

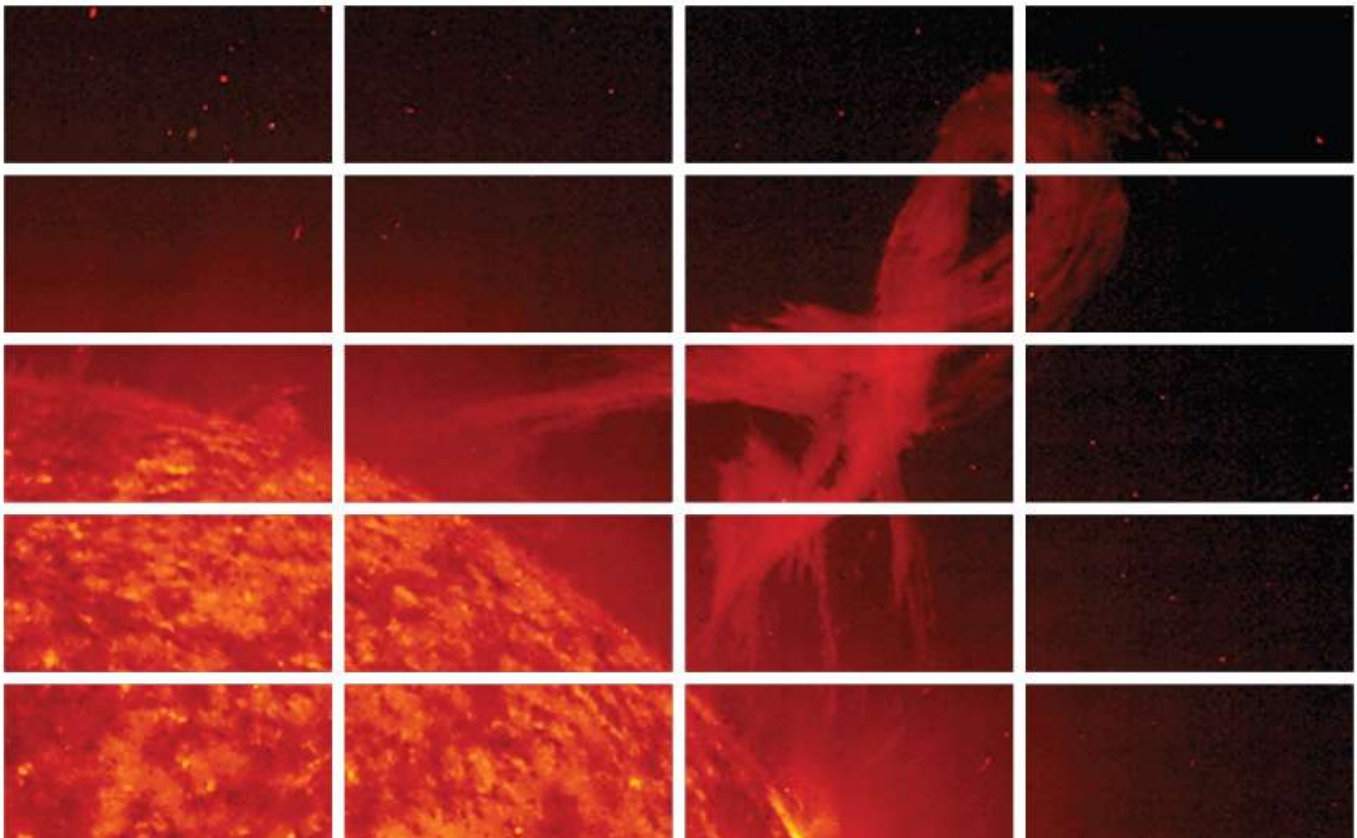


# AB1-Series Photovoltaic Modules

## Safety and Installation Manual

Please read this manual carefully before installing Abound Solar modules.

Abound Solar, Inc.  
[www.abound.com](http://www.abound.com)



## Introduction

Thank you for selecting Abound Solar photovoltaic modules. Abound Solar products provide high efficiency with long-term stability.

This instruction manual provides safety and installation instructions for Abound Solar’s AB1-Series of products.

## About this Manual

“***Bold Italicized***” (and quoted) items have a document reference number which appears in Section 9.0, **References**.

Figures are referenced by section number; prior to section 4.0, there are no figures in this document.

