RENOGY
TRUSTED ENERGY SOLUTIONS

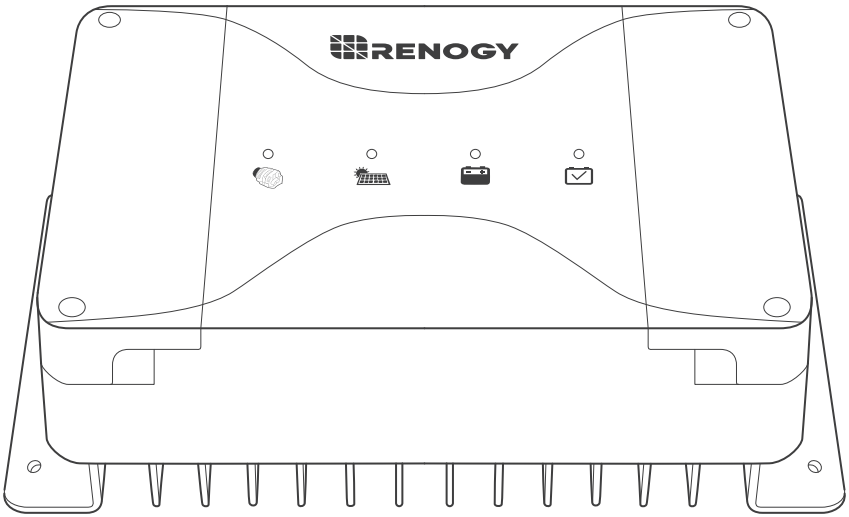
RENOGY

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

12V | 30A/50A

RBC30D1S-G3&G4 / RBC50D1S-G6

VERSION B4
August 30, 2025



USER MANUAL

Before Getting Started

The user manual provides important operation and maintenance instructions for Renogy 12V 30A/50A Dual Input DC-DC On-Board Battery Charger with MPPT (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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Table of Contents

1. General Information

1.1. Symbols Used

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

WARNING: Indicates a potentially dangerous condition which could result in 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. Introduction

Renogy 12V 30A/50A Dual input DC-DC On-Board Battery Charger with MPPT provides you with many options. With multiple stage and input, the battery charger can charge the auxiliary battery with a starter battery connected to an alternator or with solar panels connected directly to the battery charger.

While the alternator of your car prioritizes the starter battery, the battery charger allows your solar system to charge the auxiliary battery first, it is a smart way to keep the battery fully charged and off-grid for longer. The battery charger can charge the flooded, gel, AGM, or lithium battery. With the BT-2 Bluetooth Module and the Renogy app, you can monitor the device remotely through your phone in real time.

1.3. Key Features

- **Robust and Sleek Design**
  The housing of the battery charger is made of steel plates to ensure its firmness and a more fashionable appearance.
- **Multi-input for Battery Charging**
  The battery charger offers you many options to charge the auxiliary battery. With multiple input, it can charge the auxiliary battery with a starter battery connected to an alternator or with solar panels connected directly to the battery charger.
- **Multi-stage Battery Charging**
  Up to three stage battery charging including bulk, boost, and float as well as equalization for select battery types.
- **Multiple Protections**
  The battery charger is equipped with undervoltage protection, overvoltage protection, overload protection, overtemperature protection, reverse current protection, reverse polarity protection, and short circuit protection.
- **RJ45 Communication Port Featured**
  With the BT-2 Bluetooth Module and the Renogy app, you can monitor the update parameters of the battery charger remotely through your phone.

1.4. SKU

Renogy 12V 30A Dual Input DC-DC On-Board Battery Charger with MPPT	RBC30D1S
Renogy 12V 50A Dual Input DC-DC On-Board Battery Charger with MPPT	RBC50D1S

1.5. Important Safety Instructions

Warning

- Do not puncture, drop, crush, penetrate, shake, strike, or step on the battery charger.
- Do not open, disassemble, repair, tamper with, or modify the components of the battery charger.
- Install the battery charger on a vertical surface indoors protected from direct sunlight, high

temperature, and water. Make sure there is good ventilation.

- Do not insert foreign objects into battery charger.
- Risk of explosion! Never install the battery charger in a sealed enclosure with flooded batteries! Do not install in a confined area where battery gases can accumulate.
- Confirm the polarities of the devices before connection. A reverse polarity contact will result in abnormalities.
- Refer to the Recommended Cable and Fuse Sizing in this user manual, and select the appropriate cables and fuses according to the usage.
- Keep the battery charger out of the reach of children.
- Wear proper protective equipment and use insulated tools during installation and operation.
- Do not touch the connector contacts while the battery charger is in operation.
- Disconnect all connectors from the battery charger before maintenance or cleaning.
- 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.
- In the event of fire, use fire extinguishers suitable for electrical equipment.
- If the battery charger is installed improperly on a boat, it may cause damage to the corrosive agents of the boat. Please have the battery charger by a qualified electrician.

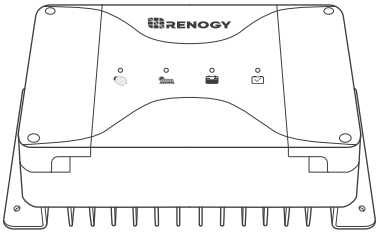
Caution

- Do not expose battery charger to flammable or harsh chemicals or vapors.
- Ensure that there is no water source including downspouts, sprinkles, or faucets above or near the battery charger.
- Ensure that the battery pack is properly connected before installation.

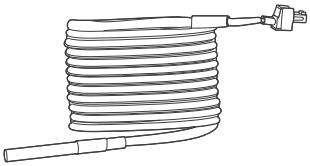
2. Get to Know Renogy Battery Charger with MPPT

2.1. What's In the Box?

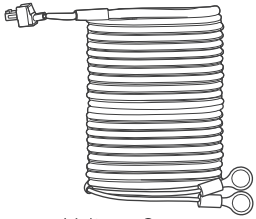
Renogy 12V 30A/50A
Dual Input DC-DC On- Board Battery Charger
with MPPT x 1



