1. INTRODUCTION

This Installation Manual contains essential information for the safe electrical and mechanical installation of PERLIGHT SOLAR PV modules. All information described within this manual is the property of PERLIGHT SOLAR. This document does not constitute a warranty, expressed or implied. PERLIGHT SOLAR does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with the installation, operation, use or maintenance of PV modules as described within this manual. No responsibility is assumed by PERLIGHT SOLAR for any infringement of patents or other rights of third parties that may result from the use of any PV modules. PERLIGHT SOLAR reserves the right to make changes to the product, specifications or installation manual without prior notice.

2. GENERAL INFORMATION

(INCLUDING WARNINGS AND SAFETY INFORMATION)

The installation of PV modules requires a great degree of skill and should only be performed by a qualified licensed professional, including licensed contractors and licensed electricians. Please be aware that there is a serious risk of injury occurring during the installation of PV modules, including the risk of electric shock. All PERLIGHT SOLAR modules are equipped with a permanently attached junction terminal box that will accept a variety of wiring applications or with a special cable assembly for ease of installation, and this does not require assembly.

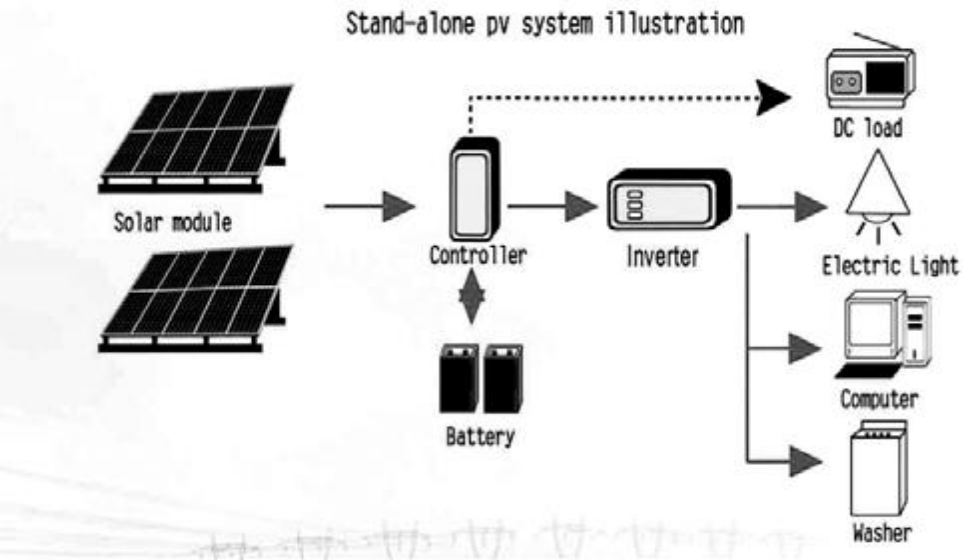
<GENERAL WARNINGS>

1. Before you attempt to install any wiring, operate or perform maintenance on the PV modules, please make sure that you completely understand the information described in this installation manual.
2. Contact with electrically active parts of a PV module such as terminals can result in burns, sparks and lethal shock whether the PV modules are connected or not.
3. PV modules produce electricity when the sufficient sunlight or other sources of light illuminate the module surface. When the modules are connected in series, the generated voltage is cumulative. When the modules are connected in parallel, the generated current is cumulative. As a result, a large-scale PV system can produce both high voltages and currents, either of which could present a serious hazard and may cause serious injury or death.
4. Do not connect PV modules directly to loads, such as motors. Output power varies depending on solar irradiation and may damage any directly connected motor or other load.

1:Should a brushless motor be directly connected to a PV module, the lock function may become active and the hall IC would most likely be damaged.

2:Should a brush type motor be directly connected to a PV module, the coil may become damaged.

<OPERATING PRINCIPLE>



<GENERAL SAFETY>

1. Consult local codes and other applicable laws concerning required permits and regulations concerning installation and inspection requirements.
2. Before installation of a PV module, contact the appropriate authorities to determine all permitting, installation and inspection requirements that should be followed.
3. Install PV modules and ground frames in accordance with applicable local rules and regulations
4. PV modules should be installed and maintained by qualified personnel. Only installation & service personnel should have access to the PV module installation site.
5. Appropriate safety practices should be followed and required safety equipment should be used in order to avoid possible safety hazards. This applies for all types of PV module installations, including rooftop and ground mounting. Note that the installation of some PV modules on roofs may require the addition of fireproofing, depending on local building / fire codes.
6. Please use PV modules with the same cell size when installed in series.
7. Follow all safety precautions for the other components used in the system.
8. To avoid risk of injury or electrical shock, access to the PV modules should be restricted to skilled technicians.
9. Do not clean the glass surface of the PV module with any chemicals. Do not let water pool on the glass surface of the PV modules for an extended period of time. This creates a risk of salt deposits on the glass surface, which may result in lower energy outputs.
10. Do not install PV modules perfectly flat, this will allow water to pool on the glass for extended periods of time.
11. Do not cover the water drain holes in the frame. There is risk of frost damage should the frame become filled with water at freezing temperatures.
12. When considering snow loads sliding off the PV modules, take appropriate measures to ensure the lower edge of the PV modules will not be damaged.

