ROVER SERIES

Maximum Power Point Tracking Solar Charge Controller

Rover 100A

Version 1.4

⚠ Important Safety Instructions ⚠

Please save these instructions.

This manual contains important safety, installation, and operating instructions for the charge controller. The following symbols are used throughout the manual to indicate potentially dangerous conditions or important safety information.

WARNING	Indicates a potentially dangerous condition. Use extreme caution when performing this task
CAUTION	Indicates a critical procedure for safe and proper operation of the controller
NOTE	Indicates a procedure or function that is important to the safe and proper operation of the controller

General Safety Information

- Read all of the instructions and cautions in the manual before beginning the installation.
- There are no serviceable parts for this controller. Do **NOT** disassemble or attempt to repair the controller.
- Do **NOT** allow water to enter the controller.
- Make sure all connections going into and from the controller are tight.

Charge Controller Safety

- **NEVER** connect the solar panel array to the controller without a battery. Battery must be connected first.
- Ensure input voltage does not exceed 150 VDC to prevent permanent damage. Use the Open Circuit Voltage (Voc) to make sure the voltage does not exceed this value when connecting panels together.

Battery Safety

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

WARNING

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

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

Table of Contents

General Information

The Rover Series charge controllers are suitable for various off-grid solar applications. It protects the battery from being over-charged by the solar modules and over-discharged by the loads. The controller features a smart tracking algorithm that maximizes the energy from the solar PV module (s) and charge the battery. At the same time, the low voltage disconnect function (LVD) will prevent the battery from over discharging.

The Rover's charging process has been optimized for long battery life and improved system performance. The comprehensive self-diagnostics and electronic protection functions can prevent damage from installation mistakes or system faults.

Key Features

- Automatically detect 12V/24V/36V/48V DC system voltages
- Innovative MPPT technology with high tracking efficiency up to 99% and peak conversion efficiency of 98%
- Deep cycle Sealed, Gel, Flooded and Lithiumbattery option ready
- Electronic protection: Overcharging, over-discharging, overload, and short circuit
- Reverse protection: Any combination of solar module and battery, without causing damage to any component
- Customizable charging voltages
- RS232 port to communicate with BT-1 Bluetooth module or DM-1 4G Date Module
- Charges over discharged lithium batteries

MPPT Technology

The MPPT Charge Controller utilizes Maximum Power Point Tracking technology to extract maximum power from the solar module(s). The tracking algorithm is fully automatic and does not require user adjustment. MPPT technology will track the array's maximum power point voltage (Vmp) as it varies with weather conditions, ensuring that the maximum power is harvested from the array throughout the course of the day.

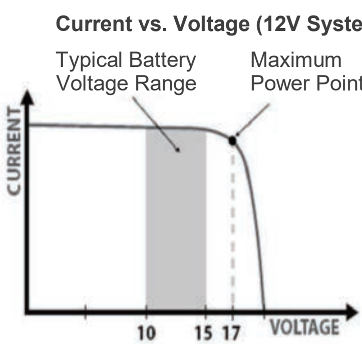
Current Boost

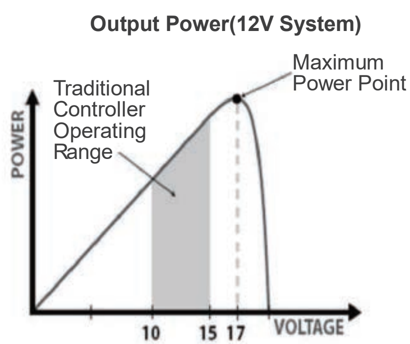
In many cases, the MPPT charge controller will "boost" up the current in the solar system. The current does not come out of thin air. Instead, the power generated in the solar panels is the same power that is transmitted into the battery bank. Power is the product of Voltage (V) x Amperage (A).

Therefore, assuming 100% efficiency:

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

Although MPPT controllers are not 100% efficient, they are very close at about 92-95% efficient. Therefore, when the user has a solar system whose Vmp is greater than the battery bank voltage, then that potential difference is proportional to the current boost. The voltage generated at the solar module needs to be stepped down to a rate that could charge the battery in a stable fashion by which the amperage is boosted accordingly to the drop. It is entirely possible to have a solar module generate 8 amps going into the charge controller and likewise have the charge controller send 10 amps to the battery bank. This is the essence of the MPPT charge controllers and their advantage over traditional charge controllers. In traditional charge controllers, that stepped down voltage amount is wasted because the controller algorithm can only dissipate it as heat. The following demonstrates a graphical point regarding the output of MPPT technology.



