

WANDERER PG

Solar Charge Controller

10A PWM

Version 1.1



Important Safety Instructions

Please save these instructions.

This manual contains important safety, installation, and operating instructions for the charge controller. The following symbols are used throughout the manual:

WARNING

Indicates a potentially dangerous condition. Use extreme caution when performing this task.

CAUTION

Indicates a critical procedure for safe and proper operation of the controller

NOTE

Indicates a procedure or function that is important to the safe and proper operation of the controller.

■ **General Safety Information**

- Read **all** of the instructions and cautions in the manual before beginning the installation.
- There are no serviceable parts for this controller. Do **NOT** disassemble or attempt to repair the controller.
- Make sure **all** connections going into and from the controller are tight. There may be sparks when making connections, therefore, make sure there are not flammable materials or gases near installation.

■ **Charge Controller Safety**

- **NEVER** connect the solar panel array to the controller without a battery. Battery must be connected first. This may cause a dangerous occurrence where the controller would experience a high open circuit voltage at the terminals.
- Ensure input voltage does not exceed **50 VDC** to prevent permanent damage. Use the Open Circuit (Voc) to make sure the voltage does not exceed this value when connecting panels together in series.

- The charge controller should be installed indoors in a well-ventilated, cool, and dry environment.
- Do NOT allow water to enter the controller.

■ Battery Safety

- Do NOT let the positive (+) and negative (-) terminals of the battery touch each other.
- Use only sealed lead-acid, flooded, gel or lithium batteries which must be deep cycle.
- Explosive battery gases may be present while charging. Be certain there is enough ventilation to release the gases.
- Be careful when working with large lead acid batteries. Wear eye protection and have fresh water available in case there is contact with the battery acid.
- Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high of an equalizing charge or too long of one may cause damage. Please carefully review the specific requirements of the battery used in the system.
- Equalization is carried out only for non-sealed / vented / flooded / wet cell lead acid batteries.
- Do NOT equalize VRLA type AGM / GEL / LITHIUM batteries UNLESS permitted by battery manufacturer.

WARNING

Connect battery terminals to the charge controller BEFORE connecting the solar panel (s) to the charge controller. NEVER connect solar panels to charge controller until the battery is connected.

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General Information

The Wanderer PG charge controller is intelligent positive ground controller suitable for various off-grid solar applications. Integrating highly efficient PWM charging, this controller increases battery life and improves system performance. It can be used for 12V/24V battery banks. The controller is embedded with self-diagnostics and electronic protection functions that prevent damages from installation mistakes or system faults.

Key Features

- Automatically detects 12V or 24V DC system voltages, 10A Charging Capacity
- Deep Cycle Sealed, Gel and Flooded battery options
- 4 Stage PWM charging: Bulk, Boost, Float, and Equalization
- Temperature compensation and correcting the charging and discharging parameters automatically, improving battery lifetime
- Protection against: reverse current, overcharging, short-circuit, and reverse polarity
- Backlit LCD screen for displaying system operation, diverse load control and error codes
- Integrated 5V 2A USB ports for extra charging
- Positive ground charge controller

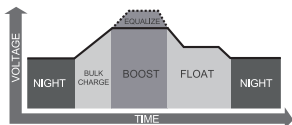
PWM Technology

The Wanderer PG utilizes Pulse Width Modulation (PWM) technology for battery charging. Battery charging is a current based process so controlling the current will control the battery voltage. For the most accurate return of capacity, and for the prevention of excessive gassing pressure, the battery is required to be controlled by specified voltage regulation set points for Absorption, Float, and Equalization charging stages. The charge controller uses automatic duty cycle conversion, creating pulses of current to charge the battery.

The duty cycle is proportional to the difference between the sensed battery voltage and the specified voltage regulation set point. Once the battery reached the specified voltage range, pulse current charging mode allows the battery to react and allows for an acceptable rate of charge for the battery level.

Four Charging Stages

The Wanderer PG has a 4-stage battery charging algorithm for a rapid, efficient, and safe battery charging. They include: Bulk Charge, Boost Charge, Float Charge, and Equalization.



Bulk Charge: This algorithm is used for day to day charging. It uses 100% of available solar power to recharge the battery and is equivalent to constant current.

