

# INVERTER CHARGER

48V Pure Sine Wave Inverter & Charger

**5000W**



Version 1.0





# Important Safety Instructions



**Please save these instructions.**

This manual contains all safety, installation and operating instructions for the Inverter Charger. The following symbols are used throughout the manual:



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



Indicates a critical procedure for safe and proper operation of the inverter.



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

## ■ General Safety Information

- Installation and wiring must comply with the Local and National Electric Codes (NEC) and must be done by a certified technician.
- Read all of the instructions and cautions in the manual before beginning the installation.
- There are no serviceable parts for this inverter. Do NOT disassemble or attempt to repair the inverter.
- Make sure all connections going into and from the inverter are tight. There may be sparks when making connections, therefore, make sure there are not flammable materials or gases near installation.
- DO NOT attempt to touch the unit while it is operating as temperatures will be very hot. In addition, do not open the terminal cover while the unit is in operation.
- Installing breakers or fuses outside of the unit is recommended.
- After installation, check that all line connections are tight and secured.
- DO NOT parallel this device with other AC input sources to avoid damage.

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## ■ Battery Safety

- Do NOT let the positive (+) and negative (-) terminals of the battery touch each other.
- Use Lithium batteries or deep cycle Sealed Lead Acid, Flooded, Gel, AGM batteries.
- Explosive battery gases may be present while charging. Be certain there is enough ventilation to release the gases.
- Be careful when working with large lead acid batteries. Wear eye protection and have fresh water available in case there is contact with the battery acid.
- Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high of an equalizing charge or too long of one may cause damage. Please carefully review the specific requirements of the battery used in the system.

## ■ Installation Safety

- The unit should be installed in a well-ventilated, cool, and dry environment. Make sure the fans of the unit and the ventilation holes are not blocked.
- Do not expose the unit to rain, moisture, snow, or liquids of any type.

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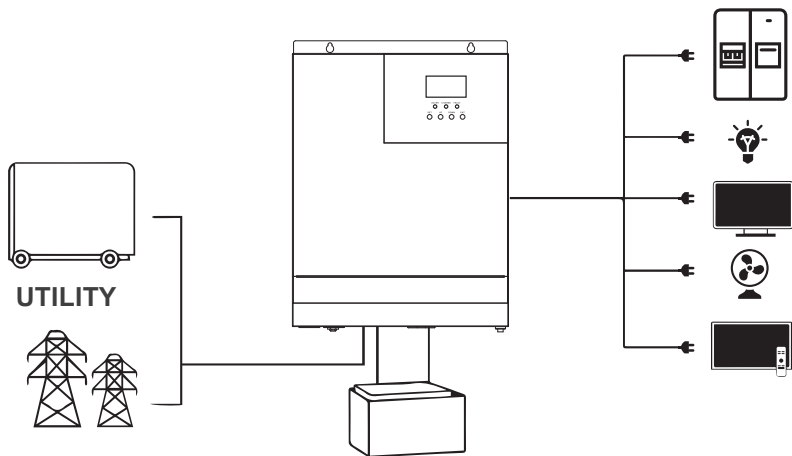
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## General Information

The new all-in-one Renogy Inverter Charger is an advanced hybrid system combining the advanced charging algorithm with industrial reliability and electrical energy of pure sine wave inverters to give you a complete power system. The AC-DC charging module adopts an advanced control algorithm resulting in a powerful battery charger. The DC-AC inverter module is based on an all-digital intelligent design, using advanced SPWM technology to output pure sine wave converting direct current into alternating current, suitable for ac loads such as household appliances, power tools, and industrial equipment. The product adopts a segment LCD display design, which displays the operating data and operating status of the system. Lastly, the inverter charger has comprehensive electronic protections to ensure that the entire system is more secure and stable.

### ■ Key Features

- Powerful bypass function with uninterrupted power supply function.
- Dynamic LCD display and intelligent LEDs providing important system information
- Manual ON/OFF switch controlling AC output
- Power saving mode function, reduce empty load loss.
- Adjustable fan, efficient heat dissipation, extending the life of the system.
- Supports lead-acid battery and lithium battery types
- Complete electronic protection including: short-circuit protection, over-voltage protection, overload protection and more!
- Wired remote control for turning your system on/off from a distance.



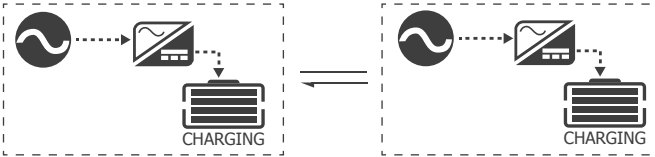
## 48V Battery Storage

**Power or generator (Utility):** Access at the AC input can power the load and charge the battery. If you do not have a power supply or generator, the system can also operate normally, where the load is supplied by batteries.

**Battery:** The role of the battery is to ensure the normal use of electricity for the system load.

**Household load:** Can be accessed to a variety of household and office loads, including refrigerators, lamps, televisions, fans, air conditioning and other AC loads.

## ■ Battery Charging Modes:

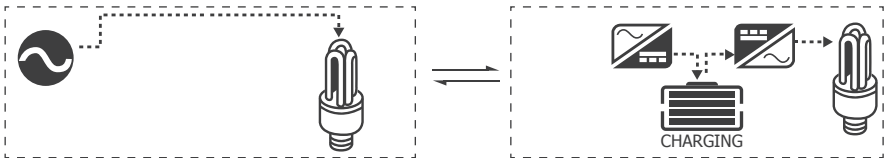


## ■ Load Output Working Modes

The inverter has 2 working modes that dictate how the incoming power is used to power the loads. Users may configure the output source priority to configure load power.

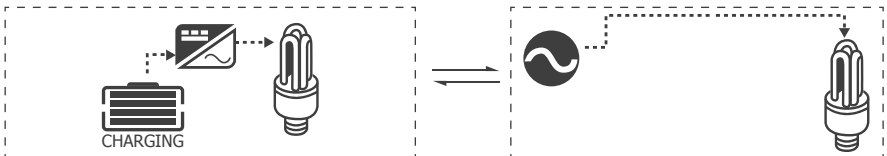
### Utility Priority

Equivalent to a backup UPS for use in unstable areas of the grid, Utility will provide power to the loads as priority. Battery energy will provide power to the loads only when utility power is not available.



