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MPPT Charge Controller 30A PRO

Model Number: 710-3044-01

Exclusion for Documentation

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Product Name (Model Number)

MPPT Charge Controller 30A PRO (710-3044-01)

Contact Information

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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
BVS	Battery Voltage Sensor
LCD	Liquid Crystal Display
LFP, $LiFePO_4$	Lithium-ion Iron Phosphate
MPPT	Maximum Power Point Tracking
PV	Photovoltaic
SOC, SoC	State-of-Charge
TTL	Transistor-Transistor Logic
TVS	Transient voltage suppressor
PWM	Pulse Width Modulation

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 MPPT Charge Controller 30A PRO 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.
- Do not ground any PV conductors. The charge controller has a common negative design.
- Use the charge controller with a 12|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 MPPT Charge Controller 30A PRO 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 such as a Xantrex Battery (LFP). 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 both banks. All connected batteries should either be: Sealed (AGM) *or* Gel *or* Flooded *or* Lithium-ion (LFP).

Failure to follow these instructions can result in equipment damage.

FCC Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

⚠CAUTION

Unauthorized changes or modifications to the equipment could void the user's authority to operate the equipment.

This device complies with (ISED Canada) Industry Canada EMC standard(s), pursuant to ICES-003, Class B. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

FCC Radiation Exposure Statement

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm (~7.5 ft) from all persons and must not be co łocated for operating in conjunction with any other antenna or transmitter.

End of Life Disposal

The Xantrex Solar MPPT Charge Controller 30A PRO 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 MPPT Charge Controller 30A PRO 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.

TABLE OF CONTENTS

1 INTRODUCTION

Thank you for purchasing the Xantrex Solar MPPT Charge Controller 30A PRO. Engineered with advanced MPPT technology, the charge controller maximizes real-time solar energy harvest—even under changing light conditions—ensuring optimal efficiency and system performance. Built-in Bluetooth® enables convenient system monitoring through the Xantrex Mobile app, while CAN communication allows seamless integration with third-party multiplex systems. Designed with comprehensive electronic protection, the charge controller safeguards your system against reverse polarity, overvoltage, short circuits, and overheating for safe and reliable operation.

This chapter includes the following topics:

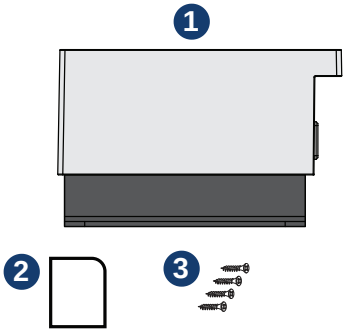
Features

The charge controller is equipped with the following features:

1. **MPPT High-Performance Tracking**
   - Utilizes advanced MPPT algorithm for real-time maximum power point tracking
   - Achieves up to 99.9% tracking efficiency
   - Increases solar energy harvest by 15–20% compared to PWM charging
2. **High-Efficiency Power Conversion**
   - Digital power control architecture
   - Delivers up to 98% circuit conversion efficiency
   - Maximizes overall system output with minimal energy loss
3. **Adaptive Voltage and Current Regulation**
   - Provides regulated charging voltage during open-circuit or BMS-protected states
   - Automatically reduces charging current when solar input exceeds rated capacity
   - Maintains safe operation during variable or oversized solar input
4. **Comprehensive Battery Compatibility**
   - Supports Lithium ($LiFePO_4$), AGM, Gel, Sealed, and Flooded batteries
   - Automatic voltage detection for lead-acid battery systems
   - Customizable charge profiles for system-specific battery requirements
5. **Flexible Monitoring and Configuration**
   - Built-in Bluetooth® and CAN communications
   - Enables real-time system status display and configuration
6. **Smart Thermal and Environmental Protections**
   - Dynamic current derating under elevated internal temperatures
   - Temperature-compensated charge regulation to optimize battery life
   - Built-in protection for PV short circuit, battery open circuit, and TVS surge/lightning

Materials List

The charge controller base package includes the following items:

