

General Installation Manual for BEST Solar Module

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WARNING

Please read this manual completely before installing BEST solar module. This module produces electricity when exposed to light. Follow all applicable electrical safety precautions. Only qualified personnel should install or perform maintenance work on this module. Do not handle modules when they are wet.

INTRODUCTIONS

BEST solar modules come in various sizes to satisfy a full range of applications. Each module is made of crystalline-silicon cells. To protect the cells from the most severe-environmental conditions, modules are made of high transmission rate and low iron tempered glass, anti-aging encapsulation material, and high climate resistant and insulation back sheet by hot lamination, with anodized aluminum alloy frame and junction box.

APPLICATIONS

Modules are reliable, virtually maintenance free power supply, designed to operate efficiently in sunlight. By modules, the solar radiant energy is transformed into electrical energy for using. Modules, usually be used as one fittings of PV solar system. A set of basic PV solar system is consisted of PV solar module, controller, inverter, and storage battery.

Modules can be used in roof PV solar systems, PV stations, building, and other electric generation application etc widely.

CODES and REGULATIONS

The mechanical and electrical installation of PV systems should be performed in accordance with all applicable coded; including electrical codes, building coded, and electric utility interconnect requirements.

Requirements may also vary with system voltage, and for DC or AC application.

MECHANICAL INSTALLATIONS

Mounting site

Modules can be used on land except for corrosive salt area and sulfurous area.

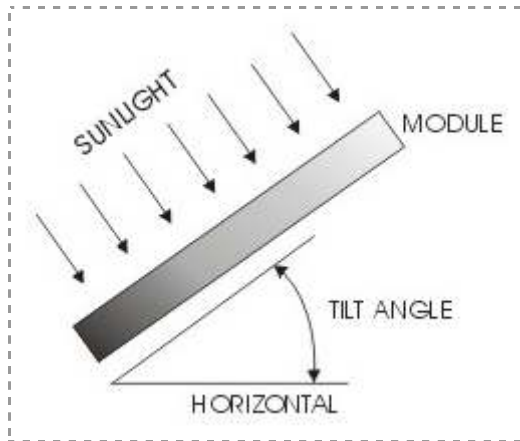
Excluded applications include, but are not limited to, installations where modules are likely to come in contact with any salt water or where likely to become partially or wholly submerged in fresh or salt water, examples of which include use on boats, docks and buoys. Don't install modules in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain etc.

Modules are designed for a maximum allowable design pressure of 50 pounds per square foot, about 2400Pa, which may correspond to a nominal wind speed of approximately 130 km/h in certain circumstances.

Actual maximum allowable wind speed may be influenced by module type, mounting configuration, location, and other factors. In no case should modules be exposed to pressures greater than 50 pounds per square foot of uniformly distributed wind, snow, or other loading.

Not install modules near naked flame or flammable materials.

When choosing a site, avoid trees, buildings or obstructions. Modules should be mounted to maximize direct exposure to sunlight and to eliminate or minimize shadowing. Even partial shadowing can substantially reduce module and system output. Furthermore, partial shadowing can elevate the shaded portion internal temperature, which may lower output and shorten module life.



Orientation of installations

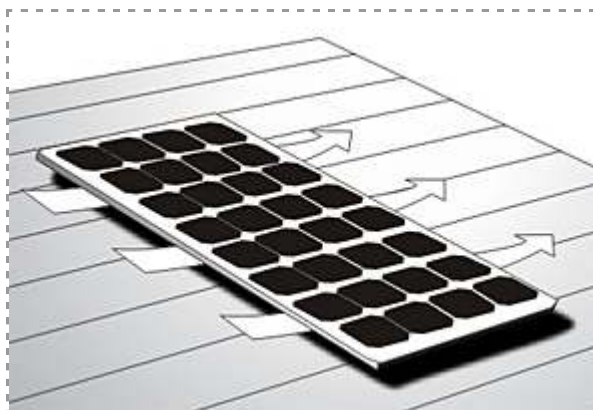
Modules may be mounted at any angle from a vertical orientation to a horizontal one. The appropriate fixed tilt angle and azimuth orientation should be used in order to maximize the exposure to sunlight.