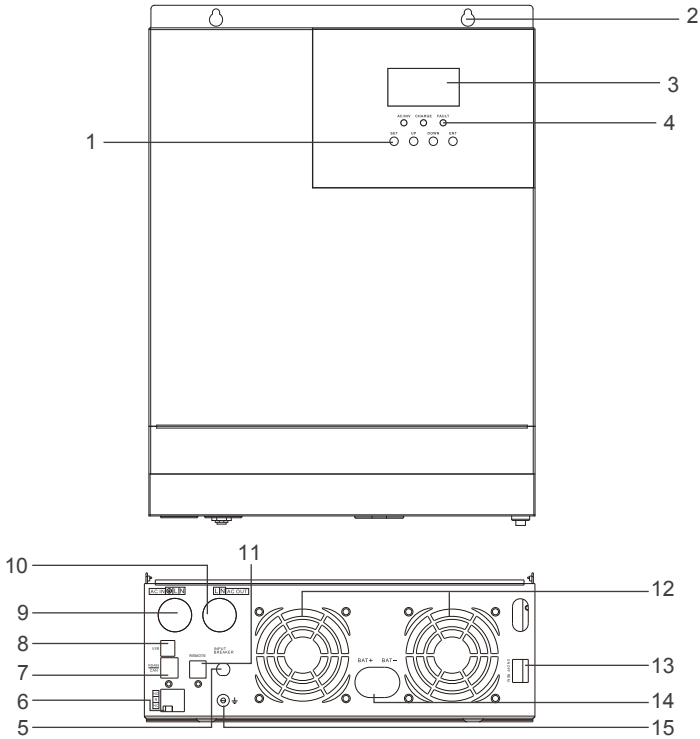
### Inverter Mode

The Battery energy will supply power to the loads. Utility provides power to the loads only when battery voltage drops to low voltage which maximizes the use of DC power.



# Product Overview

## Identification of Parts

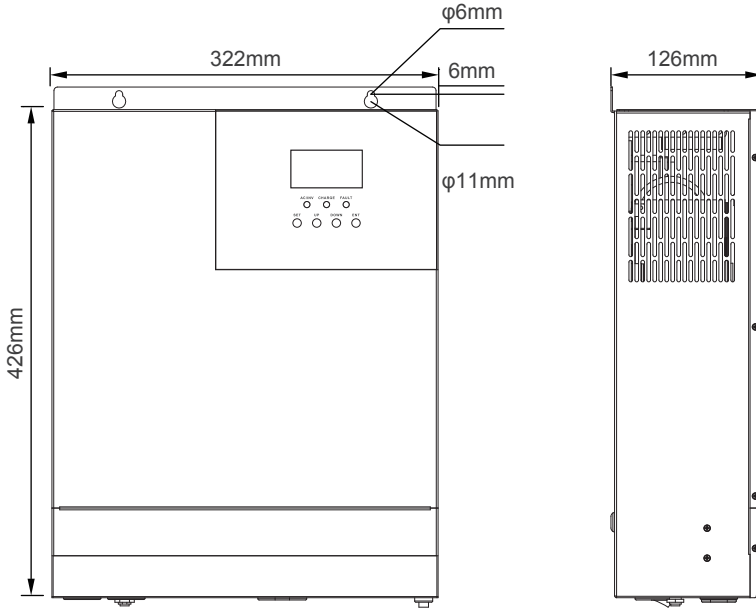


## Key Parts

- |                                 |                                      |
|---------------------------------|--------------------------------------|
| 1. LCD Buttons                  | 6. USB Debugging Port (Internal Use) |
| 2. Mounting Holes               | 9. AC Input Terminal                 |
| 3. LCD Screen                   | 10. AC Output Terminal               |
| 4. LED Indicators               | 11. Wired Remote Port                |
| 5. AC Input Breaker             | 12. Cooling Fans                     |
| 6. Dry Contact Port             | 13. Main On/Off Power Switch         |
| 7. RS485/CAN Communication Port | 14. Battery Input Terminal           |
|                                 | 15. Grounding Lug                    |



## Dimensions



## Optional Components



### **Renogy BT-2 Bluetooth Module:**

The BT-2 Bluetooth module is a great addition to any Renogy charge controllers with a RS485 port and is used to pair charge controllers with the DC HOME App. After pairing is done you can monitor your system and change parameters directly from your cell phone. 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.



### **Wired Remote Control:**

The remote for the solar inverter gives users the opportunity to power on/off from a distance. Giving you approximately 16.4ft of distance, simply connect the cable to the remote port on the unit. Make sure both the solar inverter and the wired remote are both in the off position. Then you will be able to turn on the solar charger via remote power switch.

**Note:** Make sure the solar inverter main switch is OFF to use the remote correctly

# Installation

Please read this manual carefully and familiarize yourself with the installation procedures before installation.

## **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 inverter.

## **NOTE**

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

## ■ Location Recommendations

### **WARNING**

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

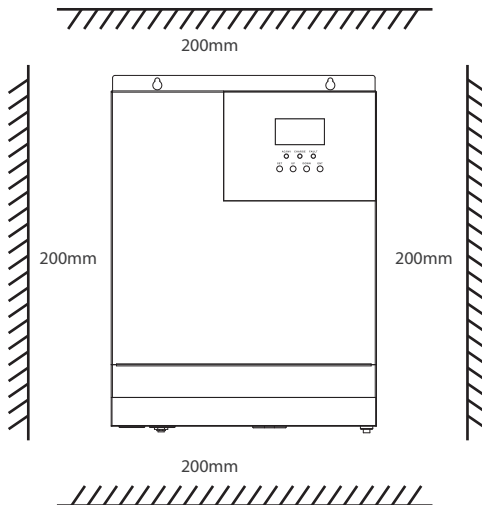
### Ensure installation follows the following guidelines:

1. **Cool, dry, well-ventilated area** — Heat is the worst enemy for electronic equipment. Inverters must be in an area where the fans are not blocked or where they are not exposed directly to the sun. They should be in an area free of any kind of moisture and allow for clearance of at least 8" around the unit to provide adequate ventilation.
2. **Protection against fire hazard** — the unit should be away from any flammable material, liquids, or any other combustible material. The unit can spark and the consequences could be severe.
3. **Close proximity to battery bank**—prevent excessive voltage drop by keeping the unit close to the battery bank and having a properly sized wire going from the battery bank to the inverter.
4. **WARNING** **Do not install the inverter in the same compartment as the battery bank because it could serve as a potential fire hazard.**
5. **Limiting electromagnetic interference (EMI)** — ensure the inverter is firmly grounded to a building, vehicle, or earth grounded. Keep the inverter away from EMI receptors such as TVs, radios, and other audio/visual electronics to prevent damage/interference to the equipment.

