30A PWM
SOLAR CHARGE CONTROLLER
USER MANUAL



MODEL: RS-PWM30PF-NG 12VOLT 30AMP

THIS MANUAL CONTAINS IMPORTANT SAFETY AND OPERATING INSTRUCTIONS FOR THE SOLAR CHARGE CONTROLLER. PLEASE READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.

02 Congratulations
04 Features and Advantages
05 Installation
07 Wiring Connections
08 Operation - LCD Display
11 Charging Stages
13 LED Indication
15 Specifications
18 APP Quick-Start Guide

Congratulations!

You have made an excellent choice by purchasing this high-quality RICH SOLAR PWM solar controller which has been manufactured to the highest standards of performance, quality and safety.

We want you to be completely satisfied with your purchase, so this solar controller comes with a 2-year warranty.

If you require technical support regarding this product, please call **1-800-831-9889** or email **support@richsolar.com**.

Claims to faulty product within the 2-year warranty period will be repaired or replaced free of charge, provided you present valid proof of purchase (keep your receipt).

Version and Ratings

This is a standard version of RICH SOLAR 12V 30A PWM controller
Rated for 12V solar panel (Max. 30V)
Rated maximum output current of 30A

WARNING

Risk of explosive gases: working in vicinity of a lead-acid battery is dangerous. Explosive gases develop during normal battery operation. Be certain there is enough ventilation to release the gases.
It is important that each time before using or connecting your solar controller, always read this manual and follow the instruction exactly.

- Make sure to connect the red to the positive on the battery and the black to the negative.
- Please double check before connecting. Connecting to the wrong terminals may burn out the controller.
- Confirm that the power wires are tightened to the correct torque to avoid excessive heating from loose connections.
- Refer to the battery specifications and exercise caution to avoid short-circuiting the battery connections.
- Accidental 'shorting' of the terminals or wiring can result in sparks, causing personal injury or a fire hazard. We recommend covering the panel(s) with a soft cloth to block all incoming light during the installation. This will ensure that no damage is caused to the Solar Panel or Battery if the wires are accidentally short circuited.
- Always install a battery fuse on each circuit, including the solar controller.

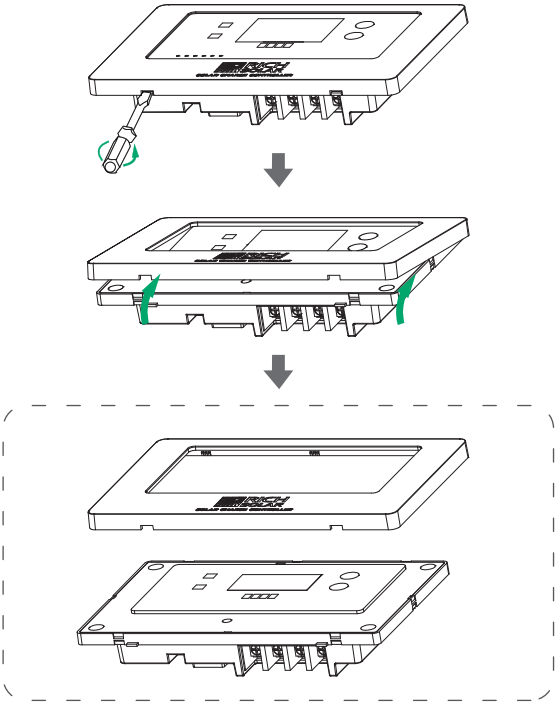
Features and Advantages

- PWM technology, switching control by MOSFET
- Common negative grounding connection
- High efficiency and low power consumption
- Battery type setting and battery condition indication
- Smart charging control
- Charging time management
- LED indication for the battery condition and charging status
- Digital display charging parameters and battery settings
- Manually activates Lithium battery against BMS protection
- Thermal protection
- Over-voltage protection, short-circuit protection, reverse polarity protection
- No sparks
- The thinnest and compact design
- Corrosion-resistant terminals and connectors
- Conformal coating supplied to the inside board against moisture
- Includes a port for external battery temperature sensor (BTS - optional)
- Compatible with most rechargeable lead-acid batteries, including Flooded (WET), AGM, GEL, Calcium and Lithium batteries
- Designed to meet UL 1741 and comply with CE, FCC, and RoHS requirements

