

DIY599.com

Rechargeable LiFePO4 battery Device

BAT500

INSTRUCTION MANUAL

Version 1.3 / Revision 4

This device is for use by licensed radio amateurs only

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Changes

To previous revision of this manual

Manual Version / revision	changes
V1.3/ 1	Initial release
V1.3/ 2	spelling mistake in the manual
V1.3/3	Overheat indication LED changed from RED to YELLOW
V1.3/ 4	BMS reset button

connectors

input side

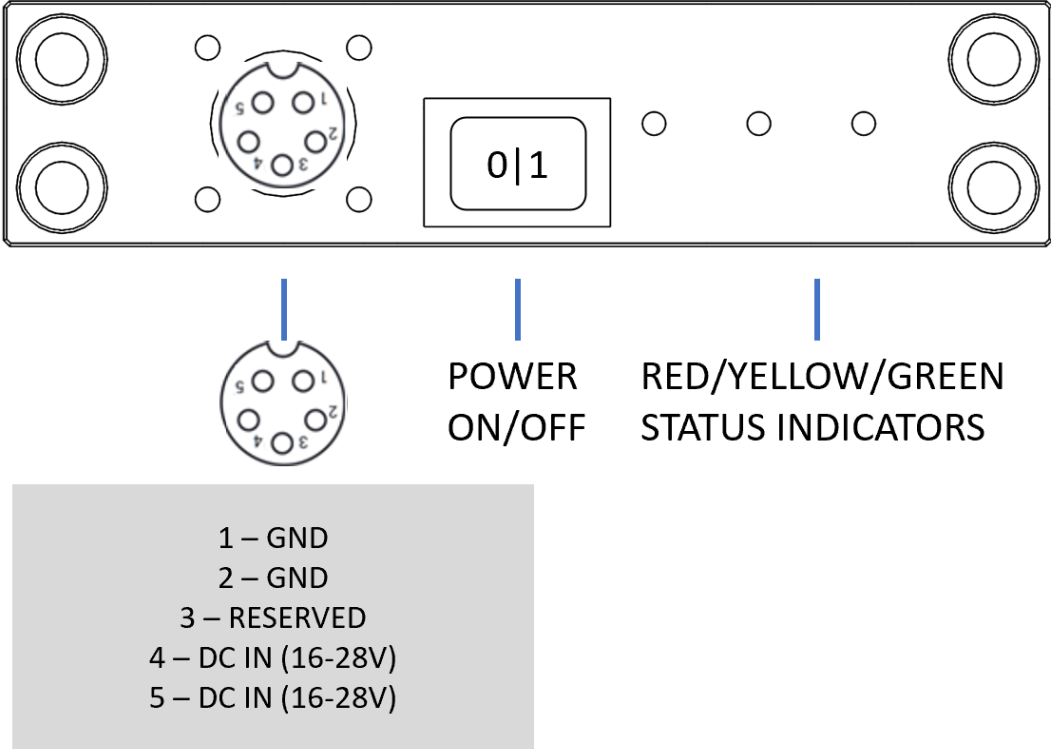


Figure 1

 **there is no reverse polarity protection, incorrect wiring will destroy the device.**

output side

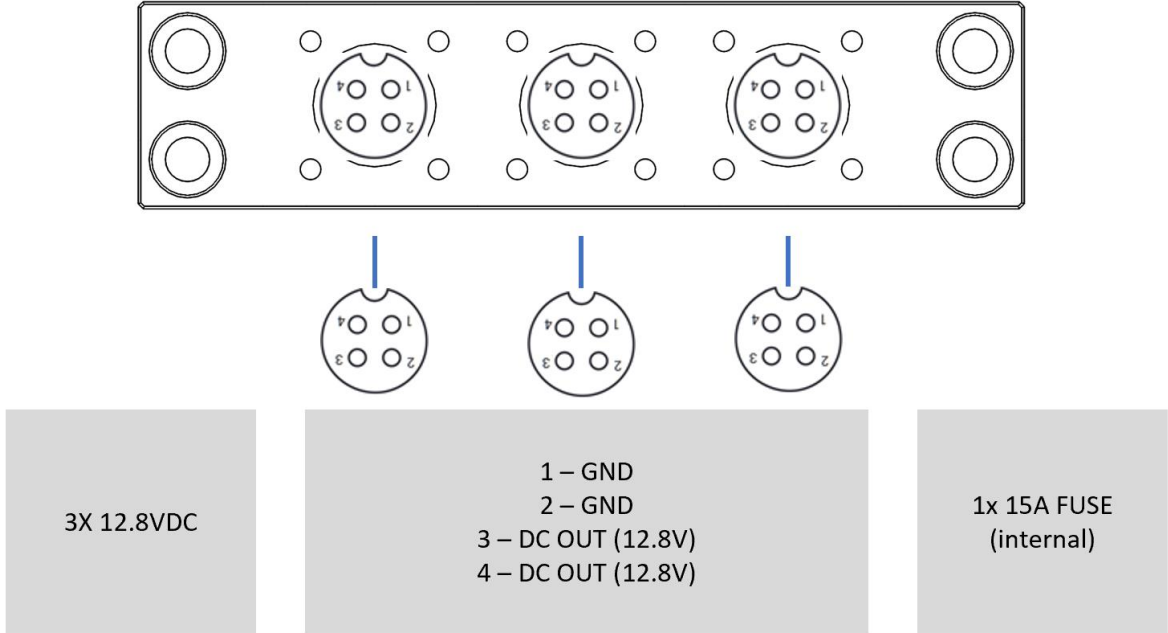


Figure 2



there is no reverse polarity protection, incorrect wiring will destroy the device.

System Connections