Incorrect orientation of modules installation will result in loss of power output. Modules connected in series should be installed at same orientation and angle. Different orientation or angle may cause loss of power output due to difference of amount of sunlight exposed to the modules.

In the Northern Hemisphere, modules should face south, and in the Southern Hemisphere, modules should face north.

Module tilt angle

Modules produce the most power when they are pointed directly at the sun. For installations where modules are mounted to a permanent structure, modules should be titled for optimum winter performance. As a rule, if the PV system power production is adequate in the winter. It will be satisfactory during the rest of the year. The module tilt angle is measured between the modules and the ground.



Mounting

Use fasteners to fasten the modules to the mounting support structure. Modules should be bolted to support structures through mounting holes located in the frame's back flanges only. Stainless-steel bolts, with nuts, washers, and locks washers, are recommended for module mounting. Creation of additional holes for mounting is not recommended and will invalidate the warranty. Modules should not be mounted by supports at the ends.

Mounting support structure should withstand forces from wind and snowfall pressure etc. Mounting support structure should use proper materials and corrosive treatment.

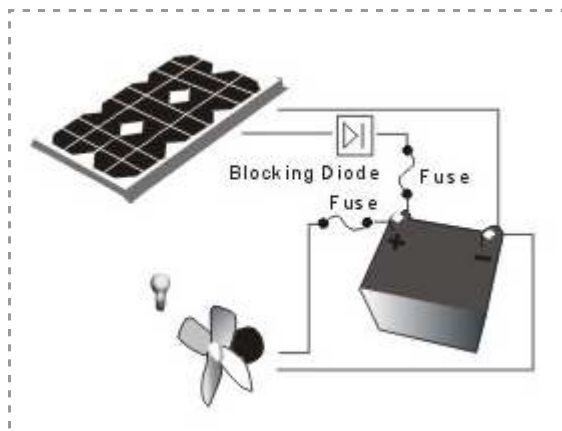
Installation the modules should has proper ventilation. A clearance of 4.5 inches (about 115mm) or more behind the modules is recommended to permit air circulation and cooler module operation. Elevated temperatures lower operating voltage and power, and shorten module lifetime. Clearance of 1/4 inch (6.35mm) or more between modules is required to allow for thermal expansion of the frames.

ELECTRICAL INSTALLATIONS

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.



Overcurrent 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.

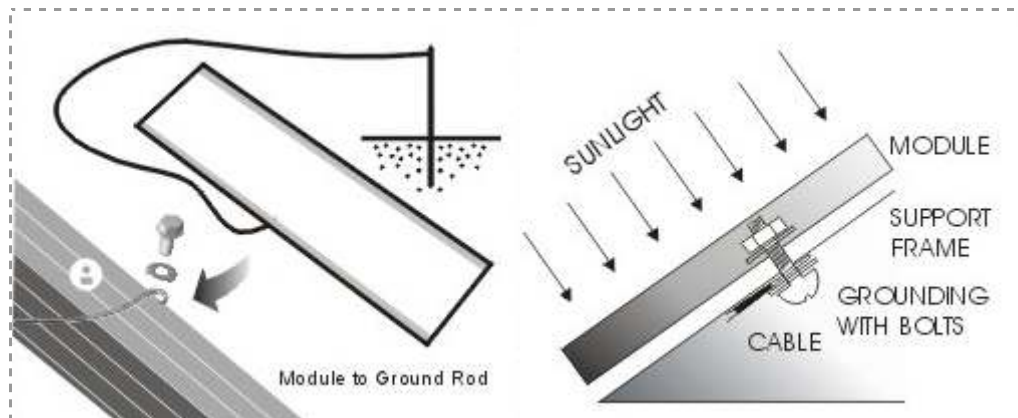
Always fuse the connections at the battery for safety. Refer to the module rating label (on module) for recommended fuse size. Also, refer to the charge controller owners manual.

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.

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.

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.



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.

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.

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 andle) 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.

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/□ and 25□ 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 ate constructed frame as it will void warranty. Handled with care, if the front glass is broken or if the polymer backskin is tom, 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.

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 $100\text{mW}/\text{m}^2$, AM 1.5 spectrum, and a cell temperature of 25°C (77°F)).

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 ampacities, fuse sizes, and size of controls connected to the PV output