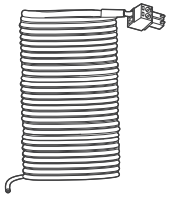
User Manual × 1



Temperature Sensor × 1



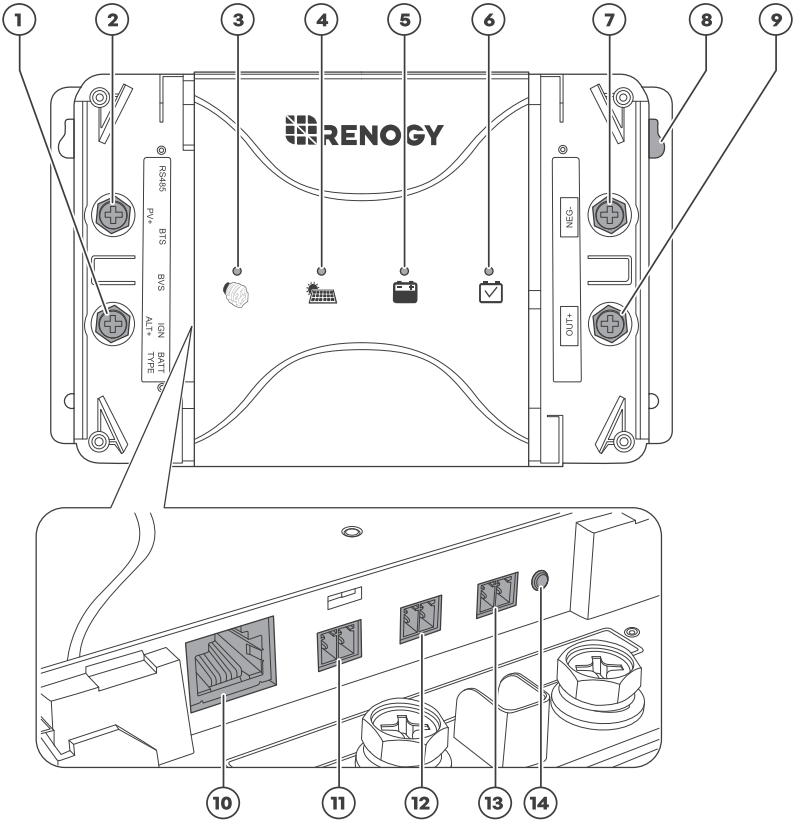
Voltage Sensor x 1



IGN Signal Wire x 1

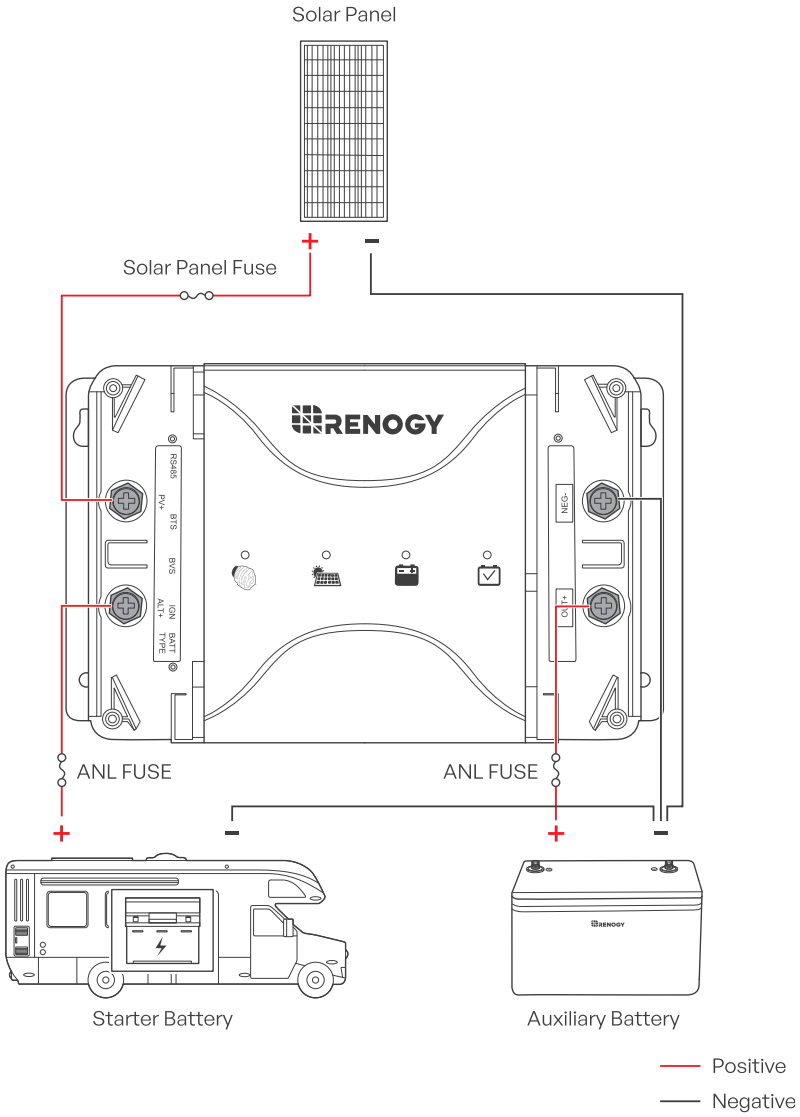
Make sure that all accessories are complete and free of any signs of damage.

2.2 Product Overview



No.	Part	No.	Part
1	Positive Starter Battery Terminal	8	Mounting Hole
2	Positive Solar Terminal	9	Positive House Battery Terminal
3	Alternator / Charging Indicator	10	RS485 Communication Ports
4	Solar Charging Indicator	11	Battery Temperature Sensor Port
5	Auxiliary Battery Indicator	12	Battery Voltage Sensor Port
6	Battery Type Indicator	13	Ignition Signal
7	Negative Common Terminal	14	Battery Type Setting Knob

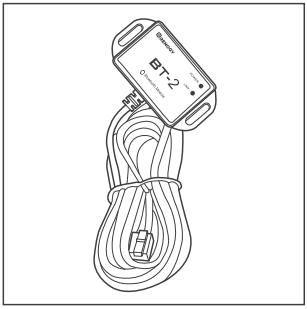
2.3. Wiring Diagram



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.

2.4. Optional Accessories

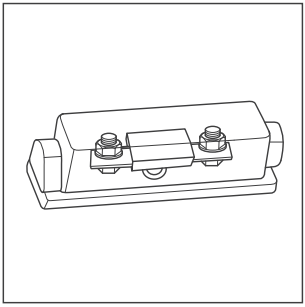
You can buy optional accessories from renogy.com.



Renogy BT-2 Bluetooth Module

With a Renogy BT-2 Bluetooth Module (sold separately), the battery charger can be connected to the Renogy app for remote device monitoring.

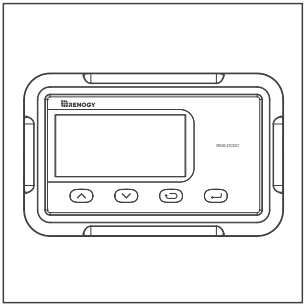
The battery charger supports bluetooth for system monitoring and parameter modifying with the Renogy BT-2 Bluetooth Module.



Renogy ANL Fuse Set

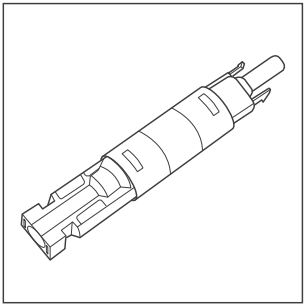
- **RBC30D1S: 40A**
- **RBC50D1S: 60A**

Renogy ANL fuse offers complete protection to your system, protects your battery charger, battery, inverter, and connecting wires from over-current, and ensures you get the longevity out of your system that expected.



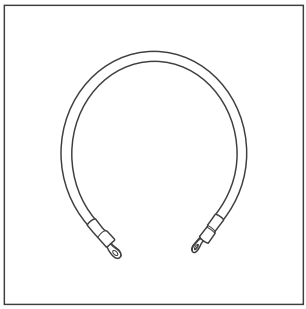
Monitoring Screen for DC-DC MPPT Battery Charger Series

The RMS-DCDC is a high precision meter designed for DC-DC MPPT Series onboard battery chargers. Engineered for an aesthetically clean and professional look once mounted, this meter can be flush-mounted and features a backlit LCD.



Solar Panel Fuse

Solar panel fuse provides single circuit protection for solar panels, preventing damage from high currents.



Fuse Cable

The cable is integrated with copper rings at both ends, enabling the battery charger to be connected with an external fuse.

2.5. Recommended Cable Sizing

- The cable specifications listed above account for critical, less than 3% voltage drop and may not account for all configurations.
- The specification of fuse cable is consistent with the input or output terminal of the battery charger.

Renogy 12V 30A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC30D1S)

Cable	Cable Length (ft) / (m)	Recommended Cable Size
Input / Output	0 ft to 10 ft (0 m to 3 m)	8 AWG to 10 AWG
	11 ft to 20 ft (3 m to 6 m)	4 AWG to 6 AWG
	21 ft to 30 ft (6 m to 9 m)	4 AWG

Renogy 12V 50A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC50D1S)

Cable	Cable Length (ft) / (m)	Recommended Cable Size
Input / Output	0 ft to 10 ft (0 m to 3 m)	8 AWG
	11 ft to 20 ft (3 m to 6 m)	6 AWG
	21 ft to 30 ft (6 m to 9 m)	4 AWG

2.6. Recommended Fuse Sizing

For your safety, it is recommended to install fuses at both the input and output ends of the battery charger to ensure safe operations.

Fuse from Solar Panel to Battery Charger	
Solar Panel to Battery Charger Fuse = Solar Panel / Solar Panel Array Total Amps * 1.56	
Solar Panels in Series	**Solar Panels in Parallel**
Total Amps: $Isc_1 = Isc_2 = Isc_3$ Fuse = Isc_1 * 1.56	Total Amps: $Isc_1+Isc_2+Isc_3$ Fuse = $(Isc_1+Isc_2+Isc_3)$ * 1.56

- The specifications of the fuse are determined by the solar panel and battery charger parameters.
- In the formula, Isc represents the rated current of the solar panel, and 1, 2 or 3 represents the solar panel number, respectively.

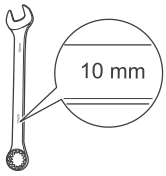
Read the user manual of the solar panel to obtain working voltage parameters, and calculate the corresponding fuse specifications according to the formula.