BAT500 must be switched on with the ON/OFF switch, so that the internal battery connections are switched to the consumer outputs. The internal battery of the BAT500 is charged by connecting an external solar panel. The battery is charged by the MPPT charge controller built into the device.

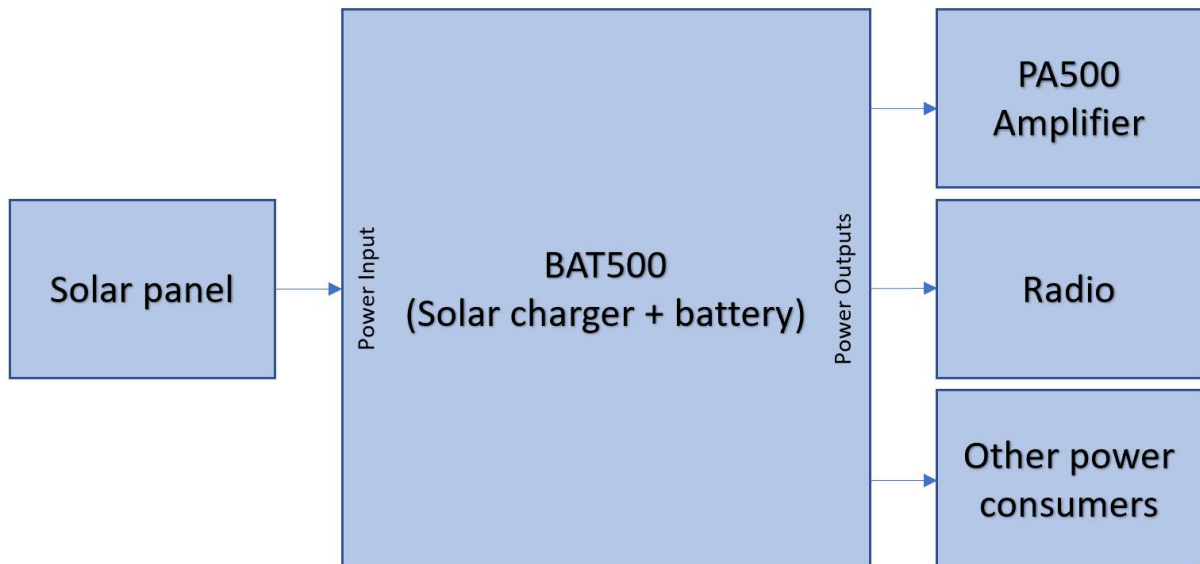


Figure 3

getting started

Before using the BAT500 device, you'll need to charge it. We recommend to use a power source solar panel or an AC/DC power supply) which can provide 16 to 28V and up to 3.5A of continuous current. You need to turn on the device for charging.



there is no reverse polarity protection, incorrect wiring will destroy the device.
there is no overvoltage protection at the input, too high voltage will destroy the device.