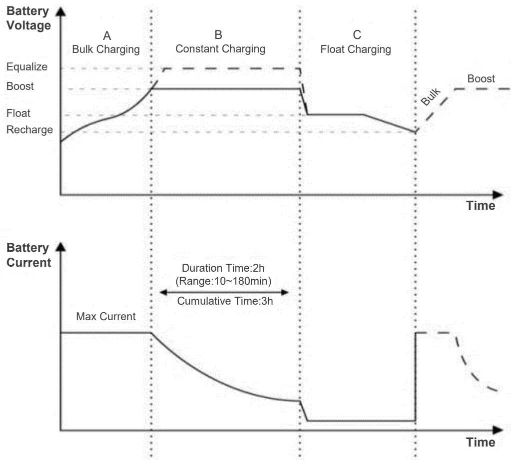


Limiting Effectiveness

Temperature is a huge enemy of solar modules. As the environmental temperature increases, the operating voltage (Vmp) is reduced and limits the power generation of the solar module. Despite the effectiveness of MPPT technology, the charging algorithm will possibly not have much to work with and therefore there is an inevitable decrease in performance. In this scenario, it would be preferred to have modules with higher nominal voltage, so that despite the drop in performance of the panel, the battery is still receiving a current boost because of the proportional drop in module voltage.

Four Charging Stages

The Rover MPPT charge controller has a 4-stage battery charging algorithm for a rapid, efficient, and safe battery charging. They include: Bulk Charge, Boost Charge, Float Charge, and Equalization*.



Bulk Charge: This algorithm is used for day to day charging. It uses 100% of available solar power to recharge the battery and is equivalent to constant current. In this stage the battery voltage has not yet reached constant voltage (Equalize or Boost), the controller operates in constant current mode, delivering its maximum current to the batteries (MPPT Charging).

Constant Charging: When the battery reaches the constant voltage set point, the controller will start to operate in constant charging mode, where it is no longer MPPT charging. The current will drop gradually. This has two stages, equalize and boost and they are not carried out constantly in a full charge process to avoid too much gas precipitation or overheating of the battery.

- **Boost Charge:** Boost stage maintains a charge for 2 hours by default. The user can adjust the constant time and preset value of boost per their demand.

Float Charge: After the constant voltage stage, the controller will reduce the battery voltage to a float voltage set point. Once the battery is fully charged, there will be no more chemical reactions and all the charge current would turn into heat or gas. Because of this, the charge controller will reduce the voltage charge to smaller quantity, while lightly charging the battery.

The purpose for this is to offset the power consumption while maintaining a full battery storage capacity. In the event that a load drawn from the battery exceeds the charge current, the controller will no longer be able to maintain the battery to a Float set point and the controller will end the float charge stage and refer back to bulk charging.

⚠ **Equalization:** Is carried out every 30 days of the month. It is intentional overcharging of the battery for a controlled period of time. Certain types of batteries benefit from periodic equalizing charge, which can stir the electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge increases the battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

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

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

WARNING Equalization may increase battery voltage to a level damaging to sensitive DC loads. Ensure that all load allowable input voltages are greater than the equalizing charging set point voltage.

Lithium Battery Activation

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

Additional Components

Additional components included in the package:

Remote Temperature Sensor:

This sensor measures the temperature at the battery and uses this data for very accurate temperature compensation. Accurate temperature compensation is important in ensuring proper battery charging regardless of the temperature.

Controller Paralleling Cable:

This communication cable is needed to parallel two or more Rover 100A charge controllers. Paralleling 100A Rovers allows for higher wattage systems.

Figure 1

NOTE This cable should only be used to parallel two Rover 100A charge controllers.

Optional Components

Optional components that require a separate purchase:

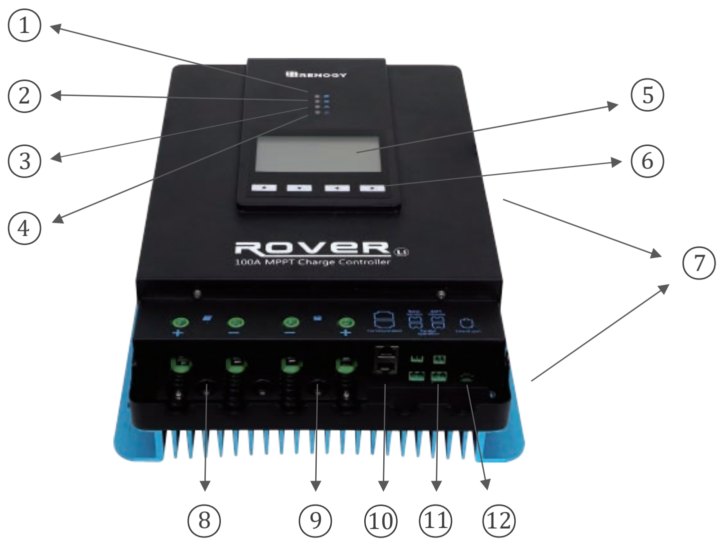
Renogy BT-1 & BT-2 Bluetooth Module:

The Bluetooth module is a great addition to any Renogy charge controllers with a RS232 or RS485 port and is used to pair charge controllers with the Renogy DC Home App. After pairing is done you can monitor your system and change parameters directly from you cell phone or tablet. No more wondering how your system is performing, now you can see performance in real time without the need of checking on the controller's LCD.

Renogy DM-1 4G Data Module:

The DM-1 4G Module is capable of connecting to select Renogy charge controllers through an RS232, and is used to pair charge controllers with Renogy 4G monitoring app. This app allows you to conveniently monitor your system and charge syeters parameters remotely from anywhere 4G LTE network service is available.

