LS BPD series Solar Charge Controller

1. Safety Information

- Read all of the instructions in the manual before installation.
- DO NOT disassemble or attempt to repair the controller.
- Install external fuse or breaker as required.
- Do disconnect the solar module and fuse/ breakers near to battery before installing or moving the controller.
- Power connections must remain tight to avoid excessive heating from a loose connection.
- Only charge batteries that comply with the parameters of controller.
- Battery connection may be wired to one battery or a bank of batteries.
- Risk of electric shock, the PV and load can produce high voltages when the controller is working.

2. Overview

Thank you for selecting the LS BPD series solar charge controller. The LS-BPD controller is a waterproof PWM charge controller that adopts the most advanced digital technique. The multiple load control modes enable it can be widely used on solar home system, field monitoring, traffic signal, solar street light, solar garden lamp, etc.
It's an easy operation and cost efficient controller featured as: □

- 3-Stage intelligent PWM charging：Bulk, Boost/Equalize, Float
- Support 3 charging options: Sealed, Gel, and Flooded.
- Programmable LVD and main parameters via digital tube and button
- Multiple load control modes
- Extensive Electronic protection
- Battery temperature compensation function.
- IP67 waterproof degree

3. Product Features

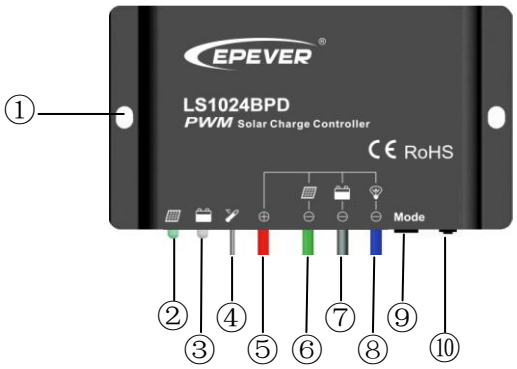


Figure 1 Product Feature

①	Mounting hole Φ5	⑥	PV negative wire
②	Charging status LED indicator	⑦	Battery negative wire
③	Battery status LED indicator	⑧	Load negative wire
④	Temperature Sensor *	⑨	Digital tube
⑤	PV、Battery and Load positive wire	⑩	Button

*** If the temperature sensor short-circuited or damaged, the controller will be charging or discharging at the internal temperature of device.**

4. Wiring

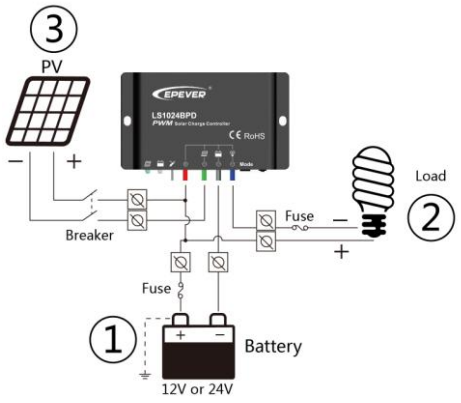


Figure 2 Connection diagram

(1) Connect components to the charge controller in the sequence as shown above and pay much attention to the "+" and "-". Please don't insert the fuse or turn on the breaker during the installation. When disconnecting the system, the order will be reserved.

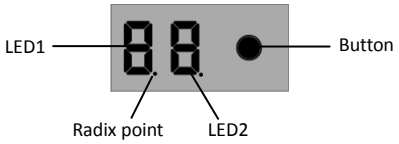
(2) After power on the controller, check the battery LED indicator on the controller, it will be on solid green. Otherwise please refer to chapter 8. Always connect the battery first, in order to allow the controller to recognize the system voltage.

(3) The battery fuse should be installed as close to battery as possible. The suggested distance is within 150mm.

5. LED Indicators

Indicator	Color	Status	Instruction
	Green	On Solid	PV connection normal but low voltage(irradiance) from PV, no charging
	Green	Slowly Flashing(1Hz)	In charging
	Green	Fast Flashing(4Hz)	PV reverse polarity
	Green	OFF	No PV voltage(night time) or PV connection problem
	Green	On Solid	Normal
	Green	Slowly Flashing(1Hz)	Full
	Green	Fast Flashing(4Hz)	Over voltage
	Orange	On Solid	Under voltage
	Red	On Solid	Over discharged
	Red	Fast Flashing(4Hz)	Battery Overheating
	Red	On Solid	Load ON
	Red	OFF	Load OFF
Charging (green) and battery indicator (orange) flashing simultaneously			Controller overheating

6. Setting Operation



➢ Button function

The controller parameters can be set via the button:

Mode	Note
Load ON/OFF	When the load mode is Manual mode, press the button can turn on/off the load.
Clear error	Press the button
Browse Mode	Press the button and hold on 5s then the digital tube will be on. Press the button to roll the item in circle.
Parameter set Mode	Press the button to roll the item in the browse mode and hold on 5s to enter edit parameters with the LED2 flashing. Modify the value by pressing the button. Save the data and return to the menu until the LED2 stop flash.

