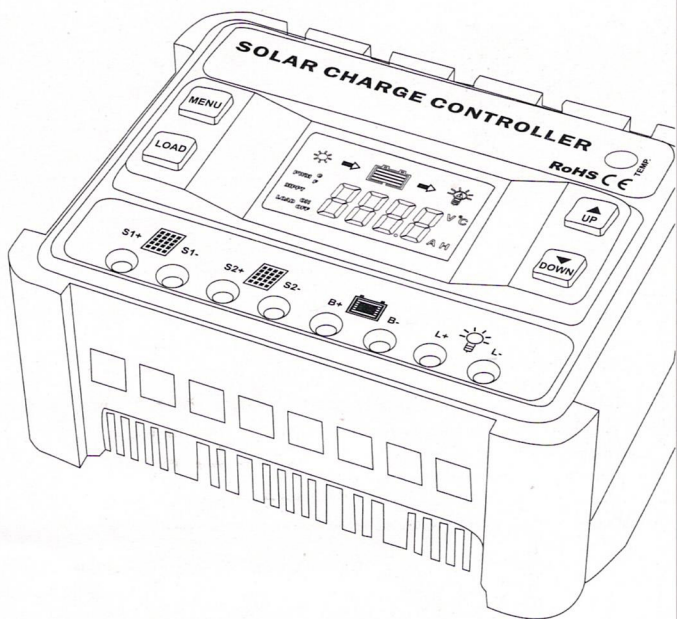


# PWM SOLAR CHARGE CONTROLLER ENS SERIES



※ THE IMAGE SHOWN HERE IS INDICATIVE ONLY. PLS REFER TO THE ACTUAL PRODUCT

## 1. Major Features and Functions

With your new PWM solar charge controller, you own a state-of-the-art device which was developed according to the latest available technical standards. There are two series including LED and LCD series. It comes with a number of outstanding features and functions, such as:

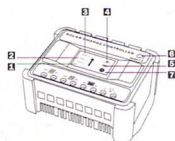
- Pulse Width Modulation Technology, which offers the good efficiency of your PV system.
- Automatically detects 12/24V or 24/48V system voltage.
- LED indicators or LCD display by symbol and data.
- Temperature-compensated, three-stage I-U curve charge regulation
- Full electronic protection (reverse polarity, over-current, short-circuit, over temperature, current drawback, lightning etc.)
- High efficiency
- Positive ground
- Dual terminals for solar panel input
- Battery type can be: GEL, AGM and solar battery etc.

## 2. Recommendations for Use

- The PWM warms up during normal operation. If there is insufficient ventilation (e.g. in an installation cabinet), the controller limits the solar charge current to prevent overheating.
- The PWM does not need any maintenance or service. Remove dust with a dry tissue.
- It is important that the battery is fully charged frequently (at least monthly), otherwise the battery will be permanently damaged.
- A battery can only be fully charged, if not, too much energy is drawn during charging. Keep this in mind, especially if you install additional loads.

## 3. PWM Controller Face-plate Indication

### 3.1 LED series



1. LED indicates: battery capacity 25%
2. LED indicates: battery capacity 50%
3. LED indicates: battery capacity 75%
4. Charge LED indicator
5. Fault LED indicator
6. Temperature sensor
7. ON/OFF button

### 3.2 LCD series



1. LCD screen display
2. Menu button
3. Load ON/OFF button
4. Setting button (UP)
5. Setting button (DOWN)
6. Temperature sensor

## 4. Mounting and Connecting

- The PWM is intended for indoor use only.
- Protect it from direct sunlight and place it in a dry environment.
- Never install it in humid rooms (like bathrooms).
- The PWM measures the ambient temperature to determine the charging voltage.
- The PWM and the battery must be installed in the same room.
- The PWM warms up during operation, and therefore it should be installed on a non-flammable surface only.

