MPPT Charge Controller 60A|150V

Model Number: 710-6048-01

Exclusion for Documentation

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Document Number: 975-1179-01-01 Rev A **Date:** August 2023

Product Name [Model Number]

MPPT Charge Controller 60A|150V [710-6048-01]

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
TVS	Transient voltage suppressor

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 60A|150V 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|36|48 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 60A|150V 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/IC Radiation Exposure Statement
The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co‑located for operating in conjunction with any other antenna or transmitter.
Déclaration d'ISED Canada:
Cet appareil est conforme aux règles RSS Gén du Canada. Le fonctionnement est soumis aux deux suivants conditions:

1) cet appareil ne doit pas causer d'interférences et
2) cet appareil doit accepter toutes les interférences, y compris celles pouvant causer des effets indésirables fonctionnement de l'appareil. Exposition aux radiations: Cet équipement est conforme à la réglementation canadienne sur les radiations.
limites d'exposition établies pour un environnement non contrôlé.

Déclaration d'exposition aux radiations IC
Les antennes utilisées pour cet émetteur doivent être installées de manière à assurer une distance de séparation d'au moins 20 cm au moins de toute personne et ne doivent pas être co-localisés pour fonctionner en conjonction avec autre antenne ou émetteur.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.
This device complies with Canadian ICES-003 and RSS-247.

Selon la réglementation d 'Industrie Canada, cet émetteur radio ne peut fonctionner qu 'en utilisant une antenne type et gain maximum (ou inférieur) approuvés pour Industrie Canada par l'émetteur. Réduire brouillage radioélectrique potentiel avec d'autres utilisateurs, le type d'antenne et son gain doivent être choisis que la puissance isotrope rayonnée équivalente (e.i.r.p.) n'est pas supérieure à celle nécessaire pour communication réussie.
Cet appareil est conforme aux normes canadiennes ICES-003 et RSS-247.

End of Life Disposal

The Xantrex SOLAR MPPT Charge Controller 60A|150V 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 60A|150V 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 60A|150V. The Xantrex SOLAR MPPT Charge Controller 60A|150V is a high quality, 48-volt solar charge controller. It is designed to take solar energy and charge many voltage types of batteries such as 12|24|36|48 volts using a smart charging algorithm integrated with maximum power point tracking.

This chapter includes the following topics:

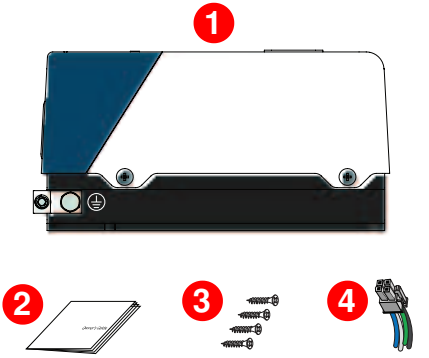
Features

The charge controller is equipped with the following features:

1. Maximum power point tracking (MPPT) technology
   - Capable of ultra fast tracking speed including multiple power point peaks with a 99.5% efficiency rating.
   - The MPPT control algorithm maximizes effective rate and time energy harvesting.
   - Has a wide maximum power point operating voltage range.
2. Multi-function operation
   - Supports various battery types - the charge controller can charge sealed, gel, flooded lead acid, and Xantrex LFP batteries.
   - Charging power and current limitation - the solar charge controller is protected from over-charging, input overloading, and short-circuiting.
   - Battery temperature compensation - with the optional Battery Temperature Sensor (BTS) [PN: 808-0232-01], charging parameters are automatically adjusted for efficient charging of the battery.
   - Real-time energy statistics - energy use history is stored using on board memory and recalled for information purposes.
   - Overheating power reduction - full charging operation at a wide temperature range and dynamically reduces power output upon reaching beyond the temperature range limit.
3. Multiple interfaces
   - LED Indicators - located on the front panel of the unit to show charging, battery, and event status.
   - Bluetooth® smartphone app - available for monitoring and setting parameters.
   - Electrical ports - pairs of DC POS(+) and NEG(–) terminals for PV and batteries.
   - BTS port - for connecting the optional Battery Temperature Sensor (BTS) [PN: 808-0232-01].

