



# Solar Charge Controller User Manual

Model: LMS 2430

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## Safety warning

During the process of installation and usage, please make sure to obey the following safety regulations and notes to avoid damage to controller.

- There is no maintainable part inside the controller. Users should not disassemble or repair the controller without permission.
- Before installing and adjusting the connection of controller, please make sure to disconnect the connection of photovoltaic panel and the fuse or breaker around battery terminals.
- After installation, make sure all the wire connections are reliable to avoid heat accumulation caused by virtual earth.

## 1. Product properties

The LMS 2430 intelligent solar controller is equipped with industrial-grade STM 8 microprocessor to control the charge and discharge process and has perfect and reliable battery charge and discharge period management. The charge circuit is characterized by high efficiency and low consumption by controlling the MOSFET of ultra low internal resistance controlled by PWM. This controller has multiple load control modes and is adaptable to different industries. The product can be applied to the following occasions:

- Outdoor environment monitoring system
- Automatic control system for agriculture and garden
- Solar power system
- Communication station, WIFI hotspot
- Street lighting system
- Other systems which are supplied by solar energy and have requirement for power EMI indicator

## 1.1 Specification

Items	LMS2430
System voltage	12V/24V
Maximum voltage of PV	40V
Maximum charge	30A
Maximum discharge	30A
Maximum output	12V/24V
Maximum output power	360W/720W
Charge way	3-stage PWM charge
Compatible battery	lead-acid cell
USB charge port	5V/1A
Dimension	150*85*35mm
Weight	230g

Tab1. Controller configuration

This product is a new-generation solar charge and discharge controller for lead-acid battery. The product includes but is not limited to the following functions and properties:

- LCD displayer
- Excellent heat balance design and natural air cooling
- 4-stage charge period management(EQU, Bulk, ABS, Float)
- Charging temperature compensation function. The controller can automatically adjust the charge parameters of battery by environment temperature to lengthen the service life of battery.
- Sophisticated electronic protection, including over-current protection, short-circuit protection and low-voltage protection.
- Comprehensive and reliable load control mode can identify the day and night.
- Well-designed charge loop can effectively improve the efficiency of charge and discharge, and reduce the heat consumption in charge and discharge.
- Statistics of charge volume of battery

## 1.2 Charge management

LMS 2430 intelligent solar controller contains built-in 4-stage charge management. The controller can charge the battery rapidly, effectively and safely in PWM way according to pre-set charge parameters from 0~100% impulse width. Charge process is shown in Fig1.

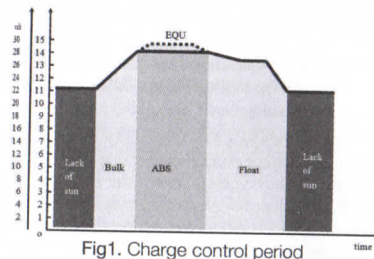


Fig1. Charge control period

### Equilibrium charge ( EQU )

This stage will be activated only when the battery recovers from over-discharge to normal charge. Similar to direct charge stage, photovoltaic panel charges the battery rapidly with full power until the battery voltage gets close to equilibrium charge. In the status of equalizing charge, continuous charging with high current and voltage will help to activate the battery and prevent the aging due to over-discharge.

### Direct charge ( Bulk )

Direct charge is also called as quick charge. During this stage, photovoltaic panel charges the battery quickly with full power. When the battery gets close to constant voltage charge stage, the charge stage is shifted to constant voltage charge.

### Constant voltage charge ( ABS )

Under constant voltage charge status, photovoltaic panel voltage will be stabilized to the regulated voltage of ABS (mean value) by PWM chopped wave in order to limit the charge rate of battery. It is beneficial to the conversion between electric energy and chemical energy in the battery and guarantees the full conversion of charge current. When offline voltage of battery is close to constant regulated voltage, the battery is fully charged.

### Floating charge ( Float )

In floating charge status, voltage of photovoltaic panel is stabilized to the regulated voltage of floating charge (mean value) to limit the charge rate of battery. This charge status is used to continuously supplement the battery and make up the energy loss caused by self discharge. In the loaded condition, voltage of floating charge also provides electric energy of photovoltaic panel for load.

