

DM200 Series User Manual

| Models | Applications |
|---------|------------------------------------------------------------------------------------------------------|
| DM200 | All-in-one constant current MPPT charge controller |
| DM200-U | All-in-one constant current MPPT charge controller with IoT function (built-in communication module) |
| DM200-C | All-in-one constant current MPPT charge controller with IoT function (external communication module) |

Version : V1.01
The above information is subject to change without prior notice.

1. Overview

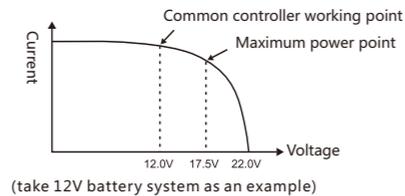
SR-DM200 series waterproof all-in-one constant current MPPT charge controller integrates MPPT solar charging management, LED step-up constant current drive, remote networking communication and other functions, ideal for lead-acid battery/lithium battery / gel battery etc. With high reliability, high efficiency, high precision and ease of installation and maintenance, it has found wide applications in solar street lights, solar garden lights, etc.

Features:

- ◆ MPPT technology, tracking efficiency up to 99.5%, charging conversion efficiency up to 96%;
- ◆ Applicable to both lead-acid battery and lithium battery, operating parameters can be set by remote control;
- ◆ Very low sleep current, more energy efficient and convenient for long distance transportation and storage;
- ◆ Lead-acid battery constant voltage charging with multi-stage temperature compensation;
- ◆ 10-period programmable load power/time control;
- ◆ Battery charge and discharge high and low temperature protection, with working temperature settable;
- ◆ Multiple intelligent power modes are available for selection, and load power can be adjusted automatically according to the battery level;
- ◆ High-precision digital step-up constant current control algorithm ensures high efficiency and high constant current accuracy;
- ◆ Infrared wireless communication allows for parameters setting/reading, status reading, etc.;
- ◆ Multiple protections including battery/PV polarity reverse protection, LED short circuit/open circuit/limited power protection and more;
- ◆ Extensible to provide IoT remote communication monitoring function (-U/-C series);
- ◆ All aluminum housing with up to IP68 waterproof rating meets the requirements of use in a variety of harsh environments

2. Instructions for Use

2.1 MPPT charging introduction:



MPPT (Maximum Power Point Tracking) is an advanced charging method. The MPPT controller detects the generation power of solar panel in real time and tracks the highest voltage and current value (V_I), allowing the system to charge the battery with maximum efficiency. Compared to traditional PWM controller, the MPPT controller can maximize the power of solar panel and thus can provide a larger charging current. In general, the MPPT controller can improve the energy utilization by 15% -20% compared with the PWM controller.

Peak voltage (V_{pp}) of the solar panel is about 17V, while the battery voltage is about 12V. In general, when the controller is charging the battery, the voltage of solar panel is about 12V and does not fully reach its maximum power. But, MPPT controller can overcome this problem. It constantly adjusts the input voltage and current of the solar panel to achieve the maximum input power.

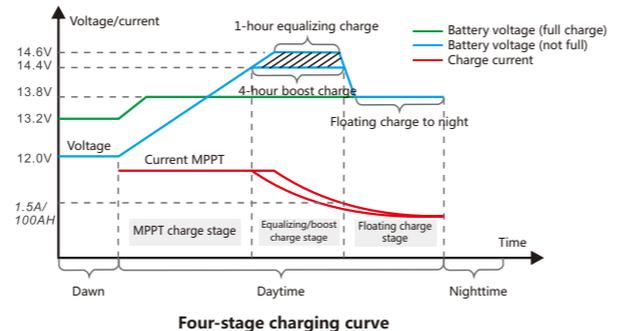
Also, the maximum power point often changes due to different ambient temperature and lighting conditions. The MPPT controller adjusts the parameters from time to time according to different conditions, so that the system is always near the maximum operating point.

MPPT cannot be used alone as a stage of charging. It is usually used to combine boost charge, floating charge, equalizing charge and other charging methods to charge the battery.

When the controller starts working, it will make a judgment of the battery voltage. If the battery voltage is higher than 13.2 V (x2 / 24V), the controller will consider that the battery is fully charged and will directly enter the floating charge stage without equalizing charge or boost charge.

When the initial charging voltage of the battery is lower than 13.2V (x2 / 24V), the charging process is:

MPPT charge – boost charge (equalizing charge) – floating charge, where the equalizing charge interval is 30 days.



