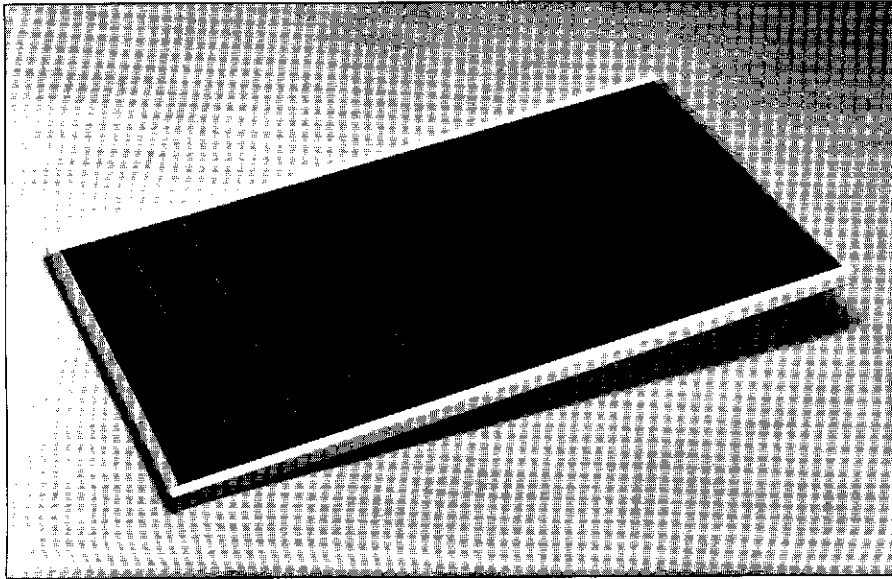


UNI-SOLAR®

SOLAR ELECTRIC MODULE US-64

Owner's Manual & Installation Guide



CAUTIONS

Solar electric modules produce DC electricity when exposed to light. The voltage from one individual module is not considered hazardous, however if modules are connected in series to increase voltage or in parallel to increase current the shock hazard increases. When installing or working around photovoltaic modules, batteries and related electrical equipment, observe industry standards and practices as well as manufacturer's safety recommendations.

WARNINGS

- Cover the solar modules with an opaque material before making your wiring connections. This will prevent the modules from producing electricity while making the connections and reduce the risk of electric shock or sparks.
- Use insulated tools and wear electrical rubber gloves rated for maximum system voltage when handling modules.

- Observe safe electrical practices at all times. Make connections in well-ventilated areas free from flammable gas vapors and open flames.
- Observe proper polarity when connecting the modules into an electrical circuit. Reverse connection will damage the module and may result in fire.
- Do not use any solar module without blocking diode protection to prevent reverse currents from flowing into the module either from a battery or from another module in the circuit.
- Do not attempt to concentrate sunlight on the modules for increased output. Doing so may cause damage and will void the warranty.
- Do not walk on the modules and avoid dropping any sharp objects on the face.
- Contact appropriate authorities before installing solar electric modules to determine if permits and inspections are required for your particular area.

- Ground module frame and all metal structures for all systems at any voltage. Follow the requirements of the National Electric Code or other applicable code for your location.
- Module installation should be performed only by qualified persons. If you are not familiar with electrical power equipment, contact a trained electrician to assist you with your installation.

DISCLAIMER OF LIABILITY

The information contained in this manual is based on United Solar's knowledge and experience, but such information and suggestions do not constitute a warranty expressed or implied. The methods of installation, use and maintenance of solar modules are beyond the control of United Solar. United Solar assumes no responsibility and expressly disclaims liability for any loss, damage or expense associated with the use, installation or operation of the product. Any liability of United Solar is strictly limited to the Limited Warranty attached hereto. United Solar reserves the right to make changes to product specifications or to the instruction manual without notice.

INSTALLATION

Mounting

Mounting holes on the aluminum frame of the modules are provided that fit 1/4 inch diameter fasteners (see Figure 1). Mount the modules using at least four (4) fasteners with lockwashers and nuts. Clearance between the module and a mounting surface can be the minimum necessary to prevent wire chafing. When installing modules on a building, use stand off or rack methods. Contact your United Solar distributor for details.

