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INSTALLATION MANUAL

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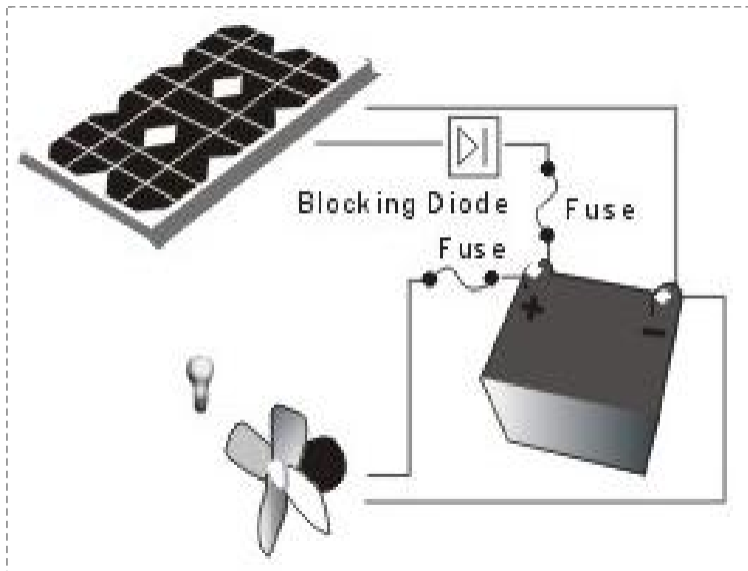
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VI) ELECTRICAL INSTALLATIONS

a) Blocking diodes

Blocking diodes can prevent nighttime battery discharging caused and prevent modules from loss of array output and being damaged or destroyed by reverse current flow.

Blocking diodes should be installed in series with each module or series string to prevent possible back flow of energy through the module(s) when modules or strings are connected in parallel or used in conjunction with a battery.



b) Over current protection

Whenever necessary to comply with local codes, use a fuse or circuit breaker, rated for the maximum series fuse rating of the module and the system voltage.

Always fuse the connections at the battery for safety. Refer to the module rating label (on module) for recommended fuse size. Also, refer to the charge controller owners manual.

All electrical components should have ratings equal or greater to the system rating. Do not exceed the maximum allowable system voltage as listed on the module label.

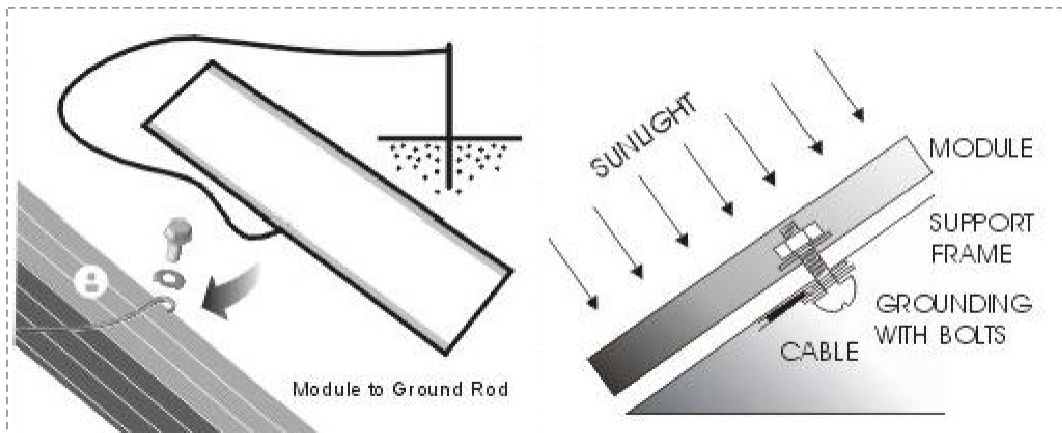
c) Grounding

All module frames should be grounded for safety. The support structure must also be grounded unless they are mechanically connected by nut and bolts to the grounded modules.