Fuse from Starter Battery to Battery Charger	
Renogy 12V 30A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC30D1S)	45-60A
Renogy 12V 50A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC50D1S)	75-100A

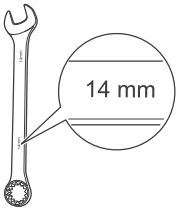
3. Preparation

3.1. Required Tools

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

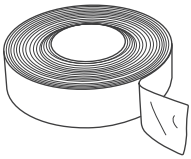


Wrench (10 mm)

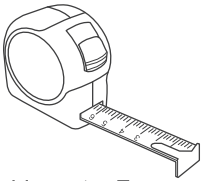


Wrench (14 mm)

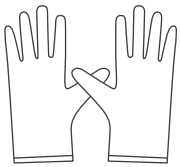
Phillips Screwdriver (#2)



Insulation Tape

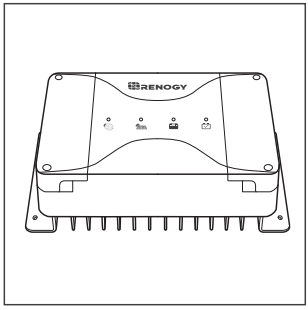


Measuring Tape



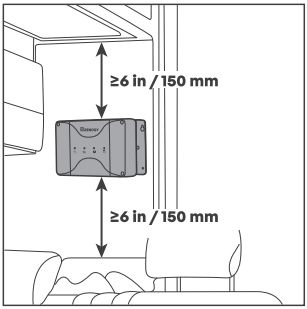
Insulating Gloves

3.2. Checking Battery Charger



1. 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 it has any visible damage.



2. Confirm the installation location.

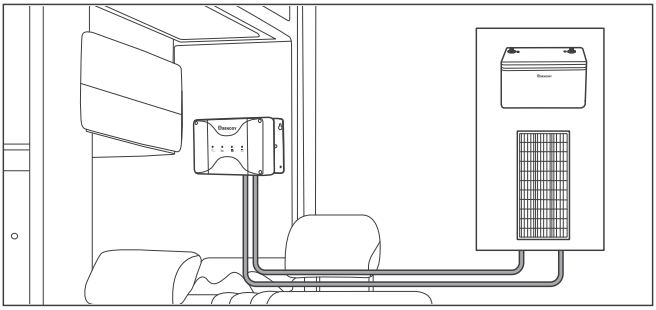
⚠ Install the battery charger indoors and prevent its components from being exposed to direct sunlight. Prevent water from entering the battery charger.

⚠ Risk of explosion! Never install the battery charger in a sealed enclosure with flooded batteries! Do not install it in a confined area where battery gases can accumulate.

⚠ Place the battery charger on a vertical surface. Make sure there is good ventilation.

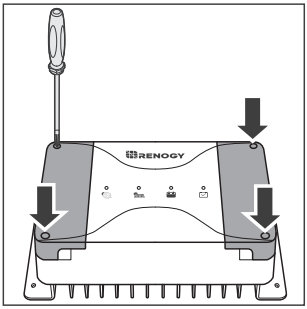
⚠ The battery charger requires at least 6 inches (150 mm) of clearance above and below for good ventilation.

⚠ Make sure that the battery charger is installed in an environment with relative humidity between 0% and 95% and no condensation.



3. Measure whether the adapter cable is long enough to connect the battery charger.

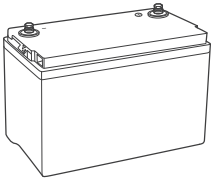
ℹ If the adapter cable is not long enough, you can use an extension cable or reselect the position where the battery charger needs to be secured.



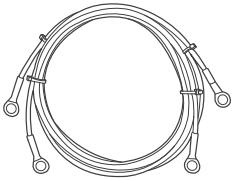
4. Remove the four screws on the protective cover and remove the cover with a phillips screwdriver.

3.3. Checking Auxiliary Battery

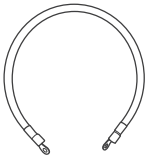
Recommended Components



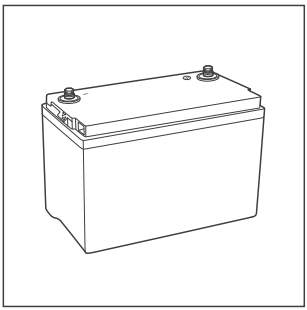
Auxiliary Battery



Ring Terminals Adapter Cable



Fuse Cable



1. Inspect the auxiliary battery 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.

- The battery charger can only be applied to a deep-cycle sealed lead-acid battery, a flooded battery, an AGM battery, a gel battery or a lithium iron phosphate battery.
- The battery may produce explosive gases when being charged. 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.
- Do not use the battery if it has any visible damage.
- Do not touch the exposed electrolyte or powder if the battery housing is damaged.

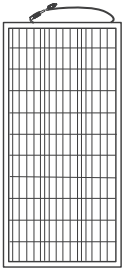
System Voltage	
Battery / Battery pack system voltage = System voltage U	
Batterys in Series	**Batterys in Parallel**
System Voltage U: $U_1+U_2+U_3$	System Voltage U: $U_1=U_2=U_3$

2. The batteries can be combined in parallel or in series as needed. This battery charger supports a maximum system voltage of 16V. Read the user manual for battery voltage parameters, and calculate the battery or battery pack system voltage according to the formula to ensure that it does not exceed 16V.

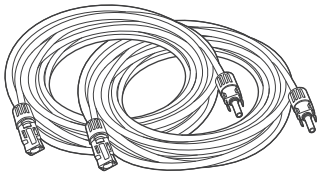
- In the formula, U represents the battery voltage, and 1, 2 or 3 represents the battery number, respectively.
- Do not use the battery charger if the battery or battery pack system voltage exceeds 16V. Doing so will cause damage to the battery charger.

3.4. Checking Solar Panel (Optional)

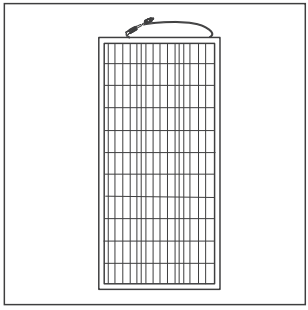
Recommended Components



Solar Panel



Solar Panel Extension Cables



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.

The solar panels can be combined in parallel or in series as needed.

Do not use the solar panel if it has visible damage.

Cover the solar panels or turn them over before connecting them to the battery charger.

Working Voltage	
Working Voltage of Solar Panel / Solar Panel Array = Working Voltage U	
Solar Panels in Series	**Solar Panels in Parallel**
Working Voltage U: $U_1+U_2+U_3$	Working Voltage U: $U_1=U_2=U_3$

2. Read the user manual of the solar panel for the working voltage, and calculate the working voltage of solar panel / solar panel array according to the formula.

In the formula, U represents the working voltage of the solar panel, and 1, 2 or 3 represents the solar panel number, respectively.

Ensure that the working voltage of the solar panel / solar panel array is not less than 15V.

For a 30A battery charger, ensure that the working voltage of the solar panel / solar panel array does not exceed 30V. For a 50A battery charger, ensure that the working voltage of the solar panel / solar panel array does not exceed 50V.

Maximum Output Power	
Maximum Output Power of Solar Panel / Solar Panel Array= Maximum Output Power W	
Solar Panels in Series	**Solar Panels in Parallel**
Maximum Output Powe W: $W_1+W_2+W_3$	Maximum Output Powe W: $W_1+W_2+W_3$

3. 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.

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

For a 30A battery charger, ensure that the maximum output power of the solar panel does not exceed 400W. For a 50A battery charger, ensure that the maximum output power of the solar panel does not exceed 660W.

3.5. Checking Automobile Alternator (Optional)

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 fans, radio, lights, and others are turned off.
3. Take a voltage reading across the main vehicle battery.
4. Leave the engine running for around 5 or 10 minutes, then repeat step 3.

If your readings are around 14.4V DC, then you most likely have a traditional alternator.

If your readings are around 12.5V to 13.5V, then 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.

