

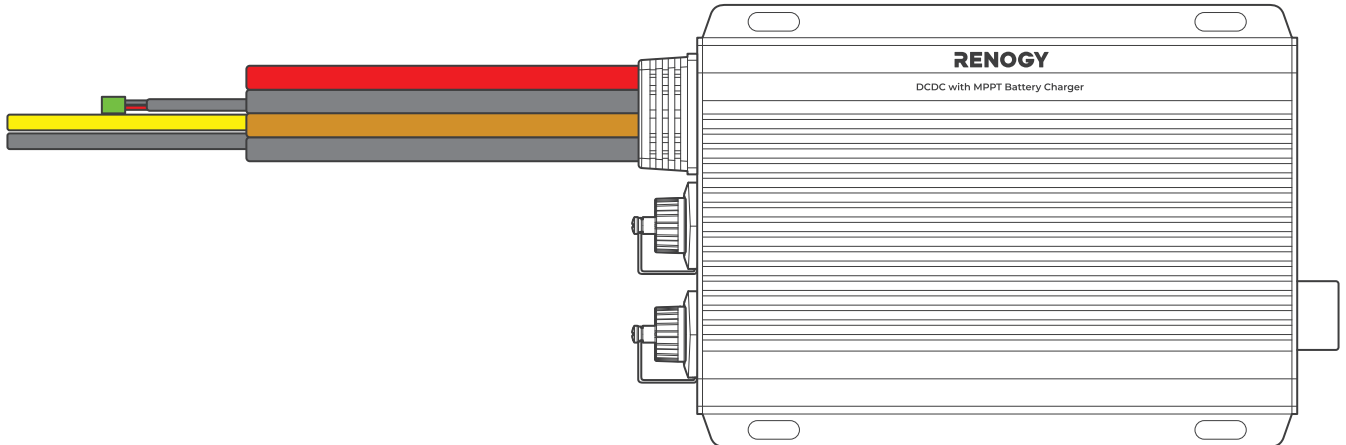
RENOGY

Dual Input DC-DC On-Board with MPPT Battery Charger

12V/24V 50A | IP67

RBC2125DS-21W-G4

VERSION A8
May 31, 2026



USER MANUAL

Before Getting Started

The user manual provides important operation and maintenance instructions for Renogy 12V/24V 50A IP67 Dual Input DC-DC On-Board with MPPT Battery Charger (hereinafter referred to as battery charger).

Read the user manual carefully before operation and save it for future reference. Failure to observe the instructions or precautions in the user manual can result in electrical shock, serious injury, or death, or can damage the battery charger, potentially rendering it inoperable.

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Online User Manual

Visit your local Renogy website to view the complete user manual.



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1. General Information

1.1. Symbols Used

The following symbols are used throughout the user manual to highlight important information.

-  **WARNING:** Indicates a potentially hazardous condition that could result in personal injury or death.
-  **CAUTION:** Indicates a critical procedure for safe and proper installation and operation.
-  **NOTE:** Indicates an important step or tip for optimal performance.

1.2. Symbols on Product

Symbol	Description	Symbol	Description
	Keep dry		Fragile
	Ventilation		Read and understand the instruction manual before use.
	Do not dispose of the product together with household waste.		Materials used are recyclable.
	Australian compliance certifications		CE mark of conformity EU/EEA Importer
	Product complies with FCC requirements.		Restriction of Hazardous Substances compliant
	Product complies with ECE Regulation No. 10.		

1.3. Introduction

Renogy 12V/24V 50A IP67 Dual Input DC-DC On-Board with MPPT Battery Charger allows you to charge your house (auxiliary) battery from solar panels or the starter battery in your RV. It is a charging device that not only converts direct current to the appropriate voltage for charging a battery but also incorporates MPPT (Maximum Power Point Tracking) technology to optimize power conversion from solar panels.

The battery charger is versatile and can be connected to either 12V or 24V auxiliary batteries. The built-in buck converter module is designed to adapt to different voltage requirements, enabling 12V solar panels to charge 24V batteries at their native voltage and 24V solar panels to charge 12V batteries at their native voltage.

Thanks to the exclusive intelligent charging logic, the battery charger prioritizes solar energy and automatically adjusts working modes based on sunlight intensity, efficiently charging your house battery while easing the load on generators. The battery charger seamlessly switches to solar charging in ample sunlight and smoothly transitions to generator charging during low light, ensuring uninterrupted device power.

Equipped with intelligent boost and buck logic, it seamlessly accommodates 12V/24V voltage systems, elevating DIY possibilities to the uttermost. Maximizing energy utilization, it boasts a robust 50A current and an impressive 720W output power, making a slim, waterproof dual charging solution perfect for confined spaces. You can embrace an eco-conscious charging experience without compromising efficiency or space, redefining sustainable energy utilization with the battery charger.

1.4. Key Features

- **Intelligent Boost and Buck Logic**

Effortlessly converts between 12V and 24V systems with over 90% efficiency for boosting and 94% for voltage reduction, offering a dual charging solution adaptable to various DIY configurations.

- **Prioritize Solar Green Energy**

Features auto-switching charging mode while prioritizing green power, achieving 97% charging efficiency, and delivering 720W high charging power for a greener approach.

- **IP67 Waterproof**

Ensures robust safety standards with multiple certifications like CE, FCC, and RoHS, guaranteeing a secure off-grid power experience alongside strong IP67 waterproof performance.

- **Extremely Compact and Lightweight**

Compact and light enough to be mounted in engine compartment and side storeroom, allowing for a more spacious and comfortable living space.

- **Smart Living Unleashed**

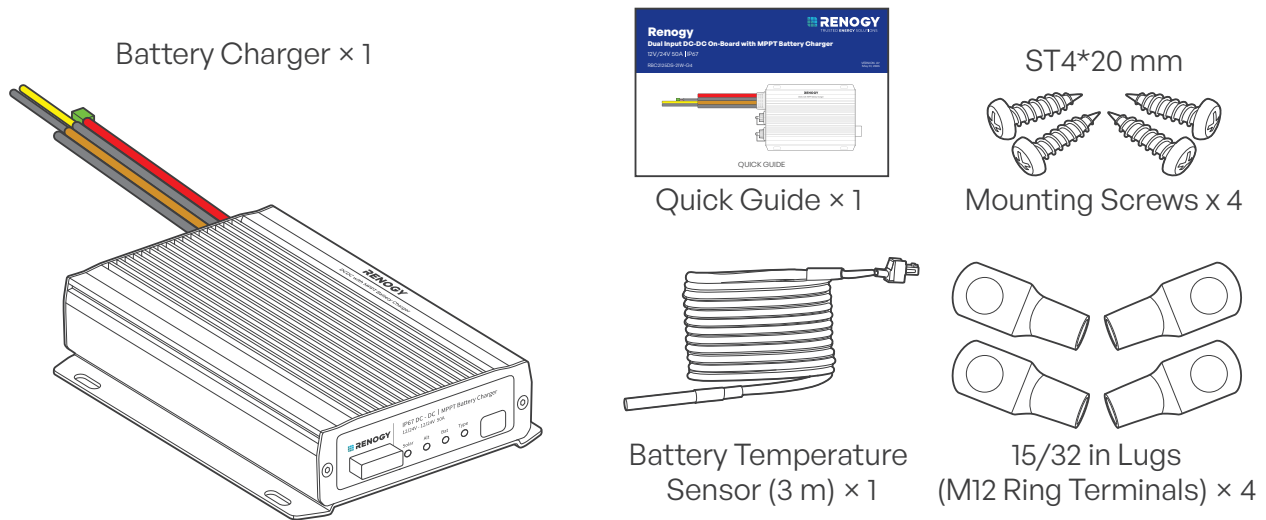
Compatible with both built-in Bluetooth and wired CAN communication to get real-time data, striving for the most reliable experience for off-grid users.

1.5. SKU

Renogy 12V/24V 50A IP67 Dual Input DC-DC On-Board with MPPT Battery Charger	RBC2125DS-21W-G3
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2. Get to Know 12V/24V 50A DC-DC Battery Charger with MPPT

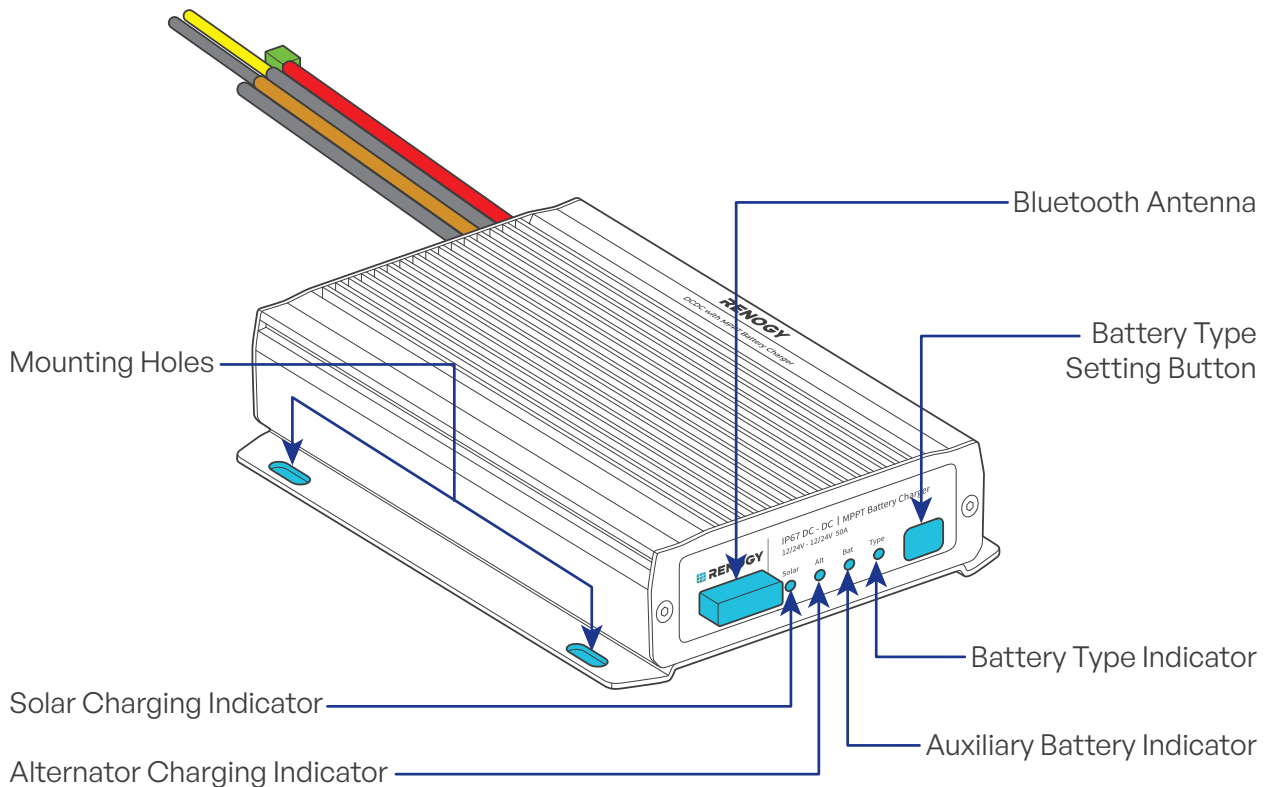
2.1. What's In the Box?



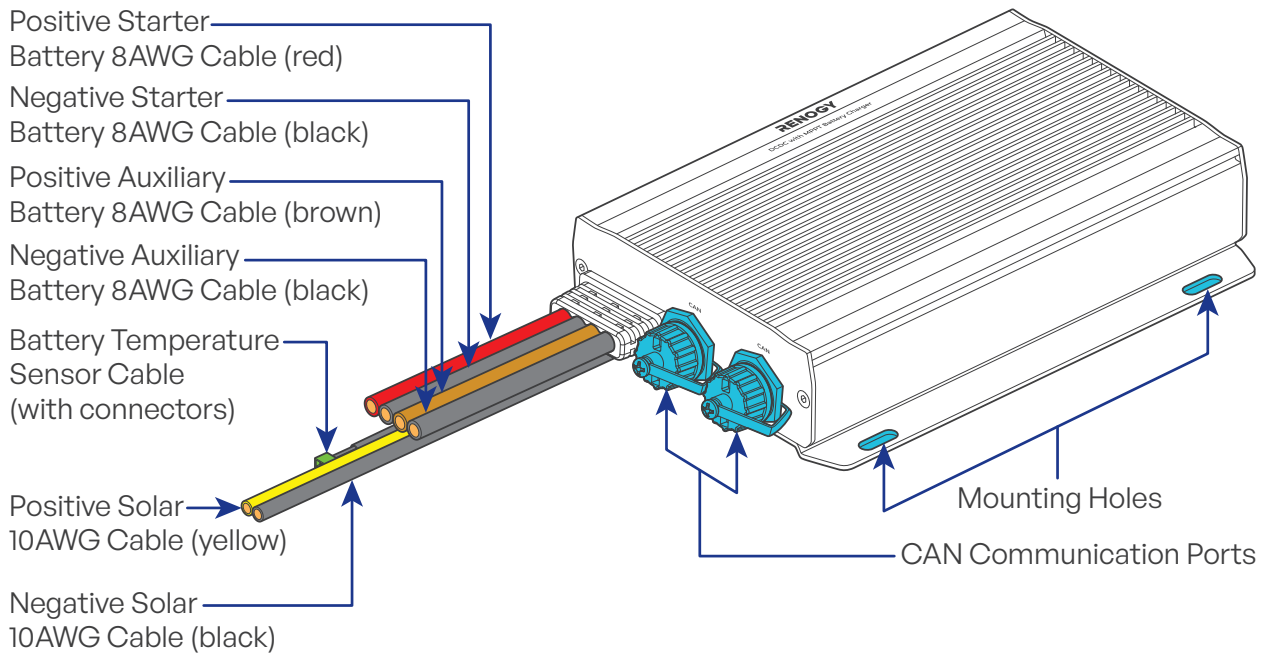
- i** Make sure that all accessories are complete and free of any signs of damage.
- i** The accessories and product manual listed are crucial for the installation, excluding warranty information and any additional items. Please note that the package contents may vary depending on the specific product model.
- i** The 15/32-inch lugs (M12 ring terminals) are used to connect starter battery on your vehicle to your auxiliary battery.

