# **Solar Controller / Battery Charger**

Input: DC12V Solar panel (Max.25V)

Output: DC12V, 8AMP

**DC12V, 12AMP** 

**DC12V, 15AMP** 

**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, as well as provides a cycling automatic Equalizing feature every 28 days.
- 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.
- Provides external battery temperature sensor (Optional).
- 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 and non-waterproof selectable.



For use with 12Volt Solar Panel Only

12V 8Amp controller is suitable for solar panels up to 135 Watts

12V 12Amp controller is suitable for solar panels up to 200 Watts

12V 15Amp controller is suitable for solar panels up to 250 Watts

## WARNING - IMPORTANT PLEASE READ

- This charger is designed for indoor use (non-waterproof type ) or outdoor Use (waterproof type).
- 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,

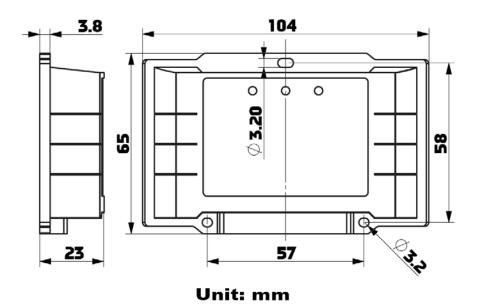


Figure 1.1

## 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 an 8Amp 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.

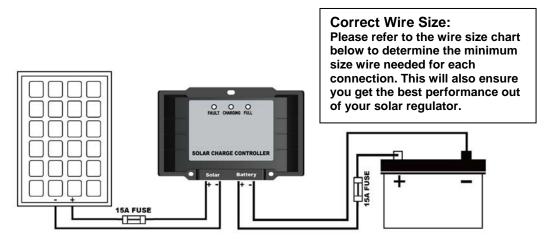


Figure 2.1

	<b>Battery Connection</b>	Solar Array Connection		
Length of Wire	< 1m	6m	9m	12m
Size (AWG)	18 or 16	14	12	12

- 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 or External wire

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.

The unit is also provided an additional version to preset the battery type and temperature compensation, please see below Figure 3.2 to make the external wire setting for the proper battery chemical, the factory default setting is at AGM battery.

Note: Once the Dip switch setting or external wire connection is finished, do not freely change the DIP switch or external wire connected; otherwise it may damage your battery.

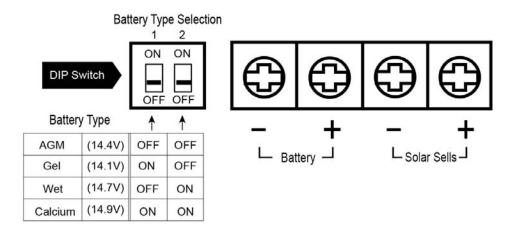


Figure 3.1- Battery type setting via DIP switch

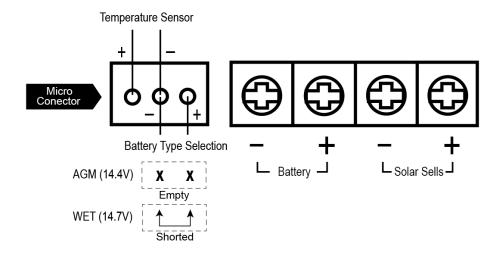


Figure 3.2- Battery type setting via external wire

## The external wires connections:

As an additional version, the unit provides a port to connect the external battery temperature sensor and battery type selection wire.

**Battery type setting:** if shorted the external wire according to above Figure 3.2, the unit will be worked for WET (Flooded) battery type setting; the factory default setting is for AGM battery type (external wire without connection).

**Battery temperature sensor**: If the external battery temperature sensor is connected to the battery as above Figure 3.2, the unit will optimize the charging performance subjected to the battery temperature detected and also provide the battery over temperature protection, in some case, if battery over temperature occurs, the controller will automatically stop charging.