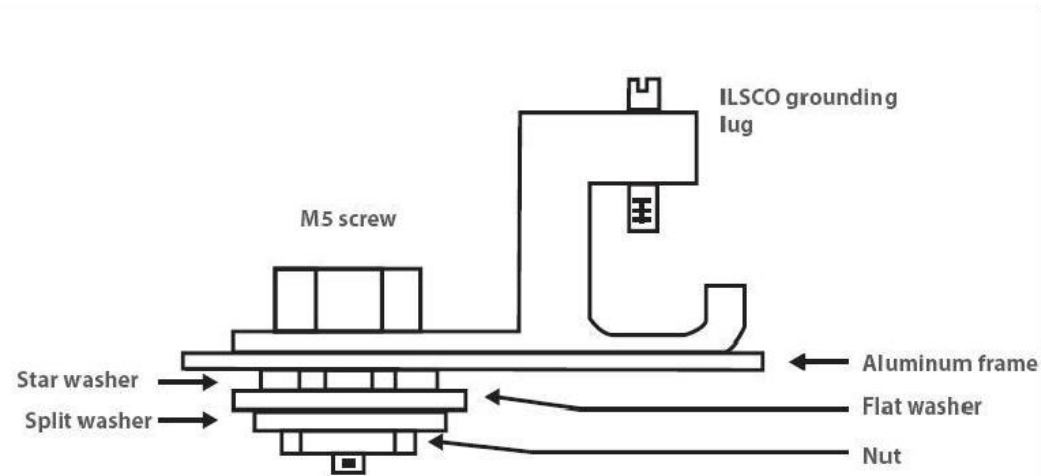
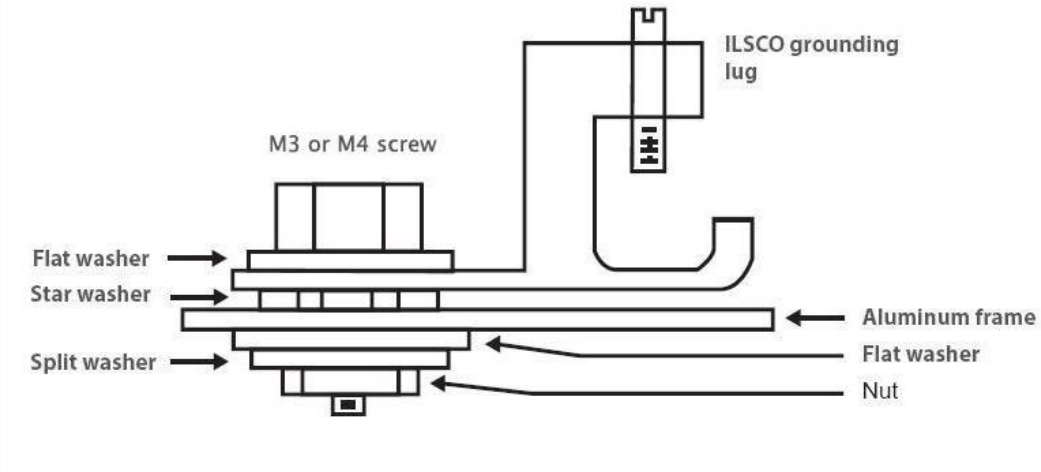
Insert ground wire here 

Attach a separate ground wire to grounding holes on modules frame with a self tapping screw. Module frame is provided with grounding holes. Stainless-steel bolts, with nuts, washers, and locks washers, are recommended for module grounding. The ground wire should be at least the same size as the electrical conductors, ground wires greater than 10AWG is recommended.



Assemble the recommended ILSCO grounding lug to the Aluminum frame using stainless steel M3, M4 or M5 screw and hardware as shown below. Note: there are two different size grounding holes, the smaller of which is being phased out. Further, build up of hardware for mounting the grounding lug are the same—except for the M3 & M4 screw, and added flat washer is mounted directly under the M3 & M4 screw head. The star washer is fitted directly under the grounding lug and makes electrical contact by penetrating the anodized coating of the Aluminum frame. The screw assembly is further fitted with a flat washer, then a split lock washer and finally a nut to secure the entire

assembly, as shown. Recommended torque of M3, M4 or M5 screw assembly is 0.8NM or 1.5NM.



For module with $\Phi 5.1$ mm grounding holes

d) Wiring

Modules are equipped with factory installed wires and quick connectors. Modules have been designed to be easily interconnected in series.

One module has a pair of male and female waterproof cables and connectors for electrical connection, that are pre-wired inside the junction box. The cables have obvious marks of the positive and the negative. Module bypass diodes type is: Yangzhou HY Technology Development Co., Ltd. type 10SQ050, maximum junction temperature rating: 200°C.

The maximum number of modules connected in series must not exceed the maximum system voltage stated on datasheet.



The connectors at the opposite end of these wires allow easy series connection of adjacent modules by firmly inserting the male connector of a module into the female connector of an adjacent module until the connector is fully seated.

