victron energy
BLUE POWER

Manual

EN

Appendix

BlueSolar charge controller MPPT 70/15

1 General Description

1.1 Ultra fast MPPT tracking

Especially in case of a clouded sky, when light intensity is changing continuously, a fast MPPT algorithm will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

1.2 BatteryLife: intelligent battery management

1.2.1. Conventional battery management

When a solar charge controller is not able to recharge the battery to its full capacity within one day, the result is often that the battery will be continually be cycled between a “partially charged” state and the “end of discharge” state. This mode of operation (no regular full recharge) will destroy a lead-acid battery within weeks or months.

1.2.2. BatteryLife algorithm

The BatteryLife algorithm will monitor the state of charge of the battery and day by day slightly increase the load disconnect level until absorption voltage is reached. From that point onwards the load disconnect level will be modulated so that absorption voltage is reached about once every week. The BatteryLife algorithm will substantially increase service life of the battery when compared to 1.2.1.

1.2.3. Upsizing the PV array or regularly “downsizing” the load

A lead-acid battery will last even longer if a full recharge, including several hours absorption time, is achieved at least once every week.

1.3 Load output

The load output is short circuit proof and can supply loads with a large DC input capacitor such as an inverter (but it can not start a DC load and an inverter simultaneously).

1.4 Resin encapsulated electronics

Protects the electronic components are against the environment

1.5 Internal temperature sensor

Compensates absorption and float charge voltages for temperature.

1.6 Automatic battery voltage recognition
The MPPT 70/15 will automatically adjust itself to a 12V or a 24V system.

1.7 Three step charging
The BlueSolar MPPT Charge Controller is configured for a three step charging process: Bulk – Absorption - Float.

1.7.1. Bulk stage
During this stage the Controller delivers as much charge current as possible to rapidly recharge the batteries. When the battery voltage reaches the absorption voltage setting, the Controller activates the next stage (absorption).

1.7.2. Absorption stage
During this stage, the Controller switches to the constant voltage mode, where the absorption voltage is applied to the battery. When the charge current decreases to the float transition current setting, the battery is fully charged and the Controller switches to the float stage.

1.7.3. Float stage
During this stage, the float voltage is applied to the battery to maintain it in a fully charged state.
When battery voltage drops below 13,2 Volt during at least 1 minute a new charge cycle will be triggered.

2 Safety instructions

Danger of explosion from sparking

Danger of electric shock

● It is advised to read this manual carefully before the product is installed and put into use.
● This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.
● Install the product in a heatproof environment. Ensure therefore that there are no chemicals, plastic parts, curtains or other textiles, etc. in the immediate vicinity of the equipment.
● Ensure that the equipment is used under the correct operating conditions. Never operate it in a wet environment.
● Never use the product at sites where gas or dust explosions could occur.
● Ensure that there is always sufficient free space around the product for ventilation.
● Refer to the specifications provided by the manufacturer of the battery to ensure that the battery is suitable for use with this product. The battery manufacturer's safety instructions should always be observed.
● Protect the solar modules from incident light during installation, e.g. cover them.
● Never touch uninsulated cable ends.
● Use only insulated tools.
● Connections must always be made in the sequence described in section 3.5.

3. Installation

3.1. General

● Mount vertically on a non-flammable substrate, with the power terminals facing downwards.
● Mount close to the battery, but never directly above the battery (in order to prevent damage due to gassing of the battery).
● Use cables with 6 mm² cross section. Do not exceed 5 m cable length. (if the cables to the PV panels must be longer than 5 m, increase cross section or use parallel cables and install a junction box next to the controller and connect with a short 6 mm² cable to the controller).
● 20A battery fuse: replacable fuse in the controller, next to the battery terminals.
● Grounding: if grounding is required, **use one grounding point only. Never ground both the minus of the solar array and the minus of the battery.**

3.2. PV configuration

● The controller will operate only if the PV voltage exceeds battery voltage (Vbat).
● PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V.
● Maximum open circuit PV voltage: 75V.

The controller can be used with any PV configuration that satisfies the three above mentioned conditions.

For example:

<u>12V battery and mono- or polycristalline panels</u>
● Minimum number of cells in series: 36 (12V panel).
● Recommended number of cells for highest controller efficiency: 72 (2x 12V panel in series or 1x 24V panel).
● Maximum: 108 cells (3x 12V panel in series).

<u>24V battery and mono- or polycristalline panels</u>
● Minimum number of cells in series: 72 (2x 12V panel in series or 1x 24V panel).
● Maximum: 108 cells (3x 12V panel in series).

3.3. Configuration of the controller (see figure 1 and 2)

A four pin header is available to select one of three battery management options:

3.3.1. **No bridge:** BatteryLife algorithm (see 1.2.2.)

3.3.2. **Bridge between pin 1 and pin 2:** conventional (see 1.2.1.)
Low voltage load disconnect: 11,1V or 22,2V
Automatic load reconnect: 13,1V or 26,2V

3.3.3**. Bridge between pin 2 and pin3:** conventional (see 1.2.1.)
Low voltage load disconnect: 12V or 24V
Automatic load reconnect: 14V or 28V

3.4 LED's

Green LED: will be on or blinking when the battery has been connected
On: one of the two conventional algorithms
Blinking: BatteryLife algorithm

Yellow LED: signals charge sequence
Off: no power from PV array (or PV array connected with reverse polarity)
Blinking fast: bulk charge (battery in partially charged state)
Blinking slow: absorption charge (battery charged to 80% or more)
On: float charge (battery fully charged)

3.5 Cable connection sequence (see figure 3)

First: connect the cables to the load, but ensure that all loads are switched off.

Second: connect the battery (this will allow the controller to recognize system voltage).

Third: connect the PV array (when connected with reverse polarity, the controller will heat up but will not charge the the battery).