Some kinds of batteries are benefited from regular equalizing charge which can stir electrolyte and balance the voltage of battery to complete chemical reaction. Equalizing charge raises battery voltage and makes it higher than standard supplemental voltage, and gasifies battery electrolyte.

It should be noted that the conversion of charge process has stages, for example, direct charge is the only way to enter constant voltage charge stage. Before the end of direct charge stage, constant voltage charge stage will not be activated. Only when battery voltage is lower than charge return voltage, controller enters into direct charge stage, and then enters into constant voltage charge stage after quitting direct charge status until the battery is finally full-charged. When battery is initially connected to controller, if voltage of battery is higher than charge return voltage, charging will not be started even though voltage of photovoltaic panel is sufficient to charge the battery.

Status of charge indicator light is shown in Tab2

Indicator light status	Charging status ( Green light )	Load status ( Red light )
OFF	Insufficient voltage of photovoltaic panel, charge process is stopped.	Load is closed
Constant ON	Ongoing constant voltage charge	Load is opened
Slow blinking	Battery is getting close to full charge and float charge ongoing.	Load is over current
Quick blinking	Ongoing direct charge or equilibrium charge	Load is short circuit

Tab 2. status of charge / load indicator light

### 1.3 Load control mode

LMS 2430 intelligent solar controller has 6 built-in load control modes which can meet most requirements of light control of solar lighting system. The 6 built-in load control modes are as follow:

- Pure light-control mode ( L mode )

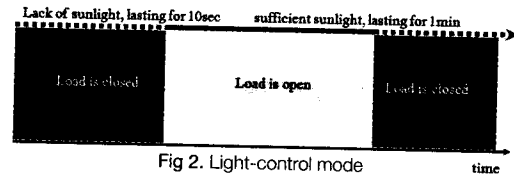


Fig 2. Light-control mode

In all related modes of light control, the controller can judge whether environment lighting is low enough to require to open the load according to the voltage of photovoltaic panel. In making the judgment, the controller must detect the voltage of photovoltaic panel lower than light-control load starting threshold for continuous 10sec. At this time, load is opened normally. When the voltage of photovoltaic panel is recovered to the value above light-control load starting threshold and remains the value for continuous 1min, the load is closed normally. The continuous threshold detection lasting for 10sec and 1min is to prevent false judgment caused by car light, lightning and other lights from circumstance.

- **Light-control & timing mode ( LT mode )**

Similar to pure light-control mode, the controller judges whether current ambient brightness needs to open the load according to the voltage of photovoltaic panel. What is different is that after load is opened, even though the voltage of photovoltaic panel is lower than the load-closing threshold within 1 ~ 13h timing period, the controller will still shut down the load by timing and restart the load again at dark.

- **3 light-control stages ( 3L mode )**

Similar to pure light control mode, the controller judges whether it is necessary to open or close the load under current ambient brightness according to the voltage of photovoltaic panel. The controller controls load output by 100%, 50% and 30% PWM to lengthen the opening duration of load in 3 time sections.

- **Manual mode ( H mode )**

In manual mode, the opening or closing of load is manually controlled by ▲ button.

- **Normal open mode ( 24H mode )**

In normal open mode, load will be output continuously, which is the so called 24h working mode.

- **Charge mode ( CH mode )**

Load control takes no effect in this mode. That means controller only activates battery charge function and load is closed.

