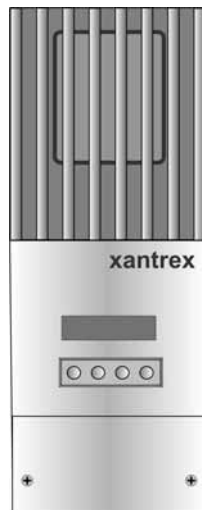


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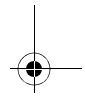
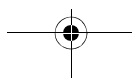
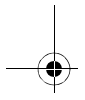
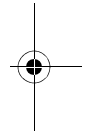
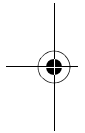
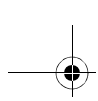
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**Owner's Manual**

**Solar Charge  
Controller**

DRAFT

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# Solar Charge Controller

## Owner's Guide

## About Xantrex

Xantrex Technology Inc. is a world-leading supplier of advanced power electronics and controls with products from 50 watt mobile units to 1 MW utility-scale systems for wind, solar, batteries, fuel cells, microturbines, and backup power applications in both grid-connected and stand-alone systems. Xantrex products include inverters, battery chargers, programmable power supplies, and variable speed drives that convert, supply, control, clean, and distribute electrical power.

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# About This Guide

## Purpose

The purpose of this Guide is to provide explanations and procedures for installing, configuring, operating, maintaining, and troubleshooting the Solar Charge Controller.

## Scope

This Guide provides safety guidelines, detailed planning and setup information, procedures for installing the unit, as well as information about operating and troubleshooting the unit. It does not provide details about particular brands of photovoltaic (PV) panels. You need to consult individual PV manufacturers for this information.

## Audience

This Guide does not provide sufficient information for anyone but a qualified installer to install this product. Installers should be electricians or technicians fully educated on the hazards of installing electrical equipment. The monitoring and operation information in this manual is intended for anyone who needs to operate the Solar Charge Controller.

## Organization

This Guide is organized into five chapters and three appendices.

Chapter 1 describes features and functions of the Solar Charge Controller.

Chapter 2 contains information and procedures to install the Solar Charge Controller.

## About This Guide

Chapter 3 contains information and procedures to configure the Solar Charge Controller.

Chapter 4 contains information about the operation of the Solar Charge Controller.

Chapter 5 contains information about identifying and resolving possible problems with systems using a Solar Charge Controller.

Appendix A provides the specifications for the Solar Charge Controller.

## Conventions Used

The following conventions are used in this guide.



### WARNING

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



### CAUTION

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

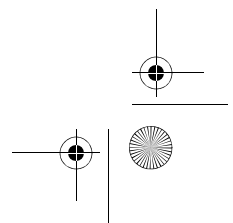
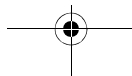
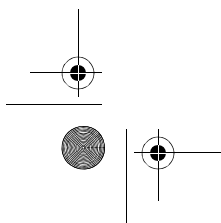
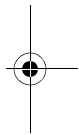
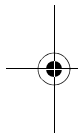
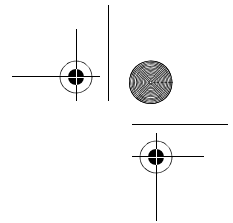
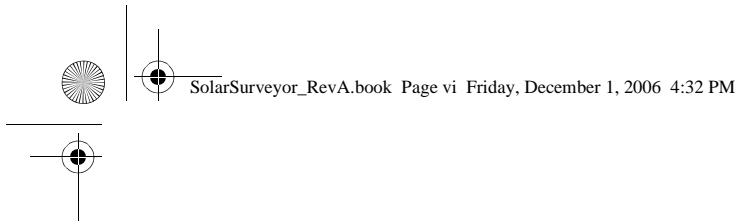
**Important:** These notes describe an important action item or an item that you must pay attention to.

## Abbreviations and Acronyms

AGM	Absorbed Glass Mat
AWG	American Wire Gauge
EMC	Electro-Magnetic Compatibility
FCC	Federal Communications Commission

## Related Information

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





# Important Safety Instructions



## WARNING

This manual contains important safety instructions that should be followed during the installation and maintenance of this product. *Be sure to read, understand, and save these safety instructions.*

## General Safety Instructions

- All electrical work must be done in accordance with local, national, and/or international electrical codes.
- Before installing or using this device, read all instructions and cautionary markings located in (or on) this guide, the unit, the batteries, PV array, and any other equipment used.
- This product is designed for indoor mounting only. Do not expose this unit to rain, snow or liquids of any type.
- To reduce the chance of short-circuits, use insulated tools when installing or working with the unit or any DC source (such as PV, hydro, wind, or batteries).
- Remove all jewelry when installing or working with the unit or any DC source. This will greatly reduce the chance of accidental exposure to live circuits.
- The unit contains more than one live circuit (batteries and PV array). Power may be present at more than one source.
- This product contains no user-serviceable parts.

## Safety

---



### **WARNING: Limitations on use**

The Solar Charge Controller is not intended for use in connection with life support systems or other medical equipment or devices..

---

## Battery Safety Information



### **WARNING**

A battery can produce the following hazards to personal safety:

- electrical shock
- burn from high-short-circuit current
- fire or explosion from vented gasses.

Observe proper precautions when working with or around batteries.

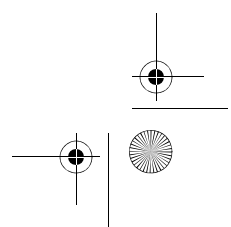
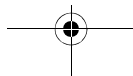
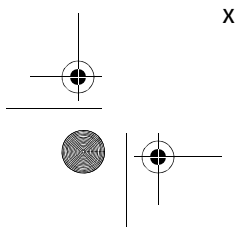
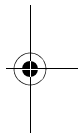
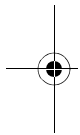
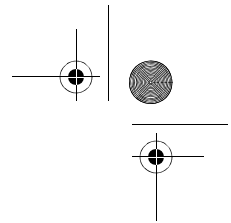
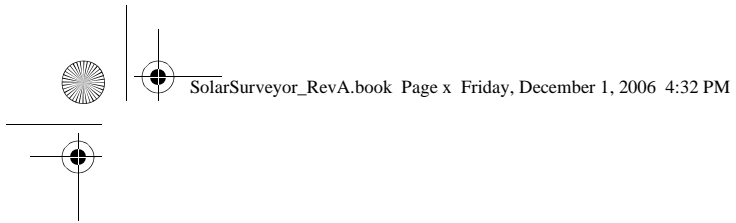
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- Always wear eye protection, such as safety glasses, when working with batteries.
- Remove all jewelry before working with batteries.
- Never work alone. Have someone assist you with the installation or be close enough to come to your aid when working with batteries.
- Always use proper lifting techniques when handling batteries.
- Always use identical types of batteries.
- Never install old or untested batteries. Check each battery's date code or label to ensure age and type.
- Batteries should be installed in a well-vented area to prevent the possible buildup of explosive gasses. If the batteries are installed inside an enclosure, vent its highest point to the outdoors.
- When installing batteries, allow at least 1 inch of air space between batteries to promote cooling and ventilation.

## Safety

---

- NEVER smoke in the vicinity of a battery or generator.
- Always connect the batteries first, then connect the cables to the inverter or controller. This will greatly reduce the chance of spark in the vicinity of the batteries.
- Use insulated tools when working with batteries.
- When connecting batteries, always verify proper voltage and polarity.
- Do not short-circuit battery cables. Fire or explosion can occur.
- In the event of exposure to battery electrolyte, wash the area with soap and water. If acid enters the eyes, flood them with running cold water for at least 15 minutes and get immediate medical attention.
- Always recycle old batteries. Contact your local recycling center for proper disposal information.



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# 1 Introduction

Chapter 1 describes features and functions of the Solar Charge Controller.

For information on:	See:
“Features”	page 1–2
“Maximum Power Point Tracking”	page 1–3
“Charge Controlling”	page 1–5
“Auxiliary Output Functions”	page 1–10
“Automatic PV Array Night Disconnect”	page 1–12

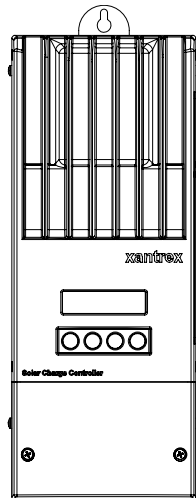
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## Features

The Xantrex Solar Charge Controller is a photovoltaic (PV) charge controller that tracks the electrical maximum power point of a PV array to deliver the maximum available current for charging batteries. The Charge Controller can be used with 12-, 24-, 36-, 48-, and 60-volt DC battery systems.

The Solar Charge Controller is designed to regulate PV input only. It is not designed to work with wind or hydro generators.

The Charge Controller can be installed (in single or multi-unit configurations) with a Xantrex XW Series Inverter Charger or in a stand-alone installation.



**Figure 1-1** Charge Controller

Standard features of the Solar Charge Controller include:

- Two- or three-stage charging process, with manual equalization to maximize system performance and maintain expected battery life.

## Maximum Power Point Tracking

- Maximum Power Point Tracking (MPPT) to deliver the maximum available power from a PV array to a bank of batteries. See “Maximum Power Point Tracking” on page 1–3.
- Configurable auxiliary output. See “Auxiliary Output Functions” on page 1–10.
- Two-line, 16-character liquid crystal display (LCD) and four buttons for configuration and system monitoring.
- Input over-voltage and under-voltage protection, output over-current protection, and backfeed (reverse current) protection. Warning and Fault messages appear on the LCD when the unit shuts down as a protective measure.
- Over-temperature protection and power derating when output power and ambient temperature are high.
- Battery Temperature Sensor (BTS) to provide automatically temperature-compensated battery charging.
- Xanbus<sup>®</sup>-enabled. Xanbus is a network communications protocol developed by Xantrex. The Charge Controller is able to communicate its settings and activity to other Xanbus-enabled devices, such as the XW Series Inverter/Charger, the System Control Panel II (SCP), XW Automatic Generator Start (XW-AGS), and other Xantrex XW-MPPT-60-150 Solar Charge Controllers.
- 5-year limited warranty.

## Maximum Power Point Tracking

Maximum Power Point Tracking allows the Charge Controller to harvest the maximum energy available from the PV array and deliver it to the batteries.

The MPPT algorithm continuously adjusts the operating points in an attempt to find the maximum power point of the array. The algorithm can then determine if it is harvesting more or less power than the previous operating points.

The Charge Controller applies a variable load on the array—shown by the power curve (solid line) in Figure 1-2—until it finds the maximum wattage (the greatest number of amps per volt), as indicated by “MPP” in Figure 1-2. The Charge Controller then holds the array at this point for as long as the array continues to produce the required current. As panel shading, cloud cover, and sunlight angle shift, the Charge Controller finds the new maximum power point without interrupting its output power flow.

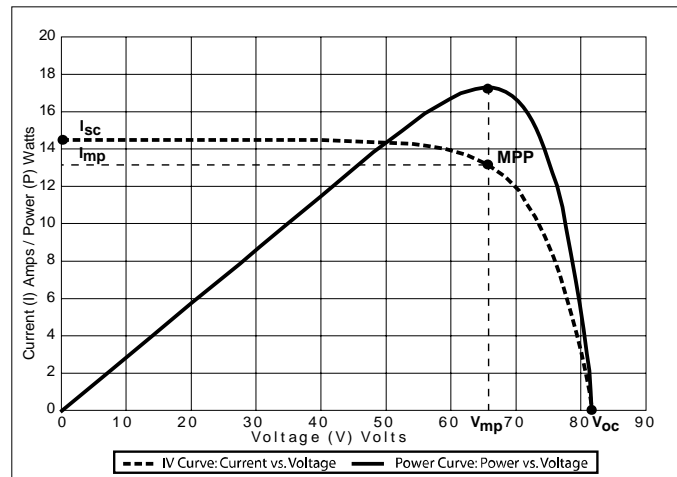


Figure 1-2 Maximum Power Point Curve

## Charge Controlling

The Charge Controller can regulate PV array current at 12, 24, 36, 48 or 60 volts DC for charging batteries. It produces up to 3500 watts and 60 amps of charging current for all battery voltages except 60 V.



Figure 1-3 PV Charge Controller

The Charge Controller controls how the batteries are charged by the DC source (the PV array). It can be configured to use a two-stage (“No Float”) or three-stage charging process to maintain battery voltage at bulk or float levels.

When charging, the Charge Controller regulates the battery voltage and the output current based on the amount of DC power available from the PV array and the state of charge of the battery.

The Charge Controller is able to charge a lower nominal-voltage battery from a higher-nominal voltage array. For example, the Charge Controller can charge a 12-volt battery from a 36-volt array. This gives flexibility to installers to use longer wiring runs without compromising efficiency on a higher-voltage array.

The Charge Controller is not able to charge a higher-voltage battery from a lower-voltage array.

---

## Three-Stage Battery Charging

The three-stage charging process results in more efficient charging compared to on-off relay type or constant voltage solid-state regulators. The final float stage reduces battery gassing, minimizes electrolyte loss, and ensures complete battery recharging. Battery voltage and current vary during the three-stage charging process as shown in Figure 1-4 on page 1-7.

### Bulk Stage

During the bulk stage, the Charge Controller sets its voltage limit to the bulk/absorption voltage setting. If the batteries are discharged, the Charge Controller operates in constant current mode, delivering its maximum current to the batteries. When the battery voltage reaches the Float voltage setting, the controller will transition to the absorption stage.

### Absorption Stage

During the absorption stage, the Charge Controller continues to deliver its maximum available current output until the battery voltage reaches the bulk/absorption voltage setting. The Charge Controller then operates in constant voltage mode, holding the battery voltage at the bulk/absorption voltage setting for a pre-set time limit (the default time limit is four hours). During this time, current falls gradually as the battery capacity is reached. The Charge Controller transitions to the float stage if any one of three criteria are met:

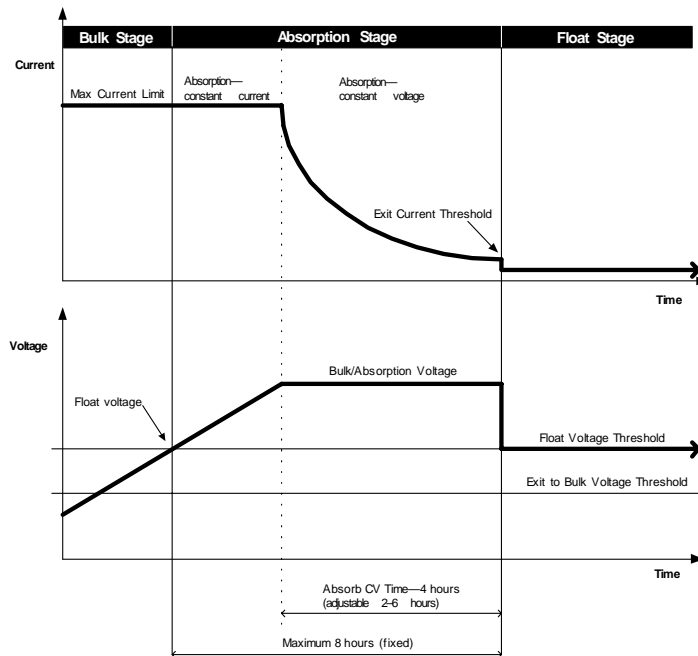
1. The charge current allowed by the batteries falls below the exit current threshold, which is equal to 2% of battery capacity (for a 500 Ah battery bank, this would be 10 A), for one minute.
2. The battery voltage has been at or above the float voltage (which it reached during the bulk stage) for eight hours.

## Charge Controlling

- The battery voltage has been at the bulk/absorption voltage setting for a pre-set time limit (the Absorb CV Time).

### Float Stage

During the float stage, the voltage of the battery is held at the float voltage setting. Full current can be provided to the loads connected to the battery during the float stage from the PV array. When battery voltage drops below the Exit to Bulk Voltage threshold for 1 minute, a new bulk cycle will be triggered.



**Figure 1-4 Three-stage Battery Charging Process<sup>a</sup>**

a. An actual charging cycle for a PV-based system that is in use while it is being charged will likely differ from the cycle represented in Figure 1-4. This is because a PV system's output is limited by the amount of solar energy available, and also because DC loads will affect the charge current and the measured battery voltage.

---

## Two-Stage Battery Charging

The two-stage charging process includes the bulk and absorption stages, but uses a “No Float” stage instead of “Float.” Two-stage charging is recommended for off-grid applications, where batteries are used more frequently and maintaining them at the float voltage is both less important and less practical. Two-stage charging can extend the life of most batteries.

### No Float Stage

During the No Float stage the Charge Controller does not produce any charge current. Instead the Charge Controller monitors the battery voltage and transitions back to the bulk stage once the voltage drops below the Exit To Bulk Voltage setting for 1 minute.

---

**Note:** For more information about battery charging settings, see Table 3-2, “Battery Menu Values” on page 3–7 and Table 3-3, “Custom Battery Menu Values” on page 3–10.

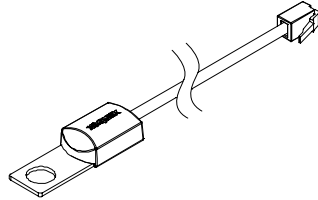
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## Battery Temperature Compensation

The Battery Temperature Sensor (BTS) automatically adjusts the charging process of the Charge Controller. With the BTS installed, the Charge Controller will increase or decrease the battery charging voltage depending on the temperature of the battery to optimize the charge to the battery and to protect it from over-charge or damage. Using the BTS can extend battery life and improve overall charging.

The BTS plugs into the BTS jack located inside the wiring compartment of the Charge Controller. The BTS can be installed on the negative battery post or on the side of the battery.





**Figure 1-5** Battery Temperature Sensor

If the BTS is not installed, the voltage settings for charging are based on one of three temperature settings (Cold, Warm, or Hot) available on the Charge Controller configuration menu. See “Configuring Battery Characteristics and Battery Charging” on page 3–5.

## Equalization Charging

The Charge Controller can be used to provide the battery bank with an equalize charge.

Equalization is a deliberate overcharge designed to return each battery cell to optimum condition by reducing sulfation and stratification in the battery. The equalization charge is generally performed only on flooded, vented (non-sealed or “wet”) lead-acid batteries, as recommended by the battery manufacturer.

To avoid damaging your batteries, be sure to read all cautions and warnings concerning equalization charging. For more information, see “Battery Equalization” on page 4–17.

---

**Important:** The Charge Controller maximum output voltage is limited to 72 V for a 60 V battery system, which is the bulk voltage setting for 60 V batteries. Because of this output limit, the Charge Controller does not equalize 60 V batteries.