Materials List

The charge controller base package includes the following items:

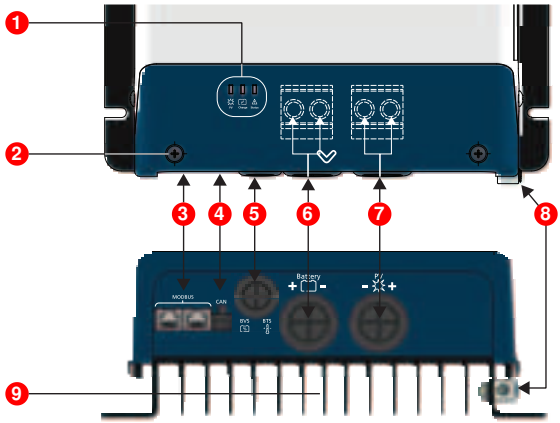


1	Xantrex SOLAR MPPT Charge Controller 60A|150V
2	Product Notice with QR code to online Owner's Guide
3	Mounting screws
4	RV-C cable with connector

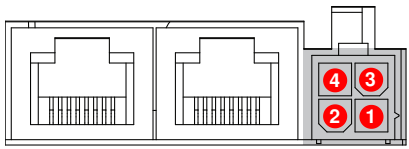
NOTE: If any of the items are missing, contact Xantrex or any authorized Xantrex dealer for replacement. See *Contact Information on page 1*.

IMPORTANT: Keep the carton and packing material in case you need to return the charge controller for servicing.

Front and Terminal Panels



1	LED indicators [PV|Charge|Status] for PV input, charging battery, and status
2	Terminal panel screws (2x) - remove to access the PV and Battery terminals
3	Modbus ports
4	CAN port (see PIN assignments below)
5	Access hole to: ■ Battery voltage sensor (BVS on the left) ■ Battery temperature sensor (BTS on the right)
6	Access hole to: ■ Battery output POS(+) terminal (left) ■ Battery output NEG(–) terminal (right)
7	Access hole to: ■ PV input NEG(–) terminal (left) ■ PV input POS(+) terminal (right)
8	DC Ground terminal
9	Heatsink



1	CAN_H	**3**	CAN_COM
2	CAN_L	**4**	Not connected

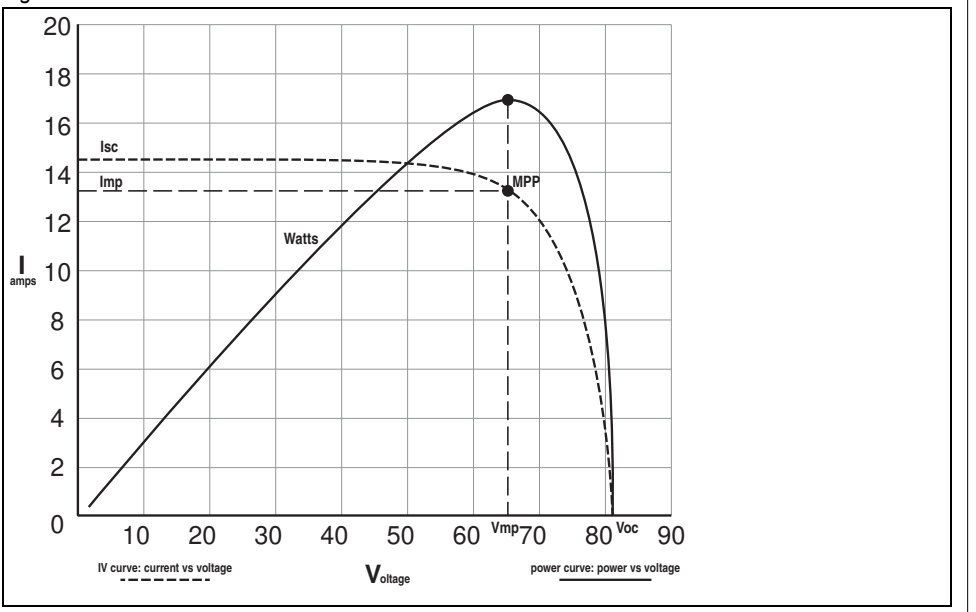
Maximum Power Point Tracking (MPPT)

MPPT enables 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 array operating voltage so that the array continuously operates at its maximum power point.

The solar charge controller applies a variable charging load on the array—shown by the power curve (solid line) in *Figure 1 on page 12*—until it finds the maximum wattage (the point at which both operating voltage and current can be maximized at the same time), as indicated by "MPP" in the same figure. The charge controller then holds the array at this point for as long as the array continues to produce the maximum power possible. As panel shading, cloud cover, and sunlight angle shift, the charge controller finds the new maximum power point without interrupting its output power flow.

