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10A / 20A / 30A Solar Charge Controller

PU1024B / PU2024B / PU3024B series

INSTRUCTION MANUAL

Dear Customer,

Thank you very much for choosing our product.

This manual contains important information about the installation and operation of your solar charge controller.

Please read this manual carefully **before installation** and pay special attention to the safety recommendations.



PU1024B / PU2024B / PU3024B Solar Charge Controller



Nominal system voltage	12V/24V DC*
Maximum PV input voltage	50V
Nominal charge / discharge current	
PU1024B	10A
PU2024B	20A
PU3024B	30A

*The solar charge controller automatically recognises the system voltage 12V/24V after battery connection.

Warranty: The charge controller is warranted to be free from defects for a period of **one year** from the date of shipment to the original end user.

The manufacturer is not responsible for the damage to any parts of the controller due to contact with water or liquids, misuse, battery parameters mismatch, incorrect system configuration, unauthorised repair, or operating values beyond the limits.

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1 Important Safety Information

- Please inspect the controller thoroughly after it has been delivered. If any damage is seen, please notify the shipping company, the supplier or our company immediately.
- Keep the controller away from rain, exposure to water, severe dust, vibrations, corrosive gases and intense electromagnetic interference.
- There are no user serviceable parts inside the controller. Do not disassemble or attempt to repair it.

2 General Information

This **Photonic Universe B series** solar charge controller uses advanced digital technologies and operates fully automatically. It includes various important features:

- 12V/24V DC automatic detection or user-defined working voltage
- High efficiency series PWM charging, which increases the battery lifetime and improves the solar system performance
- Use of a MOSFET as an electronic switch, without any mechanical or relay switching
- Multiple load control modes giving flexibility to the load output
- Sealed, Gel, Flooded and a User-defined battery type options
- Temperature compensation, where the controller corrects the charging parameters automatically depending on the ambient temperature for more delicate charging
- New method of calculating the state of charge (SOC) of the battery accurately to determine the correct available battery capacity
- Electronic protection: overheating, over charging, over discharging, overload, and short circuit
- Reverse polarity protection for any combination of the solar module and the battery
- Voltage, current and power calculation (with energy counters recording the statistics), for improved visibility and enhanced data on the solar system performance
- Use of standard *Modbus* communication protocol for RS-485 bus

connections, making communication distances much longer and protocol compatibility better

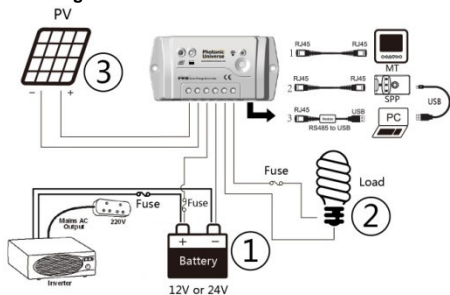
- Supports further firmware updates

3 Installation Instructions

3.1 General Installation Notes

- Be very careful when working with batteries. Wear eye protection. Have fresh water available to wash with immediately and clean any contact with battery acid.
- Never short circuit the battery positive and negative terminals and wires, this may cause an explosion or fire.
- Install external fuses/breakers as required.
- Disconnect the solar module and the battery fuse / breaker before installing or adjusting the controller.
- Confirm that the power connections are tightened to avoid excessive heating from a loose connection.
- Uses insulated tools and avoid placing metal objects near the batteries.
- Explosive gasses may be present during charging. Be certain there is sufficient ventilation to release the gasses.
- Avoid direct sunlight and do not install in locations where water can enter the controller.
- Loose power connections and/or corroded wires may result in resistive connections that melt wire insulation, burn surrounding materials, or even cause fire. Ensure tight connections and use cable clamps to secure cables and prevent them from unnecessary movement.
- Only charge batteries that comply with the parameters of the controller.
- Battery connection may be wired to one battery or a bank of batteries. These instructions refer to a single battery, but it is implied that the battery connection can be made to either one battery or a group of batteries in a battery bank.
- Select the system cables according to $3.5A/mm^2$ current density.

