30A PWM
SOLAR CHARGE CONTROLLER
USER MANUAL



MODEL: RS-PWM30F-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.

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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 PWM controller 12V 30A:
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.

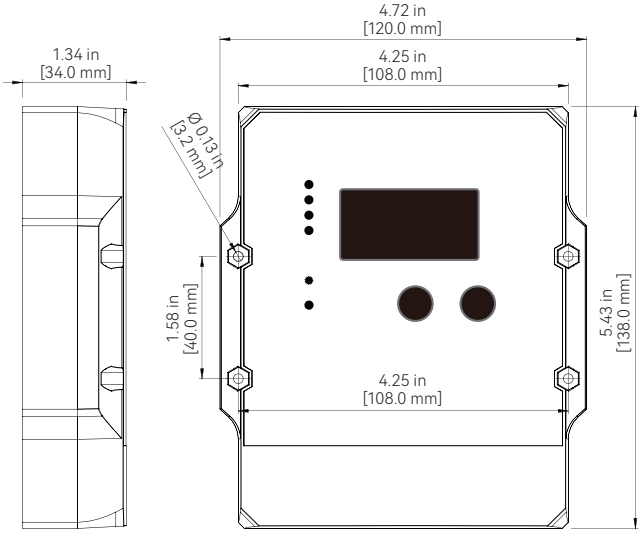
Features and Advantages

- 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
- 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

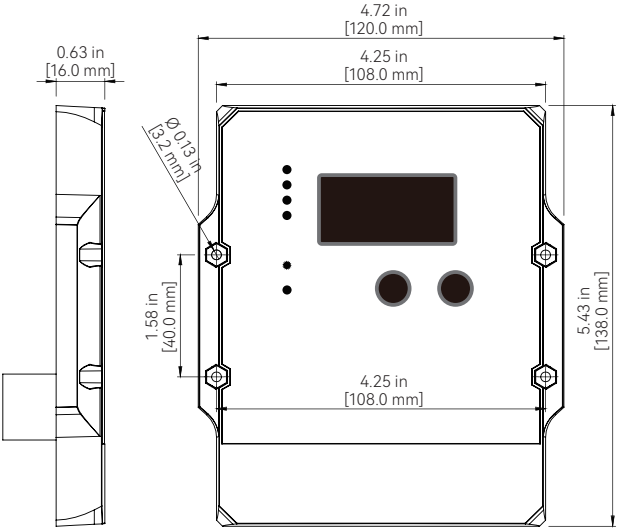
Surface Mount

The quickest and easiest way to mount the unit is to use the four plastic spacers and self-tapping 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).

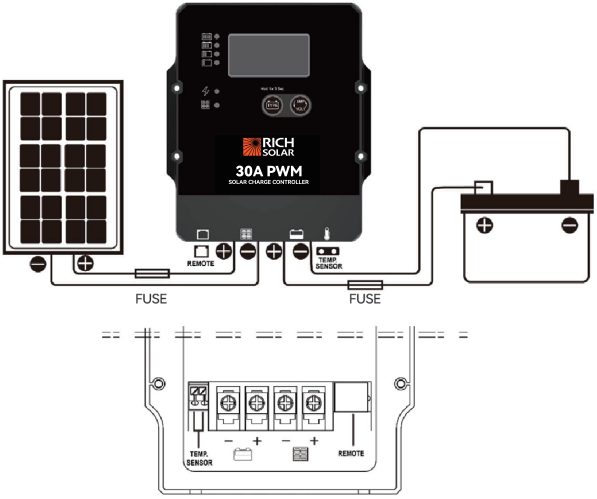


Wiring Connections

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 6 types of batteries for selection: $LiFePO_4$, LTO, Gel, AGM, WET (conventional lead-acid), and Calcium battery.



Press and hold the **BATTERY 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 AGM Battery, and the controller will automatically memorize your selection.

