

xantrex™

A MISSION CRITICAL ELECTRONICS BRAND



Owner's Guide

30A PWM Charge Controller 709-3024-01

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Product Name and Part Number

30A PWM Charge Controller | 709-3024-01

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IMPORTANT SAFETY INFORMATION

READ AND SAVE THIS OWNER'S GUIDE FOR FUTURE REFERENCE.

Read these instructions carefully and look at the equipment to become familiar with the device before installing, operating, configuring, maintaining, and troubleshooting it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



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



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

Table 1 Abbreviations and acronyms

AGM	Absorbent Glass Mat lead-acid battery
BTS	Battery Temperature Sensor
BMS	Battery Management System
LCD	Liquid Crystal Display
LFP, LiFePO ₄	Lithium-ion Iron Phosphate
MPPT	Maximum Power Point Tracking
PV	Photovoltaic
SOC	State-of-Charge

Product Safety Information

1. Before using the solar charge controller, read all instructions and cautionary markings on the solar charge controller's components, the batteries, and all appropriate sections of this guide.
2. Use of accessories not recommended or sold by the manufacturer may result in injury to persons, a risk of electric shock, or a risk of fire.
3. The solar charge controller is designed to be connected to your DC electrical systems. The manufacturer recommends that all wiring be done by a certified PV technician or electrician to ensure adherence to the local and national electrical codes applicable in your jurisdiction.
4. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the solar charge controller with damaged or substandard wiring.
5. Do not operate the solar charge controller if it has been damaged in any way.
6. This solar charge controller does not have any user-serviceable parts. Do not disassemble the solar charge controller except where noted for connecting wiring and cabling. See your warranty for instructions on obtaining service. Attempting to service the solar charge controller yourself may result in a risk of electrical shock or fire.
7. To reduce the risk of electrical shock, disconnect all DC power sources from the solar charge controller before attempting any maintenance or cleaning or working on any components connected to the solar charge controller.
8. Do not expose the solar charge controller to rain, snow, or liquids of any type. This product is designed for dry-locations-use only. Damp environments will significantly shorten the life of this product and corrosion caused by dampness will not be covered by the product warranty.
9. To reduce the chance of short-circuits, always use insulated tools when installing or working with this equipment.

10. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with electrical equipment.

DANGER

ELECTRICAL SHOCK AND FIRE HAZARD

Installation must be done by qualified personnel to ensure compliance with all applicable installation and electrical codes and regulations. Instructions for installing the Xantrex SOLAR 30A PWM Charge Controller are provided here for use by qualified personnel trained in Recreational Vehicle and Solar power systems.

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

WARNING

ELECTRIC SHOCK, FIRE, AND EXPLOSION HAZARD

- Do not connect the charge controller to a residential electrical system.
- Connect PV panels in parallel only. Do not connect the PV panels in series.
- Do not ground any PV conductors. The charge controller has a common negative design.
- Use the charge controller with a 12 or 24 VDC nominal battery system only.

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

CAUTION

PHYSICAL INJURY HAZARD

This Xantrex SOLAR 30A PWM Charge Controller is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Failure to follow these instructions can result in injury or equipment damage.

CAUTION

LITHIUM ION BATTERY TYPE HAZARD

Make sure to use a lithium ion battery pack that includes a certified Battery Management System (BMS) with built-in safety protocols. Follow the instructions published by the battery manufacturer.

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

NOTICE

BATTERY DAMAGE

Do not mix battery types. The charge controller can only select one battery type setting for all batteries connected to its bank. All connected batteries should either be: Sealed (AGM) or Gel or Flooded or Lithium-ion iron phosphate.

Failure to follow these instructions can result in equipment damage.

End of Life Disposal

The Xantrex SOLAR 30A PWM Charge Controller is designed with environmental awareness and sustainability in mind. At the end of its useful life, the charge controller can be decommissioned and disassembled. Components which can be recycled must be recycled and those that cannot be recycled must be disposed of according to local, regional, or national environmental regulations.

Many of the electrical components used in the Xantrex SOLAR 30A PWM Charge Controller are made of recyclable material like steel, copper, aluminum, and other alloys. These materials can be auctioned off to traditional scrap metal recycling companies who resell reusable scraps.