2.2. Product Overview

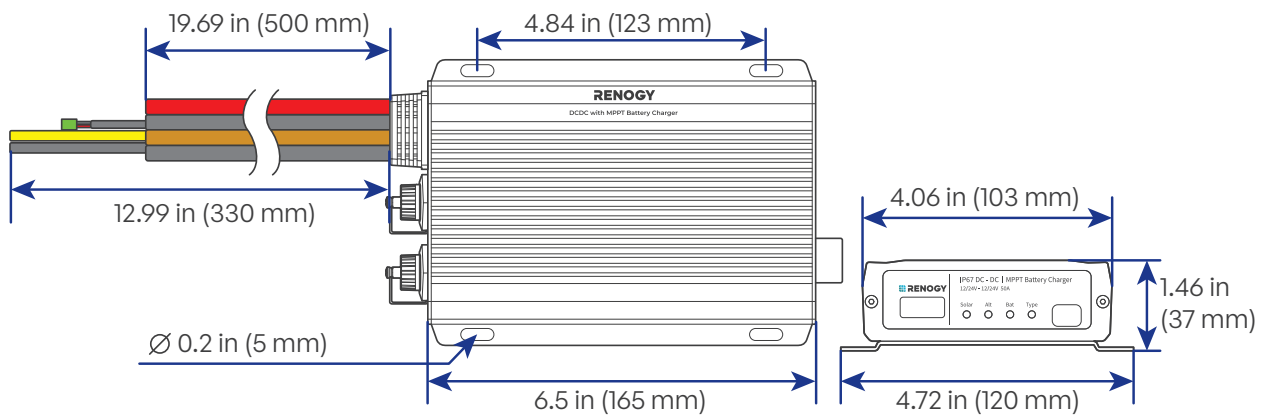
■ Right-side View



Left-side View

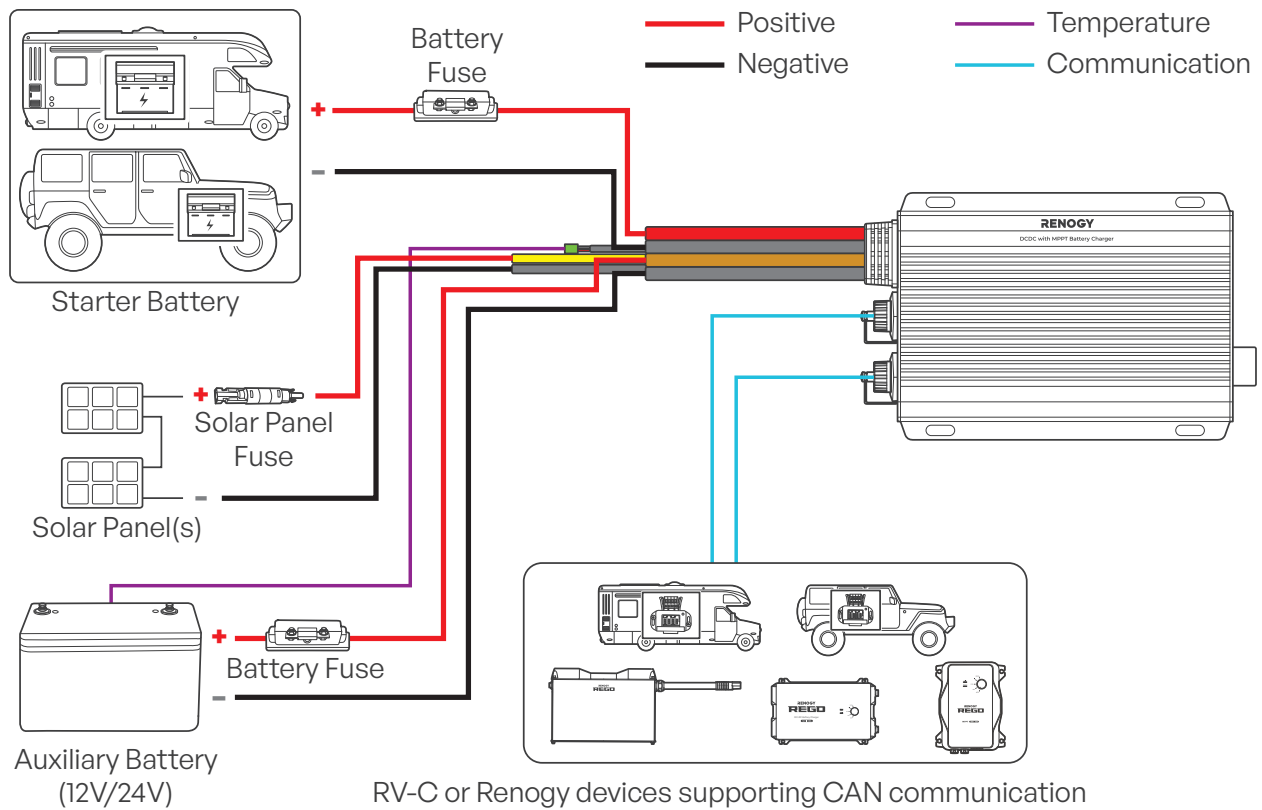


2.3. Dimensions



i Dimension tolerance: ± 0.2 in (0.5 mm)

2.4. System Setup



- i** The wiring diagram only shows the key components in a typical DC-coupled off-grid energy storage system for the illustrative purpose. The wiring might be different depending on the system configuration. Additional safety devices, including disconnect switches, emergency stops, and rapid shutdown devices, might be required. Wire the system in accordance with the regulations at the installation site.
- i** The battery charger can be connected separately to the solar panel for charging the auxiliary battery or to the vehicle's starting battery for charging the auxiliary battery.

3. Preparation

3.1. Recommended Tools & Accessories



i Prior to installing and configuring the battery charger, prepare the recommended tools, components, and accessories.

3.2. How to Size the Fuse?

For your safety, it is recommended to install fuses on both the input and output sides of energy equipment to ensure safe operation.

■ Device to Solar Panel

Refer to the solar panel user manual for operating voltage parameters and calculate the corresponding fuse rating using the formula:

In the formula, I_{sc} represents the rated current of the solar panel, and 1, 2 or 3 represents the solar panel number, respectively.

Fuse Rating = I_{sc} (or total I_{sc}) $\times$ 1.56, rounded up.	
Solar Panels in Series	Solar Panels in Parallel
Total Amps: $I_{sc1} = I_{sc2} = I_{sc3}$ Fuse = $I_{sc1} \times 1.56$	Total Amps: $I_{sc1} + I_{sc2} + I_{sc3}$ Fuse = $(I_{sc1} + I_{sc2} + I_{sc3}) \times 1.56$

You can also refer to the table below:

I_{sc} (or total I_{sc}) Range	Calculated Value ($I_{sc} \times 1.56$)	Rounded Up Standard Fuse
0 – 5A	$\leq 7.8A$	10A
5 – 8A	7.8 – 12.48A	15A
8 – 13A	12.48 – 20.28A	20A
13 – 16A	20.28 – 24.96A	25A
16 – 19A	24.96 – 29.64A	30A
19 – 23A	29.64 – 35.88A	40A

Note: When selecting a fuse, check the Maximum Fuse Rating listed in the solar panel specifications. The fuse rating must not exceed this value.

Quantity Required:

- Single panel or single string (no parallel connection): A fuse may be installed on the positive output terminal of the string (not mandatory but recommended). When solar panels are connected in series, current flows along a single continuous path and remains essentially constant. Therefore, installing a

properly rated fuse at the positive output terminal of the entire string provides overcurrent protection for the whole string.

- Multiple panels or strings in parallel: A fuse must be independently installed on the positive output terminal of each string (mandatory). If no more than two strings are connected in parallel, fuses are not mandatory but recommended. Parallel configurations require individual protection for each branch. If one solar panel (or sub-array) short-circuits or fails, healthy branches will feed current into the faulty branch, causing damage or danger. To prevent such reverse or abnormal current, a fuse must be installed on the positive output terminal of each parallel solar panel (or each parallel sub-array). This way, if any single branch fails, that branch can be isolated locally, protecting the other branches and maintaining safe and continuous operation of the entire system.

■ Device to Auxiliary Battery

Installation location: To ensure the auxiliary battery (especially LiFePO₄) reaches 100% state of charge, install the device as close to the battery as possible, ideally within 20 cm (8 inches), and no more than 1.5 m (5 feet) away, to minimize voltage drop during the final charging stage.

Device Max Charging Current	Fuse Size
10A	15 - 20A
15A	20 - 25A
20A	25 - 30A
25A	35 - 40A
30A	40 - 50A
40A	50 - 60A
50A	60 - 80A
60A	80 - 90A
100A	130 - 150A

■ Device to Stater Battery

Installation location: The fuse must be installed close to the positive terminal of the vehicle's starter battery, ideally within 20 cm (8 inches).

Device Max Charging Current	Fuse Size
10A	15 - 20A
15A	25 - 30A
20A	30 - 40A
25A	35 - 40A
30A	50 - 60A
40A	60 - 70A
50A	70 - 80A
60A	80 - 100A
100A	150 - 180A

3.3. How to Size Wires?

Cable standard: Use UL-listed stranded soft copper wire rated for temperatures above 221°F (105°C). Such wire offers excellent high-temperature performance and higher theoretical ampacity.

Fuse matching principle: The fuse rating must be strictly less than the wire's maximum current rating to ensure 100% protection of the wire. In an overcurrent situation, the fuse should blow first.

Cable length: Refers to the sum of the lengths of the positive and negative cables.

■ Device to Auxiliary Battery or Stater Battery

Use the table below to select the wire gauge based on the fuse. The table already accounts for a voltage drop of <8%, but may not be suitable for all configurations.

Fuse Size	Cable Length (ft) / (m)	Cable Gauge Size
-----------	-------------------------	------------------

15 – 20A	0 – 13 ft / 0 – 4 m	16 AWG / 1.32 mm ²
	13 – 18 ft / 4 – 5.5 m	14 AWG / 2.08 mm ²
	18 – 23 ft / 5.5 – 7 m	14 AWG / 2.08 mm ²
	23 – 28 ft / 7 – 8.5 m	14 AWG / 2.08 mm ²
	28 – 40 ft / 8.5 – 12 m	12 AWG / 3.33 mm ²
25 – 30A	0 – 13 ft / 0 – 4 m	14 AWG / 2.08 mm ²
	13 – 18 ft / 4 – 5.5 m	12 AWG / 3.33 mm ²
	18 – 23 ft / 5.5 – 7 m	12 AWG / 3.33 mm ²
	23 – 28 ft / 7 – 8.5 m	10 AWG / 5.26 mm ²
	28–40 ft / 8.5–12 m	10 AWG / 5.26 mm ²
30 – 40A	0 – 13 ft / 0 – 4 m	12 AWG / 3.33 mm ²
	13 – 18 ft / 4 – 5.5 m	12 AWG / 3.33 mm ²
	18 – 23 ft / 5.5 – 7 m	10 AWG / 5.26 mm ²
	23 – 28 ft / 7 – 8.5 m	10 AWG / 5.26 mm ²
	28–40 ft / 8.5–12 m	8 AWG / 8.37 mm ²
40 – 50A	0 – 13 ft / 0 – 4 m	10 AWG / 5.26 mm ²
	13 – 18 ft / 4 – 5.5 m	10 AWG / 5.26 mm ²
	18 – 23 ft / 5.5 – 7 m	8 AWG / 8.37 mm ²
	23 – 28 ft / 7 – 8.5 m	8 AWG / 8.37 mm ²
	28–40 ft / 8.5–12 m	6 AWG / 13.30 mm ²
55 – 80A	0 – 13 ft / 0 – 4 m	8 AWG / 8.37 mm ²
	13 – 18 ft / 4 – 5.5 m	6 AWG / 13.30 mm ²
	18 – 23 ft / 5.5 – 7 m	6 AWG / 13.30 mm ²
	23 – 28 ft / 7 – 8.5 m	4 AWG / 21.15 mm ²
	28–40 ft / 8.5–12 m	3 AWG / 26.67 mm ²
80 – 100A	0 – 13 ft / 0 – 4 m	6 AWG / 13.30 mm ²
	13 – 18 ft / 4 – 5.5 m	6 AWG / 13.30 mm ²
	18 – 23 ft / 5.5 – 7 m	4 AWG / 21.15 mm ²
	23 – 28 ft / 7 – 8.5 m	3 AWG / 26.67 mm ²
	28–40 ft / 8.5–12 m	2 AWG / 33.62 mm ²
100 – 140A	0 – 13 ft / 0 – 4 m	4 AWG / 21.15 mm ²
	13 – 18 ft / 4 – 5.5 m	3 AWG / 26.67 mm ²
	18 – 23 ft / 5.5 – 7 m	2 AWG / 33.62 mm ²
	23 – 28 ft / 7 – 8.5 m	1 AWG / 42.41 mm ²
	28–40 ft / 8.5–12 m	1/0 AWG / 53.49 mm ²

140 – 160A	0 – 13 ft / 0 – 4 m	3 AWG / 26.67 mm ²
	13 – 18 ft / 4 – 5.5 m	2 AWG / 33.62 mm ²
	18 – 23 ft / 5.5 – 7 m	1 AWG / 42.41 mm ²
	23 – 28 ft / 7 – 8.5 m	1/0 AWG / 53.49 mm ²
	28–40 ft / 8.5–12 m	2/0 AWG / 67.43 mm ²
170 – 190A	0 – 13 ft / 0 – 4 m	2 AWG / 33.62 mm ²
	13 – 18 ft / 4 – 5.5 m	2 AWG / 33.62 mm ²
	18 – 23 ft / 5.5 – 7 m	1 AWG / 42.41 mm ²
	23 – 28 ft / 7 – 8.5 m	1/0 AWG / 53.49 mm ²
	28–40 ft / 8.5–12 m	2/0 AWG / 67.43 mm ²
190 – 220A	0 – 13 ft / 0 – 4 m	1 AWG / 42.41 mm ²
	13 – 18 ft / 4 – 5.5 m	1 AWG / 42.41 mm ²
	18 – 23 ft / 5.5 – 7 m	1/0 AWG / 53.49 mm ²
	23 – 28 ft / 7 – 8.5 m	2/0 AWG / 67.43 mm ²
	28–40 ft / 8.5–12 m	3/0 AWG / 85.01 mm ²
220 – 260A	0 – 13 ft / 0 – 4 m	1/0 AWG / 53.49 mm ²
	13 – 18 ft / 4 – 5.5 m	2/0 AWG / 67.43 mm ²
	18 – 23 ft / 5.5 – 7 m	2/0 AWG / 67.43 mm ²
	23 – 28 ft / 7 – 8.5 m	3/0 AWG / 85.01 mm ²
	28–40 ft / 8.5–12 m	4/0 AWG / 107.22 mm ²
260 – 300A	0 – 13 ft / 0 – 4 m	2/0 AWG / 67.43 mm ²
	13 – 18 ft / 4 – 5.5 m	3/0 AWG / 85.01 mm ²
	18 – 23 ft / 5.5 – 7 m	3/0 AWG / 85.01 mm ²
	23 – 28 ft / 7 – 8.5 m	4/0 AWG / 107.22 mm ²
300 – 350A	0 – 13 ft / 0 – 4 m	3/0 AWG / 85.01 mm ²
	13 – 18 ft / 4 – 5.5 m	4/0 AWG / 107.22 mm ²
350 – 400A	0 – 13 ft / 0 – 4 m	4/0 AWG / 107.22 mm ²

■ Device to Solar Panel

Solar cables with MC4 waterproof connectors available on the market are typically 12 AWG / 4 mm² or 10 AWG / 6 mm².

- Total current ≤ 20A: You can directly use Y-branch connectors.
- Total current > 20A: Use a combiner box or busbar to connect in parallel, then use a thicker total cable to connect to the energy device. No additional fuse is required after the total output bus (though installation is optional).

You must use weather-resistant, UV-resistant PV1-F solar cables that are certified by local codes. The minimum bending radius should be ≥ 43 mm / 1.69 in.

The table below is based on copper-core PV1-F cables (rated 90°C / 194°F), DC voltage drop ≤ 3%, ambient temperature ≤ 40°C / 104°F. If ambient temperature > 40°C / 104°F, the ampacity must be adjusted

according to the correction factors in NEC 310.15(B) (e.g., for 90°C/194°F insulation at 40°C/104°F ambient, the correction factor is 0.91, ~9% derating). When multiple cables are run in conduit, ampacity must be further derated by 15%–25%.