3.2 Wiring



1. Connect components to the charge controller in the sequence 1-2-3 as shown above and pay attention to the correct polarity (“+” and “-”). When disconnecting the system, the disconnection order **must be reversed** to the order of connection (3-2-1).
2. After connecting the battery (1), check that the battery LED is turned ON. If not, refer to the troubleshooting section of this manual. Always connect the battery first, in order to allow the controller to recognise the system voltage (12V or 24V).
3. The battery fuse should be installed as close to the battery as possible. The suggested distance is within 150mm from the battery terminal.
4. This solar charge controller has a positive common ground design (which means that internally the positive terminals of the solar panel, battery and load are connected and the regulation happens through the negative terminals). Therefore any positive terminal of the controller (solar, load or battery) can be earth connected if required.
NOTE: if your system is a negative common ground system (e.g. a vehicle or a boat), you can still use this solar charge controller in your system. However you **must not** use grounding of any of the positive terminals of the solar charge controller. You **should not** ground the negative terminals of the solar panel or the load either. The only terminal of the controller which can be connected to your

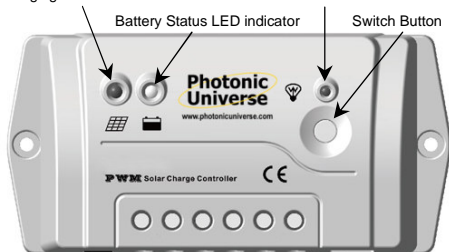
negative common ground is the negative battery terminal.

- If your system has an inverter, do not connect it to the load terminals of the solar charge controller as most inverters are too powerful for that. Always connect the inverter to the battery directly.




4 Operation

4.1 LED Indicators

Charging Status LED indicator Load Status LED indicator



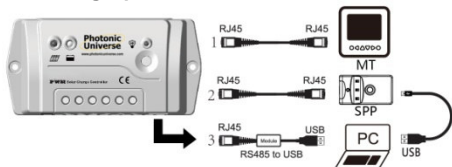
Indicator Status Description

	Green	On Solid	PV connected
	Green	Slowly Flashing	PV is charging
	Green	Fast Flashing	PV reversing
	Green	OFF	No charge
	Green	On Solid	Normal
	Green	Slowly Flashing	Full
	Green	Fast Flashing	Over voltage
	Orange	On Solid	Under voltage
	Red	On Solid	Over discharged
	Red	On Solid	Normal
	Red	Slowly Flashing	Overload
	Red	Fast Flashing	Short circuit
Charging, load and battery indicator (red) are all flashing simultaneously			System voltage error
Charging, load and battery indicator (orange) are all flashing simultaneously			Controller overheating

Switch Button Function

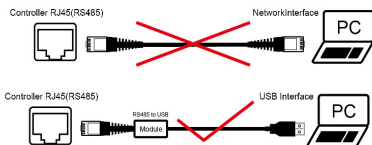
- 1) Manually switch the output to the load terminals ON/OFF.
- 2) Resume to normal work after the fault is cleared up.

4.2 Setting Operation



There are three methods to program the controller and monitor parameters:

- 1) Remote meter MT50 (Use the standard twisted network cable supplied with the meter) – see Appendix I for details.
- 2) Super parameter programmer SPP-02 (Use the standard twisted network cable supplied). One-button configuration is available for batch processing.
- 3) PC monitoring and setting software “Solar Station Monitor” (use USB to RS485 converter cable PTR-USB).



WARNING: DO NOT connect the controller to any Ethernet socket (such as a network socket on your router or computer) otherwise the controller will be damaged.

Note: Our Company is also preparing to launch another communication method for your controller: **a mobile App** via RS485 to USB cable or through an optional **Wi-Fi module** for the controller (see Appendix II). Please contact us for the release date.

•Load Set (requires a link to MT50/SPP-02/USB to programme)

1. Manual Control (default)
2. Light ON/OFF
3. Light ON+Timer
4. Time Control

Note: In the *Light ON/OFF* and *Light ON+Timer* modes, the Load is turned on after 10 min delay.

•Battery Type (requires MT50/SPP-02/USB to programme)

1. Sealed (default)
2. Gel
3. Flooded
4. User-defined

•Other parameters (requires MT50/SPP-02/USB to programme)

See section 6. **Specifications** for parameters that can be changed.