The system is now ready for use.

4. Troubleshooting

Problem	Possible cause	Solution
Charger does not function	Reversed PV connection	Connect PV correctly
	No fuse inserted	Insert 20A fuse
Blown fuse	Reversed battery connection	1. Connect battery correctly 2. Replace fuse
The battery is not fully charged	A bad battery connection	Check battery connection
	Cable losses to high	Use cables with larger cross section
	Large ambient temperature difference between charger and battery ($T_{ambient\_chrg} > T_{ambient\_batt}$)	Make sure that ambient conditions are equal for charger and battery
	Only for a 24V system: wrong system voltage chosen (12V instead of 24V) by the charge controller	Disconnect PV and battery, after making sure that the battery voltage is at least >19V, reconnect properly
The battery is being overcharged	A battery cell is defect	Replace battery
	Large ambient temperature difference between charger and battery ($T_{ambient\_chrg} < T_{ambient\_batt}$)	Make sure that ambient conditions are equal for charger and battery
Load output does not become active	Maximum current limit exceeded	Make sure that the output current does not exceed 15A
	DC load in combination with capacitive load (e.g. inverter) applied	Disconnect DC load during start-up of the capacitive load
	Short-circuit	Check for short-circuit in the load connection

5 Specifications

BlueSolar charge controller	MPPT 70/15
Battery voltage	12/24 V Auto Select
Maximum battery current	15 A
Maximum PV power, 12V 1a,b)	200 W (MPPT range 15 V to 70 V)
Maximum PV power, 24V 1a,b)	400 W (MPPT range 30 V to 70 V)
Automatic load disconnect	Yes, maximum load 15 A
Maximum PV open circuit voltage	75 V
Peak efficiency	98 %
Self consumption	10 mA
Charge voltage 'absorption'	14,4 V / 28,8 V
Charge voltage 'float'	13,8 V / 27,6 V
Charge algorithm	multi-stage adaptive
Temperature compensation	-16 mV / °C resp. -32 mV / °C
Continuous/peak load current	15A / 50A
Low voltage load disconnect	11,1 V / 22,2 V or 12 V / 24 V or BatteryLife algorithm
Low voltage load reconnect	13,1 V / 26,2 V or 14 V / 28 V or BatteryLife algorithm
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature
Operating temperature	-30 to +60°C (full rated output up to 40°C)
Humidity	100 %, non-condensing
	ENCLOSURE
Colour	Blue (RAL 5012)
Power terminals	6 mm² / AWG10
Protection category	IP65 (electronic components)
Weight	0,5 kg
Dimensions (h x w x d)	100 x 113 x 40 mm

1a) If more PV power is connected, the controller will limit input power to 200W resp. 400W.
1b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V.

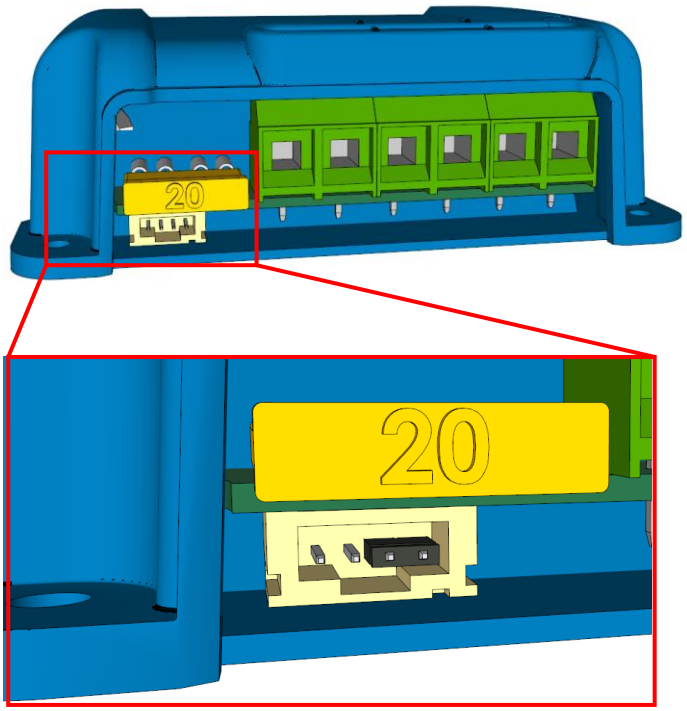


Figure 1a: configuration pins

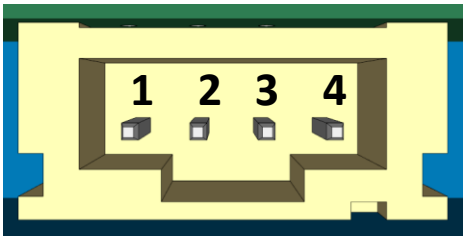


Figure 1b: pin numbering

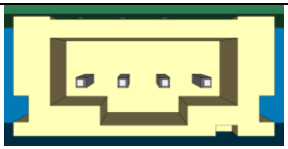
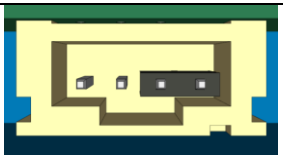
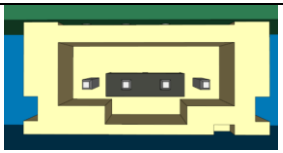
No bridge: BatteryLife algorithm	
Bridge between pin 3 and 4: Low voltage disconnect: 11.1V or 22.2V Automatic load reconnect: 13.1V or 26.2V	
Bridge between pin 2 and 3: Low voltage disconnect: 12.0V or 24.0V Automatic load reconnect: 14.0V or 28.0V	

Figure 2: Battery management options

Figure 3: Power connections

Victron Energy Blue Power

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