

The Traveler Series™: *Adventurer*

30A PWM

Flush Mount Charge Controller w/ LCD Display



2775 E. Philadelphia St., Ontario, CA 91761
1-800-330-8678

Version 5.0

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 (V_{oc}) 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 cell 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.

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.

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General Information

The Adventurer is an advanced charge controller for off-grid solar applications. Integrating highly efficient PWM charging, this controller increases battery life and improved system performance. It can be used for 12V or 24V battery or battery bank. The controller is embedded with self-diagnostics and electronic protection functions that prevent damages from installation mistakes or system faults.

Key Features

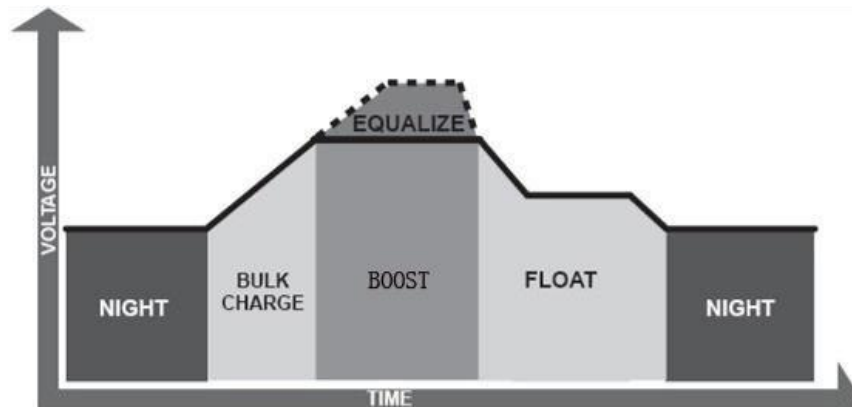
- Automatic recognition for 12V or 24V system voltage
- 30A charging capacity
- Backlit LCD screen for displaying system operating information and data.
- Full control of parameter settings that can be adjusted.
- Deep Cycle Sealed, Gel, Flooded and Lithium battery option.
- 4 Stage PWM charging: Bulk, Boost, Float, and Equalization
- Temperature compensation and correcting the charging and discharging parameters automatically, improving battery lifetime.
- Protection against: overcharging, over current, short-circuit, and reverse polarity.
- Unique USB port on the front display
- Integrated communication port for remote monitoring
- Charges over-discharged lithium-ion batteries
- Specifically designed for RV application and allows for aesthetically clean flush mounting on walls
- Remote temperature compensation compatible
- Remote battery voltage sensor compatible

PWM Technology

The Adventurer 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 Adventurer 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 of time. 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.

WARNING: 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.

Lithium Battery Activation

The Adventurer PWM charge controller has a reactivation feature to awaken a sleeping lithium battery. The protection circuit of Li-ion battery will typically turn the battery off and make it unusable if over-discharged. This can happen when storing a Li-ion pack in a discharged state for any length of time as self-discharge would gradually deplete the remaining charge. Without the wake-up feature to reactivate and recharge batteries, these batteries would become unserviceable and the packs would be discarded. The Adventurer will apply a small charge current to activate the protection circuit and if a correct cell voltage can be reached, it starts a normal charge.

CAUTION: When using the Adventurer to charge a 24V lithium battery bank, set the system voltage to 24V instead of auto recognition. Otherwise, the over-discharged 24V lithium battery wouldn't be activated.

Included Components



Remote Temperature Sensor (TS-R)

Measures the temperature at the battery and uses this data for very accurate temperature compensation. The sensor is supplied with a 6.6ft cable length that connects to the charge controller.

NOTE: The Adventurer comes equipped with a temperature sensor, but it is **ONLY** for the charge controller's temperature compensation, not the battery's temperature compensation.



Remote Battery Voltage Sensor (RBVS)

Measures battery voltage accurately. The voltage detected at the battery terminals on the controller may differ from the real battery voltage due to the connection and cable resistance. Therefore, this sensor, though not required, is recommended for best performance.