5 Protection, Troubleshooting

5.1 Protection

•PV Array Short Circuit

When a PV array short circuit occurs, the controller will stop working. Clear the problem to resume normal charging.

•Load Overload

If the load current exceeds the rated current of the controller (≥ 1.05 times the rated discharge current), the controller will disconnect the load. Overloading must be cleared up, then press the switch button.

•Load Short Circuit

Fully protected against load wiring short circuits (≥ 2 times the rated discharge current). After one automatic load reconnection attempt, the fault must be cleared by restarting the controller or pressing the switch button.

•PV Reverse Polarity

Full protection against PV reverse polarity, no damage to the controller will happen as a result. Correct the mistake to resume normal operation.

•Battery Reverse Polarity

Full protection against battery reverse polarity, no damage to the controller will happen as a result. Correct the mistake to resume normal operation.

•Battery working voltage error

If the battery voltage does not match the controller working voltage,

the controller will stop working. After correcting the voltage, normal operation can be resumed by pressing the switch button.

•Damaged Temperature Sensor

If the temperature sensor is short-circuited or damaged, the controller will be charging or discharging the battery at the default temperature 25°C as a safety precaution.

•Overheating Protection

If the temperature of the controller heat sink exceeds 85°C the controller will automatically start the overheating protection and stop charging / discharging the battery. When the temperature falls below 75°C, the controller will resume normal operation.

•High Voltage Transients

PV input has limited protection against high voltage surges. In lightning prone areas, additional external suppression is advised.

Note: The controller has a daily automatic fault recovery function which will reduce the need for manual intervention and clear non-hardware faults.

5.2 Troubleshooting

Faults	Possible reasons	Troubleshooting
Charging LED indicator is off during daytime when PV modules are exposed to light.	PV array disconnection or reversed polarity	Check that PV and battery wire connections are correct and tight. Disconnect and reconnect them in the correct order.
Green Battery LED indicator is fast flashing	Battery voltage is higher than over voltage disconnect voltage (OVD)	Check the battery voltage. If it is too high, disconnect the solar module immediately and replace the controller.
Battery LED indicator is orange	Battery under voltage	Load output is still on. Charging LED indicator will return to green automatically when the battery is fully charged.
Battery LED indicator is red and the load output is not working	Battery over discharged	The controller has cut off the load output automatically. LED indicator will return to green automatically when the battery is fully charged.

Load status indicator is red and slowly flashing	Over load	Remove or disconnect the additional load and press the switch button. The controller will resume working after 3s.
Load status indicator is red and fast flashing	Short circuit	Clear the short circuit and press the switch button. The controller will resume working after 3s.
All the LED indicators are flashing (battery LED is orange)	Temperature of the controller is too high	When the heat sink of the controller exceeds 85°C, the controller will automatically stop. When the temperature falls below 75°C, the controller will resume working. Please reduce the PV or load power or add external ventilation.
All the LED indicators are flashing (battery red indicator flashing)	System voltage error	Check whether the battery voltage matches the controller working voltage. Please change to a suitable battery or reset the working voltage. If there is no mistake, press the switch button to resume normal operations.
State of Charge Value (on a remote display – optional) is incorrect	Wrong battery type chosen; inappropriate user-defined battery type; charge/discharge cycle	Change to the right battery type. Amend user-defined battery parameters including temperature compensation charging voltage. Check SOC when the battery is in standby (not in charge/discharge cycle)

6 Technical specifications

Electrical Parameters

Parameter	Value
Nominal System Voltage	12V / 24V DC
Max. PV input voltage	50V
Max. Battery Terminal Voltage	34V
Rated Battery Current	PU1024B 10A; PU2024B 20A PU3024B 30A
Charge Circuit Voltage Drop	≤0.28V
Discharge Circuit Voltage Drop	≤0.20V
Self-consumption	≤ 8.4mA/12V; ≤ 7.8mA/24V
Temperature compensation coefficient	-3mV/°C/2V (Default)
Grounding	Positive grounding

Battery Voltage Parameters

(parameters are for 12V system at 25°C, please use x2 for a 24V system).

