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1 User Manual Introduction

The Manual includes the relevant information on installation and safe operations of PV modules of Jolywood (Taizhou) Solar Technology Co., Ltd. (PV modules hereinafter abbreviated as “modules”). Jolywood (Taizhou) Solar Technology Co., Ltd. is referred to as "Jolywood ". Failure to follow these safety guidelines can result in personal injury or property damage.

The installers must read and understand the manual before installing. Should there be any questions, please contact our customer service department or our local representative for more detailed information. The installer must follow all safety precautions, requirements of local authorities and legal provisions or requirements of the authorized agencies as described in the manual. Before installing the solar photovoltaic system, installers shall be familiar with their mechanical and electrical requirements. The operation of a photovoltaic system requires relevant expertise and must be systematically installed and maintained by qualified personnel with specialized knowledge.

Please keep the manual in good place for further reference, (maintenance and service) or present it when selling or processing the modules.

Jolywood’s modules have passed the tests of the global testing and certification bodies, so please feel free to use in compliance with the requirements of the Installation Manual.

The module installer must inform the end customer (or consumer) of the above.

1.1 Disclaimer

Jolywood reserves the right to change this installation manual without prior notice. Jolywood does not guarantee any express or implied information contained in this manual. If the customer does not follow the requirements listed in this manual during the installation of the module, the limited warranty for the product provided to the customer will be void.

1.2 Scope of responsibility

Jolywood shall not be held liable for any of the following forms of injury and damage, including but not limited to physical damage and property damage caused by module operation, system installation errors, and failure to follow the instructions in this manual.

2 Safety measures

2.1 Warning

Read and understand all safety rules before installing, wiring, operating or maintaining modules. Photovoltaic modules generate electricity when exposed to light source environments. Photovoltaic arrays of multiple modules can cause fatal electric shock and/or burn hazards. Personnel without prior authorization and training are not allowed to touch the photovoltaic modules and terminals.

2.2 General Safety

- A. The installer must follow all safety precautions, requirements of local authorities and legal provisions or requirements of the authorized agencies as described in the manual. The operation of a photovoltaic system requires relevant expertise and must be systematically installed and maintained by qualified

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personnel with specialized knowledge. Personnel without authorization and related training should not touch the photovoltaic modules and access the installation area or module storage area.

- B. Do not use modules with broken glass. Damaged modules must not be repaired as any contact with the modules may result in electric shock. Do not disassemble modules or any parts of the modules. Do not artificially collect sunlight onto these solar modules.
- C. Do not connect the positive polarity of any single PV module with that of the cable. Do not connect the positive polarity of any single photovoltaic module with that of the cable. Make sure that the insulation gaskets of the joints are closely tightened without any gaps in case of the risk of fire and/or electric shock.
- D. According to the National Electrical Code, the maximum system voltage shall not exceed 1500V.
- E. Jolywood module electric shock protection Class II.

2.3 Operation Safety

- A. Avoid damaging modules, do not scratch or impact modules. Do not use paint or adhesive on the front and back of the module. Avoid scratching or cutting cables or exposing the connectors to sunlight for a long time to maintain the good insulation of module. Do not drop the module or let anything fall down onto the unit. Do not place any heavy objects or sharp objects on the modules.
- B. Do not use water to extinguish the fire without the power supply disconnected.
- C. Only work in a dry environment with dry tools. Do not work in a humid environment without wearing any protective measures. In the sun, regardless of whether the photovoltaic module is connected to the system, do not touch the module's junction box, connector, cable etc. directly without any protection.
- D. Do not climb, step on, stand, walk or jump directly on the package or modules.

3 Unpacking, transport and storage







Preventive measures and general safety rules:

- A. The modules should be stored in the original box before installation. Please protect the package from damage. Transport the modules and unpack the modules according to the recommended shipping method and unpacking procedure. Avoid damaging modules, do not scratch or impact modules. Do not apply pressure directly on the unit during transportation. Improper transportation or installation may damage the modules, which is excluded from the warranty. Do not step on or stand above the package and modules.
- B. Only work in a dry environment, ensuring that all modules and electrical contacts are clean and dry prior to installation. If it is necessary to store the unmounted modules outdoors for a certain period of time, always cover the modules and ensure that the glass is facing down on the soft surface to prevent water from entering inside the module and connectors being damaged.