➢ Digital Tube Display

- The reference of LED for parameter and setting value is shown in the table

LED1	Item	LED2 Default	LED2 Range	Value
1	Battery type	1	1-3	1：Sealed 2：Gel 3：Flooded
2	Low voltage disconnect voltage①	5	0-4.②	10.6V-12.0V Unit value=0.1V（x2/24V）
3	Load set	0	0-4	0:Light ON/OFF 1:Light ON +Timer 2:Manual Mode 3:Output mode 4:Test mode
4	Light ON/OFF threshold voltage③	5	1-7.②	1-17V（x2/24V）
5	Light ON+Time mode1:Time1	5	0-4.②	0-14H，Unit value= 1H
6	Light ON+Time mode2:Time2	5	0-4.②	0-14H，Unit value= 1H

①Low Voltage Reconnect Voltage =Low Voltage Disconnect Voltage+0.5V/12V(x2/24V).
②Radix point of LED segment display indicate the value added "10", for example 0.=10, 4. =14.
③For day/night detection, load will be automatically turned on/off when PV voltage is below/above threshold voltage.

- **LED Code**

Code	Detail	
E1	Over discharged	If fault and working state on left appear, corresponding code will be displayed. Several states occur at the same time, these code will be displayed circularly (interval 1s). Only one state occurs, the code flashes per 1s. You can enter setting mode and set parameters despite the error shows
E2	Under voltage	
E3	Load over load①	
E4	Load short circuit	
.	The radix point of LED1 lighting up indicates that load is ON. Oppositely, load is OFF.	Load state (radix point) will conceal during fault displaying and parameter setting

①When load current reaches1.02-1.05 times 1.05-1.25 times, 1.25-1.35 times and 1.35-1.5 times more than nominal value, controller will automatically close loads in 50s,

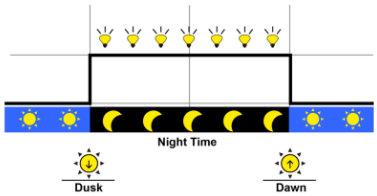
30s,10s and 2s respectively.

NOTE: Just only the Load over load and the Load short circuit can be cleared by pressing the button.

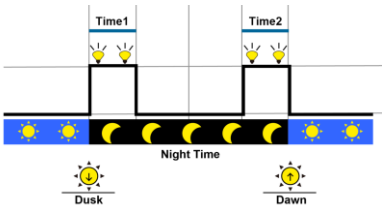
➢ Load control setting

(1) Manual Mode

(2) Light ON/OFF (Default)



(3) Light ON +Timer



(4)Output mode

The load will be on for 24 hours. The button is disabled.

(5)Test mode

The same as light ON/OFF mode but no 10 minutes delay. The test mode is only used to test load switch. It can return to the previous mode after controller restart.

NOTE: In the mode of Light ON/OFF and Light ON + Timer, the Load is turned on after 10minutes delay.

7. Protection

- PV Short Circuit
  If the PV array short circuit, the controller will stop charging, clear it to resume normal operation.
- PV Reverse Polarity
  Fully protection against PV reverse polarity, correct the wire connection to resume normal operation.
- Battery Reverse Polarity
  Fully protection against battery reverse polarity, correct the wire connection to resume normal operation.
- Battery Over Voltage
  When the battery voltage reaches to the set point of Over Voltage Disconnect Voltage, the controller will stop charging the battery to protect the battery from being over charged to break down.
- Battery Over Discharge
  When the battery voltage reaches to the set point of Low Voltage Disconnect Voltage, the controller will stop discharging the battery to protect the battery from being over discharged.
- Battery Overheating
  The controller detect the environment temperature through the external temperature sensor. If the environment temperature exceeds 65 ºC, the controller will automatically start the overheating protection to stop working, and recover below 50 ºC.
- Load Overload
  Load will be switched off when 1.05 times rated current overload happens. Controller will automatically attempt to reconnect load for 5 times. If overload protection still exist after controller's 5 times attempts, user have to reduce load appliance, then press the button or repower the controller or wait for one night-day cycle (night time>3 hours).
- Load Short Circuit
  Load will be switched off when load short circuit (≥4 times rated current) happens. Controller will automatically attempt to reconnect load for 5 times. If short circuit protection still exist after controller's 5 times attempts, user have to clear short circuit ,then press the button or disconnect and restart the controller or wait for one night-day cycle (night time>3 hours).
- Controller Overheating
  If the Internal temperature of the controller exceeds 85 ℃, the controller will automatically start the overheating protection, and recover below 75 ℃.
- High Voltage Transients
  The controller is protected against small high voltage transients. In lightning prone areas, additional external suppression is recommended.