Electronic equipment such as the circuit boards, connectors, and fuses can be broken down and recycled by specialized recycling companies whose goal is to avoid having these components end up in the landfill.

For more information on disposal, contact Xantrex.

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1 INTRODUCTION

Thank you for purchasing the Xantrex SOLAR 30A PWM Charge Controller. The Xantrex SOLAR 30A PWM Charge Controller is a high quality, 12V or 24V solar charge controller. It is designed to take solar energy and charge a 12V or 24V battery using a 3-stage pulse width modulation (PWM) charging algorithm.

This chapter includes the following topics:

Product Features	11
Materials List	12
Unit Features	13

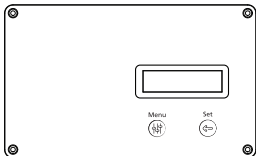
Product Features

The charge controller is equipped with the following features:

- **Employs advanced 3-stage pulse width modulation (PWM) charging algorithm** optimized for charging 12 VDC or 24 VDC nominal rated rechargeable batteries, such as:
 - Sealed (AGM)
 - GEL
 - Flooded (FLD)
 - Lithium-ion Iron Phosphate (LFP)
- **Full charging operation at a wide temperature range**, such as:
 - between -20 to 55 °C (for lead-acid batteries)
 - between 0 to 55 °C (for lithium-ion)
- **Battery temperature compensation** which works with the 30A PWM Charge Controller and the optional Remote Battery Temperature Sensor (PN: 708-0080) - charging parameters are automatically adjusted for efficient charging of the battery.
- **LCD Display** - located on the front panel of the unit and is equipped with control buttons.
- **Electronic protection** from over-charging, input overloading, and short-circuiting.

Materials List

The charge controller base package includes the following items.

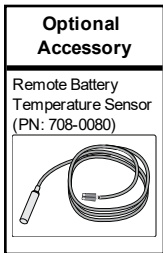


1

2



3

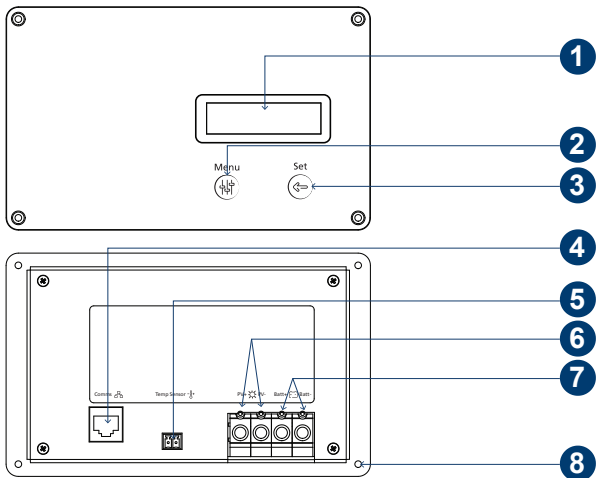


1	Xantrex SOLAR 30A PWM Charge Controller
2	Owner's Guide
3	Mounting screws (#4 x 3/8" wood screws)

NOTE: If any of the items are missing, contact Xantrex or any authorized Xantrex dealer for replacement. See *Contact Information on page 1*.

IMPORTANT: Keep the carton and packing material in case you need to return the charge controller to your authorized Xantrex dealer for replacement.

Unit Features



1	LCD display - See <i>OPERATION</i> on page 24.
2	MENU button - See <i>OPERATION</i> on page 24.
3	SET button - See <i>OPERATION</i> on page 24.
4	COM port non-functional. ⚠ Do not use.
5	BTS port - Connect the optional Remote Battery Temperature Sensor (PN: 708-0080).
6	PV - DC [+] and [-] input terminals - Connects to a PV/solar panel.
7	Battery - DC [+] and [-] output terminals - Connects to a 12V or 24V battery.
8	Mounting holes - See <i>Mounting Requirements</i> on page 18.

2 INSTALLATION

Before beginning your installation:

- Read this entire chapter so you can plan the installation from beginning to end.
- Assemble all the tools and materials you require for the installation.
- Be aware of all safety and electrical codes which must be met.