2.2 Sleep and wake-up:

Enter sleep:

Press the [OFF] button on the CU remote control or mini remote control. The controller will turn off all external control devices, and then enters the sleep state of very low power consumption, to avoid the lithium battery feed caused by not use for a long time;

Wake up from sleep:

1. Press the [ON] button on the CU remote control or mini remote control to wake up the controller in a sleep state and turn it back to normal work;

2. PV wakeup :

A. If the option [Yes] is selected for the [PV wakeup] function, the controller entering sleep mode, as connected to a PV panel, will be awakened in the daytime to charge the battery for more than 30 minutes when the charging conditions are met. The load will be automatically turned on at night. If the charging time is less than 30 minutes, the lights will not light up at night, and the controller will continue to sleep;

B. If the option [No] is selected for the [PV wakeup] function, the controller entering sleep mode, as connected to a PV panel, will be awakened in the daytime to charge the battery when the charging conditions are met. But at night, the controller will continue to sleep. (Note: [PV wakeup] function can be selected by CU remote control)

| Wake-up method | Controller status | | | |
|-----------------|-------------------|--------------------------|--------------------------------|--------------------------------------------------------------------------|
| | Sleep | Wakeup | Charge | Discharge |
| CU-ALL5 | OFF button | ON button | -- | -- |
| CU-mini2 | OFF button | ON button | -- | -- |
| PV Wakeup [Yes] | -- | PV charging for 1 minute | Normal charging in the daytime | If charged for 30 minutes in the daytime, battery can discharge at night |
| PV Wakeup [No] | -- | PV charging for 1 minute | Normal charging in the daytime | Battery does not discharge at night, controller continues to sleep |

2.3 Indicator and remote control status:

DM200 CONTROLLER HAS THREE RED INDICATORS

Three red indicators:

| Indicators | Status | Descriptions | Remote control system status |
|----------------|-------------|-----------------------------------------------------------------------|------------------------------|
| PV indicator | Steady on | Solar panel voltage is higher than light control voltage | Free |
| | Off | Solar panel voltage is lower than light control voltage | Free |
| | Slow flash | In charging | Charging |
| BAT indicator | Steady on | Battery works properly | Free |
| | Off | Battery is not connected or lithium battery over discharge protection | Over discharge |
| LOAD indicator | Steady on | Load is turned on | Discharge |
| | Off | Load is turned off | Free |
| | Slow flash | Load open circuit | Open circuit |
| | Quick flash | Load short circuit | Short circuit |

2.4 Intelligent power:

The SR-DM200 controller can select an appropriate intelligent power mode according to the actual battery capacity, the number of rainy days and other factors. Specific intelligent power modes include: High, Medium, Low, Auto, USE (custom), No (off).

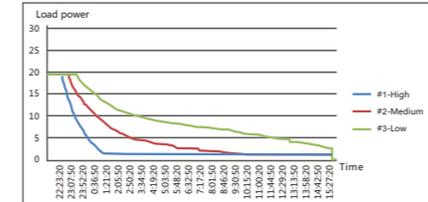
Intelligent power modes:

High - The battery capacity at the starting point of power reduction is high, and the load lighting time is the longest. This mode is suitable for use in areas with more rainy days or poor lighting conditions;

Medium - The battery capacity at the starting point of power reduction is moderate, and the load lighting time is moderate. This mode is suitable for use in scenarios where both brightness and the number of rainy days are required to be considered;

Low - The battery capacity at the starting point of power reduction is low, and the load lighting time is the shortest. This mode is suitable for use in scenarios where lighting effect is highly required;

Intelligent power curve



Intelligent power experiment data

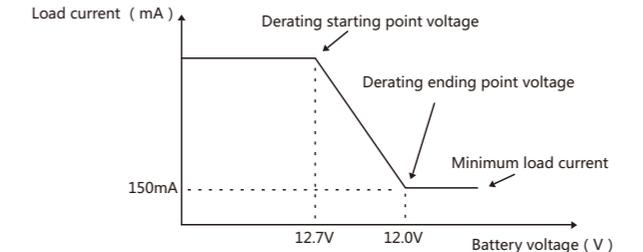
| Comparison of intelligent power consumption and the number of rainy days | | |
|--------------------------------------------------------------------------|---------------------------|-----------------------------------|
| Intelligent power mode | Power consumption per day | Number of continuous working days |
| No | 100% | 1 |
| Low | 50% | 2 |
| Medium | 25% | 4 |
| High | 15% | 6 |

Test descriptions:
1. The test battery is fully charged, and loads are consistent in the maximum power and working time.
2. Assume that the power consumption is 100% when intelligent power mode is turned off.
3. Test result is the data obtained under a single condition (the charge amount is 0 per day).
Actual use may be different from the test condition, and the test result is for reference only.