Boost Charge: When the battery has charged to the Boost voltage set-point, it undergoes an absorption stage which is equivalent to constant voltage regulation to prevent heating and excessive gassing in the battery. The Boost time is 120 minutes.

Float Charge: After Boost Charge, the controller will reduce the battery voltage to a float voltage set point. Once the battery is fully charged, there will be no more chemical reactions and all the charge current would turn into heat or gas. Because of this, the charge controller will reduce the voltage charge to smaller quantity, while lightly charging the battery. The purpose for this is to offset the power consumption while maintaining a full battery storage capacity.

In the event that a load drawn from the battery exceeds the charge current, the controller will no longer be able to maintain the battery to a Float set point and the controller will end the float charge stage and refer back to bulk charging.

Equalization: Is carried out every 28 days of the month. It is intentional overcharging of the battery for a controlled period. Certain types of batteries benefit from periodic equalizing charge, which can stir the electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge increases the battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

WARNING

Once equalization is active in the battery charging, it will not exit this stage unless there is adequate charging current from the solar panel. There should be NO load on the batteries when in equalization charging stage.

Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high of equalizing charge or for too long may cause damage. Please carefully review the specific requirements of the battery used in the system.

Common Positive Grounding

The Wanderer PG is a positive ground controller. In a positive ground controller all positive terminals are bonded together and charge/load control switching is done in the negative leg of the circuit. When using positive ground controller in a positive ground system, the positive terminals can be grounded at various points in the system.

In a negative ground system, the positive ground controller can also be used if the system grounding is proper. This means there should only be one grounding point in the negative ground system, either on the panel, battery or load.

For example, if the battery negative is grounded, do not ground the negative side of the solar panel or load. Having multiple ground points will disable the controller's ability to control PV charging or load operation, and can lead to system failures. Do not ground a positive ground controller when added to a negative ground system. Negative ground systems can be found in cabins, RV's and boats.

Identification of Parts



Key Parts

- ① LCD Screen
- ② Select Button
- ③ Enter Button
- ④ USB Ports
- ⑤ Load Terminals
- ⑥ Battery Terminals
- ⑦ PV Terminals
- ⑧ Communication Port (reserved for future development)

Installation

WARNING

Connect battery terminal wires to the charge controller **FIRST**, then connect the solar panel(s) to the charge controller. **NEVER** connect solar panel to charge controller before the battery.

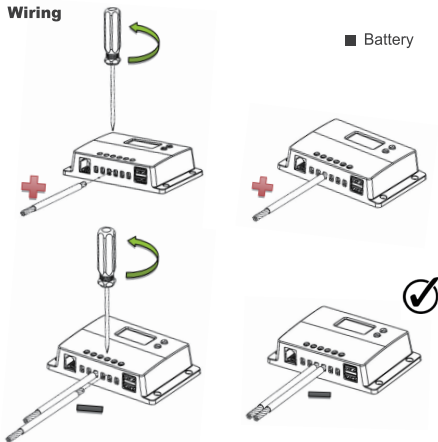
CAUTION

Do not over-torque or over tighten the screw terminals. This could potentially break the piece that holds the wire to the charge controller.

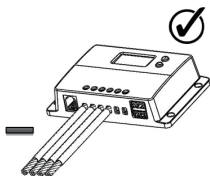
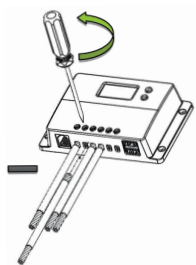
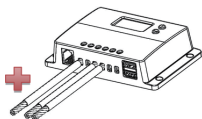
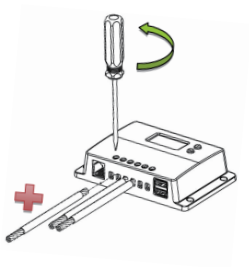
Refer to the technical specifications for max wire sizes on the controller and for the maximum amperage going through wires.