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### Other Precautions:

- When installing the battery, be very careful, when installing lead-acid liquid batteries, you should wear protective glasses, once in contact with battery acid, please wash with water in time.
- Avoid placing metal objects near the battery to prevent short circuits in the battery.
- Acid gas may be generated when the battery is charged so ensure good ventilation around the environment.
- Incorrect or improper connection points and corroded wires can cause great heat to melt the wire insulation, burning surrounding materials, and even cause fire, so ensure that the connection is tightened
- It is best to avoid mobile applications when the wire shakes and cause the connection head loose.
- Outdoor installation should avoid direct sunlight and rain, snow.
- Do not install the inverter in harsh environments such as damp, greasy, flammable and explosive areas or where dust accumulation is high.
- The municipal electrical input and AC output are high voltage, do not touch the wiring.
- Do not touch the unit when the fan is working.
- To avoid damage, do not use more than one (in parallel) input AC power supply.



**Please Note:** While the inverter has fans for cooling, this installation location optimal for natural convection cooling will improve the overall efficiency .

## ■ Wiring

### WARNING

The Renogy Inverter is suitable for 48V battery banks systems ONLY. Not following the minimum DC requirement may cause irreversible damage to the unit.

### CAUTION

Be careful of the positive and negative poles. Reversing the poles may cause permanent damage to the inverter.

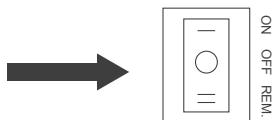
### NOTE

The input terminals of the inverters have large capacitors connected to them. Once a positive and negative wire are connected to the terminals, it will complete the circuit, and commence drawing a heavy current momentarily. As a result, there may be a sparking occurring even if the inverter is in the off position. To minimize sparking, it is recommended that the user have the appropriate size wire feeding into the inverters and/or install an external fuse leading into the inverter.

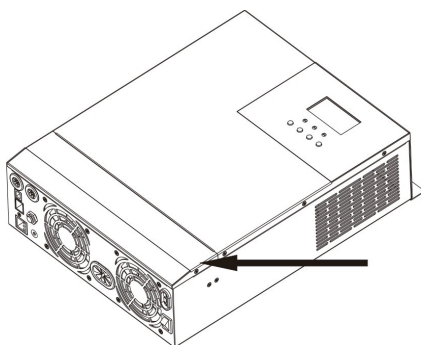
### CAUTION

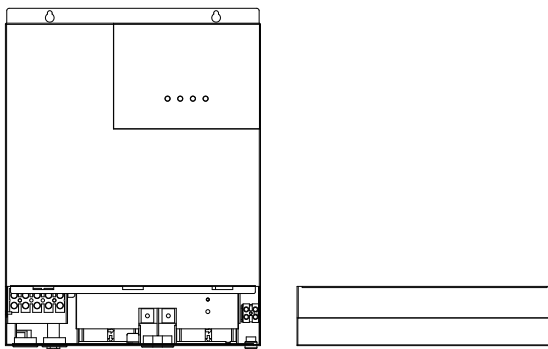
After the power switch is switched off, there is still high energy inside the inverter, do not open or touch the internal device, wait for the capacitance to be put off after the relevant operation.

Locate the power button on the inverter and make sure the inverter main power is turned off



Remove the terminal cover by unscrewing the appropriate terminals located on the face of the inverter





Wiring and installation methods must comply with national and local electrical specifications. The following chart is reference only. Longer wire runs between the inverter and battery bank will require thicker wiring size to minimize loss and improve system performance.

Specification	Minimum Recommended Wiring AWG	Max Amps
Battery Wiring	2AWG	120A
AC Input Wiring	8AWG	40A, Max Bypass
AC Output Wiring	8AWG	30A Continuous 40A, Max Bypass

## ■ Battery Wiring

### CAUTION

Be careful of the positive and negative poles. Reversing the poles may cause permanent damage to the inverter.

### NOTE

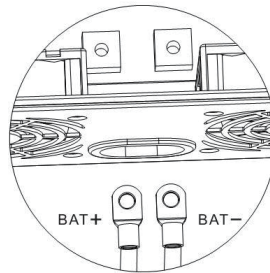
The input terminals of the inverters have large capacitors connected to them. Once a positive and negative wire are connected to the terminals, it will complete the circuit, and commence drawing a heavy current momentarily. As a result, there may be a sparking occurring even if the inverter is in the off position. To minimize sparking, it is recommended that the user have the appropriate size wire feeding into the inverters and/or install an external fuse leading into the inverter.

Rated Battery Discharge Current	Maximum Battery Charging Current	Recommended Wiring	Recommended Circuit Breaker	Recommended Ring Terminal
120A	60A	2AWG	2 pole, 150-160A	5/16"

### NOTE

Make sure any circuit breakers are disconnected and ensure the unit is in the off position.

The inverter takes a 48V battery input to operate. This will require combining 12V or 6V batteries in series to achieve the minimum voltage DC requirement. It is recommended to use battery cables with ring terminals. The ring terminals must be firmly tightened and secured on the respective battery terminals to prevent any excessive heating or resistance. Connect the positive and negative battery ring terminals to the respective positive and negative battery terminals on the inverter.



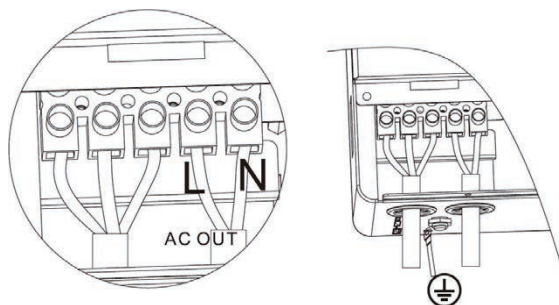
## ■ AC Output Wiring

- NOTE** Only the Live and Neutral wires will be connected to the Output Terminal Block, the Ground will be connected to the screw terminal.
- NOTE** Make sure any circuit breakers are disconnected and ensure the unit is in the off position.
- WARNING** AC Output should NEVER be connected to public power/utility or a generator.
- CAUTION** There are two terminal blocks with "IN" and "OUT" markings. Please do NOT misconnect input and output connectors.