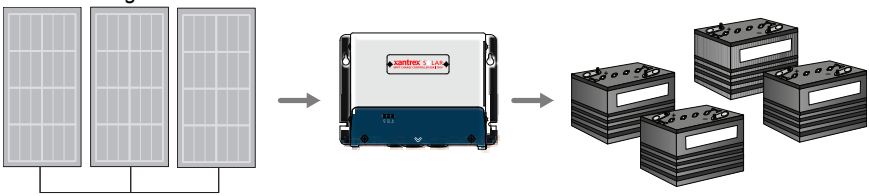
Figure 1 MPPT Power Curve



Charge Controlling

The charge controller can regulate PV array current for charging batteries at 12|24|36|48 volts.

Figure 2 PV Charge Controller



The charge controller controls how the batteries are charged by the DC source (the PV array).

When charging, the charge controller regulates the charging voltage and current based on the amount of DC power available from the PV array and the current 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 for installers to use simpler wiring runs, smaller gauge PV cables, when wiring PV panels in-series without compromising the efficiency of a higher-voltage array.

The solar charge controller is not able to charge a higher-voltage battery from a lower-voltage array.

Table 2 Battery to PV Array Voltages

Battery System Voltage	Minimum PV Array Voltage	Max PV Open Circuit Voltage
12 V	14 V	120V[1] 150V[2]
24 V	26 V	
36V	38 V	
48V	50 V	

[1] 25°C ambient temperature

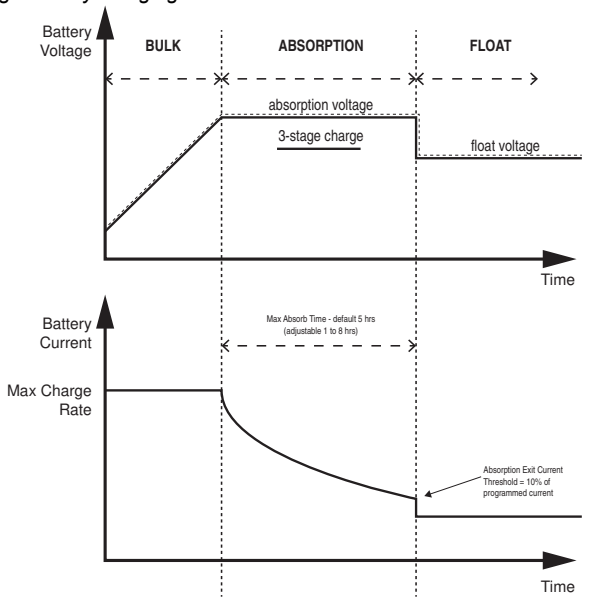
[2] Minimum operating ambient temperature

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 3* .

Bulk Stage	During the bulk stage, the charge controller operates with a constant current, delivering maximum current to the batteries. When the battery voltage reaches the Absorption voltage setting, the controller automatically transitions to the absorption stage.
Absorption Stage	During the absorption stage, the charge controller operates in Constant Voltage mode and the current falls gradually as charge is returned to the battery. The voltage limit in this stage is the Absorption Voltage setting.
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 the battery voltage drops below the ReCharge Volts setting for 15 minutes, a new bulk stage cycle will be triggered.

Figure 3 Three-stage battery charging



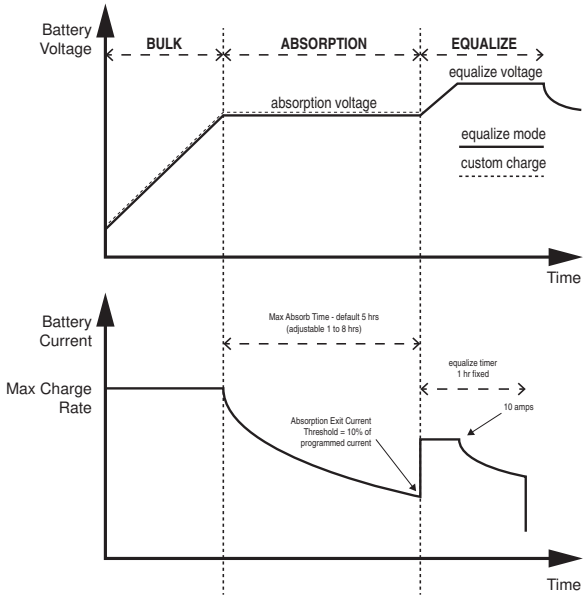
Equalization Charging

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

Equalization is a deliberate overcharge designed to return each cell in the battery 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.