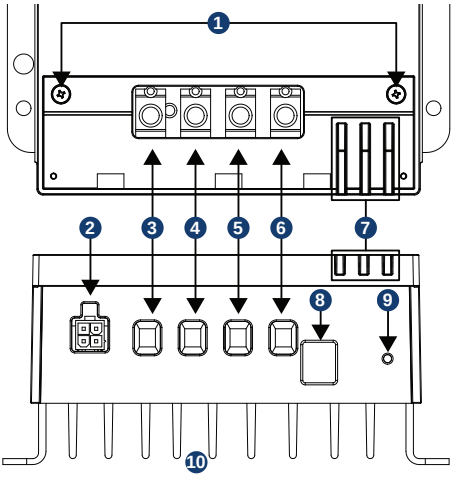


1	Xantrex Solar MPPT Charge Controller 30A PRO
2	Quickstart Guide with QR code to online Owner's Guide
3	Mounting screws

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 for servicing.

Front and Terminal Panels



1	Terminal panel screws (2x) - remove panel to access the PV and Battery terminals
2	CAN port (4-pin Molex® type RV-C)
3	PV input POS(+) terminal
4	PV input NEG(–) terminal
5	Battery output NEG(–) terminal
6	Battery output POS(+) terminal
7	LED indicators [PV|Charge|Status] for PV input, charging battery, and status
8	Battery temperature sensor (2-pin)
9	Pinhole key (button)
10	Heatsink

Maximum Power Point Tracking (MPPT)

The Maximum Power Point Tracking (MPPT) system is an advanced charge control technology that optimizes energy harvest from solar modules by continuously adjusting the operating parameters to locate and maintain the array's maximum power point. Due to the non-linear voltage-current characteristics of photovoltaic (PV) arrays, there exists a specific point—known as the maximum power point (MPP)—where the array delivers its highest power output.

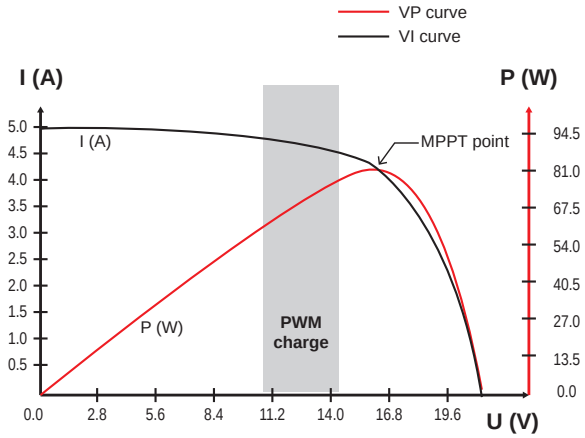
Conventional charging technologies, such as switch-mode or PWM (Pulse Width Modulation), are unable to maintain operation at the MPP, resulting in reduced energy harvest and lower charging efficiency. In contrast, an MPPT charge controller actively tracks and regulates the input from the PV array to ensure it consistently operates at or near the MPP, maximizing power transfer to the battery.

Example – 12V System:

For a 12V nominal battery system, the peak power voltage (Vmp) of a typical solar panel may be approximately 17V. In a PWM system, the panel voltage is pulled down to match the battery voltage (\~12V), limiting the panel's output. An MPPT controller, however, dynamically converts the higher voltage down to the required battery voltage while simultaneously increasing current, thus extracting full power from the panel.

Compared to PWM controllers, MPPT controllers can deliver up to 15–20% more charging efficiency, especially under conditions of cold temperatures, low battery voltage, or variable sunlight. This results in faster charge times and improved energy utilization across the system.

Figure 1 MPPT Power Curve



In addition, the maximum power point of a solar array varies with changes in ambient temperature and irradiance. The MPPT controller continuously monitors these environmental conditions and automatically adjusts operating parameters to maintain operation near the array's optimal power point. This tracking process is fully autonomous and requires no user intervention.

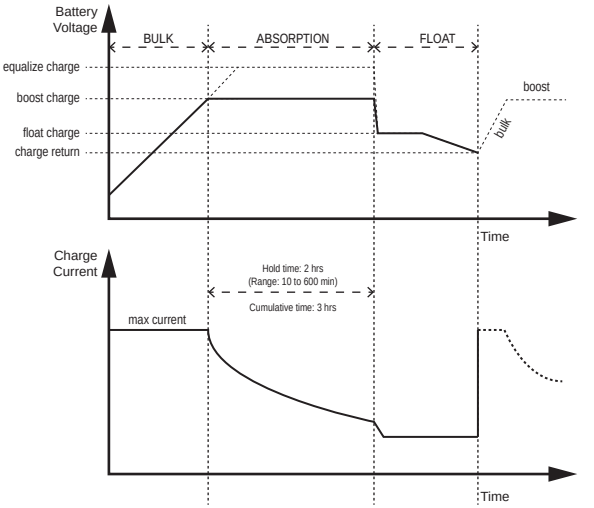
As light intensity decreases, the output current of the solar panel drops accordingly. Additionally, the open-circuit voltage of the panel also declines with reduced irradiance. Together, these changes result in a lower overall power output from the solar array under diminished light conditions.

