



Solar Charge and Discharge Controller User Manual

Flush Mount Solar Charger
RS-PWM30RV

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Important Safety Instructions

This manual contains all instructions of safety, installation and operation of RS-PWM30RV controller ("the controller" is referred in this manual).

1. Read all the instructions and warnings carefully before installation.
2. No user serviceable component inside controller. DO NOT disassemble or attempt to repair the controller.
3. Avoid direct sunlight, high temperatures and DO NOT install the controller at locations where water can get in.
4. Install the controller at well ventilated places, the controller's heat sink will be very hot during operation.
5. Installing appropriate external fuses/breakers is suggested.
6. Please make sure to switch off all connections of the PV array and the fuse/breakers which close to the battery before the controller installation and adjustment.
7. Power connections must remain tight to avoid excessive heating from the loose connection.

TABLE OF CONTENTS

1. OVERVIEW.....	01
2. APPEARANCE.....	01
3. INSTALLATION AND WIRING	03
4. LCD DISPLAY.....	06
5. PROTECTION.....	08
6. TROUBLESHOOTING.....	08
7. TECHNICAL SPECIFICATIONS.....	09
8. DISCLAIMER.....	11
9. DIMENSIONS	12

1. OVERVIEW

1 / OVERVIEW

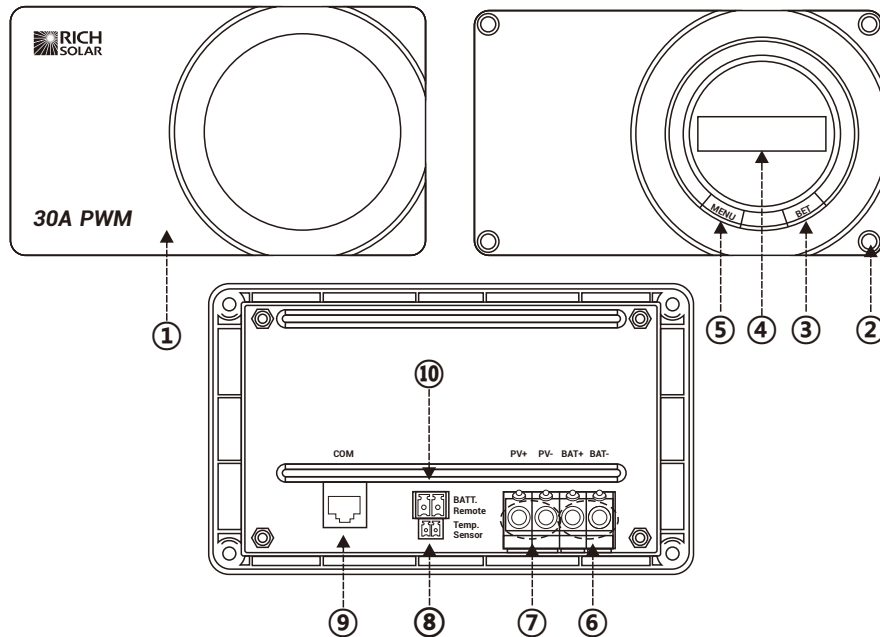
The RS-PWM30RV is a negative-ground, flush mount solar charge controller, designed for an aesthetically clean and integrated look on RV and Vessel, also included surface mount cover to suit personal preference. The RS-PWM30RV adopts highly efficient PWM charging mode, also comes equipped with special LCD display to show the real-time operating status of system. This charge controller is fully controlled automatically, which provide simple usage pattern to users.

