Lightweight
Folding Solar Charging Kit

INSTRUCTION MANUAL

For 80W, 100W and 120W models

Application: motorhomes, caravans, RVs, campervans, cars, boats, yachts and other systems with 12V lead-acid batteries

Contents

1. Product overview

Thank you for purchasing this lightweight folding solar charging kit. This manual offers important information and suggestions regarding installation, usage, troubleshooting and more. Please read this manual carefully and in full before using the product.

This kit is constructed from two identical, aluminium-framed solar panels with a durable ETFE coating. Although this coating protects the panels from adverse weather, it is recommended that you handle the kit with care. The solar cells can become damaged from strong impact, for example if the kit is accidentally dropped, mishandled or comes into contact with a sharp object. Care should also be taken to avoid scratching the surface.

The kit is fitted with a two-part folding stand which may be erected to position the panels towards direct sunlight to maximize the energy output. When not in use, the kit can be placed inside the protective storage case – made with a layer of soft foam for added cushioning. The handles feature a set of small magnets designed to help keep the kit closed tightly when folded, however, please grip both sides of the handle together when lifting the kit to prevent accidental damage.

For ease of installation, the solar kit comes with crocodile clips for fast connection to your battery. The battery cable supplied with the kit uses waterproof, push-locking plugs to connect to the controller. Before attempting to fold the kit away, ensure that you first disconnect the battery cables (as well as any cables from an optional load device). The kit will not close with the cables still connected inside, and attempting to do so could result in damage. These cables can be stored in the exterior zip-pocket of the case.

Charging of your battery will be regulated by a waterproof, high-efficiency MPPT solar charge controller - mounted on the back of the solar kit. This controller constantly measures your battery's state of charge in order to select the most appropriate charging parameters (voltage, current and charging program). The Maximum Power Point Tracking (MPPT) functionality offers increased efficiency compared to standard PWM charge controllers, and ensures that the solar panel provides as much power as possible. The controller also provides the following important protection functions for your battery:

- **Overcharge protection** - one of the most important functions of the controller. When your battery is full, the controller will either switch to a trickle-charging mode where it will continue to gently top-up the battery, or it will stop the charging completely.
- **Reverse current protection** - stops the power flow from the battery into the solar panel at night.
- **Reverse polarity protection** - if you accidentally connect the kit to the battery using the wrong polarity, your system is safe.
- **Load protection** – if you have connected a 12V load to the controller (optional), the controller will be protected from short circuits, excessive current and overheating.

In addition, the charge controller has a temperature sensor which measures the ambient temperature. To regulate the speed of chemical reaction inside the battery, the controller will choose a slightly higher charging voltage in low ambient temperatures, and a lower voltage in high temperatures.

2. Installation instructions

1) Ensure that your battery is not fully discharged. **The battery must generate at least 10V to start the solar charge controller.** If your battery is fully discharged, the solar charge controller will not start and the kit will not be able to charge the battery. In such case, charge the battery first by other means for a short period of time to allow the voltage to reach 9V.

2) Unfold the solar panels, extend the battery leads and connect the crocodile clips to the + positive (red) and – negative (black) battery terminals on a 12V lead-acid battery.

Note: It is recommended that the kit is always connected to the battery terminals directly. Unless you are certain, do not use any existing 12V inputs or sockets (e.g. a cigarette lighter socket) for connecting the kit because these inputs or sockets may not be rated / may not have their connecting cables rated to the required power. Moreover, such inputs or sockets may be connected via other electronic components (e.g. ignition or another controller) which would interfere with the operation of your solar kit.

3) Check and confirm that the solar charge controller has started and detected the battery. If the battery has been detected, the **yellow** battery status LED on the controller should turn on. The **green** charging status LED should also turn on, which means that the controller is ready for solar input. If there is enough light falling on the solar panels, the **green** LED will start flashing, indicating that the kit is now charging the battery.

Note: The battery status and charging status LED lights may not be easily visible in bright, direct sunlight. If you have any doubts, try checking the LED status indoors or in a shaded area.

Note: the charge controller in your kit is designed for 12V lead acid batteries (gel, AGM, sealed, flooded etc). The controller charges the batteries at a default charging voltage 14.4V (at 25°C), reducing to float voltage 13.7V (at 25°C) when the battery is full. While these voltages are suitable for charging most 12V lead acid batteries, please check the charging voltage requirements of your battery before using this kit to ensure that your battery will be charged correctly.