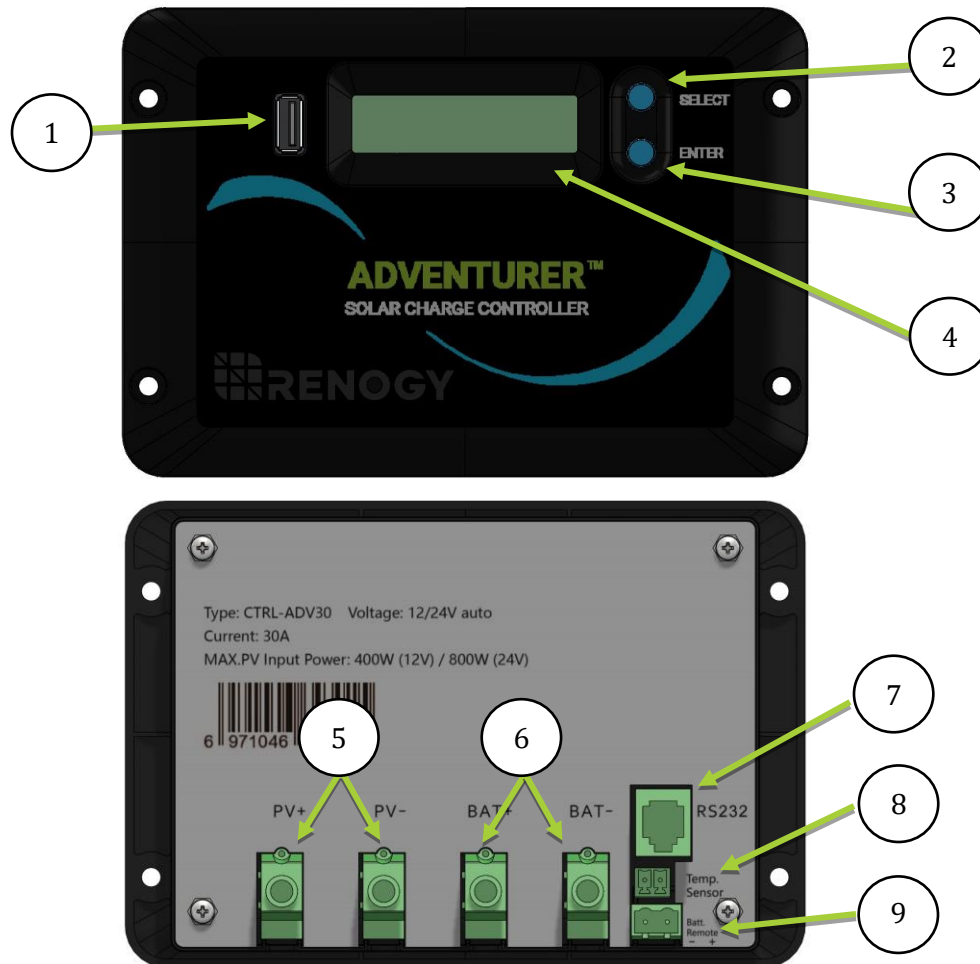
Adventurer Surface Mount Attachment

The Renogy Adventurer Surface Mount will give you the option to mount the charge controller to any flat surface; circumventing the flush mount option.

NOTE: Screws included for the attachment

NOTE: Screws are included for flush mounting.

Identification of Parts



Key Parts

1. USB Port
2. Select Button
3. Enter Button
4. Liquid Crystal Display (LCD)
5. PV terminals
6. Battery Terminals
7. RS232 Port (optional accessory)
8. Remote Temperature Sensor Terminal (optional accessory)
9. Remote Battery Voltage Sensor Terminal (optional accessory)

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.

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

Mounting Recommendations:

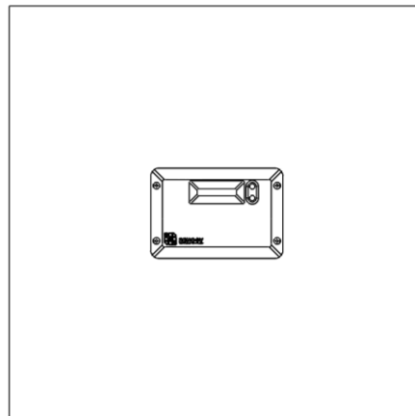
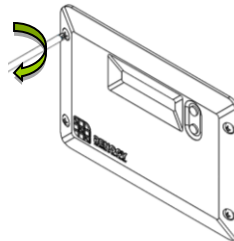
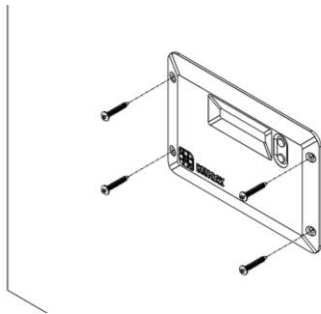
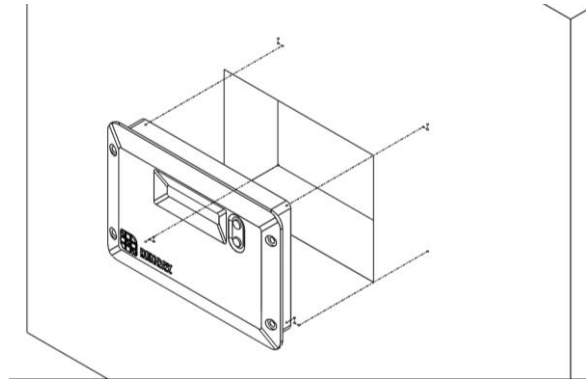
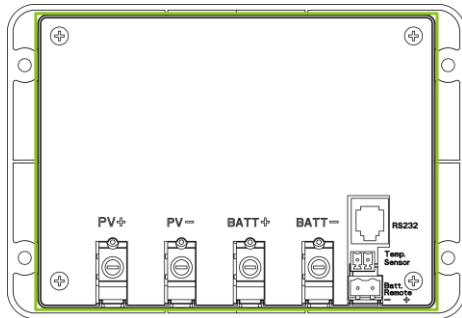
WARNING: Never install the controller in a sealed enclosure with flooded batteries. Gas can accumulate and there is a risk of explosion.

