC Panel or AC generator input is beyond the operating range of the unit (103 to 132 Vac).	Check utility or generator output voltage.
Display is ON, AC is not available on both hardwire and unit AC socket	The 15A input circuit breaker on the Main AC Panel or AC generator is tripped or turned OFF. The 15 A circuit breaker on AC Distribution Panel and 15 A supplementary protector near the four AC outlets on the front panel have tripped.	Reset the 15 A input circuit breaker. Reset the 15A supplemental protector near the four AC outlets on the front panel and reset the 15A circuit breaker on the AC Distribution Panel
Display is ON, AC is available on hardwire output but not on unit AC socket	15 A supplementary protector on the front panel has tripped.	Press the reset button to reset the circuit breaker.
Bypass LED is flashing	This is normal.	During the first 20 seconds of transfer from inverter to Bypass Mode, the inverter continuous to run and the Bypass LED flashes. This provides time for the utility to get steady before it switches over. During the 20 seconds delay time, the display feature is frozen.

Possible Problem Loads

The inverter can drive most loads, however, there are special conditions that can cause a load to behave differently than expected. The following describes some of the common problems encountered when using an inverter.



WARNING: Fire Hazard

Transformerless Battery Chargers are not to be used with any model of the PowerHub 1800 family. Connecting a transformerless battery charger could result in an overheating condition and possibly a fire.

Ceiling Fans

Most large diameter, slow turning fans run correctly, but generate more noise than when connected to utility power. High speed fans tend to operate normally.

Cell Phones

Some cellular telephones experience interference in the form of a clicking sound.

Clocks

The inverter keeps the frequency accurate to within a few seconds a day; however, external loads in the system may alter the inverter's output waveform causing clocks to run at different speeds. There may be periods where clocks keep time and then mysteriously do not.

Dimmer Switches

Most dimmer switches lose their ability to dim the lights when used with an inverter and operate only in the fully ON or OFF position. Newer, microprocessor controlled dimmers tend to work better in inverter applications.

Heavy Loads

If the battery bank cannot deliver the necessary amperage to drive a heavy load, the inverter will shut OFF. The battery voltage will then slowly rise back above the low voltage threshold causing the inverter to resume operation. As soon as the heavy load draws the batteries down, the cycle will continue unless the load is reduced or an additional source of power is added.

Microwave Ovens

Microwave ovens are sensitive to peak output voltages. The higher the voltage, the faster they cook. Since the inverter's peak output voltage is dependent upon battery voltage and load size, the microwave's cook time may need to be increased.

Printers

Most inkjet type printers work well in inverter applications. Laser printers, however, require high current for their fusing circuit and are not recommended for use with an inverter.

Rechargeable Devices



CAUTION: 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.

When first using a rechargeable device, monitor its temperature for 10 minutes to ensure it does not become abnormally hot. Excessive heat will indicate that it is incompatible with the inverter.

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.

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	<ul style="list-style-type: none">• 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.

Table A-2 Electrical Specifications for the Battery Box

Parameter	PowerHub 1800 Inverter
Protection	Ten 20 A/32 Vdc Fuses for short circuit and reverse polarity conditions.

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	PowerHub 1800
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)

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 this time the current rises to 6 A, the unit transitions back to the Bulk Stage and starts over.

If during this stage, the unit stays at 4 A or less, 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.

