



# User Manual

Solar Controller / Battery Charger



MODEL: RS-PWM8

## 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 is backed by our own 2-year warranty.

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

Faulty product claims made within the 2-year time frame will be repaired or replaced free of charge provided you have satisfactory proof of purchase (keep your receipt).

# VERSION AND RATINGS

RICH SOLAR PWM controllers

## 12V 8AMP

Rated for 12V solar panel (Max. 25V)

Rated maximum output current of 8Amp

Suitable for Solar panels up to 135 Watts.

# 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 GASSES.**

**IT IS IMPORTANT THAT EACH TIME BEFORE USING OR CONNECTING YOUR SOLAR CONTROLLER, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.**

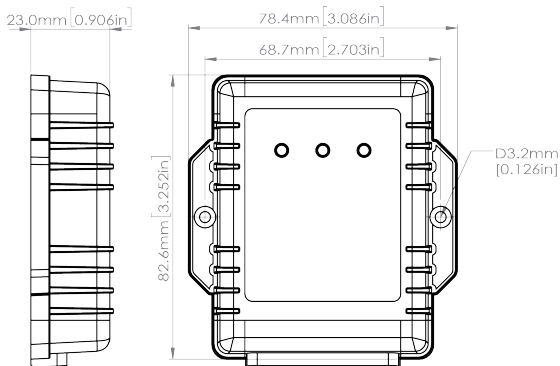
- Make sure you connect the red to the positive on the battery and the black to the negative on battery.
- Please double check before you connect, connecting to wrong terminals may burn out the controller.
- Confirm that the power wires are tightened to the correct torque to avoid excessive heating from a loose connection.
- Refer to battery specification, be very careful not to short circuit to the battery connections.
- Accidental 'shorting' of the terminals or wiring can result in sparks causing personal injury or a fire hazard. We recommend that you cover up the panel(s) with some sort of soft cloth so you can 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 Positive Grounding connection
- High efficiency and low power consumption
- Battery type setting via DIP switch
- Smart charging control
- Charging time management
- LED indication for the battery condition and charging statuses
- Thermal protection
- Over voltage protection, Short circuit protection, Reverse polarity protection
- No sparks
- Waterproof
- Corrosion-resistant terminals and connectors.
- Conformal coating supplied to the inside board against moisture
- Suitable for most of the rechargeable Lead acid battery, including Flooded (WET), AGM, GEL, Lithium (LiFePO<sub>4</sub>) battery
- Designed according to CE standard, EMC, FCC compliance.

## INSTALLATION

The quickest and easiest way to mount the unit is to use the three plastic spacers and self-tapping screws supplied and mount the unit to a flat surface.



# WIRING CONNECTIONS

To protect the Battery and the Solar Panel, we strongly recommend that you place an inline fuse on the positive wire on both the “Solar” and “Battery” Circuits. A 15A fuse for 12V 8A controller, (As close to the Battery / Panel as possible)

The Solar Controller has 4 terminals which are clearly marked ‘Solar’ and ‘Battery’. There is a (12V) and earth (GND) terminal for each circuit.

Refer to the wiring diagram below.



## Correct Wire Size:

Please refer to the wire size table below to determine the minimum size wire needed for each connection. This will also ensure you get the best performance out of your solar controller.

Length of Wire	Battery Connection		Solar Array Connection		
	5ft	10ft	10ft	15ft	20ft
Size (AWG)	14	12	14	12	12

1. Use the string wires, screw tightly the wires to the “Solar” terminal on the back of controller and connect to the Solar Panel like shown.
2. Use the string wires, screw tightly the wires to the “Battery” terminal on the back of controller and connect to the Battery like shown.

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

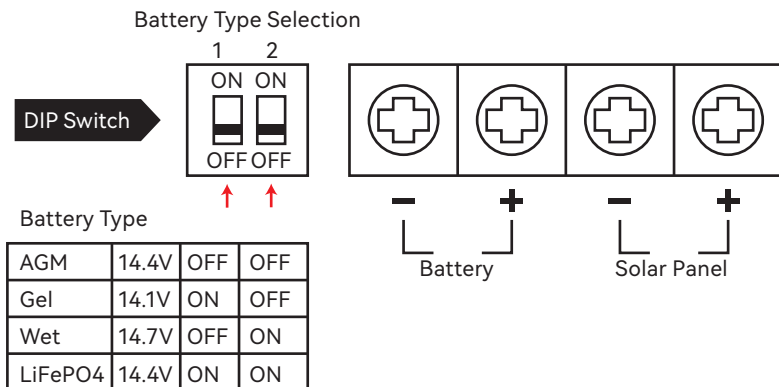
Please check your battery manufacturer's specifications to select correct battery type. The unit provides 4 battery types for selections: Gel, AGM, WET (conventional lead acid), and LiFePO4.