Identification of Parts



Key Parts

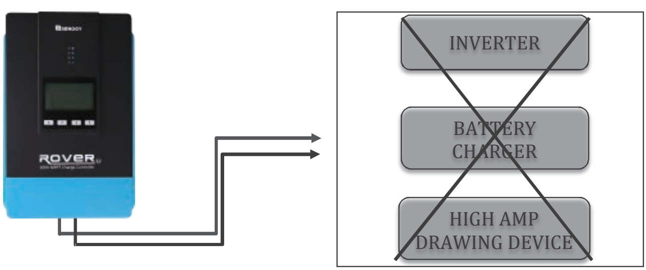
1.PV LED Indicator
2.Battery LED Indicator
3.Controller Parallel LED Indicator
4.System Error LED Indicator
5.LCD Screen
6.Operating Keys
7.Mounting Holes
8.PV Terminals
9.Battery Terminals
10.RS485 Port (Optional Accessory)
11.Remote Temperature Sensor/ Battery Remote Port/ Controller Parallel Port (Optional Accessory)
12.RS232 Port (Optional Accessory)

Installation

Recommended tools to have before installation:

Screwdriver	Multi-Meter
	

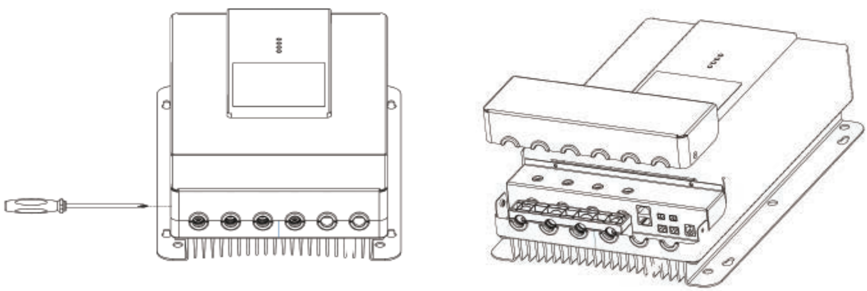
WARNING Connect battery terminal wires to the charge controller FIRST then connect the solar panel(s) to the charge controller. NEVER connect solar panel to charge controller before the battery.



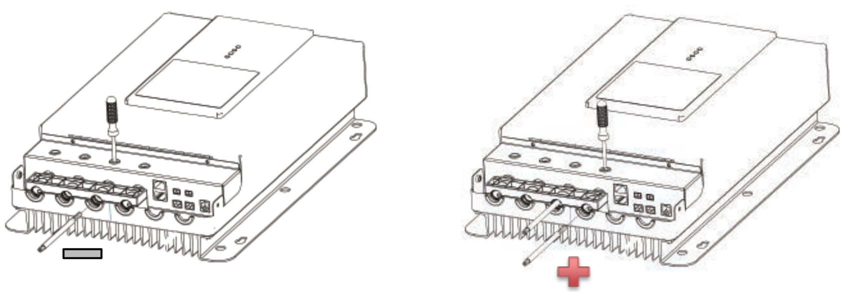
CAUTION Do not over tighten the screw terminals. This could potentially break the piece that holds the wire to the charge controller.

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

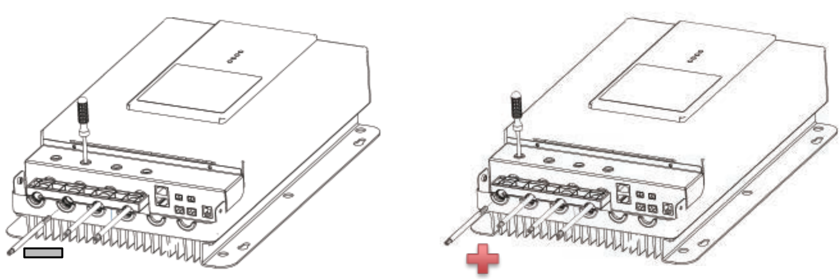
1. Remove Cover



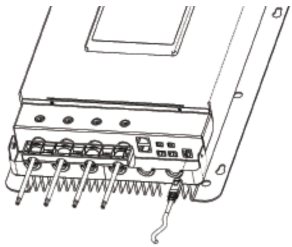
2. Connect Battery

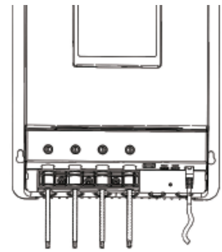


3. Connect Solar Panels

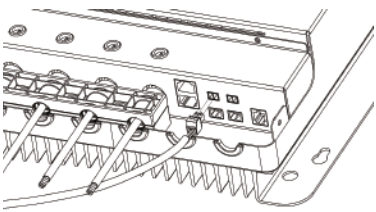


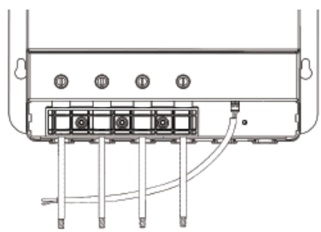
4. Bluetooth Module communication (optional)





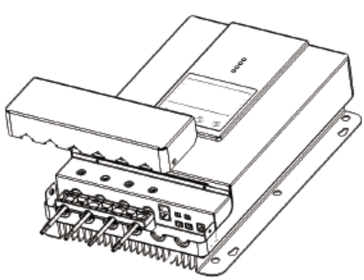
5. Temperature Sensor (not polarity sensitive)