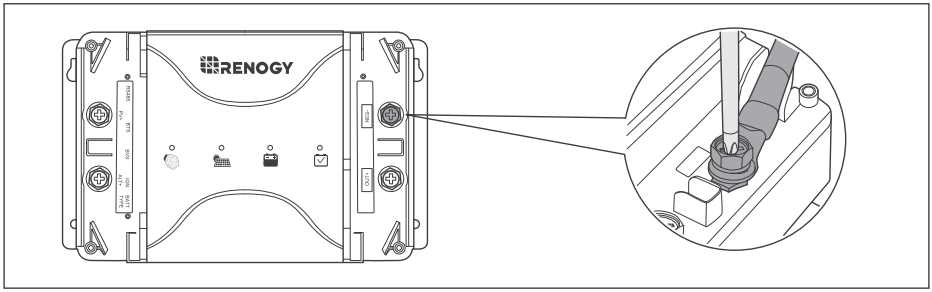
To prevent overuse of the starter battery, it is essential to select the battery charger specification. The specification of the battery charger is no greater than 1.5-2 times the specification of the alternator.

4. Battery Charger Wiring

⚠ Do not overtorque the terminals on the battery charger.

⚠ Do not connect the positive terminal first.

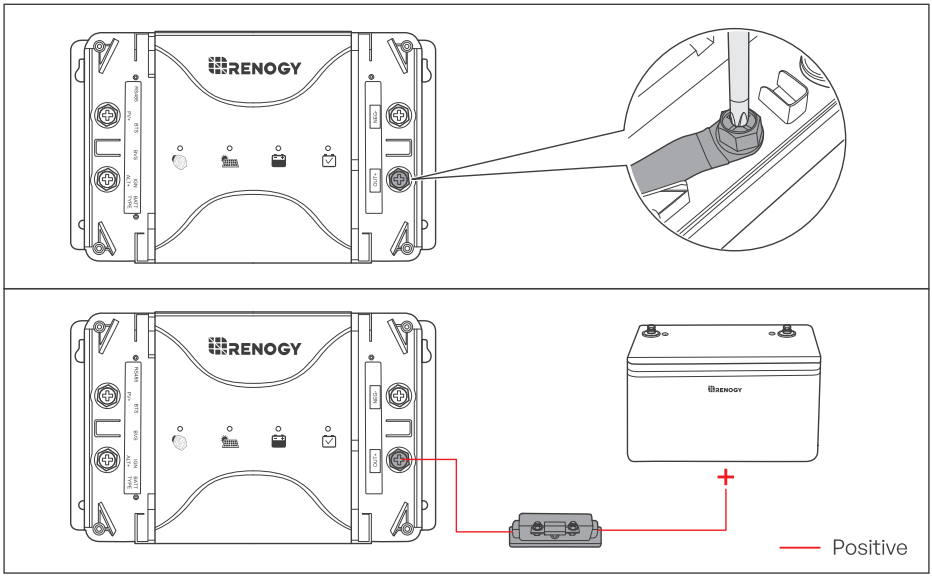
4.1. NEG- Terminal Wiring



Connect the auxiliary battery to (NEG-) terminal of the battery charger.

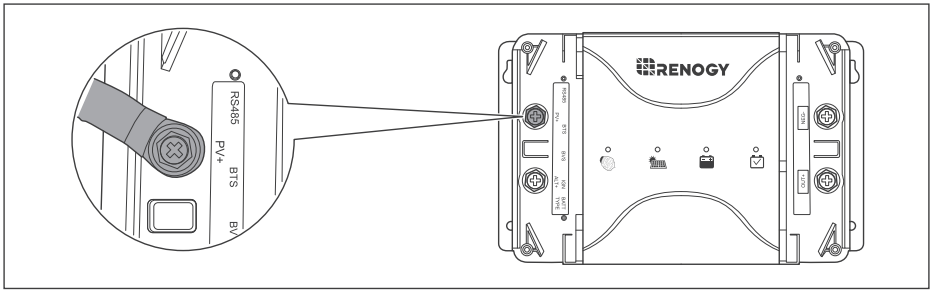
ℹ Connect the negative terminal of the solar panel and the negative terminal of the starter battery to the negative pole of the auxiliary battery.

4.2. Auxiliary Battery Positive Wiring



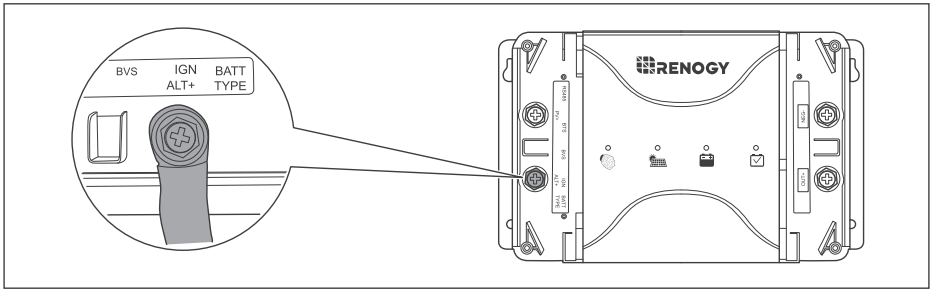
Connect the positive terminal of the auxiliary battery to one end of the fuse box. Connect the other end of the fuse box to the OUT+ terminal of the battery charger. Make sure all the terminals are tight and secure.

4.3. Solar Positive Wiring



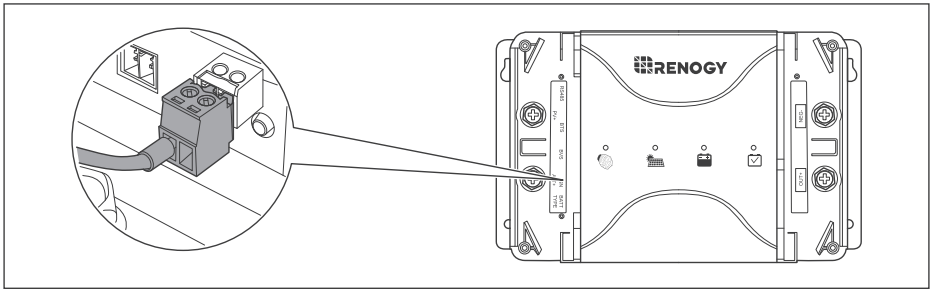
Connect the positive terminal of the solar panel to the Positive Solar Terminal (PV+) of the battery charger.

4.4. ALT Positive Wiring



Connect the positive terminal of the starter battery to the Positive Starter Battery Terminal (ALT+).

4.5. IGN Signal Wire Wiring (For smart alternator only)



Insert the terminal block of the IGN Signal Wire to the Ignition Signal (IGN), and the bare wire terminal to the ignition of the vehicle.

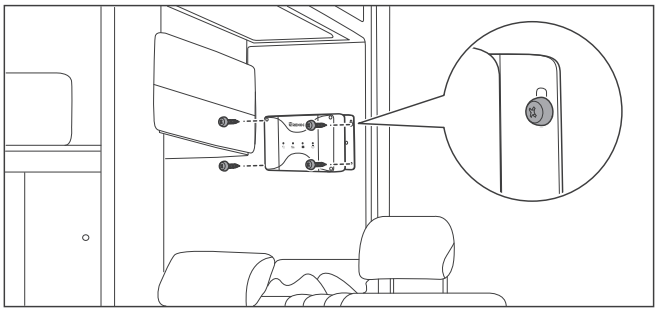
The traditional alternator does not need to be connected to the IGN Signal Wire.

4.6. Mounting

When selecting a location for the battery charger, make sure that the battery charger is as close as possible to the battery (auxiliary battery). The battery charger can be installed in the cabin of the vehicle, along the chassis rails, in the internal guard panel of the vehicle, behind the grille or headlights, or even on the side of the radiator. However, ensure that the area is not susceptible to moisture or other substances as well as potential high temperatures. It is recommended to ensure

good ventilation for better operation of the battery charger.

Make sure that the battery charger is installed firmly to prevent it from falling off.

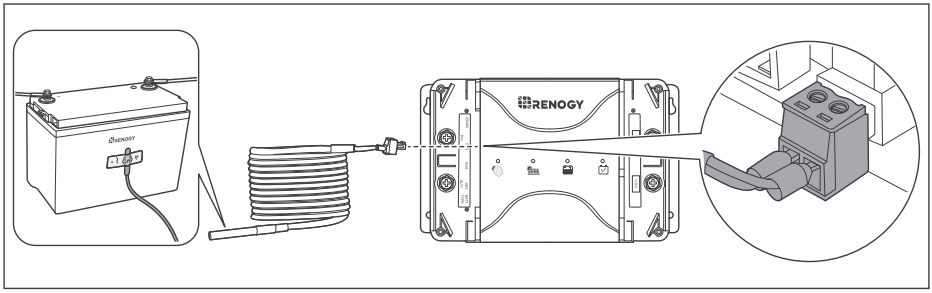


Place the battery charger against a flat surface and secure it with included screws.