4) Place the kit outside in a sunlit area, with no obstructions or shading on the solar panels. To maximize the output, adjust the position of the kit periodically to track the movement of the sun in the sky.

Note: Placing the kit indoors next to a window will reduce the output considerably and is not recommended.

3. Solar charge controller operation

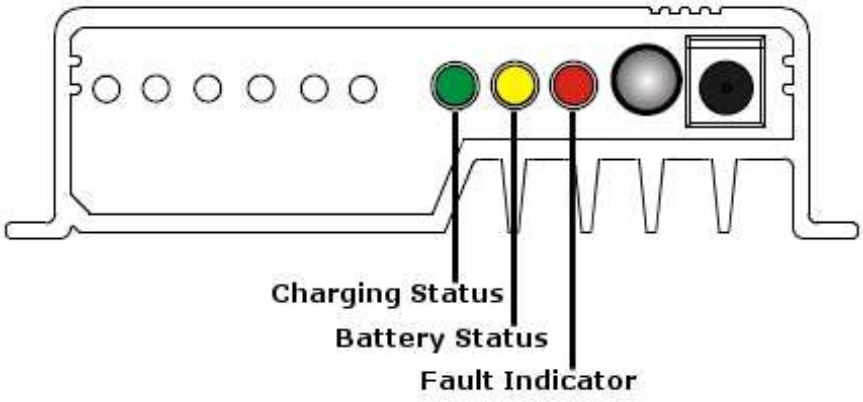

Figure 1: Charge controller indicators

LED	Status	Function
Green: Charging status	On	Ready, not charging
	Fast flash (5 times per second)	Charging (Bulk stage)
	Flash (once per second)	Charging (Boost stage)
	Slow flash (once per 2 seconds)	Battery is full, float charging (maintaining)
Yellow: Battery status	Off	Battery disconnected, or overvoltage protection
	On	Battery normal
	Slow flash (once per 2 seconds)	Low battery voltage
	Fast flash (5 times per second)	Low voltage protection enabled (for load)
Red: Fault indicator	Off	Normal operation
	On	No output power
	Flash (once per second)	Over temperature
	Fast flash (5 times per second)	Short circuit or over current protection

Figure 2: LED indicators and explanations

4. Troubleshooting

Fault	Possible cause	Suggested solution
All LED indicators are OFF, battery connected	Fuse is blown	Check the fuse in the fuse holder at the end of the battery cables of your kit and replace if required.
	Reverse polarity	Battery has been connected with a reversed polarity. Please check and amend your connections.
	Battery voltage too low	Measure battery voltage with a digital multimeter. Min 10V is required for start-up of the kit. If your battery is too low or completely discharged, charge it first by other means.
	Battery power not supplied to controller	Battery power is not reaching the solar charge controller for any other reason. Please check the battery cables of your kit for signs of damage. Pull-test any cable joints (strongly) between the controller and your battery: - connections directly under the controller; - attachment of cables to the plugs; - fuse holder connection; - attachment of cables to crocodile clips.
Green LED permanently ON, battery connected	Not enough solar power	Ensure there is no shading on the solar panels. Check wiring between the controller and solar panels for reverse polarity, loose connections or fraying.
Yellow LED OFF	Battery over voltage	Using a digital multimeter check if the battery voltage is higher than the over-voltage disconnect point (15.5V), and if confirmed, disconnect the solar kit. Resolve the voltage problem if other sources are charging the battery. If no other sources, contact the supplier or manufacturer of your kit for advice.
Yellow LED flash	Battery is too low / battery is over-discharged	Remove any loads or power drain on the battery. Allow the solar charging kit sufficient time to recharge the battery. If this happens repeatedly, your battery may be too small for your usage or have lost capacity due to its use, and may have to be replaced.

Red LED flash (once per second)	Controller Overheating	Cool down the surrounding area. Improve ventilation around the solar kit. Decrease the power or remove any load if it is connected to the load output of the charge controller. If no load connected, contact the supplier or manufacturer of your kit for advice.
Red LED flast flash (5 times per second)	Short circuit or over current	Switch off all devices connected to the load. Locate and remove the short circuit. The controller will reconnect after 1 minute. If no load connected, contact the supplier or manufacturer of your kit for advice.
All LED flashing	System voltage error	Check battery voltage is suitable for the controller's operating voltage. If not, change to a suitable battery or reset the working voltage.