Features :

- The appearance design derives from the concept of solar annular light wave, endues the controller with artistic sense
- Flush mount and embedded installation design
- High quality and low failure rate components (ST/IR) to ensure the product life
- 3-Stage intelligent PWM charging: Bulk, Boost/Equalize, Float
- Compatible with lead-acid and lithium batteries^①
- Real-time energy statistics function
- Battery temperature compensation function
- Digital LCD monitor for informative display of operational parameters and fault messages
- Remote voltage and temperature interface design, to collect the accurate battery voltage and temperature
- RS485 communication port with Modbus protocol, and short circuit protection for 5V/200mA power supply
- Multiple peripherals: PC software, APP, Cloud platform software, etc
- Rated charging current at working temperature without de-rating
- Extensive electronic protections
- Monitor and set the parameters via PC software or APP

① The Lead-acid battery of User and Lithium battery can be set via the PC software.

2 / APPEARANCE



2. APPEARANCE

No.	Item	No.	Item
①	Controller case	⑥	Battery terminals
②	Mounting hole sizeφ4.5mm	⑦	PV terminals
③	SET button	⑧	Remote temperature sensor port ⁽¹⁾
④	LCD	⑨	RS485 communication port
⑤	MENU button	⑩	Remote battery voltage sensor port ⁽²⁾

(1) The controller will charge the battery at 25°C as default and no temperature compensation, when the temperature sensor is damaged.

(2) The port can detect accurate battery voltage. One end of the 2P wire connect the 5.08-2P terminal to insert ⑩ port, the other end connect the battery, and make sure the "+" and "-" poles are connected correctly.

-2.1 Accessories (Included)



Temperature Sensor
(Model: RT-MF58R47K3.81A)



5.08-2P terminal

-2.2 Accessories (Optional)

1) Remote Temperature Sensor (Model: RTS300R47K3.81A)



Acquisition of battery temperature for undertaking temperature compensation of control parameters, the standard length of the cable is 3m (length can be customized). The RTS300R47K3.81A connects to the port ⑩ on the controller.

NOTE: The temperature sensor short-circuited or damaged, the controller will be charged or discharged at the default temperature 25 °C.

2) USB to RS485 communication cable (Model: CC-USB-RS485-150U)



USB to RS485 converter is used to monitor each controller using Solar Station PC software. The length of cable is 1.5m. The CC-USB-RS485-150U connects to the RS485 Port on the controller.

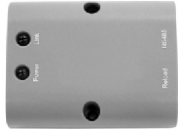
3) RS485 TO WIFI Converter (Model: eBox-WIFI-01)



After the controller is connected with the eBox-WIFI-01 through the standard Ethernet cable (parallel cable), the operating status and related parameters of the controller can be monitored by the mobile APP software through WIFI signals.

3. INSTALLATION AND WIRING

4) RS485 TO BLE Converter (Model: eBox-BLE-01)



After the controller is connected with the eBox-BLE-01 through the standard Ethernet cable (parallel cable), the operating status and related parameters of the controller can be monitored by the mobile APP software through Bluetooth signals.

5) Logger (Model: eLOG01)



After the controller is connected with the eLOG-01 through the RS485 communication cable, it can record the operating data of the controller or monitor the real-time operating status of the controller via PC software.