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## **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)

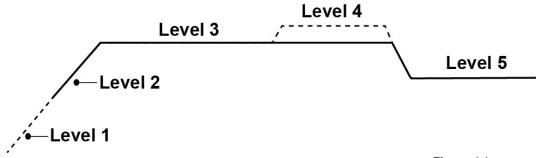


Figure 4.1

**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	Fault	Charge	Full	
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 = 1 Hz flash; Fast flash = 3 Hz flash

## **SPECIFICATION**

1-1         Rated solar panel amps         8/12/15         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           2-1         Minimum battery start charging voltage         3         Min         VDC           2-1         Minimum battery start charging voltage         3-10         +/-0.2         VDC           2-2         Soft start charging voltage         3-10         +/-0.2         VDC           2-3         Soft start charging voltage         10-14.0         +/-0.2         VDC           2-3         Soft start charging voltage         10-14.0         +/-0.2         VDC           2-5         Absorption charging voltage         14.1         +/-0.2         VDC           2-5         Absorption charging voltage         14.1         +/-0.2         VDC	4	Electrical Deservators			
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1-3 Max. solar cell array voltage (output has no load) 1-4 The controller lowest operating voltage (at solar or battery side) 1-5 Standby current consumption at night 1-6 Maximum voltage drop-Solar panel to battery 2 Charging characteristics 2-1 Minimum battery start charging voltage 3-10				Max.	
1-4					
Side   Standby current consumption at night   2					
1-6   Maximum voltage drop-Solar panel to battery   2   Charging characteristics		side)			
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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 4/6/7.5         AMP           2-4         Bulk charge voltage         10-14.0         +/-0.2         VDC           2-5         Absorption charging voltage at 25°C         14.1         +/-0.2         VDC          Gel type battery         14.4         +/-0.2         VDC          WET type battery         14.7         +/-0.2         VDC          WET type battery         14.9         +/-0.2         VDC          Calcium type battery         14.9         +/-0.2         VDC          Calcium type battery         14.9         +/-0.2         VDC           2-6         Absorption transits to Equalizing or Float condition:        Calcium type battery         14.9         +/-0.2         VDC           2-6         Absorption transits to Equalization of the arging timer timed out         4         Hour         +/-0.1         AMP          Only for WET or Calcium battery        Battery voltage discharged to less than         11.5         +/-0.2         VDC           2-8			0.25	Max.	VDC
2-2   Soft start charging voltage   3-10   +/-0.2   VDC					
2-3         Soft start charging current (50% PWM duty)         Up to 4/6/7.5         AMP           2-4         Bulk charge voltage         10-14.0         +/-0.2         VDC           2-5         Absorption charging voltage at 25°C					
2-4 Bulk charge voltage 10-14.0					
2-5 Absorption charging voltage at 25°C Gel type battery AGM type battery (default setting) WET type battery Calcium type battery Charging current drops to less than Charging current drops Charging current drops to less than			<u> </u>		
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AGM type battery (default setting) WET type battery Calcium type battery  14.7	2-5				
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2-6 Absorption transits to Equalizing or Float condition: Charging current drops to		WET type battery	14.7	+/-0.2	VDC
Charging current drops to or Absorption charging timer timed out or Absorption charging activeOnly for WET or Calcium batteryBattery voltage discharged to less thanAutomatic equalizing charging periodical 28 Day 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 2-13 Temperature compensation range 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 4-1 Input output terminal 4-2 Temperature sensor port or DIP switch 5 Physical Parameters 5-1 Controller material 5-2 Power terminal maximum stranded wire size #12AWG stranded-3 mm² 5-4 IP grade 6-1 Operating temperature 6-2 Storage temperature 6-2 Storage temperature 6-2 Storage temperature 6-2 Storage temperature 7-8 MV/C 2-10 J1.5 +/-0.2 VDC 2-11 J1.5 +/-0.2 VDC 2-12 Hour 2-13 Temperature compensation coefficient 2-2 Hour 2-14 Mour 2-15 Hour 2-16 Hour 2-17 Hour 2-18 Hour 2-19 Equalization charging helps 2-20 +50			14.9	+/-0.2	VDC
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6-1 Operating temperature -25 ~ 50*C 6-2 Storage temperature -40 ~ 85*C				<u> </u>	
6-2 Storage temperature -40 ~ 85*C			-25 ~ 50*C		
	6-3	Operating Humidity range	100% no condensation		