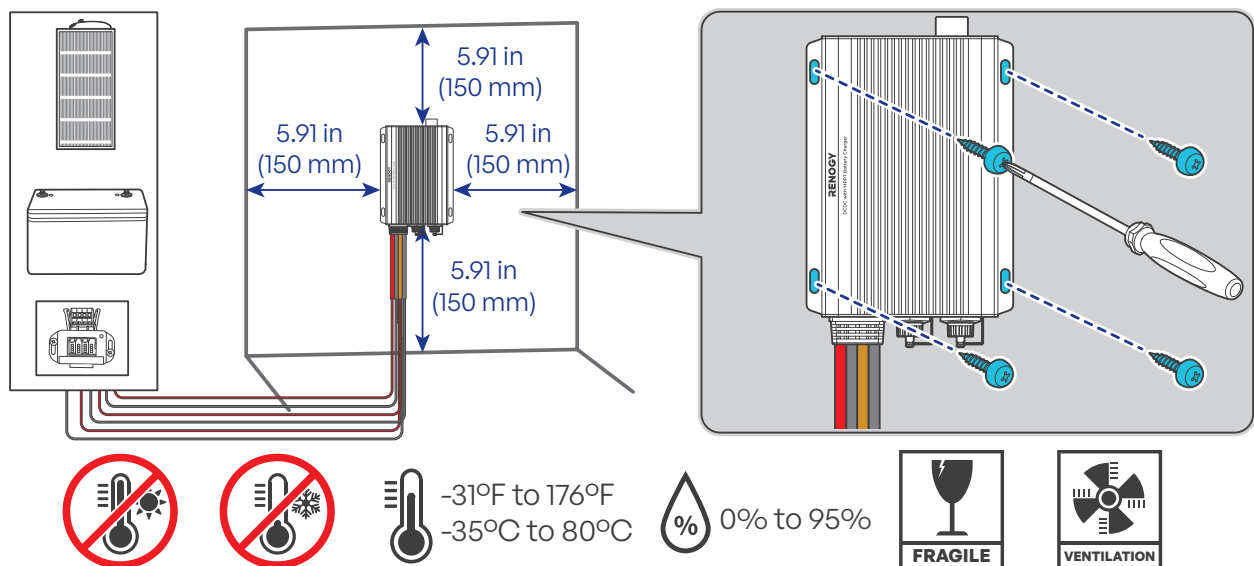
Fuse Size	Cable Length (ft) / (m)	Cable Gauge Size
0 - 10A	0–16.4 ft / 0–5 m	12 AWG / 3.33 mm ²
10 - 20A	0–26.2 ft / 0–8 m	10 AWG / 5.26 mm ²
20 - 30A	0–32.8 ft / 0–10 m	8 AWG / 8.37 mm ²
30 - 40A	0–39.4 ft / 0–12 m	6 AWG / 13.30 mm ²
40 - 50A	0–49.2 ft / 0–15 m	4 AWG / 21.15 mm ²
50 - 60A	0–59.1 ft / 0–18 m	3 AWG / 26.67 mm ²
60 - 70A	0–65.6 ft / 0–20 m	2 AWG / 33.62 mm ²
70 - 80A	0–82.0 ft / 0–25 m	1 AWG / 42.41 mm ²
80 - 90A	0–98.4 ft / 0–30 m	1/0 AWG / 53.49 mm ²
90 - 100A	0–114.8 ft / 0–35 m	2/0 AWG / 67.43 mm ²
100 - 150A	0–131.2 ft / 0–40 m	4/0 AWG / 107.22 mm ²

This table provides conventional recommended values. For actual selection, it is advisable to perform accurate calculations based on your specific system voltage, cable length, and allowable voltage drop. For more precise calculations, refer to the NEC 310.16 ampacity table (USA) or CSA C22.1 Tables 2/4/5 (Canada).

3.4. Plan a Mounting Site

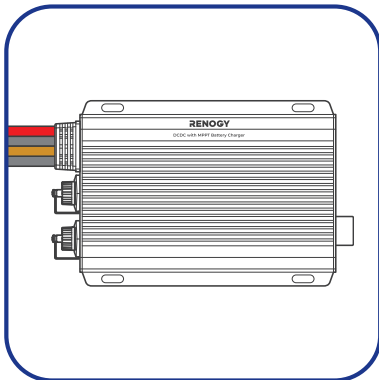
The battery charger requires adequate clearance for installation, wiring and ventilation. The minimum clearance is provided below. Ventilation is highly recommended if it is mounted in an enclosure. Select a proper mounting site to ensure the battery charger can be safely connected to the battery, solar panel(s), and the other necessary devices with the relevant cables.

You can mounting the battery charger vertically on a wall or horizontally on the floor.



- ⚠ Risk of explosion! Never install the battery charger in a sealed enclosure with flooded batteries! Do not install the battery charger in a confined area where battery gases can accumulate.
- ⚠ The battery charger should be installed on a flat surface protected from direct sunlight.
- ⚠ Keep the battery charger out of the reach of children and animals.
- ⚠ Do not expose the battery charger to flammable or harsh chemicals or vapors.
- ⚠ Make sure that the battery charger is installed in a place at ambient temperature from -31°F to 176°F (-35°C to 80°C).
- ⚠ Make sure that the battery charger is installed in an environment with relative humidity between 0% and 95% and no condensation.
- ⚡ If the battery charger is installed improperly on a boat, it may cause damage to components of the boat. Have the battery charger by a qualified electrician.
- i The battery charger should be as close to the battery as possible to avoid voltage drop due to long cables.
- i It is recommended that all cables (except communication cables) should not exceed 10 meters (32.8 feet) because excessively long cables result in a voltage drop. The communication cables should be shorter than 6 m (19.6 feet).
- i Keep the battery charger away from EMI receptors such as TVs, radios, and other audio/visual electronics to prevent damage or interference to the equipment.

3.5. Check the Battery Charger

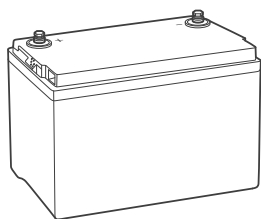


Inspect the battery charger for any visible damage including cracks, dents, deformation, and other visible abnormalities. All connector contacts shall be clean, free of dirt and corrosion, and dry.

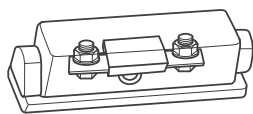
- ⚠ Do not use the battery charger if there is any visible damage.
- ⚠ Do not puncture, drop, crush, penetrate, shake, strike, or step on the battery charger.
- ⚠ There are no serviceable parts in the battery charger. Do not open, dismantle, repair, tamper with, or modify the battery charger.
- ⚠ Confirm the polarities of the devices before connection. A reverse polarity contact can result in damage to the battery charger and other connected devices, thus voiding the warranty.
- ⚠ Do not touch the connections while the battery charger is in operation.
- ⚠ Wear proper protective equipment and use insulated tools during installation and operation. Do not wear jewelry or other metal objects when working on or around the battery charger.
- i Do not dispose of the battery charger as household waste. Comply with local, state, and federal laws and regulations and use recycling channels as required.

3.6. Check the Auxiliary Battery

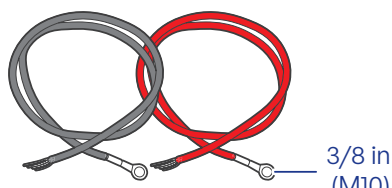
Recommended Components & Accessories



12V/24V Battery
(11V to 32V)



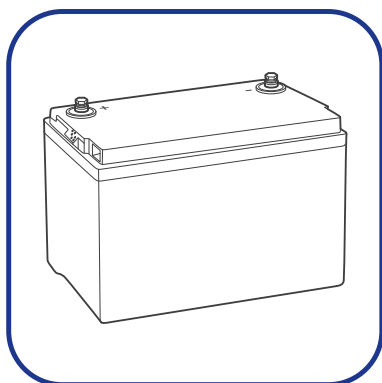
Battery Fuse



Battery Adapter Cables × 2



Fuse Cable × 1



1. Inspect the battery for any visible damage including cracks, dents, deformation, and other visible abnormalities. All terminals shall be clean, free of dirt and corrosion, and dry.

The battery charger can only be connected to 12V or 24V deep-cycle gel-sealed lead-acid batteries (GEL), flooded lead-acid batteries (FLD), sealed lead-acid batteries (SLD/AGM) or lithium iron phosphate batteries (LI).

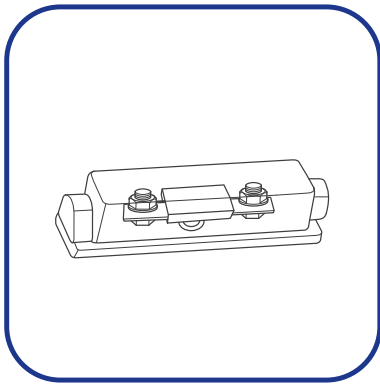
- ⚠ Do not use the battery if there is any visible damage. Do not touch the exposed electrolyte or powder if the battery housing is damaged.
- ⚠ When being charged, the battery may give off explosive gas. Make sure there is good ventilation.
- ⚠ Take care to use a high-capacity lead-acid battery. Be sure to wear protective goggles. If carelessly getting electrolyte in your eyes, flush your eyes with clean water immediately.
- ⚡ Combine batteries in parallel or in series as needed. Prior to installing the battery charger, ensure all battery groups are installed properly.
- i Read the user manual of the battery in use carefully.

Battery or Battery Bank System Voltage	
Battery or Battery Bank System Voltage = System Voltage U	
Batteries in Series	Batteries in Parallel
System Voltage U: $U_1 + U_2 + U_3$	System Voltage U: $U_1 = U_2 = U_3$

2. This battery charger works seamlessly with both 12V and 24V battery systems. Please consult the battery manual for accurate system voltage information. Ensure that the 16V overvoltage protection is not triggered for 12V systems and the 32V protection is not activated for 24V systems.

Read the battery user manual for battery voltage parameters, and calculate the voltage of the battery or battery pack system according to the formula to ensure that it does not exceed 32V.

- i In the formula, U represents the battery voltage, and 1, 2, or 3 represents the battery number respectively.



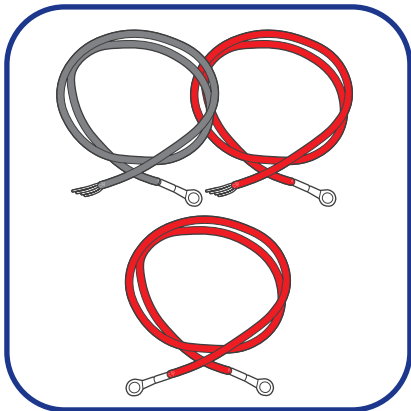
3. Inspect the Battery fuses for any visible damage including cracks, dents, deformation, and other visible abnormalities. All terminals shall be clean, free of dirt and corrosion, and dry.



Do not use the ANL Fuses if there is any visible damage.



For details on how to install and use the ANL Fuse, see its user manual.



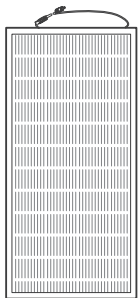
4. Inspect the Battery Adapter Cables and Fuse Cable for any visible damage including cracks, dents, deformation, and other visible abnormalities. All connector contacts shall be clean, dry, and free of dirt and corrosion.



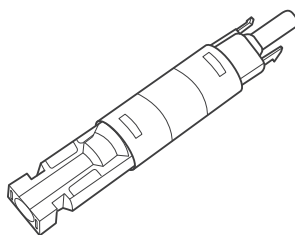
Do not use the battery adapter cables and fuse cable if there is any visible damage.

3.7. Check the Solar Panel(s)

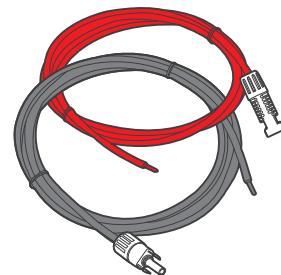
Recommended Components & Accessories



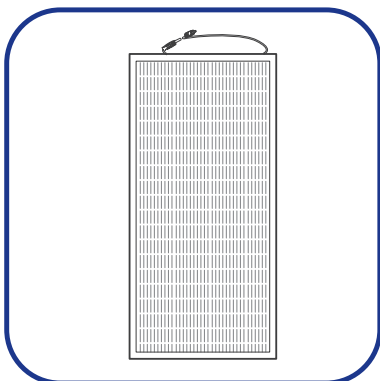
Solar Panel (s)



Solar Panel Fuse



Solar Panel Extension Cables × 2



1. Inspect the solar panel for any visible damage including cracks, dents, deformation, and other visible abnormalities. All connector contacts shall be clean, dry, and free of dirt and corrosion.

-  Do not use the solar panel if there is any visible damage.
-  Cover the solar panel prior to connecting it to the battery charger to prevent any electrical current or voltage from being generated or flowing through the system during the installation process. This reduces the risk of electrical shocks or accidents while making connections, ensuring the safety of the installer and the integrity of the equipment.
-  Do not install the solar panel on a surface constructed from combustible material.
-  Do not expose the solar panel to direct flame or heat sources.
-  Keep the solar panel out of the reach of children.
-  Keep the solar panel away from explosives and corrosive substances.
-  Do not step, walk, stand, or jump on the solar panel. Localized heavy loads may cause damage to the solar cells, which will ultimately compromise the performance of the solar panel.
-  Do not bend the solar panel. Bending the solar panel will cause damage to the cells and affect panel performance.
-  Do not immerse the solar panel in water.
-  Read the user manual of the solar panel carefully before installation.
-  The solar panels can be combined in parallel or in series as needed.
-  Identify the polarities (positive and negative) on the cables used for solar panels. A reverse polarity contact may damage the unit.

Maximum Output Power	
Maximum Output Power of Solar Panel or Solar Panel Array = Maximum Solar Input Power W	
Solar Panels in Series	Solar Panels in Parallel
Maximum Output Power W: $W_1+W_2+W_3$	Maximum Output Power W: $W_1+W_2+W_3$

2. Read the user manual of the solar panel for the maximum output power, and calculate the maximum output power of solar panel or solar panel array according to the formula. Ensure that the maximum output power of the solar panel/solar panel array does not exceed 720W.

-  In the formula, W represents the output power of the solar panel, and 1, 2, or 3 represents the solar panel number respectively.

Open Circuit Voltage	
Open Circuit Voltage of Solar Panel or Solar Panel Array = Open Circuit Voltage U	
Solar Panels in Series	Solar Panels in Parallel
Working Voltage U: $U_1+U_2+U_3$	Working Voltage U: $U_1=U_2=U_3$

3. Read the user manual of the solar panel for the maximum open circuit voltage, and calculate the maximum open circuit voltage of solar panel or solar panel array according to the formula. Ensure that the open circuit voltage of the solar panel/solar panel array does not exceed 50V.

-  In the formula, 1, 2, or 3 represents the solar panel number respectively.

Short Circuit Current (Isc)	
Short Circuit Current (Isc) of Solar Panel or Solar Panel Array = Short Circuit Current (Isc) I	
Solar Panels in Series	Solar Panels in Parallel
Short Circuit Current (Isc) I: $I_1=I_2=I_3$	Short Circuit Current (Isc) I: $I_1+I_2+I_3$

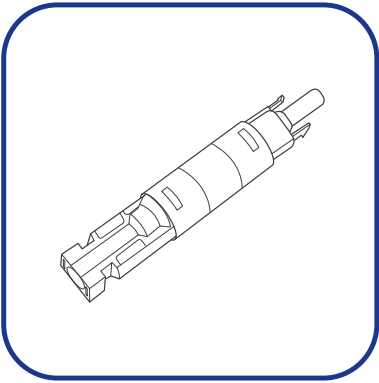
4. Read the user manual of the solar panel for the short circuit current (Isc), and calculate the short circuit current (Isc) of solar panel or solar panel array according to the formula. Ensure that the short circuit current of the solar panel/solar panel array does not exceed 48A.



