SHARP

PLEASE READ THIS MANUAL COMPLETELY BEFORE INSTALLING OR USING THE MODULES

INSTALLATION MANUAL

PHOTOVOLTAIC MODULE

ND-L3EJEA

SHARP CORPORATION

1.INTRODUCTION

This manual contains information of electrical and mechanical installation and safety information which you should know before using photovoltaic module **ND-L3EJEA**.
The information in this manual is described on the basis of Sharp's knowledge and experience. But such information and suggestions do not constitute a warranty.
Sharp Corporation reserves the right to make changes to the product, specifications, or to the manual without prior notice.

2.MECHANICAL INSTALLATION

The modules may be fastened to a support using the bolt holes in the bottom of the frame at location "C", as shown in Figure 1 (back view of the module) and Figure 6 (mounting detail). The module should be fastened with four (4) M8 (5/16") bolts. The mounting method is designed to allow module loading of 2400 Pa. Take care during installation to not block the drain holes (D) shown in Figure 1.

3.ELECTRICAL INSTALLATION

To ensure proper system operation and maintain your warranty, be careful to observe the correct cable connection polarity (Figure A) when connecting the modules to a battery or to other modules.
All solar modules must be grounded by electrical connection of the module frames to ground. Care must be taken to arrange the system ground so that the removal of one module from the circuit will not interrupt the grounding of any of the other modules.
Each photovoltaic module has a hole in the side frame for either a bolt, nut and washer grounding the module to the frame, a ground lug fastened by bolt or screw, or an 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 B. In a connection of this type, the hardware (such as a star washer) must score the frame surface to make positive electrical contact with the frame. The ground wire must not be smaller than No.14 AWG (2.1mm^2), and should be sized according to The National Electrical Code.

The terminal box is shown in Figure2. When connecting the modules to a battery or to other modules, you must carefully observe correct cable connection polarity as shown Figure 3 and Figure A. If not connected correctly the bypass diodes could be destroyed. This will void your warranty.

By loosening the two cover screws as shown in Figure 2, open the cover of wiring box.
Figure 3 shows the inside of the wiring box. The rahge of typical terminal cabling is AWG 14.
Remove the appropriate grommets and route the interconnecting cables through grommets as shown in Figure 3. To remove the grommets, push them from inside of the box.

To connect wires to terminal block, a wire lug connector may be used as shown in Figure 4. For direct wiring, strip back insulation about 16mm and wrap stripped wire around screw under square washer as shown in Figure 5. Tighten terminal screw securely with a proper screwdriver. After completed terminal wiring, secure the cover of wiring box.

When connecting the modules to a battery or to other modules, you must carefully observe correct cable connection polarity as shown in Figure A. If not connected correctly, the bypass diode could be destroyed. This will void your warranty.

4.ELECTRICAL RATINGS

Rated electrical characteristics are within ±10 percent of the indicated values of Isc, Voc and within +10/-5 percent of Pmax under standard test conditions (irradiance of 100 mW/cm$_2$, AM 1.5 spectrum, and a cell temperature of 25•C (77°F)).
The above electrical characteristics are based on the results of out going test. The warranty condition is specified in the warranty card separately issued.

Maximum Power (Pmax)	123.0 W
Open-Circuit Voltage (Voc)	21.3 V
Short-Circuit Current (Isc)	8.04 A
Operating Voltage (Vpmax)	17.2 V
Current at Vpmax (Ipmax)	7.16 A
Maximum System Voltage	600 V
Maximum Series Fuse	15 A

The above electrical characteristics are based on the results of out going test.
Please do not expose solar module to sunlight concentrated with mirrors, lenses or similar means.
Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions.
Accordingly, the values of Isc and Voc marked on UL Listed modules 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 module output. Refer to Sec. 690-8 of the National Electric Code for an additional multiplying factor of 125 percent (80 percent of rating) which may be applicable.

Installation for wiring shall be in accordance with the NEC and grounding method shall comply with the NEC, article 250 (see instruction manual Figure A and B).
In the coverage of Canadian UL listing, installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

IMPORTANT SAFETY WARNINGS

(1) Never touch the end of output cables with bare hands when the module is irradiated. Cover the surface of module with cloth or other suitable sufficiently opaque material to isolate the module from incident light and handle the wires with rubber-gloved hands to avoid electric shock.
(2) Do not wear metallic jewelry which may become cause of electric shock during installation.
(3) Do not expose solar module to sunlight concentrated with mirrors, lenses or similar means.
(4) Consult local codes and other applicable laws and statutes concerning required permits, regulations concerning installation, and inspection requirements.
(5) Install modules and ground frames in accordance with applicable codes.
(6) Product should be installed and maintained by qualified personnel.
(7) Do not drop tools or hard objects on the solar module.
(8) Do not scratch the back film by hard objects.
(9) Do not shadow cells, if possible, to avoid causing module hot spots.
(10) Do not pour chemicals on modules when cleaning.
(11) Keep children away from modules.
(12) Do not connect the modules directly to the loads such as motor since the variation of the output power depending on the solar irradiation causes the damage for the connected motor.

1 : In case of brushless motor, the lock function gets active and the hall IC is most likely to be damaged.