This chapter includes the following topics:

Safety Instructions	15
Wiring Requirements	16
Mounting Requirements	18
Basic Installation Steps	19

Safety Instructions

WARNING

ELECTRICAL SHOCK AND FIRE HAZARD

- All wiring should be done by qualified personnel to ensure compliance with all applicable installation codes and regulations. Design the power system using a certified recreational vehicle and PV system designer and install using a certified RV technician.
- Comply with all applicable installation codes and regulations.
- Do not connect to power sources during installation.
- Connect only PV modules of the same size and rating to build a PV array. Mixing and matching different PV modules are not recommended.

Failure to follow these instructions can result in death, serious injury, or equipment damage

NOTICE

EQUIPMENT DAMAGE

Check that the maximum open-circuit voltage of the PV array, which includes a 25% safety factor, does not exceed the charge controller's maximum PV open circuit voltage of 50V.

Failure to follow these instructions can result in charge controller damage.

Wiring Requirements

WARNING

ELECTRICAL SHOCK AND FIRE HAZARD

Make sure that wiring is in good condition and that wire is not undersized. Do not operate the solar charge controller with damaged or substandard wiring.

Failure to follow these instructions can result in death, serious injury, or equipment damage

WARNING

ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the screw terminals on the charge controller to 10.6 lb-in (1.2 N-m) torque to ensure a proper connection.

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

NOTICE

REVERSE POLARITY

- Ensure that the "+" and "-" poles on both the battery and PV are connected correctly.
- Check polarity at all terminals before making the final DC connection. Pos(+) (red) cable must connect to "+" pole; Neg (-) (black) cable must connect to "-" pole.

Failure to follow these instructions can result in non-operation of equipment.

Output power from the PV array varies depending on PV module size, connection method, or sunlight angle, the minimum wire size may be calculated using the short circuit current rating (I_{sc}^1) of the PV array. Refer to the value of I_{sc} in the manufacturer's PV module data specification sheet.

NOTE: The I_{sc} of the PV array (which includes a 25% safety factor) must not exceed the charge controller's maximum PV input current of 30A.

Refer to *Table 2* for sizing PV and battery wires.

Table 2 Wiring Sizes

	Maximum PV input current	Minimum Wire Size	Maximum Wire Size
PV Wiring (rated for PV/solar applications per local codes and also fit the terminals)	30A	10AWG	6AWG
Battery Wiring	30A	10AWG	6AWG

¹ Multiplied by 125 % per the NEC, Article 690

Mounting Requirements

WARNING

ELECTRICAL SHOCK AND FIRE HAZARD

Do not cover or obstruct ventilation openings and/or heat sink. Do not mount in a zero-clearance compartment. Overheating may result.

Failure to follow these instructions can result in death, serious injury, or equipment damage

The charge controller should only be installed in locations that meet the following requirements:

Dry	Do not allow water or other fluids to drip or splash on the charge controller.
Cool	Ambient air temperature should be between 0 °C and 40 °C (32 °F and 104 °F)—the cooler the better within this range.
Ventilated	Allow at least 15 cm (10 inches) of clearance at the top and bottom edges of the charge controller for air flow. Ensure that ventilation openings and heatsink or back plane on the unit are not obstructed.
Safe	Do not install the charge controller in the same compartment as batteries or in any compartment capable of storing flammable liquids like gasoline.
Close to the battery	Do not use excessive DC cable lengths: they increase wire resistance and reduce input power.
Protected from battery gases	Do not mount the charge controller where it will be exposed to gases produced by the batteries. These gases are very corrosive and prolonged exposure will damage the equipment.
Wall mounting	Choose a wall location that is accessible, close to the battery, but well-ventilated. See <i>Mounting Template on page 37</i> for the mounting template.

Basic Installation Steps

WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

- User shall install a fuse that is 1.25 to 2 times the rated current of the controller on the positive battery side with a distance from the battery not greater than 150 mm.
- Ensure that the "+" and "-" poles on both the battery and PV are connected properly.
- Intended for indoor dry locations only.
- Do not charge a frozen battery.
- Minimum charge ambient for Li-ion batteries is 0 °C (32 °F).