The Adventurer is designed for flush mounting on a wall. It consists of a face plate with projecting terminals on the backside for connecting the battery bank, panels, and optional sensors for accurate battery voltage sensing and battery temperature compensation. If utilizing the wall mount, then the wall will be required to be cut to accommodate the projecting terminals on the backside. Make sure that the pocket of the wall cut leaves enough space to not damage the terminals when the Adventurer is being pushed back into the cut out section of the wall.

The front of the Adventurer will serve as a heat sink, therefore it is important to ensure that the mounting location is not near any heat generating sources and ensure that there is proper airflow across the faceplate of the Adventurer to remove the heat dissipated from the surface.

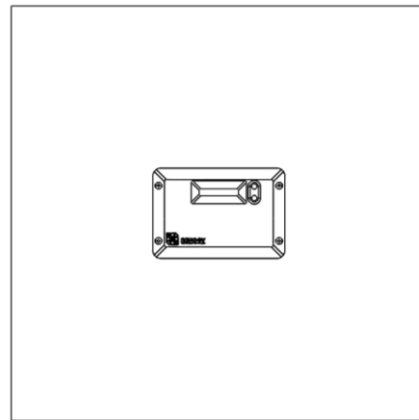
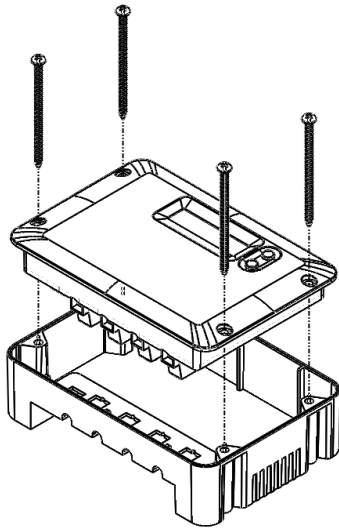
1. **Choose Mounting Location**—place the controller on a vertical surface protected from direct sunlight, high temperatures, and water. Make sure there is good ventilation.
2. **Check for Clearance**—verify that there is sufficient room to run wires, as well as clearance above and below the controller for ventilation. The clearance should be at least 6 inches (150mm).
3. **Cut out Wall section**—the recommended wall size to be cut should follow the inner protruding part of the charge controller while being careful not to go past the mounting holes. The depth should be at least 1.7 inches (43mm).
4. **Mark Holes**
5. **Drill Holes**
NOTE: The Adventurer comes equipped with screws for wall mounting. If they are not suitable try using Pan Head Phillips Screw 18-8 Stainless Steel M3.9 Size 25mm length screws.
6. **Secure the charge controller.**

Flush Mounting:



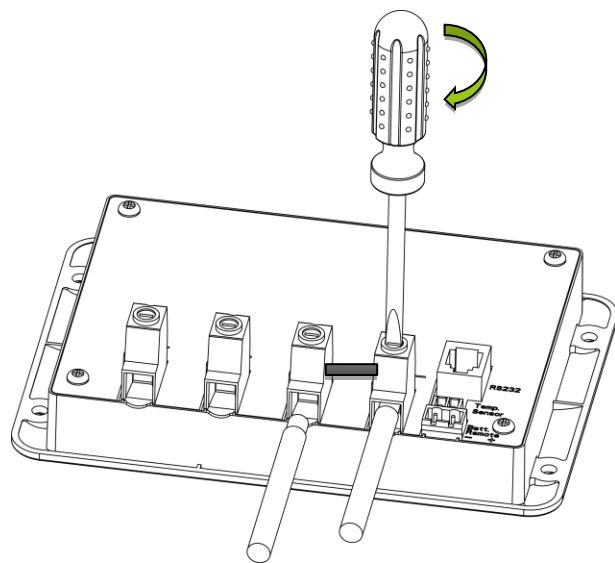
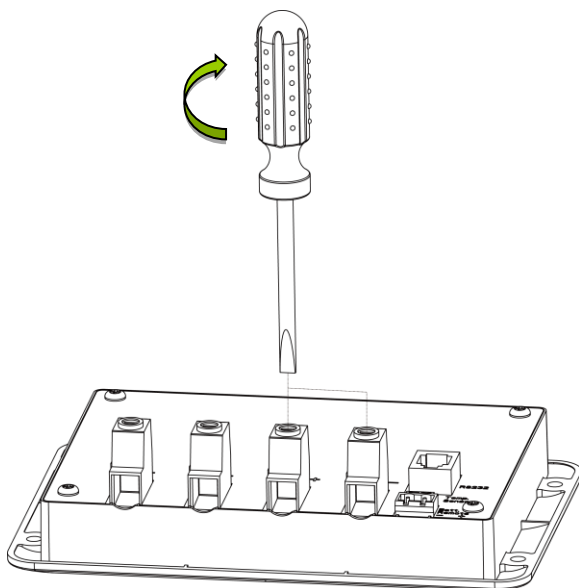
Surface Mount Attachment:

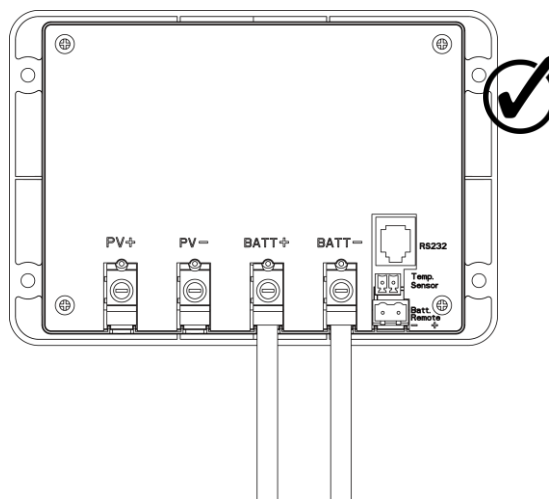
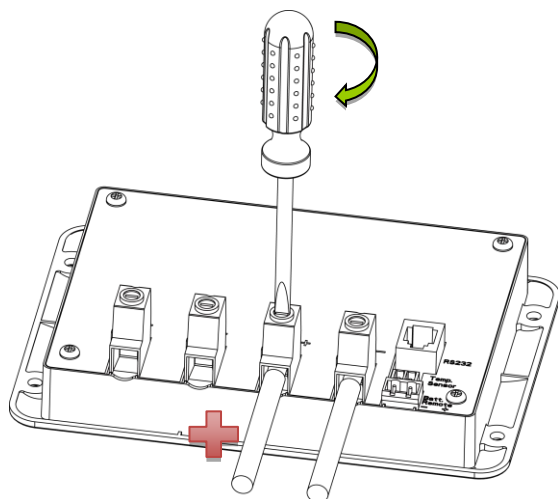
The charge controller can also be mounted on a flat surface using the Adventurer Surface Mount Attachment. In order to properly mount the charge controller, steps 1 and 2 for the flush mount option can be followed. However, there is no need to cut a section of the wall considering the charge controller can now be mounted on a flat surface using the attachment. Mark and drill holes using the four pan head Phillips screws that are provided specifically for the surface mount option.



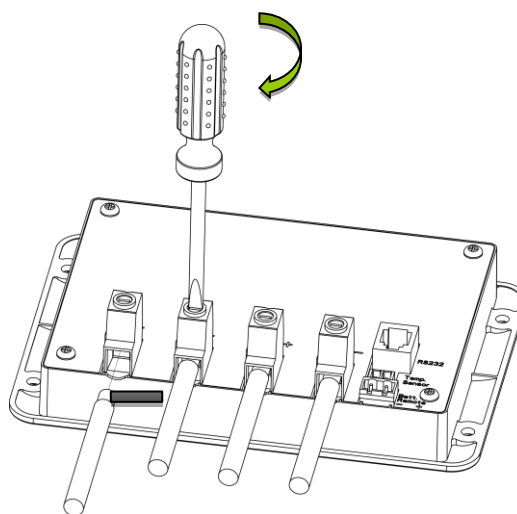
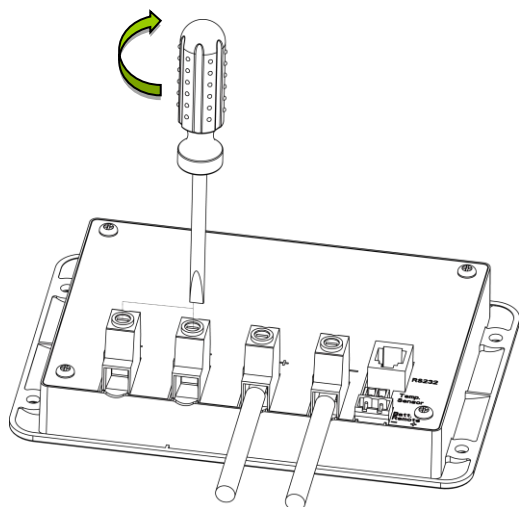
Wiring

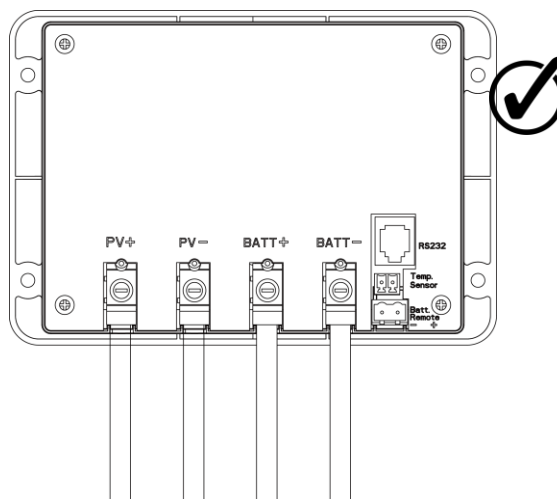
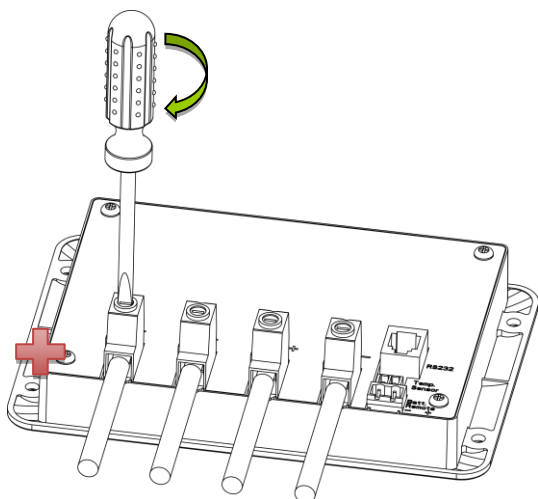
1. Unscrew battery terminals and connect battery connections