Figure 3: Troubleshooting

5. Frequently asked questions (FAQ)

Q. What type of batteries can be used with this kit?

A. Any 12V lead acid battery (typically used in cars, caravans, motorhomes, boats etc). The battery cannot be too small; you need to ensure that it can safely accept the maximum current provided by your solar kit. We recommend the following as a guide:

Power rating of the solar kit	80W	100W	120W
Minimum battery capacity	40Ah	50Ah	60Ah

Figure 4: Minimum recommended battery capacity

You may be able to use a smaller battery if it can accept high current and faster charging. Please check the battery specifications with the supplier / manufacturer of the battery, including the charging voltage required by the battery.

Q. Can this kit charge a Lithium battery?

A. No. This folding kit is not suitable for charging Lithium batteries.

Q. Can this kit charge a 24V battery?
A. No, this kit is designed to charge a 12V battery.

Q. What is the pair of unconnected "+" and "–" cables in the middle of the controller?
A. These cables are the optional 12V load output of the controller. It is not necessary to connect anything to them as the charging function of the solar kit / controller will operate regardless of whether these cables are connected or not. If needed, this 12V output can be used to power small 12V devices (with current up to 10A) such as LED lights, 12V-to-USB converters etc. The output also has over-discharge battery protection i.e. it turns itself off when the battery becomes low. An infrared programming device (purchased separately) might be required to set up the load output timing.

Q. Can the kit charge two or more 12V batteries connected in parallel ("+" to "+", "–" to "–")?
A. Yes, it's possible if the batteries are the same type, capacity and are always used together - wired in parallel as a single 12V battery bank.

Q. Is there any risk that the solar kit will over charge my battery?
A. No. One of the main protection functions of the charge controller is to ensure that your battery is not overcharged.

Q. Can I extend the battery leads?
A. Yes, it's possible – please choose a cable with the same cross section for extension.

Q. Can the kit be connected to my battery through a cigarette lighter or another connector?
A. You can use another connector between the kit and the battery with care. Ensure that the connector is wired directly

to your battery (with no other electrical components in between) and also that both the connector and the cables connecting it are rated to the power of your kit.

Q. Can rain damage the solar kit?
A. No, it won't damage the kit as the panels and controller are fully waterproof, but we recommend wiping and drying the kit after rain to avoid rust, corrosion or discolouration.

6. Maintenance

It is recommended to perform the following tasks (with the power disconnected) at least twice a year to keep the kit in good working condition:

- Clean the frontside of the solar panels gently using a soft cloth (dry or moist, with lukewarm water). Do not use brushes, scrapers, metal tools, or any high-pressure water tools. Do not use any cleaning substances and do not allow the surface of the solar panel to come into contact with any chemicals.
- Use a suitable lubricant on hinges if required. Ensure it does not come into contact with the solar panel surface.
- Remove any dirt or insects from the frame.
- Check all the wires to ensure that the insulation is not damaged from solarisation, frictional wear, dryness, insects, vermin etc. Maintain or replace wires if necessary.

7. Warranty

This product is covered by a 1 year warranty which guarantees the quality of assembly, wiring and materials for the kit and the solar charge controller. The warranty does not cover the fuse, usual wear and tear, unauthorised modifications, mechanical, chemical and transport damage.

8. Technical specifications

Solar panels:

	ARF-FWP-80M	ARF-FWP-100M	ARF-FWP-120M
Cell type	mono	mono	mono
Folded size (mm)	510 x 565 x 50	615 x 565 x 50	715 x 565 x 50
Net weight (kg)	4.5	5.5	6.3
Max. power (W)	80	100	120
Max. power voltage (V)	18.3	19.1	19.1
Max. power current (A)	4.37	5.23	6.74
Open circuit voltage (V)	22.6	22.6	22.6
Short circuit current (A)	4.85	6.07	7.28

Figure 5: Specifications for all models of folding solar kits

Specifications under standard test conditions (STC): 1000W/m2, AM 1.5, 25 °C. Data provided for the solar panels only, without the effect of the MPPT solar charge controller which is capable of boosting solar panel current in certain conditions.

Solar charge controller:

Electrical and mechanical parameters	
Technology	Maximum Power Point Tracking (MPPT)
Nominal system voltage	12V DC
Bulk / Boost charging voltage (at 25°C)	14.4V
Float charging voltage (at 25°C)	13.7V
Rated current	10A
Maximum battery voltage	15.5V
Overall dimensions	85.8 x 81 x 23.1 mm
Net weight	0.26 kg
Temperature compensation	-30mV/ºC for Bulk / Boost -18mV/ºC for Float

Figure 6: Specifications of the solar charge controller