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

CAUTION

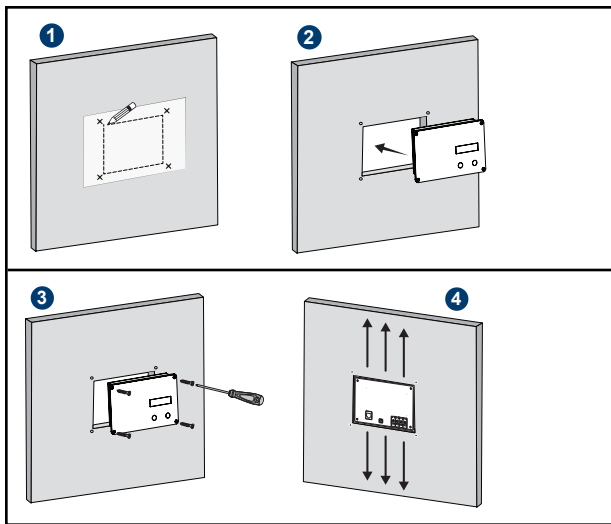
EQUIPMENT DAMAGE

Do not integrate this charge controller with a residential electrical system.

Failure to follow these instructions can result in injury or equipment damage.

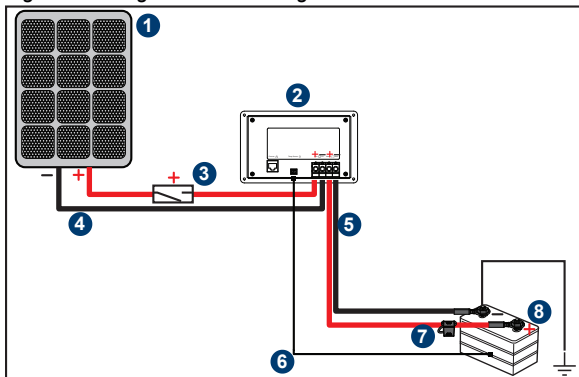
1. Prepare the tools for wall mounting and wiring installation.
 - #2 Phillips screwdriver
 - keyhole saw
 - pencil
 - power drill with bit set (see NOTE)
 - other tools such as wire stripper, cutter, crimper, wrench

Figure 1 Wall-mounting instructions



- | | |
|---|--|
| 1 | Using the mounting template at the end of this guide, mark the positions of the mounting holes and the outline of the hole in the wall. |
| 2 | Using a keyhole saw, cut the hole in the wall and insert the back of the charge controller through the hole. |
| 3 | Using the provided mounting screws, secure the charge controller on the wall.
NOTE: For drilling on hard wood use bit size 1/16 and on soft wood use bit size 3/64 |
| 4 | Allow for 15 mm (10 in.) of clearance on the top and bottom of the unit. |

Figure 2 Wiring connections diagram



1	Solar panel	5	Black neg(-) battery cable
2	Xantrex SOLAR 30A PWM Charge Controller	6	BTS cable
3	Red pos (+) PV cable. Install a PV disconnect device.	7	Red pos (+) battery cable with built in DC fuse
4	Black neg (-) PV cable	8	12/24V Battery

2. Connect the cables in the following sequence: Battery cables, PV cables, ground, and accessories, if applicable.

Battery cables

- a. Remove the DC fuse from the fuse holder on the red pos(+) battery cable.
- b. Connect the battery's red pos(+) cable to the charge controller's pos(+) terminal.
- c. Connect the battery's black neg(-) cable to the charge controller's neg(-) terminal.
- d. Connect the battery's red pos(+) cable to the battery's pos(+) terminal.
- e. Connect the battery's black neg(-) cable to the battery's neg(-) terminal.

IMPORTANT: Always follow the battery manufacturer's recommendations. See for possible lead-acid battery configurations. Do not configure 12-volt 4-cell LiFePO₄ batteries.

PV cables

- a. Cover the solar panel with a blanket to avoid energizing the cables.
- b. Install a PV Disconnect device on the red pos(+) PV cable. Install it closer to the solar panel's pos(+) terminal. Keep it open.
- c. Connect the red pos(+) PV cable with an open PV disconnect device to solar panel's pos(+) terminal and the charge controller's PV pos(+) terminal.
- d. Connect the black neg(-) PV cable to the solar panel's neg(-) terminal and the charge controller's PV neg(-) terminal.

Ground

- a. The charge controller is a common-negative charge controller, where all the negative terminals of the PV array and battery can be grounded simultaneously or just any one of them.

However, in some practical applications, all negative terminals of the PV array and battery can also be ungrounded. If this is the case, the grounding terminal on the charge controller must be grounded, which may prevent electromagnetic interference from the environment and also prevent personal injury due to electric shock.