For a series electrical connection, should connect positive (+) connector of the first module to the negative (-) connector of the following module. For a parallel electrical connection, should connect positive (+) connector of the first module to the positive (+) connector of the following module.

The cable typically used to interconnect the modules should be stranded or solid copper single-conductor type, rated sunlight resistant, for modules and module wiring that is exposed to weather, from 12AWG (4.0mm²) up to 14AWG(2.5mm²) gauge copper wire.

The maximum and minimum diameters of the cable that may be used with the cable connector are 8mm and 6mm respectively. A separate return wire or wires may be required to run the positive and negative terminations of the series string of modules to the load. Male and/or female connectors pre-attached to wires may be used at the string terminations for return wire connections and/or for source circuit box terminations. Modules have bypass diode(s) installed.

VII) MAINTENANES

It is not uncommon for a remote site to be checked but once per year. Under most conditions, normal rainfall is sufficient to keep the module glass clean.

Clean the glass with a soft cloth using mild detergent and water. Modules that are mounted, fiat (0°tilt angle) should be cleaned more often, as they will not self-clean as effectively as modules mounted at a 15°tilt or greater.

It is advisable to perform periodic inspection of the modules for damage to glass, backskin, frame and support structure. Check electrical connections for loose connections and corrosion. Check if mounting support structure and modules are loose. Check connections of cables, connectors, and grounding. Change modules must be the same kind and type, if need. Modules can operate effectively without ever being washed, although removal of dirt from the front glass can increase output. The glass can be washed with a wet sponge or cloth, wear rubber gloves for electrical insulation.

VIII) SAFETY PRECAUTIONS

Module installation and operation should be performed by qualified personnel only. Children should not be allowed near the solar electric installation.

Avoid electrical hazards when installing, wiring, operating and maintaining the module. Modules produce DC electricity when exposed to light and therefore can produce an electrical shock or burn. Modules produce voltage even when not connected to an electrical circuit or load. Modules produce nearly full voltage when exposed to as little as 5% of full sunlight and both current and power increase with light intensity. Do not touch



live parts of cables and connectors. As an added precaution, use insulated tools and rubber gloves when working with modules in sunlight.

Fall of modules from high place will cause death, injury or damage. Do not drop module or allow objects to fall on module, never leave a module unsupported or unsecured. If a module should fail, the glass can break a module with broken glass cannot be repaired and must not be used.

When installing or working with module or wiring, cover module face completely with opaque material to halt production of electricity. Modules have no on/off switch. Modules when exposed to sunlight generate high voltage and are dangerous, modules can be rendered inoperative only by removing them from sunlight, or by fully covering the front surface with opaque cloth, cardboard, or other completely opaque material, or by working with modules face down on a smooth, flat surface when installing or maintaining.

Do not artificially concentrate sunlight on the module.

Modules can produce higher output than the rated specifications. Industry standard ratings are made at conditions of 1000W/m² and 25°C cell temperature. Reflection from snow or water can increase sunlight and therefore boost current and power. In addition, colder temperatures can substantially increase voltage and power.

Modules are intended for use in terrestrial applications only, thus excluding aerospace or maritime conditions or use with sunlight concentration.

It is recommended that the module remains packed in the box until time of installation.

Work only under dry conditions, with a dry module and tools, since sparks may be produced, do not install module where flammable gases or vapors are present.

Do not drill holes into module frame as it will void warranty. Modules are constructed frame as it will void warranty.

Handled with care, if the front glass is broken or if the polymer backskin is torn, contact with any module surface or the frame can produce electrical shock. Particularly when the module is wet, broken or damaged modules must be disposed of properly. Do not disassemble, bend, impact by sharp objects, walk on, and throw or drop etc. keep back surface free from foreign objects.

Avoid sharp edges.

Use module for its intended function only follows all module manufacturers' instructions. Do not disassemble the module, or remove any part or label installed by the manufacturer. Do not treat the back of the module with paint or adhesives.

If not otherwise specified, it is recommended that requirements of the latest local, national or regional electrical codes be followed.

Retain this installation manual for future reference.

IX) NOTES

The electrical characteristics are within ± 5 percent of the indicated values of I_{sc} , V_{oc} , and P_{max} under standard test conditions (irradiance of 100mW/cm², AM 1.5 spectrum, and a cell temperature of 25°C (77°F)).



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Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the PV output.