13. Do not expose PV modules to sunlight concentrated with mirrors, lenses or similar means

14. Should a problem occur, turn off inverters and circuit breakers immediately.
15. Should the glass surface of a PV module break, wear goggles and tape the glass down to keep the broken pieces in place.
16. A defective PV module may generate power ever if it is removed from the system. It can be dangerous to handle said PV module while exposed to sunlight. Place a defective PV module in a carton so the PV cells are completely shaded.
17. When PV modules are placed in series, the maximum open circuit voltage must not be greater than the specified maximum system voltage. Please remember the total voltage is the sum of all component PV modules. For parallel connections, please be sure to take proper measures to restrict reverse current flow.

<HANDLING SAFETY>

1. Do not place an excessive load on the surface of the PV module or twist the frame. The glass surface is fragile and may break.
2. Do not stand or step on the PV module. The surface glass of the PV module is slippery.
3. Do not hit or put an excessive load on the glass or backsheeting. PV cells are very thin and can be easily broken.
4. Do not scratch or hit the back film. The backsheeting film is easy to damage.
5. Do not hit the terminal box or pull on the cables. The terminal box may crack and break.
6. Never touch the terminal box or the end of the output cables with bare hands when the PV module is irradiated. Cover the surface of PV module with a cloth or other suitable and sufficiently opaque material to isolate the PV module from incident light and handle wires with rubber-gloved hands to avoid electric shock.
7. Do not scratch the output cable or bend it with force. The insulation of the output cable may break and result in electric sparks or shock.

8. Do not pull on the output cable with excessive force. The output cable may unplug and cause electric sparks or shock.
9. Do not drill holes in the frame. This may compromise the frame strength and cause corrosion of the frame.
10. Do not scratch the insulation coating of the frame (except for attaching the ground connection). Frame scratches may result in corrosion or compromise the framework strength.
11. Do not loosen or remove the PV module screws. This may compromise the joint strength of PV module and cause corrosion.
12. Do not touch the PV module with bare hands. The PV module frame has sharp edges and may cause injury.
13. Do not drop the PV module or allow objects to fall upon the PV module.
14. Do not artificially concentrate sunlight onto the PV module.

<INSTALLATION SAFETY>

1. Always wear protective head gear, insulating gloves and safety shoes (with rubber soles).
2. Keep the PV module packed in the carton until installation.
3. Do not touch the PV module unnecessarily during installation. The glass surface and the frames may get hot. There is a risk of burns and electric shock.
4. Do not work when raining, snowing or in windy conditions.
5. Use insulated tools.
6. Do not use wet tools.
7. Do not drop tools or hard objects on PV modules
8. When installing elevated PV modules, be careful not to drop any objects (PV modules or tools).
9. Make sure flammable gases are not generated near the installation site.
10. Completely cover the PV module surface with an opaque material during PV module installation and wiring.
11. Make sure all plug connections and wiring work is secure.
12. Due to the risk of electrical shock, do not perform any work if the terminals of the PV module are wet.
13. Do not touch the terminal box or output cable ends (connectors) with bare hands during installation or under sunlight, regardless of whether the PV module is connected or disconnected from the system.
14. Do not unplug the connector when the system circuit is connected to a load.
15. Do not stomp on the glass. There is a risk of injury or electric shock if the glass becomes broken.
16. Do not work alone (always work with a team of 2 or more people).
17. Wear a safety belt if working on rooftops or other elevated locations.
18. Do not wear metallic jewelry which can cause electric shock during installation.
19. Do not damage the surrounding PV modules or mounting structure when replacing a PV module.
20. Bind cables with insulation locks. Cables hanging from the terminal box are dangerous. They may be bitten or pulled on by animals.