**⚠ Note:** connect the PWM by following the steps described below to avoid installation problems.

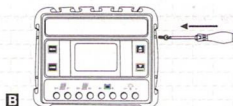
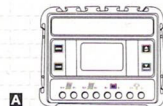
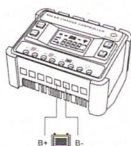


Fig.1

Please see fig 1 that show how to install the PWM on the wall by screws.

- Make sure that the ventilation slits are unobstructed.
- Mount PWM in a way that ensures there is enough space below and above for the air to vertically flow through the ventilation slots.



#### 4.1 Connecting to the battery

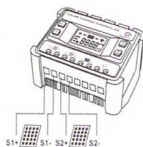
Connect the wires leading to the battery with the correct polarity. To avoid any voltage from the wires, first connect the PWM and then the battery. 20A: min 2.5mm<sup>2</sup>, 30A: min 4mm<sup>2</sup>, 40A: min 6mm<sup>2</sup>, 50A: min 8mm<sup>2</sup>, 60A: min 8mm<sup>2</sup>, 70A: min 10mm<sup>2</sup>, 80A: min 10mm<sup>2</sup>

**Note:** Greater wire sizes and length give smaller power losses.

**Note:** Mind the recommendations of your battery manufacturer. We strongly recommend connecting a fuse directly to the battery to protect any short circuit in the battery wiring. The fuse must at least take the PWM normal current or more.

For example, you can use a slow acting 40A fuse with a 30A PWM controller.

**Note:** If wrong connection beep alarms.



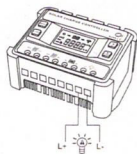
#### 4.2 Connecting to the solar arrays

Connect the wires leading to the solar arrays with proper polarity. To avoid any voltage from the wires, first connect the controller, then the solar array. Mind the recommended wire size: 20A: min 2.5mm<sup>2</sup>, 30A: min 4mm<sup>2</sup>, 40A: min 6mm<sup>2</sup>, 50A: min 8mm<sup>2</sup>, 60A: min 8mm<sup>2</sup>, 70A: min 10mm<sup>2</sup>, 80A: min 10mm<sup>2</sup>

**Note:** Place the positive and the negative wires close to each other to minimize electromagnetic effects.



**Note:** Solar panels provide voltage as soon as exposed to sunlight. Mind the solar panel manufacturer's recommendations.

**Note:** If wrong connection beep alarms.



#### 4.3 Connecting to the load

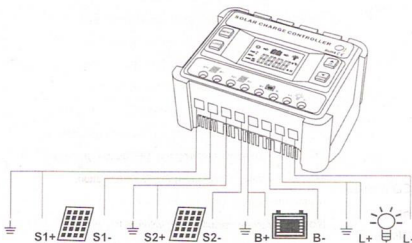
Connect the wires leading to the loads with proper polarity. To avoid any voltage on the wires, please first connect the wire to load, then to the controller.

**Note:** If the DC loads were protected by short circuit, over current or low voltage, there is a  in  shall flash (LCD screen displays).

**Note:** There is fuse inside of the controller. If fault happens, fuse blow.

## 5. Grounding the Solar System

Be aware that the positive terminals of the PWM are connected internally and therefore have the same electrical potential. If any grounding is required, always do this on the positive wires.



## 6. Starting up the controller

As soon as the PWM is connected to the battery, it starts operating and LCD to display the battery voltage (we called the main window) When solar voltage is applied, it will start charging the battery and if you press menu button to switch to screen state No.2, you can see the PV charge current.

System voltage

The PWM adjusts itself automatically to 12V or 24V or 48V system.

As soon as the voltage at the time of start-up exceeds 18.0V, the PWM implies that it is a 24V system; once the start-up voltage reaches 36V, the PWM detects that it is a 48V system.

## 7. LCD Screen Display Functions (LCD series only)


The PWM controller is equipped with a big LCD display panel and 4 buttons.

There is one main window and seven different screens display different states by pressing the menu button to change the states.