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- C. When unpacking, it must be operated by 2 or more people at the same time. Do not lift the module by grasping the module terminal box or lead wires. Use both hands to carry the module and do not stack the modules. Do not place modules in an environment without reliable support or unfixed. Do not place any heavy objects or sharp objects on the modules.

3.1 Package identification description

<p>3.1.1 Prohibit modules from being discarded at random, need special recycling.</p> 	<p>3.1.2 Prohibit modules from rain or moisture.</p> 
<p>3.1.3 The modules in the package are fragile items, which should be handled with care.</p> 	<p>3.1.4 The package should be vertically up when transported.</p> 
<p>3.1.5 Do not step on or stand above the package and modules.</p> 	<p>3.1.6 Do not stack the modules on the outer packaging. The highest number of layers is 2.</p> 

3.2 Unpacking Precautions

- A. When unloading the modules from the transport vehicle, use a reasonable lifting fixture to allow up to 2 brackets per sling. Before lifting, make sure that the trays and cartons are damaged, skewed, and that the hoisting ropes are durable. When the hoisting is on the ground, the two men put the carton gently on the project in a relatively flat position. Or use a forklift to remove the modules from the truck, and the unloaded modules are placed on a level surface.

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- B. When the module is temporarily stored in the project, place the module in a dry and ventilated place. Do not stack modules at the project site. Cover the modules with a tarpaulin and use a curtain or mesh belt to reinforce the tarpaulin to protect the modules from moisture and rain.

3.3 Secondary transportation and precautions

- A. If the module requires two long-distance transportation or long-term storage, it is forbidden to remove the original packaging. The finished product packaged in the package can be transported by land, sea or air. During transportation, secure the box to the transport platform to ensure that the package does not roll over. Take land transportation as an example. When transporting a normal truck, stack up to 2 layers. It is forbidden to cut the strap.
- B. It is not allowed to remove the original packaging when the project is checked at the site. Only 1 layer of transportation is allowed during transportation. During transportation, secure the box to the transport platform to ensure that the package does not roll over. Do not use tricycle transport modules. Do not use rope binding, back assembly. Single-back modules are prohibited, and it is prohibited to carry or drag modules through the wires or junction boxes of the modules.

3.4 Storage

- A. It is forbidden to let the modules rain or get wet. If it is necessary to store the unmounted modules outdoors for a certain period of time, always cover the modules and ensure that the glass is facing down on the soft surface to prevent water from entering inside the module and connectors being damaged.
- B. If the modules require long-distance transportation or long-term storage, do not remove the original packaging of the modules.
- C. Project warehouse storage (Humidity <70%; Temperature: -20°C ~+50°C) 60 pieces of double glass modules and 72 pieces of double glass modules static stacking stack 2 tray. Normal warehouse storage (humidity <70%; temperature: -20°C ~ +50°C): 60 pieces of double glass modules and 72 pieces of double glass modules can be stacked up to 2 layers.

4 Unpacking instruction

4.1 Unpacking safety

- A. When unpacking outdoors, it is forbidden to work under the conditions of rain. Because the carton will become soft and open after the rain, the photovoltaic modules inside will come out and cause damage to the modules or bruises. If there is wind on the site, special attention should be paid to safety. Especially in the case of high winds, it is recommended not to carry the modules and properly fix the modules that have been unpacked.
- B. The work floor needs to ensure that the package can be placed horizontally and stably. Use a supportive removal tool when disassembling the carton to prevent the modules from falling down.
- C. Wear protective gloves during unpacking to avoid injury and fingerprints on the glass surface.
- D. The outer package can query the modules information, please read it carefully before unpacking.

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- E. Each module needs to be lifted by 2 people. Do not lift the module by grasping the module terminal box or lead wires. Use both hands to carry the module and do not stack the modules.
- F. The unpacked modules must be completely assembled and prohibited from being stacked at the project site.