2 : In case of the motor with brush, the coil is most likely to be damaged.

(13) Do not block up D-holes on the establishment.

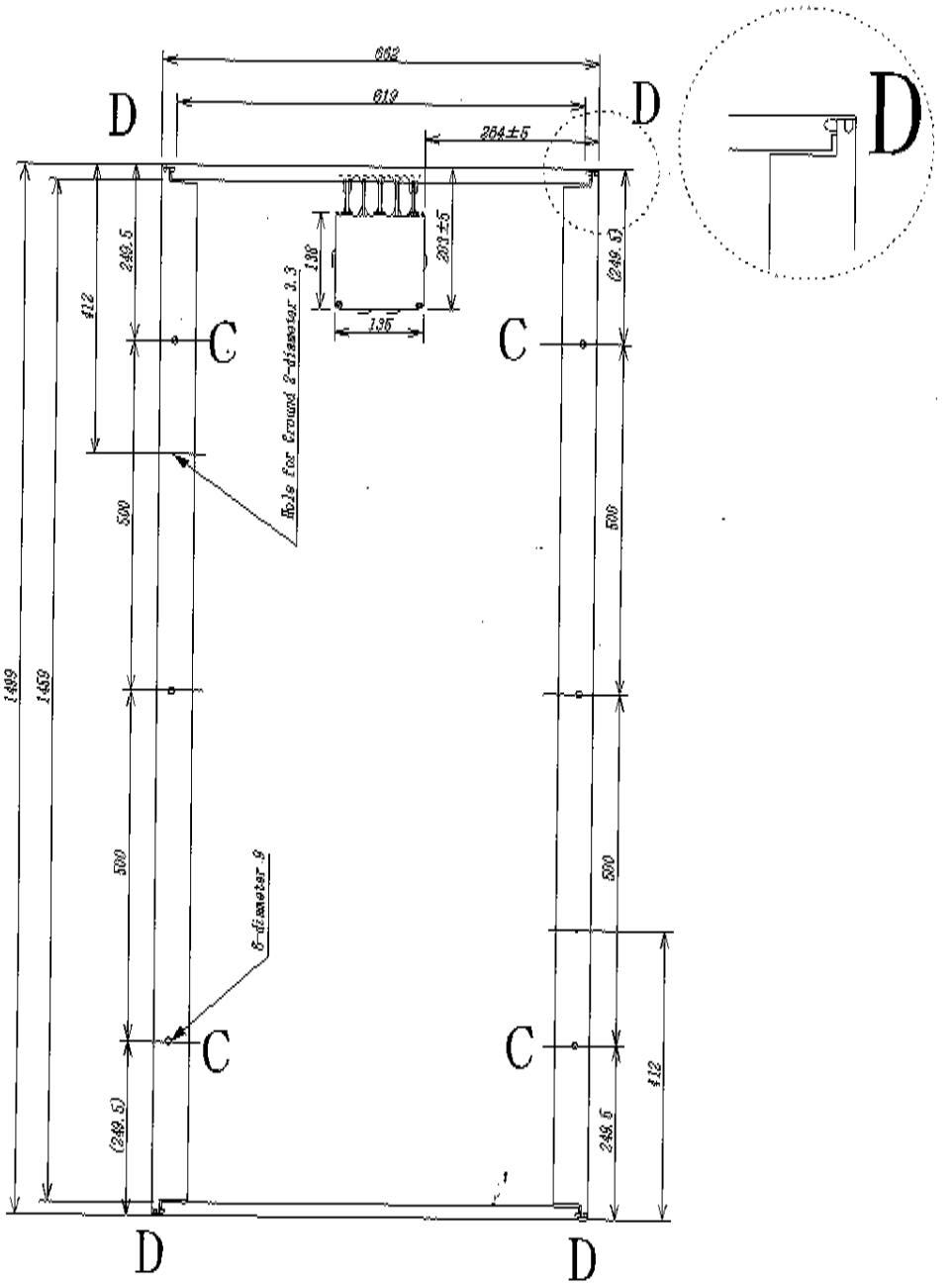
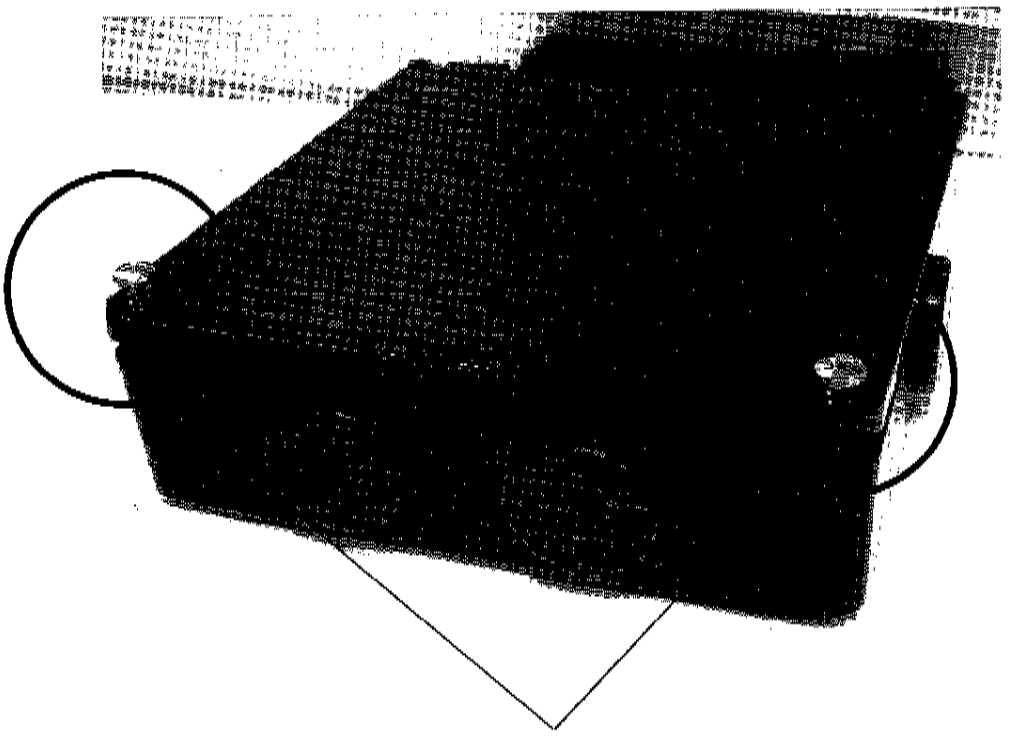