Orientation

Pick a location with a maximum exposure to sunlight. Avoid shadows, especially during the middle of the day. Orient the module so that the surface will receive the maximum sun exposure over the year for your particular site. Typically this is achieved by tilting the module toward the equator at an angle equal to the latitude of the site plus 10 degrees. To increase summer performance use a shallower tilt angle, to increase winter performance use a steeper tilt angle.

Wiring

There is a wiring junction box located on the rear of each module (see Figure 2). To access the junction box, loosen the four (4) screws and lift off the cover. The junction box is equipped with four (4) knock-outs which will accept either electrical conduit (1/2" trade size) or strain-reliefs. It is not recommended to run wires through the knock-outs without the use of either strain-reliefs or conduit. You may use any combination of knock-outs which is most convenient for your installation. Use a tool such as a screwdriver to remove the knock-out. Screwdriver should be placed at the indicated (arrow) spot on the junction box. Install either a strain-relief or a conduit fitting. Follow the diagram in Figure 2 to make your wiring connections. For connecting multiple modules in series or parallel, refer to Figure 3. Reposition the cover on the junction box and tighten the four (4) screws.

Blocking Diodes

Proper use of a suitable blocking diode prevents reverse current flow into a module from a battery, another parallel-connected module or from another charging source.

For 12 volt systems it is suggested to use a blocking diode in series with each module. One of the supplied jumpers may be used to install a blocking diode in the module junction box if desired, refer to Figure 3.

For higher voltage systems you should use a single blocking diode of appropriate rating in each series-connected

Solar Module Specifications

	US-64
Rated Power (Watts)	64
Operating Voltage (Volts)	16.5
Operating Current (Amps)	3.88
Open Circuit Voltage (Volts)	23.8
Open Circuit Voltage (Volts) at -10° C and 1250 W/m ²	27.1
Short Circuit Current (Amps)	4.8
Short Circuit Current (Amps)* at 75° C and 1250 W/m ²	6.3
Series fuse rating (Amps)	8
Minimum blocking diode (Amps)	8
Weight (lbs./kgs.)	20.2/9.17

During initial 8-10 weeks of operation, the module has higher electrical output than rated output. The output may be higher by 15%, the operating voltage may be higher by 11% and operating current may be higher by 4%.

Electrical specifications ($\pm 10\%$) are based on measurements performed at Standard Test Conditions of 1000 W/m² irradiance, Air Mass 1.5, and Cell Temperature of 25° C after long-term stabilization. Performance may vary up to 10% from rated power due to low temperature operation, spectral and related effects.

Maximum system open circuit voltage 600VDC.

* Refer to section 690-8 of the National Electric Code for an additional multiplying factor of 125% which may be applicable.