Installation

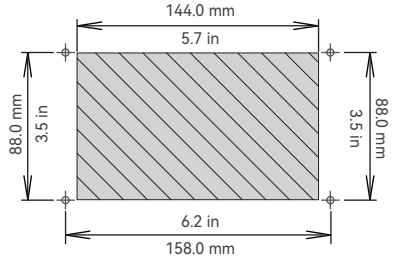
Surface Mount

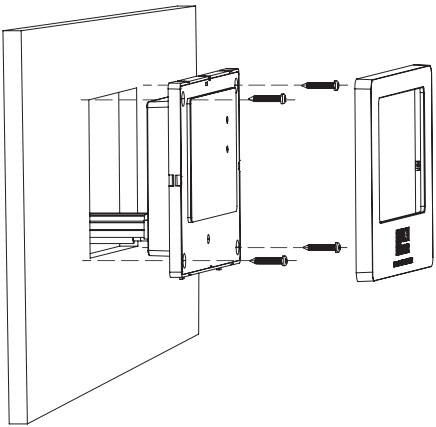
The quickest and easiest way to mount the unit is to remove the front cover and tap screws supplied to secure it to a flat surface.



Flush Mount

Before using this mounting method, make sure there is sufficient depth behind the controller or in the cavity (refer to diagram below).

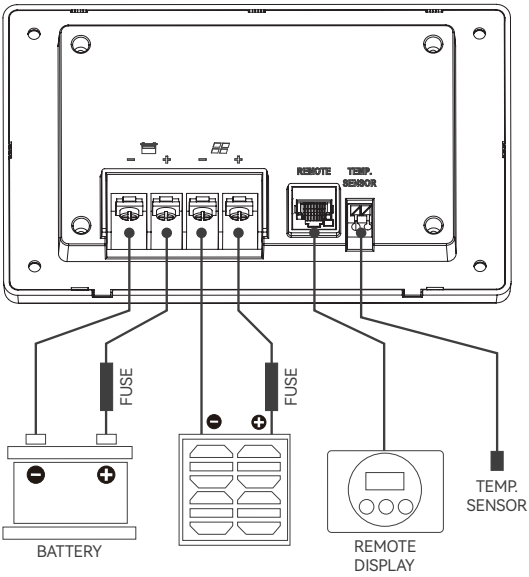




Wiring Connections

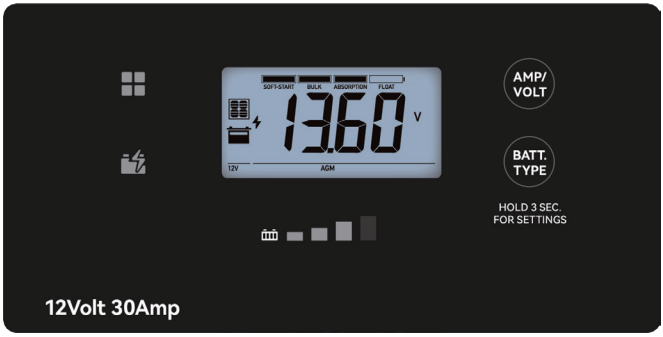
The Solar Controller has 4 terminals which are clearly marked ‘Solar’ and ‘Battery’.
Refer to the wiring diagram below, please cover the solar panel before connecting cables.

When the connections are completed, the Solar Controller will start working automatically.



Operation - LCD Display

Please check your battery manufacturer's specifications to select correct battery type. The unit provides 8+1 battery types for selections: LCO, LTO, LFP, Crystal (Lead crystal), GEL, AGM, WET (Conventional flooded lead-acid) and Calcium battery plus Custom setting via App.



Press and hold the **BATT. TYPE button** for 3 seconds to enter battery type selection mode. The selected battery type will be shown on the LCD meter. The default setting is LFP Battery, and the controller will automatically memorize your selection.

$LiFePO_4$ battery shown on the LCD indicates Lithium Iron Phosphate (LFP) battery.
LTO battery shown on the LCD indicates Lithium Titanate Oxide ($Li_4Ti_5O_{12}$) battery.
The LCO battery type setting is only recommended when working with 3-series Lithium Cobalt Oxide ($LiCoO_2$) battery.

Caution: Incorrect battery type setting may damage your battery.

When the controller powers on, the unit will run self-qualify mode and automatically show items below on LCD before going into charging process:



Self-test starts, digital meter segments test



Software version test



Rated voltage and current test

Press **BATT. TYPE button** to navigate your desired battery type as below:

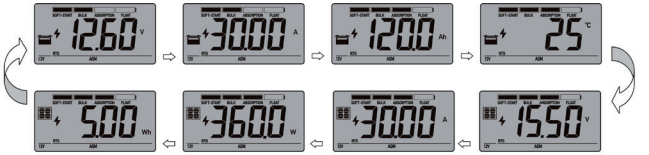


Press the **AMP/VOLT button** again to confirm the selected battery type (it will stay solid). Alternatively, the selection will be automatically confirmed after 3 seconds.