4.2 Unpacking steps

- A. Before unpacking, please check the product name and serial number on the A4 paper of the outer box, and prohibit the custom unpacking method.
- B. When unpacking, cut all vertical packing belts with a blade or scissors, first cut the long side packing belt, then cut the short side packing belt; remove the upper cover of the carton and take out two or three upper lifting brackets.
- C. When removing the modules from the box, two people must stand on either side of the box while lifting the assembly, one hand grasping the corner of the assembly, and the other hand grasping the short side while removing the assembly. If unpacking on a horizontal floor, remove the modules from the side of the package to the other side, and then carry them. If unpacking on a non-horizontal floor, use a supportive removal tool when removing the carton to prevent the module from falling down.
- D. Modules removed from the box are prohibited from leaning against the mounting post and placed in an environment without reliable support or unfixing.

5 Installation

Double glass series modules product by Jolywood can be used for more than 30 years according to the following conditions. After-life PV modules need to be disposed of reasonably according to local laws and regulations. In addition to the required IEC certification, the product has been tested to verify its resistance to ammonia that may be present near the cowshed and whether it is suitable for installation in wet (coastal) areas and areas where sandstorms occur frequently.

5.1 Installation Safety

- A. The solar modules of Jolywood can be installed horizontally or vertically, but the lateral installation can minimize the influence of dust on the shading of the modules.
- B. Do not remove the module packaging and leave the modules in the carton before installation.
- C. When installing modules, only work in a dry environment with dry tools. Do not work in a humid environment without wearing any protective measures. Do not install modules under any rainy, snowy or windy conditions. Keep the connectors dry and clean when installing modules to avoid the risk of electric shock. If the terminal of the module is wet, no work can be done to avoid electric shock. Please install it immediately after unpacking.
- D. Do not wear metal rings, wristwatches, earrings, nose rings, lip rings, or other metal materials when installing or repairing PV systems.
- E. Use on-transparent material to completely cover the module during installation to prevent power loss. Do not open the electrical connection or pull out the connector while the circuit is under load. Do not

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touch the modules during installation unless necessary. Glazed surfaces and brackets may generate high temperatures, which might impose the risk or hazards of burns and electric shock.

- F. Do not damage the back glass of the assembly while bolting the assembly to the bracket during assembly. If you need to replace modules, do not damage the surrounding modules or mounting structure.
- G. When installing modules, don't work alone, and keep working with teams of 2 or more people.
- H. After the modules are installed, the cables should be fixed or tied so that they are not exposed to direct sunlight after installation and can prevent the cable from aging. Low-hanging cables can cause various problems, such as electric leakage and fire in the water.
- I. The application level of Jolywood is Class A. Different color modules are avoided from being installed in the same array or roof.

5.2 Installation method

5.2.1 Mechanical installation and precautions

The connection of the module to the bracket system can be mounted using clamps or bezels. Installation modules must be carried out according to the following examples and recommendations. If the installation method is different from Jolywood, please consult Jolywood's local technical support or after-sales, and obtain the consent of Jolywood, otherwise the modules will be damaged and the warranty will be invalid.

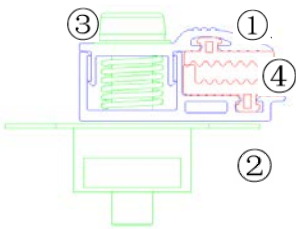
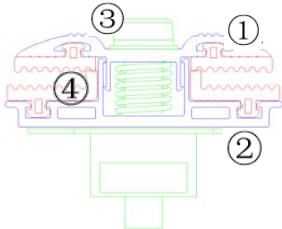
- A. The mechanical load of the Jolywood (including snow and wind loads) depends on the way the Jolywood are installed. The mechanical load should be calculated by the professional system designer based on the actual conditions and environmental conditions. Moreover, it does not withstand the excessive force generated by the thermal expansion of the support structure.
- B. The drain hole should not be blocked under any circumstances during installation or use.