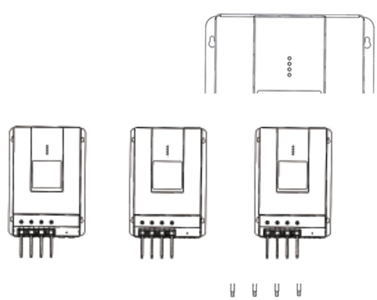




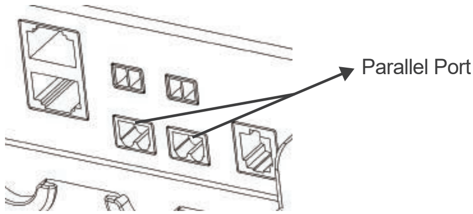
Secure the Temperature Sensor lug to one of the battery posts

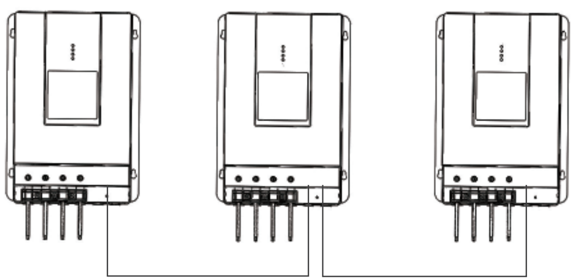
6. Install Cover





7. Paralleling Function (Optional)





NOTE

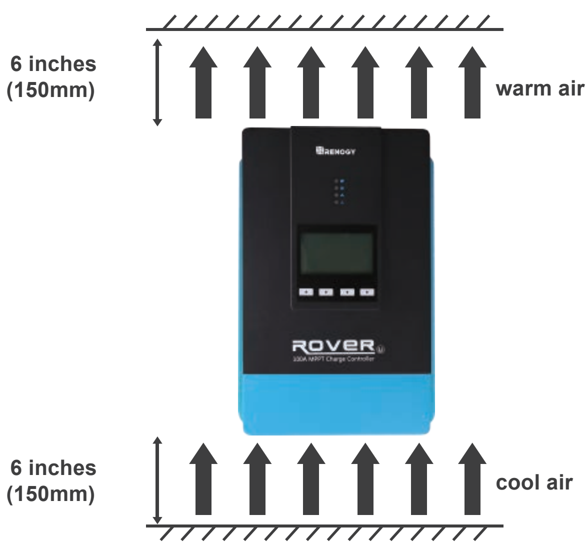
Use the provided paralleling cable to combine multiple Rover 100A Charge Controllers. Connect the cable into the port labeled Parallel Operation on each Rover 100A. Using this function will allow the Rover to act as one large charge controller (Example above 300A).

Mounting Recommendations

WARNING

NEVER INSTALL THE CONTROLLER IN A SEALED ENCLOSURE WITH FLOODED BATTERIES. GAS CAN ACCUMULATE AND THERE IS A RISK OF EXPLOSION.

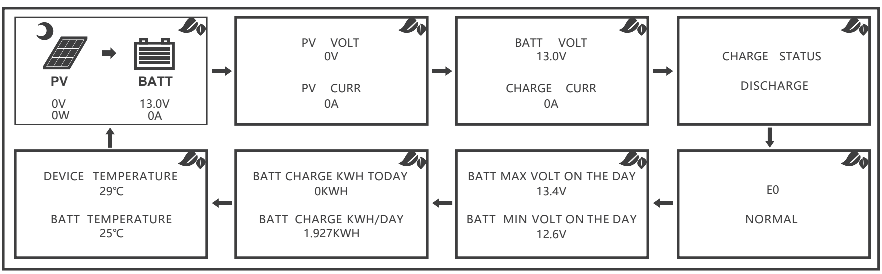
1. **Choose Mounting Location —** place the controller on a vertical surface protected from direct sunlight, high temperatures, and water. Make sure there is good ventilation.
2. **Check for Clearance —** verify that there is sufficient room to run wires, as well as clearance above and below the controller for ventilation. The clearance should be at least 6 inches (150mm).
3. **Mark Holes**
4. **Drill Holes**
5. **Secure the charge controller.**



Operation

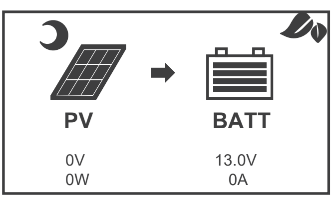
Rover is very simple to use. Simply connect the batteries, and the controller will automatically determine the battery voltage. The controller comes equipped with an LCD screen and 4 buttons to maneuver though the menus.

Main Display



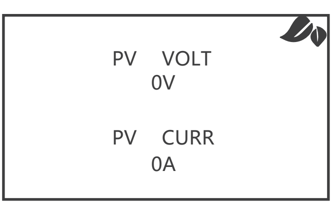
To cycle through the Main Menu screens, press the UP or DOWN buttons.