In the formula, I represents the short circuit current (Isc) of the solar panel, and 1, 2, or 3 represents the solar panel number respectively.



Short circuit current is the abnormal flow of electric current in a power system, occurring between phases or between phase and ground (or neutral) during operation, with values often exceeding the rated current and dependent on the electrical distance from the short-circuit point to the power source. For detailed information, please refer to the specific solar panel manual.



5. The appropriate current rating for the solar panel fuse should be determined by multiplying the total short current amperage of the solar panel array by 1.56.

Rated Current of the Solar Panel Fuse = Short Circuit Current (Isc) of Solar Panel x 1.56

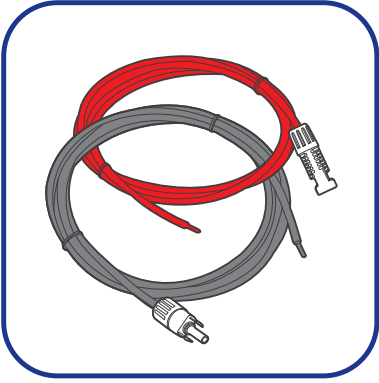
Inspect the solar panel fuse for any visible damage including cracks, dents, deformation, and other visible abnormalities. All terminals shall be clean, free of dirt and corrosion, and dry.



Do not use the solar panel fuse if there is any visible damage.



For details on how to install and use the solar panel fuse, see its user manual.



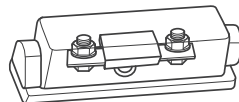
6. Inspect the Solar Panel Extension Cables for any visible damage including cracks, dents, deformation, and other visible abnormalities. All connector contacts shall be clean, dry, and free of dirt and corrosion.



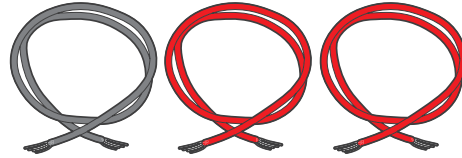
Do not use the solar panel extension cables if there is any visible damage.

3.8. Check the Alternator on Your Automobile

Recommended Components



*ANL Fuse



Bare Wires x 3



Accessories marked with “*” are available on renogy.com.

The automobile alternator may be a smart alternator or a traditional alternator. The connection method of a smart alternator or a traditional alternator depends on its parameters. Before installing the battery charger, read the user manual of the vehicle or consult the vehicle supplier to determine the type of alternator.

In addition, you can use a multimeter by yourself to measure the alternator to determine the type of alternator.

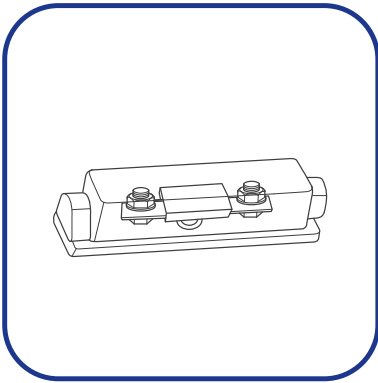
1. Locate your main vehicle battery or the starter battery.
2. Start the engine. Ensure all any fans, radio, lights, and others are turned off.
3. Take a voltage reading across the main vehicle battery.
4. Leave the engine run for around 5 or 10 minutes, then repeat Step 3.

Taking a 12V system as an example, if the vehicle's starter battery is 24V, the following parameters should be multiplied by 2.

Readings around 14.4V DC indicates you most likely have a traditional alternator. If your readings are around 12.5-13.5V, you most likely have a smart alternator.



In general, the working voltage of a traditional alternator ranges from 13.2V to 16V, and that of a smart alternator ranges from 12V to 16V. Consult the vehicle supplier for help if necessary.



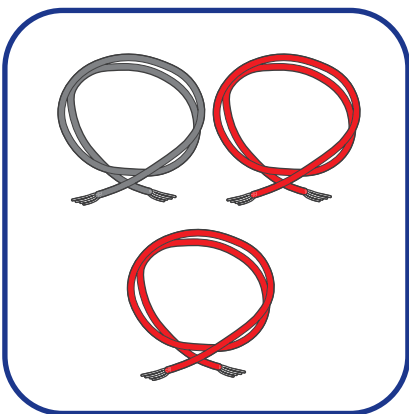
1. Inspect the Battery fuses for any visible damage including cracks, dents, deformation, and other visible abnormalities. All terminals shall be clean, free of dirt and corrosion, and dry.



Do not use the ANL Fuses if there is any visible damage.



For details on how to install and use the ANL Fuse, see its user manual.



2. Inspect the bare wires for any visible damage including cracks, dents, deformation, and other visible abnormalities.

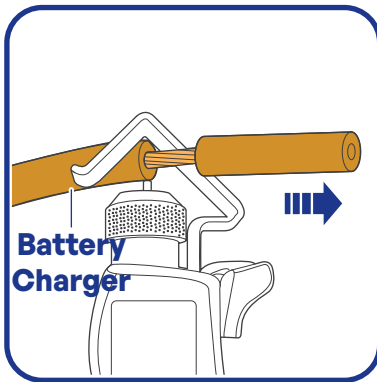


Do not use the bare wires if there is any visible damage.

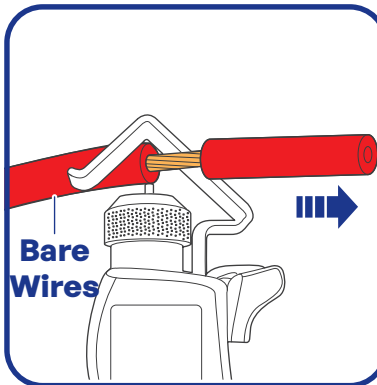
3.9. How to Install Cables on the Battery Charger?

! You are allowed to make connections using insulated conduit, junction boxes, or welding methods. If the battery charger is installed outdoors, please ensure that the wiring connections are waterproof.

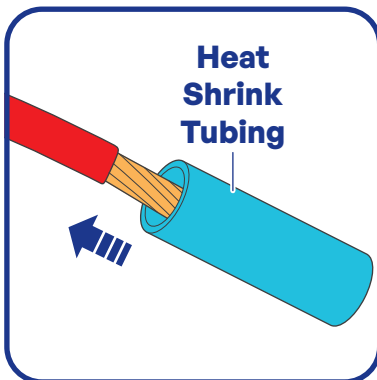
The illustrations are based on the Positive Auxiliary Battery Cable. The butt-splice connectors we use in the manual come in separate butt-splices and heat shrink tubings.



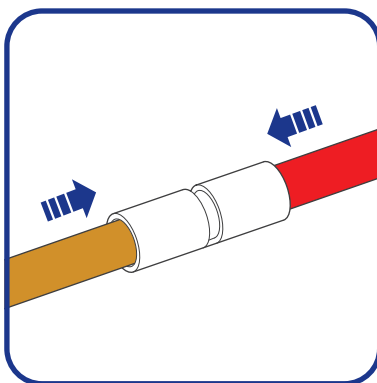
Step 1: Wear insulating gloves before wiring. Remove some insulation from the end of the Positive Auxiliary Battery Cable based on the length of the butt-splice with a wire stripper.



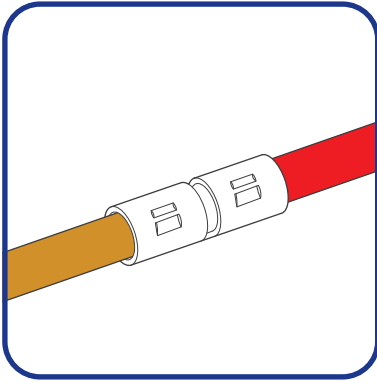
Step 2: Remove some insulation from one end of a bare wire based on the length of the butt-splice with a wire stripper.



Step 3: Thread the exposed bare wire through a piece of heat shrink tubing.



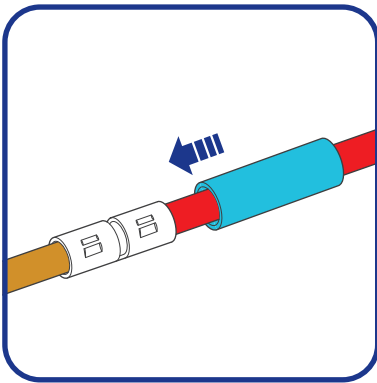
Step 4: Insert the Positive Auxiliary Battery Cable and bare wire into the butt-splices.



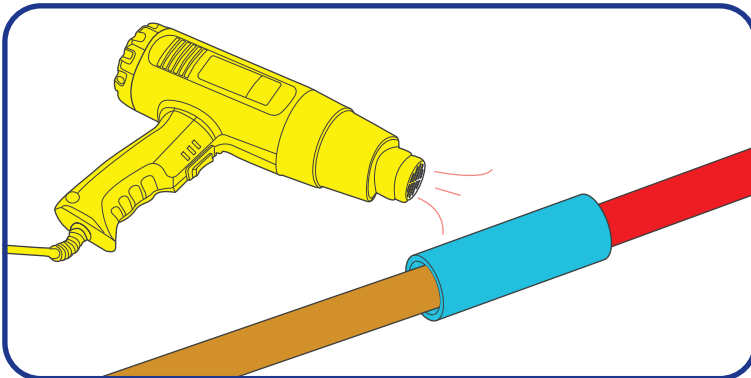
Step 5: Securely crimp the butt-splices onto the cables using a manual hydraulic pliers.



You can solder the wires to the butt-splice, ensure that a good connection is made.

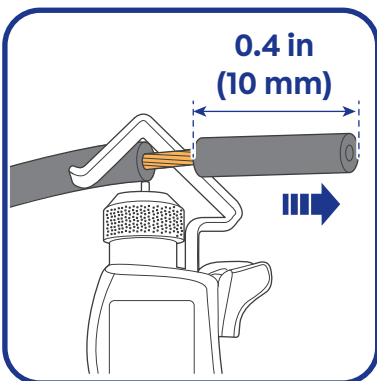


Step 6: Slide the heat shrink tubing over the butt-splices.

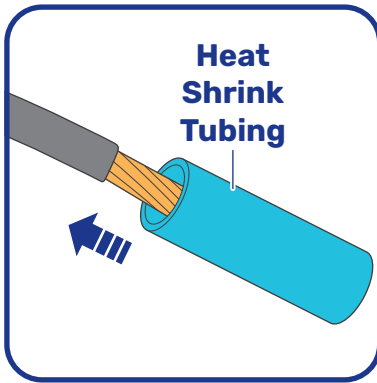


Step 7: Apply heat to the heat shrink tubing using a heat gun until it shrinks and forms a tight seal.

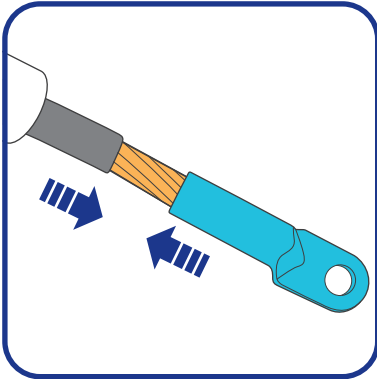
3.10. How to Install 15/32 in Lugs on the Starter Battery Wires?



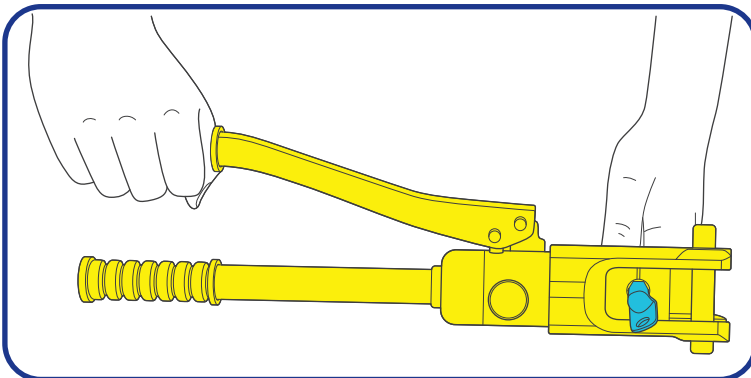
Step 1: Strip approximately 0.4 inches (10 mm) of insulation from the end of a bare wire using a wire stripper.



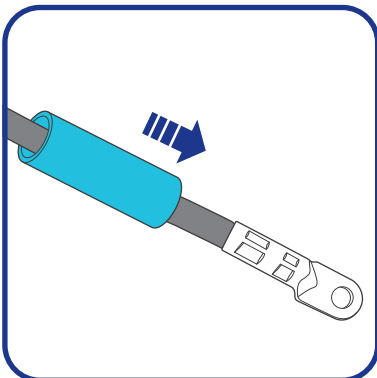
Step 2: Thread the exposed bare wire through a piece of heat shrink tubing.



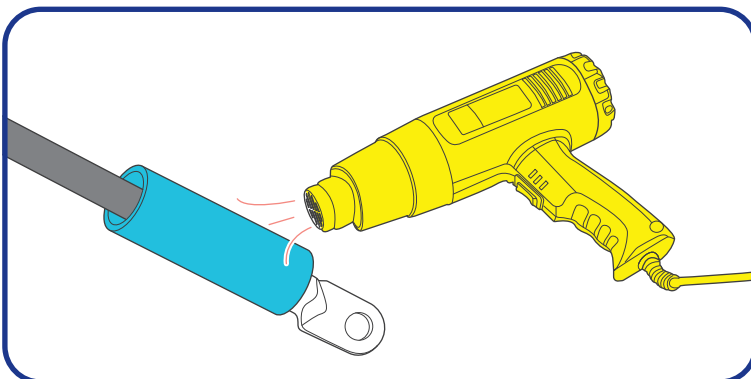
Step 3: Attach a 15/32-inch lug or 3/8-inch lug onto the end of the bare wire.



Step 4: Securely crimp the lug onto the bare wire using a manual hydraulic pliers.



Step 5: Slide the heat shrink tubing over the 15/32-inch lug or 3/8-inch lug.

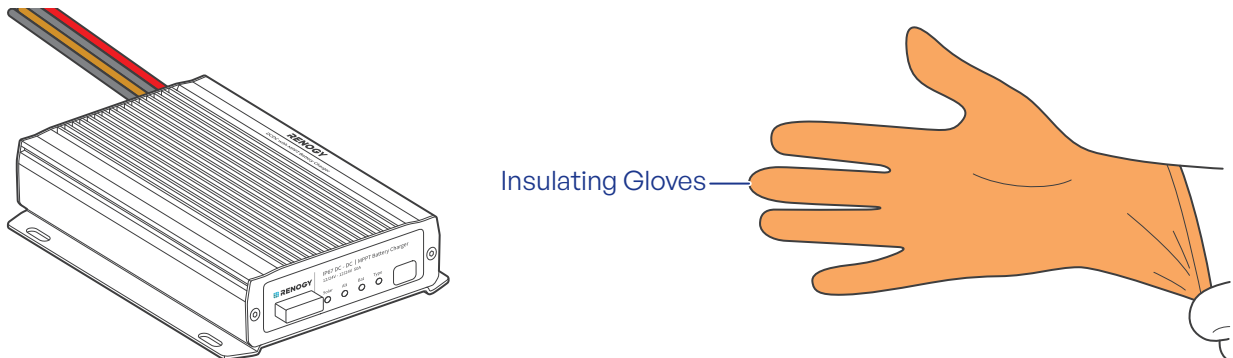


Step 6: Apply heat to the heat shrink tubing using a heat gun until it shrinks and forms a tight seal.