**Note:** If LCD screen in main menu, press "MENU", then change to submenu. If in submenu, by press "UP" or "DOWN", you can change to different states.

### 7.1 LCD screen display explanation:

Main Menu		Main window	Battery voltage
Submenu		LCD screen displays state No.1	PV charging current The high precision (Optional)
		LCD screen displays state No.2	Load's discharge current The high precision (Optional)
		LCD screen Displays state No.3	Total PV charge Ah
		LCD screen Displays state No.4	Total battery discharge Ah
		LCD screen Displays state No.5	The setting of equalization charge voltage: If you long press 5s the menu button, going into the setting station (the data flashing). By pressing the "UP" button, you can increase the value. By pressing the "DOWN" button, reduce the value. <b>Note:</b> the factory default setting value is 14.4V in 12V system, 28.8V in 24V system, 57.6V in 48V system 12V system: the setting range is from 14V to 15V 24V system: the setting range is from 28V to 30V 48V system: the setting range is from 56V to 60V
		LCD screen displays state No.6	The setting of low voltage disconnecting: If you long press 5s the menu button, going into the setting station (the data flashing). By pressing the "UP" button, you can increase the value. By pressing the "DOWN" button, reduce the value. <b>Note:</b> the factory default setting value is 11V in 12V system, 22V in 24V system, 44V in 48V system 12V system: the setting range is from 10.4V to 11.4V 24V system: the setting range is from 20.8V to 22.8V 48V system: the setting range is from 41.6V to 45.6V

		<p>LCD screen displays state No.7</p>	<p>The setting of low voltage reconnecting: If you long press 5s the menu button, going into the setting station (the data flashing). By pressing the "UP" button, you can increase the value. By pressing the "DOWN" button, reduce the value.</p> <p><b>Note:</b> the factory default setting value is 12.8V in 12V system, 25.6V in 24V system, 51.2V in 48V system  12V system: the setting range is from 12.2V to 13.2V  24V system: the setting range is from 24.4V to 26.4V  48V system: the setting range is from 48.8V to 52.8V</p>
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## 7.2 Buttons' function explanation:

	<p>When LCD screen in submenu, press it to go back to main window.</p> <p>When LCD screen in main menu, press it to go into the submenu.</p> <p>When the LCD screen stay in state No.5, 6 and 7, Long press 5s the button to make the data setttable( data flashing)</p>
	<p>ON/OFF the DC load</p>
	<p>Press it to increase the setting value (in state No.5, 6 and 7).  Once LCD screen go into the submenu, by pressing "UP" to change to last state. eg. If LCD screen in state No.3, you press "UP" then change to state No.2</p>
	<p>Press it to reduce the setting value (in state No.5,6 and 7).  Once LCD screen go into the submenu, by pressing "DOWN" to change to next state. eg. If LCD screen in state No.2 you press "DOWN" then change to state No.3.</p>

### Notes:

1. If without any operation, no matter the LCD screen in which state, it shall go back to main window which displays the battery voltage.
2. The LCD screen shall be off after 30s, you can affect it by press any button.
3. Only when the LCD screen in main window, the load button can ON/OFF the DC load.

## 8. Safety Recommendations

- Batteries store a large amount of energy. Under no circumstances, never short-circuit a battery. We recommend connect a fuse (slow acting type, according to the normal regulator current) directly to the battery terminal.
- Battery can produce flammable gases. Avoid making sparks, or using fire or any open flame around the battery. Make sure that the battery room is ventilated.
- Avoid touching or short circuiting wires or terminals. Be aware that the voltages on specific terminals or wires can be as much as 95V. Use isolated tools, stand on dry ground, and keep your hands dry.
- Keep children away from batteries and charge controllers.
- Please observe the safety recommendations of the battery manufacturer. If in doubt, consult your dealer or installer.