---

---

## Auxiliary Output Functions

The Charge Controller has a configurable auxiliary output (producing 5 to 13 volts at 200 mA) to drive a relay for load control or to turn on devices such as vent fans or indicator alarms. The auxiliary output can be configured to perform only one function at a time.

See “Configuring the Auxiliary Output” on page 3–14 for information about auxiliary output trigger sources and how to enable and configure the auxiliary output for your application.



### CAUTION

The auxiliary output is intended only to energize a low-current circuit such as a relay coil. Connection to a high-amperage device will open the fuse in the common line and possibly damage the unit.

---

## Load Control

The Charge Controller auxiliary output can be configured to drive a relay to disconnect or reconnect loads depending on battery voltage. This load control function enables the Charge Controller to help prevent damage to the battery from over-discharge during periods of poor charging (due to ambient temperature, for example) or excessive loads.

To use the Charge Controller to control loads and protect your batteries, you must connect the Charge Controller auxiliary output to a relay that controls a battery disconnect to disconnect the load from the batteries. The Charge Controller auxiliary output must be configured to activate when the batteries reach a pre-set voltage level.

## Auxiliary Output Functions

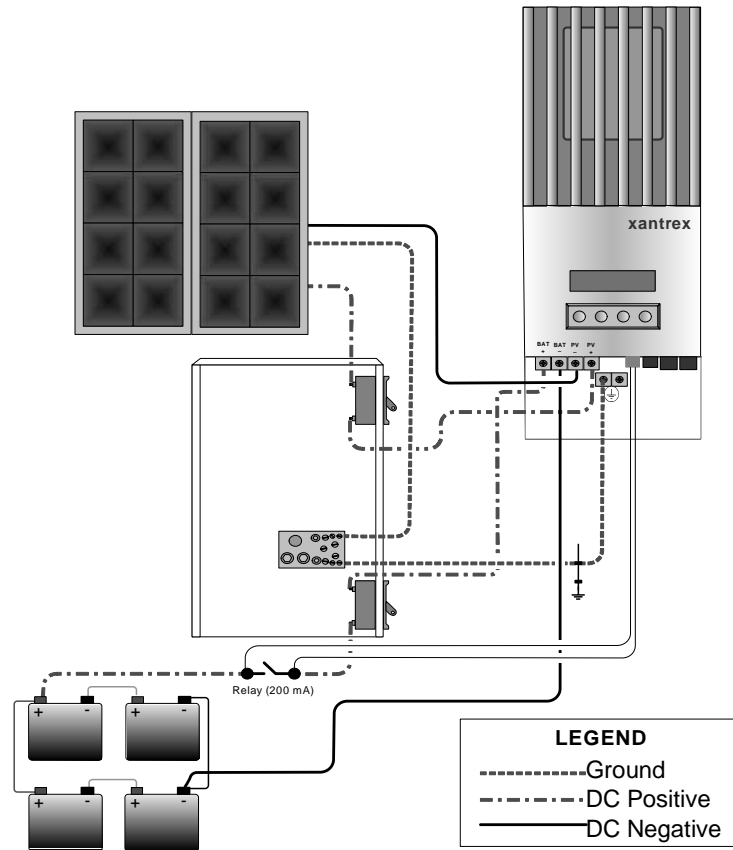


Figure 1-6 Load Control Wiring

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## Vent Fan

The Charge Controller auxiliary output can be configured to power a small DC fan to clear a battery compartment of harmful gases. The Charge Controller auxiliary output must be configured to activate when the batteries reach their gassing voltage.

The auxiliary output can also power a small DC fan to cool the Charge Controller heat sink when the heat sink temperature rises above a pre-set temperature.

## Alarms

The auxiliary output can be configured to trigger an alarm or indicator light when a pre-set condition occurs, such as low or high battery voltage, high PV array voltage, or a Charge Controller fault.

## Automatic PV Array Night Disconnect

At night, or when the PV array voltage is less than the battery voltage, the Charge Controller opens an internal relay to prevent battery current from flowing back to the PV array. In this mode of operation the Charge Controller draws minimal power from the battery.

This automatic night-time disconnect eliminates the need for a blocking diode between the battery and the PV array. If the PV array consists of thin-film or amorphous solar modules, diodes may still be required to prevent damage during times of partial shading of the array. Check the documentation provided with the PV modules.

# 2 Installation

Chapter 2 contains information and procedures to install the Solar Charge Controller.

For information on:	See:
“PV Array Requirements”	page 2–2
“Mounting”	page 2–4
“Grounding”	page 2–9
“Wiring”	page 2–10
“Installing the Battery Temperature Sensor”	page 2–27
“Commissioning”	page 2–29

## PV Array Requirements

**Note:** The following information provides only general guidelines. The installation and rated performance of your PV array is subject to inspection and approval by the authority having jurisdiction.

### Array Size

For PV array sizing guidelines, use the XW Solar Charge Controller PV array sizing tool accessible from [www.xantrex.com/support](http://www.xantrex.com/support).

Although the Solar Charge Controller can harvest a maximum of 3500 W, the PV array size can be as high as 6720 W (based on  $48 \text{ A} \times 140 \text{ Vdc} = 6720 \text{ W}$ ).

### Array Voltage



#### **CAUTION: Equipment damage**

The PV array voltage must never exceed 150 V<sub>oc</sub> (open circuit voltage) under any conditions.

The maximum V<sub>mpp</sub> (PV array voltage for Charge Controller MPPT operation) is 140 Vdc. The difference between V<sub>mpp</sub> and V<sub>oc</sub> is shown in Figure 1-2 on page 1-4.

When calculating PV array size for the Solar Charge Controller you should consider the expected V<sub>oc</sub> of the array under all possible conditions. Panel voltage increases with decreasing temperature. The array needs to be sized so that the 150 Vdc does not occur, even at the lowest expected panel temperature during open circuit. The panel manufacturer provides a V<sub>oc</sub> rating per panel, but it is usually rated at 25 °C (77 °F). Ensure that the V<sub>oc</sub> rating at the coldest ambient temperature does not exceed 150 Vdc. A factor of 1.25 is applied to the rated V<sub>oc</sub> at 25 °C when the panel is colder than -21 °C.

## PV Array Requirements

## Array Current

**Important:** The  $I_{sc}$  (short circuit current) rating of the array must not exceed the 60 A input current rating of the Charge Controller at any time.

Panels rated up to 48 A at 25 °C (77 °F) are recommended to allow for increases in  $I_{sc}$  at low panel temperatures and at solar noon. Ensure that the  $I_{sc}$  rating under all conditions does not exceed 60 A. A factor of 1.25 is applied to the rated  $I_{sc}$  at 25 °C when the panel is colder than -21 °C.

## MPPT Voltage Range

The Charge Controller maximum power point tracking algorithm maximizes the output energy of PV arrays as long as the operating voltage is within the MPPT operational window. Ensure that the PV array used in the system operates within the MPPT operational window.

Effects of array voltages outside of the MPPT operational window are shown in Table 2-1.

Table 2-1 MPPT Operational Window

Voltage	Effect of Array Voltage	Charge Controller Mode
$V_{oc} < Batt_{nom}$ (system battery voltage)	Charge Controller not operating.	Low Light
$V_{MPP} = Batt_{nom}$ to 140 Vdc	Maximum harvest of solar energy.	Charging (MPPT window)
$V_{MPP} > 140$ Vdc (or $V_{oc} > 140$ Vdc)	Charge Controller shuts down. Unit may be damaged if $V_{oc} > 150$ V.	Over-voltage fault.

## Mounting

The instructions in this chapter are applicable to the typical stand-alone installation. Installation procedures will vary according to your specific application. For special applications, consult a qualified electrician or your Xantrex Certified Dealer.

If installing the Charge Controller as part of an XW System, see the *XW System Installation Guide* for additional information.

---

**Important:** *Installations must be compliant with all local electrical codes.* Installation of this equipment should only be performed by a qualified electrician or by a Certified Renewable Energy (RE) System installer.

---

## Choosing a Location

The Charge Controller must be mounted vertically and installed indoors in a dry, protected location away from flammable materials, sources of high temperature, moisture, and vibration. The location must also be sheltered from direct sunlight, rain, snow, and wind-blown debris.



### CAUTION: Equipment damage

Never install the Charge Controller where it is exposed to salt water spray. Exposure to salt water will void the warranty and may cause a shock hazard.



### WARNING: Explosion/corrosion hazard

To reduce the risk of fire or explosion, do not install the Charge Controller in sealed compartments containing batteries or in locations that require ignition-protected equipment.

To reduce the risk of corrosion from hydrogen-sulfide gas vented by batteries, do not install the Charge Controller in sealed compartments containing batteries.



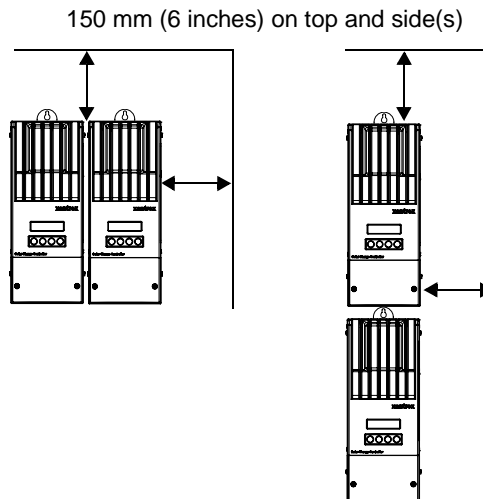
## Mounting

If using “sealed” batteries, the controller can be mounted in the same enclosure as long as it is adequately ventilated.

For optimal and safe operation, ensure there is adequate clearance around the Charge Controller. See Table 2-2 and Figure 2-1. If clearances are reduced below these minimums, rated performance may not be achieved.

**Table 2-2** Minimum Clearance Requirements

Location	Minimum Clearance
Above	150 mm (6 inches). When units are mounted in a vertical stack, the topmost unit must maintain the minimum clearance to the nearest surface.
In front	Sufficient room to allow for easy access to read the display, to prevent accidental contact with the heat sink, and to perform maintenance.
On sides	150 mm (6 inches) on at least one side of the overall assembly. A maximum of two units can be mounted side by side or side mounted against an XW Series Power Distribution Panel (part number 865-1015). In both configurations, the minimum clearance around the outermost unit must be maintained.



**Figure 2-1** Minimum Clearance Requirements

---

## Removing the Wiring Terminals Cover

Before mounting, remove the wiring terminals cover to access the mounting holes and the wiring terminals. The wiring terminals cover is secured with two Phillips #8-32  $\times$  2 1/2-inch screws on the front cover of the unit. See Figure 2-2.

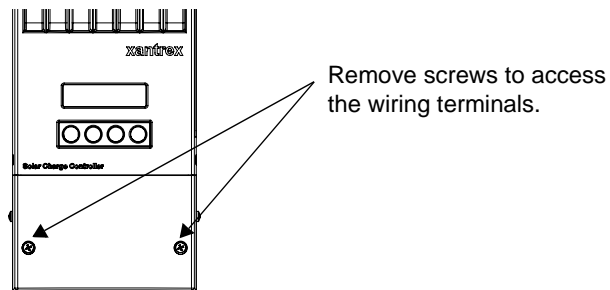


Figure 2-2 Removing the Wiring Terminals Cover

## Removing Knockouts

Six dual-knockouts are provided for routing battery, PV array, BTS, and network cables into the Charge Controller. Bushings or conduits must be used to protect the wiring from damage from rough edges around the knockout holes.

## Mounting

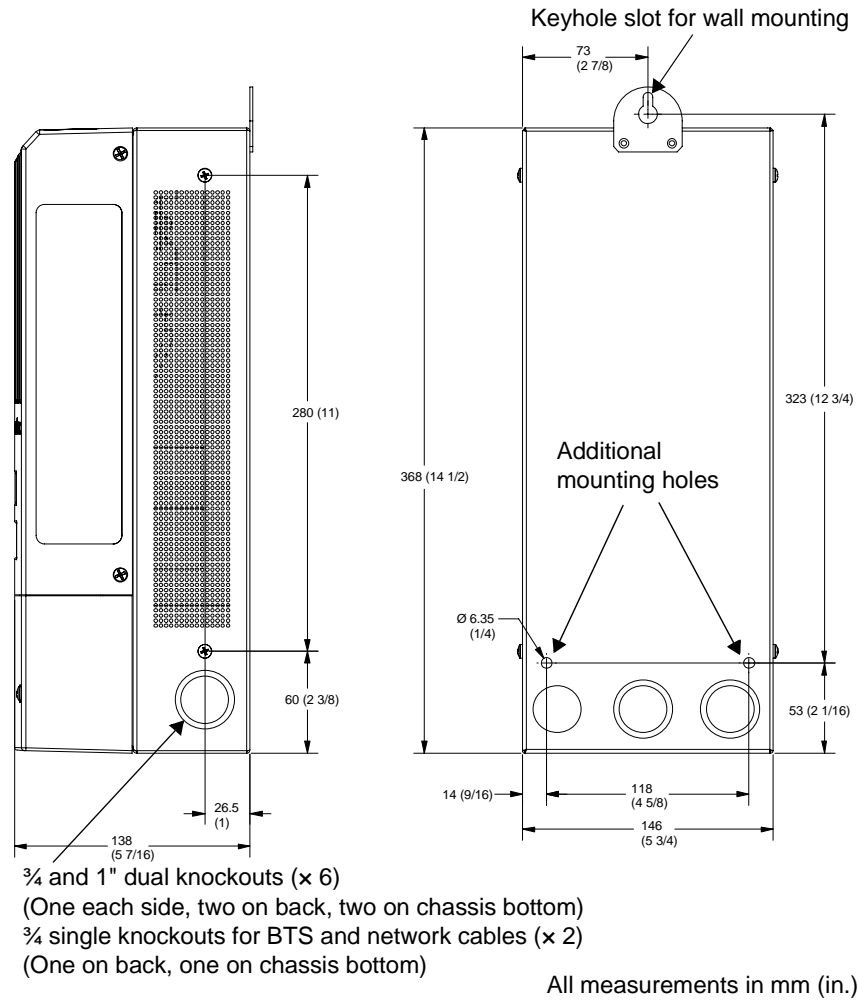


Figure 2-3 Dimensions and Knockout Locations

## Mounting the Charge Controller

The Charge Controller is vertically mounted using three #10  $\times$  1/2-inch or #12  $\times$  1/2-inch pan-head screws.

### To mount the Charge Controller:

1. Remove the wiring terminals cover.
2. Mark the location of the keyhole slot on the wall.
3. Secure the top mounting screw in the location marked. Leave the screw head backed out approximately 1/4 inch (6 mm).
4. Place the controller onto the screw and pull it down into the keyhole slot.
5. Insert two screws in the two mounting holes provided to secure the unit to the wall.
6. Provide strain-relief clamps or conduit to prevent damage to the circuit board and terminal block from pulling on the wires.

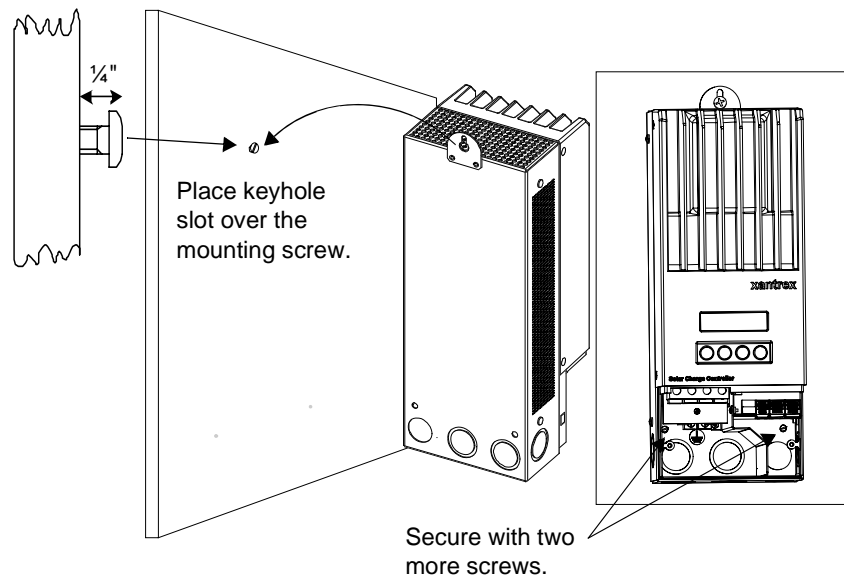


Figure 2-4 Mounting the Solar Charge Controller

## Grounding

The Charge Controller is designed to work only with negative-grounded electrical systems. Grounding for both PV and battery circuits is provided inside the wiring compartment. Each ground connection can accommodate up to #6 AWG wire size.

A fuse rated at 1 A, 600 V (accessible from inside the wiring compartment) grounds the negative conductor of the PV array and provides PV ground-fault protection (PV-GFP). Replace with Littelfuse KLKD 1 or equivalent.



### WARNING: Shock hazard

Do not connect the battery negative to ground. NEC requirements specify that the battery negative ground must be done only through the 1A PV-GFP fuse. Bonding the battery negative to ground disables PV ground-fault protection. The battery compartment must only be grounded if it is metal. See Figure 2-7 on page 2-15 for correct routing of the battery negative.

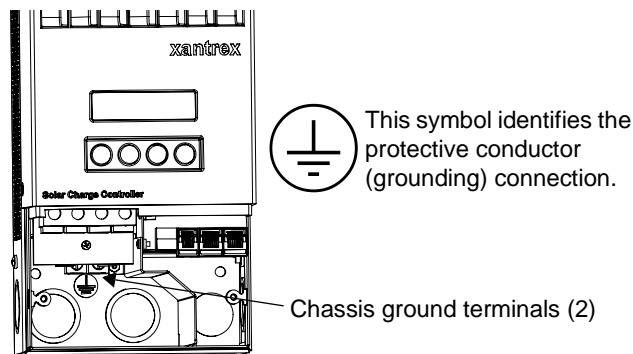


Figure 2-5 Charge Controller Safety Ground Connector



### WARNING: Shock hazard

Disconnect PV and battery circuits before removing the grounding connections or before removing or installing the PV-GFP fuse.

## Wiring

**Important:** *Installations must meet all local electrical codes.*  
Installations of this equipment should only be performed by a qualified electrician or a Certified Renewable Energy (RE) System Installer.



### **WARNING: Shock hazard**

Disconnect PV and battery circuits before wiring.

## DC Terminal Connector Locations

Terminal connectors for DC wiring are located inside the wiring compartment. The labels above the DC wiring terminals and inside the wiring compartment identify all the connection points. See Figure 2-6.