Figure 1

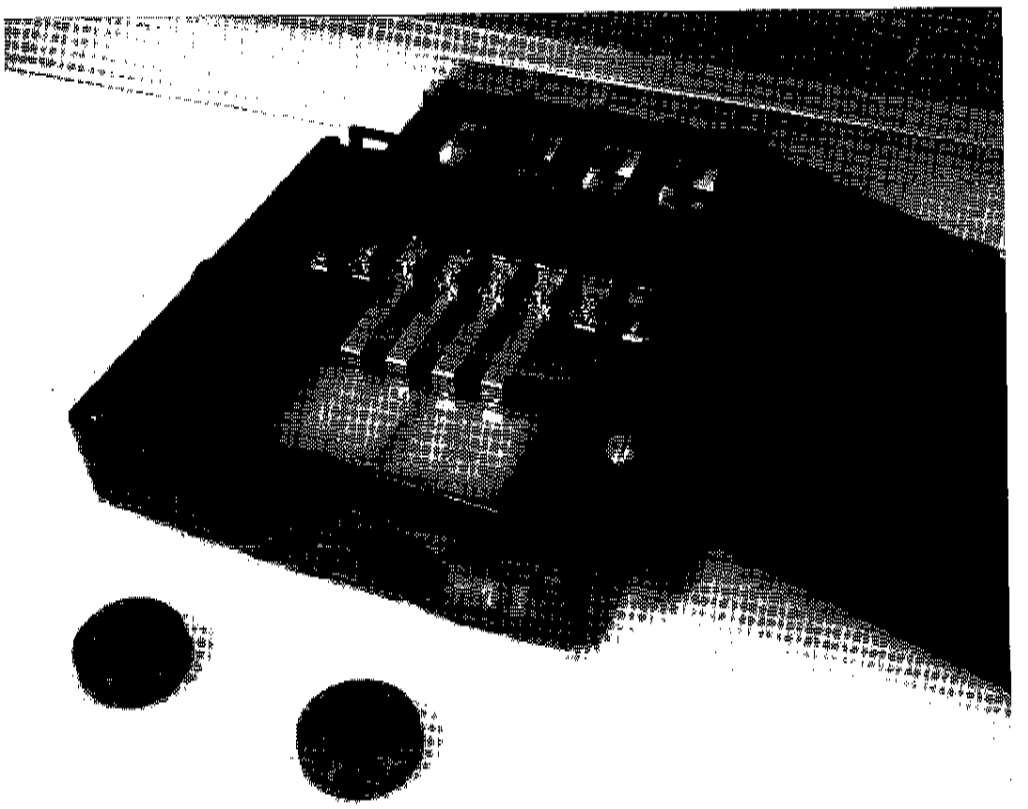
Table A

Dimension ; L	Permissible Deviation
0.5 < L < 3	±0.2
3 < L < 6	±0.3
6 < L < 30	±0.5
30 < L < 120	±0.8
120 < L < 400	±1.2
400 < L < 1000	±2
1000 < L < 2000	±3
2000 < L < 4000	±4

Permissible deviations in dimensions without tolerance indication is shown in table A