Wiring

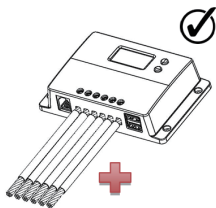
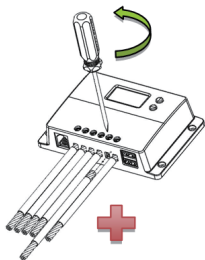
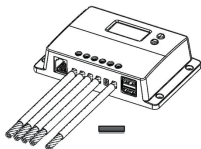
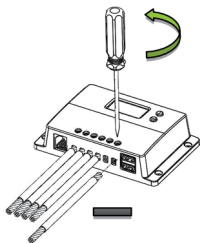
■ Battery



■ Solar Panel



■ Load



Mounting Recommendations

WARNING

Never install the controller in a sealed enclosure with flooded batteries. Gas can accumulate and there is a risk of explosion.

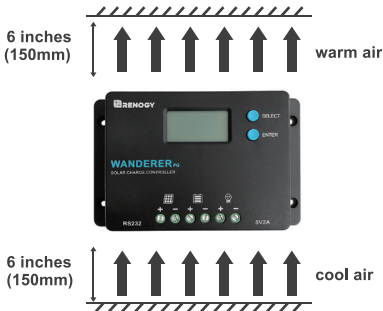
1. Choose Mounting Location—place the controller on a vertical surface protected from direct sunlight, high temperatures, and water. Make sure there is good ventilation.

2. Check for Clearance—verify that there is sufficient room to run wires, as well as clearance above and below the controller for ventilation. The clearance should be at least 6 inches (150mm).

3. Mark Holes

4. Drill Holes

5. Secure the charge controller.

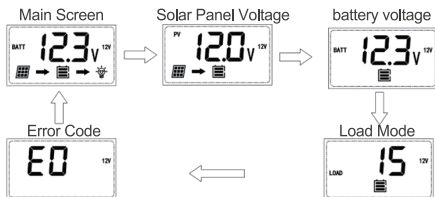


Operation

After connecting the battery to the charge controller, the controller will turn on automatically. Assuming normal operation, the charge controller will cycle through different displays. The user can adjust some parameters based on the display screen. The user can manually cycle through the display screens by using the “SELECT” and “ENTER” buttons.

- **SELECT** Cycles forwards through the different display screens.
- **ENTER** Customize some parameters on the charge controller & Turn the load ON/OFF in the Manual Mode

Main Display

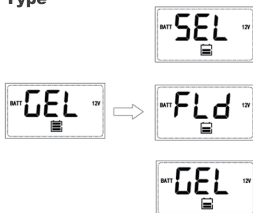


LCD Indicators

Icon or Value	State	Description
	Steady on	Solar Panels Charging Battery
	3 Bars Flashing	Battery Voltage (16.1V+)
	3 Bars	Battery Voltage (12.9V- 16.0V)
	2 Bars	Battery Voltage (12.5-12.8V)
	1 Bar	Battery Voltage (11.6-12.4V)
	No Bars	Battery Voltage (11.5V and below)
	No Bars Flashing	Battery Voltage (10.9V and below)
	Steady on	Load is On

Programming Battery Type

To enter the battery programming settings hover over the Battery Voltage screen and press down the Enter button. When the battery type starts to flash press the Select button to cycle through the battery types and press Enter to finalize selection.



Programming Load Terminal

To enter the load programming settings hover over the Load Mode screen and hold the Enter button. When the number starts to flash press the Select button to cycle through the load types and press Enter to finalize selection.



Setting	Mode	Description
0	Automatic (On/Off)	The load will turn on at night when the solar panel is no longer producing any power after a short time delay. The load will turn off when the panel starts producing power.
1-14	Time control	When the panel is no longer producing power, the load will be ON for 1-14 hours or until the panel starts producing power.

15	Manual	In this mode, the user can turn the Load On/Off by pressing the Enter button at any time.
16	Test	Used to troubleshoot load terminal (No Time Delay). When voltage is detected load will be off and when no voltage is detected load will be on.
17	24Hr	The load will be on for 24 hours a day.