4.7. Temperature Sensor Wiring

The temperature sensor can detect the battery temperature and update it to the battery charger for charging voltage calibration. This ensures the battery charger (with operating temperature range from -31ºF to 149ºF or -35ºC to 65ºC) can charge the battery normally.

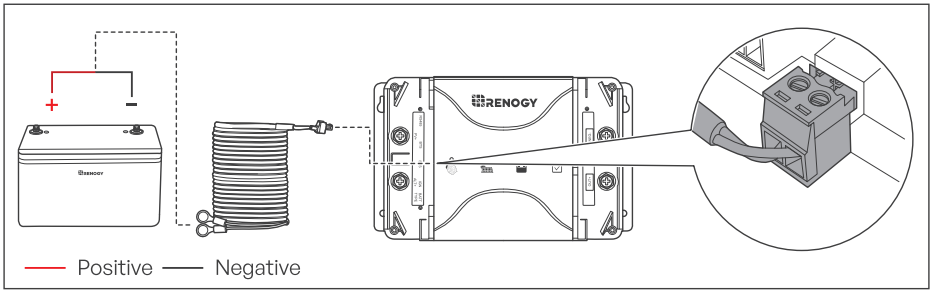
Do not use the temperature sensor on a LiFePO4 (LFP) battery which comes with a battery management system (BMS).



1. Insert the temperature sensor terminal block into the BTS port of the battery charger.
2. Adhere the sensor on the top or side of the battery with insulation tape.

4.8. Voltage Sensor Wiring

The Battery Voltage Sensor is the perfect solution by providing an accurate battery voltage to the battery charger and allowing it to adjust the charging stage precisely resulting in overall extension of your battery life.



1. Insert the voltage sensor terminal block to the BVS port.
2. Connect the voltage sensor ring terminal to the positive and negative poles of the battery system.

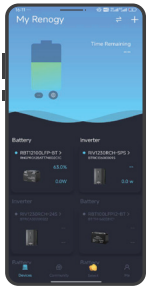
> Identify the polarities (positive and negative) on the cables used for the batteries. A reverse polarity contact may damage the battery charger.
>
> The voltage sensor ring terminal is M8 (Approx. 5/16”). If the battery bolt size is small, use a gasket to fix it to prevent it from falling off.

5. Communication

With a Renogy BT-2 Bluetooth Module (sold separately), the battery charger can be connected to the Renogy app for remote device monitoring.

The battery charger supports bluetooth for system monitoring and parameter modifying with the Renogy BT-2 Bluetooth Module.

Download the Renogy app. Login to the app with your account.

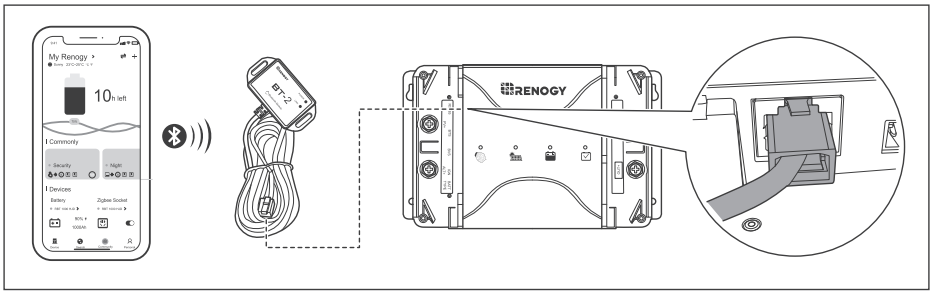


Renogy App

GTE IT ON Google Play

Download on the App Store

> Read the user manual of the Renogy BT-2 Bluetooth Module for more instructions.
>
> Make sure that the battery charger is turned on before connection.



1. Power on the battery charger.
2. Connect the Bluetooth Module to the RS485 port on the bottom of the battery charger.
3. Connect the battery charger to the Renogy app.

6. Operation

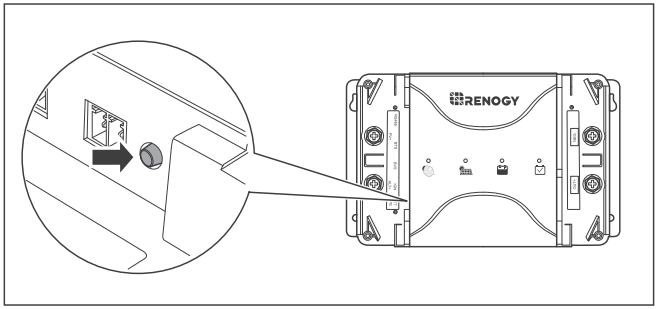
Manually set the battery type according to needs. The knob with 5 gears makes the selection of battery type more convenient.

In the Renogy app, you can also set the battery type. Check the operating status of the battery charger and modify some parameters. If you need to program multiple parameters of the battery, you can set the battery type in the user mode.

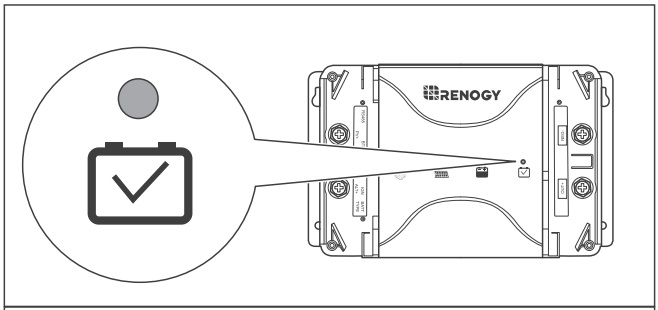
6.1. Selecting the Battery Type

⚠ Refer to battery manufacturer technical specifications when choosing a preset battery. Incorrect battery type selection resulting in damage will not be covered by warranty.

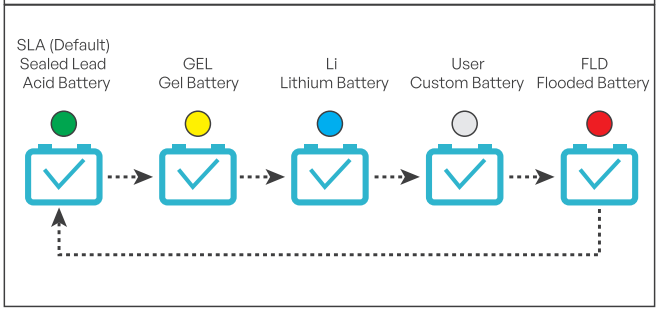
Battery Type Setting Button



1. Press the Battery Type Setting Knob on the left side.



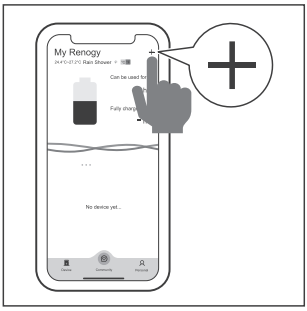
2. The Battery Type Indicator flashes different colors to represent different types of battery.



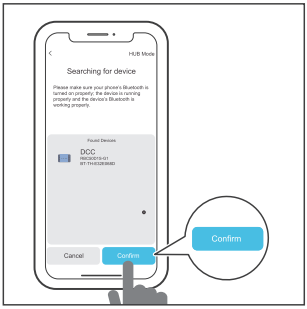
Renogy app

Make sure the Bluetooth of your phone is turned on.

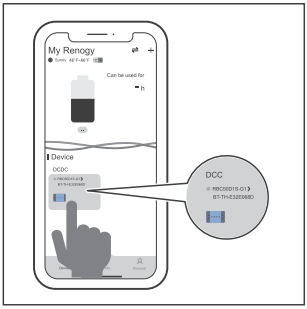
The version of the Renogy app might have been updated. Illustrations in the user manual are for reference only. Follow the instructions based on the current app version.



