OPTI-Solar

Solar Charge Controller
with Programmable Street-Light Function

User Manual
(English)

Solar Charge Controller with Programmable Street-Light Function

Thank you for selecting this Smart solar charge controller product. Although Smart is very simple to use,please take the time to read this operators manual and become familiar with the controller. This will help you to make full use of many advantages, the Smart can provide your solar lighting system.

Description

It comes with a number of outstanding features, such as:

- Case protection: IP67 protection
- Dimming function:30%~70% of rated power adjustable
- Digital Unit to configure Smart charge controller via UART
- External temperature sensor for temperature compensation of charge voltages
- 6 modes for solar street light system
- PWM voltage regulation use 3 stages of charging including boost and equalization
- Battery type and protection level selection.
- 12V fixed,24V fixed,12V/24V Automatic recognition
- Standard UART interface

Installation

The following diagrams provide an overview of the connections and the proper order.

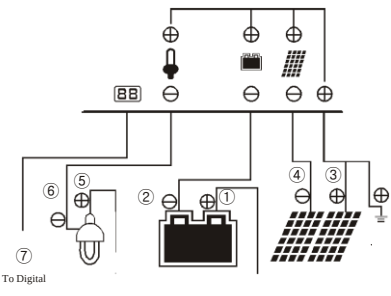
Caution:

1.To avoid any voltage on the wires, first connect the wire to the controller, then to the battery, panel or load.
Recommended minimum wire size:
SC-05SM: 1.5mm^2; 10SM: 2.5mm^2; SC-15SM/20SM: 4mm^2.

2.Make sure the wire length between battery and controller is as short as possible.
Be aware that the positive terminal of Smart are connected together and therefore have the same electrical potential. If any grounding is required, always do this on the positive wires.

3.when installed the controller,please press the test button to activate the controller.

4.Connecting capacitive load may trigger short circuit protection.



LED indications Faults & Alarms

LED Display Explanation:

LED	Display	Status
Green	Slow blink	float state(1 second on, 1 second off)
	Blink	Battery connected, day detected (0.4second on, 0.4 second off)
	Fast blink	Equalization state (0.1second on, 0.1second off)
	Lighted	Battery connected, night detected
RED	Off	No faults detected
	Slow blink	Dimming(2 seconds on, 0.5second off)
RED Green	Off	No battery connected
	Lighted together (1second)	Controller start-up

Faults & Alarms

Faults	Display	Reason	Remedy
Loads are not supplied	Red LED on	Battery is low	Load will reconnect as soon as battery is recharged.
	Red LED slow blink	Over current/Short circuit of loads/ Over temp	Switch off all loads. Remove short circuit. Controller will switch on load automatically after max 1 minute. After the temperature reduces,the load opens automatically
	Red LED fast blink	Battery voltage too high(>15.5V/31V)	Check if other sources overcharge the battery. If not,controller is damaged.
		Battery wires or battery fuse damaged, battery has high resistance	Check battery wires, fuse and battery.
Battery is empty after a short time	Red LED on	Battery has low capacity	Change battery
Battery is not being charged during the day	Green LED on	Solar array faulty or wrong polarity	Remove faulty connection /reverse polarity

Street-Light Function

The Smart controller comes with a sophisticated Street-light function. It has dimming function.

There are 6 modes available:
1.Single time and Dusk to Dawn mode(Figure①)
2.Double time mode 1(Figure②)
3.Double time mode 2(Figure③)
4.Double time mode 3(Figure④)
5.Double time mode 4 (Figure⑤)
6.Double time mode 5(Figure⑥)

① Day/night threshold Day/night threshold
Sunset Sunrise
Time 1+Time 2
Rated power
Light on
Dusk to Dawn
Light off
Light off

② Day/night threshold Day/night threshold
Sunset Sunrise
Time 1
Light on
Time 2
Dimming
Light off
Light off

③ Day/night threshold Day/night threshold
Sunset Sunrise
Time 1
Light on
Light on
Time 2
Light off
Light off