Screen 1



Displays solar panels Voltage and Wattage production on left side of screen. Shows Voltage and Amperage being sent to the battery on the right side of the screen

Screen 2



Displays solar panels Voltage and Current production

Screen 3

BATT VOLT
13.0V

CHARGE CURR
0A

Displays battery Voltage and charging Current

Screen 4

CHARGE STATUS

DISCHARGE

Shows charge controllers current charging stage (Discharge, Boost, Float and Equalize).

Screen 5

E0

NORMAL

Displays Error code and controller’s status

Screen 6

BATT MAX VOLT ON THE DAY
13.4V

BATT MIN VOLT ON THE DAY
12.6V

Displays Maximum and Minimum battery voltage throughout the day

Screen 7

BATT CHARGE KWH TODAY
0KWH

BATT CHARGE KWH/DAY
1.927KWH

Displays Kilowatt hours charged today, and average Kilowatt hours charged per day

Screen 8

DEVICE TEMPERATURE
29℃

BATT TEMPERATURE
25℃

Displays ambient temperature and battery temperature (Remote temperature sensor needed)

System Settings Display

To enter the following screen long press OK button on any of the main menu screens.

Set Menus
1.Device Set
2.Parameter Set
3.System Log
4.Password
5.Factory Reset
6.Device Information

Use the UP and DOWN buttons then press OK button to enter the desired setting.

1. Device Set

1.Device ID:	C100-0001
2.BackLight Time:	ON
3.Error Alarm:	OFF
4.SOC:	ON

1. Device ID: Controller’s model number
2. BackLight Time: On/Off
3. Error Alarm: On/Off
4. SOC: Turns SOC % on main display on/off

2. Parameter Set

1.Sys Batt Volt:	AUTO(12V)
2.Batt Type:	SLD
3.Batt Capacity:	200
4.Batt OVD:	16.0V

1. Sys Batt Volt: User can change between (Auto/12V/24V/36V/48V)
2. Batt Type: User can change between Sealed (SLD), Gel, Flooded (FLD), Lithium (Li) and User (USE)
3. Battery Capacity: User can set battery bank's Amp hour capacity
4. Batt OVD: User can set battery over voltage disconnect

5.Chg Limit Volt:	15.5V
6.Equa Volt:	14.6V
7.Boost Volt:	14.4V
8.Float Volt:	13.8V

5. Chg Limit Volt: User can set the charge controller's maximum charging Voltage
6. Equa Volt: User can set the Equalization Voltage
7. Boost Volt: User can set the Boost Voltage
8. Float Volt: User can set the Float Voltage

9.Boost Return Volt:	13.2V
10.Batt LVR:	12.6V
11.Batt UVW:	12.0V
12.Batt LVW:	11.1V

9. Boost Return Volt: User can set the Boost Return Voltage (Voltage when charge controller will re-enter boost stage.
10. Batt LVR: User can set Low Voltage Reconnect
11. Batt UVW: User can set Under Voltage Warning
12. Batt LVW: User can set Low Voltage Warning

13.Equa Chg Time:	120MIN
14.Boost Chg time:	120MIN
15.Equa INV:	30D
16.Temp Comp:	-3mV/℃/2V

13. EquaChg Time: User can set Equalization time
14. Boost Chg Time: User can set Boost time
15. Equa INV: User can set Equalization interval
16. Temp Comp: User can set Temperature compensation

3. System Log

1.Same day
2.History
3.Total

1. Same day: View system information for current day
2. History: View Historical data
3. Total: View system overall generation

Same day

MinBatVol:	13.4V
MaxBatVol:	13.4V
MaxChgCurr:	0A
MaxChgPow:	0W
Charged AH:	0AH
Charged KWH:	0KWH

MinBatVol: Batteries lowest voltage for current day
MaxBatVol: Batteries highest voltage for current day
MaxChgCurr: Maximum charging current (Amps) for current day
MaxChgPow: Maximum charging power (Watts) for current day
Charge AH: Battery Amp hours charged for current day
Charged KWH: Battery Watt hours charged for current day

Choose History Day
0001 Days Ago

Press UP or DOWN buttons to select the desired day

0001 Days Ago

MinBatVol:	11.5V
MaxBatVol:	12.6V
MaxChgCurr:	0A
MaxChgPow:	0W
Charged AH:	0AH
Charged KWH:	0KWH

MinBatVol: Batteries lowest voltage for current day
MaxBatVol: Batteries highest voltage for current day
MaxChgCurr: Maximum charging current (Amps) for current day
MaxChgPow: Maximum charging power (Watts) for current day
Charge AH: Battery Amp hours charged for current day
Charged KWH: Battery Watt hours charged for current day

ANALYSIS

Rundays:	8D
LVW-Count:	0
FUL -Count:	0
Charge AH:	826AH
Generation:	12.568KWH

Rundays: Number of days system has been operational
LVW-Count: Number of times controller entered Low Voltage Warning
FUL-Count: Number of times batteries have been fully charged
Charge AH: Total Amp hours charged
Generation: Total Kilowatt hours charged

4. Password

Input Password

....

User can set desired password

Input New Password

....