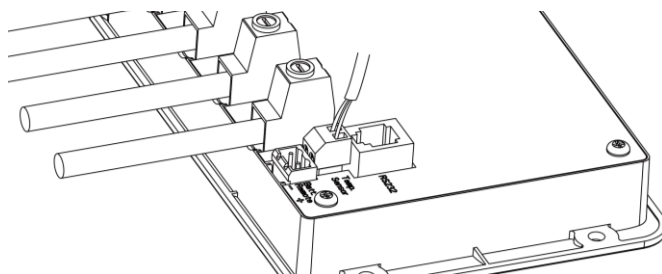
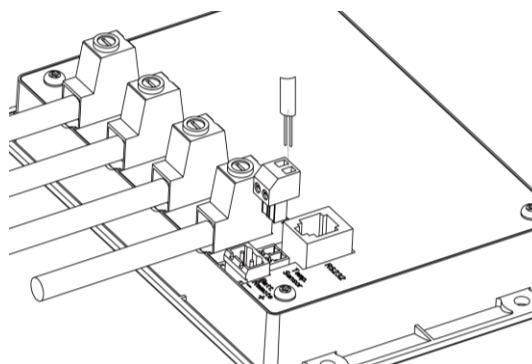
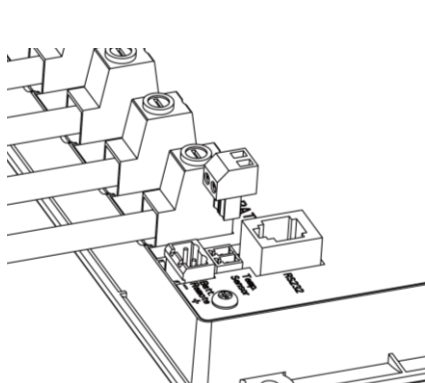


2. Unscrew PV terminals and connect PV connections

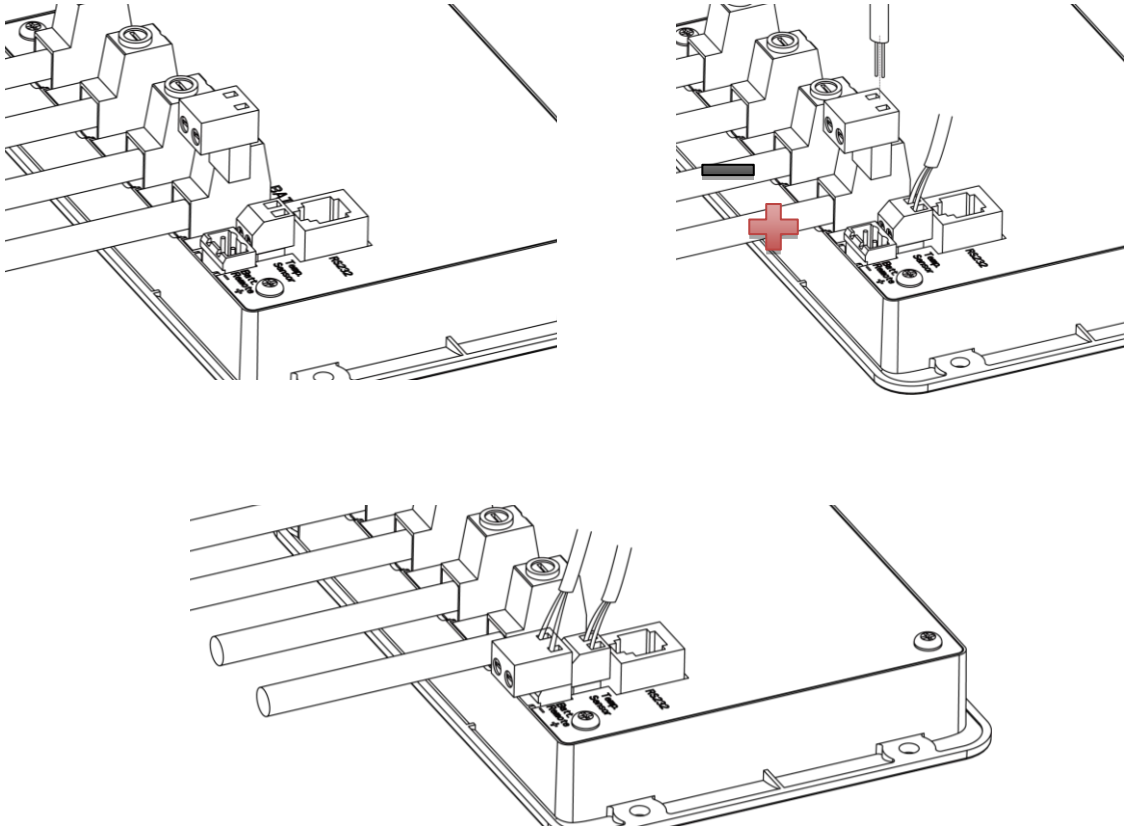




3. Insert Temperature Sensor block terminal and connect wires (POLARITY SENSITIVITY DOES NOT MATTER)



4. Insert Battery Voltage Sensor block terminal and connect wires (POLARITY SENSITIVE)



WARNING: If unscrewing the wires from the Temperature Sensor Block and Battery Voltage Sensor Block, make sure to not mix up the wires and terminal blocks. Doing so will result in irreversible charge controller damage.