## Table of Contents

1.0	Compliance Information.....	1
2.0	Module Overview.....	1
3.0	Safety.....	2
4.0	Installation.....	3
4.1	Mechanical installation.....	3
4.2	Electrical installation.....	5
5.0	Operation and Maintenance.....	7
6.0	Disposal and Recycling.....	7
7.0	Warranty Terms and Conditions.....	8
8.0	Disclaimer of liability.....	8
9.0	References.....	8
10.0	Product Label.....	9

## 1.0 Compliance Information

TÜV ID#: 0000018894

UL File #: E320912

Report #: US-UL-10-0009-PV



## 2.0 Module Overview

Abound Solar modules are comprised of two sheets of glass that are bonded together. The interior of this assembly contains a semiconductor film, which will produce electricity when exposed to sunlight. Wires with industry standard MC4 style connectors provide for the electrical connections. The junction box is on the rear of this module assembly and provides strain relief to the wires. These are frameless modules. Each module weighs about 12 kg, which is about 25 pounds.

### Ratings

These modules have been evaluated by Underwriters Laboratories, Inc., to meet or exceed a positive or negative loading of 2,400 N/m<sup>2</sup> (50 lbs/ft<sup>2</sup>).

### 3.0 Safety

All instructions should be read and understood before attempting to install, wire, operate, and/or maintain the photovoltaic module.

Caution: Risk of Electrical Shock

PV modules generate DC electrical energy when exposed to sunlight or other light sources.

**Contact with electrically active parts of the module such as terminals can result in burns, sparks, and lethal shock whether the module is connected or disconnected.** The shock hazard increases as modules are connected in parallel, producing higher current, and as modules are connected in series, producing higher voltage.



Caution: Risk of Broken Glass. Since the module consists primarily of glass, the possibility of broken glass exists. Broken glass can be sharp and cause injury if not handled with protective equipment such as gloves and eyewear.

Carefully plan for installation:

- Prior to design of the system and installation of the product, please make sure that you have the latest versions of all applicable product documentation.
- Check that all other system components (inverters, wires, racks, balance of system materials, etc.) are mechanically and electrically compatible.
- Do not artificially concentrate sunlight on a module.
- Pay attention to the design of the PV system and electrical capacity of system components (especially the inverter), because under certain conditions this module may generate more than its STC rated power ( $P_{MPP}$ ).
- Do not remove modules from packaging until ready to install. If it is necessary to

store modules prior to installation, keep them indoors in original shipping containers.

- It is required that the installation meet all requirements of local and applicable codes – such as the latest National Electrical Code (USA) or Canadian Electrical Code (Canada) or other national or international electrical standards..
- **Safety Application:** Class A: General access, hazardous voltage, hazardous power applications.
- **Module Meets Safety Class II**

#### Handling precautions

- Protective gloves should be worn when handling solar modules to protect against sharp objects or electric shock.
- Proper Personal Protective Equipment should be worn at all times.
- Do not stand or step on a module.
- Do not drop a module.
- Do not break the glass surfaces of a module.
- To avoid the hazard of electric shock and injury, covering the front surface of the modules with a dense, opaque material such as a cardboard box, during installation and handling of the modules is recommended.
- All Abound Solar modules are shipped with an intact junction box and edge seal. If either of these features is missing or appears damaged at time of delivery, please contact your module supplier.

- Do not carry a module by its wires or junction box.
- Do not drop or place heavy items or tools on the surface of the module.
- Never leave a module unsupported or unsecured.
- Do not use or install broken modules.
- Do not allow any foreign objects such as clips or tools to damage, intrude or penetrate into the edge seal.
- Do not disassemble the module, or remove any part installed by the manufacturer.
- Do not treat any portion of the module with paint or adhesives to avoid damage to the module, inoperable conditions, or reducing the module's functionality.
- Do not penetrate any portion of the module with screws, drills, or any other foreign object.
- Do not set or strike modules on their edges or corners.
- Do not disconnect plugs while under load.
- Make sure you comply with all local and national codes and permit requirements.

## 4.0 Installation

To ensure safe and proper application, prior to installation and activation of warranty, all applications must be submitted and acknowledged through Abound Solar's "**Project Architecture Report (PAR)**" process.

Installations in Canada must be in accordance with CSA C22.1, Safety Standard Electrical installations, Canadian Electrical Code, Part 1.