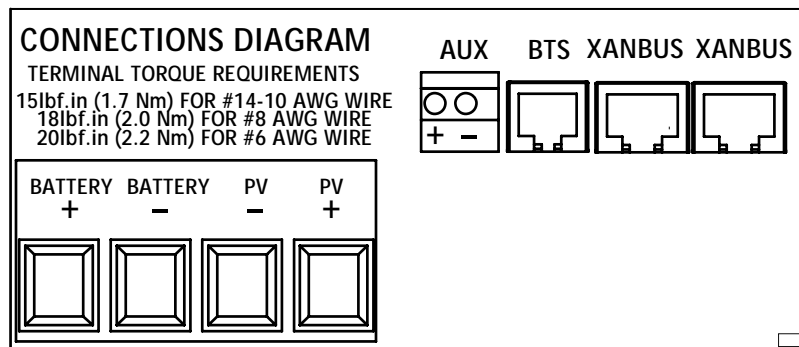


Figure 2-6 DC Connection Terminals

## Wire Size and Over-current Protection Requirements

The wiring, over-current protection devices (fuses and circuit breakers), and installation methods used must conform to all national and local electrical code requirements.

Wiring must be protected from physical damage with conduit or a strain relief clamp.

## Wiring

To preserve signal integrity on communication cables, the BTS, auxiliary output, and network cables must pass through a different conduit than the conduits used for PV wiring and battery cables. You should pull the BTS cable through the conduit first as the connector may not fit if other wires have been pulled first.

### Current Rating

The Charge Controller PV input is rated for 48 A continuous (60 A maximum)  $I_{sc}$ . Since PV outputs can vary due to the array size or sunlight angle, the safe minimum wire size must be chosen for maximum array short-circuit current. Consult PV array manufacturer specifications.

### Minimum Wire Gauge

For installations where the PV array output is the maximum allowable 60 A  $I_{sc}$ , the minimum allowable wire gauge is #6 AWG (13.3 mm<sup>2</sup>) copper wire with a 90 °C (194 °F) insulation rating. This wire gauge is determined by electrical code requirements regarding conduit knockout sizes, wire bending radius, and space available within the Charge Controller wiring compartment.

No crimp-on terminals or lugs are required.

### Over-current Protection

Over-current protection must be installed for the battery and PV circuits to protect the Charge Controller from short circuits at its input and output. The NEC requires all circuits to be protected with a device rated for 125% of the rating of the circuit.

### Battery Circuit

The DC-rated fuse or circuit breaker between the battery and the Charge Controller must have a maximum size of  $1.25 \times 60$  A (the short circuit rating of the Charge Controller). That is, the fuse or circuit breaker must be rated less than 75 A.

---

## PV Circuit

The DC fuse or circuit breaker DC-rated fuse or circuit breaker between the PV array and the Charge Controller must be rated for the  $I_{sc}$  of the array but cannot exceed the 60 A rating ( $1.25 \times 48$  A).

## Long-distance wire runs

If there is a significant distance between the PV array and the Charge Controller or between the Charge Controller and the battery, larger wires can be used to reduce the voltage drop and improve performance. Refer to Table 2-3.



### WARNING: Equipment damage

Do not connect an array capable of delivering over 60 A  $I_{sc}$  to the Charge Controller. Wires larger than #6 AWG can be used only to reduce power loss in the wiring.

To use a larger size wire, use a splicer block (terminal block) approved and rated for this application. This allows the larger cable size from the batteries to be “spliced” to the #6 AWG wire connected to the Charge Controller. The splicer block must be installed outside of the Charge Controller wiring compartment.

Follow manufacturer’s recommendations for torque and mounting. Splicer blocks and split-bolt kerneys are available from renewable energy suppliers.

## Maximum One-way Distance and Wire Size

**Important:** Local and national electrical codes must be followed for determining additional installation requirements. Larger wire sizes may be used to improve performance, but may not be installed directly into this Charge Controller. Use a splicer block as previously described.

---



## Wiring

Refer to Table 2-3 and find the maximum current in the left column, and the one-way distance from the PV array to the Charge Controller (or the distance from the Charge Controller to the battery) on the same line, then read the wire size required at the top of the column.

**Table 2-3 One-Way Wire Distance and Wire Size**

Maximum one-way wire distance for a < 3% voltage drop assuming 60 Adc charging current

12 Vdc application shown

For 24 Vdc systems, multiply distance by 2

For 36 Vdc systems, multiply distance by 3

For 48 Vdc systems, multiply distance by 4

For 60 Vdc systems, multiply distance by 5

Distance in feet (meters)					Distance in feet (meters) <sup>a</sup>				
Amps	12 AWG	10 AWG	8 AWG	6 AWG	4 AWG	3 AWG	2 AWG	1 AWG	1/0 AWG
10	8.8 (2.68)	14 (4.27)	22.2 (6.77)	35.3 (10.76)	56.1 (17.10)	70.9 (21.61)	89.6 (27.31)	112.5 (34.29)	141.7 (43.19)
12	7.3 (2.23)	11.6 (3.54)	18.5 (5.64)	29.4 (8.96)	46.7 (14.23)	59.1 (18.01)	74.6 (22.74)	93.7 (28.56)	118.1 (36.00)
14	6.3 (1.92)	10 (3.05)	15.9 (4.85)	25.2 (7.68)	40.1 (12.22)	50.6 (15.42)	64.0 (19.51)	80.4 (24.51)	101.2 (30.85)
16	5.5 (1.68)	8.7 (2.65)	13.9 (4.24)	22.1 (6.74)	35.0 (10.67)	44.3 (13.50)	56.0 (17.07)	70.3 (21.43)	88.6 (27.01)
18	4.9 (1.49)	8.8 (2.38)	12.4 (3.78)	19.6 (5.97)	31.2 (9.51)	39.4 (12.01)	49.8 (15.18)	62.5 (19.05)	78.7 (23.99)
20	4.4 (1.34)	7 (2.13)	11.1 (3.38)	17.6 (5.36)	28.0 (8.53)	35.4 (10.79)	44.8 (13.66)	56.2 (17.13)	70.9 (21.6)
25		5.6 (1.71)	8.9 (2.71)	14.1 (4.30)	22.4 (6.83)	28.3 (8.63)	35.8 (10.91)	45.0 (13.72)	56.7 (17.28)
30		4.7 (1.43)	7.4 (2.26)	11.8 (3.60)	18.7 (5.70)	23.6 (7.19)	29.9 (9.11)	37.5 (11.43)	47.2 (14.39)
35			6.4 (1.95)	10.1 (3.08)	16.0 (4.88)	20.2 (6.16)	25.6 (7.80)	32.1 (9.78)	40.5 (12.34)
40			5.6 (1.71)	8.8 (2.68)	14.0 (4.27)	17.7 (5.39)	22.4 (6.83)	28.1 (8.56)	35.4 (10.79)
45				7.8 (2.38)	12.5 (3.81)	15.7 (4.79)	19.9 (6.07)	25.0 (7.62)	31.5 (9.60)
50				7.1 (2.16)	11.2 (3.41)	14.2 (4.33)	17.9 (5.46)	22.5 (6.86)	28.3 (8.63)
60				6.3 (1.92)	9.3 (2.83)	11.8 (3.60)	14.9 (4.54)	18.7 (5.7)	23.6 (7.19)

a. These wire sizes are not approved to be installed in the controller, but may be used external to the controller (using a splicer block) to reduce voltage drop and improve performance.

---

## Connecting the Charge Controller

The following procedure is illustrated in Figure 2-7.



### **WARNING: Shock hazard**

Whenever a PV array is exposed to light, a shock hazard exists at the output wires or exposed terminals. To reduce the risk of shock during installation, cover the array with an opaque (dark) material before making the connections.



### **WARNING: Shock hazard**

Do not connect the battery negative to ground. Bonding the battery negative to ground disables PV ground-fault protection. See Figure 2-7 on page 2–15 for correct routing of the battery negative.

---

#### **To connect the Charge Controller:**

1. Connect the PV array's positive (+) output to the PV array disconnect.
2. Route another (+) cable from the other end of the PV disconnect to the Charge Controller terminal marked PV +.
3. Connect the PV array's negative (–) output to the Charge Controller terminal marked PV –.
4. Connect a positive (+) cable from the Charge Controller terminal marked BAT + to the battery disconnect.
5. Connect a second positive (+) cable to the other side of the battery disconnect and connect to the positive (+) battery terminal.



### **CAUTION: Reverse polarity damage**

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

6. Connect the negative (–) battery cable to the Charge Controller terminal marked BAT –.

## Wiring

7. Torque the Charge Controller terminals according to the following table:

Wire Size		Torque Value	
AWG	mm <sup>2</sup>	in-lb	Nm
14-10	2.5-6	15	1.7
8	10	18	2
6	16	20	2.25

Allow some slack on the cables within the Charge Controller and secure the wiring with strain reliefs or cable clamps.

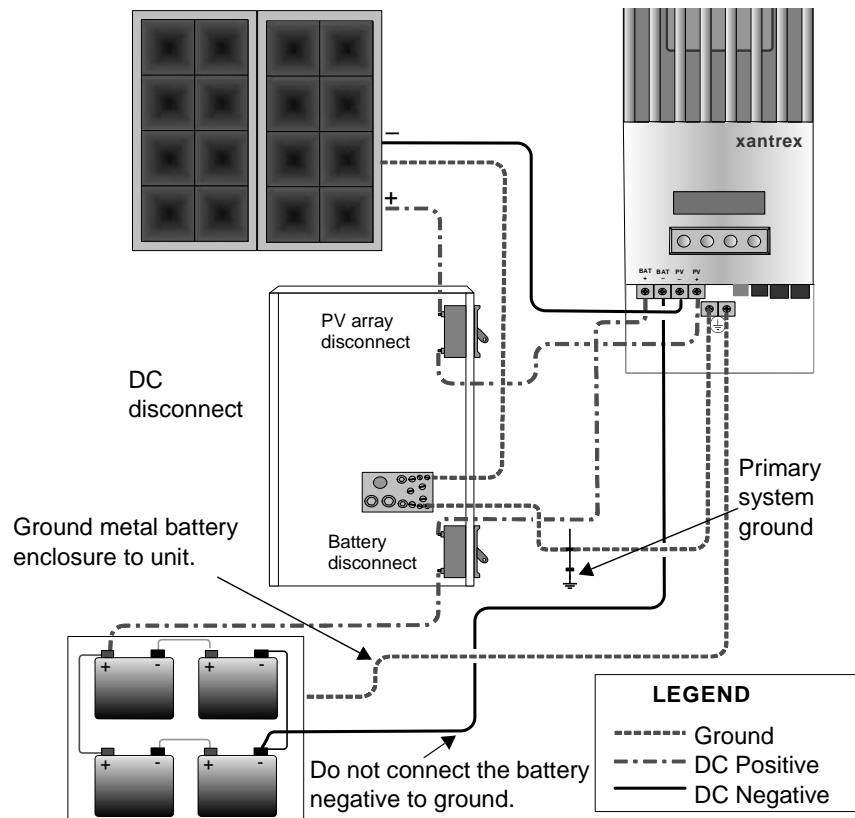


Figure 2-7 Charge Controller Wiring

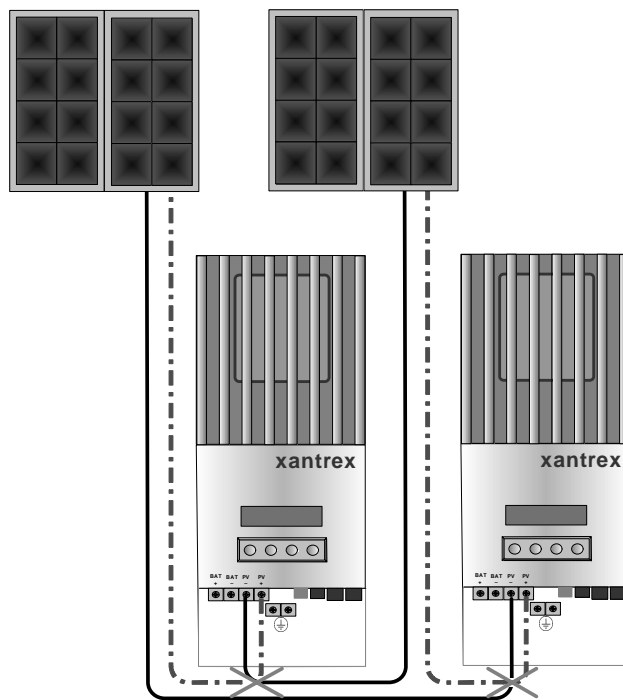
## Connecting Multiple Units

Each Charge Controller must be connected to a separate PV array. The PV arrays must be of the same type with similar fill factor and maximum power point voltage.



### **WARNING: Shock hazard and equipment failure**

Ensure each Charge Controller is correctly connected to its own PV array(s) and that no wires are crossed. If Charge Controllers “share” more than one PV array, an input current difference of over 1 A between arrays can cause each Charge Controller to fail—the ground fault protection fuse will blow, followed by short circuit failure. See Figure 2-8.



**Figure 2-8** Improper Multiple Charge Controller DC Wiring

## Aux Output Connections



### WARNING

If the PV-GFP internal protection has activated, shock-hazardous voltages may appear at the AUX connector. To avoid a shock hazard, ensure that all connections made to the AUX terminals have no uninsulated wire segments and that all wiring has an insulation rating of at least 300 V.

The auxiliary output connectors can accept 22 AWG to 14 AWG copper solid or stranded wire.

## Network Installation

The Xantrex XW-MPPT-60-150 is a Xanbus<sup>®</sup>-enabled device. Xanbus is a network communications protocol developed by Xantrex. The Charge Controller is able to communicate its settings and activity to other Xanbus-enabled devices, such as the XW Series Inverter/Charger, the System Control Panel II (SCP), XW Automatic Generator Start (XW-AGS), and other Xantrex XW Solar Charge Controllers.

Communications wiring (using Xanbus network cables) between multiple Charge Controllers allows information about each Charge Controller and its associated PV array to be communicated between all of the Charge Controllers in the system. Information about the entire system can be displayed on any Charge Controller LCD in the system.

For example, in a two-Charge Controller system, if Charge Controller #1 is producing 1500 W and Charge Controller #2 is producing 2000 W, both units display a total system power of 3500 W. The accumulated amp-hours and kilowatt-hours produced by both units that day is also displayed.

Without communications wiring, each Charge Controller in a system will only display information specific to the unit and its associated PV array.

---

## Network Components

A Xanbus network consists of the following components:

- Xanbus-enabled devices—these include the Charge Controller, the XW Series Inverter/Charger, XW-AGS, and SCP II. The network can consist of a maximum number of 20 devices, with no more than 10 of one kind of device.
- Xanbus power supply—the network requires a power supply capable of providing 15 Vdc/200 mA to each device. The XW Series Inverter/Charger can provide network power, but if no inverter/charger is installed, an external power supply is required. Contact Xantrex for more information.
- Network cables—each Xanbus-enabled device is connected by a Category 5 (CAT 5 or CAT 5e) cable, a standard cable available from Xantrex or any computer supply store. The cable consists of eight conductors in four twisted pairs with an RJ45 modular connector wired to the T568A standard.



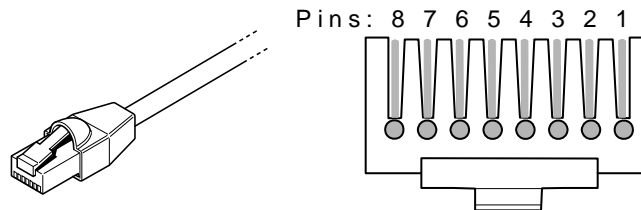
### **CAUTION: Equipment damage**

Do not use crossover cable.

Table 2-9 contains the arrangements of wire colors to pin numbers for the T568A standard.

**Figure 2-9 T568A Standard Wiring**

Pin Number	Conductor Name	CAT 5 Cable Insulation Color	CT5E Cable Insulation Color
1	NET_S	White/Green	White/Orange
2	NET_S	Green	Orange
3	NET_C	White/Orange	White/Green
4	CAN_L	Blue	Blue
5	CAN_H	White/Blue	White/Blue
6	NET_C	Orange	Green
7	NET_S	White/Brown	White/Brown
8	NET_C	Brown	Brown

**Figure 2-10 RJ45 Connector**

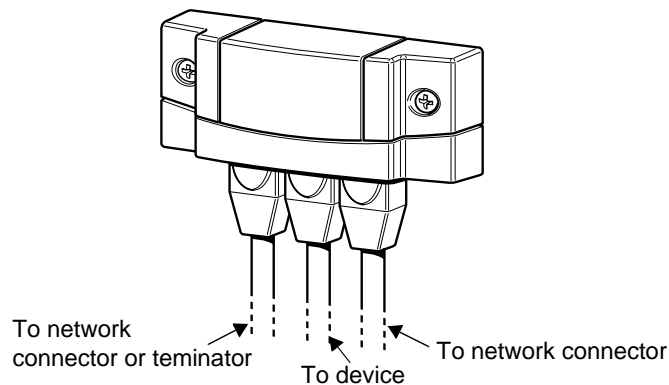
- Network terminators (Figure 2-11)—the Xanbus network must be properly terminated at each end with male or female network terminators to ensure the communication signal quality on the network. If the network is not properly terminated, signal quality is degraded and performance on the network is reduced. Permanent configuration with no terminators is not supported by Xantrex. The Charge Controller ships with one male terminator already installed. Depending on your network layout, this terminator may need to be removed and inserted into another device elsewhere in the network.



**Figure 2-11** Network Terminators

- Network connectors—The three-way connector houses three RJ45 jacks that provide a device connection point on a multi-drop backbone layout (see “Multi-Drop Backbone Layout” on page 2–22). All three jacks are wired identically and can accept either network cables or terminators. One jack is available for connecting to a Xanbus-enabled device. The remaining jacks are reserved for connection to other network connectors, a network cable terminated with a female terminator, or a male terminator.

The network connector is mounted to a bulkhead or a wall, as shown in Figure 2-12.



**Figure 2-12** Three-Way Network Connector



## Network Installation

## Ordering Network Components

Table 2-4 provides a partial list of network components and part numbers. Pre-made cables are available in standard lengths from 3 feet to 75 feet.

For the most up-to-date list, call your dealer. Call your dealer or visit the Outlet Store at **www.xantrex.com** to purchase cables and other network components.

**Table 2-4** Network Components and Part Numbers

Network Component	Part Number
Network termination—Male (2 per pack)	809-0901
Network termination—Female (2 per pack)	809-0905
Three-way network connector	809-0903
Network cable 3 ft. (0.9 m)	809-0935
Network cable 5 feet (1.5 m)	809-0936
Network cable 7 feet (2.0 m)	809-0937
Network cable 10 feet (3.0 m)	809-0938
Network cable 14 feet (4.3 m)	809-0939
Network cable 25 feet (7.6 m)	809-0940
Network cable 50 feet (15.2 m)	809-0941
Network cable 75 feet (22.9 m)	809-0942

## Network Layout

Xanbus-enabled devices can be connected in one of two Xanbus System layouts: multi-drop backbone or daisy chain. Each network layout has advantages and disadvantages, depending on the application and/or environment. It is up to you or your system designer to decide which layout is best for your installation.

