

## 10A dual battery solar charging kit set for 40W – 120W Photonic Universe solar panels Instruction manual

Dear Customer,

Thank you very much for choosing **Photonic Universe** products. This manual will guide you through the installation of your solar kit and answer frequently asked questions. Please read this manual carefully before installing the kit.

*Remember, any work should be carried out by an appropriately qualified person with all necessary precautions and safety measures taken.*

### Contents of the package

No	Item	Quantity
1	10A dual battery solar charge controller	1
2	Plastic corner mounting brackets	4
3	Waterproof double entry cable gland	1
4	5m double core battery cable 2.5mm <sup>2</sup> cross section	1
5	Pair of waterproof MC4 cable connectors	1
6	Instruction manual	1

This 10A dual battery solar charging kit set is suitable for 40W – 120W **Photonic Universe** solar panels with the maximum power voltage 17-18V and 5m cable with MC4 connectors attached to the solar panel. If the solar panel was supplied with a short 1m cable, you will also need a pair of solar extension cables in addition to this set.

The kit is designed for charging either one 12V battery, or two independent and electrically isolated 12V batteries. For the purposes of this instruction manual, when we refer to a “battery”, we will either mean a single 12V battery, or a 12V bank of several batteries connected in parallel (“+” to “+”, “-” to “-”).

### Electrical installation of the solar kit for two independent batteries

- Before you install the solar kit, please make sure that both 12V batteries are charged so that they generate at least 6V or more. This is required to enable the solar charge controller to work. If your batteries are fully discharged, please charge them by other means first, otherwise the controller will not start.
- Cut 5m battery cable supplied with the kit into two pieces for Battery 1 and Battery 2. Connect the terminals of your 12V batteries to the solar controller Battery 1 and Battery 2 terminals, following the order of connection stated in the solar controller manual. If the length of 5m cable is not enough for both batteries, please use some extra cable with 2.5mm<sup>2</sup> cross section.  
*Note: when you connect the batteries to the solar controller, the battery LED lights on the controller should start flashing about once every second. This means the controller has detected the batteries.*
- When connecting the solar panel to the charge controller, we recommend installing additional MC4 connectors approximately 1m away from the solar panel for ease of connection, and also for feeding the solar panel cable through the waterproof cable entry gland. Follow the instructions below to install additional MC4 connectors:
  - If your solar panel was supplied with 5m cable with MC4 connectors, cut this cable approximately 1m from the solar panel (so that 1m cable remains attached to the solar panel and 4m cable with MC4 connectors becomes a separate piece of cable). Attach the pair of MC4 connectors supplied with the kit on the end of 1m solar panel cable (note the polarity printed on MC4 connectors: male should be attached on “+” lead, female on “-” lead). You may need pliers or a crimping tool to attach MC4 connectors.

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- Plug the MC4 end of 4m cable (which has been cut off from the solar panel) into the new MC4 connectors on 1m solar panel cable
- Connect bare ends of 4m cable to the solar controller. Make sure connection polarity is correct according to the original polarity labels on the solar panel cable: "+" to "+", "-" to "-".

*Note: if you do not need this additional MC4 connectivity point, you can skip this step by simply cutting the existing MC4 connectors on the end of 5m solar panel cable off, and connecting the bare wires to the screw terminals of the solar charge controller.*

*Note: after connecting the solar panel to the controller, and with the panel exposed to some daylight / sunlight, battery LEDs on the controller should turn to constant ON. This means the controller has started charging your batteries. If the controller LEDs turn to ON constantly first, but after a short period of time start flashing slowly again, it might mean that the batteries are fully charged. Please check the battery voltage with a digital multimeter for confirmation.*

4. For maximum output from the solar panel make sure it is exposed to as much sunlight as possible and it is not shaded. Even a small shaded area can reduce the output significantly (e.g. leaves, shades from trees etc.)
5. For information on how to operate the controller, including choosing the battery type and charging priority, please refer to the instruction manual for the solar charge controller.

To disconnect, the order should be the reverse to connection. **You should disconnect the solar panel from the controller first**, and then disconnect each of the batteries. It is important that you follow this disconnection order if you need to remove one of the batteries or if you need to change it to charge a different battery.

### **Electrical installation of the solar kit with a single battery**

The solar kit can also work with a single 12V battery if needed (it's not necessary to use Battery 2 terminals of the solar charge controller). In order to install the solar kit with a single 12V battery, please go through the above steps but skip everything which relates to the second battery.

If there is only one battery connected to Battery 1 terminals of the controller, the unit will recognise this automatically and pass 100% of solar power to this battery. You will not need to adjust charging priority settings of the controller for that.