## 2. Installation instruction

LMS 2430 intelligent solar controller will elevate its own temperature during operation. It is a must to mount it to the surface made of non-flammable materials. Installation on large-sized metal piece is more beneficial to heat dissipation. Please follow the steps below in installation:

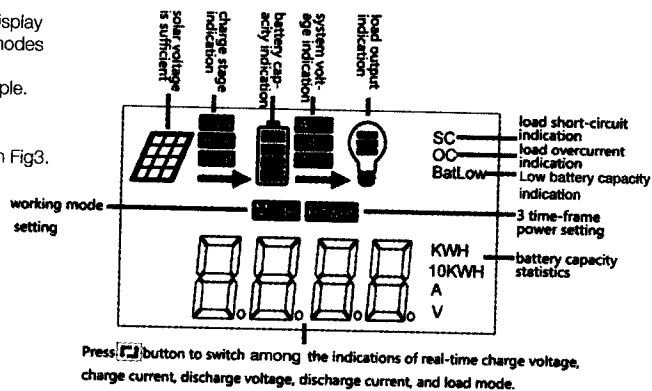
- Though the controller has inverse connection protection function, it is better to avoid the inverse connection of photovoltaic panel in engineered installation.
- Connection should be strong and reliable. Contact area of connector should be large enough to prevent virtual connection and heat accumulation caused by oxidation at connection area.

## 3. Operation and interface instruction

Controller is equipped with a LCD display and can be conveniently switched modes and parameter configuration and so on. Operation is convenient and simple.

### 3.1 LCD instruction

LCD display description, as shown in Fig3.



Press [ ] button to switch among the indications of real-time charge voltage, charge current, discharge voltage, discharge current, and load mode.

Fig 3. LCD display description

### 3.2 Start-up interface

After being powered on, the controller will detect battery voltage and display the model, for example, 1210, as shown in Fig4.



Fig 4. start-up interface

### 3.3 Main interface

Displayed contents of main interface include battery voltage, voltage of photovoltaic panel, charge current and load output current. Press [ ] button to switch among the contents as shown in Fig5, Fig6, Fig7, Fig8, Fig9, Fig10.



Fig 5. battery voltage

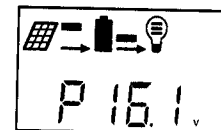


Fig 6. PV voltage

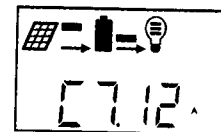


Fig 7. charge current

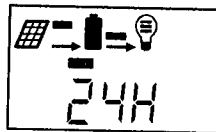


Fig 8. Load control mode

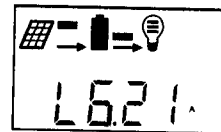


Fig 9. load output current

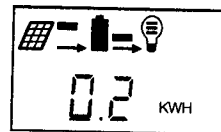






Fig 10. Charge energy

### 3.4 Controller setting

Hold on the button  until LCD has display as shown in Fig 11. When "Mode" logo blinks with the frequency of 1sec, it indicates that controller has entered into load control mode setting interface. The settable parameters of controller include load control mode, light-control timing, 3 time section duration setting, 3 time section power percentage, battery low-voltage protection value, battery low-voltage return value, battery over-voltage value, and so on. Users can switch different setting items by function button. If no setting is made in setting mode within 20sec, the controller will automatically return to main interface.

#### • Load control mode setting

The first setting item after the controller entering into setting mode is load control mode as shown in Fig11. Press   button to select one load control mode among 24H ( normal open mode ), CH ( charge mode ), H ( manual mode ), L ( pure light-control mode ), LT ( light-control & timing mode ) and 3L ( 3 light-control stages ). When load control mode is set as H mode, press  button to open and close the load.

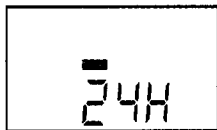


Fig 11. load control mode setting

#### • Light-control & timing setting

When load control mode of controller is set as LT( light-control & timing mode ), press  button to select mode until LCD displays image as shown in Fig12. And then press   button to adjust the duration to the range of 1~13h.



Fig 12. light-control & timing mode setting

#### • 3 time section duration setting


When load control mode of controller is set as 3L ( 3 time section duration mode ), press  button to select mode until LCD displays image as shown in Fig13 and Fig14 to set the duration of the first and second time section, and then press upward and downward button to adjust duration within the range of 0~13h. If duration is set as 0, it indicates invalid time duration. The third time duration will be set by the controller by the formula: night duration-first time duration-second time duration.