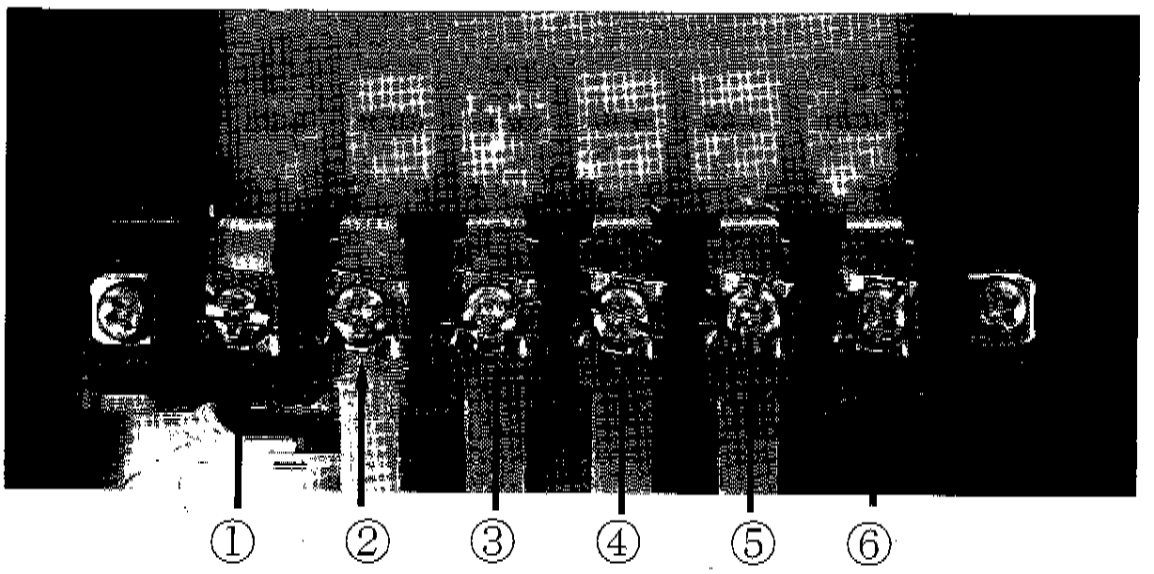


Loosen the two cover screws to open the cover.



Remove the appropriate grommets. (Push them from inside of the box)

Figure 2



①,② : Negative Terminal
③,④ : Diode Connection
⑤,⑥ : Positive Terminal

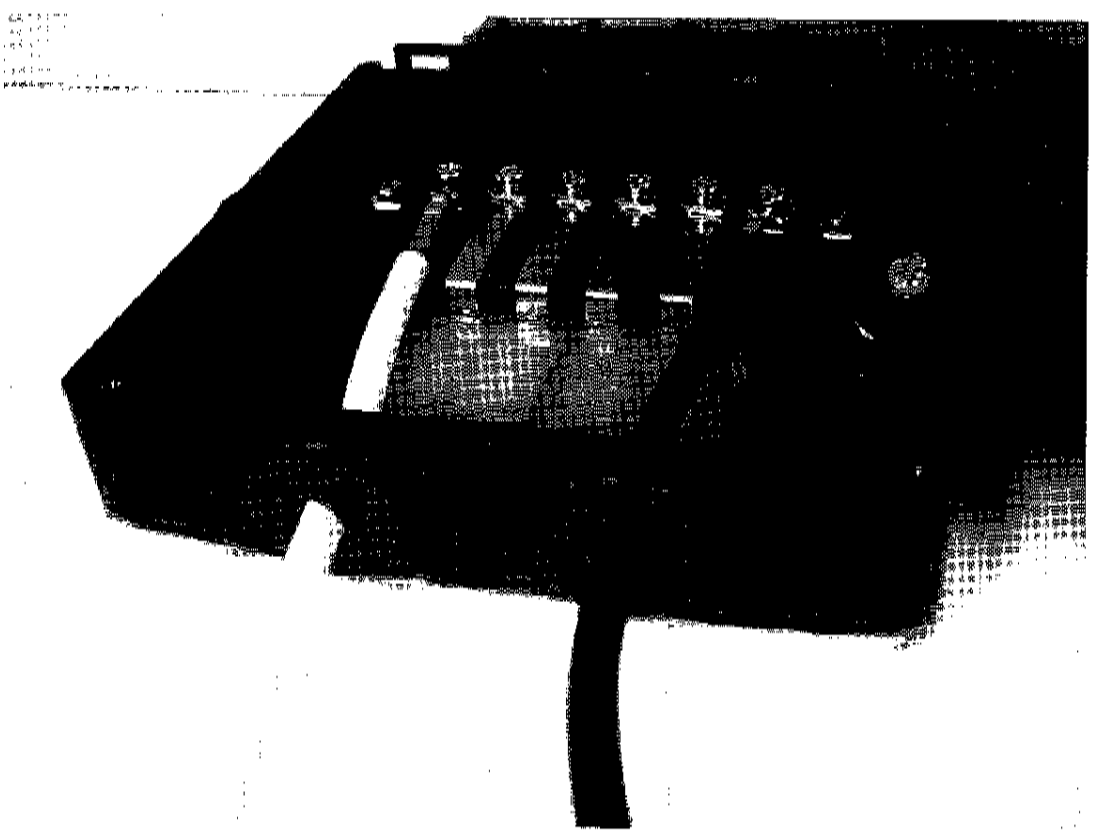
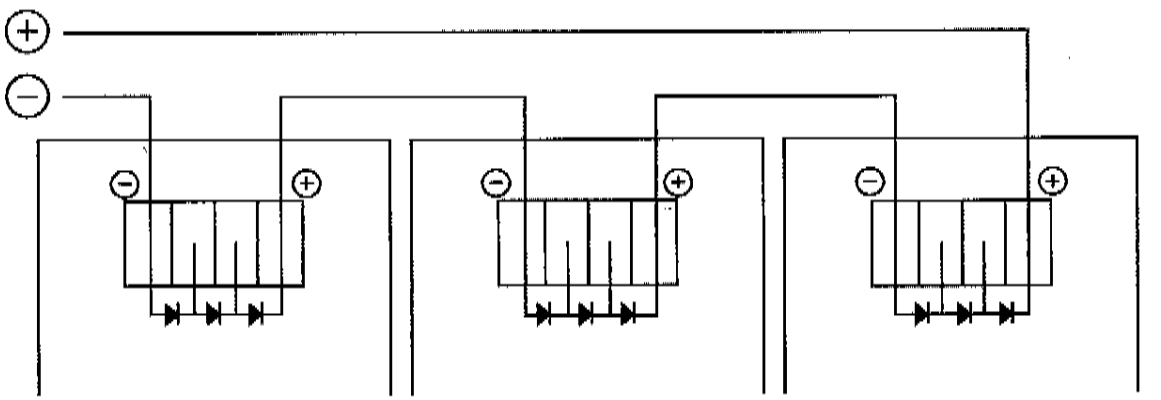