Input desired password again to save

5. Factory Reset

Factory Reset

YES NO

Resets controller to Factory Settings (Password Protected)

6. Device Information

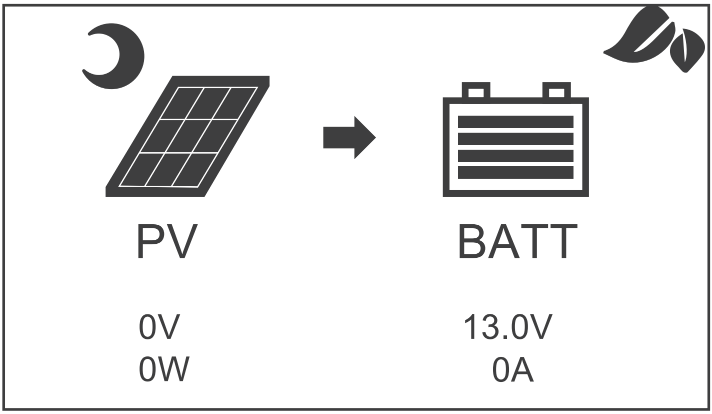
Model:	RNG-CTRL-RVR100
HW-Ver:	00.01.00
SW-Ver:	01.01.04
SN:	18070100

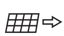
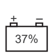
Model: Device SKU Number
HW-Ver: Hardware Version
SW-Ver: Software Version
SN: Serial Number

LCD Buttons Function

▲	Page Up/ Increase parameter value
▼	Page Down/ Decrease parameter value
◄	Return to the previous menu
►	Enter sub menu/ save parameter value/ turn load on or off in manual mode

Main Menu LCD

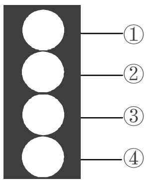


Icon or Value	State	Description
	Steady on	Nighttime
	Steady on	Daytime
	Steady on	A dynamic arrow indicates charging is in progress.
	0-100%	Current battery capacity
	0% Slow Flashing	Battery over-discharged
	100% Flash Flashing	Battery over-voltage

Parameter Settings

Screen	Parameter	Displayed Parameter	Parameter and setting range
1	System Battery Voltage	Sys Batt Volt:	12v,24v,36v,48v, AUTO
	Battery type	Batt Type:	“SLD” Sealed lead-acid battery “FLD” Flooded lead-acid battery “GEL” Gel battery “Li” Lithium battery “USE” user defined
	Nominal battery capacity	Batt Capacity:	0-9999
	Battery Over Voltage Disconnect	Batt OVD:	9.0-17.0V
2	Charging Limit Voltage	Chg Limit Volt:	9.0-17.0V
	Equalization Voltage	Equa Volt:	9.0-17.0V
	Boost Voltage	Boost Volt:	9.0-17.0V
	Float Voltage	Float Volt:	9.0-17.0V
3	Boost Return Voltage	Boost Return Volt:	9.0-17.0V
	Battery Low Voltage Reconnect	Batt LVR:	9.0-17.0V
	Battery Under Voltage Warning	Batt UVW:	9.0-17.0V
	Battery Low Voltage Warning	Batt LVW:	9.0-17.0V
4	Equalization Time	EquaChg Time:	0-600 MIN
	Boost Time	Boost Chg Time:	0-600 MIN
	Equalization Interval	Equa INV:	250 DAYS
	Temperature Compensation	Temp Comp:	-(0 to 5) mV/°C/2V

LED Indicators



①---PV array indicator	Indicating the controller's current charging mode.
②---BAT indicator	Indicating the battery's current state.
③---PARALLEL indicator	Indicating whether controller is paralled with another unit.
④---ERROR indicator	Indicating whether the controller is functioning normally.

PV Indicator (1)	**Status**
Blue Solid	The PV system is charging the battery bank
Blue Slow Flashing	The Controller is undergoing boost stage
Blue Slow Flashing	The Controller is undergoing float stage
Blue Fast Flashing	The Controller is undergoing equalization stage
Blue Double Flashing	The oversized PV system is charging the battery bank at the rated current.
Off	The PV system is not charging the battery bank. PV not detected.
BATT Indicator (2)	**Status**
Blue Solid	Battery is normal
Blue Slow Flashing	Battery over-discharged
Blue Fast Flashing	Battery over-voltage
Parallel Indicator (3)	**Status**
Blue Solid	Controller is paralleled with another controller
Blue Double Flashing	Controller is not paralleled
Error Indicator (4)	**Status**
Off	System Error. Please check LCD for Error code
Blue Solid	System is operating normally

Protections

Protection	Behavior
PV Array Short Circuit	When PV shot circuit occurs, the controller will stop charging. Clear it to resume normal operation
PV Overvoltage	If the PV voltage is larger than maximum input open voltage 150VDC, PV will remain disconnected until the voltage drops below 150VDC.
PV Overcurrent	The controller will limit the battery charging current to the maximum battery current rating. Therefore, an over-sized solar array will not operate at peak power.
PV Reverse Polarity	The controller will not operate if the PV wires are switched. Wire them correctly to resume normal controller operation.
Battery Reverse Polarity	The controller will not operate if the battery wires are switched. Wire them correctly to resume normal controller operation.
Over-Temperature	If the temperature of the controller heat sink exceeds 65℃, the controller will automatically start the reducing the charging current and shut down when temperature exceeds 80℃