Figure 4 Equalize charging



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 60A|150V, the series number of different types PV modules can be calculated. For reference, see *Table 3* and *Table 4*.
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 3 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	6	3	4	2	4	2	1
48V	6	5	4	3	4	3	1

Table 4 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	3	2	3	2	2	1
48V	3	3	3	2	2	2

- ***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 150V.

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 5 on page 18*.

Table 5 PV Array Maximum Power

Voltage	Max PV Array Power	Max PV Open Circuit Voltage
12V	800W	120V[1] 150V[2]
24V	1600W	
36V	2400W	
48V	3200W	

[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 60A.

Refer to *Table 6* for sizing PV and battery wires.

Table 6 Wiring Sizes

	Maximum PV input current	Minimum Wire Size	Maximum Wire Size
PV Wiring (to fit the terminals)	50A	6AWG	5AWG
Battery Wiring	60A	6AWG	5AWG

[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

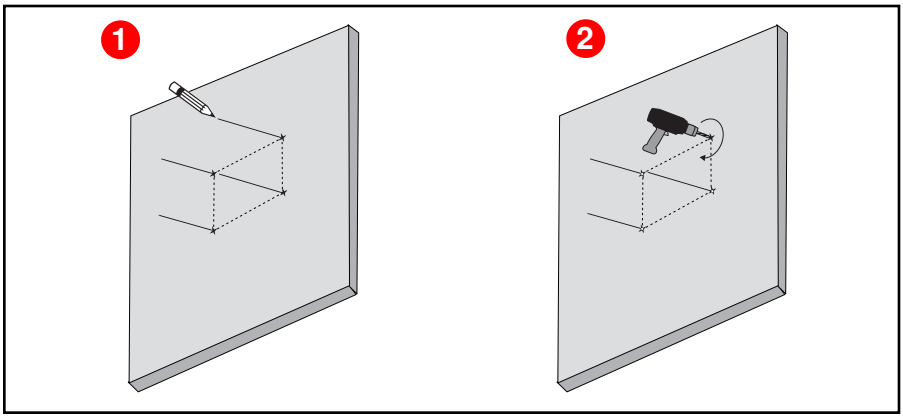
EQUIPMENT DAMAGE

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

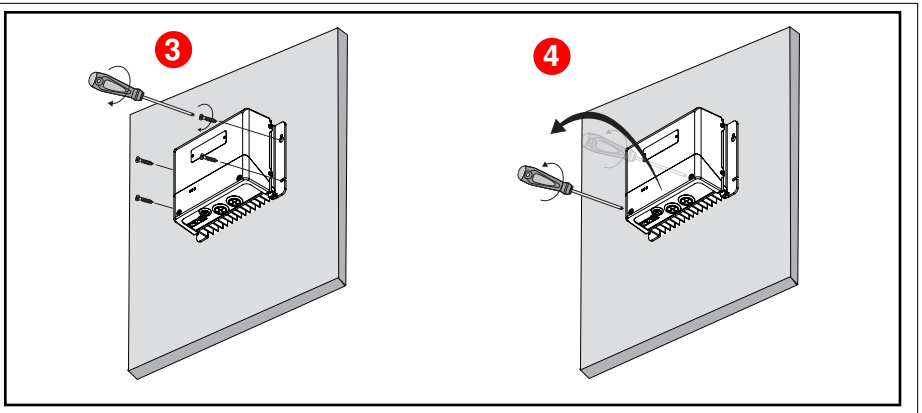
Failure to follow these instructions can result in injury or equipment damage.