Maximum Inverter Bypass Current	Recommended Wiring	Recommended Circuit Breaker
40A	8AWG	2 pole, 40A

Carefully place the correct AC wire into the respective AC Output terminal block. The ground output cable will need to be connected to the ground screw terminal located separately from the output terminal block. It is recommended to keep ground as close as possible to the inverter charger, the shorter the ground wire, the better. The order should be as follows:

⏏ : Ground | L: Live | N: Neutral



## ■ AC Input Wiring

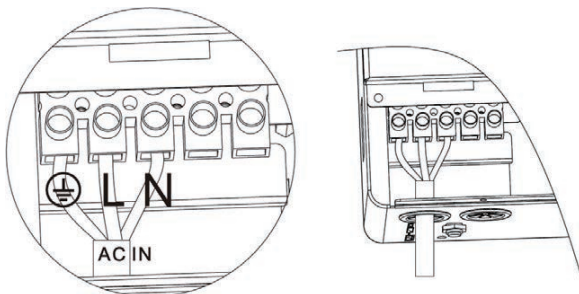
**WARNING** The AC input must never be connected to the AC output as irreversible overload or damage may result

**NOTE** The AC Input Terminal Block is connected to circuit breakers for added protection. Do not modify or alter them as it may cause irreversible damage to the inverter.

**CAUTION** There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

Run the AC input line through the AC input cable entry slot. Make sure to use appropriate cable sizing when working with AC. Carefully place the correct AC wire into the respective AC Input terminal block. The order should be as follows:

⏏ : Ground | L: Live | N: Neutral



# Communication Ports

## Dry Contacts

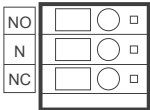
NOTE

To use this to function, an auto start controller must be installed on the generator.

there are three contacts; up to down: NO, N, NC

WARNING

Do not store units with auto gen start feature enabled. Generators exhaust dangerous fumes when running.



This contact automatically starts the generator and charges the battery bank. Under normal conditions, this terminal is NC-N point closed, NO-N point open. When the battery voltage reaches the low voltage point, the relay coil is energized, and NO-N point now is closed and NC-N point now is open.

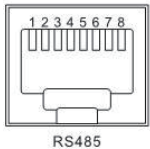
NOTE

the NO-N contact can drive the resistive load of 125VAC/1A, 30DCV/1A

NOTE

While the generator is connected, the unit now operates in "Charging Mode" with the AC power from the Generator charging the batteries as well as providing power to the AC loads.

## RS485/CAN

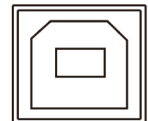


This port will be used for connecting to the BT-2 Accessory for remote monitoring and control.

Pin No.	Parameter
1	5V
2	RS485-A
3	RS485-B
4	GND
5	NC
6	CAN_H
7	NC
8	CAN_L

## USB

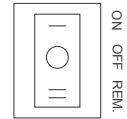
The USB port is for internal purposes only. It will not be supported as it requires proprietary information.





# Operation

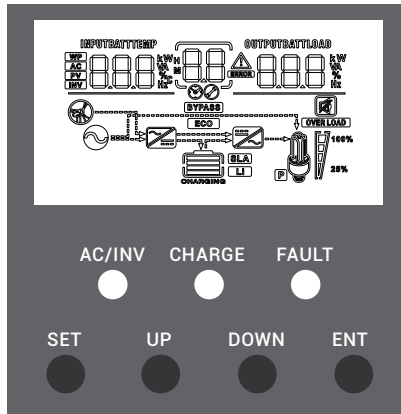
Assuming all connections are correct and tightly secured, Locate the power button on the inverter and turn the main power switch to the ON position.



The following describes the basic operation of the inverter charger

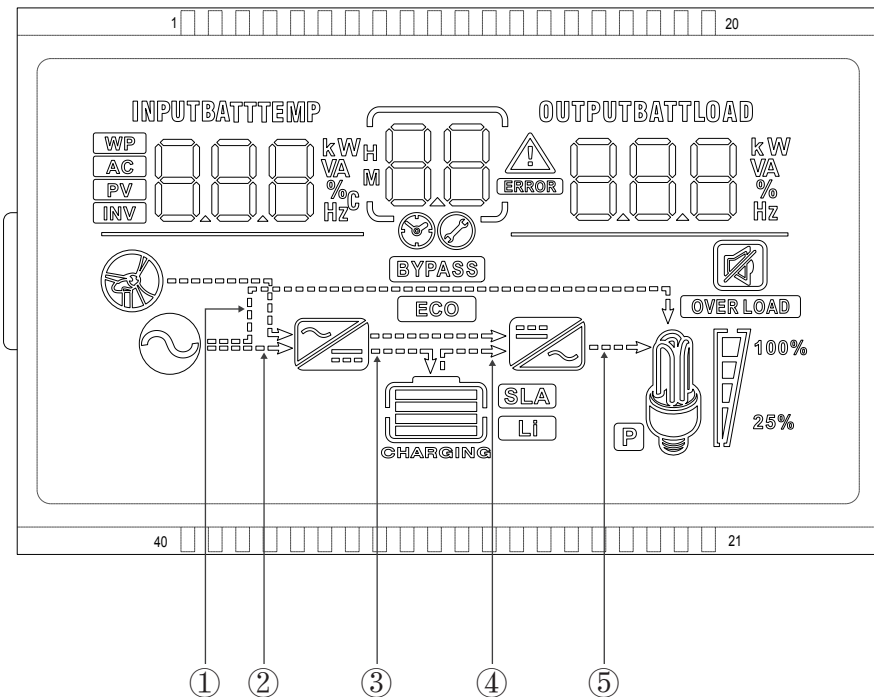
## LCD Operation

The inverter is equipped with 3 LCD indicators and 4 working buttons
























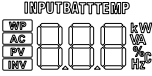
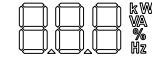
LED	Color	Behavior	Parameter
AC/INV	Yellow	Solid	The output will be powered by the AC Line
		Flashing	The output is powered by battery in battery mode
CHARGE	Green	Flashing	Battery is charging
		Solid	Battery is fully charged
FAULT	Red	Solid / Flash	System fault