## 4.1 Mechanical installation

### **Mounting safety**



Caution: Modules should be handled with care during installation, as heavy impact on the front, back or edges could result in damage to the module. Do not attempt to install the modules in high wind or wet conditions.

All installations must comply with safety laws. Check applicable building codes to ensure that the construction or structure (roof, façade, support, etc.) where the modules are being installed has enough strength.

For modules mounted on roofs, special construction or structures may be required to help provide proper installation support.

Both roof construction and module installation design have an effect on the fire resistance of a building. Improper installation may contribute to fire hazards. Additional devices such as ground faults, fuses, and disconnects may be required.

Check and follow all safety precautions of other system components used.

### **Site selection**

For stationary mounting, orient modules to face the average position of the sun. A fixed-tilt mounting is recommended, with a tilt range from 0 degrees to 50 degrees.

Avoid installing modules where they may be shaded. Pay special attention to partially shading modules by objects such as buildings, trees, windmill blades, and poles during the daytime or due to seasonal sunlight variation.

Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads.

### ***Operating conditions***

The ambient operating temperature must be between  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) and  $45^{\circ}\text{C}$  ( $113^{\circ}\text{F}$ ). The temperature limits are defined as the monthly average low and high of the installation site.

The pressure load of the installation site should not exceed  $2,400\text{ N/m}^2$  (50PSF); testing has been performed to this rating per UL procedures.

For optimal performance, avoid operating modules where:

- Modules could experience shading from seasonal sunlight variation, structures, or passing objects.
- Exposure to salt water may occur.
- Frequent or large hail, ice, and/or heavy snow occur.
- Air pollution, chemically active vapors, acid rain, soot, etc. are excessive.

### ***Racking***

Appropriate material should be used for mounting hardware to prevent the module, mounting structure, or hardware itself from experiencing decay or corrosion.

For roof-mounted systems, clearance between the roof surface and module frame is required to allow cooling air to circulate around the back of the module. This also allows any condensation or moisture to dissipate. Install modules so that air can circulate between the roof and the module. Leave a minimum of 100 mm of clearance between the roof and the module surface.

The mounting structure must not cause any twist or stress to be placed on the modules.

### ***Mounting Orientation***

Abound Solar AB1-Series solar modules should typically only be installed in a portrait orientation where the long dimension is perpendicular to the ground. Be especially careful to avoid conditions that may shade one entire cell of the module; shading of an entire cell over prolonged periods may cause permanent damage to the module.

The module should be mounted so the junction box is towards the upper half of the module. This will minimize the possibility of water ingress into the junction box.

### ***Frame***

Abound Solar AB1-Series solar modules are intended to be installed without a frame.

### ***Rails***

The mounting rails must provide support for the modules. To allow the modules to comply with the safety testing that has been done, the clips, which mount to the rails, must be placed in specific locations on the modules. These locations are shown in the illustration below, and discussed in the 'Clips' section below as well.

For systems which have more than one row of modules, it is suggested that the rails be mounted 610 mm apart. This will allow for a symmetric approach to mounting on the horizontal rails, as well as enough clearance between modules for a reasonable safety clip.

### ***Clips***

Modules are to be mounted with a minimum of 4 rubberized clips (with EPDM rubber – or similar material - contacting the module) installed on the long (1200mm) module edges, with the clips placed 295 mm  $\pm$  45 mm from the module ends as shown in the Figure 4.0. Be sure to follow the clip manufacturer's recommendations; typically a minimum gap of 1 mm is required



Use only PV rated stranded or solid copper single-conductor cable which is UV/sunlight resistant and rated 600V for the US and 1000V Europe with temperature rating of -40°C to +90°C with a minimum gauge of 14AWG and 6mm minimum cable diameter for modules and interconnect wiring that is exposed to weather.

There are no wire clips supplied with the module. If wire clips are used, ensure that they are of sufficient specification to hold a 6mm diameter cable. When routing the cable, do not exceed the minimum bend radius of the cable, which is 4X the diameter, or 24 mm.

Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at STC. Refer to section 690-8 of the National Electrical Code (USA) or equivalent for additional multiplying factors which may be applicable when determining voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the module output.

