solar power answers

70 Watt Solar Lighting System

Overview

This solar photovoltaic lighting system consists of a 70 Watt crystalline module, a self-contained photovoltaic controller with low-voltage disconnect function, a sealed lead-acid battery and 4 off 10 Watt fluorescent lights with integrated switches.

The system will provide daily lighting throughout the year. The number of hours lighting is dependent on the location in which the system is installed. The following table gives examples:

	Daily lighting hours	
Location	**Minimum**	**Maximum**
Northern Europe	2	4.5
Southern Europe	3.5	6.5
Sub-Saharan Africa	5.5	7

The number of hours lighting assumes that all of the lights are switched on. In practice this is unlikely; if one or more lights are on for less time, then a corresponding increase in lighting hours will be available from the others.

Parts List

The following parts will be required:

1. 1 off Phaesun 70 Watt 12 Volt Photovoltaic module
2. 1 off Morningstar SHS-6 Photovoltaic controller
3. 1 off Ever-Exceed 100 Ah Battery (or local equivalent – min 100 Ah)
4. 1 off Support for module – for example perforated steel angle
5. 6 mm^2 cable – length depending on installation
6. 2.5 mm^2 cable for lights – length depending on installation
7. Lighting junction boxes – number depending on installation
8. Earthing rod and clamp (if no earth available on site)
9. Sundries – screws, cable clips, terminals – dependent on installation

Items 1 to 3 are available from www.solar-power-answers.co.uk The other items should be obtained locally to suit the installation. All are easily available from electrical factors or DIY shops.

Installation

Take great care when performing the installation. If you are at all unsure of your abilities, consider engaging the services of a qualified electrician. Be aware that the battery contains sulphuric acid, which is highly corrosive. It can also deliver extremely high currents into a short circuit; remove all metal jewellery before starting work and use insulated tools wherever possible.

The system components are installed as follows:

Module: Install the module in an unshaded position with a tilt from the horizontal equal to the angle of latitude plus 15°. So, if you are in France at a latitude of 45°, tilt the module upwards by 60°. The module should be facing south in the northern hemisphere and north in the southern hemisphere. Good positions include the roof of the building or a pole firmly anchored in the ground or to the building. A suitable structure can easily be fabricated from perforated steel angle (Dexion® or similar). Ensure that the mounting is sufficiently rigid to withstand extreme weather conditions. Connect the output cable (6 mm^2) to the module at this stage as it will be difficult to do later, but do not connect it to the controller.

Battery: Position the battery in a dry, well ventilated location protected as far as possible from extremes of temperature. It is heavy, so should be either on the floor or on a well-supported shelf or other structure.

Controller: The controller is mounted to the wall as near as possible to the battery, and in any case no further than 2 metres from it. It must be protected from damp and extremes of temperature.

Lights: The light can be mounted wherever illumination is required, however as they incorporate switches, they must be within reach of the person using them. Connect cable (2.5mm^2) to the lights but do not connect it to the controller. Use junction boxes to connect the lights in parallel as required, taking great care to ensure correct polarity.

Earthing: If no earth is available, drive an earth rod into the ground outside, as near as possible to the battery location. Use green and yellow earth cable of at least 2.5 mm^2 to connect the earth rod to the battery negative terminal.

Wiring: All lighting wiring should be completed in a minimum of 1.5 mm^2 cable, although 2.5 mm^2 is preferable. The battery and module cables must be made from a minimum of 6 mm^2 cable. Keep the length of each cable run to a practical minimum as this helps to prevent power loss in the system, with the maximum length of the module cable being 10 metres. It is very important that the correct polarity is adhered to, i.e. positive terminals should always be connected to positive and negative terminals to negative. Use red cables for positive and black for negative. Use terminals on the end of the cables where appropriate and ensure that all terminals are properly tightened. Secure cables to prevent damage.

Make the connections to the controller in the following order:

1. Battery cable to terminal marked “battery” on controller
2. Battery cable to battery terminals
3. Module cable to input terminals on controller
4. Lighting cable to output (load) terminals on controller

Commissioning

Refer to the manual supplied with the controller to understand the function of the indicator lamps on the front panel. Once you have ensured that the battery is charging by means of the indicators, switch on the lamps to ensure correct operation.

Wiring Diagram