Wanderer PG Protections

Protection	Description
PV Array Short Circuit	When PV short circuit occurs, the controller will stop charging. Clear it to resume normal operation
Load Overload	If the current exceeds the maximum load current rating 1.05 times, the controller will disconnect the load. Overloading must be cleared up by reducing the load and restarting the controller.
Load Short Circuit	Fully protected against the load wiring short-circuit. Once the load short (more than quadruple rate current), the load short protection will start automatically. After 5 automatic load reconnect attempts, the faults must be cleared by restarting the controller.
PV Reverse Polarity	The controller will not operate if the PV wires are switched. Wire them correctly to resume normal controller operation.
Battery Reverse Polarity	The controller will not operate if the battery wires are switched. Wire them correctly to resume normal controller operation.

Error Codes

Error Number	Description
E0	No error detected
E01	Battery over-discharged
E02	Battery over-voltage
E04	Load short circuit
E05	Load overloaded
E06	Controller over-temperature
E10	PV over-voltage

Maintenance



Risk of Electric Shock! Make sure that all power is turned off before touching the terminals on the charge controller.

For best controller performance, it is recommended that these tasks be performed from time to time.

- Check that controller is mounted in a clean, dry, and ventilated area.
- Check wiring going into the charge controller and make sure there is no wire damage or wear.
- Tighten all terminals and inspect any loose, broken, or burnt up connections.
- Check to make sure none of the terminals have any corrosion, insulation damage, high temperature, or any burnt/discoloration marks.

Fusing

Fusing is a recommendation in PV systems to provide a safety measure for connections going from panel to controller and controller to battery. Remember to always use the recommended wire gauge size based on the PV system and the controller.

NEC Maximum Current for different Copper Wire Sizes

AWG	16	14	12	10	8	6	4	2	0
Max. Current	10A	15A	20A	30A	55A	75A	95A	130A	170A

Fuse from Controller to Battery

**Controller to Battery Fuse =
Current Rating of Charge Controller**

Ex. Wanderer PG 10 = 10A fuse from Controller to Battery

Fuse from Solar Panel(s) to Controller

Ex. 200W; 2 X 100 W panels

Parallel
Total Amperage = $I_{sc1} + I_{sc2} = (5.75A + 5.75A) * 1.56$

Fuse = minimum of $11.5 * 1.56 = 17.94 = 18A$ fuse

Technical Specifications

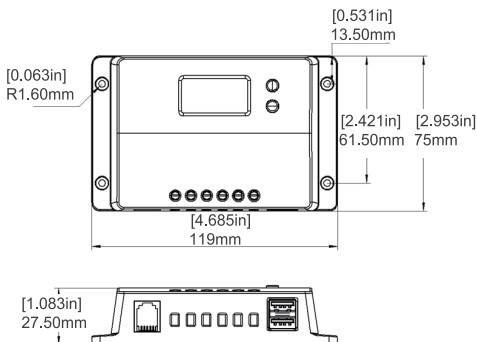
Description	Parameter
Nominal Voltage	12V/24V Auto Recognition
Rated Charge Current	10A
Max. PV Input Voltage	50 VDC
USB Output	5V, 2A max
Self-consumption	≤10mA
Temperature Compensation Coefficient	-3mV/°C/2V
Operating Temperature	-35 °C to +45 °C -31 °F to 113 °F
Storage Temperature	-35 °C to +80 °C -31 °F to 176 °F
Enclosure	IP20
Terminals	Up to #12 AWG
Weight	0.27 lbs.
Dimensions	4.68 x 2.95 x 1.08 inches
Battery Type	Sealed (AGM), Gel and Flooded

Battery Charging Parameters

All the coefficient is referred to 25 °C

Battery	GEL	SEALED	FLOODED
Over-voltage Warning	16 V	16 V	16 V
Charging Limit Voltage	15.5 V	15.5 V	15.5 V
Equalization Voltage	—	14.6 V	14.8 V
Boost Voltage	14.2 V	14.4 V	14.6 V
Float Voltage	13.8 V	13.8 V	13.8 V
Boost Return Voltage	13.2 V	13.2 V	13.2 V
Under Voltage Warning	12V	12V	12V
Under Voltage Recover	12.2V	12.2V	12.2V
Over-discharge Warning	11.1V	11.1V	11.1V
Over-discharge Recover	12.6 V	12.6 V	12.6 V
Equalization Duration	—	2 hours	2 hours
Boost Duration	2 hours	2 hours	2 hours

Dimensions



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Follow proper safety practices. If in doubt, consult a professional RV technician.