### **General Wiring Guidelines**

- All wiring should be done in accordance with applicable electrical codes.
- A qualified, licensed professional should do all wiring.
- Wiring should be protected to help ensure personal safety and to prevent its damage.
- The wires should be secure and routed in an appropriate, water free wire way.
- All modules connected in series should be of the same module number and/or type.
- Use copper wire that is PV system rated; it must be sunlight resistant and insulated to withstand the maximum possible system open circuit voltage.

### **Wiring Connections**

Use only approved MC4 or compatible connectors. When connecting the MC4 connectors, fully insert and engage both locking tabs.

The wire length on the module is 600 mm; this is enough length to allow the modules to be connected in series when mounted next to each other in portrait mode.

### **Series Connections**

The modules are intended to be wired in series within each string. The maximum number of modules which can be wired in series is dependent upon the local codes and the inverter dc input voltage limitations. Consult the latest datasheet for Voc and the appropriate temperature compensation of the modules being used. It is imperative not to exceed local code limitations and the operating voltages of the chosen inverter.

Typically, installation for series strings shall be no more than 12 modules for a 600V string taking in account Voc without temperature coefficient calculations. For 1000V strings no more than 20 modules shall be in a string.

### **Blocking Diode**

Within normal installations the AB1 modules do not require the use of a blocking diode. For some applications, such as multi-paralleled superstrings (see the European applications below), a blocking diode may be required.

### **Overcurrent Protection**

In jurisdictions falling under the US National Electrical Code (NEC), installations that contain more than two strings require overcurrent protection on each string. A 4-Amp (maximum) fuse or circuit breaker is recommended for each series-connected group of modules for over-current protection.

The required rated voltage for such overcurrent protective devices shall be based on the rated open-circuit voltage corrected for expected ambient temperature. The open-circuit voltage is the sum the open-circuit voltage of the series connected PV modules. Note that this value can greatly exceed the maximum power point (mpp) voltage.

### ***Parallel Connections***

In jurisdictions which are not covered under the US NEC, it is typical to wire several strings in parallel prior to combining these strings into one fuse. The individual strings are referred to as substrings, and the overall series/parallel combination is referred to as a superstring.

For such applications, no more than three substrings should be connected in parallel without the use of blocking diodes. With blocking diodes, no more than six strings should be connected in parallel. Each substring should have its own blocking diode.

In such applications, the size of the current limiting device must also be adjusted based on the expected output of the modules. The overcurrent device should be approximately 1.5X the combined rating of the paralleled strings.

For more information on this topic please refer to the “***AB1 Series/Parallel Configuration Guide***”.

### ***Conduits***

For applications where wire conduits are used, follow the applicable codes for outdoor installation of wires in conduits. Verify that all fittings are properly installed to protect wires against damage and prevent moisture intrusion.

### ***Prior to Commissioning***

If the remaining system is not ready for commissioning immediately after the modules

have been mounted on the racking, the modules should be left in open circuit no more than 90 days. Do not short circuit the modules; permanent damage may result.

## **5.0 Operation and Maintenance**

Under normal operating conditions, the modules should not require any maintenance. However, due to local conditions, the modules may become soiled. It is up to the site operator to determine if cleaning is appropriate.

### ***Cleaning***

Regular maintenance may help to maintain optimal system performance. Under most conditions, normal rainfall is sufficient to keep the module glass clean if the module is tilted.

If the module's front surface becomes dirty, power output will likely be reduced.

- The front surface of the module may be cleaned with water and a soft cloth or sponge on a regular basis. It is recommended to clean the back surface only as needed.
- A mild non-abrasive detergent may be applied for persistent dirt. Do not use harsh cleaning materials or sharp instruments.

### ***Maintenance***

It is recommended to inspect the electrical and mechanical connections periodically for loose connections and corrosion.

## **6.0 Disposal and Recycling**

Abound Solar has invested in a recycling program to ensure that every aspect of the lifecycle of the module is environmentally responsible. A Return Materials Authorization (RMA) process must be followed to return materials. Further information will be found in

the “**Recycling and Return Material Authorization (RMA) Process**” manual. Abound Solar modules should not be discarded into a landfill; they must be returned to Abound Solar for recycling.

Modules with broken glass cannot be repaired and should not be used since they may produce electrical shock on contact. Broken or damaged panels must be handled carefully and disposed of properly.

Place broken modules in Abound Solar packaging for transport to a dedicated recycling facility. Contact Abound Solar for additional details.