4. Installation

To ensure safe and efficient operation of the battery charger and to avoid potential damage or hazards, always follow the installation instructions in the sequence described in this manual.

4.1. Wear Insulating Gloves



4.2. Connect the Battery Charger to an Auxiliary Battery

The battery charger can only be connected to 12V or 24V deep-cycle gel-sealed lead-acid batteries (GEL), flooded lead-acid batteries (FLD), sealed lead-acid batteries (SLD/AGM) or lithium iron phosphate batteries (LI).



Always connect the battery charger to a battery before connecting it to a solar panel to ensure safe and efficient operation.

Step 1: Connect positive cable (red) to the positive auxiliary battery cable (brown) on the battery charger.

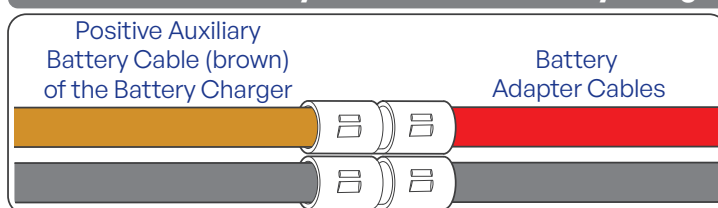
Step 2: Connect the other end of the positive cable (red) to an Battery fuse.

Step 3: Connect negative cable (gray) to the either of the 8AWG black cables on the battery charger. The black cables of the starter battery and auxiliary battery on the battery charger are both labeled “NEG.-” You can connect either the starter battery or the auxiliary battery to either cable.

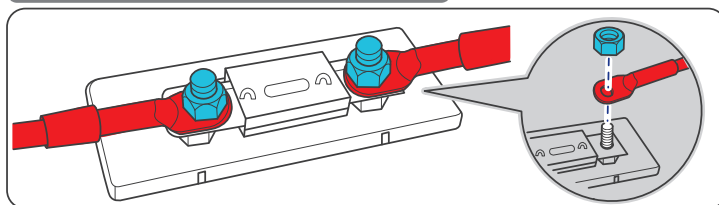
Step 4: Connect the other end of the negative cable (gray) to the negative terminal of the auxiliary battery.

Step 5: Connect the Battery fuse to the positive end of the auxiliary battery through the fuse cable (red).

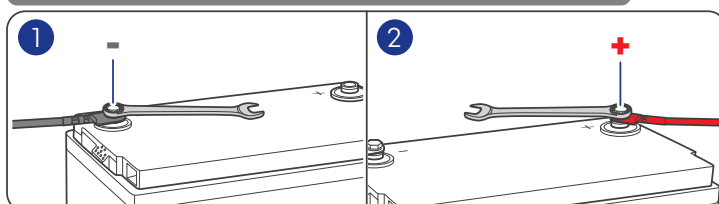
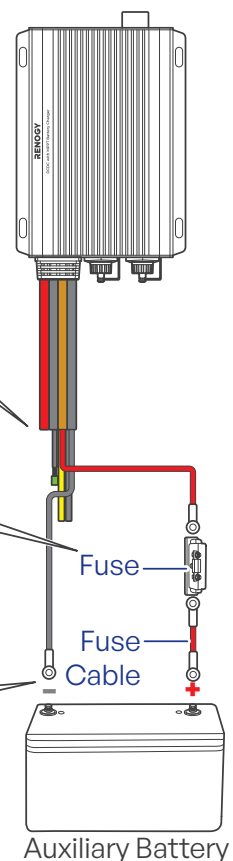
STEP-1 Install battery cables on the battery charger



STEP-2 Install an battery fuse



STEP-3 Install battery cables on the battery



 Tug on all cables to ensure firm connection.

4.3. Connect the Battery Charger to a Solar Panel

Choose proper solar panels based on your power system. Ensure that the solar panel parameters do not exceed 720W (15V to 50V, $\leq 48A$); otherwise, it may cause damage to the battery charger.

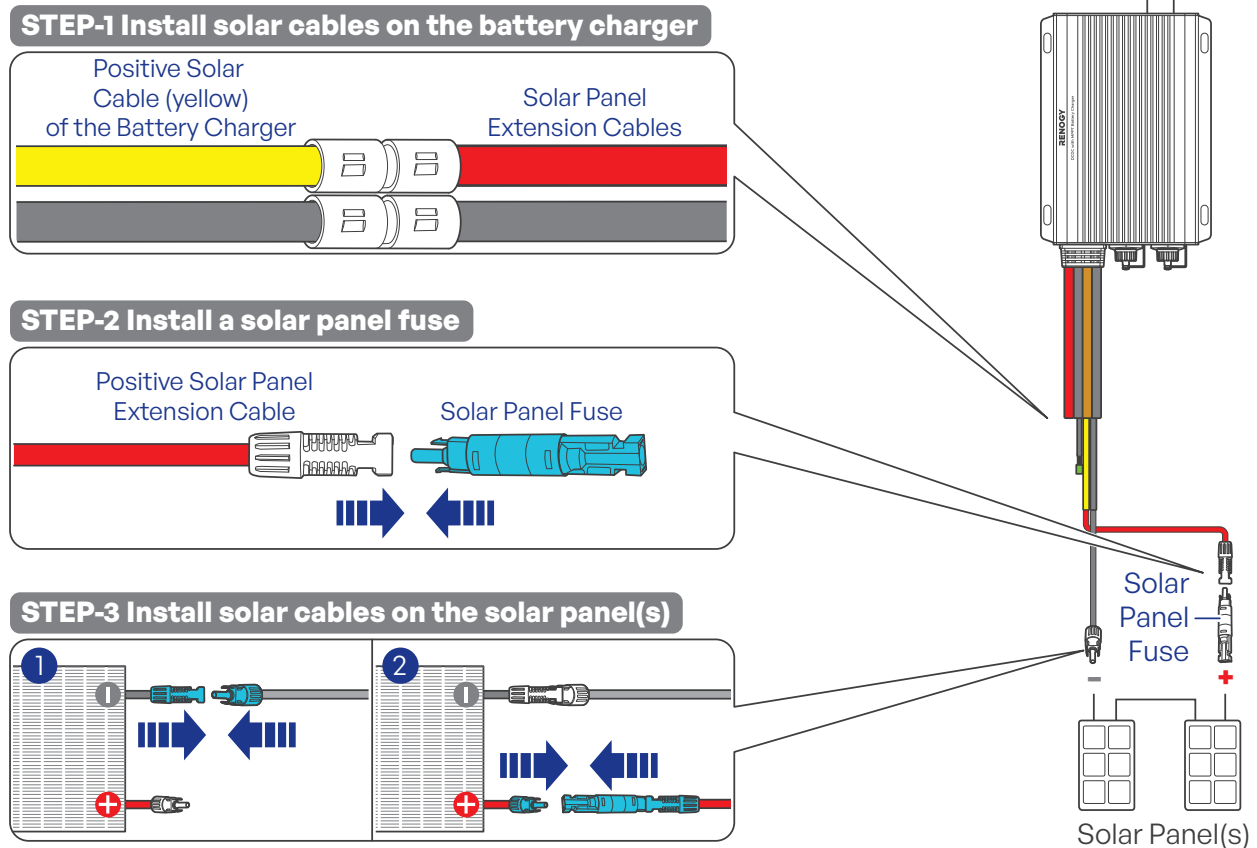
Step 1: Connect the positive solar panel extension cable to the positive solar panel cable (yellow) on the battery charger.

Step 2: Connect the other end of the positive solar panel extension cable to a solar panel fuse.

Step 3: Connect negative solar panel extension cable to the negative solar 10AWG cable (black) on the battery charger.

Step 4: Connect the other end of the negative solar panel extension cable to the negative of the solar panel.

Step 5: Connect the solar panel fuse to the positive end of the solar panel.



 Tug on all cables to ensure firm connection.

4.4. Connect the Battery Charger to a Starter Battery

Before using the starter battery to charge the auxiliary battery, measure the voltage of the starter battery and determine the charging logic based on the voltage value.

Starter Battery Voltage		Charging the Auxiliary Battery
Before Charging	During Charging	
$\geq 13.2V$, for 15 seconds	N/A	Yes
$< 13.2V$	N/A	No
N/A	$\leq 12.7V$	No

The table above shows parameters for a 12V system; for a 24V system, simply multiply by 2. You can set the auxiliary battery type to User mode and customize it through the Renogy app.

- **Smart Alternator:** Recommended start voltage: 12.0V; stop voltage: 11.5V.

- **Traditional Alternator:** Recommended start voltage: 13.2V; stop voltage: 12.7V.

Step 1: Connect positive cable (red) to the positive starter battery cable (red) on the battery charger.

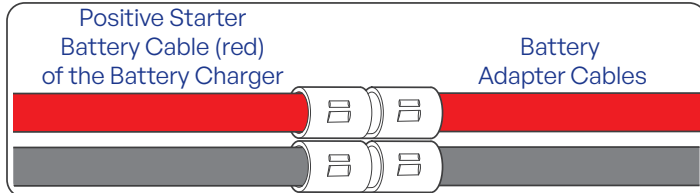
Step 2: Connect the other end of the positive cable (red) to an Battery fuse.

Step 3: Connect negative cable (gray) to the either of the 8AWG black cables on the battery charger. The black cables of the starter battery and auxiliary battery on the battery charger are both labeled "NEG.-" You can connect either the starter battery or the auxiliary battery to either cable.

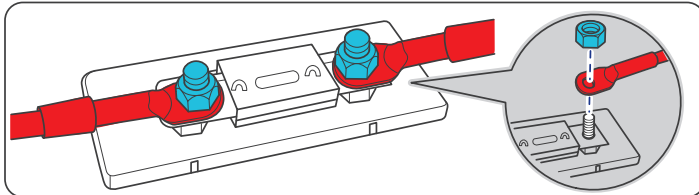
Step 4: Connect the other end of the negative cable (gray) to the negative terminal of the starter battery.

Step 5: Connect the Battery fuse to the positive end of the starter battery through the fuse cable (red).

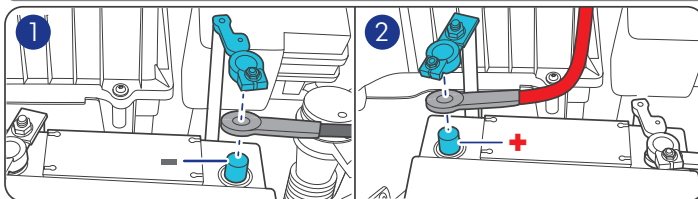
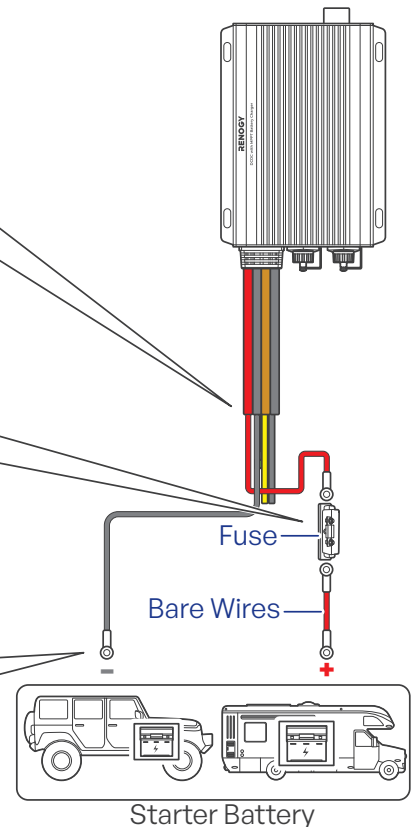
STEP-1 Install battery cables on the battery charger



STEP-2 Install an battery fuse



STEP-3 Install battery cables on the RV starter battery



i Tug on all cables to ensure firm connection.

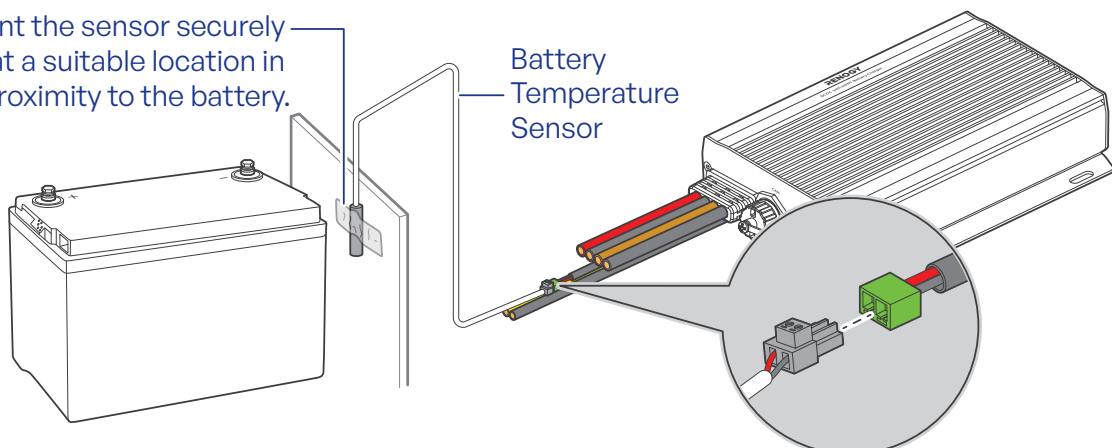
4.5. Install a Battery Temperature Sensor

The temperature sensor measures the surrounding temperature of the battery and compensates the floating charge voltage when the battery temperature is low.

Step 1: Connect the battery temperature sensor to the Battery Temperature Sensor Cable on the battery charger.

Step 2: Mount the other end of the sensor securely at a suitable location in close proximity to the battery.

Mount the sensor securely at a suitable location in close proximity to the battery.