Figure 3

Series Wiring (Voltage Additive)



Parallel Wiring (Current Additive)

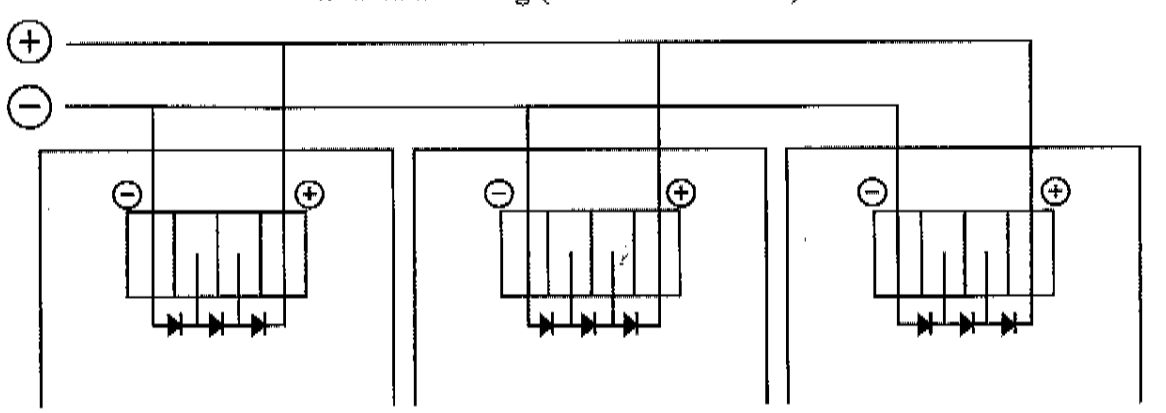


Figure A

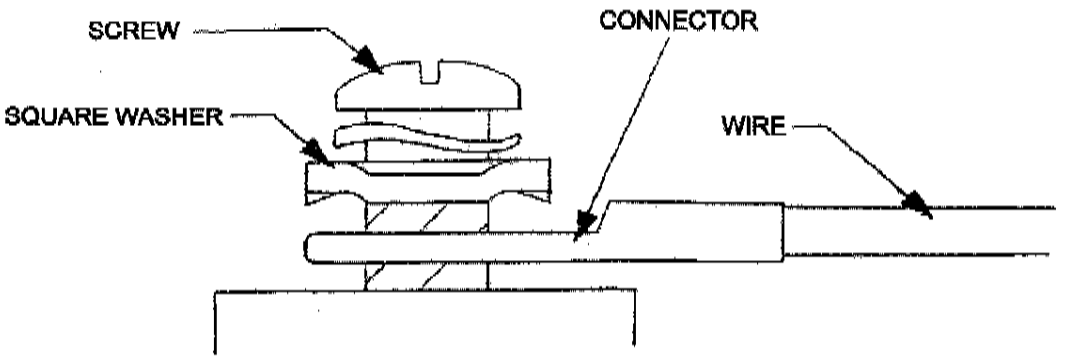