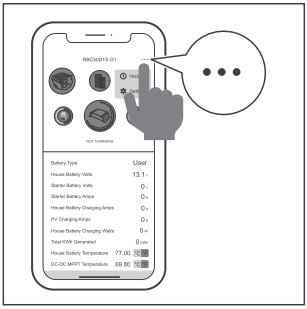
1. Open the Renogy app. Tap + to search for new devices.



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

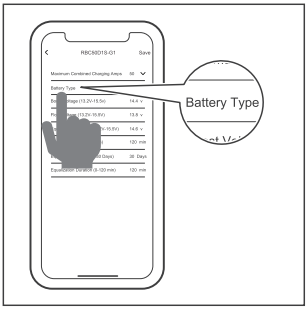


3. Tap the battery charger area to enter the device information interface.

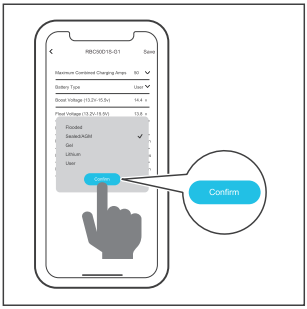


4. Tap ••• in the upper right corner.

5. Tap **Settings** to enter the mode selection interface.



6. Tap **Battery Type**.



7. According to the actual usage, tap the option button that matches the auxiliary battery in this interface to complete the battery type setting.

6.2. Battery Charging Parameters

Before modifying battery parameters, check the table below. Incorrect parameter setting will damage the device and void the warranty.

Parameters \ Battery Type	AGM / SLD	Gel	Flooded	Li (LFP)	User-defined	User Setting Range
Overvoltage Shutdown	16.0V	16.0V	16.0V	16.4V	16.0V	9.0-17.0V
Overvoltage Return	15.0V	15.0V	15.0V	15.5V	[15.4V]	—
Equalization Voltage	—	—	14.8V	—	14.6V	9.0-17.0V
Boost Voltage	14.6V	14.2V	14.6V	14.4V	14.4V	9.0-17.0V
Float Voltage	13.8V	13.8V	13.8V	—	13.8V	9.0-17.0V

Boost Return Voltage	13.2V	13.2V	13.2V	13.2V	13.2V	9.0-17.0V
Low Voltage Reconnect	12.6V	12.6V	12.6V	12.6V	[12.6V]	9.0-17.0V
Undervoltage Recover	12.2V	12.2V	12.2V	12.3V	[12.2V]	—
Undervoltage Warning	12.0V	12.0V	12.0V	12.1V	12.0V	9.0-17.0V
Low Voltage Shutdown	11.1V	11.1V	11.1V	11.1V	[11.1V]	9.0-17.0V
Boost Duration	120 min*	120 min*	120 min*	—	120 min*	10-300 min
Equalization Duration	—	120 min*	—	—	120 min*	0-300 min
Equalization Interval	0 days**	0 days**	28 days	—	30 days	0-250 days
Temperature Compensation	-3 mV / °C / 2V	-3 mV / °C / 2V	-3 mV / °C / 2V	—	-3 mV / °C / 2V	0 / 3 / 4 / 5 mV / °C / 2V

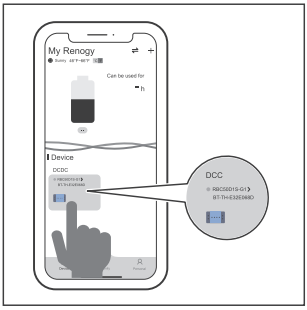
- * If the battery type is lead-acid battery and the charging current is less than 3A, the battery charger will automatically switch to float charging after 30 seconds.
- ** no Equalization Charging.
- Parameters in gray cannot be set manually
- Parameters in square brackets ([ ]) are automatically adjusted according to the relevant settings, and cannot be set directly.

6.3. User Mode

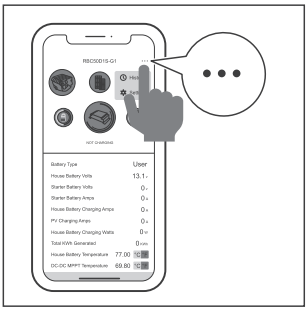
Before modifying battery parameters in user mode, check the table below and consult the battery manufacturer to check whether modification is allowed. Incorrect parameter setting will damage the device and void the warranty.

Maximum Charging Current	Renogy 12V 30A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC30D1S)	
	Max. Charging Current: 30A	Adjustable Charging Current: 30A / 20A / 10A
	Renogy 12V 50A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC50D1S)	
	Max. Charging Current: 50A	Adjustable Charging Current: 50A / 40A / 30A / 20A / 10A
Equalization Voltage	(1)For lead-acid batteries, please consult the battery manufacturer to obtain the voltage value, and then set the balance voltage according to the feedback. (2)If equalization charging is not required, set the voltage to boost voltage.	

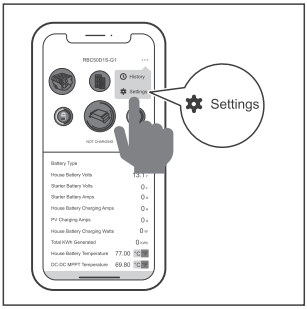
Boost Voltage	Please consult the battery manufacturer and check if this voltage value needs to be set.
Float Voltage	
Boost Duration	Please consult the battery manufacturer if it is necessary to set this parameter value.
Equalization Interval	
Equalization Duration	



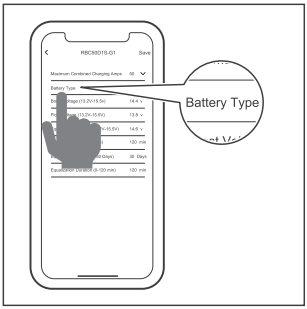
1. Open the Renogy app and tap the battery charger area to enter the device information interface.



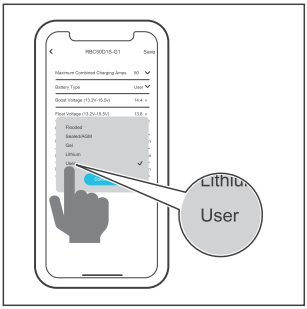
2. Tap ••• in the upper right corner.



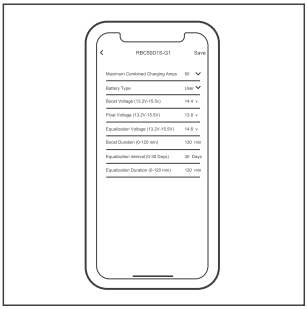
3. Tap **Settings** to enter the mode selection interface.



4. Tap **Battery Type**.



5. Tap **User** to enter the user-defined mode interface.



6. In this interface, you can customize multiple parameters of the battery. When the parameters are modified, Setting Success appears on the interface, indicating that the parameter setting is completed.

7. Working Logic

Renogy 12V 30A/50A Dual Input DC-DC On-Board Battery Charger with MPPT 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.

7.1. 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

7.2. 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	
		RBC30D1S	RBC50D1S
≥15.0V, for 10 seconds	Yes	30A Max	50A Max
<15.0V	No	N/A	N/A

7.3. 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.

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.

Alternator Type	Starter Battery Voltage		Charging the Auxiliary Battery	Charging Current	
	Before Charging	During Charging		RBC30D1S	RBC50D1S
Smart Alternator	≥12.0V, for 15 seconds	N/A	Yes	30A Max	50A Max
	<12.0V	N/A	No	N/A	N/A
	N/A	≤11.5V	No	N/A	N/A

Alternator Type	Starter Battery Voltage		Charging the Auxiliary Battery	Charging Current	
	Before Charging	During Charging		RBC30D1S	RBC50D1S
Traditional Alternator	≥13.2V, for 15 seconds	N/A	Yes	30A Max	50A Max
	<13.2V	N/A	No	N/A	N/A
	N/A	≤12.7V	No	N/A	N/A

7.4. Both the Solar Panel and Starter Battery are Connected

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 volatge.

- **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.