Key	Parameter
SET	Go to / Exit Settings menu
UP	Previous selection
DOWN	Next choice
ENT	Under the Settings menu, determine/enter options



1	Indicates that the utility/grid is powering the load	4	Indicates that the battery is powering the inverter circuit (DC-AC)
2	Indicates that the power utility/grid is powering the battery charging circuit (AC-DC)	5	Indicates that the inverter circuit is powering the load
3	The arrow only displays during startup and not part of the inverter functionality		

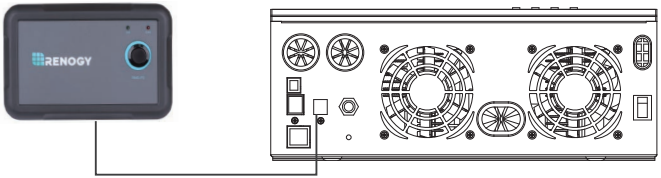
Icon	Function	Icon	Function
	Indicates that the AC input is connected to AC Source		Indicates that the inverter mode circuit is working
	This icon indicates a wide voltage AC input Mode (APL mode)		Indicates that the inverter charger is in the power bypass (Bypass)
	Indicates that the inverter charger is connected to the battery. Status:  0 %~24%,  25%~49%,  50%~74%,  75%~100%		Indicates that the inverter circuit is powered to the load
			Indicates load percentage in 25% increments from the overall wattage of the inverter charger  0 %~24%,  25%~49%,  50%~74%,  ≥75%
	Indicates that the current battery type of the inverter charger is lithium		Indicates that the buzzer is not enabled
	Indicates that the current battery type of the inverter charger is a sealed lead acid		Indicates that an alarm has occurred on the inverter charger
	Indicates that the battery is charging		Indicates that the inverter charger is in a faulty state
	Indicates AC charging circuit is working		Indicates that the inverter charger is in set mode
	AC Load voltage output		When not in setting mode displays alarm or fault code;
		Indicates the solar inverter is operating under ECO power saving mode.	

The following is on the left side of the LCD	
	Indicates AC input
	Indicates inverter circuit
	The icon appears only at startup and is irrelevant to functionality of the inverter
	Shows battery voltage, total battery charge current, charge power, AC input voltage, AC input frequency, internal heatsink temperature, and software version
The following is on the right side of the LCD	
	Indicates output voltage, output current, output power, output visual power, battery discharge current, software version. In this setting mode, the settings under the currently set parameter item code are displayed

## ■ Wired Remote

The wired remote control is an alternative way to power on or off your solar inverter from a distance. To operate:

1. Make sure the push button on the wired remote is not pressed
2. Flip the solar inverter switch to OFF mode
3. Connect the remote wire to the REMOTE port on the solar inverter model
4. To confirm success, press the power button to power on the inverter via remote



### Wired Remote LED

**Note:** The ON LED only reflects the solar inverter being on and will not change according to AC/INV or CHARGE statuses. The ERR LED will be consistent with any faults triggering the FAULT LED on the solar inverter.

LED	Color	Behavior	Meaning
ON	Green	Solid	Powered On
		Flash	Not connected

## ■ LCD Menu

On the LCD home screen, press the "UP" and "DOWN" buttons to turn the page to view the inverter's real-time data.

1	Battery Input Voltage	Fault code	Load Output Voltage
2	Battery Input Current		Battery Output Current
3	Battery Input Kilowatts		Battery Output Kilowatts
4	AC Input Frequency		AC Output Load Frequency
5	AC Input Voltage		AC Output Load Current
6	Internal Parameters		Load Output KVA
7	Inverter Temperature		Inverter Output Load Kilowatts
8	APP Software Version		Bootloader Software Version
9	Model Battery Voltage Rating		Model Output Current Rating

## LCD Programmable Features

Press the "SET" key to enter parameter setting mode. After entering the settings menu, the parameter number 00 flashes and you can press the "UP" and "DOWN" keys to select the parameter code that you want to set. To access the parameter program press "ENT" key to enter the parameter editing state, at which point the value of the parameter flashes. Adjusts the value of the parameter through the "UP" and "DOWN" buttons, and finally press "ENT" to press the key, complete the edit of the parameter, and return to the parameter selection state.

Parameters Number	Parameter Name	Set options	Description
00	Exit	[00] ESC	Exit the settings menu
01	Load Working Mode	[01] UTI (Default)	Utility will provide power to the loads as priority. Battery energy will provide power to the loads only when utility power is not available
		[01] SBU	Battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to low-level set-point in Program 04
02	Output Frequency	[02] 50.0 (Default)	The output frequency can be set through this menu. By default, the value should be 50HZ
		[02] 60.0	
03	AC Input Voltage Range	[03] APL	By default, the input voltage range is the same, 90~280VAC
		[03] UPS (Default)	By default, the input voltage range is the same, 170~280VAC
04	Battery Power to Utility Setpoint	44.0 (Default)	Setting voltage point back to utility source when selecting "UTI" in program 01. When the voltage of the battery is lower than this setting, the output switches from inverting to the utility. The setting range is from 44V to 52V
05	Utility to Battery Power setpoint	[05] 58.8V (Default)	Setting voltage point back to battery mode when selecting "SBU" in program 01. When the battery voltage is higher than the setting value, the output is switched from the utility to the battery mode. The setting range is 48V - 58.8V, in 0.4V increments. *Cannot be higher than [14]

Parameters Number	Parameter Name	Set options	Description
08	Battery type	[08] USE	User-defined, all battery parameters can be set
		[08] SLd (Default)	Sealed lead-acid battery, constant voltage charging 58.4V, floating charging voltage 55.2V
		[08] FLd	Flooded lead-acid battery, constant voltage charging 58.4V, floating charging voltage 55.2V
		[08] GEL	Gel lead-acid battery, constant voltage charging 56.8V, floating charging voltage 55.2V
		[08] LF14 LF15 LF16	<p>Lithium iron phosphate corresponding to 14 strings, 15 strings and 16 strings</p> <p>16 strings default constant voltage charging voltage 57.6V</p> <p>15 strings default constant voltage charging voltage 54V</p> <p>14 strings The constant voltage charging voltage is 50.4V, which can be adjusted</p>
		[08] n14 n13	<p>Lithium-ion battery corresponding to 13 strings and 14 strings</p> <p>Default constant voltage charging voltage</p> <p>13 strings: 53.2V 14 strings: 57.2V</p>