As the temperature of the solar panel decreases, the output current remains relatively stable, but the overall power output increases. Conversely, as the panel temperature rises, the open-circuit voltage declines, leading to a reduction in the system's maximum power output.

Charging Stages Overview

The MPPT function is part of a multi-stage charging process and cannot be used in isolation. To ensure safe and effective battery charging, MPPT is combined with other methods such as boost charging, float charging, and equalization. A complete charging cycle consists of three key stages: Bulk, Absorption, and Float.

Figure 2 Three-stage battery charging



a. **Bulk Stage**
During the bulk stage, the battery voltage has not yet reached the pre-set full-charge voltage (typically the boost or equalization voltage). The controller engages MPPT charging to deliver the maximum available solar power to the battery. Once the battery reaches the designated voltage threshold, the controller transitions to the constant voltage absorption stage.

b. **Absorption Stage**
In this stage, also referred to as holding charge, the controller maintains a constant voltage—either at the boost or equalization setpoint—while the charging current gradually tapers off. MPPT is no longer active during this stage. The absorption stage consists of two sub-modes:

- **Boost Charging**
  Boost charging maintains the battery at a constant voltage for a default duration of 2 hours, which can be user-adjusted as needed. Once the timer expires, the controller automatically transitions to the float stage.
- **Equalize Charging**
  Equalization is typically initiated every 30 days and is designed to rebalance individual cells in flooded lead-acid batteries.

⚠CAUTION

EXPLOSION HAZARD

- Equalizing vented lead-acid batteries may release explosive gases. Ensure the battery compartment is properly ventilated during this stage.
- Equalization may raise battery voltage above the limits of connected DC loads. Verify all connected devices can tolerate the equalization voltage setpoint.
- Excessive equalization voltage or duration may overcharge the battery, leading to gas evolution, plate damage, and shedding of active materials. Always consult the battery manufacturer's specifications before enabling equalization.

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

c. **Float Stage**
The float stage begins after the absorption stage and is designed to maintain the battery at full charge without overcharging. During this phase, the controller reduces charging current, allowing the battery voltage to stabilize at the float setpoint. This low-voltage maintenance charge offsets self-discharge and helps prolong battery service life.

At this stage, most solar energy is supplied directly to system loads. If load demand exceeds available solar power, the controller may not be able to sustain float voltage. If the battery voltage falls to the recovery charge setpoint, the controller exits float and re-enters the bulk stage to begin a new charging cycle.

.

Equalization Management During Float

Certain battery types—particularly flooded lead-acid—benefit from periodic equalization to stir the electrolyte, balance individual cell voltages, and complete chemical reactions. Equalization temporarily raises battery voltage above standard charge levels to promote these effects.

If scheduled or triggered, the controller will automatically initiate an equalization cycle lasting 120 minutes (default). To prevent excessive gassing or overheating, equalization and boost charging are not repeated within a single full charge cycle.

NOTE:

If system conditions (such as environmental fluctuations or active loads) prevent stable voltage regulation during absorption, the controller accumulates charging time. After 3 hours of cumulative charge time, it will automatically switch to float.

If the controller's internal clock is not synchronized, equalization cycles will occur according to its internal schedule.

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

⚠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/electrician.
- 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

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.

PV Array Requirements

1. **Serial connection (string) of PV modules** - as the core component of the PV system, the charge controller could be suitable for various types of PV modules and maximize converting solar energy into electrical energy. According to the open circuit voltage (V_{OC}) and the maximum power point voltage (V_{Mpp}) of the Xantrex Solar MPPT Charge Controller 30A PRO, the series number of different types PV modules can be calculated. For reference, see *Table 2* and *Table 3*.
2. **Maximum PV array power** - the charge controller is capable of limiting the current and power during the charging process. When the charging current or power from a charging source exceeds the charge controller's rated charging current or power, the charge controller will automatically limit the incoming charging current or power to protect the charge controller.