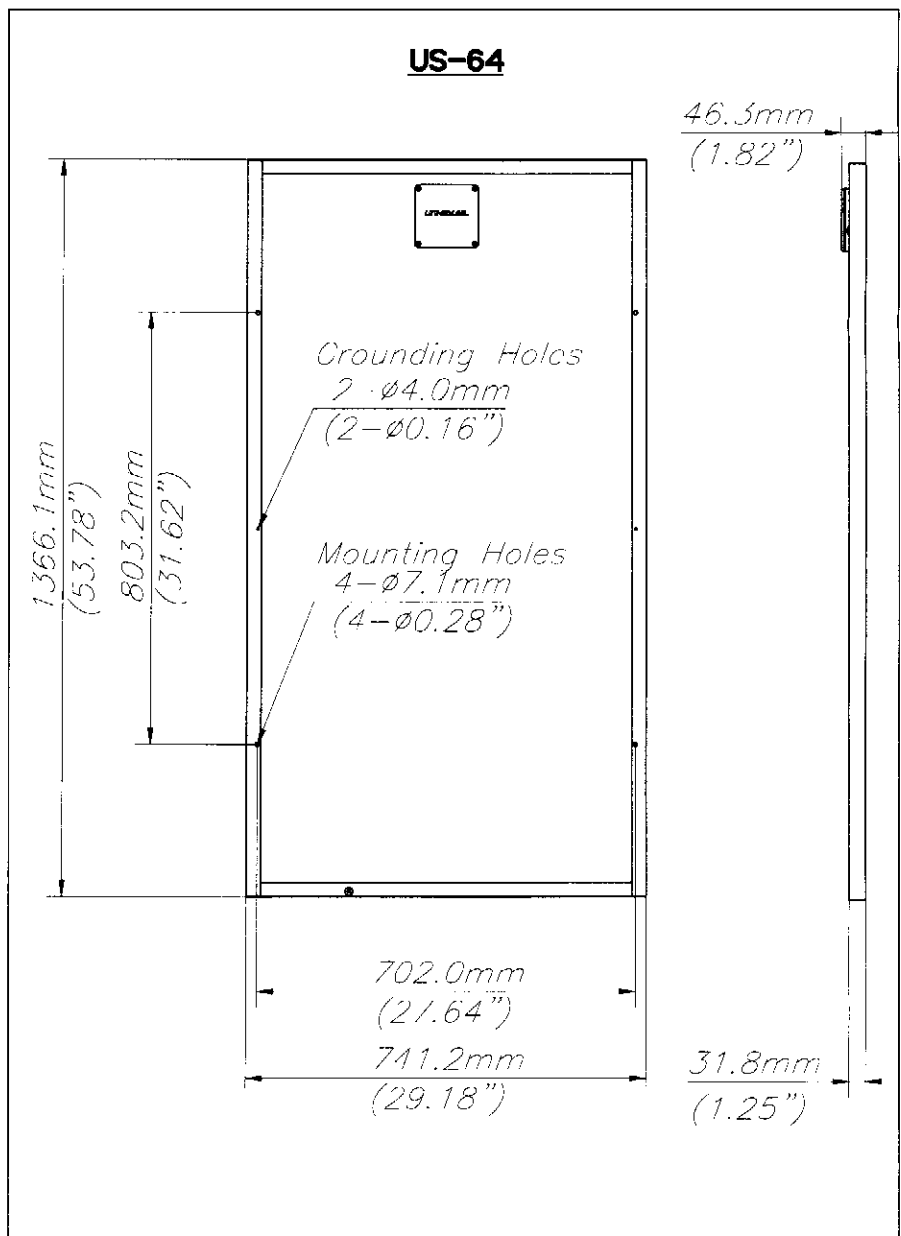


Figure 1

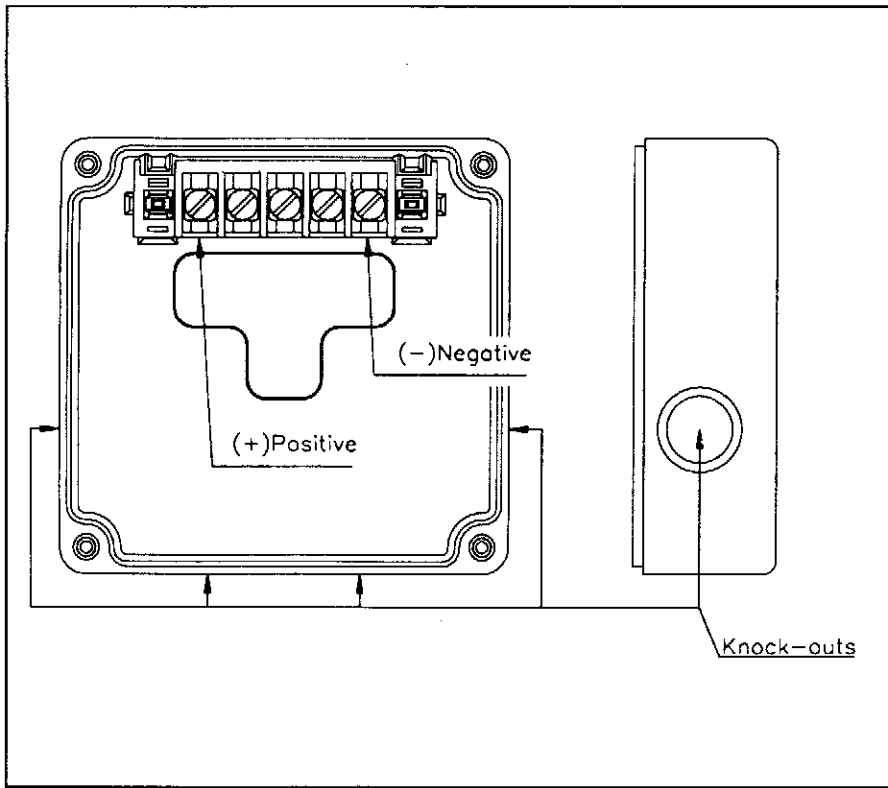


Figure 2

string of modules. Use an external termination box to mount the diode and any heat sink. For assistance contact United Solar Systems Corp.

