

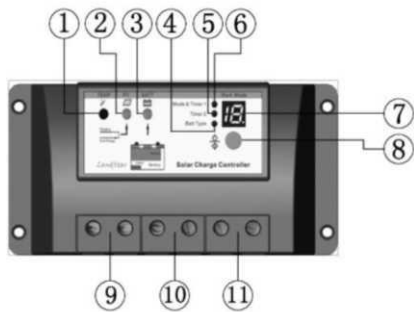
INSTRUCTION MANUAL

LS1024R / LS1524R / LS2024R

Solar Light Controller

Specification Summary

- Nominal system voltage 12 / 24VDC*
- Maximum PV input voltage 50V
- Nominal charge / discharge current
 - LS1024R 10A
 - LS1524R 15A
 - LS2024R 20A



General Information

Product Feature

1-Temperature Sensor

Measure ambient temperature and make temperature compensation for charging and discharging.

2— Charging status LED indicator

An LED indicator that shows charging status and also indicates when a solar input fault condition exists

3— Battery status LED indicator

An LED indicator that shows battery status

4— Battery type setting indicator

The indicator will be on when select battery type.

5— Timer 2 setting indicator

The indicator will be on when set timer 2.

6— Timer 1 setting indicator

The indicator will be on when set timer 1.

7—LED digital display

Display the load work mode and status

8—Setting button (in manual mode used for load ON/OFF) Set load work mode and select battery type.

9-Solar Module Terminals Connect solar modules.

10-Battery Terminals Connect batteries.

11-Load Terminals Connect loads.

Wiring



NOTE: A recommended connection order has been provided for maximum safety during installation.



NOTE: The controller is a common positive ground controller.



CAUTION: Don't connect the loads with surge power exceeding the ratings of the controller.



CAUTION: For mobile applications, be sure to secure all wiring. Use cable clamps to prevent cables from swaying when the vehicle is in motion. Unsecured cables create loose and resistive connections which may lead to excessive heating and/or fire.



Step1: Battery Wiring



WARNING: Risk of explosion or fire! Never short circuit battery positive (+) and negative (-) or cables

Before battery is connected, make sure that battery voltage is greater than 6V so as to start up the controller. If system is 24V, make sure battery voltage is not less than 18V. System voltage can only be automatically recognized when controller start up for the first time.

When install fuse, make sure that the biggest distance between the fuse holder and the positive terminal of battery is 150mm. **Do not insert a fuse at this time.**

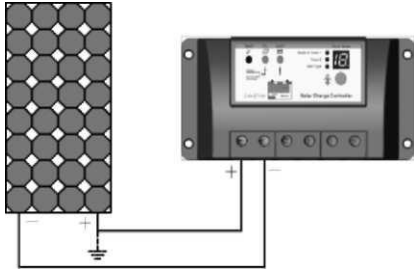
Step 2: Load Wiring

The controller loads can be connected to such electrical equipments as lights, pumps, motors and others. Controller offers power to loads through the battery voltage.

Step 3: Solar wiring

WARNING: Risk of electric shock! Exercise caution when handling solar wiring. The solar module(s) high voltage output can cause severe shock or injury. Cover the solar module(s) from the sun before installing solar wiring.

The controller can accept 12V, 24V nominal off-grid solar module(s). Grid-tie solar module(s) may be used if the open circuit voltage of solar module doesn't exceed the Maximum PV input voltage of the controller. The solar module(s) work voltage must be equal to or greater than the system voltage.



Solar Module

Step 4: Confirm Wiring

Double-check the wiring in step 1 through 3. Confirm correct polarity at each connection. Verify that all six terminals are tightened.