Check before powering up

After reading these brief instructions, you will be able to put the BAT500 into operation.

- Check charger/Solar panel voltage polarity (see Figure 1), Pin 1 and 2 should be connected to negative terminal, Pin 4 and 5 should be connected to positive terminal.

Confirm the connection of the solar panel using a DC multimeter.

- Connect the PA500 Amplifier, Radio and accessories to the output connectors. Pin 1 and 2 should be connected to negative terminal (GND), Pin 3 and 4 should be connected to positive terminal (+12V).

Confirm the connection of the solar panel using a DC multimeter.

Operation

After the device is turned on, the internal logic will enable the outputs. You can now supply the connected devices. The status LEDs give information during discharging as well as during charging. If the red LED is on during a discharge, the batteries are almost empty and the device (BAT500) must be charged immediately. **If the LED flashes red, the battery is empty, the device must be switched off and the batteries must be charged, otherwise the device goes into safety mode. The BAT500 can then no longer be switched on without further action. The BAT500 should ALWAYS be switched off when it is not in use.**

Charging

You can charge your device with a suitable solar panel that supplies the right amount of current. The maximum voltage generated must not exceed 28 V. We recommend using a solar panel or an AC/DC power supply that can supply 16V to 28V and up to 3.5 A continuous current as the power source. **You need to switch on the device to charge it.**

Capacity status LED information

Status information	LED blinking Code
Under load discharge, 100% to 60% capacity	Steady green LED
Under load discharge, 60% to 15% capacity	Steady yellow LED
Under load discharge, 15% to 10% capacity	Steady red LED
Under load discharge, 10% to 0% capacity	Blinking red LED

Table 1

Charging status LED information

warning	LED blinking code (* = ON)
Ready to charge	GREEN: * - - - - * - - - - - - - - (one short)
charging	GREEN: * - * - * - * - * - * - * - (cont. blinking)
charged	GREEN: * * * * * * * * * * * * * * (steady green)
Charger temperature limit (while charging)	YELLOW: * - * - - - - * - * - - - - (two short)
Battery voltage too low	RED: * - * - * - - - - * - * - - - - (three short)
Battery voltage critical low	RED: * - * - * - * - * - * - * - * - (cont. blinking)
Panel voltage too high	RED: * - * - * - * - * - * - * - * - (8 short)
Panel voltage too low	YELLOW: *** - *** - *** - - - - - - (3 long)

Table 2

device specifications

	BAT500
Type of battery	LiFePO4 (4S2P)
Output Voltage	12.8V
Battery Capacity	4Ah (51.2Wh)
Maximum Solar/Battery Input Voltage	28V
Minimum Battery Input Voltage	16V
Maximum Load Current (total)	10A (peak 12A)
Max. Solar charge current	4A
Number of 12V DC output ports	3
Max. battery charge voltage	14.6V
Max. battery discharge current	15A
Dimensions (L x W x H)	207x90x21mm
Weight	660g

Table 3

Protective Battery circuits

protective circuits	function
BMS primary Undervoltage protection	Undervoltage shut-off (resettable)
BMS primary Overvoltage protection	Overvoltage shut-off (resettable)
BMS primary Overcurrent protection	Overcurrent shut-off (resettable)
BMS secondary Overvoltage protection	Overcurrent shut-off (not resettable)
BMS secondary Overcurrent protection	Overcurrent shut-off (not resettable)

Table 4

Protective charging/discharging circuits

protective circuits	function
Device temperature monitoring	disable Charging if it's too hot (resettable)
Device output current overload protection	Two 15A melting fuses (positive and negative terminal protection, not resettable)

Table 5

Device safety instructions

The device can get hot. It must be operated in such a way that there are no heat-sensitive objects near the device. **Please ensure that the device is always well-ventilated during operation.** Please be aware that the device is still hot for a while after use. Please keep the device away from children, the device develops a temperature level which can cause burns to the skin. The device has an over temperature protection and will shut of when the device temperature reaches 60°C

temperature and ventilation

The device must be operated in such a way that ventilation is guaranteed at all times. Please never expose the device to direct sunlight. External ventilation may be necessary in extreme operating conditions.