8. Troubleshooting

Faults	Possible reasons	Troubleshooting
LED Charging indicator turn off during daytime when sunshine falls on PV modules properly	PV array disconnection	Confirm that PV and battery wire connections are correct and tight
No LED indicator	Battery voltage maybe less than 8V	Measure battery voltage with the multi-meter. Min.8V can start up the controller
Battery LED indicator green fast Flashing	Battery voltage higher than over voltage disconnect voltage(OVD)	Check if battery voltage is higher than OVD, and disconnect the PV
Battery LED indicator red and display "E1"	Battery over discharged	When the battery voltage is restored to or above LVR point (low voltage reconnect voltage), the load will recover
Battery LED indicator red flashing	Battery Overheating	The controller will automatically turn the system off. But while the temperature decline to be below 50 ºC, the controller will resume.
Charging(green) and battery indicator (orange)flashing simultaneously	Controller overheating	Please try to decline the environment's temperature, or the power of PV or the power of the load
Load terminals no output and display "E3" or "E4"	Over load or Short circuit	Please reduce the number of electric equipments or check carefully loads connection.

NOTE: If want to clear errors promptly, please restart the controller and disconnect the PV array firstly, then load and battery; and reconnect system according to "Chapter4".

9. Technical Specifications

Item	LS1024BPD	LS2024BPD
Nominal system voltage	12/24VDC Auto	
Battery input voltage range	8～32V	
Battery type	Sealed (Default) / Gel / Flooded	
Max. PV open circuit voltage	50V	
Rated current	10A	20A
Self-consumption	9.4mA/12V;12.2mA/24V	
Charge Circuit Voltage Drop	≤0.3V	
Discharge Circuit Voltage Drop	≤0.2V	
Temperature compensation coefficient	-3mV/℃/2V	
Working environment temperature	-35℃～+55℃	
Enclosure	IP67	
Grounding	Common Positive	
Overall dimension	108.5x64x25.6mm	108.5x83x25.6mm
Mounting dimension	100.5mm	100.5mm
Mounting hole size	Φ5	
Power cable	2.5mm^2	4.0mm^2
Net weight	0.33kg	0.41kg

Battery Voltage Control Parameters

Below parameters are in 12V system at 25 ºC, please double the values in 24V system

Battery Type	Sealed	Gel	Flooded
Over Voltage Disconnect Voltage	16.0V	16.0V	16.0V
Charging Limit Voltage	15.0V	15.0V	15.0V
Over Voltage Reconnect Voltage	15.0V	15.0V	15.0V
Equalize Charging Voltage	14.6V	——	14.8V
Boost Charging Voltage	14.4V	14.2V	14.6V
Float Charging Voltage	13.8V	13.8V	13.8V
Boost Reconnect Charging Voltage	13.2V	13.2V	13.2V
Low Voltage Reconnect Voltage	11.6V	11.6V	11.6V
Under Voltage Warning Reconnect Voltage	12.2V	12.2V	12.2V
Under Voltage Warning Voltage	12.0V	12.0V	12.0V
Low Voltage Disconnect Voltage	11.1V	11.1V	11.1V
Discharging Limit Voltage	10.6V	10.6V	10.6V
Equalize Duration	120 min.	——	120 min.
Boost Duration	120 min.	120 min.	120 min.

10. Disclaimer

- Damage from improper use or use in an unsuitable environment.
- PV or load current, voltage or power exceeding the rated value of controller.
- User disassembly or attempted repair the controller without permission.
- The controller is damaged due to natural elements such as lighting.
- The controller is damaged during transportation and shipment.

Any changes without prior notice! Version number：V2.1