## 9. Liability Exclusion

The manufacturer shall not be liable for damages caused by use, especially on the battery, 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 is any service or repair carried out by any unauthorized person, improper use, incorrect installation, or poor system design.

Opening the case voids the warranty.

## 10. Technical Data

## 10.1 LED series

Model	ENS12/24-20	ENS12/24-30	ENS12/24-40	ENS12/24-50	ENS12/24-60	ENS12/24-70	ENS12/24-80
Normal voltage	12/24V, automatic recognition						
Nominal battery charge current	20A	30A	40A	50A	60A	70A	80A
Max. PV input power	300W@12V	450W@12V	600W@12V	750W@12V	900W@12V	1050W@12V	1200W@12V
	600W@24V	900W@24V	1200W@24V	1500W@24V	1800W@24V	2100W@24V	2400W@24V
Max. solar input voltage Voc	<30V/48V						
Min.solar input voltage Vmp	>16V/32V						
Power conversion efficiency	Max. 95%						
Standby power consumption	<10mA	<10mA	<15mA	<15mA	<15mA	<25mA	<25mA
Length=1m charge loop drop	<0.25V						
Length=1m discharge loop drop	<0.05V						
Temperature compensation	-3 mV/cell*°K						
Dimensions(L*W*H)	172*126.3*73mm					192*176*94mm	
Weight(kg)	0.35	0.36	0.38	0.4	0.4	0.8	0.8
Ambient temperature range	-40 to +50°C						
Case protection	IP22						
Float charge	13.6V/27.2V						
Constant voltage charge	14.4V(14~15V settable) / 28.8V (28~30V settable)						
Low disconnect voltage	11V(10.4~11.4V settable) / 22V(20.8~22.8V settable)						
Low reconnect voltage	12.8V(12.2~13.2V settable) / 25.6V(24.4~26.4V settable)						
Grounding	Positive grounding						
Battery type	GEL, AGM, Solar battery etc						

## For 48V system

Model	ENS24/48-40	ENS24/48-50	ENS24/48-60	ENS24/48-70	ENS24/48-80
Normal voltage	24/48V, automatic recognition				
Nominal battery charge current	40A	50A	60A	70A	80A
Max. PV input power	960W@24V	1200W@24V	1440W@24V	1680W@24V	1920W@24V
	1920W@48V	2400W@48V	2880W@48V	3360W@48V	3840W@48V
Max. solar input voltage Voc	<48V/72V				
Min. solar input voltage Vmp	>32V/40V				
Power conversion efficiency	Max. 90%				
Standby power consumption	<25mA	<25mA	<25mA	<25mA	<25mA
Length=1m charge loop drop	<0.25V				
Length=1m discharge loop drop	<0.05V				
Temperature compensation	-3 mV/cell*°K				
Dimensions(L*W*H)	172*126.3*73mm			197*176*94mm	
Weight(kg)	0.55	0.55	0.6	1.3	1.45
Ambient temperature range	-40 to +50°C				
Case protection	IP22				
Float charge	27.2V/54.4V				
Constant voltage charge	28.8V (28~30V settable) / 57.6V (56~60V settable)				
Low disconnect voltage	22V (20.8~22.8V settable) / 44V (41.6~45.6V settable)				
Low reconnect voltage	25.6V (24.4~26.4V settable) / 51.2V (48.8~52.8V settable)				
Grounding	Positive grounding				
Battery type	GEL, AGM, Solar battery etc.				