Accessory

- a. Attach the Remote Battery Temperature Sensor (PN: 708-0080)'s lead to the lead-acid battery case.
- b. Connect the BTS cable to the charge controller's BTS terminal.

NOTE: To prolong the life of lead-acid batteries, the charge controller uses an algorithm in conjunction with the optional BTS to compensate for battery temperature fluctuations. This means, charging parameters are automatically adjusted for an efficient charging of the lead-acid battery.

Energize

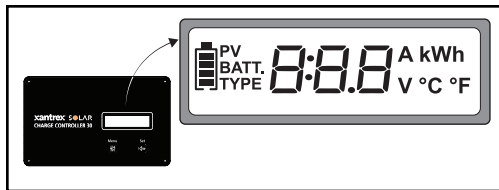
- a. Close the PV Disconnect device on the red pos(+) PV cable.
- b. Re-install the DC fuse in the fuse holder on the battery's red pos(+) cable
- c. Remove the blanket covering the solar panel.

3 OPERATION

This chapter explains how to operate the solar charge controller and includes the following topics:



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Function Buttons	25
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Automatic Cycling Status Screen	26
Battery Status	27
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Protection Features During Operation	31

LCD Display



Function Buttons







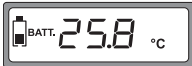
Button	Action	Description
	Short press	Allows you to: <ul style="list-style-type: none">• browse devices such as battery, PV, and battery type• browse settings such as temperature and battery type• browse status display screens
	Short press	Allows you to: <ul style="list-style-type: none">• confirm settings
	Long press (5 sec)	<ul style="list-style-type: none">• configure the temperature unit• configure the battery type

Basic Operation

Automatic Cycling Status Screen

When the LCD Display screen is on, it continually cycles through each of the status screens shown below.




Table 3 LCD Display Automatic Cycling Status Screen

	
Shows input PV voltage.	Shows input PV current.
	
Shows generated PV energy accumulated since last reset.	Shows battery voltage.
	Return to PV voltage screen.
Shows battery temperature.	

Battery Status






The battery icon changes and shows the various statuses of the battery connected in the power system.

Table 4 Battery Status

Icon	Description
	Steady: Full battery Flashing: Battery over-voltage event
	Steady bars: Battery is connected but not being charged Flashing bars: Battery being charged
	Flashing: Battery is discharged

Configuration

To reset the PV Harvest:

- Press  repeatedly until the cumulative PV Harvest status screen  is displayed.
- Simultaneously, press and hold   buttons for 5 seconds until the PV Harvest value is reset to  kWh.

To change the battery type setting:










1. Press  repeatedly until the voltage device screen is displayed. 
2. Press and hold  for 5 seconds until the current battery type flashes.
3. Press  to browse the desired battery type (see *Table 5*)
for more on battery types, then press  to confirm your selection.

Table 5 Battery Types


LCD	Description
	Sealed (AGM) battery type
	Gel battery type
	Flooded battery type
	Lithium-ion phosphate battery type

Depending on the battery type, these voltage settings are set according to charging stages.


Table 6 Battery Voltage Default Settings



Parameter	Default			
	AGM (5EL)	6EL	FLd	LFP
Over-voltage fault	16V	16V	16V	14.8V
Maximum charge voltage	15V	15V	15V	14.6V
Over-voltage fault recovery	15V	15V	15V	14.5V
Equalize voltage	14.6V	--	14.8V	14.4V
Absorption voltage	14.4V	14.2V	14.6V	14.4V
Float voltage	13.8V	13.8V	13.8V	13.4V
Re-bulk voltage	13.2V	13.2V	13.2V	13.3V
Absorption time	120m	120m	120m	30m
Equalize time	120m	--	120m	30m
Temperature compensation coefficient (mV/C/2V)	-3	-3	-3	0
NOTE: For 24V lead-acid batteries, multiply the voltage values here by two.				

To change the temperature unit setting:

1. Press  repeatedly until the temperature device screen is displayed.



2. Press and hold  for 5 seconds until the temperature screen flashes.

3. Press  to browse the desired temperature unit, °C or °F, then press  to confirm your selection.

Protection Features During Operation

NOTE: When an event is detected the LED indicators flash and the individual icons on the LCD Display also flash.