Model	Solar Panel Charging Current	Starter Battery Voltage		Power Supply Equipment	Charging Current
		Smart	Traditional		
RBC30D1S	≥14A	N/A		Solar panel	30A Max
	<14A	≥12V	≥13.2V	Hybrid	15A Max (from the solar panel) and 15A Max (from the starter battery)
	<14A	<12V	<13.2V	Solar panel	30A Max
RBC50D1S	≥24A	N/A		Solar panel	50A Max
	<24A	≥12V	≥13.2V	Hybrid	25A Max (from the solar panel) and 25A Max (from the starter battery)
	<24A	<12V	<13.2V	Solar panel	50A Max

- 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 30A/50A.
- 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:

Model	Solar Panel Charging Current	Starter Battery Voltage		Auxiliary Battery Voltage	Power Supply Equipment
		Smart	Traditional		
RBC30D1S	≥14A, for 60 seconds	N/A		≥13.2V	Solar panel
	≥14A, for 60 seconds	>11.5V	>12.7V	<13.2V	Hybrid
	≥14A, for 60 seconds	<11.5V	<12.7V	N/A	Solar panel
	<14A	>11.5V	>12.7V	N/A	Hybrid
	<14A	<11.5V	<12.7V	N/A	Solar panel
RBC50D1S	≥24A, for 60 seconds	N/A		≥13.2V	Solar panel
	≥24A, for 60 seconds	>11.5V	>12.7V	<13.2V	Hybrid
	≥24A, for 60 seconds	<11.5V	<12.7V	N/A	Solar panel
	<24A	>11.5V	>12.7V	N/A	Hybrid
	<24A	<11.5V	<12.7V	N/A	Solar panel

The 13.2V for the auxiliary battery voltage in the table above is the default Boost Return Voltage for the battery charger. If the battery type is set to User mode, this voltage value will adhere to the set Boost Return Voltage.

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.

Model	Charging Current for the Starter Battery
RBC30D1S	15A Max (from the solar panel)
RBC50D1S	25A Max (from the solar panel)

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

7.5. 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.

Model	Solar Panel Voltage	Starter Battery Voltage	Overvoltage Protection
RBC30D1S	≥30.5V	N/A	Trigger
	≤29.5V	N/A	Restore
RBC50D1S	≥50.5V	N/A	Trigger
	≤49.5V	N/A	Restore
RBC30D1S / RBC50D1S	N/A	≥16.5V	Trigger
	N/A	≤15.5V	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.

7.6. 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. Charging and Activation Logics

8.1. MPPT Technology

Based on MPPT (Maximum Power Point Tracking) technology, the battery charger can extract maximum power from the solar panel. With an automatic tracking algorithm, the MPPT technology can track the voltage of the maximum power point that changes with weather conditions, ensuring the harvest of the maximum power throughout the day.

Current Boost

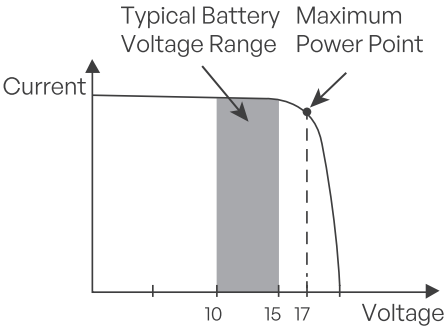
Generally, the battery charger will “boost” the current in the solar system. The power generated in the solar panel is the same as the power delivered to the battery pack. Power is the product of voltage (V) x amperage (A).

Therefore, assuming 100% efficiency:

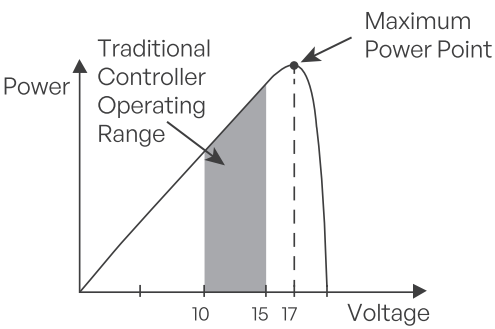
Power In= Power Out
Volts In * Amps In = Volts out * Amps out

The efficiency of the battery charger is about 92% to 95%. As the maximum power point voltage of the solar system is greater than the battery pack voltage, the potential difference is proportional to the current boost. The voltage of the solar panel needs to be stepped down to a rate at which the battery can be charged in a stable manner. Compared with traditional battery chargers, the battery charger does not waste the stepped down voltage. It is entirely possible to have the solar module input 8 amps of current into the battery charger, and have the battery charger output 10 amps of current to the battery pack. The following shows a graphic point about the output of MPPT technology.

Current vs.Voltage (12V System)



Output Power (12V System)

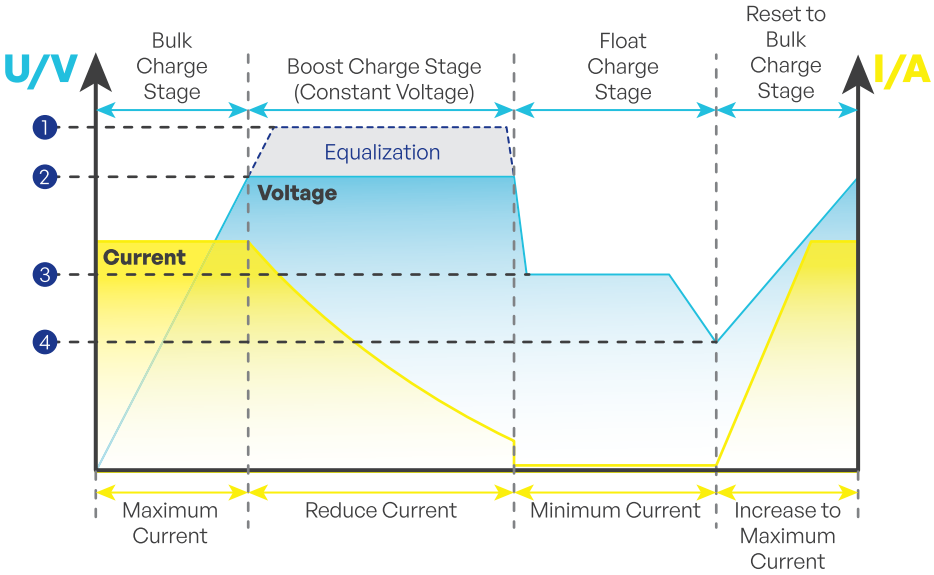


Limiting Effectiveness

High temperature is the natural enemy of solar panels. With the increase of ambient temperature, the operating voltage (Vmp) of the solar panel decreases, which limits the power generation of the solar panel. The battery charger encounters an inevitably decrease in charging performance even with the MPPT technology. In this case, it is better to use solar panels with higher nominal voltage, so that the battery can still get current boost even if the voltage drops proportionally.

8.2. Four Charging Stages

Renogy 12V 30A/50A Dual Input DC-DC On-Board Battery Charger with MPPT has a four-stage battery charging algorithm for a rapid, efficient, and safe battery charging. The stages include: Bulk Charging, Boost Charging, Float Charging, and Equalization.



1 Equalization charging voltage
2 Boost charging voltage
3 Float charging voltage
4 Low Voltage Disconnect Recover charging voltage

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. It uses 100% of available solar power to recharge the battery.

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.

8.3. Lithium Battery Activation

Renogy 12V 30A/50A Dual Input DC-DC On-Board Battery Charger with MPPT has the activation function of lithium battery. 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.

9. LED Indicators

9.1. Alternator / Charging Indicator

Color	Status	Description
Red 	ON	The alternator is charging the auxiliary battery.
	Slow Flashing	The Positive Solar Terminal is charging the starter battery.
	OFF	Not charging

Solar Charging Indicator

Color	Status	Description
Red 	ON	Bulk charge (MPPT)
	Slow Flashing	Boost charge
	Single Flashing	Float charge
	Fast Flashing	Equalization charging
	Double Flashing	Current-limit Charging
	OFF	Not charging

Auxiliary Battery Indicator

Color	Status	Description
Green 	ON	Full
Yellow 	ON	Normal voltage
Red 	ON	Undervoltage
	Slow Flashing	Overdischarge
	Fast Flashing	Overvoltage / Overtemperature

9.2. Battery Type Indicator

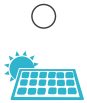
Color	Status	Description
Green 	ON	SLA (Default) - Sealed Lead Acid Battery
Yellow 	ON	Gel - Gel Battery
Blue 	ON	Li - Lithium Battery
White 	ON	User - User-defined Battery
Red 	ON	FLD - Flooded Battery

10. Troubleshooting

10.1. Alternator / Charging Indicator

Color	Status	Description
	OFF	For a traditional alternator, check the alternator input voltage. Measure it with a multimeter. Ensure that the voltage is greater than or equal to 13.2V. For a smart alternator, check the alternator input voltage. Measure it with a multimeter. Ensure that the voltage is greater than or equal to 12V. Ensure that the IGN Signal Wire, cables, and fuses are intact and properly connected.