Bypass Diodes

Every solar module includes a bypass diode across each cell, which results in reduced power loss under partial shadow conditions. When two (2) or more modules are connected in series, a bypass diode can be installed in the module junction box using the supplied jumpers, providing further shadow tolerance (see Figure 3). For assistance contact United Solar Systems Corp.

Charge Regulation

The use of a charge regulator is recommended in battery systems to prevent the solar module from overcharging the battery. Follow the manufacturer's instruction for installation of the regulator.

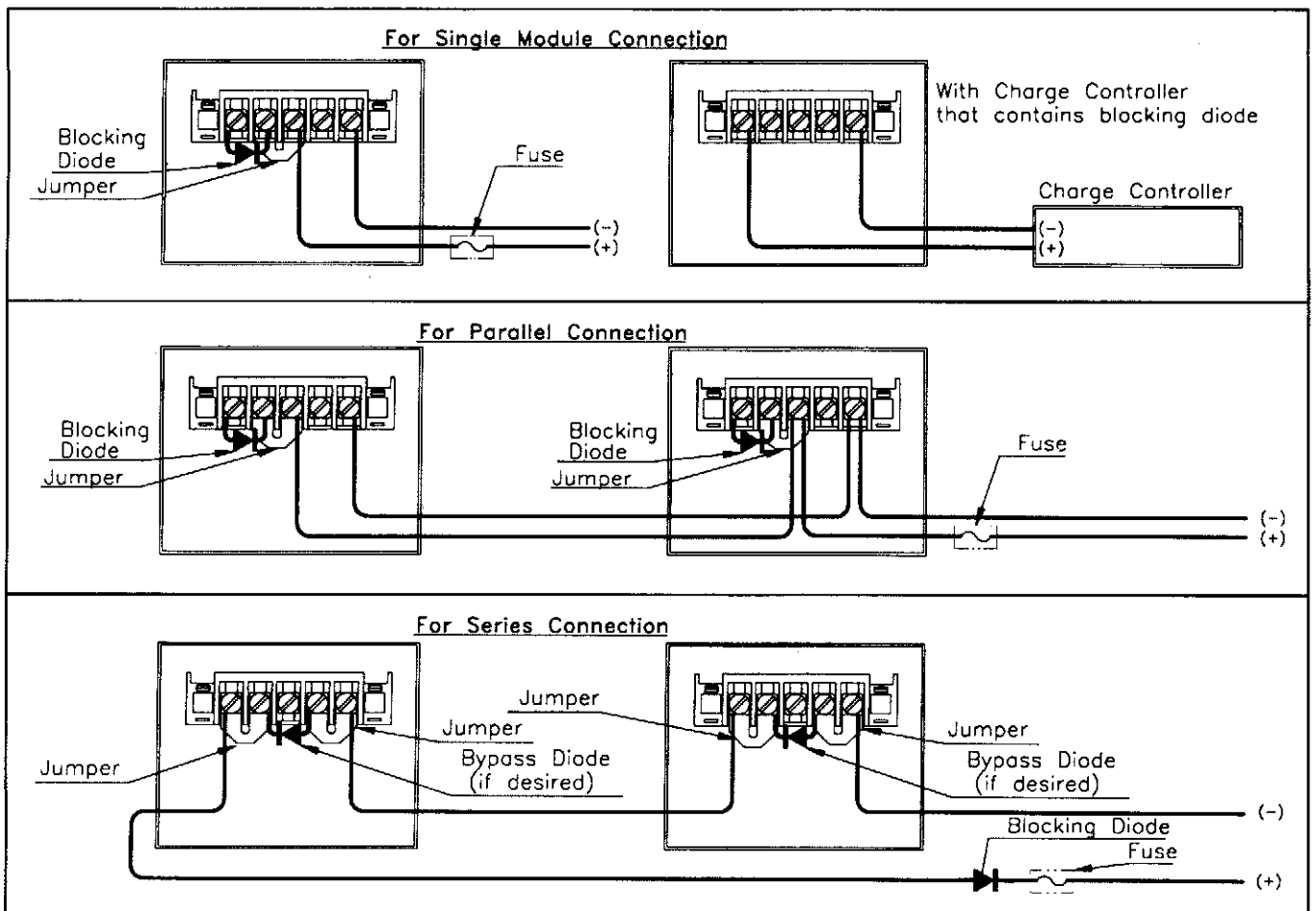


Figure 3

High Voltage Systems

Solar modules are suitable for use in high voltage systems up to 600 volts. Contact United Solar Systems for specific design advice and assistance. Do not use modules in systems having an open circuit voltage greater than 600 volts DC.

Wiring Selection

Use insulated, stranded copper wire rated at least 90° C for module-to-module wiring. Allowable wire size is 10-18 AWG. Wire insulation and size should be chosen for maximum temperature and environment. Refer to the National Electric Code section 690-8 or other recognized standard.

Grounding

The frame of each module should be connected to earth ground. A self-threading grounding screw and cup washer are provided with each module that can be used to attach a ground wire to the frame using the grounding holes shown in Figure 1. Place a copper grounding wire in between the cup washer and screw head. Module mounting fasteners can be used for grounding purposes, in which case a star lock washer must be used to ensure a good electrical connection to the module frame. Consult the National Electric Code or other recognized standard for grounding requirements.

Maintenance

Check the wiring connections periodically for tightness and corrosion. Clean the front surface of the modules as needed with mild soap and water. Do not use abrasive cleaners or solvents. Be careful when washing the modules, as the combination of water and electricity may present a shock hazard. Wear electrical rubber gloves and disconnect the module from the batteries. Short circuit the output of the module or wash at night.

Warranty

Limited Warranty Ten-Year

United Solar Systems Corp. warrants the solar module against lost power