Auto - High/medium/low intelligent power mode is automatically selected according to the parameters such as charge amount and power consumption on the day;

For example, in summer, more charge amount is needed, so the controller will run in the intelligent power mode - low, and lighting effect is better; in winter, however, less charge amount is needed, so the controller will run in the intelligent power mode - high, and the load works in a power saving mode, and can keep working in more rainy days.

USE (User-defined) - The user defines the voltage at the starting point of intelligent power derating, the voltage at the ending point of power derating and the minimum load current value;



No (Off) —The intelligent power is turned off, and the load power is output according to set time period.

2.5 Remote control operation:

2.5.1. Remote control CU-ALL5:

The communication between the controller and the handheld remote control CU-ALL5 can be operated wirelessly or by IR. Press the [+] and [-] buttons on the remote control to select a [Remote Control Type] (Infrared/Wireless) for remote operations. In actual use, the infrared remote control signal is easy to attenuate under outdoor strong light, so the remote communication distance is 5-6m, and the remote communication distance at night is 8-10m; the wireless remote control signal can penetrate the plastic housing or aluminum housing, and the wireless remote control distance can be adjusted in 0.3m to 20m.

Specific [Parameter settings] and [Run status] of remote control are as follows:

Parameter settings:

| Items | Default | Range |
|-------------------------------|-------------------------------|----------------------------------|
| Battery type | Lead | Lead / lithium 12V / lithium 24V |
| Sensing delay | No | No |
| PV wakeup | Yes | No/Yes |
| Light control voltage | 5V | 3V-11V |
| Light control delay | 10s | 5s-60min |
| Over discharge voltage | 11.0V | 9.00V-17.0V |
| Over discharge return voltage | 12.6V | 9.00V-17.0V |
| Boost charge voltage | 14.4V | 9.00V-17.0V |
| Floating charge voltage | 13.8V | 9.00V-17.0V |
| Low temperature charge | -35°C | -35°C-0°C |
| High temperature working | 65°C | 40°C-90°C |
| Load current | 0.33A | 0.15A-7.0A |
| Intelligent power | Medium | No/High/Medium/Low/Auto/**USE |
| *Derating start | 12.4V | 9.00V-17.0V |
| *Derating end | 11.4V | 9.00V-17.0V |
| *Minimum current | 0.15A | 0.05A-1.00A |
| Load parameter setting | Nth period of time | 00:00-15:00 |
| | Power with person detected | 0%-100% |
| | Power without person detected | 0%-100% |
| Reset | Yes | No/Yes |

Load parameter setting default value

| Period | H/M | Power |
|-----------------|-------|-------|
| 1 | 00:30 | 50% |
| 2 | 00:30 | 70% |
| 3 | 02:00 | 100% |
| 4 | 00:30 | 70% |
| 5 | 00:30 | 50% |
| 6 | 04:00 | 30% |
| 7 | 00:00 | 0% |
| 8 | | |
| 9 | | |
| Preddawn period | | |

Status data:

Press the [Status] button on the remote control at any interface to read the [Run Status] data of the controller;
Press and hold the [Status] button on the remote control at any interface to enter the [Status Data] submenu, where you can choose to read [Run Status] / [History Data]. After selecting the [Run Status] or [History Data], press the [Status] button to read corresponding status data.

Run Status:

| Status | Instance | Status value description |
|-----------------------------------|-----------|-----------------------------------------------------------------------------|
| System status | Discharge | Current run status: discharge / charge / idle / full / over discharge, etc. |
| Battery voltage | 12.3V | Current battery voltage |
| PV voltage | 17.6V | Current PV panel voltage |
| Charge current | 0.0A | Current charge current |
| Charge power | 0.0W | Current charge power |
| Charge AH | 0.01AH | Charge AH in the daytime |
| Load voltage | 27.1V | Current load voltage |
| Load current | 1.00A | Current load current |
| Load power | 27.2W | Current load power |
| Lighting-up time | 05:20 | Total lighting-up time of loads in the nighttime |
| Sensing time | 01:10 | The lighting-up time of loads in the nighttime with person sensed |
| Discharge AH | 2.05AH | Discharge AH in the nighttime |
| Ambient temperature | 23°C | Current internal temperature |
| Running days | 15D | Cumulative running days |
| Number of times of over discharge | 2N | Total number of times of lithium battery over discharge |
| Number of times of full charge | 10N | Total number of times of lithium battery full charge |
| Production Date | 1810 | Production date of controller |
| Software version | 1000 | Software version number of controller |