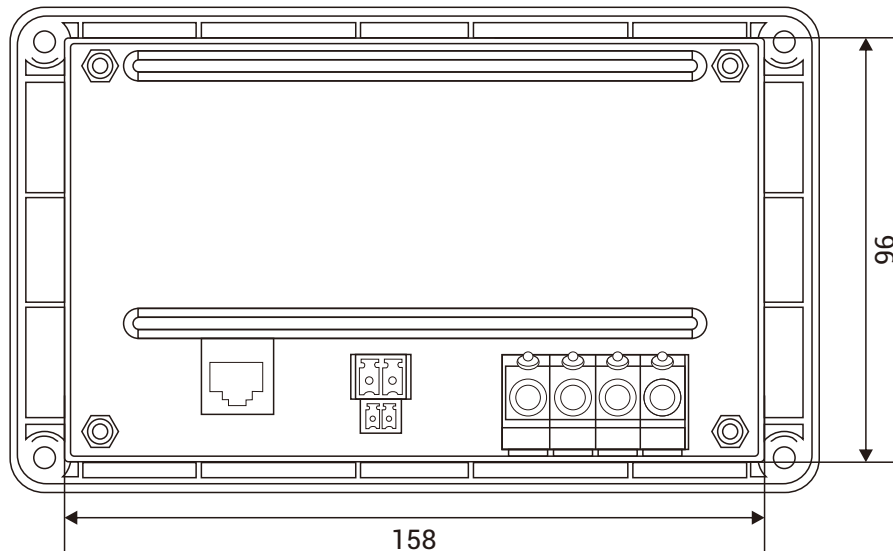
3/ INSTALLATION AND WIRING

-3.1 Install the controller

1) Determine the Installation Location and Heat-dissipation Space

Determination of installation location: The controller shall be installed in a place with sufficient air flow through the radiators of the controller and a minimum clearance of 150 mm from the upper and lower edges of the controller to ensure natural thermal convection.

2) Determine the size of Installation Location (158*96mm)

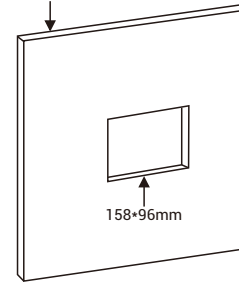


3. INSTALLATION AND WIRING

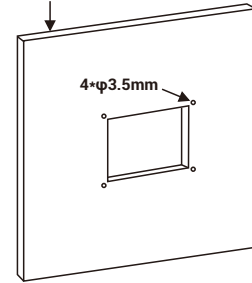
3) Cut out the section (158*96mm)

4) Mark holes and drill holes $\phi 3.5\text{mm} \times 4$

Install the panel

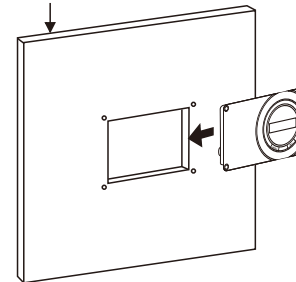


Drill the holes

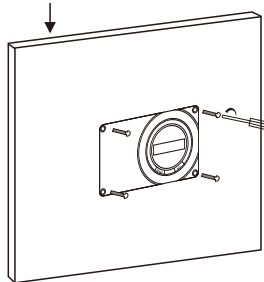


5) Secure the controller

Install the controller

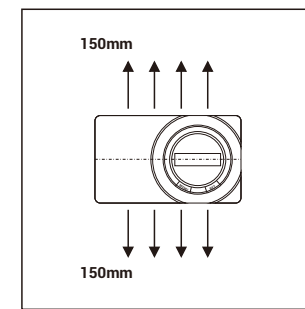
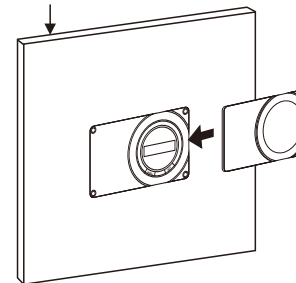