output as follows: For a period of ten (10) years from the date of sale to the original purchaser, modules returned by the original purchaser to an authorized United Solar Systems Distributor or Service Facility which upon inspection are determined to exhibit a power output of less than 90% of the Minimum Rated Power specified at the time of sale due to defects in materials or workmanship will be repaired or replaced, or, at the option of United Solar Systems Corp., it will replace such lost power by providing to buyer additional modules to restore total wattage of all defective modules in the user's installation or system to 90% of the Rated Power output.

What is not covered by the Warranty

This warranty does not apply to any module which in the judgment of United Solar Systems Corp. has been subject to misuse, neglect or accident or which has been damaged through abuse, alteration, improper installation or application, or negligence in use, storage, transportation or handling, or repaired by anyone other than United Solar Systems Corp. The warranty does not cover any transportation costs for return of module or for reshipment of any repaired or replaced module, or cost associated with installation, removal or reinstallation of modules.

Warranty Limitations

United Solar Systems Corp. shall have no responsibility for damage to persons or property or other loss or injury resulting from defect in the module or from improper use or installation. Under no circumstances will United Solar Systems Corp. be liable for any incidental or consequential damage. Any warranties implied by law, including those of merchantability and fitness for a particular purpose are hereby expressly disclaimed. The maximum liability of United Solar Systems Corp. is limited to the purchase price of the system. Such liability shall be limited in duration to twelve (12) months from the date of original

purchase. This warranty is in lieu of all other warranties, expressed or implied. The purchaser's exclusive remedy shall be only as stated herein. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

Obtaining Warranty Performance

Fill out and return the Warranty Registration Card, if supplied with the module, within thirty (30) days after purchase. Failure to return the card will not affect your rights under the warranty so long as you can establish the date on which you purchased the module. If you feel you have a claim under this warranty, first contact the dealer who sold you the module or any Authorized United Solar Systems Distributor. Check local telephone listings for location. The dealer or distributor will give advice on handling the claim. If further assistance is required, write United Solar Systems Corp. for instructions. The return of any module will not be accepted by the factory unless prior written authorization has been given by United Solar Systems Corp.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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