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 display. They are as follows:

Parameter	Display	
PV Array Voltage	 PV	0.0 ^V
↓		
Charging Current	 PV	0.0 ^A
↓		
Generated Energy	 PV	0.0 kWh
↓		
Battery Voltage	 BATT	0.0 ^V
↓		
Temperature	 BATT	0.0 ^{F°}

The Adventurer is an easy to use controller requiring minimal maintenance. The user is able to 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	Cycles backwards through the different select screens & Customize some parameters on the charge controller

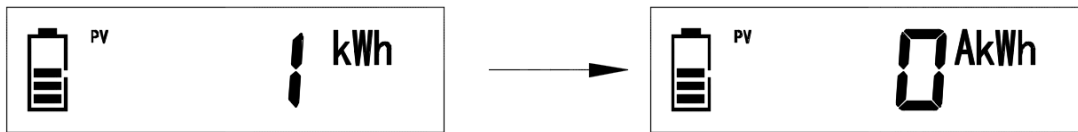
Change the Parameters

Simply hold the “ENTER” button for approximately 5 seconds until the display flashes. Once flashing, then press “SELECT” until the desired parameter is reached and press “ENTER” one more time to lock in the parameter.

NOTE: The screen must be at the appropriate interface in order to change the specific parameter.

1. Power Generation Interface → Reset

The user is able to reset the current power generation (kWh) back to 0 kWh.



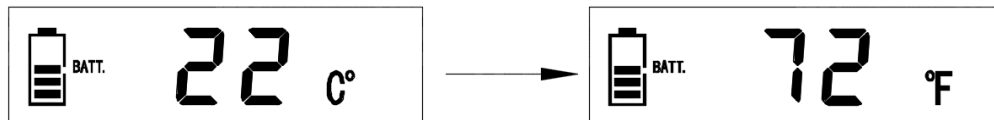
2. Battery Interface → Set Battery Type

In this interface, the user is able to select which type of battery is connected to the charge controller. Choose from Sealed, Gel, Flooded or Lithium batteries.



3. Battery Temperature Interface → Change from C° to F°

The user can select between displaying battery temperature in Celsius or Fahrenheit.

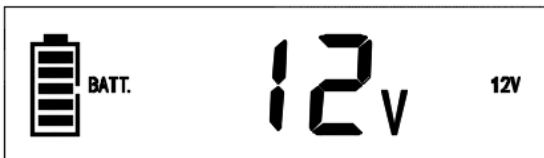


4. Set Battery Type to Lithium → Set Lithium Battery Parameters

When using the Adventurer to charge lithium battery, the user is able to set Battery Parameters. In the Battery Interface, select Lithium as Battery Type. Short press “ENTER” to enter Battery Voltage selection interface.

Press “SELECT” to select the Battery Voltage. Press “ENTER” to confirm selection and go to Charging Parameters Interface.

Press “SELECT” to change the Boost Voltage. The default setting is 14.2V and the user is able to set it in the range 12.6~16.0V, with a step of 0.2V. Hold “ENTER” to confirm the selection. The setting will also be automatically saved after 15 seconds without holding “ENTER”.



NOTE: The above settings are only available under Lithium Battery type.

System Status Icons

Icon	Behavior
	Constant: System is normal, but it is not charging
	Charging: The bars will be sequencing indicating the system is charging.
	Constant: The battery is at full charge.
	Flashing: The battery is overvoltage.
	Flashing: The battery is under voltage.
	Flashing: The bars are sequencing, indicating the controller is activating over-discharged lithium battery.
	Constant: System is abnormal.

System Status Troubleshooting

Indicator	Description	Troubleshoot
 Flashing	Battery over voltage	Use a multi-meter to check the voltage of the battery. Make sure the battery voltage is not exceeding the rated specification of the charge controller. Disconnect battery.
 Flashing	Battery under voltage	Use a multi-meter to verify the rated battery voltage. Disconnect any loads connected to the battery to allow it to charge.
Other Considerations		
Charge controller does not charge during daytime when the sun is shining on the solar panels.		Confirm that there is a tight and correct connection from the battery bank to the charge controller and the solar panels to the charge controller. Use a multi-meter to check if the polarity of the solar modules have been reversed on the charge controller's solar terminals.
Everything is connected correctly, but the LCD on the controller does not turn on		Check the rated battery voltage. The LCD will not display on the charge controller unless there is at least 9V coming from the battery bank.

