



## **Solar Controller / Battery Charger**

**Input: DC12V Solar panel (Max. 25V)**

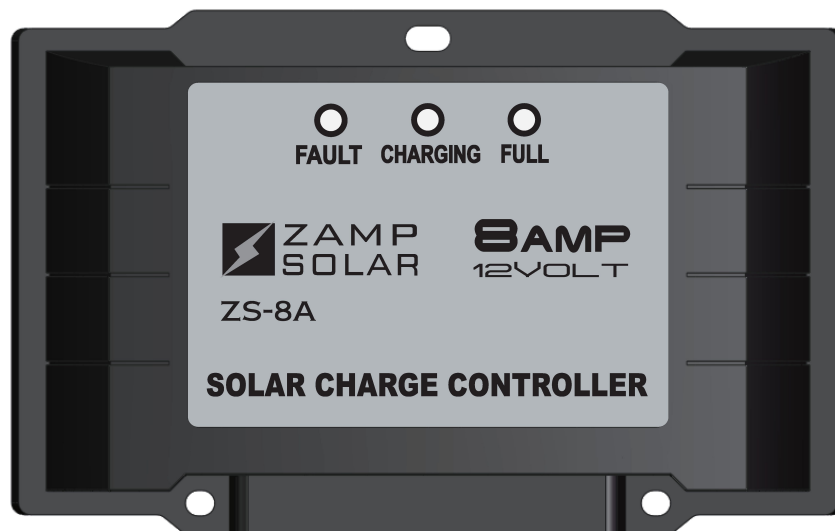
**Output: DC12V 8A**

**Model Number: ZS-8A**

## **User's Manual**

## FEATURE

- Advanced MCU control pulse width modulated (PWM) technology, high efficiency operation.
- Target for Gel, AGM, Conventional lead-acid (WET) and Calcium Batteries.
- Built in regulator to prevent your battery from being overcharged. Overcharging occurs when the charge voltage is unregulated. This can result in premature battery failure.
- Come with regulator to prevent your battery from being under charged, in the solar energy field, battery undercharge always occurs, especially on some Conventional lead –acid or Calcium batteries; The unit provides an automatic Equalization feature for deeply drained Conventional lead acid battery or Calcium battery.
- Can be connected to the battery permanently to keep the battery fully charged by using a process called “floating”. This means the controller will stop charging when the battery is full and will automatically start charging the battery as required. This process will also reduce water loss and help prevent the battery from ‘drying out’.
- Protects your battery from discharge at night. Under low light or no light conditions the solar panel voltage could be less than the battery voltage. The unit contains a special circuit which prevents current flowing back from the battery and into the solar panel.
- Colored LED’s to easily indicate the charging status and battery conditions and system faulty.
- Multi charging protections against reverse polarity, short circuit, over temperature, over voltage, etc.
- Conformal-coating circuit boards and plated terminals apply to hostile environments.
- Waterproof with IP67 .



**For use with 12Volt Solar Panel Only  
Suitable for Solar panels up to 135 Watts**

## WARNING – IMPORTANT PLEASE READ

- This charger is designed for indoor use or outdoor use.
- Do not disassemble the controller. Take to a qualified person if the unit requires repairing.
- Lead acid batteries can be dangerous. Ensure no sparks or flames are present when working near batteries.
- Eye protection should always be used. Never short circuit the battery
- Given sufficient light solar panels always generate energy even when they are disconnected.
- 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
- Do not reverse connect the wires to the solar panel or battery