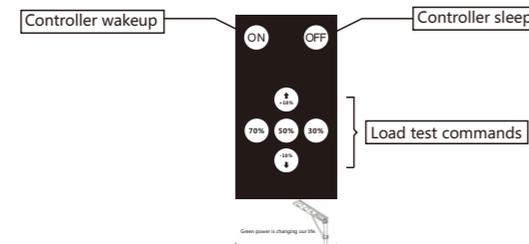
History Data:

The controller can read the running data of controller in the past 30 days through the remote control, and the number of days to read can be selected.

| Status | Instance | Status value description |
|---------------------|----------|-----------------------------------------------|
| --->Past N days<--- | | Number of days can be selected, N= 0-30 |
| Minimum voltage | 11.2V | The minimum voltage of battery before N days |
| Maximum voltage | 14.2V | The maximum voltage of battery before N days |
| Maximum temperature | 38°C | The maximum ambient temperature before N days |
| Minimum temperature | 23°C | The minimum ambient temperature before N days |
| Charge power | 205W | The maximum charge power before N days |
| Lighting-up time | 07:10 | Night lighting-up time before N days |
| Charge AH | 55AH | Total charge AH before N days |
| Discharge AH | 49AH | Total discharge AH before N days |
| Charge WH | 408WH | Total charge WH before N days |
| Discharge WH | 350WH | Total discharge WH before N days |

2.5.2 Remote control CU-mini2: (Optional)

The small remote control CU-mini2 is used for power on/off and testing.



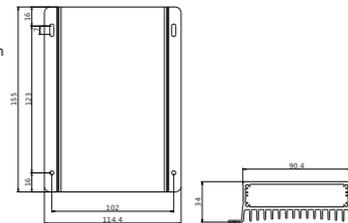
A total of 7 buttons: [ON], [OFF], [70%], [50%], [30%], [+10%], [-10%]; button icons and descriptions are as follows:

| Icon | Description |
|------|-------------------------------------------------------------------------------------------------|
| | Controller is awakened from sleep mode |
| | Controller enters a low power sleep mode |
| | Controller runs for 1 minute at 70% of the set load current |
| | Controller runs for 1 minute at 50% of the set load current |
| | Controller runs for 1 minute at 30% of the set load current |
| | Each time you press it, the test current increases by 10% and the controller runs for 1 minute. |
| | Each time you press it, the test current decreases by 10% and the controller runs for 1 minute. |

2.6 Installation method:

Installation method and size:

Controller dimensions are as follows:
Outline dimensions: 155*114.4*34mm
Installation size: 102*123mm
Hole diameter: φ3.5mm
Controller dimensions diagram:



3. Technical Parameters

| Items | Values | | Adjus table | Default |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|-----------|
| | DM200 | DM200-U | | |
| Models | DM200 | DM200-U | DM200-C | |
| Controller type | All-in-one constant current MPPT charge controller with IoT function | | | |
| System voltage | 12V/24V | | | Lead acid |
| Static power consumption | ≤10mA/12V; ≤5mA/24V | | | |
| Sleep power consumption | ≤1 mA | | | |
| Load current | 150mA ~ 7000mA | | | √ 330mA |
| Load voltage | 15V ~ 75V | | | |
| Max. load power | 100W/12V ; 200W/24V | | | |
| Load conversion efficiency | 98% (Typical efficiency: 85%-98%) | | | |
| Load current accuracy | ±3% | | | |
| Intelligent power | High / Medium / Low / Auto / Custom / No | | | √ Medium |
| Load working period | 9 periods + pre-dawn working period | | | |
| Period adjustment range | 1min. / 10min. | | | |
| Power adjustment range | 1% / 10% | | | |
| Max. solar input power | 260W/12V ; 520W/24V | | | |
| Max. charge current | 20A | | | |
| Max. solar input voltage | 95V (at minimum temperature); 92V (at standard 25° C) | | | |
| Overvoltage | Pb-16.0V; Li- Overcharge voltage +2V ; ×2.24V system | | | 16.0V |
| Charging limit voltage | Pb-15.5V; Li- Overcharge voltage +1V ; ×2.24V system | | | 15.5V |
| Equalizing charge voltage | Pb-14.6V ; Li- none ; ×2.24V system | | | 14.6V |
| Equalizing charge interval | 30 days | | | 30D |
| Boost charge voltage (Lead-acid) | 8.5V ~ 17.0V; ×2.24V system | | | √ 14.4V |
| Charge voltage (lithium battery) | | | | |
| Floating charge voltage (Lead-acid) | 8.5V ~ 17.0V; ×2.24V system | | | √ 13.8V |
| Charge return voltage (lithium battery) | | | | |
| Over discharge voltage | 8.5V ~ 17.0V; ×2.24V system | | | √ 11.0V |
| Over discharge return voltage | 8.5V ~ 17.0V; ×2.24V system | | | √ 12.5V |
| Temperature compensation coefficient | Pb: -3.0mV/°C/2V; (Lithium battery without temperature compensation) | | | |
| Light control voltage | 3V ~ 11V; ×2.24V system | | | √ 5V |
| Light control delay | 0s ~ 60s/2min ~ 60min | | | √ 10S |
| High temperature working | 40°C ~ +90°C | | | √ 65°C |
| Low temperature charging | 0°C ~ -35°C | | | √ -35°C |
| Operating temperature | -35°C ~ +65°C | | | |
| IP rating | IP68 | | | |
| Protections | Battery polarity reverse protection, solar panel polarity reverse protection, solar panel overvoltage protection, lithium battery overcharge and over discharge protection, lithium battery BMS overcharge detection protection, over temperature protection, load open circuit and short circuit protection, load overcurrent protection, etc. | | | |
| Weight | 770g | | | |
| Controller dimensions | 155*114.4*34mm | | | |
| Controller installation size | 102*123mm | | | |
| Installation hole diameter | φ3.5 | | | |

4. Protections

● **Waterproofing protection**
Rating: IP67

● **Lithium battery BMS overcharge detection protection**
When the controller detects a BMS overcharge protection, it stops charging immediately, preventing the high voltage of PV panel from being applied to both ends of the BMS for a long time, which may cause damage of the battery.

● **Lithium battery low temperature charge protection**

When ambient temperature drops to the set value, the controller stops charging to protect the lithium battery from an irreversible damage caused by low temperature.

● **High temperature protection**

When ambient temperature is above the set value, the controller stops charging and discharging to protect the lithium battery from being damaged by excessive temperature.

● **Battery reverse polarity protection**

When the battery polarity is reversed, the system will not work but it will not burn out the controller.

● **PV input end over voltage protection**

When the voltage at the PV input end is too high, the controller will automatically shut off PV input.

● **PV input end short circuit protection**

When the voltage at the PV array input end is short circuited, the controller will turn off charging; after short circuit is removed, charging will automatically recover.

● **PV input reverse polarity protection**

When the polarity of PV array is reversed, the controller will not be damaged, and normal operation will continue after wiring error is corrected.

● **Load power limit protection**

When the power of LED lights that customer uses is too large, or the load current is adjusted to be too large, the controller will limit the load power output to less than the rated value, to ensure that the controller and LED load will not be damaged.

● **Load overload and short circuit protection**

When the number of connected LEDs in series is insufficient (3 or less), the controller will stop output immediately to protect LED loads or controller from damage;

When a short circuit occurs, the controller immediately turns off load output to prevent control damage. After the load short-circuit condition is removed, controller output automatically restores within 1 minute (if it is short-circuited for a long time, output will automatically restore once every 1 hour), or press and hold the test button on the remote control (CU or mini2) for 10S to automatically restore output.

● **Load open-circuit protection**

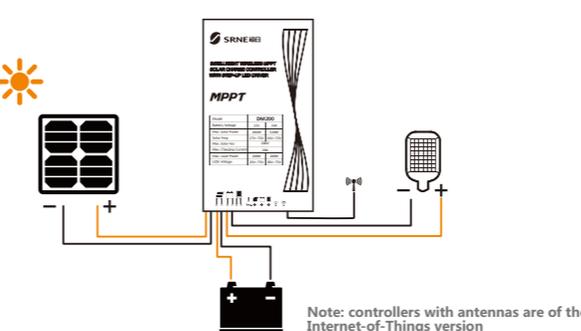
If wiring is suddenly disconnected while the LED load is normally running, the controller can immediately turn off load output and protect the controller from damage. After the load wiring is restored, the controller will automatically restore load output within 10 seconds (if the circuit is open for a long time, it will automatically restore output once every 1 hour), or press and hold the test button on the remote control (CU or mini2) for 10S to automatically restore output.