## 10.2 LCD series



Model	ENS12/24-20D	ENS12/24-30D	ENS12/24-40D	ENS12/24-50D	ENS12/24-60D	ENS12/24-70D	ENS12/24-80D
Normal voltage	12/24V, automatic recognition						
Nominal battery charge current	20A	30A	40A	50A	60A	70A	80A
Max. PV input power	300W@12V	450W@12V	600W@12V	750W@12V	900W@12V	1050W@12V	1200W@12V
	800W@24V	900W@24V	1200W@24V	1500W@24V	1800W@24V	2100W@24V	2400W@24V
Max. solar input voltage Voc	<48V/72V						
Min. solar input voltage Vmp	>32V/40V						
Power conversion efficiency	Max. 90%						
Standby power consumption	<15mA	<15mA	<20mA	<20mA	<20mA	<25mA	<25mA
Length=1m charge loop drop	<0.25V						
Length=1m discharge loop drop	<0.05V						
Temperature compensation	-3 mV/cell*°K						
LCD screen display	Battery voltage, PV charge current, Load discharge current, total PV charge Ah, total PV discharge Ah, the setting of constant voltage charging, the setting of low voltage disconnect, the setting of low voltage reconnect						
Buttons	MENU, LOAD(ON/OFF), UP, DOWN						
Dimensions(L*W*H)	172*126.3*73mm					197*176*84mm	
Weight(kg)	0.4	0.42	0.42	0.5	0.55	0.8	0.8
Ambient temperature range	-40 to +50°C						
Case protection	IP22						
Float charge	13.6V/27.2V						
Constant voltage charge	14.4V(14~15V settable) / 29.2V (28~30V settable)						
Low disconnect voltage	11V(10.4~11.4V settable) / 22V(20.8~22.8V settable)						
Low reconnect voltage	12.8V(12.2~13.2V settable) / 25.6V(24.4~26.4V settable)						
Grounding	Positive grounding						
Battery type	GEL, AGM, Solar battery etc.						

#### For 48V system

Model	ENS24/48-40D	ENS24/48-50D	ENS24/48-60D	ENS24/48-70D	ENS24/48-80D
Normal voltage	24/48V, automatic recognition				
Nominal battery charge current	40A	50A	60A	70A	80A
Max. PV input power	960W@24V	1200W@24V	1440W@24V	1680W@24V	1920W@24V
	1920W@48V	2400W@48V	2880W@48V	3360W@48V	3840W@48V
Max. solar input voltage Voc	<72V				
Min. solar input voltage Vmp	>40V				
Power conversion efficiency	Max. 90%				
Standby power consumption	<25mA	<25mA	<25mA	<25mA	<25mA
Length=1m charge loop drop	<0.25V				
Length=1m discharge loop drop	<0.05V				
Temperature compensation	-3 mV/cell*°K				
LCD screen display	Battery voltage, total PV charge Ah, total PV discharge Ah, the setting of constant voltage charging, the setting of low voltage disconnect, the setting of low voltage reconnect				
Buttons	MENU, LOAD(ON/OFF), UP, DOWN				
Dimensions(L*W*H)	172*126.3*73mm; 197*176*94mm				
Weight(kg)	0.55	0.55	0.6	1.3	1.45
Ambient temperature range	-40 to +50°C				
Case protection	IP22				
Float charge	27.2V/54.4V				
Constant voltage charge	28.8V (28~30V settable) / 57.6V (56~60V settable)				

Low disconnect voltage	22V (20.8~22.8V settable) / 44V (41.6~45.6V settable)
Low reconnect voltage	25.6V (24.4~26.4V settable) / 51.2V (48.8~52.8V settable)
Grounding	Positive grounding
Battery type	GEL, AGM, Solar battery etc.

## WARRANTY CARD

### 11. Warranty and service agreements

This warranty covers only manufacturing defects. The appliance must not be modified or altered in any way with regards to both form and function. This warranty does not apply in case of improper usage that falls beyond normal use as indicated in the user's manual or if there is damage caused by force majeure (e.g. natural disaster). Only clean and intact appliances will be accepted for warranty and non-warranty repair. The standard warranty period is 36 months starting from the purchase date. In order to make a warranty claim, this warranty card must be submitted along with proof of purchase, including the model number, purchase date and a dealer's stamp.

Model number: .....

Dealer's stamp and signature: .....

Date of warranty claim: .....

Defect(s) noted: .....