---

**Important:** Do not mix the two types of network layouts. Mixed configurations are not supported by Xantrex.

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## Multi-Drop Backbone Layout

In a multi-drop backbone layout, each Xanbus-enabled device on the network is connected by a drop cable to the network bus or backbone with a network connector, as shown in Figure 2-13.

Network terminators are required at both ends of the multi-drop backbone cable, as shown in Figure 2-13. Therefore, the Xanbus-enabled devices do not require their own termination.

If cables are placed at the end of the network, female terminators are required. Otherwise, male terminators can be inserted directly into the open jack of each network connector at the end of the network. See Figure 2-13.

**Advantages** The multi-drop backbone layout gives extra reliability and robustness.

In this layout, Xanbus-enabled devices can be removed or replaced while still keeping the network operating.

**Disadvantage** The main disadvantage of this layout is cost. The network connectors are more expensive than in a daisy chain layout (which uses no network connectors), and each device in this layout requires its own network connector.

## Network Installation

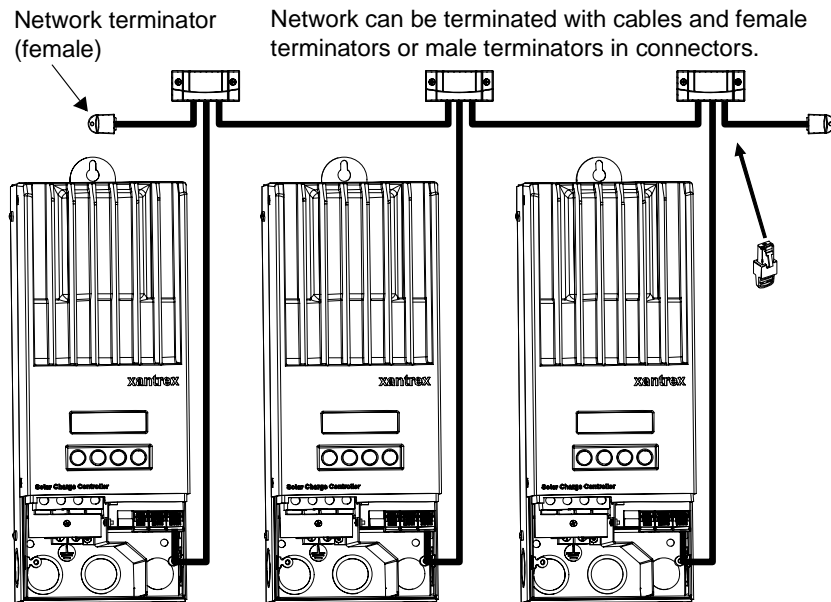


Figure 2-13 Multi-Drop Backbone Layout

## Daisy Chain Layout

In a daisy chain layout, each device on the network is linked with separate lengths of cable, as shown in Figure 2-14. This layout does not require network connectors.

As in the multi-drop backbone layout, two terminators are required to ensure the communication signal quality on the network. The Xanbus-enabled devices at each end of the chain must have a male terminator inserted into their open network ports, as shown in Figure 2-14.

**Advantage** The advantage of this layout is that it is less expensive to install because network connectors are not required.

**Disadvantage** The disadvantage of the daisy chain layout is that Xanbus-enabled devices cannot be removed from the network without interrupting the network. To make the

network function after removing a device, you must connect the Xanbus-enabled devices on either side of the missing device to each other or replace the device.

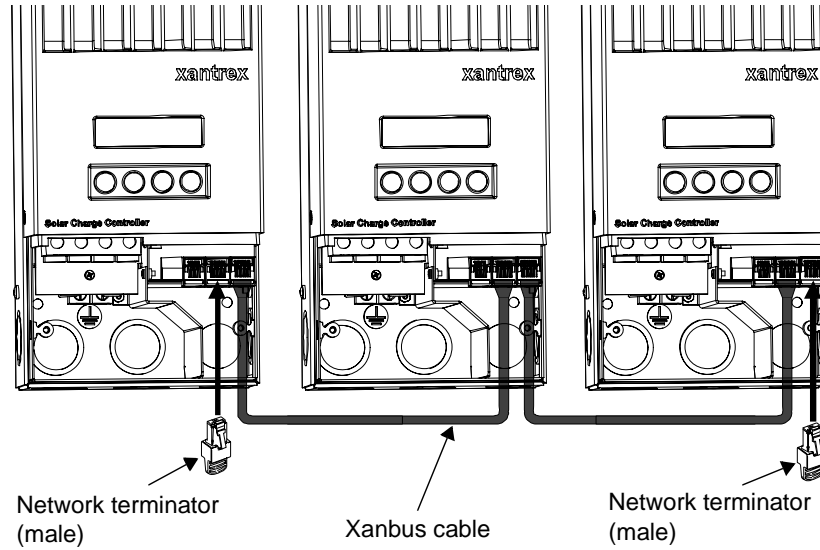


Figure 2-14 Daisy Chain Layout

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## Guidelines for Routing the Network Cables

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### WARNING: Shock hazard

Do not route the network cables in the same conduit or panel as the DC input/output cables.

---

## Connecting Network Cable Between Multiple Units

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### CAUTION: Equipment damage

Connect only Xanbus-enabled devices.

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

---



### CAUTION: Unpredictable device behavior

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

---

The procedure assumes only two Charge Controllers are connected. However, there can be up to ten Charge Controllers connected in a network. The maximum network size is limited to 20 Xanbus-enabled devices in total.

---



### WARNING: Shock hazard

Before opening the Charge Controller wiring compartment, ensure the PV array and batteries are disconnected. To reduce the risk of shock, cover the array with an opaque (dark) material.

---

## Multi-Drop Backbone Layout

### To connect network cables between multiple units:

1. Remove the wiring compartment cover from each unit.
  2. Install one network connector for each Charge Controller.
-

3. Connect a network cable from the nearest network connector to an RJ45 port in Charge Controller #1.
4. Repeat the previous step for each additional Charge Controller.
5. Connect each network connector with a network cable as shown in Figure 2-13.
6. Ensure the factory-supplied male network terminators (or a network cable and female terminator) are inserted into the empty RJ45 ports in the network connectors at the beginning and end of the network. There should be no empty RJ45 ports in any of the network connectors.

### Daisy Chain Layout

#### **To connect network cables between multiple units:**

1. Remove the wiring compartment cover from each unit.
2. Connect the network cable to an RJ45 port in Charge Controller #1.
3. Route the cable to Charge Controller #2.
4. Connect the network cable to an RJ45 port in Charge Controller #2.
5. For more than two Charge Controllers, continue connecting cable as described above.
6. Ensure the factory-supplied male network terminators are inserted into the empty RJ45 ports in the Charge Controllers at the beginning and end of the network. There should be no empty RJ45 ports in any of the Charge Controllers.

## Installing the Battery Temperature Sensor

## Installing the Battery Temperature Sensor

Installing a Battery Temperature Sensor (BTS) is highly recommended for optimum charging performance and extending battery life. The BTS automatically adjusts battery charging voltage depending on the ambient temperature. With a BTS installed, the Charge Controller can also detect over-temperature and under-temperature battery conditions and suspend charging until the battery temperature is suitable.

If a BTS is not installed and the batteries will operate in hot or cold conditions, manually adjust the temperature settings to suit the conditions. See “Configuring Battery Characteristics and Battery Charging” on page 3–5.

**Important:** If the wiring to the sensor is damaged and the wires are shorted, the Charge Controller displays an over-temperature fault message. If the BTS wires have been cut, the Charge Controller assumes that the BTS is not connected.

**Important:** The BTS cable must pass through a different conduit than the conduits used for PV wiring and battery cables.

**To install the BTS:**

1. Remove the Charge Controller wiring compartment cover.
2. Connect the ring terminal on the BTS directly to a battery terminal (recommended), or affix the double-sided adhesive backing (included) to the sensor back and attach the sensor to the side of the battery to be monitored.

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

3. Pass the end of the BTS cable through a conduit hole on the Charge Controller and insert the BTS plug into the BTS port.

4. Replace the Charge Controller wiring compartment cover.

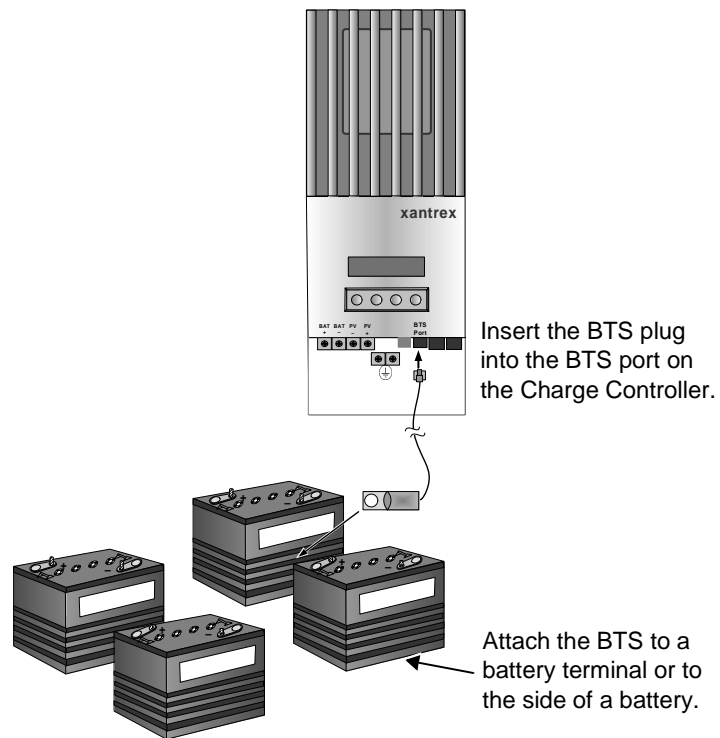


Figure 2-15 Installing the BTS



## Commissioning

During commissioning, the Charge Controller prompts you to enter important system information such as the nominal battery voltage, battery type, and battery bank capacity. If you have not installed the system yourself, ensure you have this system information prior to commissioning.

### Configuration Screens

When power is first applied to the Charge Controller, several configuration screens prompt you to enter the following information:

- A “DC out” (battery) connection, which enables the Charge Controller to read and share the same battery information with other Xanbus-enabled devices that charge or invert from the same battery bank.
- Battery type: Flooded (default), Gel, AGM, Custom.  
If you select Custom, the settings for battery type match the default settings for Flooded batteries until you reconfigure the settings on the Custom Battery menu. See “Setting a Custom Battery Type” on page 3–9.
- Nominal battery voltage of the battery bank connected to the Charge Controller.

The Charge Controller automatically detects battery voltages of 12 V, 24 V and 48 V. If your nominal system voltage is 36 V or 60 V, enter the correct system voltage on this screen.

- Battery bank capacity, in amp-hours.

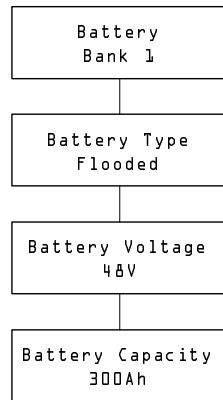


Figure 2-16 Configuration Screens

## Commissioning a Single Unit

### To commission the Charge Controller:

1. Apply battery power to the unit with a disconnect or selector switch.

The LCD displays the two startup screens in sequence, as shown in Table 2-5, followed by the configuration screens. The startup screens are only displayed when the power to the unit is removed and then replaced.

Table 2-5 Startup Screens on Charge Controller Front Panel Display

Display	Duration	Description
Xantrex XW-MPPT60-150	5 sec.	<b>Startup message 1:</b> Charge Controller model number
Ver 01.00 Build 0005	5 sec	<b>Startup message 2:</b> Firmware version and build numbers. This screen is also available in the Device Menu for referencing during normal operation (see page 3-23).

2. At the Battery screen, select a name (such as Bank 1) for the battery bank connected to the Charge Controller. Selecting a name is important for multiple Charge

## Commissioning

Controller installations (where units share data over a network), because it associates that battery bank with that unit.

3. At the Battery Type screen, select the battery type for your system. Confirm by pressing Enter.
4. When the Battery Voltage screen appears, check that the Charge Controller has detected the correct system voltage.
5. Press Enter to confirm the detected battery voltage, or if the unit has not successfully detected the voltage, select the correct voltage using the arrow buttons. When the correct battery voltage appears, press Enter.
6. At the Battery Capacity screen, select the battery capacity of your system. Confirm by pressing Enter.
7. Uncover the PV array and/or apply power with the disconnect or selector switch.

The Charge Controller starts up in sleep mode and waits for a short period to determine that the input voltage is greater than the output voltage. The LCD indicates the Charge Controller mode or any error conditions that may be present (see “Viewing Operating Status” on page 4–2). After the input voltage exceeds the output voltage by the required margin for 10 seconds, the unit begins operating.

---

## Commissioning Multiple Units

When commissioning an installation with several Charge Controllers on the same network, care must be taken to set a unique “instance” and the correct DC Out (or Battery) connection for each unit. The connection is important to define so that system totals and other related information are displayed accurately on each unit’s LCD.

Once the first unit is configured, you can copy that configuration to all other units by following the prompts on the LCD.

### To commission multiple Charge Controllers:

1. Power up the first unit.
2. At the Charger screen, set the device instance. The default instance is 00, but it can be set to any number between 00 and 31.
3. A “Copy Config?” screen appears.  
The options are Yes/No/Leave. Select No for the first unit, then you’ll be prompted to enter:
  - Battery association (default is Bank 1)
  - Battery voltage
  - Battery type
  - Battery capacity.
4. Perform steps 3 through 7 as described in “Commissioning a Single Unit”.
5. Apply power to the next unit and set its instance to a number one higher than the previous unit.
6. A “Copy Config?” screen appears. Select Yes.
7. A “Copy From?” screen appears. Select the instance of the first Charge Controller you configured.

The first Charge Controller’s configuration is copied to the second unit.

Repeat steps 4 through 6 for each additional networked unit.

# 3 Configuration

Chapter 3 contains information and procedures to configure the Solar Charge Controller.

For information on:	See:
"Configuration Menus"	page 3-3
"Configuring Battery Characteristics and Battery Charging"	page 3-5
"Configuring Charge Controller Input"	page 3-12
"Configuring the Auxiliary Output"	page 3-14
"Configuring the LCD"	page 3-21
"Resetting to Factory Defaults"	page 3-25

## Configuring the Charge Controller

The following sections describe how to configure the Charge Controller for the desired application and function.

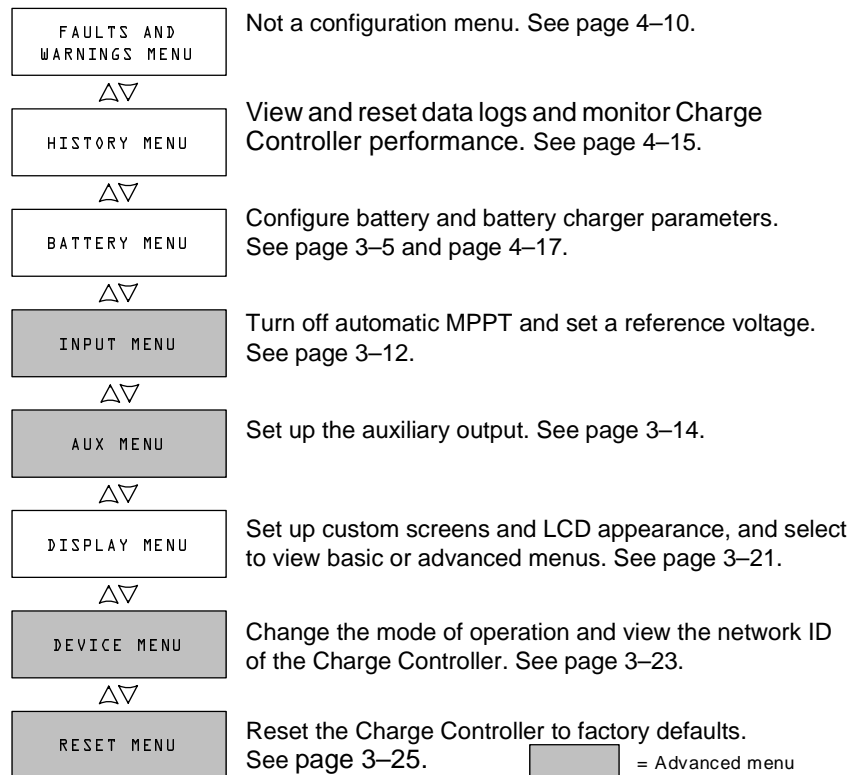
The Charge Controller is configured using the four buttons on the front of the unit.