   The actual operation of PV array is as follows:

   - ***Condition 1***: Actual charging power of PV array ≤ Rated charging power of charge controller.
   - ***Condition 2***: Actual charging current of PV array ≤ Rated charging current of charge controller.

   When the controller operates under *Condition 1* or *Condition 2*, it will carry out the charging according to the actual current or power. With this, the charge controller can work at the maximum power point of the PV array.

Table 2 PV Module String Configuration 1

System Voltage	36 Cell Voc < 23V		48 Cell Voc < 31V		54 Cell Voc < 34V		Thin-film Module
	Max	Ideal	Max	Ideal	Max	Ideal	Voc > 80V
12V	4	2	2	1	2	1	1
24V	4	3	3	2	2	2	1

Table 3 PV Module String Configuration 2

System Voltage	60 Cell Voc < 38V		72 Cell Voc < 46V		96 Cell Voc < 62V	
	Max	Ideal	Max	Ideal	Max	Ideal
12V	2	1	2	1	1	1
24V	2	2	2	2	1	1

- ***Condition 3***: Actual charging power of PV array > Rated charging power of charge controller.
- ***Condition 4***: Actual charging current of PV array > Rated charging current of charge controller.

When the charge controller operates under *Condition 3* or *Condition 4*, it will carry out the charging according to the rated current or power.

NOTICE

EQUIPMENT DAMAGE

The total open circuit voltage (Voc) of the PV array multiplied by 1.25 (a 25% safety factor) must not exceed the charge controller's maximum PV voltage rating of 100V.

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

Generally speaking, if the output power of the PV array exceeds the rated charging power of a charge controller, then the charge controller will be limited according to its rated charging power. The maximum power of the PV array shall not be greater than 1.5 times the rated charging power of the charge controller. If the maximum power of the PV array exceeds the rated charging power of charge controller too much, it will not only be under-utilizing the PV modules, but it also increases the open-circuit voltage of the PV array especially with changes in ambient temperatures. In which case, the probability of charge controller damage increases. Therefore, it is important to configure the PV power system reasonably. For the recommended maximum power of the PV array for the charge controller, see *Table 4 on page 14*.

Table 4 PV Array Maximum Power

Voltage	Max PV Array Power	Max PV Open Circuit Voltage
12V	400W	92V[1]
24V	800W	100V[2]

[1] 25°C ambient temperature

[2] Minimum operating ambient temperature

Wiring Requirements

⚠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/electrician.
- Comply with all applicable installation codes and regulations.
- Do not connect to power sources during installation.

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.

⚠CAUTION

REVERSE POLARITY

- Check polarity at all terminals before making the final DC connection. Pos(+) (red) must connect to pos(+) (red); Neg(–) (black) must connect to neg(–) (black)
- Reversing the pos(+) (red) and neg(–) (black) battery cables may blow the fuse.

Failure to follow these instructions can result in equipment damage.

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 (**Isc**[3]) of the PV array. Refer to the value of Isc in the manufacturer's PV module data specification sheet.

NOTE: The total Isc of the PV array multiplied by 1.25 (a 25% safety factor) must not exceed the charge controller's rating of 30A.

Refer to *Table 5* for sizing PV and battery wires.

Table 5 Wiring Sizes

Model	Max PV input current	Max Wire Size	Charge current	Max Wire Size
		mm² | AWG		mm² | AWG
MPPT Charge Controller 30A PRO	30A	8 | 8	30A	8 | 8

[3] 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, Indoor	Do not allow water or other fluids to drip or splash on the charge controller.
Cool	Ambient air temperature should be between 0 ºC and 40 º C (32 ºF and 104 º F)—the cooler the better within this range.
Ventilated	Allow at least 15 cm (~6 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 or where ignition protection is required. 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 *Mounting Dimensions on page 1* for the mounting template.