## MOUNTING THE DEVICE

The Solar Controller is mounted as below

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,

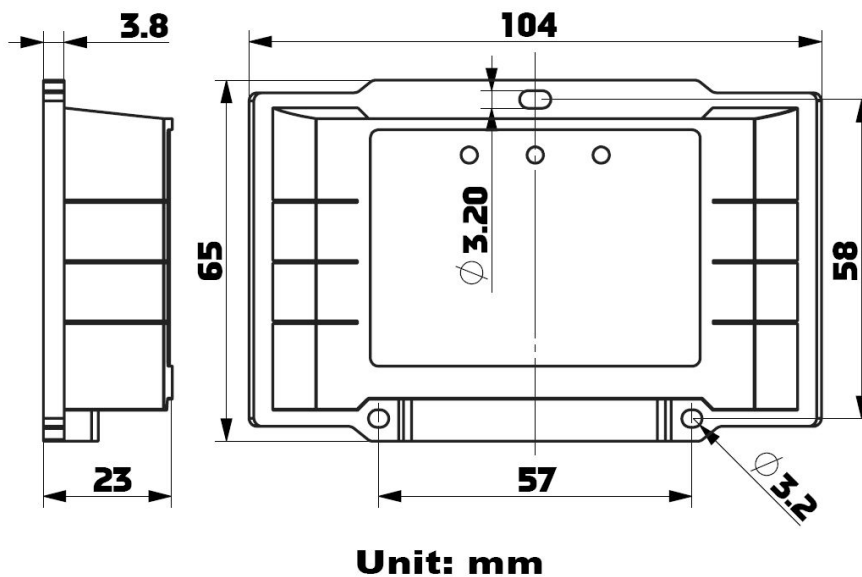


Figure 1.1

## WIRING CONNECTIONS

To protect the Battery and the Solar Panel, we strongly recommend that you place a inline fuse on the positive wire on both the “Solar” and “Battery” Circuits. A 15A fuse for ZS-8A, (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.

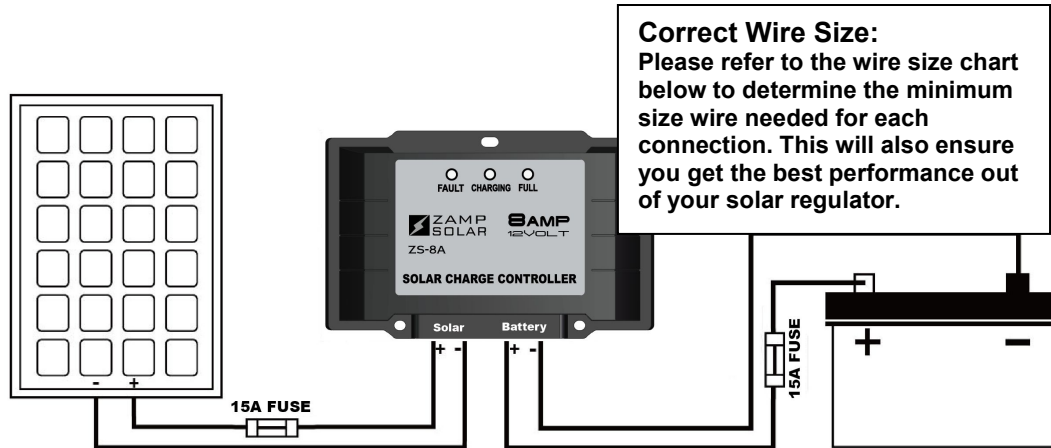


Figure 2.1

	Battery Connection	Solar Array Connection		
Length of Wire	< 1m	6m	9m	12m
Size (AWG)	14	14	12*	10*

\* If the wire length is beyond 9 meter, the wire dimension must be over 2.4 mm<sup>2</sup> please slim the end of wire prior to installation.

1. Using 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. Using 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.

### Battery type setting – via DIP Switch

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 Calcium.

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 3.1 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.**