There is a DIP switch at the back of the solar charge controller, this Dip switch is used for presetting your battery type. Please refer to Figure 3 to make DIP switch setting for the proper battery chemical; the factory default setting is at AGM battery type.

**Note: Once the Dip switch setting is finished, do not freely change the DIP switch; otherwise it may damage your battery.**

## BATTERY TYPE SETTING

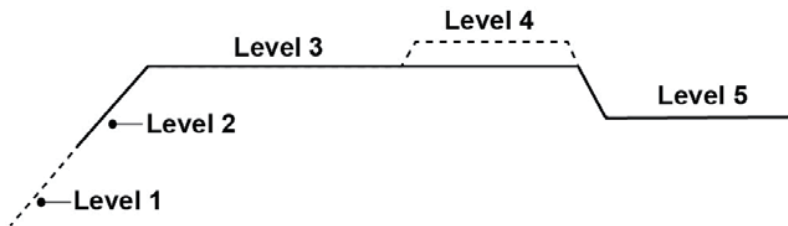
### VIA DIP SWITCH



# CHARGING STAGES

The unit has a 5-stage charging algorithm.

**Soft Charge (Level 1) – Bulk Charge (Level 2) – Absorption charge (Level 3) – Equalizing Charge\* (Level 4) – Float Mode (Level 5)**



## **Soft Charge \* –**

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 charge and battery is over 85%.




## **Equalization Charge\*-**

Only for WET battery, 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.

## **Float Charge-**

Battery is fully charged and maintained at a safe level.

## LED INDICATION

The 3 LED's indicate the charging status and Fault connection			
	RED	BLUE	GREEN
Solar Power Present-No battery connected	ON	Slow flash	Slow flash
Battery reversed	ON	Fast flash	Fast flash
Solar panel reversed	OFF	OFF	OFF
Soft start charging	OFF	Slow flash	OFF
Bulk, Absorption, Equalization charging	OFF	ON	OFF
Float charging	OFF	OFF	ON
Solar panel weak	Slow flash	OFF	OFF
At night, no charge	OFF	OFF	OFF

Slow flash=1Hz flash, Fast flash=3Hz flash



# SPECIFICATIONS

## Electrical Parameters

Rated solar panel amps	Max. 8A
Normal input solar cell array voltage	15-22 VDC
Max. solar cell array voltage (output has no load)	Max. 25 VDC
The controller lowest operating voltage at solar or battery side	9 VDC
Standby current consumption at night	2 mA
Maximum voltage drop-solar panel to battery	0.25 VDC

## Charging characteristics

Minimum battery starts charging voltage	3 VDC
Soft start charging voltage	3-10 $\pm$ 0.2 VDC
Soft start charging current (50% PWM duty)	Up to 4 AMP
Bulk charge voltage	10-14.0 $\pm$ 0.2 VDC
Absorption charging voltage at 25°C	
--Gel type battery	14.1 $\pm$ 0.2 VDC
--AGM type battery (default setting)	14.4 $\pm$ 0.2 VDC
--WET type battery	14.7 $\pm$ 0.2 VDC
--LFP battery	14.4 $\pm$ 0.2 VDC
Absorption transits to equalizing or float condition:	
--Charging current drops to	0.8 $\pm$ 0.1 AMP
-- or absorption charging timer timed out	4h
Equalization charging active (only for WET or calcium battery)	
--Battery voltage discharged to less than	11.5 $\pm$ 0.2 VDC
Equalization charging voltage at 25°C	15.5 $\pm$ 0.2 VDC
Equalization charging timer timed out	2h
Float charger voltage at 25°C	
--for GEL, AGM and WET battery	13.6 $\pm$ 0.2 VDC
--for LiFePO <sub>4</sub> battery	13.4 $\pm$ 0.2 VDC
Battery temperature compensation coefficient	-24 mV/°C
Temperature compensation range	-20~+50°C

## Protection

Over temperature protection during charging	65°C
---	------

---

**Electrical parts**

---

Input output terminal	M4 terminals
-----------------------	--------------

---

**Physical Parameters**

---

Controller material	Plastic, Standard ABS
---------------------	-----------------------

---

Power terminal maximum stranded wire size	#12 AWG stranded-3 mm <sup>2</sup>
---	------------------------------------

---

Mounting	Vertical wall mounting
----------	------------------------

---

IP grade	IP65
----------	------

---

Net weight	Approx. 200g / 0.44lb
------------	-----------------------

---

**Environmental characteristics**

---

Operating temperature	-25 ~ 50°C / -13 ~ 122 °F
-----------------------	---------------------------

---

Storage temperature	-40 ~ 85°C / -40 ~ 185 °F
---------------------	---------------------------

---

Operating humidity range	100% no condensation
--------------------------	----------------------

---

## MAINTENANCE

Occasionally, clean the case using a damp cloth and mild cleaning agent. Check with terminals without loosen, rusty; If connecting cable is damaged, replace the cable by qualified person.