Turn the screw



6) Install the control case

Install the controller case

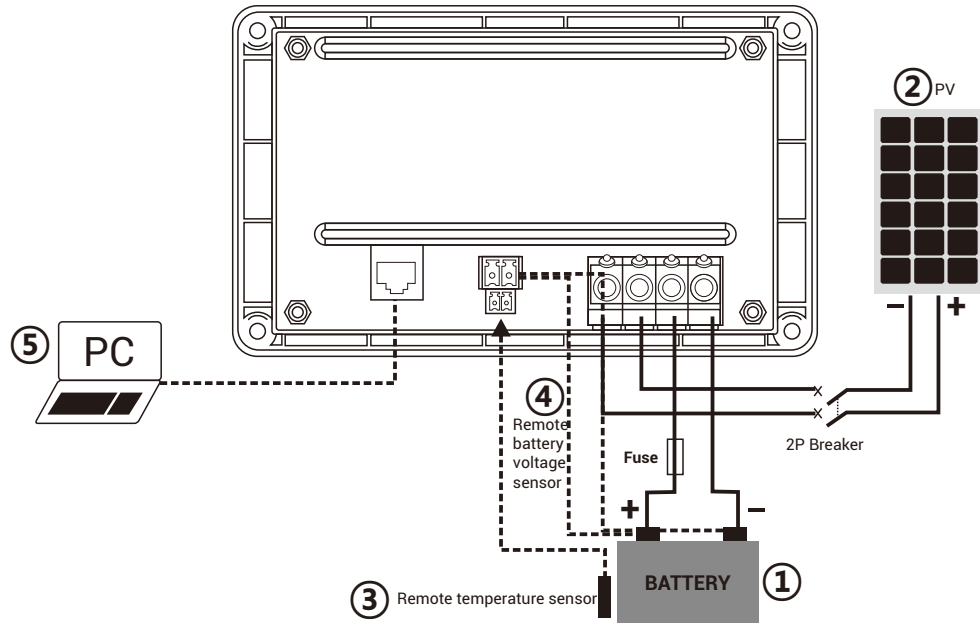


3. INSTALLATION AND WIRING

-3.2 Wiring

Step 1: connect the battery ①

⚠ CAUTION: A fuse which current is 1.25 to 2 times the rated current of the controller must be installed on the battery side with a distance from the battery not greater than 150 mm.



Step 2: Connect the PV ②

⚠ CAUTION: While wiring the controller do not turn on the breaker or fuse and make sure that the leads of "+" and "-" poles are connected correctly.

⚠ CAUTION: If the controller is used in ungoverned or frequent lightning area, must install a reasonable arrester in the PV array input side.

Step3: Connect the Remote temperature sensor cable ③

⚠ NOTE: The controller will charge or discharge the battery at 25°C as default and no temperature compensation, when the temperature sensor is damaged.

Step4: Connect the Remote battery voltage sensor ④

⚠ CAUTION: Make sure that the battery voltage sensor cable of "+" and "-" poles are connected correctly when wiring.

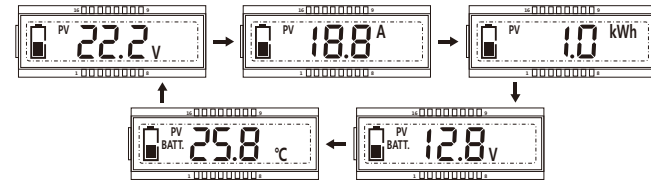
Step5: Connect the PC via the RS485 communication port ⑤

⚠ Refer to the chapter 4 "Remote set battery type".

4. LCD DISPLAY

4/ LCD DISPLAY

1) Automatic cycle interface



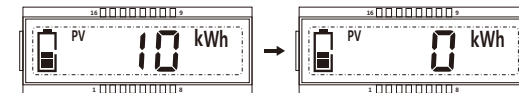
Display: PV voltage/PV current/PV power/Battery voltage/Battery temperature

2) Clear the generated energy

Operation:

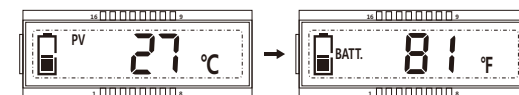
Step 1: Press the "SET" button and hold 5s under the PV power interface and the value is flashing.

Step 2: Press the "SET" button to clear the generated energy.



3) Switch the battery temperature unit

Press the "SET" button and hold 5s under the battery temperature interface.



4) Battery type

★ Battery type

1	Lead-acid battery	Sealed Gel Flooded User ⁽¹⁾
2	Lithium battery ⁽¹⁾	LiFePO ₄ (4S/12V; 8S/24V) Li(NiCoMn)O ₂ (3S/12V; 6S/24V) User

4. LCD DISPLAY

★ Set battery type by LCD⁽¹⁾

Operation:

Step1: Press the "SET" button and hold 5s under the battery voltage interface.

Step2: Press the "MENU" button when the battery type interface is flashing.

Step3: Press the "SET" button to confirm the battery type.