Parameters Number	Parameter Name	Set options	Description
09 *available in USER and lithium setting only	Boost Charge Voltage	[09] 58.4V (Default)	Changes the charging voltage setting, set the range 48V to 58.4V, in 0.4V increments
10 *available in USER and lithium setting only	Boost Charge Duration	[10] 120 min (Default)	Raise the charging maximum time setting, refers to the constant voltage charging reached at Program 09 . The range is 5min to 900min, in 5 minute increments
11 *available in USER and lithium setting only	Float Charge Voltage	[11] 55.2V (Default)	Floating charging voltage set range 48V to 58.4V, in 0.4V increments
12 *available in USER and lithium setting only	Low Voltage Load Disconnect	[12] 42V (Default)	It is recommended to set this voltage below the maximum voltage the battery can withstand. When this voltage is reached, the loads will be powered off after a time delay adjustable in Program 13 The range is 38V to 50V, in 0.4V increments
13 *available in USER and lithium setting only	Battery Over-discharged Delay Time  *If a power shortage occurs and recovers in a short time, it can cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer if heavy load appliances are equipped with time-delay function before installation	[13] 5S (Default)	The following parameter sets the delay-time after the battery voltage is below the set-point in Program 12. The set range is 5-50 seconds, in 5s increments



Parameters Number	Parameter Name	Set options	Description
14 *available in USER and lithium setting only	Battery Undervoltage Alarm	[14] 44V (Default)	Warning that the battery is approaching low voltage. The output does not shut down and the range is 40V to 52V, in 0.4V increments
15 *available in USER and lithium setting only	Battery Discharge Limit Voltage	[15] 40V (Default)	When the battery voltage goes below this voltage set-point, the inverter will immediately disconnect and shut down immediately. The set range is 36V to 50V, in 0.4V increments
16	Set Equalization charging	[16] DIS	No equalization charging
		[16] ENA (Default)	Enables equalization charging,
17	Battery Equalization Voltage	[17] 59.2V (Default)	Set equalization charging voltage. The range is 48V to 59.2V, in 0.4V increments
18	Battery Equalization Duration	[18] 120 (Default)	Setting range is from 5min to 900 min. , in 5min increments.
19	Battery Equalization Time-Delay	[19] 240 (Default)	Setting range is from 5min to 900 min, in 5min increments.
20	Equalization interval	[20] 30 days (Default)	Setting range is from 0 days to 30 days, in 1 day increments.
21	Enable Equalization Immediately	[21] DIS (Default)	Stops equalization charging immediately
		[21] ENA	Starts Equalization charging immediately
22	Power-saving Mode (ECO Mode)	[22] DIS (Default)	Disables power-saving mode
		[22] ENA	After a 5min delay from setting, the inverter will enter a power saving mode and detect the load size. Loads greater than or equal to 50W, will be powered by the inverter. Otherwise, it will automatically stay in a low detecting mode and not power any loads under 50W

Parameters Number	Parameter Name	Set options	Description
23	Overload auto-start	[23] DIS	Overload automatic restart is disabled, and the unit will not turn on the loads
		[23] ENA (Default)	Enables automatic restart if the load shutdown output has occurred. The unit attempts to restart the output after 3 minutes and After 5 attempts the unit will not longer resume to turn on the loads
24	Overtemperature auto-start	[24] DIS	Over-temperature automatic re-start is disabled
		[24] ENA (Default)	The over-temperature protection is activated and upon temperature dropping, the unit automatically restarts
25	Buzzer alarm	[25] DIS	No alarm
		[25] ENA (Default)	Enable alarm
26	Alarm	[26] DIS	No alarm prompts when the status of the primary input source changes
		[26] ENA (Default)	Enable alarm prompts when the status of the primary input source changes
27	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	[27] DIS	When disabled, the unit will not transfer to Utility mode
		[27] ENA (Default)	When enabled, the unit will transfer to Utility mode if overload occurs in battery mode.
28	Maximum AC Charging Current	[28] 60A (Default)	The range can be configured between 0-60A
29	Split Phase	[29] DIS (Default)	Supply for industrial frequency transformer (disabled)
		[29] ENA	Supply for industrial frequency transformer (enabled)

Parameters Number	Parameter Name	Set options	Description
35	Low Voltage Disconnect Recover	[35] 50.4V (Default)	Set point that recovers and reconnects the solar inverter from being disconnected in Low Voltage Disconnect. The range is from 44V -58.4V, in 0.4V increments.
36	PV Charging Current	[36] 80A (Default)	Adjustable PV current settings. The range is from 0 – 80A.
37	Battery Charging Boost Return Setpoint	[37] 52V (Default)	When the battery reached at floating status, it will need to be lower than this setpoint before it starts charging. The range is the ( Undervoltage Warning ) ~ ( Floating Voltage – 1.2V ) for the respective battery

## Electronic Protections

Number	Protection	Description
1	Overvoltage Protection	Triggered when AC Input voltage reaches 280V
2	Power Input Under-voltage Protection	When utility input is below 170VAC, charging is stopped and the inverter is in inverter mode
3	Battery Over-voltage Protection	When the battery voltage reaches the overvoltage disconnect point, the utility automatically stop charging the battery, preventing damage from overcharging the battery
4	Battery low-voltage protection	When the battery voltage reaches the low voltage disconnect voltage point, the battery discharge is automatically stopped to prevent excessive discharge of the battery from being damaged
5	Load output short-circuit protection	When a short-circuit fault occurs at the load output, the output AC voltage is immediately turned off and outputs again after 1sec, for 3 more attempts. If they fail, then the unit will need to be manually powered on
6	Over-temperature protection	When the internal temperature of the unit is too high, the it will stop charging and discharging
7	Overload protection	Output again after 3 minutes after overload protection, overload 5 times in a row until the inverter charger is powered back, with A table of technical parameters after reference to the load level and duration of the manual
8	Bypass Protection protection	Prevents battery power mode from inverting when bypass is active
9	Bypass Flow Protection	Built-in AC input overcurrent protection circuit breaker
10	Battery input overcurrent protection	When the battery discharge output current is greater than the maximum and lasts 1 minute, the AC input is loaded
11	Battery input protection	When the battery is reversed or the inverter is shorted inside, the internal battery input fuse of the inverter fuses to prevent battery damage or fire
12	Charge short-circuit protection	The inverter protects and stops when the external battery port is shorted while the AC is charging stop the output current