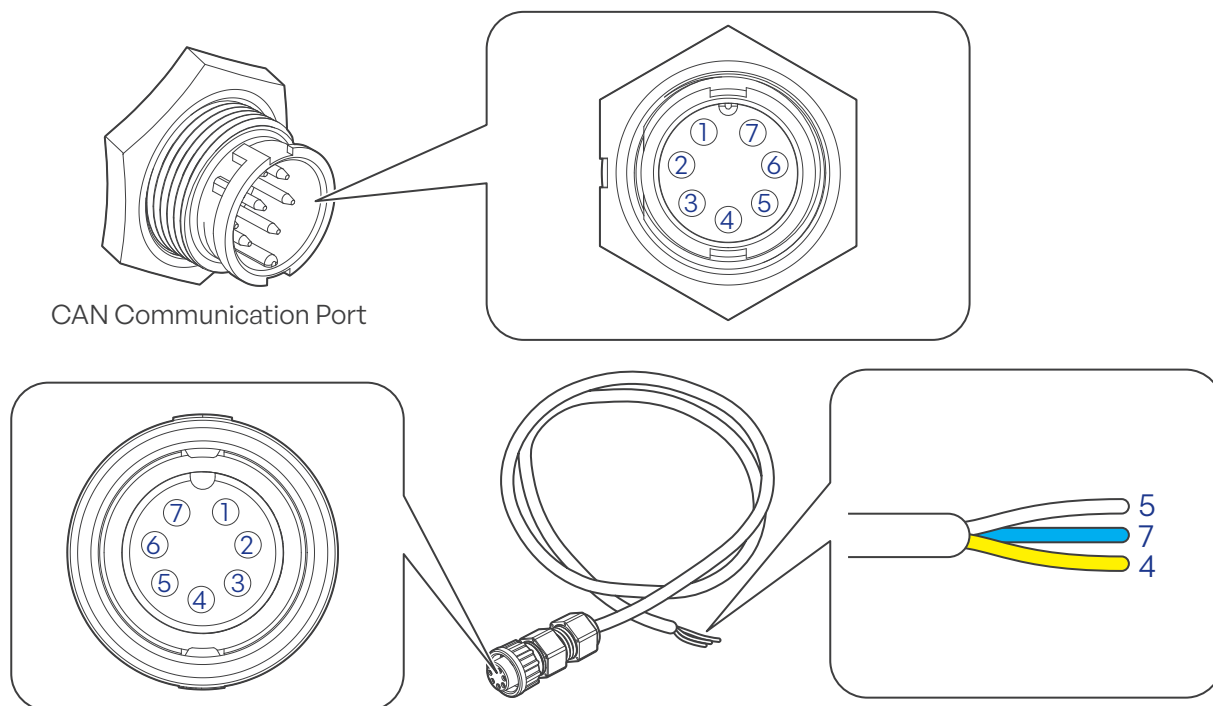


Do not use the temperature sensor on a LiFePO₄ (LFP) battery which comes with a battery management system (BMS).

4.6. CAN Communication Wiring (Optional)

Using a communication cables, connect the devices sequentially through their CAN communication ports to establish mutual communication. For details, please visit renogy.com/Support/Learning Center/Communication to view the articles “[CAN Communication Connections](#)” and “[RV-C Communication Connections](#).”

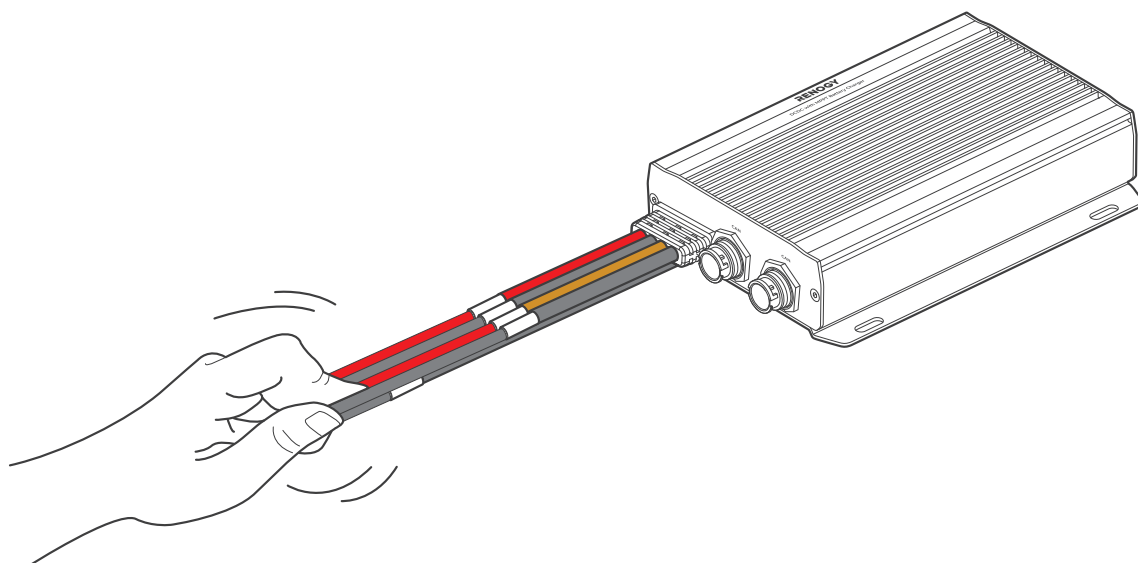
■ Terminal Definitions



Pinout No.	Definition	Wire Color
5	CAN_H	White
7	CAN_L	Blue
4	CAN_GND	Yellow

4.7. Wire Inspection

Verify that all cable connections are firmly and securely fastened. This step is essential to prevent any loose or unstable connections that could lead to operational issues or safety concerns.



5. LED Indicators

The battery charger turns on automatically after power on with the LED indicators working in accordance with the relative operating status.

Solar Charging Indicator

- **Off:** Not charging
- **Solid:** MPPT charging
- Slow flash:** Boost charging
- Single flash:** Float charging
- Double flash:** Limited-current charging
- Fast flash:** Equalization charging

Alternator Charging Indicator

- **Off:** Not charging
- **Solid:** The starter battery connected to the alternator is charging the auxiliary battery.
- Slow flash:** The solar panel is charging the starter battery.

Battery Type Indicator

- **Solid:** FLD
- **Solid:** GEL
- **Solid:** SLD/AGM
- **Solid:** 12V LI
- **Solid:** 24V LI
- **Solid:** User Mode

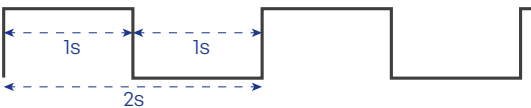
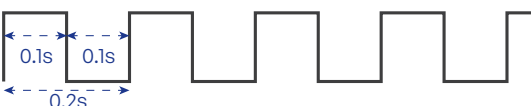
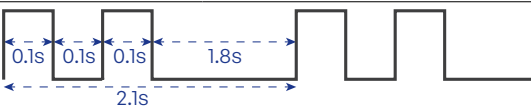
Auxiliary Battery Indicator

- **Off:** No battery detected
- **Solid:** Full charge
- **Solid:** Normal battery voltage
- **Solid:** Undervoltage warning
- Slow flash:** Overdischarge warning
- Fast flash:** Overtemperature/Overvoltage warning



If an error occurs, refer to “[9. Troubleshooting](#)” for details, or login to the Renogy app for troubleshooting details.

Check out the graphic indications of ON, OFF, Solid, Slow Flash, Fast Flash, Single Flash, and Double Flash of LEDs in the table below:

LED ON		LED OFF	
LED Pattern	Description	Graphic Expression	
Solid	The LED remains continuously illuminated without any variation.		
Slow Flash	In this mode, the LED alternates between being on and off at a relatively slow and regular interval of 1s.		
Fast Flash	In this mode, the LED alternates between being on and off at a relatively fast and regular interval of 0.1s.		
Single Flash	In this mode, the LED alternates between brief 0.05s on followed by a longer 1.95s off period.		
Double Flash	In this mode, the LED alternates between brief 0.1s on-off cycles followed by a longer 1.8s off period.		

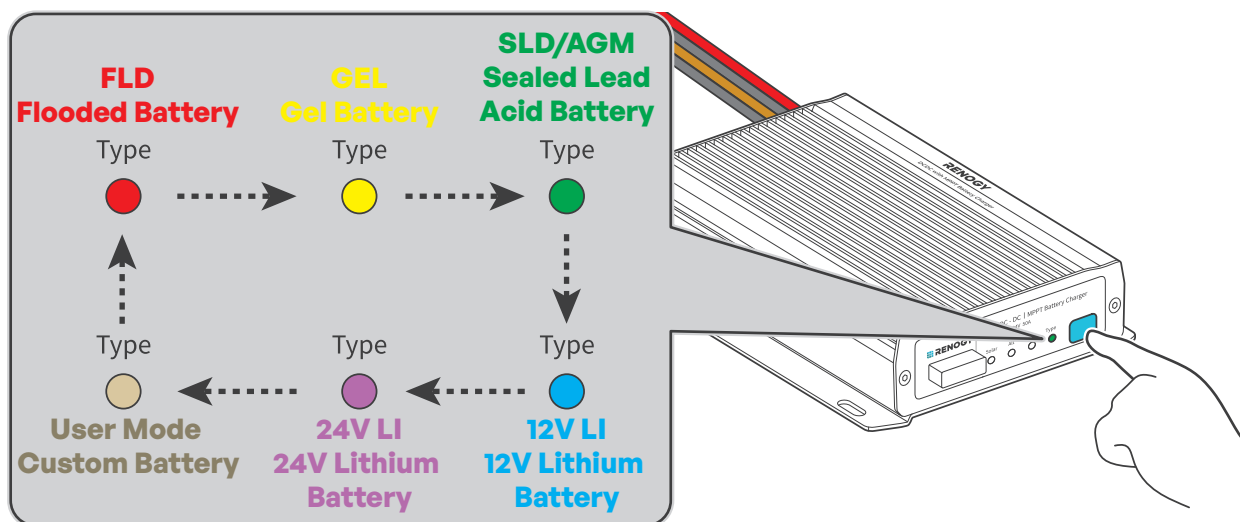
6. Configuration

6.1. Set a Auxiliary Battery Type

Upon installing the battery charger, set a correct battery type by using the Battery Type Setting Button.

1. Press and hold for 3 seconds to enter settings (LED flashes)
2. Short press to switch battery type; if no operation for 3 seconds, it will automatically save and exit (LED stays on).
3. If no operation is performed within 3 seconds after entering, it will exit directly.

For non-lithium batteries, the battery charger can automatically detect their voltage (12V or 24V).



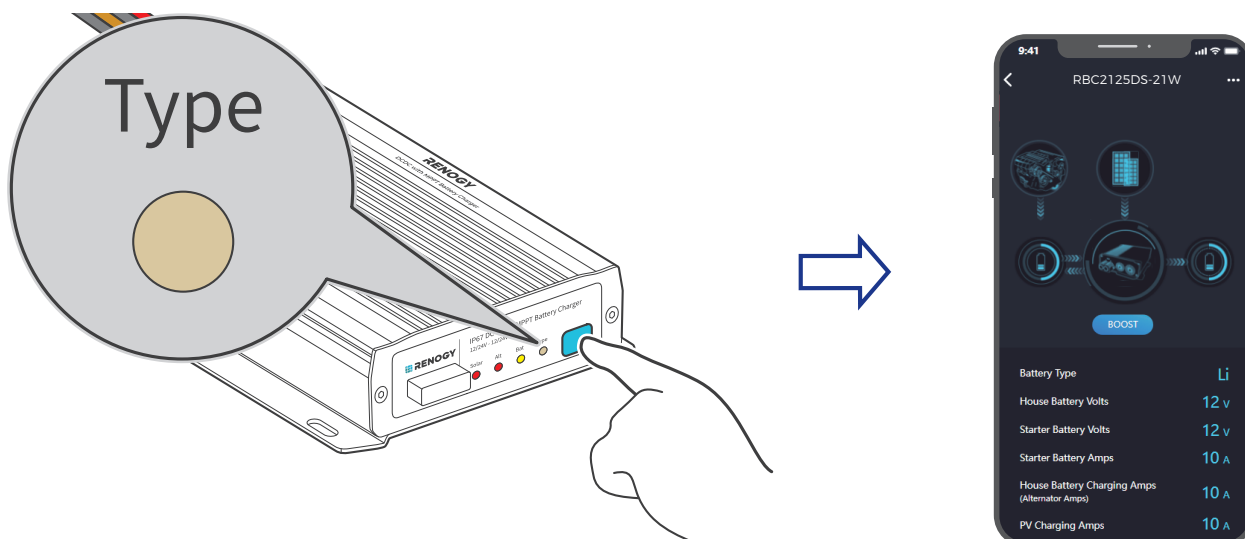
 It is essential to ensure that the battery type setting is configured correctly to avoid any potential damage to the battery charger because any damage to the battery charger resulting from an incorrect battery type setting voids the warranty.

 When setting up a lithium battery, be sure to set the voltage parameters in the system options to match the battery's actual voltage; otherwise, the equipment in the system may be damaged.

6.2. User Mode

Setting the battery type to User Mode allows you to customize your battery parameters. You can modify the parameters in the Renogy app.

 Auxiliary battery charging parameters can only be customized through User Mode, and the charger cannot customize starter battery charging parameters. For details on starter battery charging, please refer to section “[8.2. Charging Logic](#)” of this manual.



Before modifying battery parameters in User Mode, check the table below and consult the battery manufacturer to check whether modification is allowed. Incorrect parameter setting will damage the device and void the warranty.

 In User Mode, when the Equalization Voltage matches the Boost Voltage and Float Voltage, the activation mechanism for the lithium battery is initiated.

Maximum Combined Charging Current	<ul style="list-style-type: none"> 12V Battery: 50A. Adjustable at 50A, 40A, 30A, 20A, and 10A. 24V Battery: 25A. Adjustable at 25A, 20A, 15A, 10A, and 5A.
Equalization Voltage	<ol style="list-style-type: none"> For lead-acid batteries, please consult your battery manufacturer to obtain the voltage value and then complete the settings according to the feedback. If equalization charging is not required, set the voltage to boost voltage.
Boost Voltage	This value affects whether the battery can be fully charged. Please consult the battery manufacturer and set the value properly.
Float Voltage	This value affects whether the battery can be fully charged. Please consult the battery manufacturer and set the value properly.
Under Voltage Warning	This voltage value affects the life of the battery. Consult the battery manufacturer and check if this voltage value needs to be set.
Low Voltage Shutdown	
Boost Duration	Please consult the battery manufacturer if it is necessary to set this parameter value.
Equalization Duration	
Equalization Interval	

6.3. Configure Charging Parameters

The table below illustrates the default and recommended parameters for auxiliary batteries that can be connected to the battery charger. The parameters may vary depending on the specific battery you use. Read the user manual of the specific auxiliary battery or contact the auxiliary battery manufacturer for help if necessary.

-  Before modifying battery parameters, check the table below first. Incorrect parameter setting will damage the device and void the warranty.
-  Read the user manual of the battery when customizing a preset battery. Incorrect battery type selection damages the battery charger and voids the warranty.

The battery charger has a User Mode, and the specific default parameter values and customizable parameters should be primarily based on the actual displays in the Renogy app or Renogy ONE.

This table assumes default parameters for a 12V system. If the system voltage is 24V, double the values.

Battery Type Parameters	SLD/AGM	GEL	FLOODED	LI (LFP)	User-defined	User Setting Range
Overvoltage Shutdown	16.0V	16.0V	16.0V	[16.0V]	16.0V	9.0-17.0V
Compensation Voltage Limit Value	15.5V	15.5V	15.5V	15.5V	15.5V	9.0-17.0V
Equalization Voltage	14.6V	—	14.8V	—	14.6V	9.0-17.0V

<div>Battery Type</div> <div>Parameters</div>	SLD/AGM	GEL	FLOODED	LI (LFP)	User-defined	User Setting Range
Boost Voltage	14.4V	14.2V	14.6V	14.4V (Adjustable 9.0-17.0V)	14.4V	9.0-17.0V
Boost Return Voltage	14.1V	13.9V	14.3V	14.1V	[14.1V]	[Boost Voltage - 0.3V]
Float Voltage	13.8V	13.8V	13.8V	—	13.8V	9.0-17.0V
Float Return Voltage	13.2V	13.2V	13.2V	13.6V	13.2V	9.0-17.0V
Undervoltage Warning	12.0V	12.0V	12.0V	12.0V	12.0V	9.0-17.0V
Undervoltage Recover	12.2V	12.2V	12.2V	12.2V	[12.2V]	[Undervoltage Warning + 0.2V] (The third over-discharge return is + 1V.)
Low Voltage Shutdown	11.0V	11.0V	11.0V	11.0V	11.0V	9.0-17.0V
Low Voltage Reconnect	12.6V	12.6V	12.6V	12.6V	12.6V	9.0-17.0V
Boost Return Delay	5s	5s	5s	5s	5s	5s
Float Return Delay	5s	5s	5s	5s	5s	5s
Equalization Interval	30 days	—	30 days	—	30 days	0-250 days (0 represents closed)
Equalization Duration	120 min	—	120 min	—	120 min	10-600 min
Boost Duration	120 min	120 min	120 min	—	120 min	10-600 min
Temperature Compensation (mV / °C / 2V)	-3	-3	-3	—	-3	0 / 1 / 2 / 3 / 4 / 5



Parameters in gray cannot be set manually.