EM interference

This equipment has been tested and found to comply with the defined limits for amateur radio equipment. This device is tested in a laboratory, all measurements were applied with suitable measuring devices. The device itself does not emit radio frequency energy to the antenna without a connected amateur radio transceiver. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy when it's connected to an amateur radio transceiver and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and effected receiver device.
- Reduce the output power until the device no longer interferes.
- Consult the dealer or an experienced radio/TV technician for help.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications to this device, not expressly approved by DIY599 could void your authority to operate this device under compliance regulations.



This device is for use by licensed radio amateurs only

grounding and ESD protection

A connected transceiver should be connected to ground to provide some protection against lightning and damage due to electrostatic discharge (ESD). When used in a building, the connected transceiver should also be connected to other building grounds.



if the transceiver is not grounded, high voltage can be present on the chassis during RF transmission.

GENERAL TROUBLESHOOTING

fault description	Possible reasons	solution
Unable to turn on your BAT500	BMS went to low voltage safety shut-off	Connect a charger, and press the BMS reset buttons once
Unable to charge the internal battery	Not a proper power source (voltage or current too low)	Connect a proper power source
	The internal temperature monitoring stopped charging	Wait until the device temperature is back to normal range
No output power/voltage		

Table 6



If current draw of the connected devices to the BAT500 are too high (more than 15A), or a short circuit occurs, the internal fuse may blow. The unit will then no longer turn on. The device needs a service.

General battery safety Information

This section contains safety information that must be observed at all times when working on or with batteries.

To prevent personal injury or property damage and to ensure long-term operation of the batteries, read this section carefully and observe all safety information at all times.

Do not touch the device with wet hands. Do not drop or cause an impact to the charger or the device. The device can be used in locations with an ambient temperature of 0 °C to 35 °C. You can store the device at an ambient temperature of -20 °C to 50 °C. Using or storing the device outside of the recommended temperature ranges may damage the device or reduce the battery's lifespan.



WARNING

Danger to life due to incompatible lithium-ion battery

An incompatible lithium-ion battery can lead to a fire or an explosion. With incompatible lithium-ion batteries, it is not ensured that battery management is intrinsically safe and will protect the battery.

1. Ensure that the lithium-ion batteries are approved for use with the BAT500 device. Only EREMIT's "ELF217074L 12V 2Ah (IFR18650-4S1P)" Packs are currently approved to use. See battery compliance certifications UN38.2 and IEC62133-2:2017



Danger to life due to explosive gases

Explosive gases may escape from the battery and cause an explosion.

1. Protect the battery environment from open flames, embers and sparks.
2. Install, operate and maintain the battery in accordance with the manufacturer's specifications.
3. Do not burn the battery and do not heat it beyond the permitted temperature.



Chemical burns due to battery electrolyte

If handled inappropriately, battery electrolyte can leak from the battery and cause irritation to the eyes, respiratory system and skin.

1. Install, operate, maintain and dispose of the battery according to the manufacturer's specifications.
2. Whenever working on the battery, wear suitable personal protective equipment such as rubber gloves, an apron and goggles.
3. Rinse acid splashes thoroughly for a long time with clear water, and consult a doctor immediately.
4. If acid fumes have been inhaled, consult a doctor immediately.



Danger to life due to burns caused by electric arcs through short-circuit currents

Short-circuit currents in the battery can cause heat build-up and electric arcs. Heat build-up and electric arcs may result in lethal injuries due to burns.

1. Remove watches, rings and other metal objects prior to carrying out any work on the battery.
2. Use insulated tools for all work on the battery.
3. Do not place tools or metal parts on the battery.
4. Observe all safety information of the battery manufacturer.



CAUTION

Risk of burns due to hot battery components

Improper battery connection may result in excessively high transition resistances. Excessive transition resistances give rise to localized heat build-up.

1. Ensure that all power cables are used with a minimum of wire diameter(gauge) of 1mmq (AWG 17)
2. Ensure that all DC cables are connected properly (locked).



NOTICE

Damage to the battery due to incorrect selection or use of panels or chargers

Ensure that the solar panel or charger deliver the correct voltage level.

Recycling

Recycle batteries according to national and local regulations. Contact your local representative for assistance. The batteries must be disposed only in a discharged state at the collection center. In case the battery is not fully discharged, provide for a risk against short circuits. Short circuits can be prevented by isolating the terminals with tape.