**Table 3-1** Charge Controller buttons

Button	Function
Enter	<ul style="list-style-type: none"> <li>Displays the next screen level. For example, pressing Enter from the Battery Menu selection screen displays the first configurable item on the Battery menu.</li> <li>Selects and confirms selection of a menu item</li> </ul>
Up arrow	<ul style="list-style-type: none"> <li>Displays previous menu or menu item. For example, pressing the Up arrow from the Battery Menu selection screen displays the History Menu selection screen.</li> <li>Increases a selected value</li> </ul>
Down arrow	<ul style="list-style-type: none"> <li>Displays the next menu or menu item. For example, pressing the Down arrow from the Battery Menu selection screen displays the Input Menu selection screen.</li> <li>Decreases a selected value</li> </ul>
Exit	<ul style="list-style-type: none"> <li>Cancels selection of a menu item</li> <li>Displays the previous screen level. For example, pressing Exit from the Equalization Reminder screen on the Battery Menu displays the Battery Menu selection screen. Pressing Exit again displays the top-level operating screens.</li> </ul>

## Configuration Menus

The Charge Controller has seven menus for setup and monitoring system performance as shown in Figure 3-1:



**Figure 3-1** Configuration Menu Selection Screens (Advanced Menus in Gray)

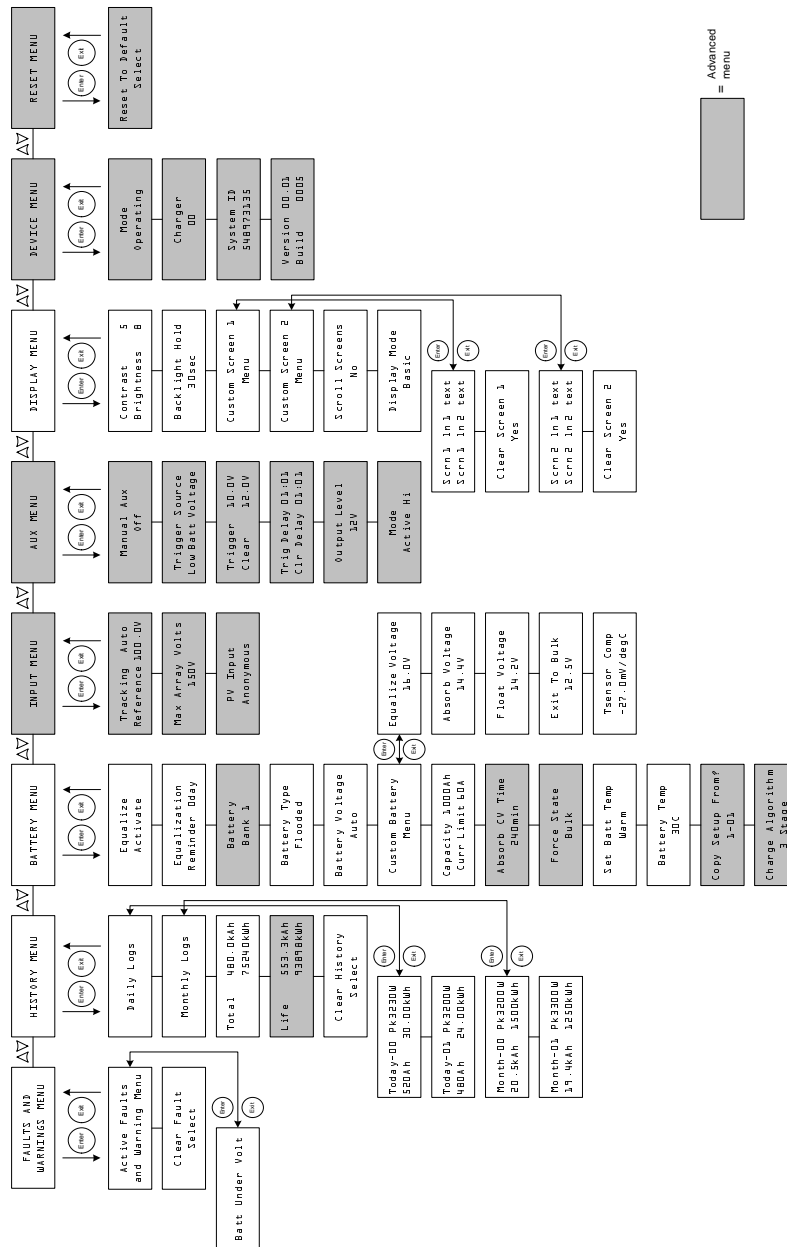


Figure 3-2 Complete Configuration Menus (Advanced Menus in Gray)



## Configuring Battery Characteristics and Battery Charging

### Basic and Advanced Menus

Some menus and associated setup items can be viewed in basic and advanced display modes. You can choose to view the basic or advanced menus on the Display Menu (see “Configuring the LCD” on page 3–21).

Basic menus contain items you may have to view and adjust on a routine basis. Advanced menus contain items intended for service personnel and one-time setup, such as auxiliary output configuration and defining custom battery types.

The Input Menu, Auxiliary Menu, and Reset Menu are advanced menus only, as are some items on the History Menu and Battery Menu.

### Configuring Battery Characteristics and Battery Charging

On the Battery Menu you can:

- Start battery equalization
- Set battery equalization voltage
- Configure your battery type, voltage and amp-hour capacity
- Configure a custom battery type by adjusting settings for each battery charge stage and fine-tuning temperature-compensated charging
- Monitor battery temperature.

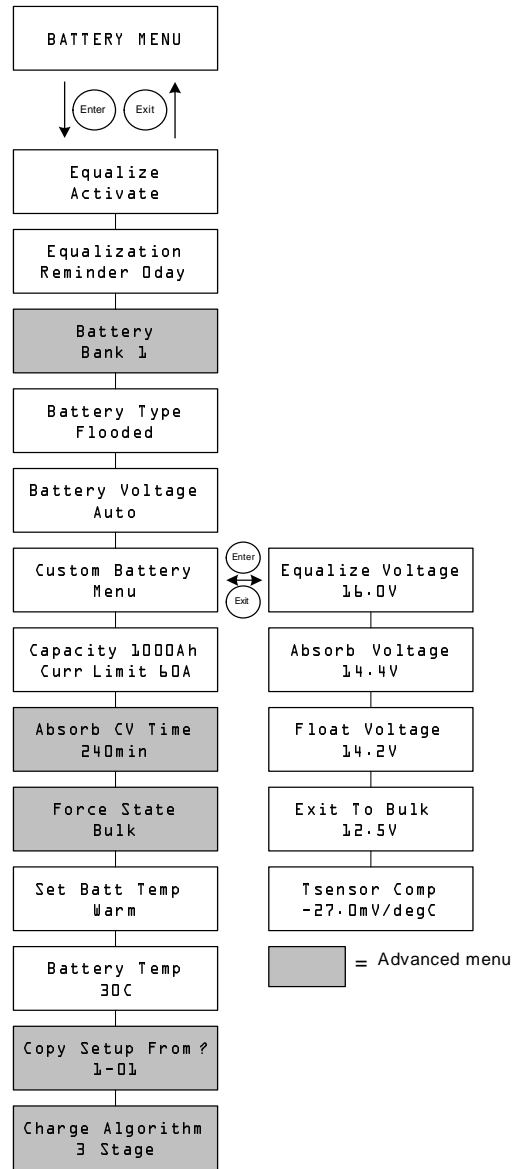


Figure 3-3 Battery Menu

## Configuring Battery Characteristics and Battery Charging

Table 3-2 Battery Menu Values

Setting	Values	Default	Description
<b>Equalize Activate</b>	Activate/Stop	Activate	Enables or disables Battery Equalization. If the Battery Type is set to GEL or AGM, this setting is disabled.
<b>Equalization Reminder 0d</b>	0–365 d(ays)	0 d	Sets a reminder that notifies you when the battery needs equalizing. If set to 0, the reminder is disabled.
<b>Battery Bank 1</b>	1–12	1	Selects the battery bank connected to the Charge Controller. This is important for networked installations, where multiple devices must coordinate their activity around common DC connections.
<b>Battery Type Flooded</b>	Flooded Lead Acid, GEL, AGM, Custom	Flooded Lead Acid	Selects your battery type. Selecting Custom allows you to adjust the Equalize, Absorption, Float, and Exit to Bulk voltage settings.
<b>Battery Voltage Auto</b>	Auto, 12V, 24V, 36V, 48V, 60V	Auto	Selects your battery voltage. The Charge Controller automatically detects 12V, 24V, and 48V systems at startup. Select the nominal voltage level that matches your system's battery voltage.

**Table 3-2 Battery Menu Values**

Setting	Values	Default	Description
<b>Custom Battery Menu</b>	n/a	n/a	Press Enter to display the Custom Battery menu and configure a custom battery type. See “Setting a Custom Battery Type” on page 3–9.
<b>Capacity 1000Ah Curr Limit 60.0A</b>	40–2000Ah 5.0–60.0A	200Ah 60.0A	<b>Line 1:</b> Sets the amp-hour capacity of your battery bank. <b>Line 2:</b> Sets the charging current limit.
<b>Absorb CV Time 240min</b>	120–360 min	240 min	Sets the maximum time spent at a constant voltage (the setting for Absorption voltage) during the absorption stage. This setting does not control the duration of the entire Absorption stage.
<b>Force State Bulk</b>	Bulk, Float	Bulk	Manually sets the charge stage to bulk or float.
<b>Set Batt Temp Warm</b>	Cold, Warm, Hot	Warm	Sets the battery temperature for compensation when the BTS is not connected. Cold is suitable for temperatures of around 10 °C (50 °F), Warm for 25 °C (77 °F), and Hot for 40 °C (104 °F). This screen appears only if a BTS is not connected.

## Configuring Battery Characteristics and Battery Charging

Table 3-2 Battery Menu Values

Setting	Values	Default	Description
<b>Battery Temp</b> 30C	-40–65 C	n/a	Shows the battery temperature detected by the BTS. This screen appears only if a BTS is connected.
<b>Copy Setup From?</b> 0-01	All available device instances (Lower-Upper).	0-01	Enables one-step configuration of a new Charge Controller in a multi-unit installation. Select the device instance of the unit you wish to copy the setup from. This screen is hidden when no compatible devices are found.
<b>Charge Algorithm</b> 3 Stage	3 Stage, 2 Stage	3 Stage	Selects the charging algorithm—3 Stage (Bulk/Absorption/Float) or 2 Stage (Bulk/Absorption/No Float).

## Setting a Custom Battery Type

**CAUTION: Equipment damage**

To avoid damaging your batteries during charging or equalization, consult your battery manufacturer and associated documentation before setting a custom battery type.

The Custom Battery menu allows you to adjust charging and equalization voltage for batteries whose specifications fall outside of the default settings for the battery types the Charge Controller offers.

You can also adjust the temperature compensation constant for the Battery Temperature Sensor on the Custom Battery menu.

**Important:** All settings for configuring a custom battery type are based on the default settings for a Flooded battery type.

The following table describes the options available on the Custom Battery menu.

**Table 3-3** Custom Battery Menu Values

Setting	Values	Default	Description
<b>Equalize Voltage</b> <b>16.0V</b>	12V battery: 10.0–16.0V 24V battery: 20.0–32.0V 36V battery: 30.0–48.0V 48V battery: 40.0–64.0V 60V battery: 50.0–72.0V	16.0V 32.0V 48.0V 64.0V 72.0V	Selects the equalization voltage (consult your battery manufacturer for equalization voltage setting).
<b>Absorb Voltage</b> <b>14.4V</b>	12V battery: 10.0–16.0V 24V battery: 20.0–32.0V 36V battery: 30.0–48.0V 48V battery: 40.0–64.0V 60V battery: 50.0–72.0V	14.4V 28.8V 43.2V 57.6V 72.0V	Sets the bulk/absorption voltage for a custom battery type.
<b>Float Voltage</b> <b>13.5V</b>	12V battery: 10.0–16.0V 24V battery: 20.0–32.0V 36V battery: 30.0–48.0V 48V battery: 40.0–64.0V 60V battery: 50.0–72.0V	13.5V 27.0V 40.5V 54.0V 67.5V	Sets the float voltage for a custom battery type.
<b>Exit to Bulk</b> <b>12.5V</b>	12V battery: 10.0–16.0V 24V battery: 20.0–32.0V 36V battery: 30.0–48.0V 48V battery: 40.0–64.0V 60V battery: 50.0–72.0V	12.5V 25.0V 37.5V 50.0V 62.5V	Sets the battery voltage trigger point for a custom battery type to transition the charger state from Float back to Bulk, or from Absorption back to Bulk.

## Configuring Battery Characteristics and Battery Charging

Table 3-3 Custom Battery Menu Values

Setting	Values	Default	Description
<b>Tsensor Comp</b> <b>-27mV/degC</b>	12V battery: -45–0mV per degC 24V battery: -90–0mV per degC 36V battery: -135–0mV per degC 48V battery: -180–0mV per degC 60V battery: -225–0mV per degC	-27mV -54mV -81mV -108mV -135mV	Battery temperature compensation for a custom battery type. This setting is the reference that the BTS uses to adjust the charging voltage when the temperature falls above or below 25 °C. See “Battery Temperature Compensation”.

**CAUTION: Equipment damage**

The Charge Controller is incapable of determining battery type and cannot warn against or disallow incorrect settings. The settings for bulk, float and equalization charge must be checked carefully against the battery specifications. Incorrect settings may damage the battery or shorten battery life.

**Battery Temperature Compensation**

When battery charging voltages are compensated based on temperature, the charge voltage will vary depending on the temperature around the batteries.

Temperature compensation can be accomplished automatically by using a BTS. The BTS attaches directly to the side of one of the batteries in the bank and provides precise battery temperature information.

See “Installing the Battery Temperature Sensor” on page 2–27 for detailed instructions on how and where to install the BTS.

If a BTS is installed, the charge controlling process will be automatically adjusted for the battery temperature. The Charge Controller uses the following coefficients to adjust the charging voltage:

- **Flooded Lead-Acid and Gel-Type Batteries (12 V nominal):**  
-27 mV per degree Celsius
- **Absorbed Glass Mat (AGM)-Type Batteries (12 V nominal):**  
-21 mV per degree Celsius

If using a BTS, when the battery temperature drops below 77 °F (25 °C), the regulation voltage setting automatically increases. When the temperature rises above 77 °F (25 °C) the regulation battery voltage setting automatically decreases.

If a BTS is not installed, you can configure the Charge Controller to use one of three temperature compensated charge settings:

- Cold—50 °F (10 °C)
- Warm—77 °F (25 °C)
- Hot—104 °F (40 °C)

If significant seasonal variations are common in your area, you will have to change the settings during the year to ensure optimal battery charging.

## Configuring Charge Controller Input

On the Input Menu you can disable automatic maximum power point tracking and configure the reference voltage level the Charge Controller operates from. Configuring the reference voltage is not required for normal operation, but can be useful for non-PV applications or for testing purposes.

The Input Menu is an advanced menu item. To display the Input Menu, go to the Display Menu, view the Display Mode screen and select Advanced. See “Configuring the LCD” on page 3–21.



## Configuring Charge Controller Input

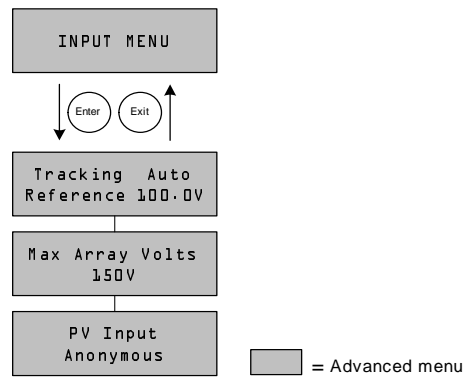


Figure 3-4 Input Menu

Table 3-4 Input Menu Values

Setting	Values	Default	Description
Tracking Auto Reference 100.0V	Auto, Manual 0.0–130.0V	Auto 100.0V	<b>Line 1:</b> Enables (Auto) or disables (Manual) MPPT. <b>Line 2:</b> When tracking is set to Manual, you can select the reference voltage the Charge Controller operates from. When tracking is set to Auto, the reference voltage updates to reflect tracking activity.
Max Array Volts 150V	0–200	n/a	Records the maximum input voltage from the array during the lifetime of the Charge Controller. You cannot reset this screen.
PV Input	Anonymous, Solar Array 1–16	Anonymous	Sets the input association for the Charge Controller.

## Configuring the Auxiliary Output

The Aux Menu allows you to enable and configure the auxiliary output. The auxiliary output provides between 5 Vdc and 13 Vdc (configurable) at 200 milliamps to power a relay, indicator light or alarm.

The Aux Menu is an Advanced Menu item. To display the Aux Menu, go to the Display Menu, view the Display Mode screen and select Advanced. See “Configuring the LCD” on page 3-21.

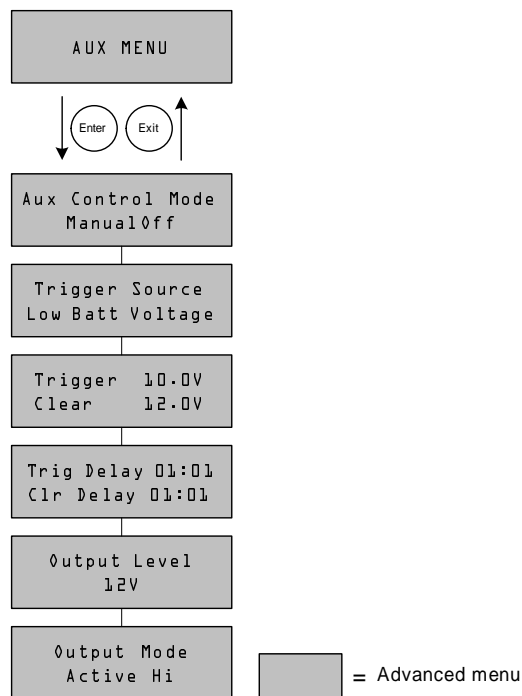


Figure 3-5 Aux Menu

## Configuring the Auxiliary Output

Table 3-5 Aux Menu Values

Setting	Values	Default	Description
<b>Aux Control Mode</b> <b>ManualOff</b>	ManualOff, ManualOn, Automatic	Manual Off	Sets the operating mode for the auxiliary output. When set to Automatic, the auxiliary output will turn on or off according to the selected Trigger Source. You can turn the auxiliary output on or off at any time by selecting ManualOn or ManualOff.
<b>Trigger Source</b> <b>Low Batt Voltage</b>	Low Batt Voltage, Hi Batt Voltage, Hi Array Voltage, Low Batt Temp, Hi Batt Temp, Hi Heat Sink Temp, Fault	Low Batt Voltage	Selects the desired condition to activate the Aux Output.

Table 3-5 Aux Menu Values

Setting	Values	Default	Description
<b>Trigger</b> 10.0V <b>Clear</b> 12.0V	Depends on Trigger Source (see Table 3-6)		<b>Line 1:</b> Selects the battery or array voltage to activate Aux Output. If the selected Trigger Source is Hi Batt Temp, Low Batt Temp, or Hi Heat Sink Temp, this screen displays Trigger Temperature Level in degrees Celsius. <b>Line 2:</b> Selects the battery or array voltage to turn off the Aux Output. If the selected Trigger Source is Hi Batt Temp, Low Batt Temp, or Hi Heat Sink Temp, this screen displays Clear Temperature Level in degrees Celsius.
<b>Trig Delay</b> 00:00 <b>Clr Delay</b> 00:00	00:00–60:59 (mm:ss format)	00:00	<b>Line 1:</b> Selects how long the selected trigger source must be active before the Aux Output activates. This can avoid unnecessary triggering by momentary loads. <b>Line 2:</b> Selects how long the trigger condition must remain inactive before the Aux Output turns off.
<b>Output Level</b> 12V	5V–13V	12V	Selects the active high auxiliary output voltage (the active low output voltage is 0 V).

## Configuring the Auxiliary Output

Table 3-5 Aux Menu Values

Setting	Values	Default	Description
<b>Output Mode</b> <b>Active Hi</b>	Active Hi, Active Lo	Active Hi	Sets the mode (polarity) of the aux output. When Active Hi is selected, the aux output turns on when the trigger source is present. When Active Lo is selected, the aux output turns off when the trigger source is present.