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 5 Wall-mounting instructions

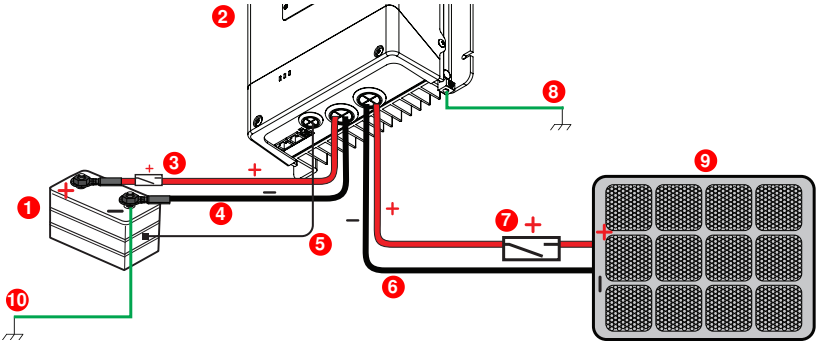


1	With the mounting dimensions shown at the end of this guide, a pencil and a ruler, mark the positions of the mounting holes in the wall.
2	Pre-drill the holes that were marked. **NOTE**: For drilling on hard wood use bit size 1/16 and on soft wood use bit size 3/64



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 6* as an illustration and the instructions in step 2 (see details *on page 23*).

Figure 6 Wiring connections diagram



1	Battery	**6**	PV NEG [–] cable between MPPT Charge Controller 60A|150V and PV panel
2	MPPT Charge Controller 60A|150V	**7**	PV POS [+] cable with PV disconnect between MPPT Charge Controller 60A|150V and PV panel
3	Battery POS [+] cable between MPPT Charge Controller 60A|150V and Battery with DC disconnect (or DC fused-disconnect)	**8**	DC equipment ground
4	Battery NEG [–] cable between MPPT Charge Controller 60A|150V and Battery	**9**	PV panel
5	BTS cable on Battery	**10**	Battery negative ground

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) and torque values for tightening nuts (or bolts). Do not configure Lithium-ion 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 Battery Temperature Sensor (BTS) [PN: 808-0232-01]'s probe 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.

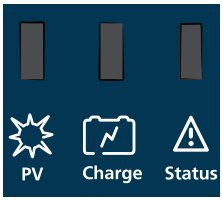
De-energize

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



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

Feature	Description
IP20	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 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 Battery Temperature Sensor (BTS) [PN: 808-0232-01], 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: There is no reverse wiring protection function for the battery.	

PV Indicator

Indicator Light	State
On	PV array producing power
Off	PV array disconnected or not receiving sunlight

Charge Indicator (also Battery Type)

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

Color	Charging Status PV Indicator light is On	Battery Type PV Indicator light is Off
Off	Charger disabled	--
Green	Float charge	12V battery
Yellow	Absorption charge	24V battery
Blue	Equalization charge	36V battery
Red	Bulk charge	48V battery

Status Indicator

Color	Status Type
Solid Green	Normal
Green (flashing)	Normal, Bluetooth® is in pairing mode
Blue	System booting
Red	Error detected

Setting Parameters and Special Functions

Monitoring Use of Mobile Phone APP (Standard Configuration)

Bluetooth® 5.0 BLE module is integrated in the controller and users can use the mobile phone APP for data monitoring, setting, and other operations to the controller.

Please download and install the Xantrex Solar app.

Definition of RS485 Communication Interface

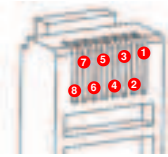
Set as communication mode

Users can utilize Modbus protocol to perform data monitoring, parameter setting and other operations.

Remote on/off of charger

Two pieces of remote on/off input signal are integrated in 485 communication wire.

The charging can be broken only by short circuit of pins (5) and (6) in the communication wire.

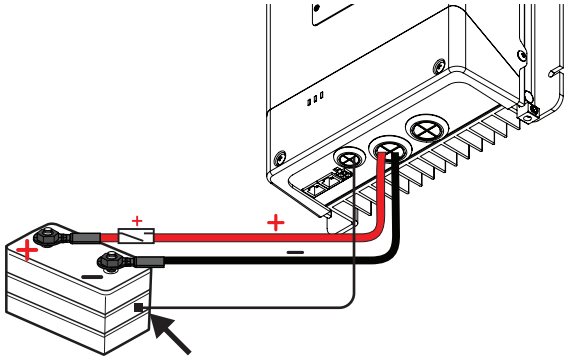


No.	Definition	No.	Definition
1	Isolate positive power supply	5	Remote on/off of charger
2	D+	6	Remote on/off of charger
3	D-	7	NC
4	Isolate power ground	8	NC

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.



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4 TROUBLESHOOTING

This chapter includes the following topics:

⚠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*.