● **Night reverse charging protection**

Prevent battery discharge through the solar panel at night.

● **TVS lightning protection**

5. Electrical Wiring Diagram



1. Wiring sequence: Firstly connect the load, then the battery and finally the solar panel.

6. Common Exceptions and Handling Methods

| No. | Exceptions | Problems | Handling methods |
|-----|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Remote control cannot work | A. Remote control password is incorrect B. Remote control working mode (infrared or wireless) is not selected properly C. Wireless remote control distance is set too short D. Remote control battery is low | B1. Press the "+" and "-" buttons at the same time to enter the (Remote Control Settings) interface and set a correct password. B2. Press the "+" and "-" buttons at the same time to enter the (Remote Control Settings) interface, and then select [Infrared Remote Control] or [Wireless Remote Control]. C1. Press the "+" and "-" buttons at the same time to enter the (Remote Control Settings) interface, and then increase the (Remote Control Distance) before testing. D1. Replace 2 AA (No. 5) batteries |
| 2 | The controller has no response after connected to the battery. Indicator does not light up and the remote control has no response. | A. There is a problem with battery power supply B. The controller is in sleep mode | A1. Check if battery wiring is intact. A2. Check if there is voltage on the battery and if the protection board is working. If there is no voltage on the battery, it indicates that the protection board has protected, and the battery can be charged to activate. B1. Press the "ON" button on the remote control to activate the controller. B2. Connect the solar panel to charge the battery. |
| 3 | Charge is normal in the daytime, but the load does not light up at night, and the LED indicator on the controller does not light up. | A. The controller is in sleep state | A1. Press the "ON" button on the remote control to activate the controller. A2. Select «PV Wakeup» as Yes, and the controller will be automatically activated if charged in the daytime. |
| 4 | The battery indicator flashes quickly and the load LED does not light up. | A. The battery is low | A1. Check if the solar panel is charging properly and if the solar panel is covered. A2. Check if the wiring between battery and solar panel wiring is disconnected or loose. |
| 5 | Load lighting-up time is short | A. The battery is low B. The load power is too large | A1. Check if the solar panel for proper charging and correct configuration. A2. Check if the lithium battery has a single-cell protection. A3. Open the "Intelligent Power" option B1. Check if the controller current is properly set and if the load power is right. |
| 6 | Load lighting-up current does not reach the set value | A. Intelligent power regulation of load current B. LED power exceeds rated value | A1. Turn "Intelligent Power" off and test load current again B1. Lower the set value or replace the lamp with less number of LEDs in series. |
| 7 | Load indicator flashes and load LED does not light up. | A. Load open circuit B. LED load wiring is shorted or the number of LEDs in series is less | A1. Check if load wiring is correct, and if the LED positive and negative poles are reversed. B1. Check if there is a short circuit in the load wiring, and if the LED positive and negative poles are reversed. B2. Check if the LED string is correct, and replace the lamp with appropriate number of LEDs in series and parallel. |
| 8 | LED load cannot be dimmed | A. There is a problem with the number of LEDs in series; a 3-LED (in series) or step-down lamp is used | A1. Replace a step-up (more than 5 LEDs in series) lamp |
| 9 | LED load lights up in the daytime or only lights up for one night | A. The solar panel is not connected B. The solar panel polarity is reversed | A1. Check if the solar panel is connected properly and the wiring is reliable. B1. Reverse the solar panel wiring in the daytime to see if the charging indicator flashes. |
| 10 | Charging indicator does not flash slowly during charging when there is sunlight in the daytime. | A. Solar panel fault or wiring error. | A1. Check if the solar panel wiring is correct and reliable, and if the solar panel is covered. |
| 11 | LED load does not light up and the battery indicator is steady on. | A. The voltage of solar panel is not lower than the light control voltage or the delay time is not up. B. The controller runs out of time | A1. Wait for reduction of solar panel voltage, and then, LED load automatically lights up B1. Controller recharge reset timer |
| 12 | Charging indicator flashes quickly and there is no charging current. | A. Lithium battery BMS overcharge protection | A1. Please wait, when the lithium battery voltage lowers to the overcharge return voltage, charging automatically restores. |