Fig 13.  
first time section duration setting

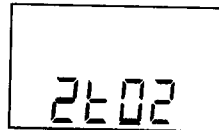



Fig 14.  
second time section duration setting

#### • 3 time section power percentage setting

When load control mode of controller is set as 3L ( 3 time section duration mode ), press  button to select mode until LCD displays image as shown in Fig15, Fig16 and Fig17 to adjust power percentage of 3 time sections within the range of 1~100%.

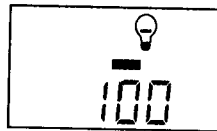


Fig 15.  
first time section power setting



Fig 16.  
second time section power setting



Fig 17.  
third time section power setting

#### • Battery low-voltage protection value setting

Battery low-voltage protection value setting is shown in Fig18 and the range is shown in Tab3.



Fig 18. battery low voltage protection value setting

Voltage parameter	12V	24V	48V	Remark
Over	14.6V 14.4V~16.8V	29.2V 28.8V~ 33.6V	58.4V 57.6V~ 67.2V	Maximum charge voltage
ChRet	13.2V	26.4V	52.8V	Charge return voltage. When battery voltage is lower than this set value, controller will enter Direct charge.
EQU	14.4V	28.8V	57.6V	Equilibrium charge
Bulk	14.0V	28.0V	56.0V	Direct-charge
ABS	14.2V	28.4V	56.8V	Voltage of constant voltage charge
Float	13.8V	27.6V	55.2V	Floating voltage
Close	11.0V 10.0V~12.0V	22.0V 20.0V~24.0V	44.0V 40.0V~48.0V	Low-voltage protection voltage. When battery voltage is lower than this set value, controller closes the load and enters into protection status.
ClsRet	12.4V 10.8V~12.6V	24.8V 21.6V~25.2V	49.6V 43.2V~50.4V	Low-voltage return voltage. After entering into low-voltage protection, battery voltage will resume this set value and open the load again.

Coeff	- 0.021V	- 0.042V	- 0.084V	Single battery temperature compensation voltage range: -3.5mV ~ -0.5mV
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Tab 3. Battery voltage parameters

• **Battery low-voltage return value setting**

Battery low-voltage return value setting is shown in Fig19 and the range is shown in Tab3. To prevent the fluctuation of load at opening and closing, low-voltage protection value and low-voltage return value must have at least 0.2V voltage difference.



Fig 19. battery low voltage return value setting

• **Battery over-voltage value setting**

Battery over-voltage value setting is shown in Fig20 and the range is shown in Tab3.



Fig 20. battery over voltage setting

## 4. Troubleshooting and maintenance

If the following abnormal situations happen in use, please check Tab4.

If technical support is required, please record malfunction phenomenon and panel indicator light status, and then contact us.

Abnormal phenomenon	Possible cause	Solution
Though there is sufficient sunshine, charge indicator light is off.	photovoltaic panel is disconnected or connected inversely.	Check if photovoltaic panel is intact and polarity is correct.
Load indicator light blinks slowly.	Load is over-current.	Check if the load is normal.
Load indicator light blinks quickly.	Load is in short circuit.	Check if the load is normal or connection is in short circuit.
When load is closed, it shows sufficient energy; When load is opened, it enters low-voltage protection mode.	Bad connection of battery or wire diameter is too small.	Check connection wire of battery or replace it with wire in thicker diameter.
It shows full charge soon after charge process is started.	Over voltage or over-current of charge	Check if maximum charge current setting fits the maximum charge current of battery. If necessary, modify charge correcting voltage to lower down charge voltage.

Tab 4. Faults and Solutions

## 5. Technical parameters

### 5.1 Voltage and threshold parameters of battery

Voltage parameters are shown in Tab3. Threshold parameters are shown in Tab5.

Parameters	LMS2430
Light-control start threshold ( PV )	5V/10V
Light-control start delay	10S
Light-control termination delay	60S
Load over-current threshold	39A

Tab 5. Threshold parameters

### 5.2 Environmental parameter

Work and storage environment temperature range: -35°C ~ +60°C.