A. Fixture installation (for Bifacial Double-Glass modules)

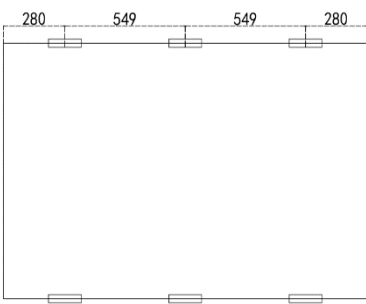
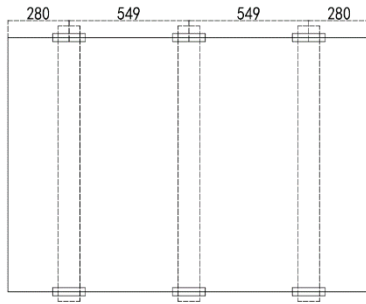
- A. Jolywood has recommended the use of EPDM or similar insulating spacers and the M8 bolts can be fixed after testing the modules with different fixtures from multiple manufacturers.
- B. Secure the assembly to the mounting rail using at least 4 clamps.
- C. Be sure to avoid the shading effect of the module fixture.
- D. When selecting this type of fixture installation method, at least four fixtures are required on each module. Install two clamps on each of the long sides of the assembly. Depending on the local weather conditions, determine if additional fixtures are needed to ensure that the modules can withstand the load.
- E. The applied torque shall be determined according to the mechanical design criteria of the bolts used by the customer, for example: M8 ---- 16-20N.m (140-180lbf.in).

【Fixture Diagrams】

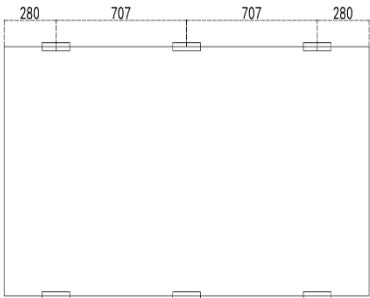
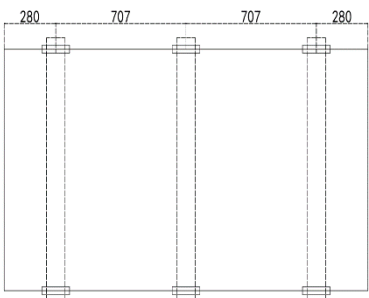
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Fixture Types	Edge Clamp	Middle Clamp
Diagram		
List of Parts	①Upper Clamp ②Lower Clamp ③M8 bolts ④EPDM rubber strip	①Upper Clamp ②Lower Clamp ③M8 bolts ④EPDM rubber strip

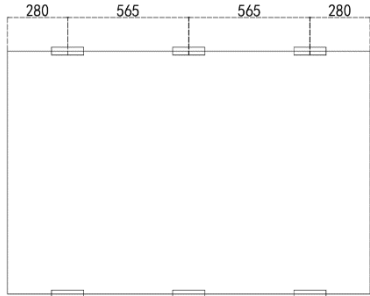
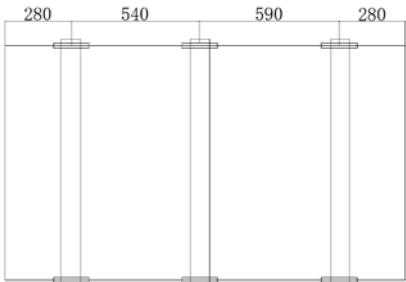
【 Fixture installation method 】

Installation Method for 2.5mm Bifacial Double-Glass modules (60-piece)		
Installation Method	Load Pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* Length of clamp: 150mm, a total number of 6 pieces; * The clamp must be mounted in the designated area of the fixture.</p>	 <p>* Length of clamp: 150mm, a total number of 6 pieces; 3 beams on the back; * The clamp must be mounted in the designated area of the fixture.</p>
	Installation Method for 2.5mm Bifacial Double-Glass modules (72-piece)	
Installation Method	Load Pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm

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Horizontal Installation	 <p>* Length of clamp: 200mm, a total number of 6 pieces;</p> <p>* The clamp must be mounted in the designated area of the fixture.</p>	 <p>* Length of clamp: 200mm, a total number of 6 pieces; 3 beams on the back;</p> <p>* The clamp must be mounted in the designated area of the fixture.</p>
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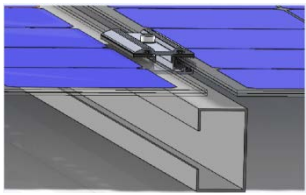
Installation Method for 2.5mm Bifacial Double-Glass modules (60-half-piece)