Event	Event Description
PV over-current	When the PV array's charging current exceeds the charge controller's rated current, the charge controller will charge at its rated current.
PV over-voltage	When the PV array's voltage exceeds 50V, the charge controller will stop charging and restart when voltage drops below 45V.
PV short circuit	When the PV array's voltage is below 50V and experiences a short-circuit event, the charge controller will stop charging and restart when the short-circuit is rectified.
PV reverse polarity	The charge controller will not function but remains undamaged. Correct the reverse polarity and operate normally.
Reverse charging	The charge controller prevents the battery from reverse charging to the PV array during nighttime or blocked sun situations.
Battery reverse polarity	The charge controller will prevent the battery from damage when the cable connections are reversed. Correct the reverse polarity and operate normally.
Battery over-voltage	The charge controller will stop charging when the battery reaches the over-voltage disconnect setpoint to prevent battery damage.
Battery over-temperature	In conjunction with the optional Remote Battery Temperature Sensor (PN: 708-0080), the charge controller will stop charging when the battery temperature exceeds 65 °C. It will return to normal operation when battery temperature cools down to 65 °C.
Unit over-temperature	The charge controller will stop charging when the charge controller's internal temperature exceeds 85 °C. It will return to normal operation when its internal temperature cools down to 75 °C.
Transient voltage	The charge controller has TVS (transient voltage suppressor) protection which can withstand low energy surges. In environments where lightning is frequent, you are recommended to install a lightning arrester.

4 TROUBLESHOOTING

WARNING

ELECTRICAL SHOCK HAZARD

Do not disassemble the charge controller. It does not contain any user-serviceable parts. Attempting to service the unit yourself could result in an electrical shock or burn.









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

NOTE: To obtain service go to *Contact Information on page 1*.

This chapter includes the following topics:

Common Issues	33
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Common Issues

	Problem	Solution
 	Over-voltage event	Check if the battery voltage is exceeding the over voltage disconnect point and disconnect the PV.
 	Battery is discharged	Charge the battery as soon as possible.
 	Over-temperature event	The charge controller will stop charging the battery above 65 °C. Charging will resume when the battery temperature cools down to 55 °C below.
 	Battery is charging voltage outside of range	Check if the actual battery type is compatible with the charge controller's battery type's charging voltage. If not, change the battery type setting to match the actual battery type. See <i>Battery Status and Types on page 1</i> .
LCD is off	No power.	Check if there is a connection to the battery. Check the fuse on the battery cable.
	Battery voltage is less than 8.5V.	Charge the battery as soon as possible to more than 8.5V.
	PV voltage is less than battery voltage.	Check that the solar panel is receiving enough sunlight to produce voltage greater than the battery voltage.
	PV cables reversed.	Check that the PV cables are connected to the solar panels and the charge controller in matching polarity.

Maintenance

NOTE: Perform these inspections at least two times per year.

- Make sure the charge controller remains in a dry environment.
- Clean up any accumulated dust or dirt on the unit.
- Check all the wires and cables for insulation damaged. Repair or replace, if necessary.
- Tighten all terminal connections to the correct torque values, if applicable. Inspect for loose or broken wire connections.
- Confirm that all terminals are free from corrosion
- If installed in the system, check and confirm that the lightning arrester is in good condition. Replace, if necessary.

5 SPECIFICATIONS

NOTE: Specifications are subject to change without prior notice.

Torque Specifications for Fasteners

30A charge controller terminal screws	10.6 lb-in (1.2 N-m)
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Cable Specifications for PV and Battery

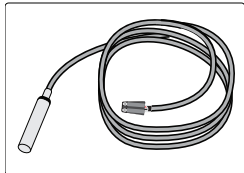
PV cable	#8AWG, 300V (min), -40°C–90°C
Battery cable	#8AWG, 300V (min), -40°C–90°C

Specifications	30A PWM Charge Controller
Part number	709-3024-01
Nominal System voltage	Auto-detect
Rated charge current	30 A @ 55 °C
Max PV short circuit current	30 A
Max PV open circuit voltage	50 VDC
Battery type	Sealed (AGM) / Gel / Flooded / LFP
Battery output voltage range	8–16 VDC (8–32) VDC
Self-consumption	≤4.2mA/12V (≤2.6mA/24V)
Temperature compensation	-3.0 mV/°C/2V
Charge circuit voltage drop	0.21 VDC
Operating temperature range	-20 to 55 °C
Storage temperature range	-30 to 80 °C
Grounding	Common-negative
IP protection	IP30
Unit weight	310 g
Physical dimensions	178.5 × 105.5 × 48.3 mm