3.COMPONENTS

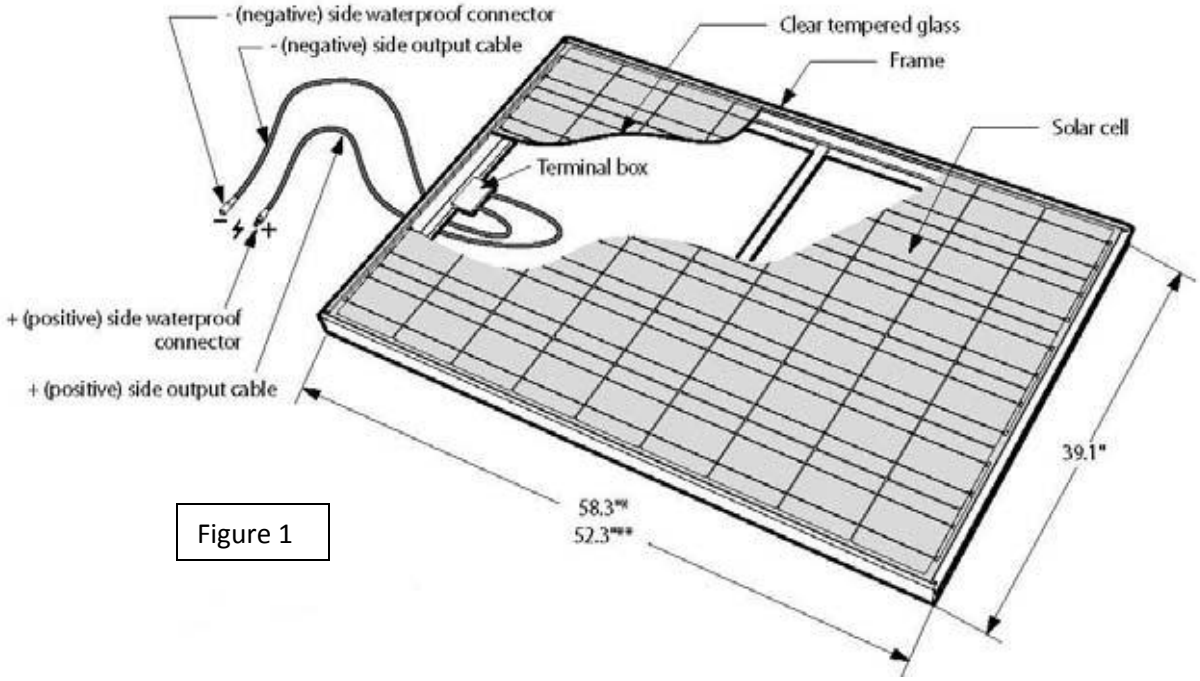


Figure 1

4. SITE SELECTION

In most applications, the PV modules should be installed in location where there is no shading throughout the year. In the Northern Hemisphere, the PV modules should typically face south, and in the Southern Hemisphere, the PV modules should typically face north. Please make sure that there are no obstructions in the surroundings of the installation site. Take proper steps to maintain reliability and safety; consider effects on PV modules from heavy snow, extreme cold, strong winds, presence of water, salt water damage, and installations on small islands or desert areas. Salt water is a corrosive agent and it is recommended to install PV modules at least 100 feet from any large body of salt water.

5. TILT ANGLE

The tilt angle of the PV module is the angle measured between the PV module and a horizontal surface. PV modules generate maximum power when directly facing the sun. For standalone systems with battery backup where the PV modules are attached to a permanent structure, the tilt angle of the PV modules should be determined to optimize the performance when the sunlight is the scarcest. In general, if electric power generation is adequate when the sunlight is the scarcest, then the chosen angle should be adequate during the rest of the year. For grid-connected installations where the PV modules are attached to a permanent structure, it is recommended to tilt the PV module at an angle equal to the latitude of the installation site so that power generation from the PV modules will be optimized over the entire year.

6. WIRING

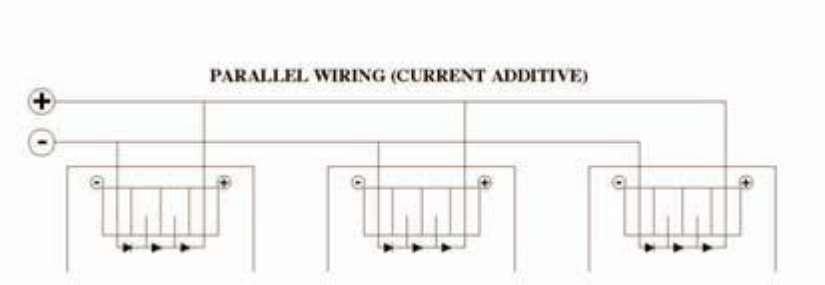


Figure 2

To ensure proper system operation and to maintain your warranty, observe the correct cable connection polarity (Figures 1&2) when connecting the modules to a battery or to other modules. If not connected correctly, the bypass diode could be destroyed. PV modules can be wired in series to increase voltage. Connect wires from the positive terminal of one module to the negative of the next module. Figure 2 above shows modules connected in series .

7. INSTALLATION

Refer to installation manual for individual models of PV module.

8.ELECTRICAL RATINGS

Refer to installation manual for individual models of PV module.