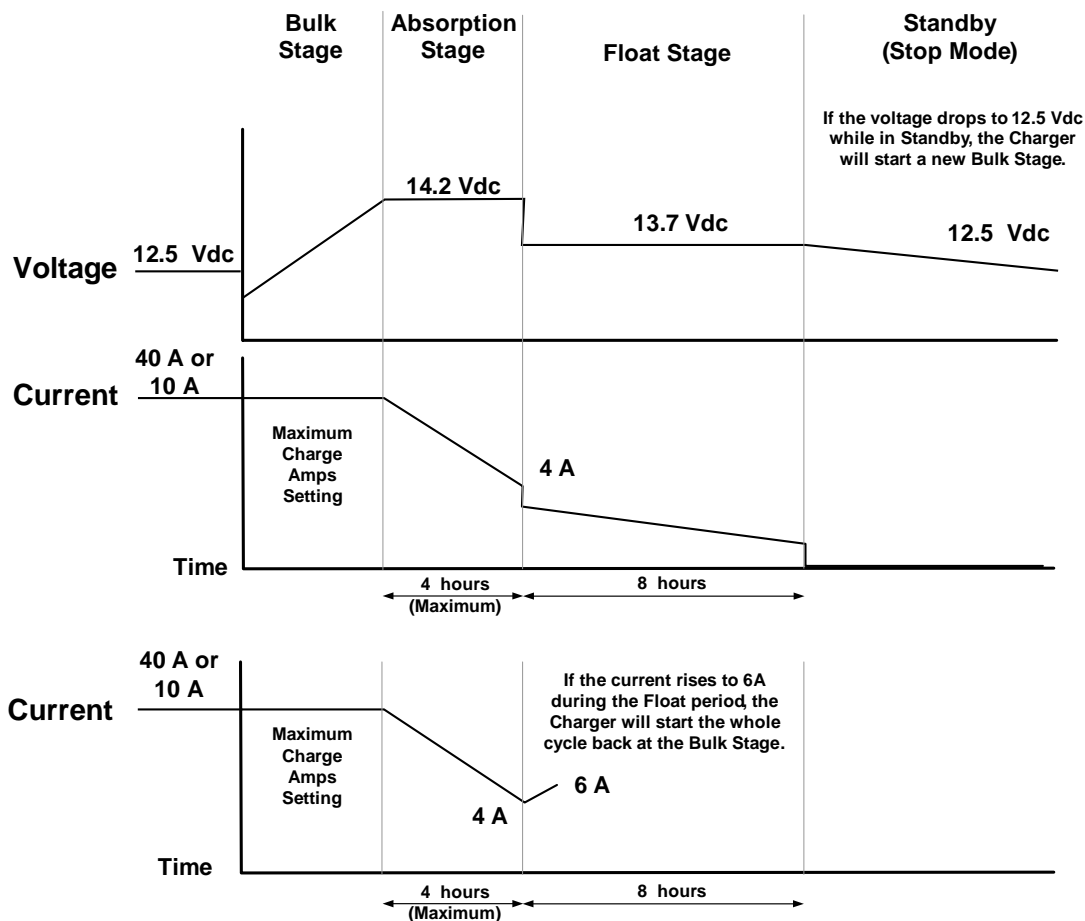


Figure A-1 Three-Stage Charging Process

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 (Default)

Parameter Name	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 (Default)

Parameter Name	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.

Index

A

- AC LED 2–5
- AC Loads 2–10
- appliances
 - battery-operated viii, 8

B

- batteries
 - first aid when working with vii
 - precautions when working with vii
 - rechargeable viii, 8
- battery chargers
 - for rechargeable batteries viii, 8
- Battery LED 2–5
- Bypass LED 2–4

C

- Ceiling Fans 3–7
- Cell Phones 3–7
- Changing Charging Settings 2–9
- Clocks 3–7
- Customer Service
 - preparing to call WA–5

D

- Dimmer Switches 3–7

E

- Error Codes 3–2

F

- Fault Condition Display 2–3
- FCC information to the user 1–viii
- first aid viii

H

- Heavy Loads 3–7

I

- Information about Your System form WA–5
- inverter
 - purchase date WA–5
 - serial number WA–5
- Inverter LED 2–4

L

- LED Display 2–3

M

- Microwave Ovens 3–8

N

- Net Power LED 2–5

O

- On/Off Power Button 2–3
- Operating Mode LEDs 2–4

P

- peak output voltage 3–8
- Power On and Off 2–6
- power tools, battery-operated viii, 8
- Printers 3–8
- Problem Loads 3–7
- proof of purchase WA–5
- purchase date WA–5

R

- Rechargeable Devices 3–8

S

safety instructions vii
Select Button 2–4
serial number WA–5
Solar LED 2–5

W

warranty
 out of warranty service WA–4
 terms and conditions WA–1
Wind LED 2–4

X

Xantrex
 web site iv

Warranty and Return Information

Warranty

What does this warranty cover? This Limited Warranty is provided by Xantrex Technology Inc. ("Xantrex") and covers defects in workmanship and materials in your PowerHub 1800. This warranty period lasts for one year from the date of purchase at the point of sale to you, the original end user customer. You will be required to demonstrate proof of purchase to make warranty claims.

This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners are also required to provide original proof of purchase to make a warranty claim.

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

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

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

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

Telephone: 1 800 670 0707 (toll free North America) Xantrex Customer Support
1 360 925 5097 (direct)
Fax: 1 800 994 7828 (toll free North America)
1 360 925 5143 (direct)
Email: customerservice@xantrex.com

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

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

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

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

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

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

Disclaimer

Product

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

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Exclusions

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

Return Material Authorization Policy

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

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

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

Record these details in "Information About Your System" on page WA-5.

Return Procedure

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

If you are returning a product from outside of the USA or Canada In addition to the above, you MUST include return freight funds and are fully responsible for all documents, duties, tariffs, and deposits.

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

Out of Warranty Service

If the warranty period for your PowerHub 1800 has expired, if the unit was damaged by misuse or incorrect installation, if other conditions of the warranty have not been met, or if no dated proof of purchase is available, your unit may be serviced or replaced for a flat fee.

To return your PowerHub 1800 for out of warranty service, contact Xantrex Customer Service for a Return Material Authorization (RMA) number and follow the other steps outlined in “Return Procedure” on page WA-3.

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

Information About Your System

As soon as you open your PowerHub 1800 package, record the following information and be sure to keep your proof of purchase.

- ☐ Serial Number _____
- ☐ Product Number PH1800
- ☐ Purchased From _____
- ☐ Purchase Date _____

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

- ☐ Type of installation (e.g. wind, solar, ac grid etc.) _____
- ☐ Length of time inverter has been installed _____
- ☐ Battery/battery bank size _____
- ☐ Battery type (e.g. sealed gel cell, sealed AGM) _____
- ☐ AC and DC wiring sizes and lengths _____
- ☐ Alarm sounding? _____
- ☐ Description of indicators on front panel _____
- ☐ Appliances operating when problem occurred _____
- ☐ Description of problem _____

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