### **Fitting the solar panel to your roof**

1. Make sure all the components of your solar charging kit are disconnected when you start fitting the solar panel.
2. Choose a location for the solar panel where it will be exposed to maximum sunlight and minimum shading from nearby objects.
3. Drill holes in each of the plastic corner brackets in the designated places.
4. Attach the brackets to the solar panel frame and mark corresponding holes on the frame.
5. Drill smaller holes in the solar panel frame, according to the diameter of self-tapping screws which you are planning to use (the drill size should be smaller than the screw diameter, so that screws grip well).
6. Using self-tapping screws, fix plastic brackets to the corners of the solar panel frame.
7. Using an appropriate adhesive, bond the brackets with the solar panel to your roof (using sand paper and cleaning the surfaces if needed). To ensure that the polarity of the wires is clear, mark the "+" solar panel lead so that it is visible from the outside.

*Note: when choosing the adhesive / bonding agent for your installation, make sure it is suitable for outdoor use (e.g. it's suitable for a wide temperature range). For added strength, in addition to bonding the brackets to the roof, you can drill a small vertical hole in each bracket and fix the brackets by self-tapping screws (if the roof surface allows that). Sealant / adhesive should then be put on the top of the screws to make the area waterproof.*

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8. Feed the solar panel cables through the cable entry gland, the hole in your roof and then bond the gland to the roof. Tighten the cable gland nuts after the adhesive has dried.

#### Adding fuses to your system

Although the solar charge controller has battery protection functions, you can install fuses in each of the battery circuits for additional protection against short circuits and wiring mistakes. They should be inline fuses between the solar charge controller and each of the batteries. The size of fuses depends on the maximum charging current of the solar panel. Please check solar panel specifications for *Maximum power current* and choose a fuse with the next available rating higher than that (to a maximum of 10A).

#### Negative common ground of vehicles and boats

Most vehicles (including campervans and motorhomes) and boats typically have the common ground when a vehicle body or boat hull is used as a shared connection point by the engine, generator, battery, lights and other system components. When installing the solar kit on such vehicles / boats, please note the following:

- To avoid any short circuits or conflicts between your vehicle / boat system and the solar kit system, you should never ground the solar panel (i.e. never connect it to your vehicle body / boat hull). The solar panel cables should be fully electrically isolated from your vehicle body / boat hull and should be connected directly to the solar charge controller.
- Your solar charge controller is a negative common ground device. If you are planning to use the solar charging kit to charge two separate batteries, the controller can work with these batteries even if their negative terminals are connected to the same negative common ground of your system. However, in order to allow the solar charge controller to treat your batteries independently and choose individual charging programmes, positive terminals of your batteries **must be fully electrically isolated from each other**, i.e. they should not be connected to each other or to the same system or wiring. This electrical isolation of “+” terminals of the batteries from each other will allow the solar charge controller to use its full dual battery functionality, for example it will be able to split the power from the solar panel to batteries according to the pre-set priority ratio and it will also be able to stop charging one of the batteries when full but continue charging the other battery.

Below you can find a description of situations in which you need to use your dual battery solar charge controller as a **single battery controller**:

- If the two batteries are connected to different systems with the same negative common ground (e.g. “engine” and “leisure” battery), but their positive terminals are also connected to a split charger or switch or another component which might link the batteries together, then the solar charge controller may not work properly. When the positive terminals of two batteries become linked, the controller will see both batteries as a mix, and it will not be able to treat batteries independently (e.g. even if you set the controller to 80%/20% it will still charge them as 50%/50%, and if one of the batteries is full it might continue charging anyway etc). You should avoid such situations when the positive terminals of two batteries become linked through another system component such as a split charger or a switch. If this is required in your system, use the solar charging kit to charge one battery at a time only, keeping the other pair of battery terminals of the solar charge controller unconnected.
- If your engine and leisure battery are connected to the positive common ground, you cannot use both Battery 1 and Battery 2 output of the solar charge controller at the same time either. You can only charge one battery at a time and keep the other pair of battery terminals of the controller unconnected. Remember: the solar panel cables should not be grounded in any case.
- If you only have one bank of two or more 12V leisure batteries to charge, and these batteries are connected in parallel (“+” to “+”, and “-” to “-”), then you should treat them as a single battery and use only one pair of battery terminals of the solar charge controller to charge them. The other pair of battery terminals of the controller should remain unconnected.

Even if your system has the negative common ground, we advise using dedicated battery cables from the terminals of the solar charge controller directly to both terminals of each battery anyway, and installing inline fuses between each battery and the solar charge controller for additional protection.

#### Charging by the engine or another charger

In a vehicle or boat, it is possible that one of the batteries connected to the solar charge controller will also be charged by your engine from time to time (e.g. your starter or “engine” battery). Sometimes you might also need to charge one of your batteries by a different charger e.g. a mains charger. In such cases you do not need to disconnect this battery from the solar charge controller, but please note the following:

- When you charge one of your batteries by the engine or a mains charger, the voltage at the terminals of this battery will increase
- The solar charge controller will detect this increase in voltage and treat it as if the battery was fully charged. So the controller might switch solar charging off temporarily for this particular battery to prevent overcharging. More power will be diverted to the other battery (assuming it is not being charged by any other source at the same time)
- When you stop charging by another charger, the solar controller will resume charging the battery.