## 7.0 Warranty Terms and Conditions

Please refer to Abound Solar’s Warranty Terms and Conditions for warranty terms and product return policies. These terms are administered on a contract basis; please refer to you sales contract.

Please note that any warranty is valid only for commissioned projects; commissioned projects require the completion of a “**Project Architecture Report**”. The modules are designed only to be installed once and demounting and remounting into a new site will void the warranty. Additionally, the “**Product Registration Procedure**” must be followed.

## 8.0 Disclaimer of liability

Abound Solar does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of, or in any way connected with failure to follow handling or installation procedures as prescribed in this manual.

For claims arising from issues not related to installation or maintenance, contact your module supplier.

For further information, please visit [www.abound.com](http://www.abound.com) or contact your Abound Solar authorized representative.

All details regarding Abound Solar’s offering are subject to the terms and conditions set forth in Abound Solar’s agreement with its customers.

Unless otherwise indicated, all electrical characteristics +/-10%. Specifications are subject to change without notice due to process adjustment and product improvements. Please check with the latest product specifications for updates.

## 9.0 References

The following documents are available through Abound Solar. Please contact Abound directly for information on the latest revisions.

### **Recycling and Return Material Authorization (RMA) Process**

(Section 6.0):

Abound Solar Document #3106760

### **Project Architecture Report**

(Sections 4.0 and 7.0)

Abound Solar Document: #3106497

### **AB1-Series Photovoltaic Module Mounting Application Note**

(Section 4.1)

Abound Solar Document: #3106761

### **AB1 Inverter Compatibility Guide**

(Section 4.2)

Abound Solar Document: #3111669

### **AB1 Series/Parallel Configuration Guide**

(Section 4.2)

Abound Solar Document: #3111670







### **Abound Solar Product Registration Procedure**

(Section 7.0)

Abound Solar Document #3109811

## 10.0 Product Label

Below is a sample image for the product label on an AB1-70B module.

 <p><b>abound</b> solar</p> <p><b>Longmont, CO, USA</b></p>		 <p>Serial Number: 1010904011234</p> <p><b>Type: AB1-70B</b></p>	<p><b>RECYCLING:</b> To ensure environment sustainability, Abound Solar covers the cost of collection and recycling of this solar module. • Contact Abound Solar before disposing in any manner. • Kontaktiere Sie Abound Solar vor anderweitiger Entsorgung dieses Produktes. • Contacte Abound Solar antes de disponer de este producto. • Contact Abound Solaire avant de disposer de ce produit.</p> <p><a href="http://www.abound.com/recycling_claim">www.abound.com/recycling_claim</a></p> <p><b>International Toll Free:</b> 00.800.4044.0000</p> <p><b>Toll Free: (North America):</b> 877.761.6555</p> <p>Covered by United States Patents: 6,423,565; 7,220,321</p> <p><b>Made in USA</b></p>																					
<p><b>CAUTION</b></p>  <p>Hazardous voltage may be present at any time, even when not in service. Read instructions before installing or servicing. Do not disconnect under load.</p>	<table> <tr> <td>Nominal peak power</td> <td>70 W</td> </tr> <tr> <td>Open circuit voltage</td> <td>46.7 V</td> </tr> <tr> <td>Short circuit current</td> <td>2.08 A</td> </tr> <tr> <td>Maximum system voltage (600V UL)</td> <td>1000 V</td> </tr> <tr> <td>Fuse rating</td> <td>4 A</td> </tr> <tr> <td>Peak power voltage</td> <td>34.85 V</td> </tr> <tr> <td>Peak power current</td> <td>1.73 A</td> </tr> <tr> <td>Fire rating</td> <td>Class C</td> </tr> <tr> <td>Meets IEC Safety Class II</td> <td></td> </tr> <tr> <td>Product revision C</td> <td></td> </tr> <tr> <td>Specifications: (+/-10%) at STC</td> <td></td> </tr> </table>		Nominal peak power	70 W	Open circuit voltage	46.7 V	Short circuit current	2.08 A	Maximum system voltage (600V UL)	1000 V	Fuse rating	4 A	Peak power voltage	34.85 V	Peak power current	1.73 A	Fire rating	Class C	Meets IEC Safety Class II		Product revision C		Specifications: (+/-10%) at STC	
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