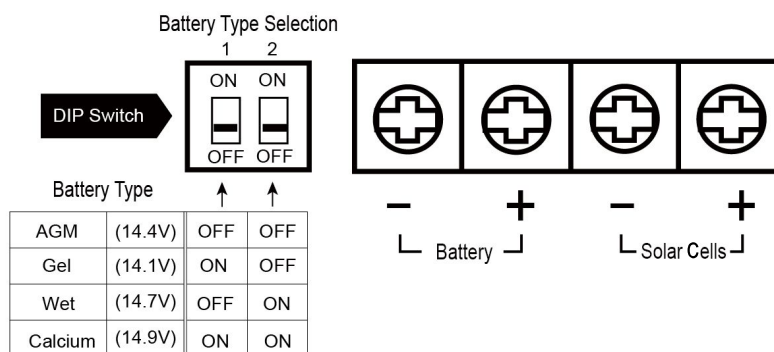
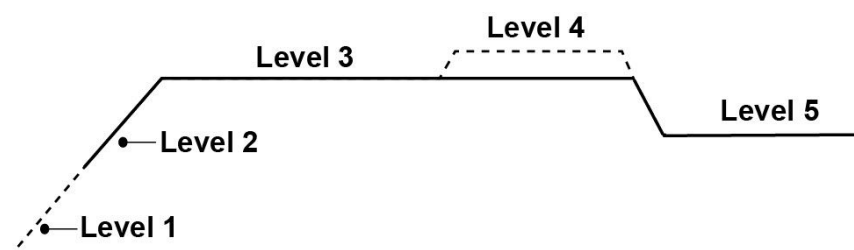


Figure-3.1

## CHARGE STAGE

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 ramps the battery voltage up to 10V.

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

**Absorption Charge-**Constant voltage charging and battery is over 85%.

**Equalization Charge\***–Only for WET battery 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 states and fully complement the loss of capacity.(Gel and AGM battery do not run Equalization charge)

**Float Charge-**Battery is fully charged and maintained at a safe level.

A fully charged battery has a voltage of more than 13.6 Volts.

## OPERATION - L.E.D. INDICATION

The 3 LED's indicate the charging status and Fault connection	Fault	Charge	Full
	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 = 3 Hz flash

## SPECIFICATIONS

<b>1</b>	<b>Electrical Parameters</b>			
1-1	Rated solar panel amps	8	Max.	AMP
1-2	Normal input Solar cell array voltage	15-22		VDC
1-3	Max. solar cell array voltage (output has no load)	25	Max.	VDC
1-4	The controller lowest operating voltage (at solar or battery side )	9V	Min	VDC
1-5	Standby current consumption at night	2	Max	mA
1-6	Maximum voltage drop-Solar panel to battery	0.25	Max.	VDC
<b>2</b>	<b>Charging characteristics</b>			
2-1	Minimum battery start 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 4		AMP
2-4	Bulk charge voltage	10-14.0	+/-0.2	VDC
2-5	Absorption charging voltage at 25°C			
	--Gel type battery	14.1	+/-0.2	VDC
	--AGM type battery (default setting)	14.4	+/-0.2	VDC
	--WET type battery	14.7	+/-0.2	VDC
	--Calcium type battery	14.9	+/-0.2	VDC
2-6	Absorption transits to Equalizing or Float condition:			
	--Charging current drops to	0.8	+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 25°C	15.5	+/-0.2	VDC
2-9	Equalization charging timer timed out	2		Hour
2-10	Float charging voltage at 25°C	13.6	+/-0.2	VDC
2-11	Voltage control accuracy	+/- 1%		
2-12	Battery temperature compensation coefficient	-24		mV/*C
2-13	Temperature compensation range	-20 ~ +50		*C
<b>3</b>	<b>Protection</b>			
3-1	Against reverse polarity or short circuit at panel side			
3-2	Against reverse polarity or short circuit at battery side			
3-3	No reverse current from battery to solar at night			
3-4	Over temperature protection during charging	65		*C
<b>4</b>	<b>Electrical parts</b>			
4-1	Input output terminal	M4 terminals		
4-2	Temperature sensor port or DIP switch			
<b>5</b>	<b>Physical Parameters</b>			
5-1	Controller material	Plastic, Standard ABS		
5-2	Power terminal maximum stranded wire size	#12AWG stranded-3 mm <sup>2</sup>		
5-3	Mounting	Vertical wall mounting		
5-4	IP grade	IP22 or IP67,		
5-5	Net weight	Approx. 200g		
<b>6</b>	<b>Environmental characteristics</b>			
6-1	Operating temperature	-25 ~ 50°C		
6-2	Storage temperature	-40 ~ 85°C		
6-3	Operating Humidity range	100% no condensation		