**Important:** If the selected Trigger Source is Low Batt Voltage or Hi Batt Voltage, changing the nominal battery voltage setting will reset the Trigger Voltage Level and Clear Voltage Level settings to their default values.

---

## Trigger Source Descriptions

**Low Batt Voltage** Activates the auxiliary output when the battery voltage falls below the Low Batt Voltage setting for the trigger delay time. Deactivates the auxiliary output when the battery voltage rises above the Clear setting for the Clear Delay time. Use this setting if you want the auxiliary output to control a relay to disconnect loads from a battery that is nearly discharged, or to activate a low-battery-voltage alarm such as a buzzer or light.

**Hi Batt Voltage** Activates the auxiliary output when the battery voltage rises above the Hi Batt Voltage setting for the trigger delay time. Deactivates the auxiliary output when the battery voltage falls below the Clear setting for the Clear Delay time. This setting is useful for:

- installations that have another external charging source such as a wind generator or hydro generator connected directly to the batteries. The Charge Controller auxiliary output can control a relay to disconnect the external charging source from the battery when the battery is in danger of being overcharged, or control a relay to turn on a diversion load.
- activating a high-battery-voltage alarm such as a buzzer or light.
- activating a vent fan to disperse hydrogen from the battery compartment when the batteries reach their gassing voltage.

**Hi Array Voltage** Activates the auxiliary output when the PV array voltage rises above the Hi Array Voltage setting for the trigger delay time. Deactivates the auxiliary output when the PV array voltage falls below the Clear setting for the Clear Delay time. Use this setting if you want the auxiliary output to control a series latching relay to disconnect the PV array from the Charge Controller or trigger an alarm when the PV array voltage exceeds the trigger setting (the Charge Controller maximum input voltage is 140 Vdc).

## Configuring the Auxiliary Output

**Low Batt Temp** Activates the auxiliary output when the battery temperature falls below the Low Batt Temp setting for the trigger delay time. Deactivates the auxiliary output when the battery temperature rises above the Clear setting for the Clear Delay time. Battery temperature is measured with a battery temperature sensor. Do not use this setting if a battery temperature sensor is not installed. With this setting, the auxiliary output can turn on an indicator alarm if the batteries are too cold. A battery with frozen electrolyte will not accept a charge.

**Hi Batt Temp** Activates the auxiliary output when the battery temperature rises above the Hi Batt Temp setting for the trigger delay time. Deactivates the auxiliary output when the battery temperature falls below the Clear setting for the Clear Delay time. Battery temperature is measured with a battery temperature sensor. Do not use this setting if a battery temperature sensor is not installed. With this setting, the auxiliary output can turn on a fan to cool the battery compartment.

**Hi Heat Sink Temp** Activates the auxiliary output when the Charge Controller heat sink temperature rises above the Hi Heat Sink setting for the trigger delay time. Deactivates the auxiliary output when the heat sink temperature falls below the Clear setting for the Clear Delay time. With this setting, the auxiliary output can turn on an external fan to cool the heat sink.

**Fault** Activates the auxiliary output when a fault occurs. This setting can be used to turn on an alarm or indicator light. When Fault is selected as the trigger source, there is no programmable trigger level or clear level. You also cannot select a specific fault as an auxiliary output trigger.

## Trigger Source Configurable Ranges

This table contains the available configuration ranges and default settings for each Trigger Source. The units, whether voltage or temperature, vary according to the Trigger Source selected. If the selected Trigger Source is a Battery Voltage, the range also varies according to the nominal battery voltage of your system.

**Important:** Changing the Trigger Level resets the auxiliary output. If an auxiliary output trigger is active, changing the trigger level will clear the trigger.

**Table 3-6** Trigger Source Configuration Ranges

Trigger Source	Range	Default Trigger	Default Clear
<b>Low Batt Voltage</b>	12V battery: 5–13V	11V	12V
	24V battery: 10–26V	22V	24V
	36V battery: 15–39V	33V	36V
	48V battery: 20–52V	44V	48V
	60V battery: 25–65V	55V	60V
<b>Hi Batt Voltage</b>	12V battery: 12–16V	14V	13V
	24V battery: 24–32V	28V	26V
	36V battery: 36–48V	42V	39V
	48V battery: 48–64V	56V	52V
	60V battery: 60–80V	70V	65V
<b>Hi Array Voltage</b>	10–145V	140V	130V
<b>Hi Batt Temp</b>	30.0–60.0 C	45.0 C	35.0 C
<b>Low Batt Temp</b>	-30.0–10.0 C	0.0 C	5.0 C
<b>Hi Heat Sink Temp</b>	50–95 C	75 C	70 C





**Table 3-7 Display Menu Values**

Setting	Values	Default	Description
<b>Contrast</b> 5 <b>Brightness</b> 8	1–9 1–9	5 8	<b>Line 1:</b> Adjusts screen contrast. <b>Line 2:</b> Adjusts backlight brightness.
<b>Backlight Hold</b> <b>5sec</b>	0, 5sec, 10sec, 30sec, 1min, Always On	5 sec	Adjusts how long the backlight stays on after the last key press. When 0 is selected, the backlight never turns on. <sup>a</sup>
<b>Custom Screen 1</b> <b>Menu</b>	n/a	n/a	Allows you to define a custom screen. Press Enter to enter Custom Screen text.
<b>Custom Screen 2</b> <b>Menu</b>	n/a	n/a	Allows you to define a custom screen. Press Enter to enter Custom Screen text.
<b>Scroll Screens</b> <b>Yes</b>	Yes, No	No	Sets the home screens to scroll automatically (once every 4 seconds).
<b>Display Mode</b> <b>Basic</b>	Basic, Advanced	Basic	Displays basic or advanced configuration menus.

a.Note: It is not recommended to leave the Backlight Hold setting at “Always On” for extended periods of time. The backlight consumes an extra 0.5 W of power from the battery. As well, turning the backlight off when not in use increases the lifespan of the backlight.

## Device Menu

On the Device Menu you can change the operating mode of the Charge Controller and view the Charge Controller's device instance or ID. Both these activities may be necessary for service or diagnostics, or when adding another Xanbus-enabled device to the system.

The Device Menu is an advanced menu item. To display the Device Menu, go to the Display Menu, view the Display Mode screen and select Advanced.

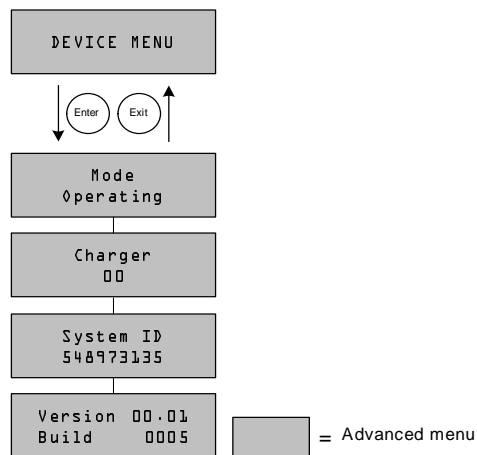


Figure 3-7 Device Menu

**Table 3-8** Device Menu Values

Setting	Values	Default	Description
<b>Mode</b> <b>Operating</b>	Operating, Standby	Operating	<b>Operating</b> is the normal mode for the unit. <b>Standby</b> disables the output by disconnecting the main power circuit from the battery. The unit cannot charge. The unit still draws some power from the battery to operate. The LCD stays on.
<b>Charger</b> <b>00</b>	00 to 31	00	Displays the device instance for the Charge Controller. This instance or ID is selected when the unit is first powered up, and uniquely identifies the unit in a multiple-unit networked installation.
<b>System ID</b> <b>548973135</b>	n/a	n/a	Xanbus system ID.
<b>Ver</b> <b>01.00</b> <b>Build</b> <b>0005</b>	n/a	n/a	Firmware version and firmware build number. This screen is identical to the screen shown at startup.

## Resetting to Factory Defaults

## Resetting to Factory Defaults

On the Reset Menu you can restore factory default settings. The Reset Menu is an advanced menu item. To display the Reset Menu, go to the Display Menu, view the Display Mode screen and select Advanced.

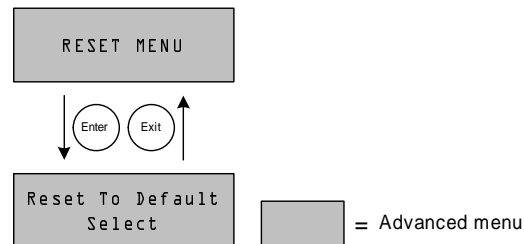


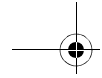
Figure 3-8 Reset Menu

Table 3-9 Reset Menu Values

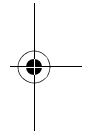
Setting	Values	Default	Description
Reset to Default Select	Select, Aux, All	Select	Returns configurable settings to factory defaults. <b>Select</b> is a prompt to select a value. You must select this before selecting a set of values to reset. <b>Aux</b> resets all values on the Aux Menu. <b>All</b> resets all configurable values to factory defaults.

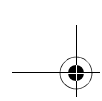
Selecting All resets all of the:

- Configurable battery/charger settings
- Configurable Auxiliary Output settings
- Configurable display settings (including contrast, backlight brightness, and scrolling screens)
- Daily and monthly history log entries
- Custom LCD screens



- 
- Total production readings for the unit (not including the lifetime production values).

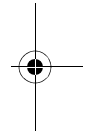




# 4 Operation

Chapter 4 contains information about the operation of the Solar Charge Controller.

For Information on:	See:
“Viewing Operating Status”	page 4–2
“Monitoring Charge Controller Operation”	page 4–9
“Battery Equalization”	page 4–17



---

## Viewing Operating Status

The Charge Controller has four buttons and a 2-line, 16 character liquid crystal display (LCD) for configuration and displaying system information and operating status.

- When in Charge Control mode the LCD shows the output power, voltage and current (and additional information as shown in Figure 4-1 on page 4–3).
- When a fault condition exists, the LCD shows “Fault Active.”
- When battery equalization is taking place, the LCD shows “Equalization Pending” (when bulk/absorption charging prior to equalization) and “mm:ss remaining” while applying the equalization charge.

## LCD Screens and What They Mean

The front panel display shows different message screens during startup and normal operations. Figure 4-1 shows the sequence in which the Startup and Operating screens are displayed or can be viewed.

All of these message screens are described in more detail in the following sections.



## Viewing Operating Status

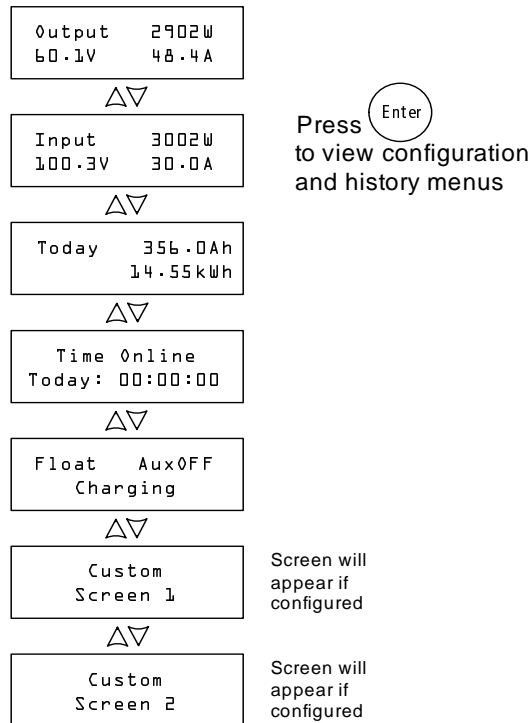


Figure 4-1 Operating Screens

## Normal Operation

All readings on the Charge Controller LCD are refreshed every two seconds. A default top-level display is available at all times (see Table 4-1). The additional screens can be displayed by pressing the down arrow or up arrow button. You can also configure the Charge Controller to scroll through each operating screen in sequence (changing every four seconds). See “Configuring the LCD” on page 3–21.

**Table 4-1 Default Operation Screen**

Display <sup>a</sup>	Description
Output 2902W 60.1V 48.4A	Power being produced by the Charge Controller now. Measured output voltage and output current.

*a. all numbers in this table and following tables are examples only. Your unit's details and performance data will vary.*

If there is sufficient energy from the PV array, the default operation screen is displayed while the Charge Controller is charging or not charging (in a “no float” state).

When more than one Charge Controller is installed, the default operation screen appears as shown in Table 4-2.

**Table 4-2 Multi-Unit Default Operation Screen**

Display	Description
System 23825W 55.6V 428.5A	Power being produced by the system now. Total measured output voltage and output current of all units in the system.

You can view more operation screens by pressing the down arrow button. The screens appear in the order shown in Table 4-3.

Each screen is displayed for a maximum of 30 seconds. If you do not press a button during that time period, the LCD shows the default operation screen again.

## Viewing Operating Status

Table 4-3 Other Operation Screens

Display	Description
<b>System</b> 4500Ah <b>Today</b> 247.5kWh	Accumulated amp-hours and kilowatt-hours produced by multiple Charge Controllers today. This screen appears only when multiple Charge Controllers are installed in a network.
<b>Input</b> 3002W 100.3V 30.0A	Measured input power, voltage, and current.
<b>Today</b> 356.0Ah 22.5kWh	Accumulated amp-hours and kilowatt-hours produced today by the individual unit.
<b>Time Online</b> <b>Today:</b> 00:00:00	Time the unit has been producing power today, in hours, minutes, and seconds.
<b>Float</b> AuxOFF <b>Charging</b>	This Status screen changes according to the state of the Charge Controller. <b>Line 1:</b> Charge state and auxiliary output state (ON or OFF). See “Charging States” on page 4-6. <b>Line 2:</b> Dynamic text that changes depending on charging state, warning or fault status, or equalization mode. See “Dynamic Text” on page 4-7. When equalizing, when a fault or warning is active, or when input voltage is low, this screen replaces the top-level default operation screen.
<b>Custom Screen 1</b>	User-defined custom screen text (configured on the Display Menu). This screen only appears if it has been configured.
<b>Custom Screen 2</b>	User-defined custom screen text (configured on the Display Menu). This screen only appears if it has been configured.

## Charging States

The charging states displayed on the LCD are described in Table 4-4.

**Table 4-4** Charging States

Text	Description
Bulk	Batteries are charging at the maximum current output of the DC source. If the Charge Controller shuts down because of low input voltage, the unit restarts in Bulk mode. This means the Charge Controller starts in bulk at the beginning of every day, regardless of the present battery voltage. If the batteries are charged already, the bulk/absorption cycle finishes after a short period and the unit transitions to float/no float (depending on Charge Algorithm configuration).
Absorb	The Charge Controller continues to deliver its maximum available current output until the battery voltage reaches the absorption voltage setting. The Charge Controller holds the battery voltage at the absorption voltage setting and the current gradually declines as the battery capacity is reached.
Float	Battery voltage is held at the float voltage setting. When battery voltage drops below the exit to bulk voltage setting for a cumulative period of 1 minute, a new bulk cycle will be triggered.
No Float	The charger does not output any power during this stage. When battery voltage drops below the Exit to Bulk voltage setting for a cumulative period of 1 minute, a new bulk cycle is triggered.
Equalize	A deliberate overcharge designed to return each battery cell to optimum condition by reducing sulfation and stratification in the battery. An equalization charge lasts one hour. When the charge mode is Equalize, this screen becomes the top-level screen. The screen displays the equalization time remaining in minutes and seconds.
ChgrOff	No charging is occurring because the input power from the PV array has fallen below the battery voltage.

## Viewing Operating Status

**Dynamic Text**

The text that appears on the second line of the charge mode screen is described in Table 4-5.

**Table 4-5** Dynamic Text

<b>Text</b>	<b>Appears When...</b>
Charging	The charge state is Bulk, Absorb, or Float.
Not Charging	Two-stage charging is selected and the Charge Controller is in the No Float stage.
Warning Active	A warning condition is present (see Active Faults and Warnings screen). For more information about the warning, press Enter to view the Active Faults and Warnings screen.
Fault Active	A fault condition is present (see Active Faults and Warnings screen). For more information about the fault, press Enter to view the Active Faults and Warnings screen.
Equalize Due	The Equalize Reminder is set and the equalize reminder time has elapsed.
Equalize Pending	Equalization is activated, but equalization has not begun because the unit is still in bulk or absorption.
mm:ss Remaining	Equalization has begun, indicating how much time remains until equalization is complete.
Standby Mode	The MPPT is off because the Charge Controller has entered Standby mode through the Device Menu.
Hibernate	The MPPT is off and Xanbus communications have stopped because the Charge Controller has entered Hibernate mode through the Device Menu.
Restart Pending	The Charge Controller is ready to restart but waiting for the timeout period to expire. This condition is normally only observed at dusk and dawn.

**Table 4-5 Dynamic Text**

Text	Appears When...
Low Light	The Charge Controller cannot charge because the input voltage from the PV array is less than the battery voltage. <sup>a</sup> The Low Light message can appear during any charging state.
Thermal Derating	The Charge Controller is thermally derating its output because its internal temperatures have exceeded their recommended levels. This condition should only happen if the unit is operating at full power and the ambient temperature around the unit is very high (exceeding 45 °C).

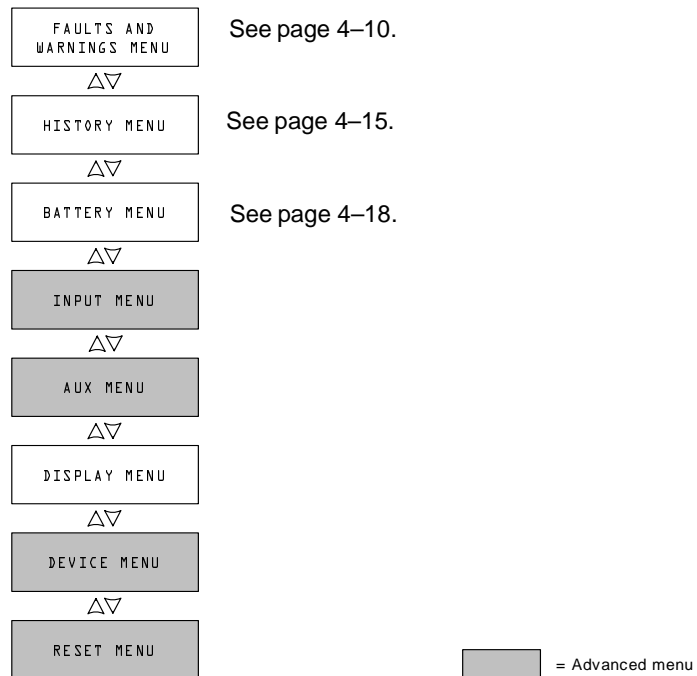
a.battery voltage plus a factor of 0.25 V per 12 V. For example, in a 24 V system, if the battery voltage is 27.0 V and the PV array is producing 27.4 V, the Low Light message appears. The Low Light message clears when the input voltage rises above the battery voltage plus a factor of 1 V per 12 V.