$LiFePO_4$ battery shown on LCD indicates Lithium Iron Phosphate (LFP) battery. LTO battery shown on LCD indicates Lithium Titanate Oxide (LTO) 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 below items on LCD before going into charging process:


Self-test starts, digital meter segments test


Software version test


Rated voltage and current test


External battery temperature sensor test (if connected)

After going into charging process, the LCD displays the charging status as below:
Press **VOLT / AMP BUTTON** in sequence, the LCD will display in turn with Battery Voltage, Charging Current, Charged Capacity (Amp-hour) and Battery Temperature (if external temperature sensor connected).

Display in the daytime -

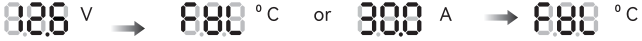


Display during the night -



Display when battery fully charged –

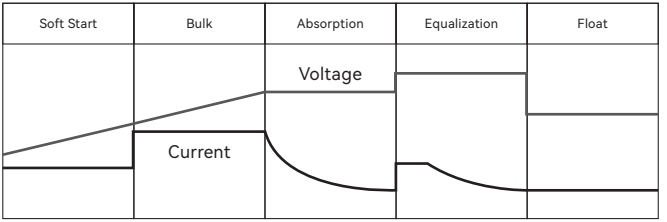
Press **VOLT / AMP BUTTON** in sequence, the LCD will display in turn with Battery Voltage, Charging Current, if you do not press the button, the LCD will alternatively display the FUL and VOLT or FUL and AMP every 2 seconds.



The VOLT / AMP button can be changed at any time during charging process.

The LCD also can be treated as an independent voltage meter or thermometer. A voltage less than 11.5V indicates that the battery is discharged and needs re-charging.

Charging Stages



Lithium Battery Wake-up- If the BMS under-voltage protection has been triggered in the Lithium battery mode (LiFePO4, LTO). Pressing both TYPE and VOLT / AMP button, the solar controller will wake up the "dead" Lithium batteries. The LCD display will show the rotation of moving bar in this wake-up period.

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 and 14.0V for LTO 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. ($LiFePO_4$, LTO, Gel and AGM battery do not run Equalization charge).

Float Mode- Battery is fully charged and maintained at a safe level.
A fully charged lead-acid battery (Gel, AGM, WET and Calcium battery) has a voltage of more than 13.6V; if the lead-acid battery voltage drops to 12.6V at float mode, it will return to Bulk charge; $LiFePO_4$ or LTO battery is set for float voltage at 13.4V; if a $LiFePO_4$ or LTO battery voltage drops to 13.2V at Float mode, they will return to Bulk charge.

LED Indication

LED Indications			
LED Color	RED	BLUE	RED
Soft Start Charging	ON	FLASH	ON
Bulk Charging (Charged Capacity <25%)	ON	ON	ON
Bulk Charging (Charged Capacity <50%)	ON	ON	OFF
Bulk Charging (Charged Capacity <75%)	ON	ON	OFF
Absorption Charging	ON	ON	OFF
Float Charging	ON	OFF	OFF
Solar Weak (At Dawn or Dusk)	FLASH	OFF	
In The Night	OFF	OFF	

			LCD Display	LCD Backlight
ORG	GREEN	GREEN		WHITE
OFF	OFF	OFF	Normal Display	ON
OFF	OFF	OFF		
ON	OFF	OFF		
OFF	ON	OFF		
OFF	ON	OFF		
OFF	OFF	ON		
Subject to Battery Voltage				OFF

LED Indications			
Solar Good, Battery Voltage < 3V	ON	OFF	FLASH
Solar Good, Battery Reversed	ON	OFF	FLASH
Solar Good, Battery Over-voltage	ON	OFF	FLASH
Solar Off, Battery Over-voltage	OFF	OFF	FLASH
Solar Good, Battery Over 149°F / 65°C	ON	OFF	
Battery Good, Solar Reverse	FLASH	OFF	
Battery Good, Solar Over-voltage	FLASH	OFF	
Over-temperature Protection			/