Basic Installation Steps

⚠WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

- User shall install a fuse that is the same as 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 install in Ignition Protection required area.
- 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

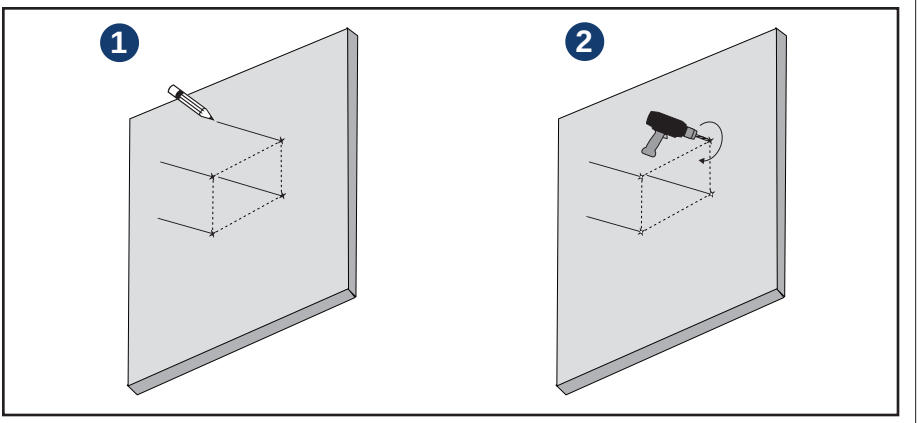
EQUIPMENT DAMAGE

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

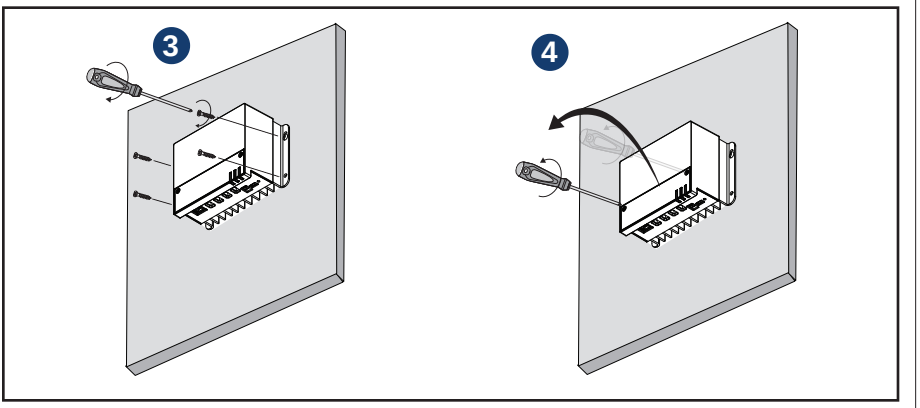
Failure to follow these instructions can result in injury or equipment damage.

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

Figure 3 Wall-mounting instructions

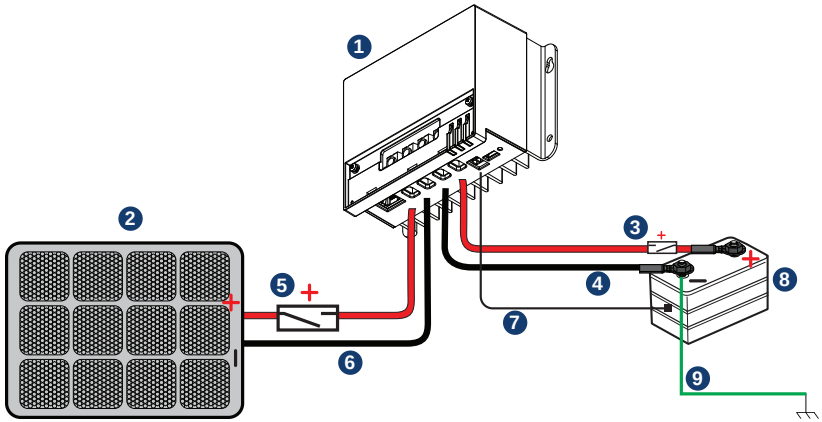


1	With the mounting dimensions shown at the end of this guide, a pencil and a ruler, mark the positions of the mounting holes in the wall.
2	Pre-drill the holes that were marked. **NOTE**: For drilling on hard wood use bit size 1/16 and on soft wood use bit size 3/64



3	Using the provided mounting screws, secure the charge controller on the wall.
4	Remove the wiring terminals cover plate at the bottom of the unit and connect the cables/wires using *Figure 4* as an illustration and the instructions in step 2 (see details *on page 19*).