System StatusTroubleshooting

PV indicator	Troubleshoot
Off during daylight	Ensure that the PV wires are correctly and tightly secured inside the charge controller PV terminals. Use a multi-meter to make sure the poles are correctly connected to the charge controller.
BATT Indicator	**Troubleshoot**
White Slow Flashing	Disconnect loads, if any, and let the PV modules charge the battery bank. Use a multi-meter to frequently check on any change in battery voltage to see if condition improves. This should ensure a fast charge. Otherwise, monitor the system and check to see if system improves.
White Fast Flashing	Using a multimeter check the battery voltage and verify it is not exceeding 68V volts.
Error Indicator	**Troubleshoot**
White Solid	System Error. Please check LCD for Error code
Buzzer (Alarm)	**Troubleshoot**
Buzzer on for 1 minute	Check the following, Battery over-discharged, Controller over-temperature or Cattery over-temperature
Buzzing for 15 seconds	Check the following, Battery under-voltage alert
Buzzing continuously	Check the following, Battery over-voltage, PV reverse polarity, PV over-voltage

Error Codes

Error Number	Description
E0	No error detected
E1	Battery over-discharged
E2	Battery over-voltage
E3	Battery under-voltage
E6	Controller over-temperature
E7	Battery over-temperature
E8	PV input over-current
E10	PV over-voltage
E13	PV reverse polarity

Maintenance

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

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

1. Check that controller is mounted in a clean, dry, and ventilated area.
2. Check wiring going into the charge controller and make sure there is no wire damage or wear.
3. Tighten all terminals and inspect any loose, broken, or burnt up connections.
4. Make sure LED readings are consistent. Take necessary corrective action.
5. Check to make sure none of the terminals have any corrosion, insulation damage, high temperature, or any burnt/discoloration marks.

Fusing

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

NEC Maximum Current for different Copper Wire Sizes									
AWG	16	14	12	10	8	6	4	2	0
Max. Current	18A	25A	30A	40A	55A	75A	95A	130A	170A

NOTE The NEC code requires the overcurrent protection shall not exceed 15A for 14AWG, 20A for 12 AWG, and 30A for 10AWG copper wire.

Fuse from Controller to Battery

Controller to Battery Fuse = Current Rating of Charge Controller

Ex. 20A MPPT CC = 20A fuse from Controller to Battery

Fuse from Solar Panel(s) to Controller

Ex. 200W; 2 X 100 W panels

****Utilize 1.56 Sizing Factor (SF)**

NOTE **Different safety factors could be used. The purpose is to oversize.**

Series:

Total Amperage= $I_{sc1} = I_{sc2} * SF$

$= 5.75A * 1.56 = 8.97$

Fuse = **9A fuse**

Parallel

Total Amperage= $(I_{sc1} + I_{sc2}) * SF$

$=(5.75A + 5.75A) * 1.56 = 17.94$

Fuse = 18A fuse

Technical Specifications

Electrical Parameters

Model	RNG-CTRL-RVR100
Nominal system voltage	12V/24V/36V/48V Auto Recognition
Rated Battery Current	100A
Battery Voltage	9V-60V
Max. Solar Input Voltage	150 VDC (25°C), 140VDC (-25°C)
Max. power point voltage range	Battery voltage +2V to 75V
Max. Solar Input Power	1300W/12V; 2600W/24V; 3900W/36V; 5200W/48V
Self-Consumption	2.7W - 2.9W
Conversion efficiency	≤ 98%
MPPT tracking efficiency	>99%
Temp. Compensation	-3mV/°C/2V (default)

General

Model	RNG-CTRL-RVR100
Dimensions	305 x 443 x 110 mm 12.00 x 17.44x 4.35 in
Mounting Holes	4 x Ø10mm
Max Terminal Size	$25mm^2$ 4 AWG
Net Weight	9.98 kg 22lbs
Working Temperature	-35°C to +45°C -31 ˚F to 113 ˚F
Storage Temperature	-35°C to +75°C -31 ˚F to 167 ˚F
Humidity Range	≤ 95% (NC)
Enclosure	IP32
Altitude	< 3000m
Communication	RS232, RS485
Certification	FCCPart 15 Class B; CE; RoHS

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:

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

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.

Battery Charging Parameters

Battery	SEALED	GEL	FLOODED	LI (LFP)	USER	Range
High Voltage Disconnect	16 V	16 V	16 V	16 V	16 V	9-17 V
Equalization Voltage	14.6 V	-----	14.8 V	-----	14.6 V	9-17 V
Boost Voltagege	14.4 V	14.2 V	14.6 V	14.4 V	14.4 V	9-17 V
Float Voltage	13.8 V	13.8 V	13.8 V	-----	13.8 V	9-17 V
Boost Return Voltage	13.2 V	13.2 V	13.2 V	13.2 V	13.2 V	9-17 V
Low Voltage Reconnect	12.6 V	12.6 V	12.6 V	12.6 V	12.6 V	9-17 V
Under Voltage Warning	12.0 V	12.0 V	12.0 V	12.0 V	12.0 V	9-17 V
Low Voltage Warning	11.1 V	11.1 V	11.1 V	11.1 V	-----	9-17 V
Discharging Limit Voltage	10.6 V	10.6 V	10.6 V	10.6 V	-----	9-17 V
Over-Discharge Delay Time	5 s	5 s	5 s	5 s	-----	1-30 s
Equalization Duration	2 hours	-----	2 hours	-----	-----	0-10 Hrs.
Equalization Interval	30 Days	-----	30 Days	-----	-----	0-250 Days
Boost Duration	2 hours	2 hours	2 hours	-----	-----	1-10 Hrs.