Figure 4

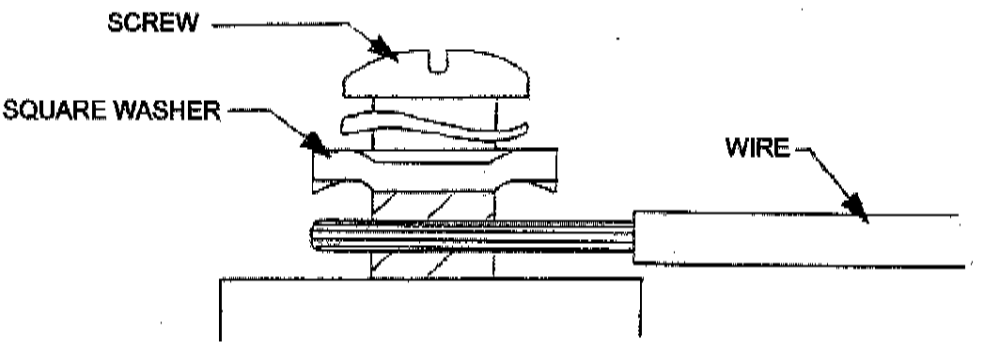


Figure 5

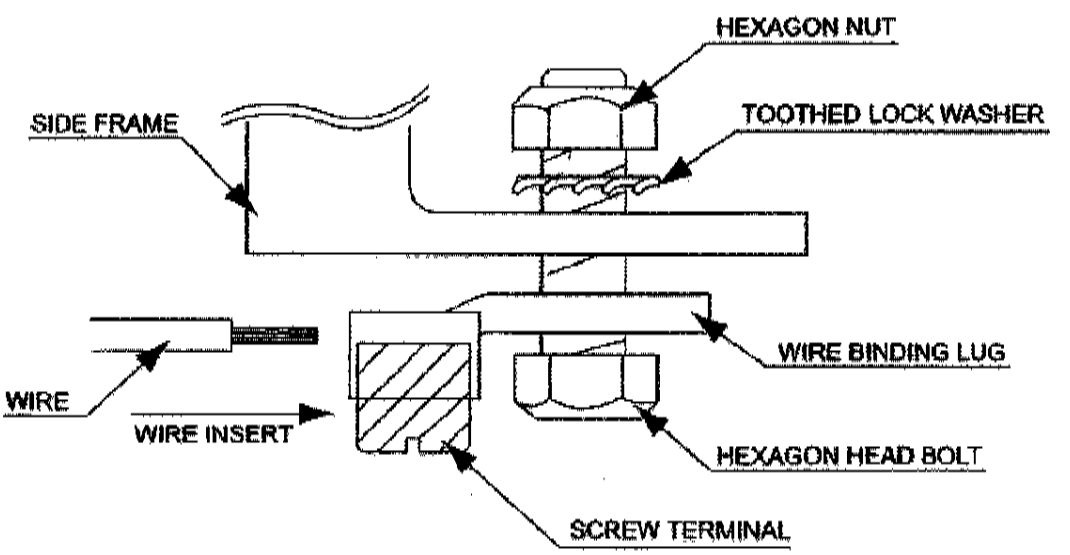
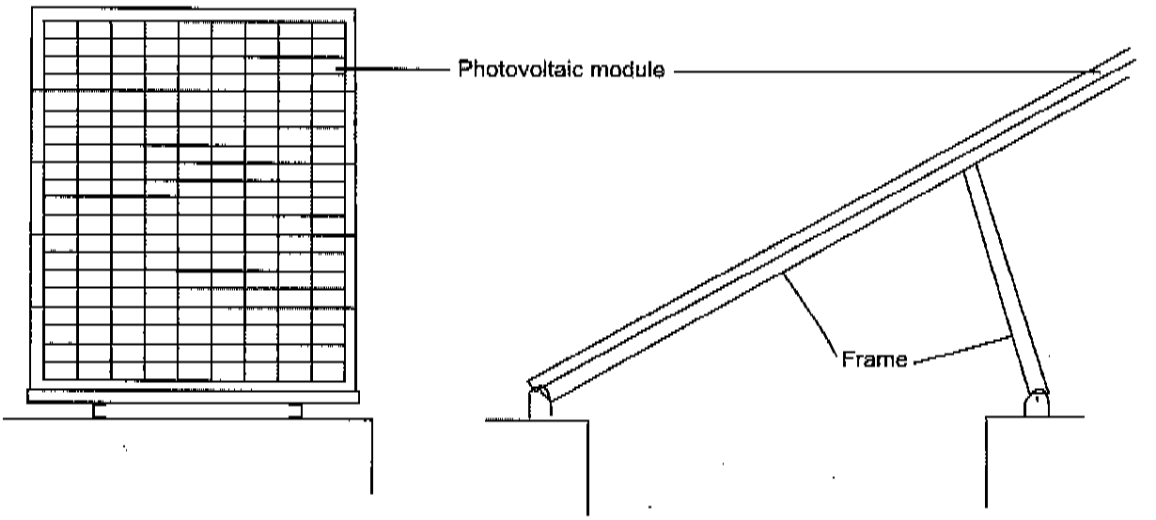