#### **Frequently asked questions**

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

A. Any sealed, gel or flooded 12V DC battery normally used in caravans, motorhomes, cars, boats, motor cycles etc. Please note that battery type settings of the solar controller relate to both batteries.

*Q. Can this kit charge a 24V battery or 2 separate 24V batteries?*

A. No, this kit is designed to charge 12V batteries. If you add another identical solar panel, the kit will be able to charge a 24V battery. Before you make any changes, you will need to contact **Photonic Universe** first for assistance and advice on the type of solar panel which can be used and the wiring.

*Q. Can the kit charge a 12V battery bank or 2 separate 12V battery banks?*

A. Generally batteries in the same 12V battery bank should have the same type, capacity and age. In this case the kit can be used for charging such battery banks, and each 12V battery bank should be treated as a single battery for the purposes of connection. For example, it is possible to connect 2 x 12V batteries (wired in parallel, “+” to “+”, “-” to “-”) to “Battery 1” terminals of the solar controller, and 3 x 12V batteries wired in parallel to “Battery 2” terminals of the controller.

*Q. Is there any risk that the solar kit will overcharge my battery?*

A. The solar charge controller has a built-in overcharge protection – it will ensure that your battery is not overcharged, by reducing the charging current/voltage to the trickle charge level or stopping the charge completely when the battery is full. However it is your responsibility to make sure that your battery size and capacity can accept the maximum charging current from the solar panel.

*Q. My battery gets charged quickly but does not last very long. I think the solar kit undercharges it?*

A. No, this is not a kit problem. Most likely your battery is at the end of its useful life so the capacity has shrunk. Consider replacing it with our special AGM or gel deep cycle batteries (see Appendix 1).

*Q. Does the kit produce less power in the winter than in the summer?*

A. If the daytime gets shorter in the winter, the total output of the solar kit will reduce proportionally. In addition, the kit would produce significantly less energy on a dark cloudy day compared to a bright sunny day. The output of the solar kit is proportional to the amount of light falling on the solar panel surface.

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*Q. Can I upgrade the solar kit to generate more power and charge my batteries faster?*

A. The solar charge controller can work with solar panels with up to 160W combined power. If the wattage of your solar panel allows it, you can add another solar panel to your kit so that the total combined power output is less than 160W. This second solar panel should be connected in parallel to your existing solar panel (“+” to “+”, “-” to “-”). It is essential that the second solar panel is made of solar cells from the same manufacturer.

If the wattage of your solar panel does not allow adding another solar panel (e.g. 150W solar panel), then you will need to upgrade the solar charge controller to 20A before adding another solar panel.

If you need help with upgrading your solar kit please contact **Photonic Universe** for assistance using the contact details below.

*Q. Can I run 240V AC household appliances from my 12V battery?*

A. You can run 12V DC appliances from your battery, but if you also want to run 240V AC household appliances you need an off-grid pure sine wave power inverter (see Appendix 2 for more details).

## Troubleshooting

It is important to remember that if your battery is not getting enough charge, it does not necessarily mean there is a problem with the solar charging kit. In most cases the power drain from the battery would simply be higher than the power generated by the solar charging kit (especially in the winter when you might have a noticeable reduction in solar energy output and an increase in energy consumption at the same time). Another reason could be that there is a power leakage in your system. Only after disconnecting the battery from the system of your vehicle / boat and from all your loads, and when you then left it charging for a considerable amount of time with no effect on the battery, should you use the following troubleshooting options:

- Disconnect and reconnect the system (solar panel should be disconnected first, then the batteries; connection in the reverse order: batteries, then the solar panel).
- If the controller does not recognise the battery (upon connection the battery light on the controller remains switched off), make sure that the battery generates at least 11.5V for troubleshooting purposes. If necessary, charge the battery by other means first.
- Disconnect the battery from your vehicle / boat (both “+” and “-”) so that there is no power drain or leakage.
- Check all connections to ensure they are secure and clean
- Check polarity of the battery connection and the solar panel connection
- Ensure the solar panel is exposed to sufficient light – ideally position it to face the sun directly
- For more information refer to the Troubleshooting section of the solar controller manual

## Warranty

The solar charge controller included in this set is covered by 1 (one) year warranty after purchase. The warranty is provided by **Photonic Universe** – we will repair or replace any products with defects at our discretion.

## Disclaimer



*Working with electricity and batteries can be dangerous. The information provided in this manual is for general guidance only. All work should follow the safety standards and should be carried out by an appropriately qualified person.*

*Photonic Universe Ltd is not responsible for any damage or injury caused by inappropriate installation or use of the product.*

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