★ Set battery type by PC⁽¹⁾



Download software

<https://www.richsolar.com/pages/downloads>—PC Software for the Solar Charge Controller

(1) Only setting the battery type of Sealed, Gel and Flooded via the LCD, the Lead-acid battery of User and Lithium battery can be set via the PC software.

5) System status icon

Icon	Phenomenon	Instruction
	Solid	System is normal but no charging
	Energy bars is Flashing	Charging
	Solid	Full
	Flashing	Battery overvoltage
	Flashing	Battery under voltage

5. PROTECTION 6. TROUBLESHOOTING

5/ PROTECTION

Protection	Instruction
PV Over current	When the charging current of the PV array exceeds the controller's rated current, it will be charge at the rated current.
PV Over voltage	When the voltage of PV will exceed 50V, the controller will stop charging and restart to charge when the PV voltage is below 45V
PV short circuit	When the PV voltage is below 50V and short circuit, the controller will stop charging; the controller restart to charge when the fault is cleared, it don't damaged the controller.
PV Reverse Polarity	When the polarity of the PV array is reversed, the controller may not be damaged and can continue to operate normally after the polarity is corrected.
Night Reverse Charging	Prevents the battery from discharging to the PV module at night.
Battery Reverse Polarity	Fully protected against battery reverse polarity; no damage will occur to the battery. Correct the miswire to resume normal operation.
Battery Over Voltage	When the battery voltage reaches the over voltage disconnect voltage, it will automatically stop battery charging to prevent battery damage caused by over-charging.
Battery Overheating	The controller can detect the battery temperature through an external temperature sensor. The controller stops working when its temperature exceeds 65 °C and restart to work when its temperature is below 55 °C.
Controller Overheating	The controller is able to detect the temperature inside the battery. The controller stops working when its temperature exceeds 85 °C and restart to work when its temperature is below 75 °C.
TVS High Voltage Transients	The internal circuitry of the controller is designed with Transient Voltage Suppressors (TVS) which can only protect against high-voltage surge pulses with less energy. If the controller is to be used in an area with frequent lightning strikes, it is recommended to install an external surge arrester.

6/ TROUBLESHOOTING

Faults	Possible reasons	Troubleshooting
The PV of LCD display 0 when the sunshine falls on PV modules properly	PV array disconnection	Confirm that PV wire connections are correct and tight
LCD is no display	Min.8V can start up the controller.	Measure battery voltage with multi-meter. Min.8V can start up the controller.
Flashing	Battery over voltage	Disconnect the solar array and measure the battery voltage whether is too high;
Flashing	Battery under Voltage	Waiting for charging the battery

7 / TECHNICAL SPECIFICATIONS

Item	RS-PWM30RV
Nominal system voltage	12/24VDC or Auto ^①
Battery input voltage range	8V~32V
Rated charge current	30A
Max. PV open circuit voltage	50V
Battery Type ^②	Lead-acid battery: Sealed(default)/Gel/Flooded/User Lithium battery: LiFePO4/Li-NiCoMn/User
Self-consumption	≤4.2mA/12V; ≤2.6mA/24V
Temperature compensate coefficient	-3mV/°C/2V(Default) ^③
Charge Circuit Voltage Drop	0.21V

① The system voltage cannot be recognized by using the Lithium battery.

② User of the Lead-acid battery and Lithium battery can be set via the PC software. The default Lithium battery parameters are only recommended. User should set the parameters according to the lithium battery datasheet again. Refer to the table 1 and table 2.

③ The temperature compensate coefficient is "0" by using the Lithium battery.

Environmental Parameters

Storage temperature range	-35°C ~ +70°C
Working environment temperature	-35°C ~ +55°C (100% input and output)
Relative humidity	≤95%, N.C.
Enclosure	Ip30
Grounding	Common negative

Mechanical Parameters

Dimension	178.5×105.5×48.3mm
Mounting dimension	166.5×93.5mm
Mounting hole size	Φ5mm
Terminal	16mm2/6AWG
Recommended cable	10mm2/8AWG
Weight	0.31kg

Lead-acid Battery Voltage Parameters

Parameters are in 12V system at 25°C, ×2 in 24V.