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|24|36|48V 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

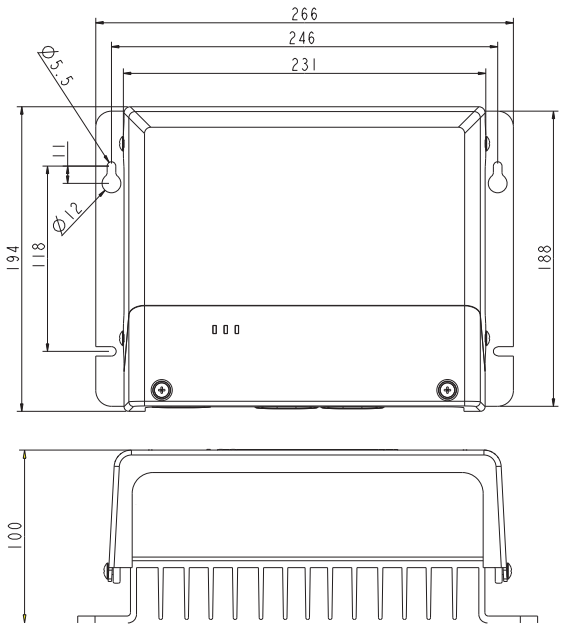
NOTE: Perform these inspections at least two times per year.

- 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 arrestor is in good condition. Replace, if necessary.

5 SPECIFICATIONS

NOTE: Specifications are subject to change without prior notice.

Table 7 Specifications

Specifications	MPPT Charge Controller 60A|150V
Dimensions (mm)	
Nominal System voltage	12|24|36|48 VDC
No load loss current	< 75 mA
Battery voltage	9–64 VDC
Max PV open circuit voltage	150 VDC
Max PV short circuit current	50 A
Max voltage at power point	Battery voltage + 2 – 120 VDC
Rated charging current	60 A
Range charging current	0–60 A
PV power 48V	3200 W
Charging conversion efficiency	>93% at full load >98% at peak
MPP Tracking efficiency	>99%

Specifications	MPPT Charge Controller 60A|150V
Temperature compensation coefficient	-3mV/°C/2V (default, settable lead-acid); no temperature compensation for lithium battery
Communication	Modbus, RV-C, Bluetooth®
Internal temperature protection	When interior temperature of controller is higher than the set value, it shall perform linear power reduction operation
External temperature sampling of battery	The temperature is used for battery temperature compensation and battery temperature protection
Protection features	Battery overcharging protection, battery over discharge protection, PV anti-reverse protection, reverse charge protection at night, interior over temperature protection of controller and over current protection in charge
Operating temperature	–35°C to 65°C (Derating > 40°C)
Elevation	≤ 2000m
IP rating	IP20
Weight	3.6kg (7.9 lbs)
Dimensions	266×188×100mm (10.5×7.4×3.9 inches)

Table 8 Battery Type Default Settings

Battery Type Voltage Setting	AGM (Sealed)	Gel	Flooded	Xantrex LFP
Over voltage fault	16.0V	16.0V	16.0V	14.8V
Over voltage fault recovery	15.0V	15.0V	15.0V	14.4V
Equalize voltage	--	--	15.0V	--
Absorption voltage level	14.3V	14.2V	14.4V	14.4V
Float voltage level	13.4V	13.8V	13.5V	13.6V
Re-bulk voltage level	13.2V	13.2V	13.2V	13.4V
Equalize time T1 (min)	--	--	60 min	--
Absorption exit current	10% X I_configure	10% X I_configure	10% X I_configure	10% X I_configure
BTS coefficient (mV/C/2V)	-3	-3	-3	0
NOTE: This table is for a 12V battery. For 24V multiply by 2 (x2). For 36V multiply by 3 (x3). For 48V multiply by 4 (x4). Automatic equalization every 30 days.				

Table 9 Custom Battery Default Settings

Battery Type / Voltage Setting	Custom by MOBUS	Custom Default
Over voltage fault	9~17V	17V
Over voltage fault recovery	9~17V	16V
Equalize voltage	9~17V	14.4V
Absorption voltage level	9~17V	14.4V
Float voltage level	9~17V	13.4V
Re-bulk voltage level	9~17V	13.2V
Equalize time T1 (min)	0~180	0
Absorption exit current	n/a	10%
Absorption Max time T2 (min)	n/a	300
BTS coefficient (mV/C/2V)	-3~0	0

NOTE: This table is for a 12V battery. For 24V multiply by 2 (x2). For 36V multiply by 3 (x3). For 48V multiply by 4 (x4).

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