10.2. Solar Charging Indicator

Color	Status	Description
	OFF	Ensure that the solar panel is not being shaded (by a tree etc.). Ensure the voltage of the solar panel is higher than 15V with a multi-meter and check the electric connections.

10.3. Auxiliary Battery Indicator

Color	Status	Description
	Solid Red	Turn off any loads connected to the battery and recharge the auxiliary battery.
	Fast Flashing Red	Ensure that the voltage of the auxiliary battery is 12V. Ensure the installation site is well ventilated. Avoid additional heating of the battery. Disconnect all loads and chargers from the battery and allow the battery temperature to decrease to operational specifications.
	Slow Flashing Red	Ensure that cables and fuses are intact and properly connected. Turn off any loads connected to the battery and recharge the auxiliary battery.

For further assistance, contact Renogy technical support service at https://www.renogy.com/contact-us.

11. Technical Specifications

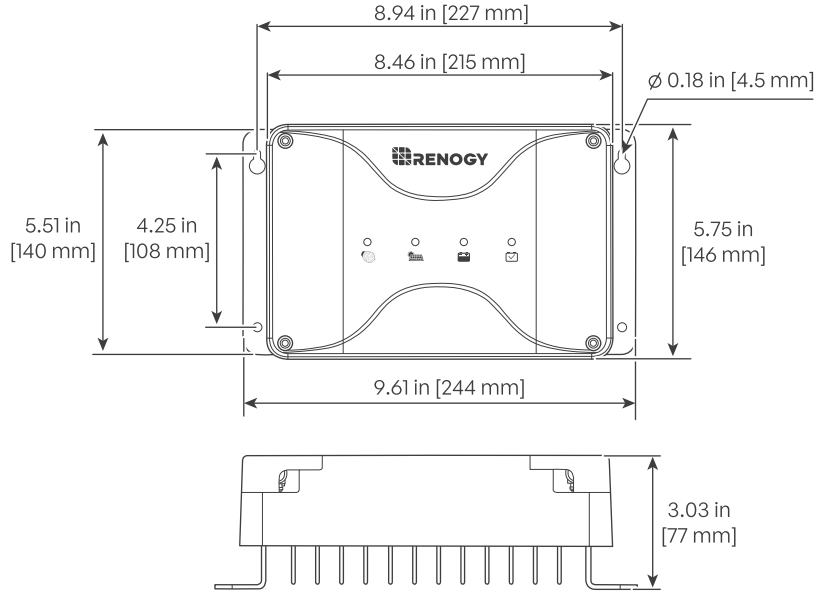
11.1 Specifications

Product	RBC30D1S	RBC50D1S
System Voltage	12V DC	
Battery Voltage Range	9V to 16V DC	
Maximum Charging Current	30A	50A
Battery Type	SLA, Gel, FLD, Li, User-defined	
Auxiliary Battery Charging Mode	MPPT	
Charging Efficiency	Up to 97%	
Max. Solar Input Voltage	30V	50V
Max. Solar Input Power	400W	660W
Alternator Input Voltage	Traditional Alternator: 13.2V to 16V DC Smart Alternator (Euro 6): 12V to 16V DC	
Temp. Compensation Coefficient	-3mV / °C / 2V	
Self-consumption	<30mA	
Operating Temperature Range	-31°F to 149°F / -35°C to 65°C	
Storage Temperature Range	-40°F to 176°F / -40°C to 80°C	
Humidity Range	0% to 95% (NC)	
Dimensions	9.61 x 5.75 x 3.03 in 244 x 146 x 77 mm	9.61 x 5.75 x 3.78 in 244 x 146 x 96 mm
Weight	3.11 lb / 1.41 kg	4.10 lb / 1.86 kg
Terminal Size	M8x1.25-14 mm	
Communication Protocol	RS485	
Grounding	Common Negative	
Certifications	CE, RoHS, FCC Part 15 Class B, ETL listed to UL1741 & CSA C22.2	

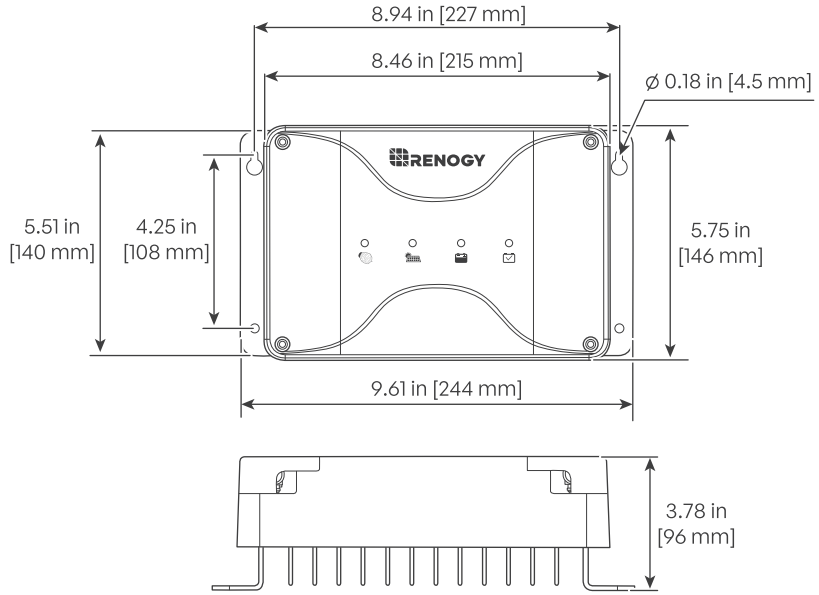
11.2. Dimensions

Dimension tolerance: ±0.2 in (0.5 mm)

Renogy 12V 30A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC30D1S)



Renogy 12V 50A Dual Input DC-DC On-Board Battery Charger with MPPT (RBC50D1S)



12. Maintenance

12.1. Inspection

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

- Check the appearance of the battery charger to make sure it is clean and dry.
- Ensure the battery charger is installed in a clean, dry and ventilated area.
- Ensure the firmness of all cables and check if there are any loose, damaged or burnt connections.
- Make sure that all indicators are in normal state.
- Ensure there is no corrosion, insulation damage, or discoloration marks of overheating or burning.

In some applications, corrosion may exist around the contacts. Corrosion can loosen springs and increase resistance, leading to premature connection failure. Apply dielectric grease to each connector contact periodically. Dielectric grease repels moisture and protects the connector contacts from corrosion.

Risk of electric shock! Make sure that all power is turned off before touching the terminals on the battery charger.

12.2. Cleaning

Follow the steps below to clean the battery charger regularly.

- Disconnect all cables that are connected to the battery charger.
- Wipe the housing of the battery charger and connector contacts with a dry cloth or non-metallic 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 charger clean and dry.
- Make sure the battery charger is completely dry before reconnection.
- When reconnecting, follow the steps in the user manual.

12.3. Storage

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

- Disconnect all cables that are connected to the battery charger.
- By applying dielectric grease to each connector contact, the dielectric grease repels moisture and protects the connector contacts from corrosion.
- Store the battery charger in a well-ventilated, dry and clean environment with a temperature between -40°F and 176°F or -40°C to 80°C.

13. 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.

13.1. Fire

1. Disconnect all cables connected to the battery charger.
2. Put out the fire with a fire extinguisher. Acceptable fire extinguishers include water, CO_2, and ABC.

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

13.2. Flooding

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

13.3. Smell

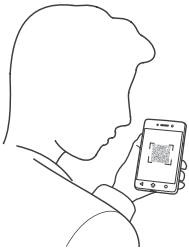
1. Disconnect all cables connected to the battery charger.
2. Make sure nothing is in contact with the battery charger.
3. Ventilate the room.

13.4. Noise

1. Disconnect all cables connected to the battery charger.
2. Make sure no foreign objects are stuck in the battery charger ports.

Renogy Support

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



Questionnaire Investigation

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

G | 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	China	www.renogy.cn
Australia	au.renogy.com	Japan	jp.renogy.com
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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, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

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) Orient 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 20cm 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 CO_2 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.

YouTube @Renogy Solar @renogyofficial @Renogy

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