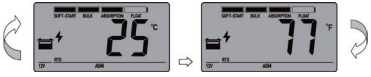
Parameter display for battery or solar side

Once the settings are completed, the solar controller will automatically go into charging process, the LCD displays the parameters of solar input or battery charging acceptance as below:

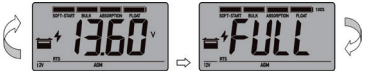
Press **AMP/VOLT button** in sequence, the LCD will display in turn with solar input voltage, current, power, kWh, battery voltage, charging current, charged capacity (Amp-hour) and battery temperature (if external temperature sensor connected).



The users can also read the battery voltage as degree Celsius or degree Fahrenheit by pressing **BATT. TYPE button** for converting.



Alternatively display voltage and FULL when battery is fully charged.

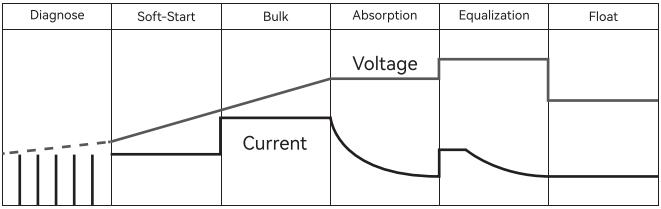


You can also visually monitor your battery charging condition for each battery; there is an LCD bar to show the percentage of charge, you can easily see the battery is charged to 25%, 50%, 75% or 100%, and also roughly match each charging stage of Soft-Start, Bulk, Absorption and Float.



The LCD can also be treated as an independent voltage meter or thermometer at night.

Charging Stages



Diagnose*- Only for Lithium battery type, subjected to the Lithium battery initial voltage then determine if going to Soft-start or Bulk charge; if the Lithium battery is protected by BMS, the controller will automatically send the signal periodically to the battery terminals to activate the BMS against protection.

Soft Start- When batteries suffer an over-discharge, the controller will softly ramp the battery voltage up to 10V.

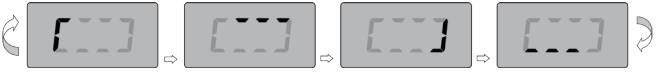
Bulk Charge- Maximum current charging until batteries rise to Absorption level.

Absorption Charge- Constant voltage charging occurs when the battery reaches over 85% capacity. For lead-acid batteries, $LiFePO_4$ batteries, and LTO batteries, full charging will complete after the Absorption stage. The absorption voltage levels are 14.2V for $LiFePO_4$ batteries, 14.0V for LTO batteries, and 12.6V for LCO batteries.

Equalization Charge*- Only for WET or Calcium battery type, when the battery is deeply drained below 11.5V, it will automatically run this stage to bring the internal cells as an equal state and fully complement the loss of capacity. (LCO, Crystal, $LiFePO_4$, LTO, GEL and AGM battery do not run Equalization charge).

Float Charge or Restart Charge* - Battery is fully charged and maintained at a safe level. A fully charged lead-acid battery (Crystal, GEL, AGM, WET or Calcium battery) has a voltage of more than 13.6 Volts; if the lead-acid battery voltage drops to 12.7V at Float mode, it will return to Bulk charge. Lithium battery will stop charge after Absorption stage, it will restart to Bulk charge if the voltage discharge less than 12.0V for LCO battery, 13.0V for LTO battery, and 13.3V for LFP battery.

Remarks:
The solar controller checks the lithium battery initial voltage to determine whether it should go to Soft-start or Bulk charge; if the Lithium battery is protected by BMS due to over-discharged, the solar controller is provided a BMS activation method by manual: Press **AMP / VOLT** button for 3 seconds to wake it up. During the period of the BMS activation by manual, the LED bar will rotate to move in LCD display.



LED Indication

Normal Charge

LED indications						
LED color	GREEN	BLUE	WHITE	WHITE	WHITE	WHITE
Soft-Start	ON	FLASH	FLASH	OFF	OFF	OFF
Bulk charge	ON	ON	ON	FLASH	OFF	OFF
Absorption / Equalization charge	ON	ON	ON	ON	FLASH	OFF
Float charge	ON	OFF	ON	ON	ON	ON

Abnormal Charge

Solar panel abnormal mode	LCD display	LED indication	LCD backlight
Solar panel weak (<15V)		Flash ON	ON
Solar panel reverse connection		Flash ON	Flash
Solar panel over voltage		Flash ON	Flash

Battery abnormal mode	LCD display	LED indication	LCD backlight
Solar panel connected, battery disconnected		Flash	Flash
Battery reverse connection		Flash	Flash
Battery over voltage (> 17V)		Flash Flash Flash Flash	Flash
Battery temperature over 149°F / 65°C		Flash Flash Flash Flash	Flash
Controller over-temperature protection fault		ON	Flash