Error Codes

Error Number	Description
E0	No error detected
E01	Battery over-discharged
E02	Battery over-voltage
E06	Controller over-temperature
E07	Battery over-temperature
E08	PV input over-current
E10	PV over-voltage
E13	PV reverse polarity
E14	Battery reverse polarity

Maintenance

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

1. Check that controller is mounted in a clean, dry, and ventilated area.
2. Check wiring going into the charge controller and make sure there is no wire damage or wear.
3. Tighten all terminals and inspect any loose, broken, or burnt up connections

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. Adventurer = 30A 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 $11.5 * 1.56 = 17.94 = \underline{\underline{18A \text{ fuse}}}$

Technical Specifications

Description	Parameter
Nominal Voltage	12V / 24V Auto Recognition
Rated Charge Current	30A
Max. PV Input Voltage	50 VDC
USB Output	5V, 2.4A max
Self-consumption	≤13mA
Temperature Compensation Coefficient	-3mV/°C/2V
Operating Temperature	-25°C to +55°C -13°F to 131°F
Storage Temperature	-35°C to +80°C -31°F to 176°F
Enclosure	IP20
Terminals	Up to #8 AWG
Weight	0.6 lbs.
Dimensions	6.56 x 4.50 x 1.90 inches
Communication	RS232
Battery Type	Sealed (AGM), Gel and Flooded

Battery Charging Parameters

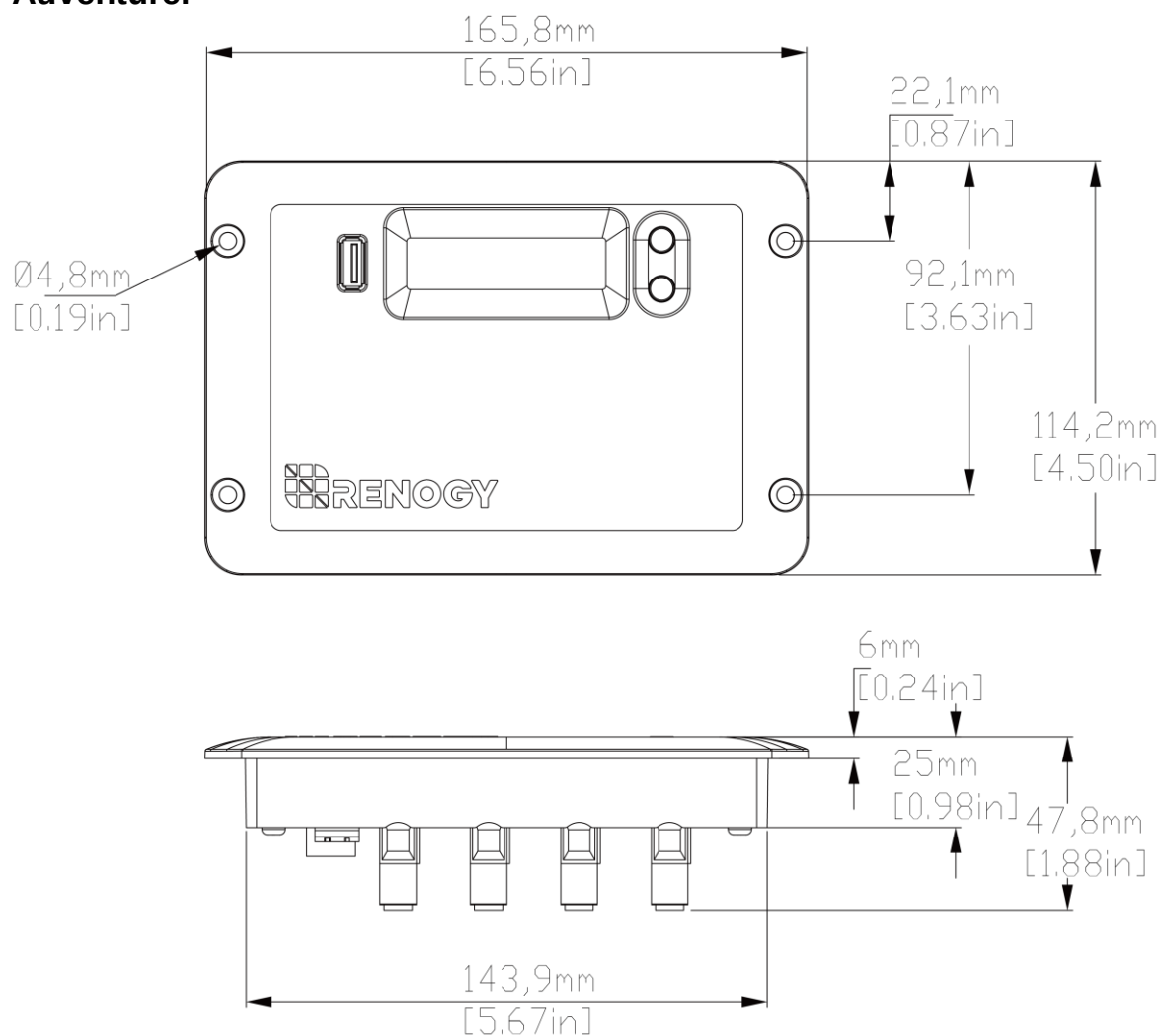
All the coefficient is referred to 25°C, and twice in 24V system rate.