Figure B



Photovoltaic module mounting method

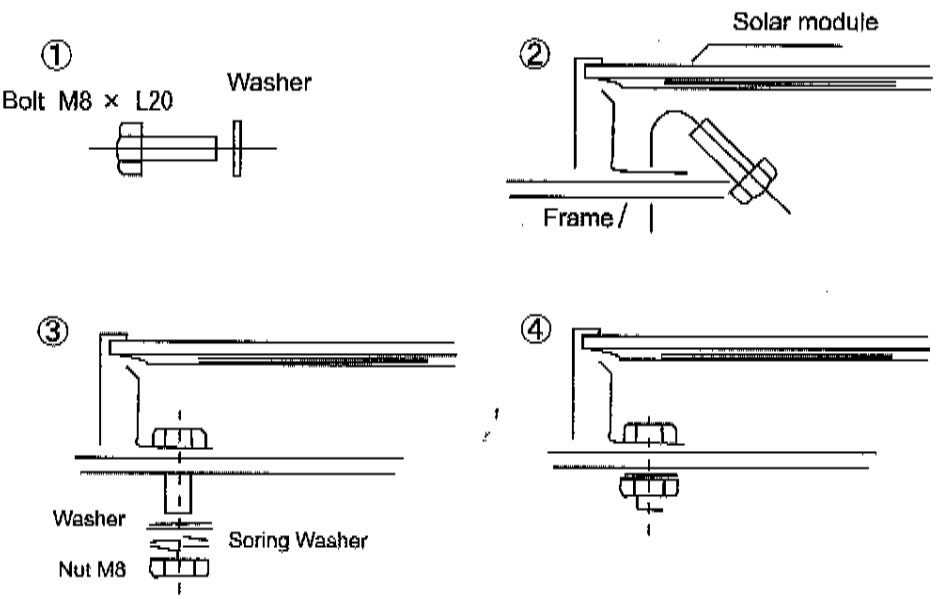


Figure 6

Addendum to Polycrystalline Power Panel Instructions

Products:

- ***80 Watt Polycrystalline***
- ***123 Watt Polycrystalline***

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE INSTALLATION

REMINDERS:

- **Avoid Electrical Hazards** when installing, wiring, operating, and maintaining your Solar Panel. The solar panel included in the kit generates DC electricity when exposed to sunlight or other light sources.
- For use in 12-Volt systems only
- **Observe Proper Polarity** throughout entire power cable wiring route.
- **Work Safely**. Do not wear jewelry when working with electrical or mechanical equipment. Use protective eyewear when working with batteries or drills. Use extreme caution when on ladders or on roof.
- **Follow all Safety Precautions of the Battery Manufacturer**. Some batteries can release flammable hydrogen gas. Do not produce sparks when working in locations where flammable gases or vapors exist. Shield skin and eyes from battery acid. Wash thoroughly with water if skin or clothing come in contact with acid or any corrosive matter, which may have accumulated, on the battery. Keep the terminals and casing clean.
- **Use a Charge Controller for wattages above 15W**
- **Do not attempt to charge non-rechargeable batteries**
- **Always connect charge controller to battery first**
- **When disconnecting, always disconnect battery last**

TROUBLESHOOTING:

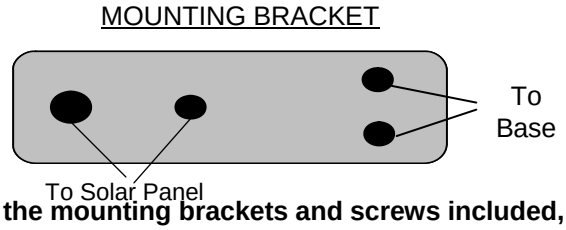
I am not sure if my panel is functioning?

- Ensure Battery is operational. Over time, a battery's ability to recharge will deteriorate
- Ensure the distance of the wires are not longer than 30 feet and all connections are secure
- Measure the panel voltage with a voltmeter. The voltage reading should be between 16 to 25 volts in the sun. (Constantly fluctuating)
- Use a **solar voltage tester** or a multi-meter to test the solar panel's voltage.

INSTRUCTIONS:

MOUNTING:

1. Choose an appropriate location that provides the most direct sunlight and can support the solar panel, and is free from shade. Be aware of surrounding objects, although an object seems far from the mounting location it may still obscure the sun from the panel. The ideal year round position for a solar panel in the Northern Hemisphere is facing due South tilted at an angle equal to your latitude. For most North American locations any angle between 30 and 50 degrees is suitable. Note: Mounting a solar panel vertically will optimize low winter sun position but is not beneficial in the summer months.



2. Using the mounting brackets and screws included, first attach the bracket to the solar panel. Place the rubber ring between the panel and the bracket. The rubber ring allows for air flow between the panel and the mounting surface, maximizing the efficiency of the panel. Note: If mounting to a roof of a vehicle, it may be necessary to drill holes in the roof. These holes should be resealed once the panel is installed, clear silicon caulking is commonly used. If mounting to a surface where it is impractical to drill holes it may be necessary to construct a frame.

Included in this kit are 6 packets of: 1- bracket, 2- self tapping screws plus clear rubber washers, 1- 1/4" bolt plus washer and nut, 1-3/16" bolt plus washer and nut, 1-rubber ring.

CHARGE CONTROLLER INSTALLATION:

Connect to Battery:

Connect the Solar Charge Controller **(SCC)** battery side (right) positive to the positive battery terminal and the negative wire to the negative battery terminal

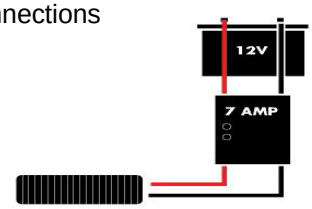
Connect to Solar Panel:

Option 1:

Strip the wire from the solar panel and connect positive to positive and negative to negative of SCC. Ensure connections are secure.

Option 2:

Some panels may include a quick connect for use with the SCC. If included, connect positive to positive and negative to negative of SCC. Ensure connections



Addendum to Polycrystalline Power Panel Instructions

GENERAL TESTING PROTOCOL

Always test outdoors under optimal sunlight conditions.