9. GROUNDING

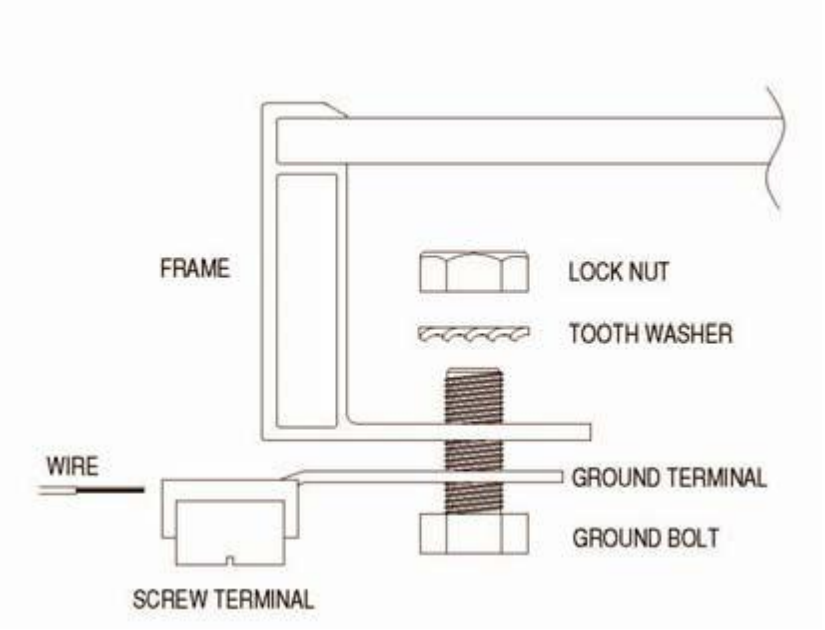


Figure 3

All PV models must be grounded by electrical connection of the module frames to the ground. Please be careful in arranging the system ground so that the removal of one module from the circuit will not interrupt the grounding of any other modules. The modules should be grounded to the same electrical point as described by one of the methods below.

Method 1

Each PV module has a hole on the side frame of either a bolt, nut and washer grounding the module to the frame, a ground lug fastened by bolt or screw, or appropriate screw (hardware not provided). An example of an acceptable ground connection using a bolt, nut and washer retaining a ground lug is shown in Figure 3. In a connection of this type, the hardware (such as a toothed locked washer/star washer) must score the frame surface to make positive electrical contact with the frame.

Method 2

Each PV module can also be grounded using third party grounding washers or clip devices provided the devices are listed and identified for grounding the metallic frames of PV panels and the devices are installed in accordance with the manufacturer's specified instructions.

Any ANSI/UL approved PV grounding method that has been listed to ANSI/UL 467 is acceptable.

Reference the Authorization to Mark documents from Wiley Electronics regarding their WEEB (Washer, Electrical Equipment Bond) such as the WEEB- PMC (Pro-Solar) and WEEB-UMC (Solarmount) and from Unirac regarding the UGC-1 and UGC-2.

The relevant sections from the National Electric Code state:
Article 690.43. "Exposed non-current-carrying metal parts of module frames, equipment and conductor enclosures shall be grounded in accordance with 250.134 regardless of voltage….Devices listed and identified for grounding the metallic frames of PV modules shall be permitted to bond the exposed metallic frames of PV modules to grounded mounting structures."

The grounding method must be considered according to local requirements and regulations at the installation site.

10.MOUNTING

Please make sure that all the information described in the installation manual is still valid and proper for your installation. The mounting method has been verified by PERLIGHT SOLAR and NOT CERTIFIED by a third party organization. The approved way to mount PERLIGHT SOLAR PV modules to a support structure is using the bolt holes provided as described in the Specifications. Although PERLIGHT SOLAR does not specify or warrant frame clips or clamps, using frame clips (not provided) or clamps module (not provided) is also possible when they are designed for PV modules and with minimum dimensions on the sides of the module in accordance with the instructions and drawings provided. If using frame clips or clamps, the modules should be fixed rigidly and there must be no damage caused to the modules by deforming the mounting structure against a design load. PERLIGHT SOLAR does not specify or warrant frame clips. The PERLIGHT SOLAR module warranty may be void if selected frame clips are improper or inadequate with respect to the module properties (including strength or material) or installation. Note that if metal clips are used, there must be a

path to ground from the clips. (Such as using star washers in the clip hardware set) Please review the descriptions and drawings carefully; not mounting the modules according to one of these methods may void your warranty. These mounting methods are designed to allow module loading of 2400pa.

11.MAINTENANCE

The PV modules are designed for a long lifetime and require very little maintenance. If the angle of the PV module is 5 degrees or more, normal rainfall is sufficient to keep the module glass surface clean under most weather conditions. If dirt build-up becomes excessive, clean the glass surface only with a soft cloth using only water. If cleaning the back of the module is required, take the utmost care not to damage the back side materials. In order to ensure the operation of the system, please check the wiring connection and the wire jacket occasionally.