## Fault Codes

Fault code	Fault name	Description
【01】	BatVoltLow	Battery under-voltage alert
【02】	BatOverCurrSw	Battery discharge current software protection
【03】	BatOpen	Battery not detected
【04】	BatLowEod	Battery undervoltage stopdischarge alarm
【05】	BatOverCurrHw	Battery overcurrent hardware protection
【06】	BatOverVolt	Charge overvoltage protection
【07】	BusOverVoltHw	Bus overvoltage hardware protection
【08】	BusOverVoltSw	Bus overvoltage software protection
【12】	bLineLoss	utility power down
【13】	OverloadBypass	Side-by-side load protection
【14】	OverloadInverter	inverter overload protection
【15】	AcOverCurrHw	Inverted overcurrent hardware protection
【17】	InvShort	Inverter short-circuit protection
【20】	OverTemperInv	inverter over temperature protection
【21】	FanFail	Fan failure
【22】	EEPROM	Memory failure
【23】	ModelNumErr	Model settings are wrong
【26】	RlyShort	Error between AC output and bypass
【29】	BusShrot	internal battery booster fault

Fault	Solutions
Screen not displaying	Make sure the battery is properly connected and charged to be able to recognize the inverter. or click any button on the screen to exit screen sleep mode.
Rechargeable battery overvoltage protection	Measure whether the battery voltage exceeds 60V and disconnect the photovoltaic array from the power-on.
Battery undervoltage protection	Wait until the battery is charged to return to above the low voltage recovery voltage.
Fan failure	Check that the fan is not turning or is blocked by something else.
Over-temperature Protection	When the temperature of the equipment cools to normal charge and discharge control is restored.
Overload Protection	(1) Reduce the use of electrical equipment; (2) restart the inverter charger and load recovery output.
Inverter short-circuit protection	Disconnect or reduce any loads from the unit. Shut down the inverter charger and turn on again to clear the error.
Battery missed alert	Check that the battery is not connected or that the battery side circuit breaker is not closed.

## Maintenance

In order to maintain optimal long-term performance, it is recommended to perform inspections of the following items twice a year.

1. Make sure that the air flow around the inverter is not blocked and remove any dirt or debris from the radiator.
2. Check all terminals to see if there is corrosion, insulation damage, high temperature or combustion / discoloration signs, tighten the terminal screws.

### WARNING

Danger of electric shock! Make sure that all power supplies on inverter disconnected and that all capacitive power is released before checking or operating accordingly!

## Technical Specifications

Model	RIV4850CH2S
<b>Utility/Grid</b>	
Rated input Voltage	220/230Vac
Input voltage range	(90Vac~280Vac) +/-2%
Frequency	50Hz/ 60Hz (auto detect)
Frequency range	47-0.3Hz x 55-0.3Hz (50Hz); 57-0.3Hz x 65-0.3Hz (60Hz);
Overload / Short circuit Protection	Breaker
Efficiency	>95%
Conversion time (Bypass and reverse)	10ms
Reverse Flow Protection	Yes
Max Bypass Current load	40A
<b>Inverter</b>	
Waveform	Pure Sine Wave
Rated Output (VA)	5000
Rated Output (W)	5000
Power factor	1
Output AC Voltage	230Vac
Unstable Input Error	±5%
Output Frequency (Hz)	50Hz ±0.3Hz      60Hz ± 0.3Hz
Efficiency	>90%
Overload protection	(102% < load < 125%)±10% : turn off the output after 5min; (125% < load < 150%)±10% : turn off the output after 10sec; (150% < load)±10% : turn off the output after 5sec;
Peak power	10000VA
Motor Capability	4HP
Output Short-circuit Protection	Breaker
Bypass Breaker Specifications	40A
Rated Battery Voltage	48V (minimum start-up voltage 44V)
Battery voltage range	40.0Vdc~60Vdc ± 0.6Vdc
Power Saving Mode Self-Consumption	< 25W
No Load Self Consumption	48W

Model	RIV4850CH2S
<b>Utility/Grid Charging</b>	
Battery type	Lead Acid or Lithium
Maximum Charging Power (AC)	60A
Unstable Condition Error	± 5Adc
Charging Voltage Range	40-60Vdc
Short-circuit protection	Breakers and fuses
Circuit Breaker Specifications	40A
Overcharge Protection	Yes; Automatically alerts and then turns off charging after 1 minute
<b>General</b>	
Certifications	FCC Part 15 Class B, RoHS
Operating Temperature	5°F ~ 131°F / -15°C ~ 55°C
Storage Temperature	-13°F ~ 140°F / -25°C ~ 60°C
Humidity	5% to 95% (three-layer paint protection)
Noise	≤60dB
Cooling	Fans
IP Grade	IP 20
Safety Class	I
Dimensions (L-W-D)	16.8*12.7*4.9 in / 426*322*124 mm
Weight	19.84lbs / 9.0kg
<b>Wired Remote Control</b>	
Dimensions	2.8*4.3*1.3 in / 70*110*32 mm
Wire Length	16.4 ft / 5m



## Non-Lithium Battery Parameters

Battery type Parameters	SLD/ AGM	GEL	Flooded Lead Acid (FLD)	USER (Default)	Custom Range
Overvoltage Disconnect	60V	60V	60V	60V	N/A
Overvoltage Disconnect Recover	58.2V	58.2V	58.2V	58.2V	N/A
Equalization Voltage[16]	-	-	59.2V	59.2V (adjustable)	48~59.2V
Boost Voltage[9]	58.4V	56.8V	58.4V	58.4V (adjustable)	48~58.4V
Float Voltage[11]	55.2V	55.2V	55.2V	55.2V (adjustable)	48~58.4V
Undervoltage recover	44.8V	44.8V	44.8V	44.8V	N/A
Low Voltage Warning [14]	43.8V	43.8V	43.8V	43.8V (adjustable)	40~52V
Low Voltage Disconnect Recover[35]	50.4V	50.4V	50.4V	50.4V	N/A
Low Voltage Disconnect [12]	42V	42V	42V	42V (adjustable)	38~50V
Discharge Limit Voltage[15]	40V	40V	40V	40V (adjustable)	36~50V
Over-discharge Delay Time[13]	5S	5S	5S	5S (adjustable)	5~50S
Equalization Duration[18]	-	-	120 minutes	120 minutes (adjustable)	5~900 minutes
Equalization Interval[20]	-	-	30 days	30 days (adjustable)	0~30 days
Boost Duration[10]	120 minutes	120 minutes	120 minutes	120 minutes (adjustable)	5~900 minutes

When modifying parameters in User Mode, the following rules must be followed to set parameters successfully.