			LCD Display	LCD Backlight
OFF	OFF	OFF	b01	FLASH
OFF	OFF	OFF	b02	FLASH
FLASH	FLASH	OFF	b03	FLASH
FLASH	FLASH	OFF	b03	FLASH
Subject to Battery Voltage			b04	FLASH
			P01	FLASH
			P02	FLASH
			OTP	FLASH

Specifications

1	Electrical Parameters	/		
1-1	Rated solar panel amps	30	Max.	AMP
1-2	Normal input solar cell array voltage	15-25	/	VDC
1-3	Max. solar cell array voltage	30	Max.	VDC
1-4	The controller lowest operating voltage at solar or battery side	8V	Min.	VDC
1-5	Standby current consumption at night	5	Max.	mA
1-6	Maximum voltage drop- solar panel to battery	0.25	Max.	VDC
2	**Charging Characteristics**	**/**		
2-1	Minimum battery starts charging voltage	3	Min.	VDC

2-2	Soft start charging voltage	3-10	±0.2	VDC
2-3	Soft start charging current (50% PWM duty)	Up to 15		AMP
2-4	Bulk charging	By the maximum rated current		
2-5	Absorption charging voltage at 77°F / 25°C	/		
/	--Gel battery	14.1	±0.2	VDC
/	--AGM battery (default setting)	14.4	±0.2	VDC
/	--WET battery	14.7	±0.2	VDC
/	--Calcium battery	14.9	±0.2	VDC
/	--LTO battery	14.0	±0.2	VDC
/	--LFP battery	14.2	±0.2	VDC

2-6	Absorption transits to equalization or float condition:	/		
/	--Charging current drops to	1.5	±0.1	AMP
/	--or Absorption charging timer timed out	4	/	Hour
2-7	Equalization charging active (Only for WET or calcium battery)	/		
/	--Battery voltage discharged to less than	11.5	±0.2	VDC
2-8	Equalization charging voltage at 77℉ / 25℃	15.5	±0.2	VDC
2-9	Equalization charging timer timed out	2	/	Hour
2-10	Float voltage (Gel, WET, Calcium, AGM battery) at 77℉ / 25℃	13.6	±0.2	VDC
/	Float voltage for LTO or LFP battery	13.4	±0.2	VDC

/	Custom setting range for Float charge	13.0-14.0	±0.2	VDC
/	Restart voltage for LTO or LFP battery	13.2	±0.2	VDC
/	Restart voltage for lead-acid battery	12.6	±0.2	VDC
2-11	Voltage control accuracy	±0.1%	/	/
2-12	Battery temperature compensation coefficient	-13.33 mV/°F (-24 mV/°C)		
2-13	The temperature compensation range for lead-acid battery	14~122°F / -10~+50°C		
3	**Protection**	**/**		
3-1	Against reverse polarity or short circuit at panel or battery	/		
3-2	No reverse current from battery to solar at night	/		
3-3	Over-temperature protection during charging	149°F / 65°C		

4	**Electrical Parts**	**/**		
4-1	Input output terminal	M4 terminals (0.16 in / 4 mm)	/	/
5	**Physical Parameters**	**/**		
5-1	Controller material	Plastic, Standard ABS		
5-2	Power terminal maximum stranded wire size	#8 AWG stranded- 5 mm^2		
5-3	Power terminal torque	Up to 17 in-lb (1.92 N·m)		
5-4	Mounting	Vertical wall mounting		
5-5	IP grade	IP22		
5-6	Net weight	Approx. 0.66 lb (300 g)		

6	Environmental Characteristics	/
6-1	Operating temperature	-13 ~ 122°F / -25 ~ 50°C
6-2	Storage temperature	−40 ~ 185°F / −40 ~ 85°C
6-3	Operating humidity range	100% no condensation

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