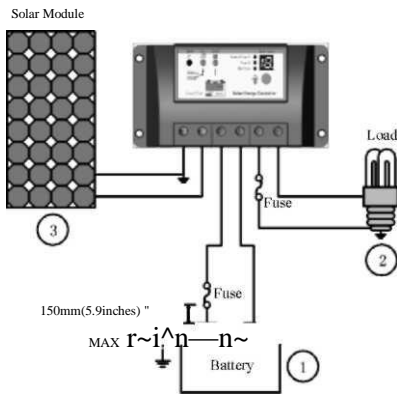


Figure 3-5 System wiring review

Step 5: Install Fuse

Install a suitable fuse in each fuse holder in the following order:

1. Battery circuit
2. Load circuit

Step 6: Confirm power on

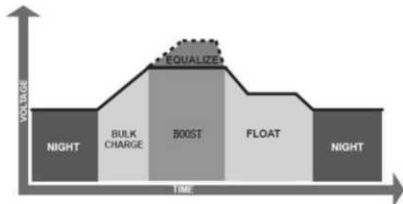
When battery power is applied and the controller starts up, the battery LED indicator will be green. If the controller doesn't start up, or the battery status LED error exists, please refer to section 5 for troubleshooting.

Operation

PWM Technology (Series Pulse Width Modulation)

The controller adopts the advanced series pulse width modulation. With range of 0-100%, it can charge the battery quickly and stably under any condition of solar photovoltaic system. The operating principle of PWM charging mode is as follows: The battery is firstly charged with pulse current and recharged after it stops charging for a while. It is repeated in this way for several times till the battery is fully charged. Intermissions allow some oxygen and hydrogen generated by chemical reaction can be chemically combined again and then absorbed, which can eliminate concentration polarization and ohm polarization naturally, and reduce the internal pressure of the battery. Consequently, it makes next charging smooth and the more power is charged to the battery. Intermittent pulse current charging mode makes battery have more time to react, which reduces the gassing volume and makes battery improve the acceptance rate of charging current.

Battery Charging Information



PWM Charging mode

•Bulk Charge

In this stage, the battery voltage has not yet reached boost voltage and 100% of available solar power is used to charge the battery.

•Boost Charge

When the battery has recharged to the Boost voltage setpoint, constant-voltage regulation is used to prevent heating and excessive battery gassing. The Boost stage remains 120 minutes and then goes to Float Charge.

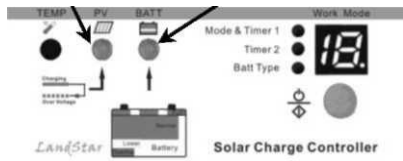
•Float Charge

After the battery is fully charged in Boost voltage stage, the controller reduces the battery voltage to Float voltage set point. When the battery is fully recharged, there will be no more chemical reactions and all the charge current transmits into heat and gas at this time. Then the controller reduces the voltage to the floating stage, charging with a smaller voltage and current. It will reduce the temperature of battery and prevent the gassing, also charging the battery slightly at the same time. The purpose of Float stage is to offset the power consumption

caused by self consumption and small loads in the whole system, while maintaining full battery storage capacity. In Float stage, loads can continue to draw power from the battery. In the event that the system load(s) exceed the solar charge current, the controller will no longer be able to maintain the battery at the Float setpoint. Should the battery voltage remains below the Boost setpoint, the controller will exit Float stage and return to Bulk charge.

LED Indicators

Charging Status LED indicator Battery Status LED indicator



LED indicators

• Charging status indicator

GREEN ON whenever sunlight is available for battery charging, GREEN FAST FLASHING when system over voltage. Please refer to section 5 for troubleshooting.

Charging Status LED indicator

Color	Indicator	Charging Status
Green	On Solid	Charging
Green	Fast Flashing	Over voltage

•Battery status indicator

GREEN ON when battery voltage in normal range GREEN SLOWLY FLASHING when battery full ORANGE ON when battery under voltage RED ON when battery over discharged Please refer to section 5 for troubleshooting.