***Only charging parameters in USER mode and LI mode can be programmed.**

*****The above parameters are based on 12V system settings. Parameters are multiplied by 2 for 24V systems, multiplied by 3 for 36V systems, and multiplied by 4 for 48V systems.**

******For Equalization Interval setting under USER mode, 0 Day refers to close equalization function.**

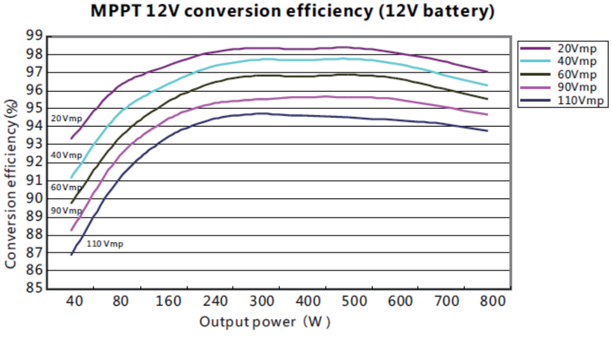
When selecting User, the battery type is to be self-customized, and in this case, the default system voltage parameters are consistent with those of the sealed lead-acid battery. When modifying battery charging and discharging parameters, the following rule must be followed:

- High Voltage Disconnect>Equalizing Voltage ≥ Boost Voltage ≥ Float Voltage > Boost Return Voltage;
- Low Voltage Reconnect>Under Voltage Warning≥ Low Voltage Warning ≥ Discharging Limit Voltage;

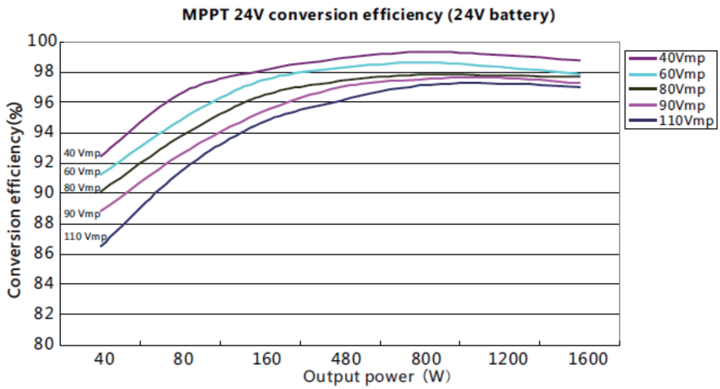
PV Power – Conversion Efficiency Curves

Illumination Intensity: 1000W/ m² **Temp 25°C**

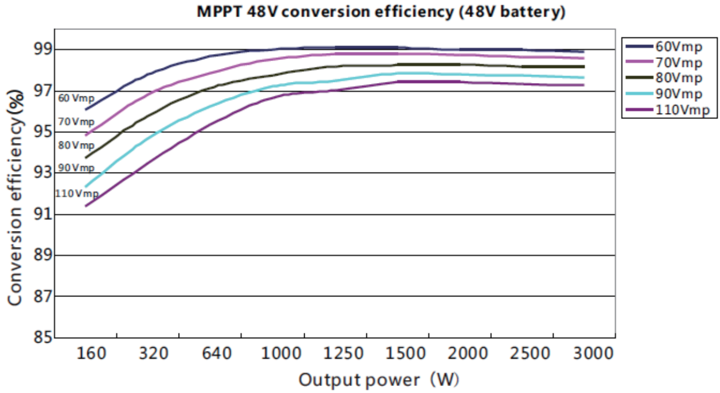
1. 12 Volt System Conversion Efficiency



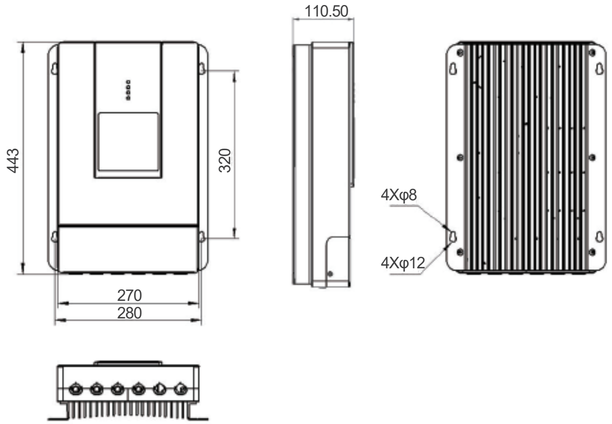
2. 24 Volt System Conversion Efficiency



3. 48 Volt System Conversion Efficiency



Dimensions



NOTE Dimensions in millimeters (mm)

RENOGY

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