1. Overvoltage Disconnect > Overvoltage Disconnect Recover ≥ Equalization voltage ≥ Boost voltage ≥ Float voltage
2. Overvoltage Disconnect > Over Voltage Disconnect Recover
3. Low Voltage Disconnect Recover > Low Voltage Disconnect (at least 2V Smaller) < Discharge Limit Voltage
4. Undervoltage Recover > Undervoltage Alarm

### NOTE

If setting the Low Voltage Disconnect in User Mode, it must always be at least 2V lower than the Low Voltage Disconnect Recovery Voltage

## Lithium Battery Parameters

	Lithium Iron Phosphate			Lithium-ion			
Battery type Parameters	(LF16)	(LF15)	(LF14)	(n14)	(n13)	USER (Default)	Custom Range
Overvoltage Disconnect	60V	60V	60V	60V	60V	60V	N/A
Overvoltage Disconnect Recover	58.2V	58.2V	58.2V	58.2V	58.2V	58.2V	N/A
Equalization Voltage[16]	-	-	-	-	-	59.2V (adjustable)	48~59.2V
Boost Voltage[09]	57.6V (adjustable)	54V (adjustable)	50.4V (adjustable)	57.2V (adjustable)	53.2V (adjustable)	58.4V (adjustable)	48~58.4V
Float Voltage[11]	-	-	-	-	-	55.2V (adjustable)	48~58.4V
Under-voltage recover	49.6V	46.4V	43.6V	45.6V	42.4V	44.8V	N/A
Under-voltage Alarm[14]	48.8V (adjustable)	45.6V (adjustable)	42.8V (adjustable)	44.8V (adjustable)	41.6V (adjustable)	44V (adjustable)	40~52V
Low Voltage Disconnect Recover[35]	54V (adjustable)	50.4V (adjustable)	47.2V (adjustable)	48.8V (adjustable)	45.2V (adjustable)	50.4V (adjustable)	N/A
Low Voltage Disconnect [12]	48V (adjustable)	44.8V (adjustable)	42V (adjustable)	42V (adjustable)	38.8V (adjustable)	42V (adjustable)	38~50V
Discharge Limit Voltage[15]	45.6V (adjustable)	42.8V (adjustable)	40V (adjustable)	39.2V (adjustable)	36.4V (adjustable)	40V (adjustable)	36~50V
Over-discharge Delay Time [13]	30s (adjustable)	30s (adjustable)	30s (adjustable)	30s (adjustable)	30s (adjustable)	5s (adjustable)	5~50s
Equalization Duration [18]	-	-	-	-	-	120minutes (adjustable)	5~900 minutes
Equalization Interval [20]	-	-	-	-	-	30days (adjustable)	0~30 days
Boost Duration [10]	Variable until Full	Variable until Full	Variable until Full	Variable until Full	Variable until Full	120Minutes (adjustable)	5~900 minutes

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When modifying parameters in User Mode or Lithium, the following rules must be followed to set parameters successfully.

1. Overvoltage Disconnect > Overvoltage Disconnect Recover  $\geq$  Equalization voltage  $\geq$  Boost voltage  $\geq$  Float voltage
2. Overvoltage Disconnect > Over Voltage Disconnect Recover
3. Low Voltage Disconnect Recover > Low Voltage Disconnect (at least 2V Smaller) < Discharge Limit Voltage
4. Undervoltage Recover > Undervoltage Alarm

**NOTE**

If setting the Low Voltage Disconnect in User Mode, it must always be at least 2V lower than the Low Voltage Disconnect Recovery Voltage

## Charging Parameters Glossary

- **Overvoltage Disconnect**—When and if the charge controller experiences a voltage higher than what is assigned, it will disconnect itself from the circuit; ceasing charge.
- **Overvoltage Recover**-- in the event a charge controller experiences an over-voltage condition set by the previous parameter, then this reconnecting parameter is put into play to direct the controller when it can connect and safely charge again. Typically over-voltage reconnection is achieved when time has passed (ex. The sun setting), or when the over-voltage condition is remedied ultimately reducing the voltage to a user defined charging voltage.
- **Equalization Voltage**-- equalization voltage is a corrective over-charge of the battery. The user should consult their battery manufacturer regarding specific battery equalization capacity. This parameter sets the equalization voltage to set the battery at when it reaches the equalization state.
- **Boost Voltage**-- users should check with their battery manufacturer for proper charging parameters. In this stage, users set the boost voltage where the battery will reach a voltage level and remain there until the battery undergoes an absorption stage.
- **Float Voltage**-- once the charge controller recognizes the set float voltage, it will commence floating. The battery is supposed to be fully charged in his state, and the charge current is reduced to maintain battery stability levels.
- **Undervoltage Recover**-- deals with the loads connected to the system. When batteries are determined to be low due to them approaching low voltage disconnect, then the loads will be shut off to give the batteries time to recover. This parameter sets the controller to shut off the loads until it can reach the low voltage reconnect stage.
- **Undervoltage Alarm**-- this parameter deals with the batteries themselves approaching the under-voltage recovery state. The user should minimize loads before the charge controller approaches a level where it will do this automatically to protect the battery from discharging.
- **Low Voltage Recover**-- parameter allows loads connected to the system will be able to operate (not fully) again.
- **Low-voltage disconnect**-- prevents over-discharge of the batteries by automatically disconnecting any loads. This extends battery life and is the precedent to being in an under-voltage state, recovering from the undervoltage state, and finally reconnecting to normal operational state.





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- **Discharging limit Voltage**-- This parameter ensures that the controller does not exceed the default or assigned parameter before needing to be charged again. This is put into play to optimize and extend the battery life by going with a higher voltage. The lower the discharge limit voltage the more negative effect on battery efficiency.

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.



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