A. Test Solar Panels for Voltage.
If included connect the Voltmeter to each individual panel separately and observe Open Voltage. Open voltage is when the solar panels are not connected to any other components. The voltmeter should be connected in parallel with the panel, positive to positive and negative to negative. If the reading is negative or there is no reading it is possible the leads have been reversed. Open Voltage can range from 16 Volts to 24 Volts. Once all panels test for voltage, proceed to step B. (Using a solar voltage tester is also an option)

B. Test Connection to Charge Controller for Voltage.
Reconnect Solar Panels, and connect to charge controller as per instructions. Measure open circuit voltage of the panel and charge controller together at the battery side of the charge controller. Open circuit voltage should read 5-10% lower than without charge controller. Open circuit measurement will read between 15 and 23.5.

C. Connect charge controller to battery
First, disconnect solar panels and connect charge controller to battery. Always connect charge controller to battery first and remove last. Observe polarity – positive to positive and negative to negative.

D. Reconnect Solar Panels to Charge Controller.
Please refer to your charge controllers User Manual for technical parameters and testing procedure, this may differ with different charge controllers.
If all testing results within the above indicated ranges, solar system is in acceptable range. If Voltage reading indicate lower ranges, repeat above connections and retest. Finally, it is common to have 12V Battery issues such as dead cells or non-rechargeable battery problems.

FAQ:

What types of batteries can I recharge?
You can recharge all types of 12 volt batteries including lead-acid automotive batteries, deep cycle (traction type) batteries, gel-cell batteries, and heavy-duty (stationary type) batteries. When using the Solar Panel to run appliances on a regular basis, we recommend the use of deep cycle marine batteries which are designed to withstand frequent charge and discharge cycles.

Can the Solar Panel drain my battery at night?
Once the solar charge controller is installed there is no danger of reverse current, so you may leave your panel installed overnight.

Can the Solar Panel overcharge my battery?
Yes, but only if used without the charge controller. That is why it is important to use a solar charge controller. Do not connect the panel directly to the battery with wattages of 15W or higher. Always use in conjunction with a solar charge controller.

Can I run my 110 volt appliances with my solar power system?
Yes. You can run your 110 volt appliances with an inverter, which will attach to your battery to change the battery's 12 volt (DC) energy into 110 volt (AC) or 220 volt (AC).

Can my panel be left outdoors without a protective covering?
Yes. The Solar panel has been weatherproofed and can be mounted outdoors without any additional protection.

Do I have to disconnect the panels from the battery when I drive my RV or while I am recharging my battery by other means?
No, solar panels are designed to be permanently connected to the battery. There is no need to disconnect them while driving a RV for example, or when charging the batteries by other means such as AC chargers, or a vehicle's generator or alternator.

General Info

1. How do solar cells generate electricity?
A. Solar Panels, also known as Photovoltaics or PV for short can be thought of as a direct current (DC) generator powered by the sun. When light photons of sufficient energy strike a solar cell, they knock electrons free in the structure forcing them through an external circuit (battery or direct DC load), and then returning them to the other side of the solar cell to start the process all over again.

2. Will solar work in my location?
A. Solar is universal and will work virtually anywhere, however some locations are better than others. Irradiance is a measure of the sun's power available at the surface of the earth and it averages about 1000 watts per square meter. Obviously different parts of the world receive more sunlight from others, so they will have more "full sun hours" per day.

3. These panels are made up of polycrystalline solar cells. What are polycrystalline cells?
A. Polycrystalline cells are created by using liquid silicon which solidifies to form bricks, these bricks are then cut into thin layers. Crystals of various sizes form during this process. These Polycrystalline panels are covered by tempered glass making them extremely durable. Polycrystalline solar panels have a higher output than amorphous panels of the same dimensions, making polycrystalline panels more cost and space effective.

INSTRUCTIONS FOR INCLUDED VOLTAGE TESTER
(Voltage Tester not included in all kits)

To test the battery:
•Disconnect or power down all other components.
•Connect the negative lead of the tester to the negative post of the battery.
•Touch the positive probe to the positive post of the battery.

To test Solar Battery Charger
•Disconnect Solar Battery Charger from all components.
•Connect the negative lead of the tester to the negative lead of the Solar Battery Charger.
•Touch the positive probe to the positive post of the Solar Battery Charger.

No lights will show if polarity is reversed.

LIMITED WARRANTY:

THESE PRODUCTS ARE WARRANTED FROM DEFECTS IN WORKMANSHIP AND FUNCTIONALITY FOR A PERIOD INDICATED ON THE PACKAGING. THIS WARRANTY DOES NOT APPLY IN THE EVENT OF MISUSE OR ABUSE OF THE PRODUCT OR AS A RESULT OF UNAUTHORIZED REPAIRS OR ALTERATIONS.POWER OUTPUT IS WARRANTED UP TO 80% OF STATED OUTPUT AND MUST BE TESTED UNDER FULL SUNLIGHT CONDITIONS. TO ADDRESS WARRANTY ISSUES, PLEASE CONTACT INITIAL POINT OF PURCHASE.