④ Day/night threshold Day/night threshold
Sunset Sunrise
Time 1
Light on
Dimming
Time 2
Light off
Light off

⑤ Day/night threshold Day/night threshold
Sunset Sunrise
Time1
Mid of Night
Time2
Light on
Light On
Light off
Light off
½ Night Time
½ Night Time

⑥ Day/night threshold Day/night threshold
Sunset Sunrise
Time1
Mid of Night
Time2
Light on
Dimming
Light off
Light off
½ Night Time
½ Night Time

"Middle of night" is detected automatically as the midpoint between dusk and dawn, no setting of a clock is required. It may take several days until the controller has "learned" the middle of the night precisely. "Middle of night" may be different from 12:00 midnight depending on your location.

The controller recognizes day and night based on the solar array open circuit voltage (only functional in street-light mode).This day/night threshold can be modified according to local light conditions and the solar array used.

Attention:
1.Dimming function can not be guaranteed to match with all the LED drivers, consult the vendor for details.
2. It will take effect in next day if the mode of controller is changed via Digital Unit.

Safety Features

Reverse polarity	Protected
Short circuit	Protected
Over current	Protected
Reverse current	Protected
Over voltage	Protected
Under voltage	Protected
Over temp	Protected
Over discharging	Protected
Over charging	Protected

● The solar panel voltage should not exceed this limit for a long time as voltage protection is done by a varistor.

Warning: The combination of different error conditions may cause damage to the controller.Always remove the error before you continue connecting the controller!

Low Voltage Disconnect Function (LVD)

Voltage controlled :
Disconnect at a fixed voltage :
SOC1 10.8V/21.6V
SOC2 11.0V/22.0V
SOC3 11.5V/23.0V

State of charge (SOC) controlled:

Disconnect at	SOC4/less than 10% battery soc 11.0V/22.0V ~11.7V/23.4V SOC5/15% battery soc 11.2V/22.4V ~11.8V/23.6V SOC6/30% battery soc 11.4V/22.8V ~11.9V/23.8V

1.If the controller goes into low voltage protection,it will restore only when the battery being recharged and the voltage reaching the reconnect voltage.

2.Around oblique line value separately on behalf of 12V and 24V system's value.

Default Settings

You can configure Smart charge controller with Digital Unit (DU-II). See DU-II manual for details.

Smart-II	Default Settings
Load control mode	Dusk to Dawn mode
Low voltage disconnect mode	SOC5
Battery type	Flooded
Day/night threshold	3.0V/6.0V

Liability Exclusion:

The manufacturer shall not be liable for damages,especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

Technical Data

Model	SC-05SM	SC-10SM	SC-15SM	SC-20SM
Nominal voltage	12V fixed;24V fixes;12 V / 24 V automatic recognition			
Max solar current or load current	5 A	10 A	15 A	20 A
Boost voltage	14.5/ 29 V (25℃)			
Equalization voltage	14.8 / 29.6 V (25℃)			
Float voltage	13.7 / 27.4 V (25℃)			
Load disconnect voltage	10.8V~11.9 V / 21.6V~23.8 V			
Load reconnect voltage	12.0V~13.2V/24.0V~ 26.4 V			
Lighting hours	0~18 Hours			
Night/day detect (Day/Night threshold)	3.0~7.5 V			
Battery type	Flooded, Sealed			
Temperature Compensation	-4.17mV/K per cell(Boost and Equalization charge); -3.33mV/K per cell(float charge)			
Max solar voltage	55 V			
Max battery voltage	40 V			
Dimming	30…70% of rated power			
Cable length	120mm/80mm			
Over voltage protection	15.5 V / 31.0 V			
Dimensions /Weight	85 x 70 x 20 mm / 200g		85 x 85 x 20mm/210g	
Wire size	SC-05SM: 1.5mm^2; SC-10SM: 2.5mm^2; SC-15SM/20SM: 4mm^2			
Typical power consumption	Lower than 13mA/15mA			
Ambient temp.	-40℃ ~ +60℃			
Case protection	IP67			
Max altitude	4000 m			