## Monitoring Charge Controller Operation

## Monitoring Charge Controller Operation

During operation, you may want to view Active Fault and Warning messages and logged power production data. This information is available on the configuration and history menus.

To view configuration and history menus, press Enter from any Operating screen.



**Figure 4-2** Configuration and History Menus

---

## Viewing Active Faults and Warnings

You can view active faults and warnings from the Faults and Warnings Menu.

Warning messages indicate a problem that could affect normal operation. “Warning Active” appears on the LCD to notify you of the warning condition. Normal operation continues until the warning condition:

- clears and normal operation continues
- escalates to a fault condition.

Fault messages indicate a fault condition. When a fault occurs, the Charge Controller:

- displays “Fault Active” on the LCD
- disables the MPPT and charging functions
- opens the relay that connects its power circuits to the battery bank.

The only fault that does not disable normal Charge Controller operation is the Auxiliary Output Overload Fault. The Auxiliary Output Overload Fault only disables the auxiliary output. Other Charge Controller functions continue operating.

Most warnings and faults clear automatically once the condition that caused them goes away. The only exceptions are the Auxiliary Output Overload Fault and the Ground Fault. The Auxiliary Output Overload Fault must be cleared manually. The Ground Fault requires you to correct the ground fault and restart the system. For more information, see Troubleshooting.

### **To view the complete list of active faults and warnings:**

1. Press Enter on the Active Faults and Warning Menu screen.
2. Press the down button to view additional fault or warning messages.



## Monitoring Charge Controller Operation

If there are no active faults and warnings, no messages are displayed after you press Enter from the Active Faults and Warnings screen.

### To manually clear a fault:

1. Identify the active fault from the active fault and warning list.
2. On the Faults and Warnings Menu, press the down arrow to view the Clear Fault screen.
3. Press Enter to view the cursor.
4. Press the down arrow to select the Fault you need to clear.

The two faults you can manually clear are “Aux Output Ovld” and “Batt Under Volt.” See Table 4-6 for descriptions of these faults.

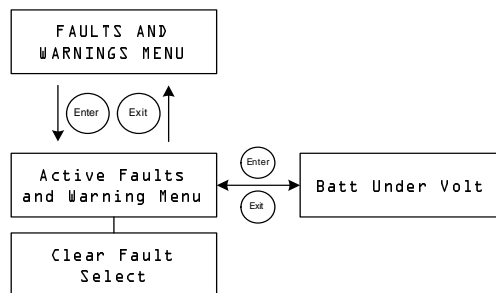


Figure 4-3 Faults and Warnings Menu

**Table 4-6** Fault and Warning Messages

Display	Description
<b>Input Over Voltage Warning</b>	During operation, the Charge Controller continuously monitors the voltage flowing through it. If the voltage exceeds 137 Vdc ( $\pm 1$ V) for one second, the Charge Controller displays a warning message. The warning clears itself when the voltage falls to 134 Vdc for 1 second.
<b>Input Over Voltage Fault</b>	During operation, the Charge Controller continuously monitors the input voltage. If the voltage exceeds 142 Vdc ( $\pm 1$ V) for one second, the Charge Controller registers a fault condition. The detection circuitry is faster than breakers or fuses, and they will not trip or blow when a fault occurs. The fault clears itself when the voltage falls to 140 Vdc for 1 second.
<b>Battery Over Voltage Fault</b>	<p>Battery Over Voltage Fault appears when the battery voltage becomes abnormally high and the Charge Controller stops charging to protect the batteries. The fault occurs when battery voltage rises above the nominal voltage</p> <ul style="list-style-type: none"> <li>• plus 4.5 V per 12 V (for example, above 33 V in a 24 V system) for 1 second.</li> <li>• plus 5.5 V per 12 V for 20 milliseconds.</li> </ul> <p>The fault clears when battery voltage falls to the nominal voltage plus 3.5 V per 12 V for 2 seconds.</p>

## Monitoring Charge Controller Operation

Table 4-6 Fault and Warning Messages

Display	Description
<b>Battery Under Volt</b>	<p>Battery Under Voltage Fault appears when the battery voltage falls to the nominal battery voltage, minus 4 V per 12 V (for example, below 32 V in a 48 V system) for 1 second. The fault clears when battery voltage rises to the nominal battery voltage, minus 3 V per 12 V for 2 seconds. You can also clear this fault manually.</p> <p>The Battery Under Voltage fault notifies you if the Charge Controller is configured with the incorrect battery voltage.</p> <p>If this fault appears, check that the “Battery Voltage” setting is correct for your system. If the Battery Voltage setting is incorrect, correct the setting under the Battery Menu. When battery voltage is set properly, the fault will clear itself.</p> <p>If the battery voltage setting is already correct, then the batteries are excessively discharged. In this case, you can manually clear the fault and let the Charge Controller charge the batteries when sufficient solar power is available. You can also shut off any loads connected to the system and charge the batteries with another charger.</p>
<b>Output Over Current Fault</b>	<p>Output Over Current Fault appears when the output current rises above approximately 90 A.</p> <p>The fault clears when output current falls below 5 A for three seconds.</p>
<b>Unit Over Temperature Flt</b>	<p>The Charge Controller monitors its internal temperatures to protect components from high temperature damage. If the internal temperatures rise above 203 °F (95 °C) while operating in Charge mode, the Charge Controller registers a fault and stops producing power. The fault clears when the internal temperature falls to 185 °F (85 °C) for at least 10 seconds.</p>
<b>Battery Over Temperature Flt</b>	<p>Battery Over Temp Fault appears when the battery temperature reaches 140 °F (60 °C). The fault clears when the battery temperature falls to 131 °F (55 °C).</p>

**Table 4-6 Fault and Warning Messages**

Display	Description
<b>Battery Under Temperature Flt</b>	Battery Under Temp Fault appears when the battery temperature reaches $-13^{\circ}\text{F}$ ( $-25^{\circ}\text{C}$ ). The fault clears when the battery temperature rises to $-4^{\circ}\text{F}$ ( $-20^{\circ}\text{C}$ ).
<b>Battery Setup Conflict Fault</b>	Battery Setup Conflict Fault appears when you have configured: <ul style="list-style-type: none"><li>• more than one charging device on the same battery bank with an inconsistent nominal battery voltage setting</li><li>• an inconsistent battery type setting.</li></ul>
<b>Aux Output Ovld</b>	Auxiliary Output Overload Fault. This fault appears when too much current is being drawn from the auxiliary output. The fault triggers when the auxiliary output voltage falls more than 1 V below the auxiliary output voltage for three seconds.
<b>Ground Fault</b>	Ground Fault appears when a ground fault causes the ground fault protection (GFP) fuse to blow. The Ground Fault message clears after system power is removed, the ground fault is corrected, the GFP fuse is replaced, and system power is restored. See Troubleshooting.

## Monitoring Charge Controller Operation

## Viewing Logged System Data

The Charge Controller stores accumulated operating data for viewing on the History menu. You can also reset some of the logged data on the History menu.

On the History Menu you can view logs for daily, monthly, or lifetime power production.

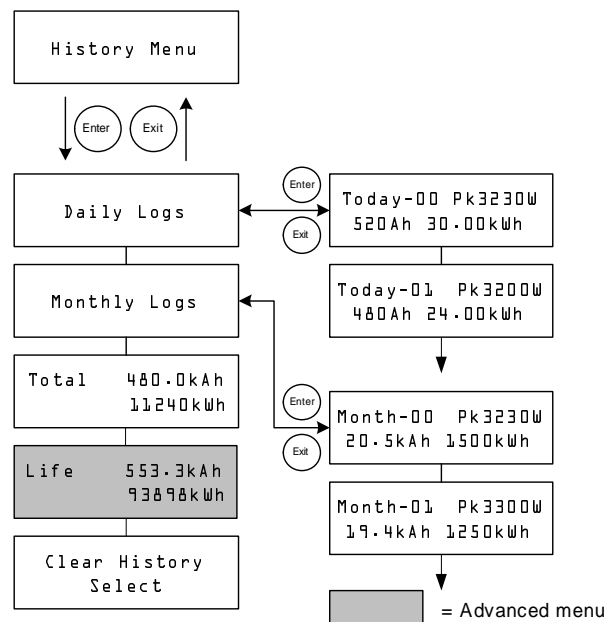


Figure 4-4 History Menu

Table 4-7 History Menu Items

Item	Description
<b>Basic Menu</b>	
<b>Daily Logs</b>	Press Enter to view the Daily logs (see page 4-16). Each Daily log contains the day's accumulated Watt-hours, Amp-hours, and the peak watts recorded that day.

**Table 4-7 History Menu Items**

Item	Description
<b>Basic Menu</b>	
<b>Monthly Logs</b>	Press Enter to view the Monthly logs (see page 4–17). Each Monthly log contains 30 days of accumulated Watt-hours, Amp-hours, and the peak watts recorded during that 30-day period.
<b>Total</b> 480.0kAh 411240kWh	Displays the total Amp-hours and kilowatt-hours produced since the last screen reset. You can reset these totals by selecting Total on the Clear History screen.
<b>Life</b> 553.3kAh 93898kWh	Displays the total kilo-amp-hours and kilowatt-hours produced since installation. These totals cannot be reset.
<b>Clear History Select</b>	Resets logged information to zero. Options available are Daily Logs, Monthly Logs, Total, All. You can clear all the daily logs and all monthly logs. You cannot clear logs for individual days and months.

## Daily Logs

To view the daily logs stored in memory, press Enter from the Daily Logs screen, then press the down arrow button to view each log, starting with the most recent. On the log screen, the current day is “Today–00,” yesterday is “Today–01,” and so on. See Figure 4-4.

The Charge Controller stores up to 30 daily logs. After 30 days, the oldest daily log is overwritten with the newest log.

After logging 30 daily logs, the Charge Controller totals the collected data and creates a new monthly log.

## Battery Equalization

### Monthly Logs

To view the monthly logs stored in memory, press Enter from the Monthly Logs screen, then press the down arrow button to view each log, starting with the current month. On the log screen, the current month is “Month–00,” the previous month is “Month–01,” and so on. See Figure 4-4.

Monthly logs consist of the total data from the previous 30 daily logs. To the Charge Controller, a “month” is a 30-day period, and does not match the months of the calendar.

The Charge Controller stores up to 12 monthly logs. After 12 months the oldest monthly log is overwritten with the newest log.

## Battery Equalization

Equalization charging is the process of deliberately charging a battery (or battery bank) at a high voltage for a set period of time to remix the electrolyte and destratify the internal plates. Equalize charging helps to remove sulfate buildup on the battery plates and balances the charge of individual cells.

Be sure to read all cautions and warnings regarding equalization charging batteries before allowing an equalization charge to occur.

---

**Important:** The Charge Controller maximum output voltage is limited to 72 V for a 60 V battery system, and so is unable to equalize a 60 V battery system.

---



### **WARNING: Explosive gases**

Equalization generates explosive gases. Ensure adequate ventilation.

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### **CAUTION: Batteries may be damaged**

Never equalize a battery more than necessary. Equalization can damage your batteries if performed too frequently or done improperly. Always check electrolyte level before *and* after equalization. Fill with distilled water according to the battery manufacturer's recommendation.

The Charge Controller enables equalization only when the battery type is set to "Flooded." Equalize mode is disabled if you have selected "GEL" and "AGM" as the battery type. As a general rule, do not equalize a battery unless there are provisions to add water to it and the manufacturer recommends equalization.



### **CAUTION: Risk of damage to DC load equipment**

The equalization voltage significantly exceeds the nominal voltage of the battery. Disconnect sensitive loads from the battery before equalizing.

Follow the battery manufacturer's recommendations for equalizing your batteries. As a guide, a heavily used flooded battery may need to be equalized once a month, and a battery in light service may only need to be equalized every two to four months.

You can set an equalization reminder on the Battery Menu. See page 3–7.

The equalization process lasts for one hour. When the equalization period had finished, the Charge Controller will return to either the float or no float charge stage.

#### **To manually begin battery equalization:**

1. From the Battery Menu screen, press Enter.
2. On the Equalize screen, select Activate.

If the battery is in the float or no float state, the Charge Controller goes back to the bulk state and goes through a full charge cycle before entering the Equalization stage. The LCD



## Battery Equalization

displays “Equalization Pending” while the Charge Controller performs this full charge cycle. The full charge cycle ensures that the batteries are fully charged before an equalization is attempted.

The Operating screen appears, indicating how much time, in minutes and seconds, remains in the equalization process.

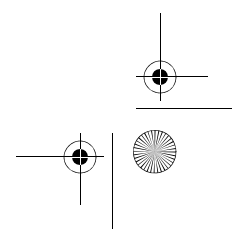
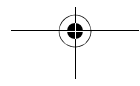
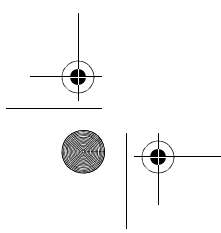
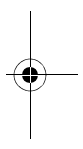
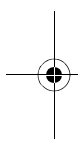
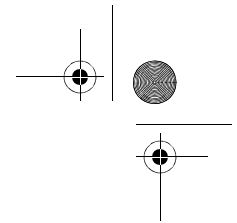
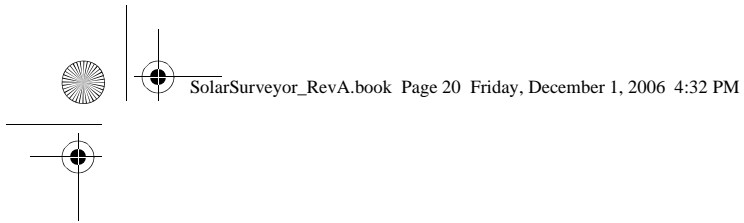
The Charge Controller applies the equalization charge for one hour. You can also stop the equalization process manually.

If conditions prevent the PV array from producing enough power for the Charge Controller to provide an equalization charge, the equalization timer continues running. If conditions continue to make it difficult to complete a full equalization charge, use another device, such as an inverter/charger, to perform battery equalization.

### **To manually stop battery equalization:**

1. From the Battery Menu screen, press Enter.
2. On the Equalize screen, select Stop.

Equalization stops, and the Charge Controller goes to either the Float or No Float stage, depending on the charge mode selected.



# 5 Troubleshooting

Chapter 5 contains information about identifying and resolving possible problems with systems using a Solar Charge Controller.

For Information on:	See:
“PV Charge Control Troubleshooting”	page 5-1

## PV Charge Control Troubleshooting

Table 5-1 lists possible problems that may arise when using the Solar Charge Controller as a PV Charge Controller.

**Table 5-1** PV Charge Control Problems

Problem	Possible Cause	Solution
The LCD shows “Low Light” under all conditions.	PV wires are connected in reverse polarity. The PV input has short circuited and input voltage is zero volts.	Verify PV polarity relative to battery negative.

**Table 5-1 PV Charge Control Problems**

Problem	Possible Cause	Solution
Uneven output current between multiple Charge Controllers.	A. Solar arrays are supplying different amounts of current to each charge controller. B. Charging set points are not all set the same. C. Excess voltage drop in wiring causing controllers to measure the battery voltage differently and regulate accordingly. D. Chargers are in Constant Voltage (absorption) mode and therefore are limiting their output current to maintain the present battery voltage. In this situation, some units will produce more output current than others.	A. Check array output, but consider that this could be a normal operating condition if the arrays are located in different locations and/or point in different directions. B. Set controllers to the same settings. C. Check wiring. Upgrading or shortening the wire run may be required. D. No need for intervention, as this is a normal operating condition.
Battery voltage is exceeding Bulk and Float settings in cold weather and not reaching settings in hot weather.	BTS is compensating charging voltages based on battery temperature.	No problem. This is the intended operation.

# A Specifications

Appendix A provides the specifications for the Solar Charge Controller.

For information on:	See:
“Electrical Specifications”	page A-2
“Environmental Specifications”	page A-3
“Optional Accessories”	page A-3
“Regulatory Approvals”	page A-3

All specifications are subject to change without notice.

## Electrical Specifications

Nominal battery voltage	12, 24, 36, 48, 60 Vdc
Maximum PV Array Voltage (Operating)	140 Vdc
Maximum PV Array Open Circuit Voltage	150 Vdc
Array Short Circuit Current	60 Adc maximum
Maximum and Minimum Wire Size in Conduit	#6 AWG to #14 AWG
Total Power Consumption	While operating: 15 mA (typical) At idle: 2.5 W (tare)
Charger Regulation Method	Three-stage (bulk, absorption, float) Two-stage (bulk, absorption)

## Derating Curve

## Environmental Specifications

## Environmental Specifications

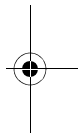
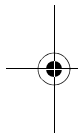
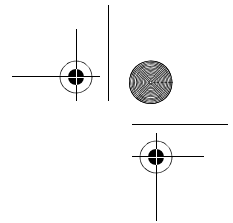
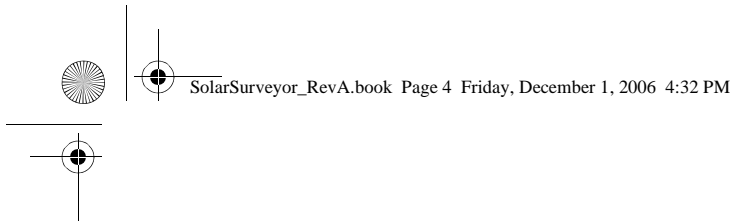
Enclosure Type	Indoor, ventilated, sheet metal chassis with $\frac{7}{8}$ " and 1" (22.22 mm and 27.76 mm) knockouts and aluminum heat sink
Operating Temperature Range (full power)	-4 to 113 °F (-20 to +45 °C)
Storage Temperature	-40 to 185 °F (-40 to +85 °C)
Altitude Limit (operating)	Sea level to 15,000 feet (4572 m) @ 15 °C
Dimensions (H × W × D)	14 ½ × 5 ¾ × 5 ½" (368 × 146 × 138 mm)
Mounting	Vertical wall mount
Weight (Controller only)	10.75 lbs (4.8 kg)
Weight (Shipping)	13.75 lbs (6.2 kg)

## Optional Accessories

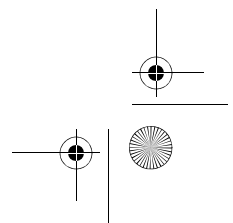
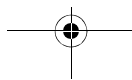
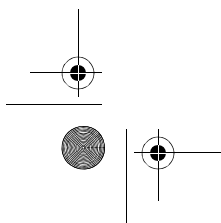
System Control Panel II	865-1050
Network cables	3 ft. (0.9 m): 809-0935 5 feet (1.5 m): 809-0936 7 feet (2.0 m): 809-0937 10 feet (3.0 m): 809-0938 14 feet (4.3 m): 809-0939 25 feet (7.6 m): 809-0940 50 feet (15.2 m): 809-0941 75 feet (22.9 m): 809-0942
Network terminators	Male (2 per pack): 809-0901 Female (2 per pack): 809-0905

## Regulatory Approvals

Certified to UL 1741 1st Edition and to CSA 107.1-01 and carries the c(CSA)us mark



A-4





# B System Control Panel Menus

Appendix B is a guide to the Charge Controller monitoring and configuration menus on the System Control Panel. The System Control Panel may be installed if the Charge Controller is part of a power management system that includes an inverter/charger.