Figure 4 Wiring connections diagram



1	MPPT Charge Controller 30A PRO	**6**	PV NEG [–] cable between MPPT Charge Controller 30A PRO and PV panel
2	PV panel	**7**	BTS cable on Battery
3	Battery POS [+] cable between MPPT Charge Controller 30A PRO and Battery with DC disconnect (or DC fused-disconnect)	**8**	Battery
4	Battery NEG [–] cable between MPPT Charge Controller 30A PRO and Battery	**9**	Battery negative ground
5	PV POS [+] cable with PV disconnect between MPPT Charge Controller 30A PRO and PV panel	**--**	--

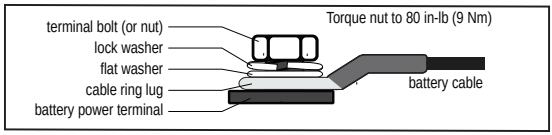
2. Connect the cables in the following sequence: Battery cables, PV cables, ground, and accessories, if applicable.

Battery cables

a. Open the DC disconnect (or DC fused-disconnect) device 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. Follow the stacking order of terminal connections (see *Figure 5*) and torque values for tightening nuts (or bolts). Do not configure Lithium-ion batteries.

Figure 5 Battery terminal stacking



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 probe of the Battery Temperature Sensor (BTS) [PN: 710-9010-01] to the lead-acid house 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.

3. Power up the system. When energizing or de-energizing the system, always follow the proper sequence.

Energize

a. Close the DC disconnect (or DC fused-disconnect) device on the red POS(+) battery cable.
b. Close the PV Disconnect device on the red POS(+) PV cable.
c. Remove the blanket covering the solar panel.

De-energize

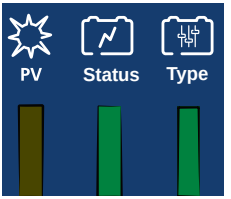
a. Cover the solar panel with a blanket.
b. Open the PV disconnect device on the red POS(+) PV cable.
c. Open the DC disconnect (or DC fused-disconnect) device on the red POS(+) battery cable.

3 OPERATION

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

Protection Features During Operation

Feature	Description
IP21	Touch proof and resistant to dust but not waterproof.
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 short circuit	The charge controller will not be damaged in case of a short-circuit event in the PV array.
PV reverse polarity	The charge controller will not function but remains undamaged. Correct the reverse polarity and the charge controller will operate normally. **However, if the PV array is reverse connected to the charge controller and energized at 1.5 times the rated current then the charge controller may become damaged.**
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 protect from accidental reverse wiring.
Battery over-temperature	In conjunction with the optional Battery Temperature Sensor (BTS) [PN: 710-9010-01], 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 55 °C.
Lithium-type Battery low temperature	When the Lithium-type battery temperature detected by the optional temperature sensor is lower than the Low Temperature Protection Threshold (LTPT), the charge controller will stop charging and discharging automatically. When the detected temperature is higher than the LTPT, the controller works automatically. The LTPT is 0 °C.
Charge controller over-temperature	The charge controller will stop charging when the charge controller's internal temperature exceeds 75 °C. It will return to normal operation when its internal temperature cools down to 60 °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 arrestor.



NOTE: When the unit is operational and events are detected, the LED indicators flash according to flash patterns discussed in the succeeding pages.

PV Indicator

Charge Stage	Light Pattern	
Bulk charging	Steady on	solid light
Boost charging	Slow flashing	on (1sec), off (1sec), 2sec cycle
Float	Single flashing	on (0.1sec), off (1.9sec), 2sec cycle
Equalize charging	Quick flashing	on (0.1sec), off (0.1sec), 0.2sec cycle
Current limited charging	Double flashing	on (0.1/0.1sec), off (0.1/1.7sec), 0.2sec cycle
Off	Off	off

(Battery) Status Indicator

NOTE: Behavior depends on whether the PV Indicator is on or off.