Battery charging setting	Sealed	Gel	Flooded	User
Over Voltage Disconnect Voltage	16.0V	16.0V	16.0V	9~17V
Charging Limit Voltage	15.0V	15.0V	15.0V	9~17V
Over Voltage Reconnect Voltage	15.0V	15.0V;	15.0V	9~17V
Equalize Charging Voltage	14.6V	—	14.8V	9~17V
Boost Charging Voltage	14.4V	14.2V	14.6V	9~17V
Float Charging Voltage	13.8V	13.8V	13.8V	9~17V
Boost Reconnect Charging Voltage	13.2V	13.2V	13.2V	9~17V
Low Voltage Reconnect Voltage	12.6V	12.6V	12.6V	9~17V
Under Voltage Warning Reconnect Voltage	12.2V	12.2V	12.2V	9~17V
Under Voltage Warning Voltage	12.0V	12.0V	12.0V	9~17V
Low Voltage Disconnect Voltage	11.1V	11.1V	11.1V	9~17V
Discharging Limit Voltage	10.6V	10.6V	10.6V	9~17V
Equalize Duration	120min	—	120min.	0~180min
Boost Duration	120min	120min	120min.	10~180min

Notes: 1. When the battery type is sealed, gel or flooded, the adjustable range of equalise duration is 0 to 180 min and boost duration is 10 to 180 min.

2. User type is the user defined battery type. The default value is the same as sealed type. When modifying please follow the rules:

- Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Reconnect Charging Voltage;
- Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage;
- Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage;

d) Under Voltage Warning Reconnect Voltage > Under Voltage

Warning Voltage \geq Discharging Limit Voltage;

e) Boost Reconnect Charging voltage > Low Voltage Disconnect

Voltage.

***Please select the battery type carefully (consult with the battery user manual or its supplier). The battery might be damaged if the settings are incorrect.**

Environmental parameters

Parameter	Value
Working temperature	-35°C ~ +50°C
Storage temperature	-35°C ~ +80°C
Humidity	$\leq 95\%$ N.C.
Enclosure	IP30

PU1024B Mechanical parameters

Parameter	Value
Overall dimension	138.6x69.3x37 mm
Mounting dimension	126 mm
Mounting hole size	$\Phi 4.3$
Terminal	4mm ²
Net weight	0.13kg

PU2024B Mechanical parameters

Parameter	Value
Overall dimension	159.6x81.4x47.8 mm
Mounting dimension	147x50 mm
Mounting hole size	$\Phi 4.3$
Terminal	10mm ²
Net weight	0.3kg

PU3024B Mechanical Parameters

Parameter	Value
Overall dimension	200.6x101.3x57 mm
Mounting dimension	190x70 mm
Mounting hole size	$\Phi 4.5$
Terminal	10mm ²
Net weight	0.5kg

We reserve the right to change this manual at our discretion.

Please look for updated versions on our website

www.PhotonicUniverse.com

Version number: V2.4.06.09.16

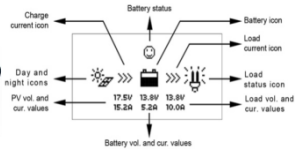
Appendix I

Remote LCD meter MT50 (optional)

Your **Photonic Universe B series** solar charge controller has a socket for connecting a remote LCD meter MT50 (purchased separately). This meter can display charging parameters such as battery and solar panel voltage, current (amps), power (watts), accumulated energy and the state of charge of your battery. It also allows modification of various charging parameters listed in **Specifications** section of this manual.

Remote LCD meter MT50

Main display parameters



Appendix II

Wi-Fi communication module and the App (optional)

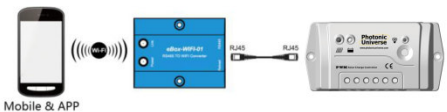
Our Company is working on an innovative Wi-Fi communication module **eBox-WiFi** for your **Photonic Universe B Series** solar charge controller. This module should be available for sale shortly.

It will plug into the RJ45 socket of your solar charge controller and communicate with a special App in your mobile phone to show details about your solar system performance. It will also allow you to adjust charging parameters of your solar charge controller (if required).

eBox-WiFi module



Connection diagram



If you would like to buy any of the above optional products for your solar charge controller please visit our online shop

www.PhotonicUniverse.com

Or call 0203 150 1111 (int. +44 203 150 1111) for a phone order.

Photonic Universe

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