## Using the System Control Panel II

When the Charge Controller is installed in a network-managed power system, the Charge Controller can be configured using the System Control Panel II. All the configuration items described in the Configuration chapter are also available on the System Control Panel menus.

The System Control Panel has four buttons for navigating between screens and menus and configuring the Charge Controller. See Figure B-1 and Table B-1.

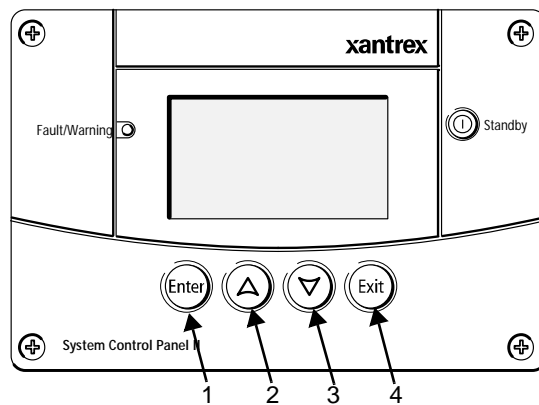


Figure B-1 System Control Panel

Table B-1 System Control Panel navigation buttons

Number	Button	Function
1	Enter	<ul style="list-style-type: none"> <li>Confirms selection of a menu item</li> <li>Moves to the next screen</li> </ul>
2	Up arrow	<ul style="list-style-type: none"> <li>Scrolls up one line of text</li> <li>Increases a selected value</li> </ul>
3	Down arrow	<ul style="list-style-type: none"> <li>Scrolls down one line of text</li> <li>Decreases a selected value</li> </ul>
4	Exit	<ul style="list-style-type: none"> <li>Cancels selection of a menu item</li> <li>Returns you to the previous screen</li> </ul>

## Using the System Control Panel II

## System Control Panel Menu Map

Figure B-2 shows how the System Control Panel screens and menus are organized. The screens and menus are described in Table B-2.

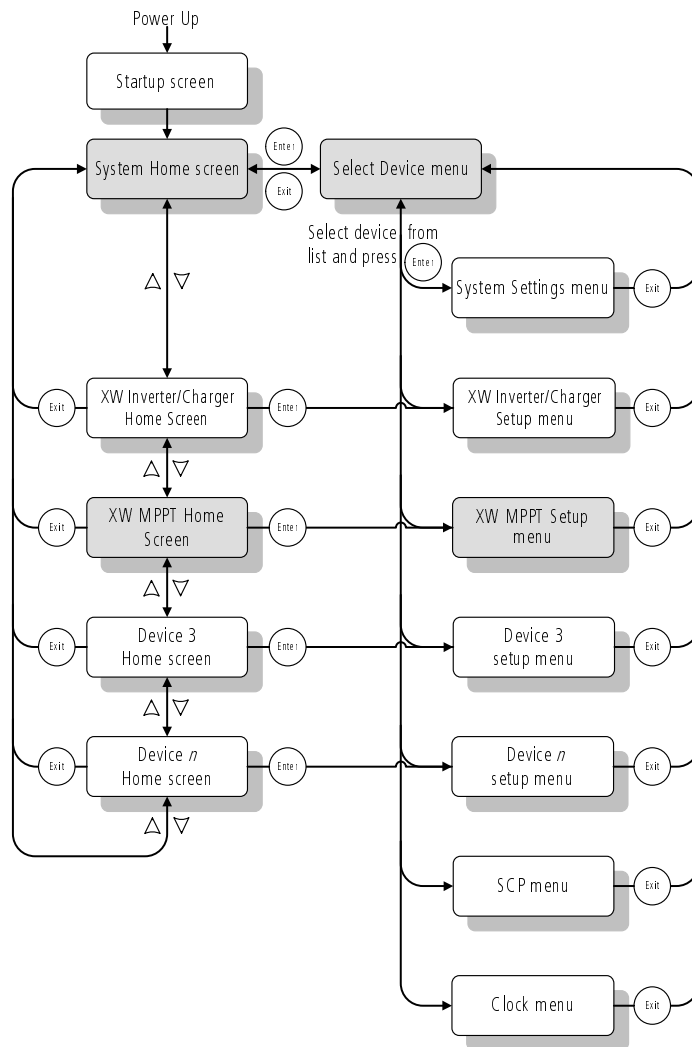


Figure B-2 System Control Panel Menu Map

**Table B-2** Screen and menu descriptions

Screen or menu	Description
Startup screen	Appears for a few seconds after the system starts up or when the system has been reset.
System Home screen	Displays status information for the power system, consisting of all Xanbus-connected devices on a single network. The System Home screen appearance varies with the status of the inverter/charger and other Xanbus-enabled devices in the power system. The System Home screen always features a “Menu” arrow pointing to the Enter button. Pressing Enter takes you to the Select Device menu.
XW MPPT (Charge Controller) Home screen	Displays status information for the Charge Controller.
Select Device menu	Displays a list of Xanbus-enabled devices in the system, including the Charge Controller and the SCP. The length of this menu depends on how many Xanbus-enabled devices are installed in the system. This menu also contains the clock menu (where you can set the time and date) and the system settings menu (where you can change system modes). The System Panel, Clock, and System Settings menus are always available from the Select Device menu, regardless of the number of Xanbus-enabled devices installed.
XW MPPT Setup menu	Displays status information and changeable settings. Changeable settings are identified by the square brackets [ ] around values in the right-hand column.

---

## Changing Settings Using the System Control Panel

If you need to change a Charge Controller setting, use the buttons on the System Control Panel to perform three basic steps:

1. View the Select Device menu.
2. Select the Charge Controller from the Select Device menu.
3. Select and adjust a changeable setting on the Charge Controller Setup menu.

Each of these three steps is described in detail in the following sections.

---

**Note:** You can also view the the Charge Controller Setup menu by pressing Enter from the Charge Controller Home screen.

---

### Viewing the Select Device Menu

The Select Device menu is where you select a Xanbus-enabled device to monitor or configure. The number of items on the Select Device menu depends on how many devices are installed in your Xanbus system.

**To view the Select Device menu:**

- u On the System Home screen, press Enter.

---

**Important:** You can always identify the System Home screen by the menu arrow in the bottom left corner of the screen. The menu arrow indicates the Enter button on the System Control Panel, which you press to view the Select Device menu.

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## Viewing the Charge Controller Setup Menu

On the Select Device menu, select the Charge Controller to view and change its settings.

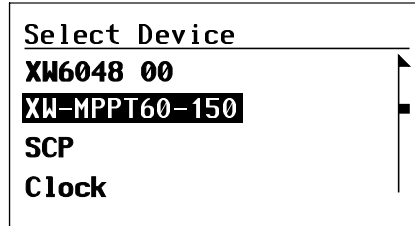


Figure B-3

**To select the Charge Controller from the Select Device menu:**

1. On the Select Device menu, use the down arrow button to highlight XW-MPPT60-150.
2. Press Enter.

The Setup menu appears.

## The Charge Controller Setup Menu

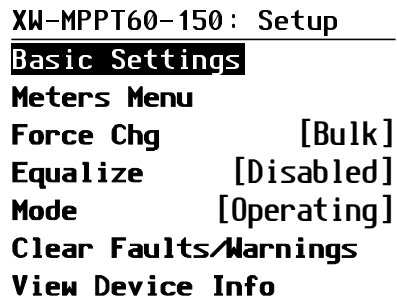
You can view the Charge Controller setup menu by pressing Enter from the Charge Controller Home screen or by selecting the Charge Controller from the Select Device menu.

---

**Important:** The Charge Controller Setup menu can be displayed in two formats: Basic and Advanced. The Basic menu is shown by default. To display the Advanced menu, press the Enter + up arrow + down arrow buttons simultaneously. The “Basic Settings” item changes to “Advanced Settings.” After configuring the Charge Controller, to prevent unintended advanced configuration, use this keypress again to hide the Advanced menu.

---

## The Charge Controller Setup Menu



```

XW-MPPT60-150: Setup
Basic Settings
Meters Menu
Force Chg      [Bulk]
Equalize      [Disabled]
Mode          [Operating]
Clear Faults/Warnings
View Device Info
  
```

Figure B-4 Charge Controller Setup Menu

Table B-3 Charge Controller Setup Menu

Menu Item	Description
Basic Settings	Displays the Charge Controller Basic or Advanced menu (to change to Advanced Settings, press Enter + up arrow + down arrow).
Meters Menu	Displays the Meters Menu.
Force Chg	
Equalize	Starts or stops battery equalization.
Mode	Selects the Charge Controller operating mode: Operating or Standby.
Clear Faults/ Warnings	Clears any active faults or warnings. If the fault or warning condition is still present, the fault or warning message may reappear.
View Device Info	Displays the Device Info screen. On the Device Info screen you can view the Warning Log, Fault Log and Event Log.

## Configure Menu

The Charge Controller Configure menu contains sub-menus for configuring:

- Multiple-unit operation
- Charger and battery settings
- Input settings
- Auxiliary output settings.

### To view the Configure menu:

- u From the Setup menu, with Configure highlighted, press Enter.

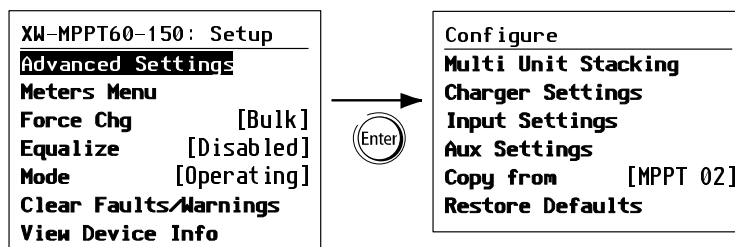


Figure B-5 Selecting the Configure Menu

For a map of all Charge Controller configuration menus, see Figure B-7 on page B-10.

Configurable settings are identified by the square brackets [ ] around the values along the right side of the screen.

### To select and change a configurable setting:

1. On the desired configuration menu, press the up arrow or down arrow button to highlight the setting you want to change.
2. Press Enter to highlight the current value of the setting.
3. Press the up arrow or the down arrow button to change the value. Hold down the button to scroll through a large range of values quickly.

The previously set value appears with an asterisk (\*) beside it.



## Configure Menu

4. Press Enter to select the value.
5. If you have another setting to change, return to step 1.

Or

If you have no more settings to change, press Exit until the SCP displays the desired screen or menu.

### To restore Charge Controller default settings:

1. On the Configure menu, select Restore Defaults.
2. Press Enter.

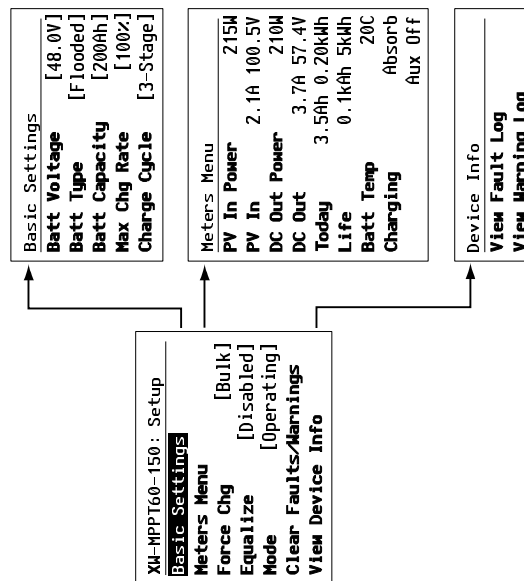


Figure B-6 Configuration Menus (Basic)

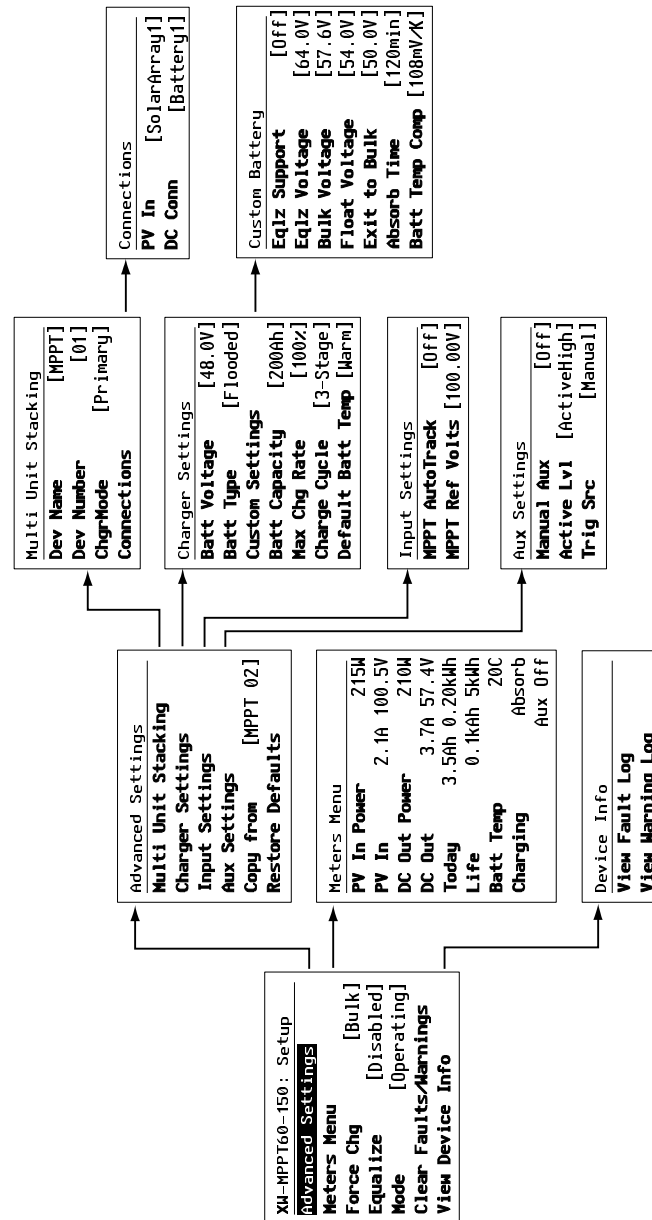


Figure B-7 Configuration Menus (Advanced)

## Monitoring the Charge Controller

You can monitor Charge Controller operation on the System Control Panel by viewing the:

- Charge Controller Home screen
- Charge Controller Meters Menu

### Charge Controller Home Screen

The Charge Controller Home screen displays real-time operational data specific to the Charge Controller.

#### To view the Charge Controller Home screen:

- u From the System Home screen, press the down arrow until the Charge Controller Home screen appears.

#### To return to the System Home screen:

- u Press the Exit button, as indicated by the “system” arrow on the Charge Controller Home screen.

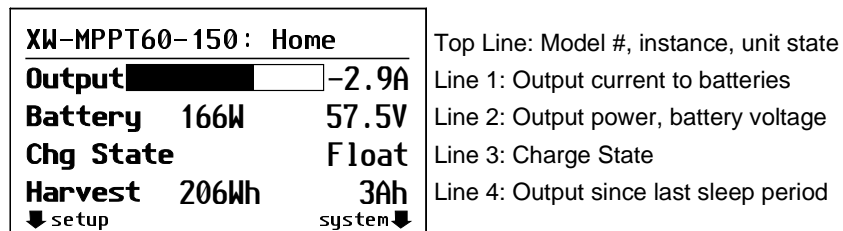


Figure B-8 Charge Controller Home Screen

The Charge Controller Home screen features a “setup” arrow pointing to the Enter button and a “system” arrow pointing to the Exit button. Pressing Enter takes you to the Charge Controller Setup menu. Pressing Exit takes you to the System Home screen.

Pressing the down arrow button takes you to the Home screens for the other Xanbus-enabled devices in the system.

## Meters Menu

You can monitor Charge Controller operation on the Meters Menu. The Meters Menu displays input and output power, battery temperature, charge stage, and total power production for that day and power production over the unit's lifetime.

You can select the Meters Menu from the Charge Controller Setup menu.

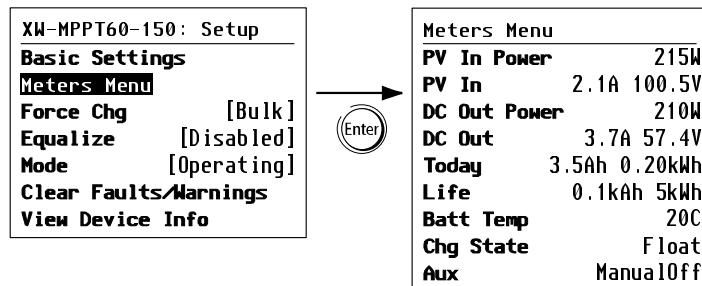


Figure B-9 Selecting the Meters Menu

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# Warranty and Product Information

## Warranty

**What does this warranty cover?** This Limited Warranty is provided by Xantrex Technology, Inc. ("Xantrex") and covers defects in workmanship and materials in your Solar Charge Controller. This warranty period lasts for 5 years from the date of purchase at the point of sale to you, the original end user customer. You require 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 also require proof of purchase.

**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)

1 360 925 5097 (direct)

Fax: 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.

IN NO EVENT WILL XANTREX BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING WHETHER IN CONTRACT OR TORT INCLUDING WITHOUT RESTRICTION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, ANY PERSONAL INJURY, ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE, OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.



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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-4.

## Return Procedure

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

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

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

## Out of Warranty Service

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

To return your Solar Charge Controller 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.

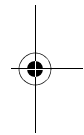
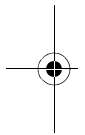
## Information About Your System

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

p	Product Number	865-1030
p	Serial Number	_____
p	Purchased From	_____
p	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.

p	Length of time product has been installed	_____
p	Battery/battery bank size	_____
p	DC wiring size and length	_____
p	Warning, Error or Panel Fault Message	_____
p	Appliances operating when problem occurred	_____
p	Description of problem	_____
		_____
		_____



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