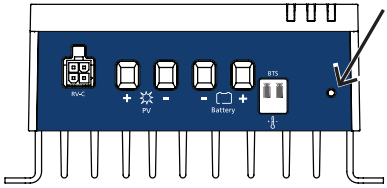
Color	Indicator light	Battery Status
Green	Steady on	Fully charged
Yellow	Steady on	Normal voltage
Red	Steady on	Low voltage
Red	Quick flashing	Over voltage or over temperature

(Battery) Type Indicator

Color	Battery Type
Green	AGM
Yellow	Gel
Red	Flooded
Blue	LFP 12V
Purple	LFP 24V
White	Custom

Setting Parameters and Special Functions

Pinhole Key Operation



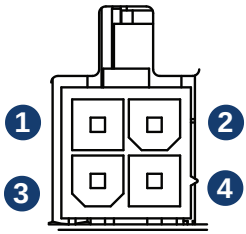
The charge controller includes a pinhole key used in conjunction with the battery type indicator to select the appropriate battery type. The operation procedure is as follows:

1. While the charge controller is in its normal operating state, press and hold the pinhole key for 8 seconds. The battery type indicator—displaying the color associated with the previously saved battery type—will begin to flash. At this point, the charge controller halts charging and enters an idle state.
2. Each subsequent press of the pinhole key will cycle through the available battery types, changing the indicator color accordingly. Once the desired battery type is selected, either press and hold the key again for 8 seconds, or leave the controller idle for 15 seconds. The charge controller will then automatically save the selected battery type and resume normal operation.

Additionally, pressing and holding the pinhole key for 20 seconds will restore the charge controller to its factory default settings.

Definition of CAN Communication Interface (RV-C)

Users can utilize RV-C protocol to perform data monitoring, parameter setting and other operations.

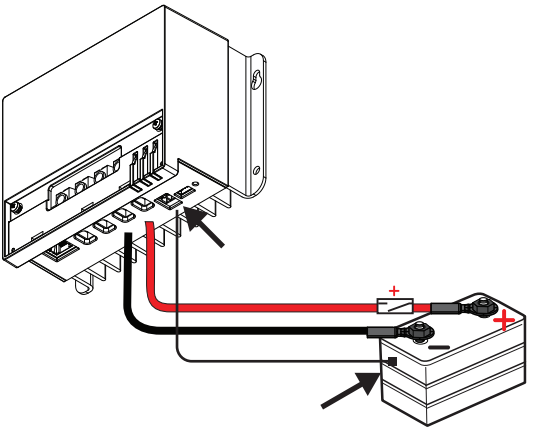


pin	Definition
1	Shield
2	COM
3	CAN_L
4	CAN_H

Battery Temperature Sensor (BTS)

When the BTS probe is not attached to the battery, protection is set at 25 °C by default; After the BTS probe is connected, high and low temperature protection is performed or charging temperature compensation is performed for the battery. However, there is no temperature compensation for the lithium battery.

Wiring method: the BTS probe is attached to a fixed location on the battery.



4 TROUBLESHOOTING

This chapter includes the following topics:

⚠WARNING

ELECTRICAL SHOCK HAZARD

- Before performing any maintenance, ensure that all AC and DC power sources are fully disconnected and locked out, as applicable.
- 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*.

Common Issues

Problem	Solution
There is voltage on the solar panel but no voltage output at the battery.	Check the battery terminals with a voltmeter to verify battery voltage It shall return to normal state after battery is disconnected and reconnected to the controller.
Connected with 12|24V normal voltage battery and the Charge | Battery Type Indicator light does not match the battery type	Check whether correct system voltage. Restart the controller. Reset the system voltage after restarting.
The device cannot be searched by mobile phone Bluetooth®.	Inspect the mobile phone's Bluetooth® settings.
No charging by controller.	Inspect whether wires are connected and fastened. Inspect whether the solar panel voltage exceeds the rated value. Inspect whether the battery exceeds the voltage. Check any error codes in the app. Check evidence of over temperature, exterior over temperature, battery over/under-temperature. Check if any of the fuses or DC disconnects/breakers are open.
Other problems or abnormal events	Restore to factory default.

Maintenance

NOTE: Perform the following maintenance at least twice per year to ensure continued safe and optimal operation of the charge controller.

- Ensure the unit remains in a dry, well-ventilated environment. Do not allow airflow around the heat sink to become obstructed.
- Clean any accumulated dust, dirt, or debris from the controller and heat sink. Remove signs of insect nests or corrosion, if present.
- Inspect all wires and cables for damage to insulation caused by UV exposure, abrasion, rodents, or dry rot. Repair or replace as needed.
- Examine all wiring terminals for signs of corrosion, discoloration, or overheating. Tighten all terminal screws to the specified torque rating.
- Confirm that all wire connections are secure and free of cracks, fraying, or mechanical stress.
- Verify that system indicators and status LEDs align with expected operation. If any fault or warning condition is shown, perform corrective action per the troubleshooting guide.
- If a lightning arrestor is installed, inspect its condition and replace immediately if failure is suspected.