Battery status LED indicator

Color	Indicator	Battery Status
Green	On solid	Normal
Green	Slowly Flashing	Full
Orange	On solid	Under voltage
Red	On solid	Over discharged

• Load status indicator:

When the load amp is 1.25times of rated current for 60 seconds, or the load amp is 1.5 times of rated current for 5 seconds (overload); or load amp is more than 3.5 times of rated current(Short Circuit) ,the LED digital tube shows "L" with slowly flashing simultaneously. Please refer to section 5 for trouble shooting.

Load status LED indicator

Color	LED digital tube	Load status
Red	"L" with slowly flashing	Overload or short circuit

• Overheating protection indicator:

When heat sink of the controller exceeds 85 C, the controller will automatically cut input and output circuit, with LED digital tube showing "H" with slowly flashing simultaneously. Please refer to section 5 for trouble shooting.

Load Control Settings

1. Dusk to Dawn

When solar module voltage goes below the point of NTTV (Night Time Threshold Voltage) at sunset, the controller will recognize the starting voltage and turn on the load after 10 minutes delay. When solar module voltage goes above point of DTTV (Day Time Threshold Voltage), the solar controller will recognize the starting voltage and turn off the load after 10 minutes delay.

2. Light ON + Timer

When solar module voltage goes below the point of NTTV (Night Time Threshold Voltage) at sunset; the solar controller will recognize the starting voltage and turn on the load after 10 minutes delay. The load will be on for several hours which users set through LED digital tube. The controller has dual timer function. Please refer to table 4-5 "Load Work Mode Setting".

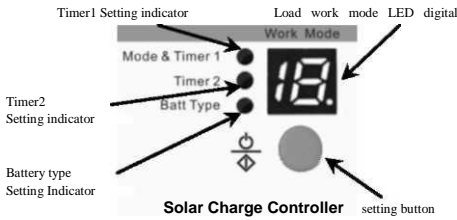
3. Test mode

This mode is the same as Dusk to Dawn. But there is no 10 minutes delay when controller recognizes the starting voltage. When below the starting voltage, the controller will turn on the load, if higher, it will turn off load. The test mode makes it easy to check the system installation.

4. ON/OFF mode

This mode is to turn ON and OFF the load by manual.

• Load Work Mode Setting



Press the setting button once and setting indicators will be changed once among timer 1, timer2 and battery type.

When timer 1 setting indicator is on, press the setting button for more than 5 seconds till the LED digital tube flashes. Then press the setting button till the desired number appears according to the following table. The setting is finished when the digital tube stop flashing.

Timer 2 setting is the same as timer 1 when the setting indicator is on timer2.

Battery Type Setting

When battery type setting indicator is on, press the setting button for more than 5 seconds till the LED digital tube flashes. Then press the setting button till the desired number appears according to the following table. The setting is finished till the LED digital display stops flashing.

Battery type setting

Battery type	Digital tube display
Sealed lead acid battery	1
Gel battery	2
Flooded battery	3

Protection

•PV Array Short Circuit

If PV array short circuit occurs, clear it to resume normal operation. **•Load Overload**

If the load current exceeds the maximum load current rating, the controller will disconnect the load. The greater the overload, the faster the load will be disconnected. A small overload could take a few minutes to disconnect. Overloading must be cleared up through reapply power or pressing the setting button.

•Load Short Circuit

Fully protected against load wiring short-circuit. After one automatic load reconnect attempt, the fault must be cleared by reapply power or pressing the setting button. **•PV Reverse Polarity**

Fully protection against PV reverse polarity, no damage to the controller will result. Correct the miswire to resume normal operation. **•Battery Reverse Polarity**

Fully protection against battery reverse polarity, no damage to the controller will result. Correct the miswire to resume normal operation.

•Damaged Local Temperature Sensor

If the temperature sensor short-circuited or damaged, the controller will be charging or discharging at the default temperature 25 C to prevent the battery damaged from overcharging or over discharged.

•Overheating Protection

If the temperature of the controller heat sink exceeds 85°C, the controller will automatically start the overheating protection.

•High Voltage Transients

Battery is protected against high voltage transients. In lightning prone areas, additional external suppression is recommended.