Specifications

Electrical Parameters	
Rated solar panel current	Max. 30 AMP
Normal PV input voltage	Max. 15-25 VDC
Max. PV input voltage	Max. 30 VDC
Min. operating voltage (solar or battery side)	Min. 8 VDC
Rated charging current	Max. 30 AMP
Max. voltage drop from panel to battery	Max. 0.25 VDC
Standard current consumption at night	Max. 10 mA
Charging Characteristics	
Min. battery start charging voltage	Min. 3 VDC
Soft-start charging voltage range	3-10 ±0.2 VDC
Soft-start charging current	Max. 15 AMP
Bulk charge	Max. 30 AMP
Absorption charging voltage at 77°F / 25℃	
-- LCO battery	12.6 ±0.2 VDC
-- LTO battery	14.0 ±0.2 VDC
-- LFP battery (default setting)	14.2 ±0.2 VDC
-- GEL battery	14.1 ±0.2 VDC
-- AGM battery	14.4 ±0.2 VDC
-- WET battery	14.7 ±0.2 VDC
-- Crystal battery	14.7 ±0.2 VDC

-- Calcium battery	14.9 ±0.2 VDC
-- Custom setting range for Absorption charge	13.2-15.5 ±0.2 VDC
Absorption transits to Equalization or Float/Stop condition:	
-- Charging current drops to	1.5 ±0.1 AMP
-- or Absorption charging timer timed out for lead-acid battery	4 Hour
-- or Absorption charging timer timed out for Lithium battery (CV1+CV2)	4 Hour
Equalization charging activation (Only for WET or Calcium battery)	
-- Battery voltage discharged less than	11.5 ±0.2 VDC
-- Custom setting for automatic equalization charging period	0-100 Day
Equalization charging voltage at 77°F / 25℃	15.5 ±0.2 VDC
Equalization charging timer timed out	2 Hour
Equalization charging voltage range for CUSTOM setting	13.2-16.2 ±0.2 VDC
Custom setting for Equalization time range	5-500min
Float voltage (for Crystal, GEL, WET, AGM and Calcium battery) at 77°F / 25℃	13.6 ±0.2 VDC
-- Custom setting range for Float charge	13.0-14.0 ±0.2 VDC

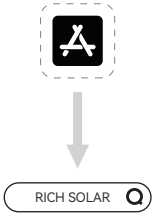
Restart voltage	
-- for Crystal, GEL, WET, AGM and Calcium battery	12.7 ±0.2 VDC
-- for LCO battery	12.0 ±0.2 VDC
-- for LTO battery	13.0 ±0.2 VDC
-- for LFP battery	13.3 ±0.2 VDC
-- Custom setting range for restart voltage	12.5-13.5 ±0.2 VDC
Voltage control accuracy	± 1 %
Battery temperature compensation coefficient	-13.33 mV/°F (-24 mV/°C)
The temperature compensation range for lead-acid batteries	14~122°F / -10~+50°C
Electrical Parts	
Input output terminal	M4 Terminals (Approx. Ø0.16 in / 4 mm)
Physical Parameters	
Controller material	Plastic (PC)
Mounting	Surface or Flush mounting
IP grade	IP22
Net weight	Approx. 0.66 lb (300 g)
Environmental Characteristics	
Operating temperature	-13~122°F / -25~50°C
Storage temperature	-40~185°F / -40~85°C
Operating humidity range	0-85% RH

Remarks: The custom settings are realized by RICH SOLAR App.

APP Quick-Start Guide

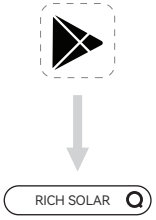
DOWNLOAD THE APP

1. iOS users can search for “RICH SOLAR” in the App Store or scan the QR code below to download the app.



Scan the QR Code

2. Android users can search for “RICH SOLAR” in the Google Play Store or scan the QR code below to download the app.



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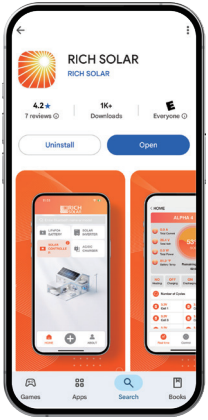

- After installation, open the RICH SOLAR App and allow Bluetooth access when prompted.
- If the app fails to find the device, ensure the device is on and your phone's Bluetooth is enabled. Then reopen the app or restart your phone's Bluetooth and search again.

APP TUTORIAL VIDEO

Scan the QR code to watch the app tutorial video

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V2.0