5 SPECIFICATIONS

NOTE: Specifications are subject to change without prior notice.

Table 6 Specifications

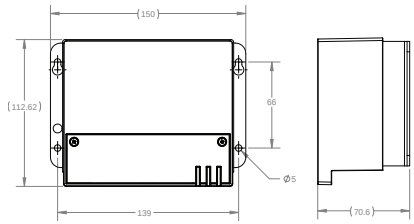
Specifications	MPPT Charge Controller 30A PRO
Dimensions (mm)	
Nominal System voltage	12|24 VDC
No load loss current	< 10 mA
Battery voltage	9–32 VDC
Max PV open circuit voltage	92 VDC (25 °C); 100VDC (lowest ambient temperature)
Recommended PV open circuit voltage	74 VDC; 80VDC (with 1.25 safety factor)
Max voltage at power point	(Battery voltage + 2) ~ 72 VDC
Rated charging current	30 A
Max PV input power	400W (12VDC); 800W (24VDC)
Charging conversion efficiency	≤98%
MPP Tracking efficiency	>99%
Temperature compensation coefficient	-3mV/°C/2V (default, settable lead-acid); no temperature compensation for lithium battery
Operating temperature	–35°C to 60°C
IP rating	IP21
Communication	Bluetooth® and CAN
Elevation	≤ 2000m
Weight	830g (1.8 lbs)
Dimensions	150×112.6×70.6mm (5.9×4.4×2.8 inches)
Compliance	ETL-listed complies to UL1741 & CSA 107.1

Table 7 12VDC Battery Type Default Settings

Battery Type / Voltage Setting	AGM	Gel	Flooded	LFP (Lithium)	Custom
Over voltage disconnect	16.0V	16.0V	16.0V	---	9~17V
Equalize charge voltage	14.6V	---	14.8V	---	9~17V
Boost charge voltage	14.4V	14.2V	14.6V	14.4V	9~17V
Float charge voltage	13.8V	13.8V	13.8V	---	9~17V
Boost charge voltage recovery	13.2V	13.2V	13.2V	---	9~17V
Equalize charge voltage duration	120 min	---	120 min	---	0~600 min
Equalize charge interval	30 days	0 days	30 days	---	0~250 days 0 = equalize charge off
Boost charge voltage duration	120 min	120 min	120 min	---	10~600 min
NOTE: This table is for a 12V battery. Automatic equalization every 30 days.					

Table 8 24VDC Battery Type Default Settings

Battery Type / Voltage Setting	AGM	Gel	Flooded	LFP (Lithium)	Custom
Over voltage disconnect	32.0V	32.0V	32.0V	---	18~34V
Equalize charge voltage	29.2V	---	29.6V	---	18~34V
Boost charge voltage	28.8V	28.4V	25.2V	28.8V	18~34V
Float charge voltage	27.6V	27.6V	27.6V	---	18~34V
Boost charge voltage recovery	26.4V	26.4V	26.4V	---	18~34V
Equalize charge voltage duration	120 min	---	120 min	---	0~600 min
Equalize charge interval	30 days	0 days	30 days	---	0~250 days 0 = equalize charge off
Boost charge voltage duration	120 min	120 min	120 min	---	10~600 min
NOTE: This table is for a 24V battery. Automatic equalization every 30 days.					

If a custom battery type is selected, the system will default to the same voltage parameters as those used for sealed lead-acid batteries. When modifying the charge and discharge settings for a custom battery, the following logic rules must be observed to ensure proper system behavior:

- **Overvoltage Disconnect Voltage > Charge Limit Voltage ≥ Equalization Voltage ≥ Boost Charge Voltage ≥ Float Voltage > Boost Charge Recovery Voltage**
- **Overvoltage Disconnect Voltage > Overvoltage Recovery Voltage**

These relationships maintain proper voltage hierarchy for safe and efficient charging operation. Always consult your battery manufacturer's specifications before adjusting any parameters.

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