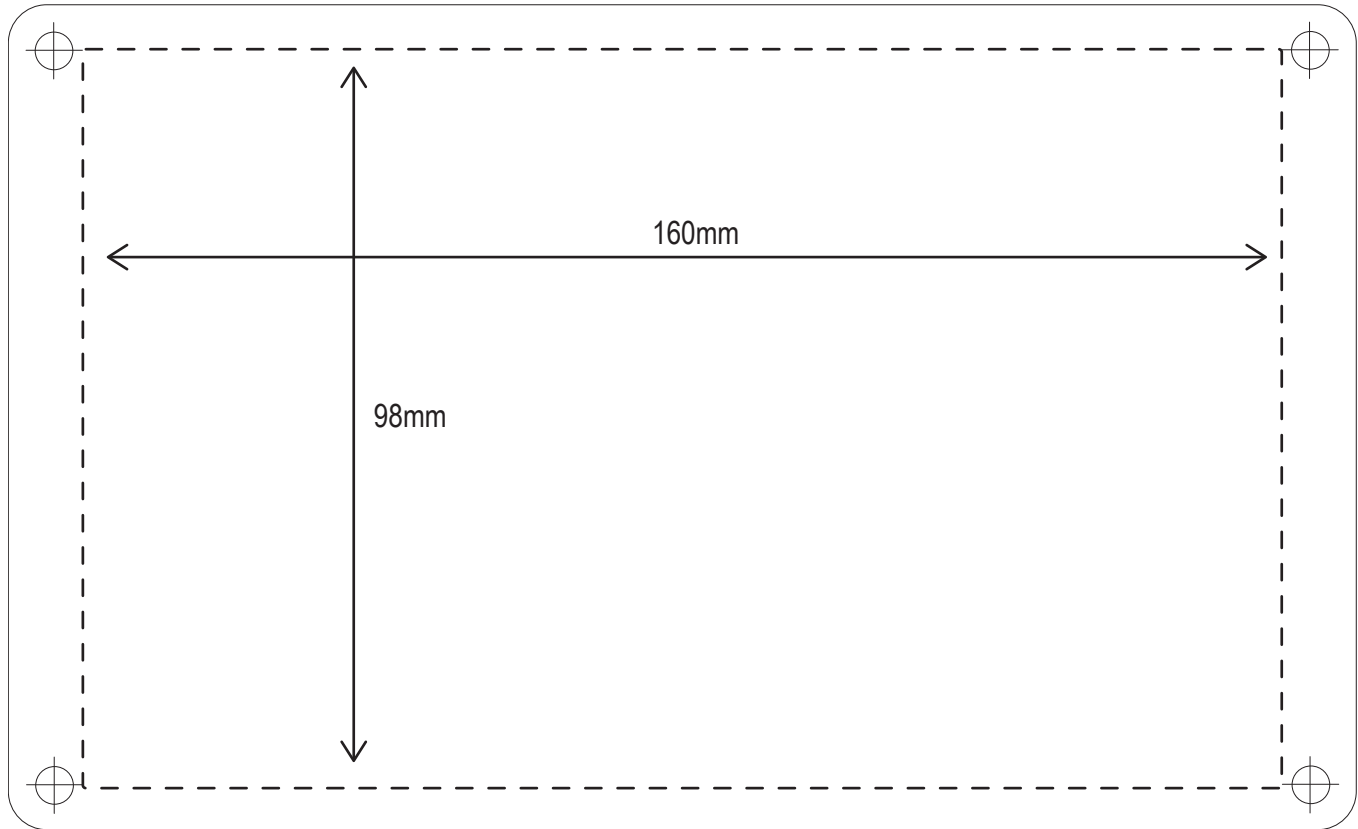
Accessory List

Accessories (Sold Separately). Contact a Xantrex authorized dealer to order.

Remote Battery Temperature Sensor (PN: 708-0080)



Mounting Template



NOTE: Use this dotted line cutout for making a hole pattern in walls where you plan to mount the charge controller.

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