Declaration of conformity:

The battery complies with the current regulations of the EU guidelines. UN38.3 and IEC62133-2:2017

- Do not open or dismantle a battery.
- Do not expose the battery to heat or fire. Avoid storage in direct sunlight.
- Do not short-circuit a battery.
- Do not store the battery haphazardly in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects.
- Do not remove a battery from its original packaging until required for use.
- Do not subject the battery to mechanical shock.
- In the event of a battery leaking, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts of water and seek medical advice.
- Do not use any charger other than that specifically provided for use with the equipment. See also chapter "Charging".
- Observe the plus (+) and minus (–) marks on battery and equipment and ensure correct use. • Do not mix batteries of different manufacture, capacity, size or type within a device.
- Keep the battery out of the reach of children.
- Keep the battery clean and dry.
- The battery needs to be charged before use.
- Use only the battery in the application for which it was intended.
- When possible, remove the battery from the equipment when not in use.
- Do not store a battery longer than 1 month in a discharged state.
- Do not storage a battery longer than 1 year without recharge.
- The battery must be recycled or disposed of properly. 0°C to +45°C For discharge: -20°C to

Operating Temperature

For charge: 0°C to +40°C For discharge: 0°C to +40°C

storage Temperature

< 1 year: -10°C to +20°C < 3 months: -10°C to +45°C < 1 month: -10°C to +50°C

Recommendation

Store the battery at below 20°C, low humidity, no dust and no corrosive gas atmosphere. Store the battery with a state of charge between 40-60%.

Charging

If the power source is a solar panel and it is only partially illuminated, it may not provide enough voltage to charge the internal batteries. If the electronics of the BAT500 determine that the input voltage of the solar panel power source is not sufficient, the internal solar charger will not charge the battery cells. The BAT500 will only allow charging when the battery is in the safe range.

AFTER-SALES SERVICE POLICY

If this kit is bought in the European union, this product has a limited one-year warranty effective from the date of purchase. This warranty covers only manufacturing and parts defects. It does not cover damage caused by lightning, excess voltage on the power supply, accidental damage or purposeful damage or misuse. If the product needs warranty repair within two weeks of receiving the product, DIY599 will pay for the shipping both ways. After two weeks DIY599 will pay only for return shipping. If the product is not covered under warranty, the customer pays for shipping both ways plus the cost of the repair.

WARRANTY LIMITATIONS

Any of the following will void the warranty applicable to the product and its accessories:

- A. Modification-, removal-, or maintenance of the internal circuitry, without permission and authorization;
- B. Unauthorized change of product's embedded software;
- C. Immersion in liquid or signs of external damage;
- D. Warranty period expired;
- E. Product's serial number is missing, torn or blurred so we cannot determine if the device is under warranty;
- F. Product was not bought from DIY599 or authorized distributor of DIY599.

None of the following conditions, are covered by the warranty:

- A. Damage caused by improper use by the user ;
- B. Damage caused by an accident ;
- C. Damage due to incorrect testing, maintenance, debugging, or other changes ;
- D. Damage is not caused by the material or the quality of production ;
- E. Damage to the shell or other external components due to improper use.

Contact us for service: service@DIY599.com

Note Amateur Radio Operation

DIY599.com is obligated as a manufacturer of amplifier devices to draw attention to the following legal provisions:

The following restrictive conditions apply:

This device is intended for use by radio amateurs within the meaning of the law on amateur radio in the valid amended. During operation of the device, the amateur radio law and supplementary laws and regulations must be observed.

WARRANTY TERMS

For amateur radio power amplifier PA500 legal guarantee determinations apply only if the device is operated in a manner corresponding to its intended use. This includes in particular the compliance with the operating limits mentioned in this manual.

DISCLAIMER of LIABILITY

All PA-500 specifications and descriptions are based on the latest information available at the time of this document's printing. As we are always striving to improve and update our products, ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE and DIY599 reserves the right to make changes and improvements at any time without further notice or obligation to notify any person or organization of such revisions or changes, made in order to improve the reliability, function, quality and design and/or performance of the PA500. Further, this Manual is provided "as is" and DIY599 shall not be liable for possible errors contained herein.

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