Item	Sealed	Gel	Flooded	User
Over Voltage Disconnect Voltage	16.0 V	16.0 V	16.0 V	9 ~ 17 V
Charging Limit Voltage	15.0 V	15.0 V	15.0 V	9 ~ 17 V
Over Voltage Reconnect Voltage	15.0 V	15.0 V	15.0 V	9 ~ 17 V
Equalize Charging Voltage	14.6 V	—	14.8 V	9 ~ 17 V
Boost Charging Voltage	14.4 V	14.2 V	14.6 V	9 ~ 17 V
Float Charging Voltage	13.8 V	13.8 V	13.8 V	9 ~ 17 V
Boost Reconnect Charging Voltage	13.2 V	13.2 V	13.2 V	9 ~ 17 V
Low Voltage Reconnect Voltage	12.6 V	12.6 V	12.6 V	9 ~ 17 V
Under Voltage Warning Reconnect Voltage	12.2 V	12.2 V	12.2 V	9 ~ 17 V
Under Volt. Warning Volt.	12.0 V	12.0 V	12.0 V	9 ~ 17 V
Low Volt. Disconnect Volt.	11.1 V	11.1 V	11.1 V	9 ~ 17 V
Discharging Limit Voltage	10.6 V	10.6 V	10.6 V	9 ~ 17 V
Equalize Duration	120 min.	—	120 min.	0 ~ 180 min.
Boost Duration	120 min.	120 min.	120 min.	10 ~ 180 min.

Table1

(1) When the battery type is sealed, gel, flooded, the adjusting range of equalize duration is 0 to 180min and boost duration is 10 to 180min.

(2) User should follow the rules as below when modifying the parameters value in user battery type (factory default value is the same as sealed type):

a. Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Reconnect Charging Voltage.

b. Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage

c. Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage.

d. Under Voltage Warning Reconnect Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage.

e. Boost Reconnect Charging voltage > Low Voltage Disconnect Voltage.

8. DISCLAIMER

Lithium Battery Voltage Parameters

Item	LiFePO4(4s)	Li-NiCoMn(3s)	User
Over Voltage Disconnect Voltage	15.6 V	13.5 V	9 ~ 17 V
Charging Limit Voltage	14.6 V	12.6 V	9 ~ 17 V
Over Voltage Reconnect Voltage	14.7 V	12.7 V	9 ~ 17 V
Boost Charging Voltage	14.5 V	12.5 V	9 ~ 17 V
Boost Reconnect Charging Voltage	13.2 V	12.1 V	9 ~ 17 V
Low Voltage Reconnect Voltage	12.8 V	10.5 V	9 ~ 17 V
Under Voltage Warning Reconnect Voltage	12.8 V	12.2 V	9 ~ 17 V
Under Volt. Warning Volt.	12.0 V	10.5 V	9 ~ 17 V
Low Volt. Disconnect Volt.	11.1 V	9.3 V	9 ~ 17 V
Discharging Limit Voltage	10.6 V	9.3 V	9 ~ 17 V

Table 2

NOTE:

- ① The above voltage parameters is default, we suggest user to check the actual parameters of lithium battery if necessary.
- ② Temperature compensate coefficient is 0 for lithium batteries.
- ③ The above parameters should multiply by 2 for 8S LiFePO4 and 6s Li-NiCoMn.

8/ DISCLAIMER

This warranty does not apply under the following conditions:

- Damage from improper use or use in an unsuitable environment.
- PV or load current, voltage or power exceeding the rated value of the controller.
- The controller is working temperature exceeds the range of working temperature.
- User disassemble and attempt to repair the controller without permission.
- The controller is damaged due to natural causes such as lightning.
- The controller is damaged during transportation and shipment.

9. DIMENSIONS

9/ DIMENSIONS