Parameters in square brackets ([]) are automatically adjusted according to the relevant settings, and cannot be set directly.



Temperature compensation is not required for lithium batteries, 0 indicates that it is turned off.



When setting the Boost Voltage in lithium battery mode, the Overvoltage Shutdown will be determined by the modified Boost Voltage. For example, if the Boost Voltage is increased by 0.1V, the Overvoltage Shutdown will also increase by 0.1V.

6.4. Activate Lithium Batteries

The battery charger can activate connected lithium batteries. Lithium batteries may enter sleep mode when the in-built protection is triggered. In such case, the battery charger provides a small current to reactivate the sleeping lithium battery. The lithium battery can be charged normally after successful activation.



By default, the lithium activation function is enabled in the battery charger. You can disable it in the Renogy app.

■ Operation Condition

Set the battery type of the battery charger to LI or USER. For details, see “[6.1. Set a Auxiliary Battery Type](#)”.

■ Operation Logic

- **For 12V Lithium Battery**

If the battery voltage drops below 9V, the battery charger automatically activates the activation function (on the premise that the activation function is enabled in the Renogy app) and continues to charge the battery using constant voltage until the battery voltage reaches 14.4V.

- **For 24V Lithium Battery**

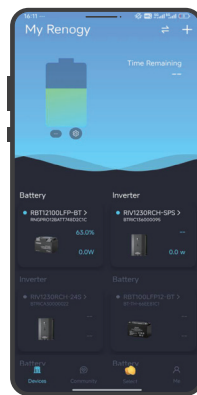
If the battery voltage drops below 18V, the battery charger automatically activates the activation function (on the premise that the activation function is enabled in the Renogy app) and continues to charge the battery using constant voltage until the battery voltage reaches 28.8V.

7. Monitoring

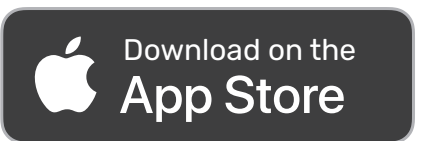
Depending on the specific application, the battery charger can establish either short-range or long-range communication connections with monitoring devices. These monitoring devices facilitate real-time monitoring, programming, and complete system management, offering comprehensive control and enhanced flexibility.

-  Make sure the Bluetooth of your phone is turned on.
-  The version of the Renogy app might have been updated. Illustrations in the user manual are for reference only. Follow the instructions based on the current app version.
-  Make sure that the battery charger is properly installed and powered on before it is paired with the Renogy app.
-  To ensure optimal system performance, keep the phone within 10 feet (3 m) of the battery charger.

To ensure optimal connection performance, download the latest Renogy app. Login to the app with your account.



Renogy App



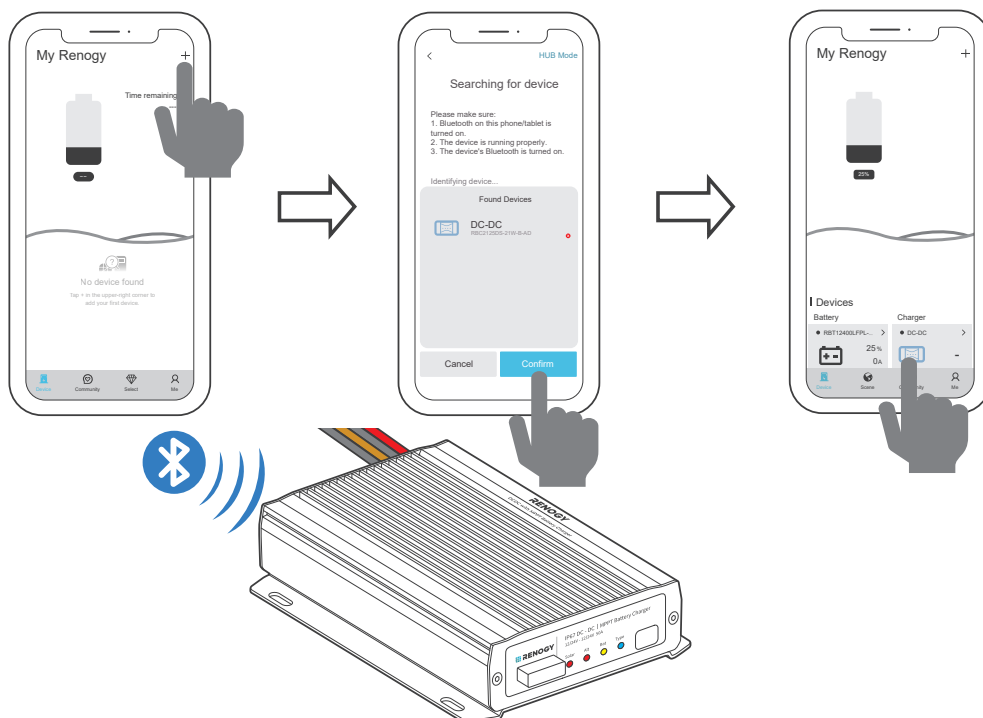
7.1. Short-Range Monitoring

If only short-range monitoring is required, connect the battery charger to the Renogy app directly through the Bluetooth of your phone.

Step 1: Open the Renogy app. Tap **+** to search for new devices.

Step 2: Tap **Confirm** to add the newly found device to the device list.

Step 3: Tap the battery charger icon to enter the device information interface.



7.2. Wireless Long-Range Monitoring

If long-range communication and programming are required, connect the battery charger to Renogy ONE (sold separately) through Bluetooth, and then pair Renogy ONE Core with the Renogy app.

Recommended Components

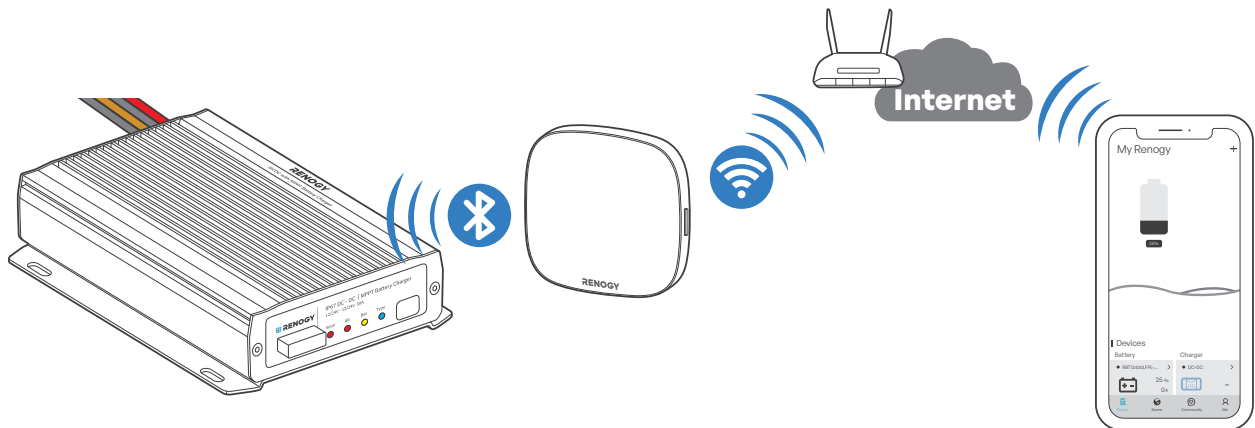


*RENOGY ONE Core

-  Components marked with “*” are available on renogy.com.
-  Make sure that the Renogy ONE is powered on before the connection.
-  For instructions on Renogy ONE, see [Renogy ONE Core User Manual](#).
-  Make sure the battery charger does not communicate with any other device.

Step 1: Connect the battery charger to Renogy ONE through the Bluetooth of your phone.

Step 2: Pair the Renogy ONE with the Renogy app through Wi-Fi or by scanning the QR code in the Renogy ONE. On Renogy ONE, go to “**System** > **Settings** > **Pair with App**” to get the QR code.



8. Working & Charging Logic

8.1. Automatic Voltage Matching Function

Whether you are connecting a 12V or 24V solar panel or starter battery, this battery charger will automatically adjust the charging current and voltage values based on the rated voltage of the battery being charged.

■ Charging the Auxiliary Battery

Nominal Voltage			Charging Voltage	Maximum Charging Current
Auxiliary Battery	Solar Panel	Starter Battery		
12V	15V to 50V	12V	12V	50A
		24V		
		12V		
		24V		
24V	15V to 50V	12V	24V	25A
		24V		
		12V		
		24V		



For details about when the solar panel and/or starter battery charge(s) the auxiliary battery, see [“8.2. Charging Logic”](#) in this manual.

■ Charging the Starter Battery

Nominal Voltage			Charging Voltage	Maximum Charging Current
Starter Battery	Solar Panel	Auxiliary Battery		
12V	15V to 50V	12V	12V	25A
		24V		
		12V		
		24V		
24V	15V to 50V	12V	24V	12.5A
		24V		
		12V		
		24V		



For details about when the solar panel and/or starter battery charge(s) the auxiliary battery, see [“8.2. Charging Logic”](#) in this manual.

8.2. Charging Logic

Renogy 12V/24V 50A IP67 Dual Input DC-DC On-Board with MPPT Battery Charger can be connected to the solar panel and the automobile starter battery simultaneously or to the solar panel or the automobile starter battery separately to charge the auxiliary battery. The charging logic depends on the connection method.

8.2.1. Battery Fully Charged Criteria

First, please refer to the table below to understand the criteria the battery charger uses to automatically determine if the battery is fully charged:

Battery Type	Charging Stage	Battery Fully Charged
Non-lithium batteries	Float charging	Yes
	Non float charging	No
Lithium batteries	Boost charging for approximately 1 hour	Yes
	Non boost charging	No

8.2.2. Connect Only to the Solar Panel

After the battery charger starts to operate, it determines the level of the auxiliary battery automatically. If the auxiliary battery is not fully charged, the battery charger will charge the auxiliary battery.

Solar Panel Voltage	Charging the Auxiliary Battery	Charging Current	
		12V battery	24V battery
≥15.0V, for 10 seconds	Yes	50A Max	25A Max
<15.0V	No	N/A	

8.2.3. Connect Only to the Starter Battery

After the battery charger starts to operate, it determines the level of the auxiliary battery automatically. If the auxiliary battery is not fully charged, the battery charger will charge the auxiliary battery.

-  All voltage parameter values in this section use a 12V system as an example; for a 24V system, they should be multiplied by 2.
-  When the battery charger is connected only to the starter battery, it will only use the starter battery to charge the auxiliary battery and will not charge the starter battery itself.

Before using the starter battery to charge the auxiliary battery, measure the voltage of the starter battery.

Starter Battery Voltage		Charging the Auxiliary Battery	Charging Current	
Before Charging	During Charging		12V battery	24V battery
≥13.2V, for 15 seconds	N/A	Yes	50A Max	25A Max
<13.2V	N/A	No	N/A	
N/A	≤12.7V	No	N/A	

You can set the auxiliary battery type to User mode and customize it through the Renogy app.

- **Smart Alternator:** Recommended start voltage: 12.0V; stop voltage: 11.5V.
- **Traditional Alternator:** Recommended start voltage: 13.2V; stop voltage: 12.7V.

8.2.4. Both the Solar Panel and Starter Battery are Connected

i All voltage parameter values in this section use a 12V system as an example; for a 24V system, they should be multiplied by 2.

■ Determining the Charging logic Before Charging

When the input of the battery charger is connected to both the solar panel and the starter battery, before charging, the battery charger will automatically select the charging logic based on the charging current from the solar panel to the auxiliary battery and the starter battery voltage.

- **Solar-only charging:** if the energy provided by the solar panel is sufficient, the battery charger charges the auxiliary battery using only the solar panel.
- **Hybrid charging:** if the solar energy is insufficient, the battery charger charges the auxiliary battery using both the solar panel and the starter battery.

Solar Panel Charging Current	Starter Battery Voltage	Power Supply Equipment	Charging Current	
			12V battery	24V battery
≥24A	N/A	Solar panel	50A Max	25A Max
<24A	≥13.2V	Hybrid	25A Max (from the solar panel) and 25A Max (from the starter battery)	12.5A Max (from the solar panel) and 12.5A Max (from the starter battery)
<24A	<13.2V	Solar panel	50A Max	25A Max

You can set the auxiliary battery type to User mode and customize it through the Renogy app.

- **Smart Alternator:** Recommended start voltage: 12.0V; stop voltage: 11.5V.
- **Traditional Alternator:** Recommended start voltage: 13.2V; stop voltage: 12.7V.

i During hybrid charging, the maximum charging current provided by the solar panel and starter battery may fluctuate slightly due to voltage variations. The total combined current is limited to 50A.

i If both the solar panel and the starter battery fail to meet the working conditions, the battery charger will stop operating.

■ Determining the Charging logic During the Hybrid Charging Process

During the hybrid charging process, the battery charger continuously monitors the charging current from the solar panel to the auxiliary battery, as well as the voltage changes of the starter battery and auxiliary battery. It automatically adjusts the charging logic according to the table below:

Solar Panel Charging Current	Starter Battery Voltage	Auxiliary Battery Voltage	Power Supply Equipment
≥24A, for 60 seconds	N/A	≥ Boost Return Voltage	Solar panel
≥24A, for 60 seconds	>12.7V	< Boost Return Voltage	Hybrid
≥24A, for 60 seconds	<12.7V	N/A	Solar panel
<24A	>12.7V	N/A	Hybrid
<24A	<12.7V	N/A	Solar panel

You can set the auxiliary battery type to User mode and customize it through the Renogy app.

- **Smart Alternator:** Recommended start voltage: 12.0V; stop voltage: 11.5V.
- **Traditional Alternator:** Recommended start voltage: 13.2V; stop voltage: 12.7V.

■ Charging the Starter Battery

When the battery charger determines that the auxiliary battery is fully charged automatically, it starts to charge the starter battery while maintaining a very small current to continue charging the auxiliary battery.

The maximum charging current for the battery charger to charge the starter battery should be no more than half of the rated current.

Starter Battery Voltage		Charging Current	
12V battery	24V battery	12V battery	24V battery
<ul style="list-style-type: none">• <13.8V, start charging• ≥13.8V or instantaneous voltage >15V, stop charging after 60 seconds	<ul style="list-style-type: none">• <27.6V, start charging• ≥27.6V or instantaneous voltage >30V, stop charging after 60 seconds	25A Max (from the solar panel)	12.5A Max (from the solar panel)

 When both the auxiliary battery and the starter battery are fully charged, the battery charger activates the standby state.