Battery	GEL	SEALED	FLOODED	LITHIUM
High Voltage Disconnect	16 V	16 V	16 V	16V
Charging Limit Voltage	15.5 V	15.5 V	15.5 V	15.5V
Over Voltage Reconnect	15 V	15 V	15 V	15 V
Equalization Voltage	-----	14.6 V	14.8 V	-----
Boost Voltage	14.2 V	14.4 V	14.6 V	14.2 V (User: 12.6-16 V)
Float Voltage	13.8 V	13.8 V	13.8 V	-----
Boost Return Voltage	13.2 V	13.2 V	13.2 V	13.2 V
Low Voltage Reconnect	12.6 V	12.6 V	12.6 V	12.6V
Under Voltage Recover	12.2 V	12.2 V	12.2 V	12.2 V

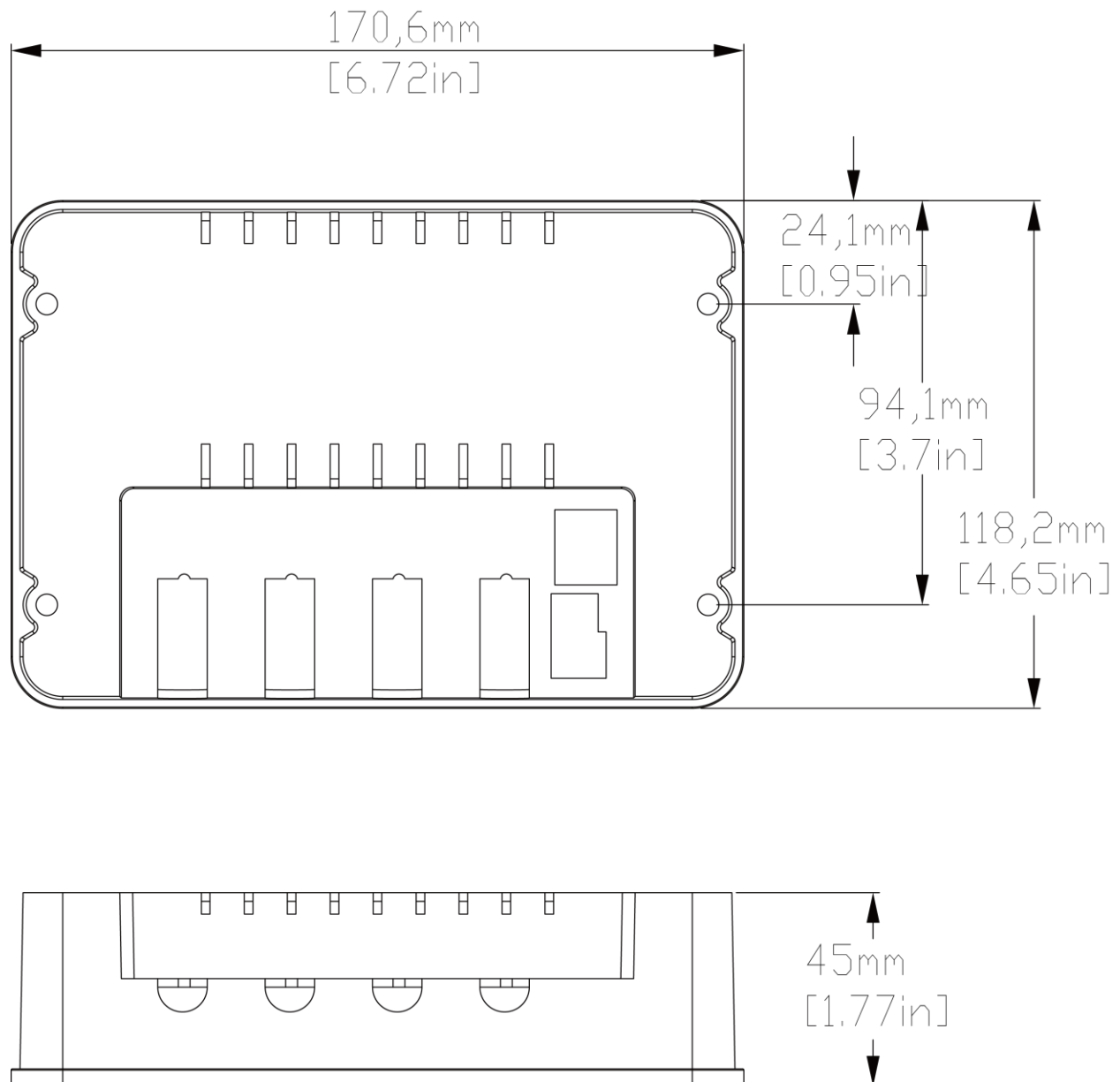
Under Voltage Warning	12 V	12 V	12 V	12V
Low Voltage Disconnect	11.1 V	11.1 V	11.1 V	11.1 V
Discharging Limit Voltage	10.8 V	10.8 V	10.8 V	10.8 V
Equalization Duration	-----	2 hours	2 hours	-----
Boost Duration	2 hours	2 hours	2 hours	-----

Dimensions

Adventurer



Adventurer Accessory



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For the most up to date manual, visit our download page at www.renogy.com



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