8.3. Overvoltage Protection

The battery charger is equipped with Overvoltage Protection. When the voltage of the solar panel or starter battery reaches the trigger value, the charger will shut off input to prevent damage. Charging automatically resumes when the voltage returns to the restore value.

Solar Panel Voltage	Starter Battery Voltage		Overvoltage Protection
	12V battery	24V battery	
≥50V	N/A		Trigger
≤49V	N/A		Restore
N/A	≥16.5V	≥33.0V	Trigger
N/A	≤15.5V	≤31.0V	Restore

 The battery charger will immediately stop operating if it triggers the overvoltage protection. It will only resume operation once the voltage reaches the restore value.

8.4. Low Current Cut-off Mode

■ Working conditions

When the solar panel output current falls below 7A, the charger switches to alternator-only charging. The low current cut-off value can be set to 7–10A via the Renogy App.

 Setting the value to 0A disables this feature.

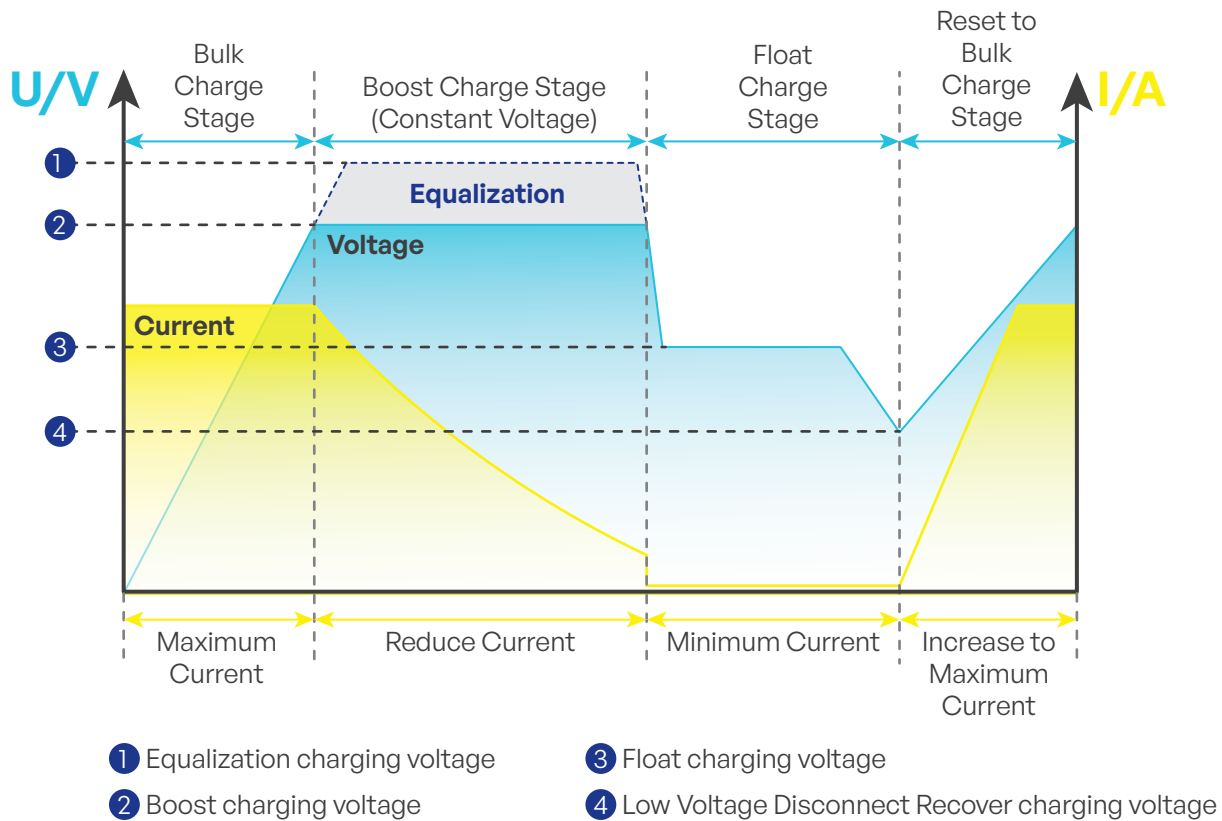
■ Exit conditions

After the battery charging mode activates for 5 minutes, the battery charger judges the charging current of the solar panel again.

- If the low current cut-off value < charging current ≤ half of the rated current lasts for 10s continuously, the battery charger switches to hybrid charging.
- If charging current ≥ 50% of rated current and the auxiliary battery is in float or boost stage, the charger switches back to solar-only charging.

8.5. Battery Charging Stages

The battery charger utilizes cutting-edge MPPT technology to efficiently track the maximum power output of solar panels in various conditions, ensuring real-time optimization. It also incorporates four distinct charging stages: bulk, boost, float, and equalization.



Adjust the time depending on the specific battery bank size.

Bulk Charge Stage

The battery charger will supply constant current until the battery voltage reaches the boost voltage.

Boost Charge Stage

The battery charger will supply constant voltage and reduce the current slowly through this stage.

Default boost duration: 2 hours. After this time, the charger will enter the float stage.



Boost Duration is not applicable to lithium batteries.



The stage is determined by internal software in the battery charger.

Float Charge Stage

During this stage the battery charger will supply a constant voltage which is determined by the battery selected and will keep current at a minimum level. This stage acts as a trickle charger.

After reaching a constant voltage in the charging process, the battery charger reduces the voltage to a float level. At this point, the battery is fully charged, and any excess current is converted to heat or gas. The charger then maintains a lower voltage to offset power consumption, ensuring a full battery capacity. If a load exceeds the charge current, the charger exits float mode and returns to bulk charging.



Float charging is not applicable to lithium batteries.

Equalization

This stage is only available for batteries with equalization, such as non-sealed, vented, flooded, and wet cell lead acid batteries. During this stage the batteries are charged at a higher voltage than normal and for most batteries this could cause damage. Refer to the user manual of the battery or contact the battery

manufacturer to see if this stage is needed.



During Equalization charging, the battery charger remains in this stage until sufficient charging current is sourced from the solar panel. Note that there should be no load on the batteries during Equalization charging..



Overcharging and excessive gas precipitation can harm battery plates, leading to material shedding. Carefully review the battery's specific requirements to avoid damage from prolonged or excessively high Equalization charging .



Equalization may elevate battery voltage to levels that could damage sensitive DC loads. Ensure that the allowable input voltages of all loads exceed the set voltage during Equalization charging..

9. Troubleshooting

This section discusses general troubleshooting tips specific to LED indicator status.

LED	Fault	Possible Cause	Solution
Solar 	Indicates the solar charging fails to function well.	<ul style="list-style-type: none"> The output voltage of the solar panel is below 15V (for a 12V system) / 30V (for a 24V system). The output voltage of the solar panel is excessively high, triggering overvoltage protection. 	<ul style="list-style-type: none"> For solar panel voltage under 15V (for a 12V system) / 30V (for a 24V system), ensure there is no shade or damage on the solar panel. In scenarios where overvoltage protection is triggered, check the way in which the solar panels are connected.
Alt 	Indicates the starter battery is not charging the auxiliary battery.	The starter battery voltage is below 13.2V.	Recheck the alternator type. For details, see “3.7. Check the Alternator on Your Automobile” in this manual. If the actual output value from the alternator is relatively low, modify the cut-in voltage in the Renogy app.
Bat  Solid	An undervoltage warning is triggered in the auxiliary battery.	The auxiliary battery voltage is low.	Charge the auxiliary battery immediately.
Bat  Slow flash	An overdischarge warning is triggered in the auxiliary battery.	The auxiliary battery is over-discharged.	Disconnect all loads from the auxiliary battery, and charge it immediately.
Bat  Fast flash	An overvoltage or overtemperature warning is triggered in the auxiliary battery.	The auxiliary battery is over-charged or at a high temperature.	<ul style="list-style-type: none"> If the protection is triggered without a Battery Temperature Sensor installed, it indicates the auxiliary battery is overcharged. If the protection is triggered with a Battery Temperature Sensor installed, the auxiliary battery is at a high temperature. Follow the troubleshooting steps below: <ol style="list-style-type: none"> Check the auxiliary battery temperature in the Renogy app. Temperatures higher than 149°F (65°C) result in an overtemperature alarm. Ensure the auxiliary battery is installed in a well-ventilated site. The warning for the auxiliary battery temperature is cleared when it drops to 140°F (60°C). Check the auxiliary battery voltage. For 12V batteries, the auxiliary battery voltage should be within 16V. For 24V batteries, the auxiliary battery voltage should be within 32V. Higher voltages trigger an overvoltage alarm. In such case, stop charging the auxiliary battery.

-	The battery charger stops charging.	Low-temperature protection for the auxiliary battery.	When the temperature of the auxiliary battery drops below -31°F (-35°C), the battery charger will stop charging. Please warm up the auxiliary battery, and charging will resume once the temperature is above -22°F (-30°C).
		Over-temperature protection for the battery charger.	If the temperature of the battery charger exceeds 212°F (100°C), immediately provide ventilation to cool down the charger. The normal operating temperature range for the battery charger is -31°F to 176°F (-35°C to 80°C). When the temperature exceeds 194°F (90°C), the charger will decrease its load. If the temperature exceeds 212°F (100°C), the battery charger will stop working.



For technical support, contact our technical service through renogy.com/contact-us.

10. Specifications

System Voltage	12V/24V to 12V/24V DC
Nominal Output Power	720W
Battery Voltage Range	9V to 32V DC
Maximum Charging Current	50A@12V 25A@24V
Battery Type	SLD, AGM, GEL, FLD, LI, and USER
Auxiliary Battery Charging Mode	MPPT
Nominal Charging Efficiency	For 12V batteries: ≥94% For 24V batteries: ≥92%
Max. Solar Input Voltage	50V
Max. Alternator Input Voltage	32V
Operating Temperature Range	-31°F to 176°F / -35°C to 80°C
Storage Temperature	-40°F to 176°F / -40°C to 80°C
No Load Current	< 100mA
Humidity	0% to 95%, RH, no condensation
Dimensions	7.01 x 4.78 x 1.47 in / 178.2 x 121.5 x 37.5 mm
Weight	3.35 lb / 1.52 kg
Certifications	CE, RoHS, and FCC Part 15 Class B

11. Maintenance

11.1. Inspection

For optimum performance, it is recommended to perform these tasks regularly.

- Ensure the battery charger is installed in a clean, dry, and ventilated area.
- Ensure there is no damage or wear on the cables.
- Ensure that the connection is secure and check for any loose, damaged, or burned connections.
- Make sure the indicators are in proper condition.
- Ensure there is no corrosion, insulation damage, or discoloration marks of overheating or burning.
- If the battery charger is dirty, use a damp cloth to clean the outside of the device to prevent dust and dirt from accumulating. Before the battery charger is powered on, make sure it is completely dry after cleaning.



In certain situations, corrosion may occur at the connection point. Corrosion can increase resistance and lead to connection damage. Applying insulating grease at the connection can help. Insulating grease is moisture-resistant and protects the connection from corrosion.



Risk of Electric Shock! Before touching any connections on the battery charger, ensure that all power sources are turned off.

11.2. Disconnect the Connections from the Battery Charger

Disconnect all devices in the following order:

- Disconnect the connections between the battery charger and the starter battery, starting with the negative cable, then the positive cable.
- Disconnect the connections between the battery charger and the solar panel, starting with the negative cable, then the positive cable.
- Disconnect the connections between the battery charger and the auxiliary battery, starting with the negative cable, then the positive cable.

11.3. Cleaning

Follow the steps below to clean the battery charger regularly.

- Disconnect all cables connected to the battery charger.
- Wear proper protective equipment and use insulated tools during operation.
- Wipe the housing of the battery charger with a dry cloth or nonmetallic brush. If it is still dirty, you can use household cleaners.
- Dry the battery charger with a clean cloth and keep the area around the battery charger clean and dry.
- Before reconnecting the battery charger to the auxiliary battery, starter battery, and solar panel, ensure that all components are completely dry.

11.4. Storage

Follow the tips below to ensure that the battery charger is stored well.

- Disconnect all cables connected to the battery charger.
- Apply insulating grease to each bare wire. Insulating grease provides moisture resistance and protects the bare wires from corrosion.
- Store the battery charger in a well-ventilated, dry, and clean environment with the temperature between -40°F to 176°F or -40°C to 80°C.

12. Emergency Responses

In the event of any threat to health or safety, always begin with the steps below before addressing other suggestions.

- Immediately contact the fire department or other relevant emergency response team.
- Notify all people who might be affected and ensure that they can evacuate the area.



Only perform the suggested actions below if it is safe to do so.

12.1. Fire

1. Disconnect all cables connected to the battery charger.
2. In the event of a fire, use a fire extinguisher suitable for electrical equipment, such as a FM-200, CO₂, or dry powder extinguisher. A fire blanket or sand can also be used to extinguish the fire. If a suitable fire extinguisher is not available, evacuate immediately and contact the fire department.



Do not use type D (flammable metal) fire extinguishers.

12.2. Flooding

1. If the battery charger is submerged in water, stay away from the water.
2. Disconnect all cables connected to the battery charger.

12.3. Smell

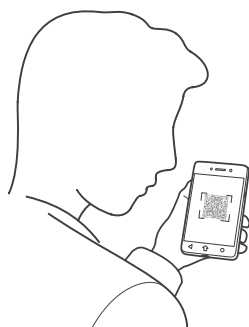
1. Ventilate the room. Disconnect all cables connected to the battery charger.
2. Ensure that nothing is in contact with the battery charger.

Renogy Support

To discuss inaccuracies or omissions in this quick guide or user manual, visit or contact us at:



contentservice@renogy.com



Questionnaire Investigation



To explore more possibilities of solar systems, visit Renogy Learning Center at:

 | renogy.com/learning-center



For technical questions about your product in the U.S., contact the Renogy technical support team through:



support@renogy.com



1(909)2877111

For technical support outside the U.S., visit the local website below:

Canada |  | ca.renogy.com

Australia |  | au.renogy.com

Spain |  | es.renogy.com

Germany |  | de.renogy.com

Netherlands |  | nl.renogy.com

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- Endless solar project ideas & sources



Warranty Statement

For full warranty terms and conditions, visit the Warranty page of the RENOGY website at <https://www.renogy.com/warranty>.

■ Australia

RNG AU PTY LTD

3/11 David St, Dandenong VIC 3175

Tel: 1800 560 588

■ North America and Other Countries

RNG International Inc.

5050 S Archibald Ave, Ontario, CA 91762, USA

Tel: +1 (909) 287 7111

FCC

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 installation. 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:

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

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.



Renogy Empowered

Renogy aims to empower people around the world through education and distribution of DIY-friendly renewable energy solutions.

We intend to be a driving force for sustainable living and energy independence.

In support of this effort, our range of solar products makes it possible for you to minimize your carbon footprint by reducing the need for grid power.



Live Sustainably with Renogy

Did you know? In a given month, a 1 kW solar energy system will...



Save 170 pounds of coal from being burned



Save 300 pounds of CO₂ from being released into the atmosphere



Save 105 gallons of water from being consumed



Renogy Power PLUS

Renogy Power Plus allows you to stay in the loop with upcoming solar energy innovations, share your experiences with your solar energy journey, and connect with like-minded people who are changing the world in the Renogy Power Plus community.



@Renogy Solar



@renogyofficial



@Renogy

Renogy reserves the right to change the contents of this manual without notice.

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