Installation Method	Load Pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	
Horizontal Installation	 <p>* Length of clamp: 150mm, a total number of 6 pieces;</p> <p>* The clamp must be mounted in the designated area of the fixture.</p>	 <p>* Length of clamp: 150mm, a total number of 6 pieces. 3 beams on the back. One of the clamps is offset to the side to avoid the beam contact box.</p> <p>* The clamp must be mounted in the designated area of the fixture.</p>

【 Fixture installation diagram 】

Step 1 : Loosen the nut and gasket.	
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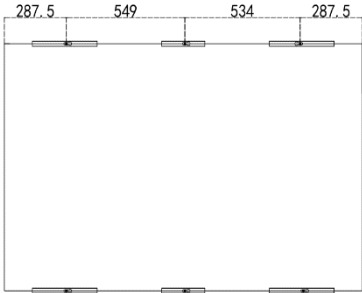
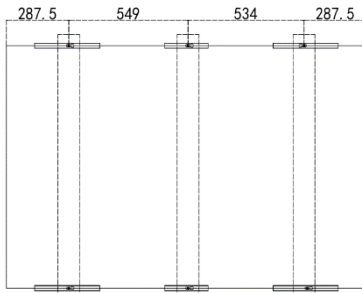
Step 2 : Insert the bolt into the mounting hole, screw on the nut, and maintain the gap between the upper and lower clamps to load the modules.	
Step 3 : Insert the assembly into the upper and lower clamp, and ensure the edge of the modules to contact the EPDM and tighten the nut.	 Diagram for Modules Installation

B. Installation of Mini-frame (for Bifacial Double-Glass modules)

【Installation Environment for Mini-Frame Modules】

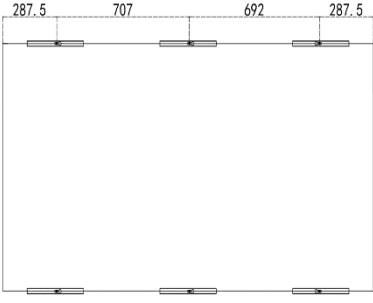
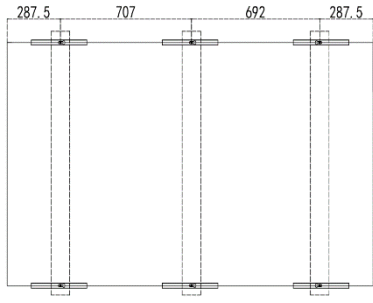
- A. When installed with a fixed bracket, the modules shall be installed so that they can absorb sunlight to the maximum degree throughout the year.
- B. When installed with a tracker bracket, the modules shall be installed in a way not be blocked by buildings, trees, chimneys, etc. at any time the day.
- C. Do not install in a corrosive environment, such as a beach or a landfill that is susceptible to flooding.
- D. Do not mount the Mini frame near open flames or flammable objects.

【Installation Method for Mini Frame】

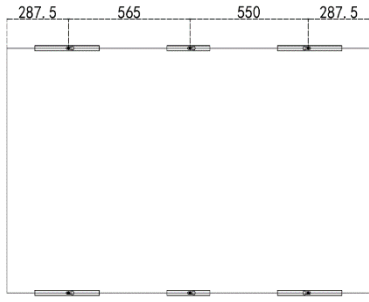
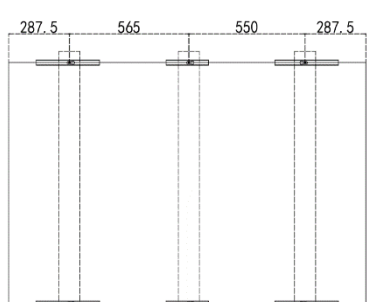
Installation Method for Bifacial Double-Glass Modules (60-piece) with Mini Frame		
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	
Horizontal Installation	 <p>* Size of Mini Frame 300*200*300mm, a total number of 6 pieces;</p> <p>* Install the small frame in the fixture</p>	 <p>* Size of Mini Frame 300*200*300mm, a total number of 6 pieces; 3 beams on the back;</p> <p>* Install the small frame in the fixture mounting area.</p>

mounting area.

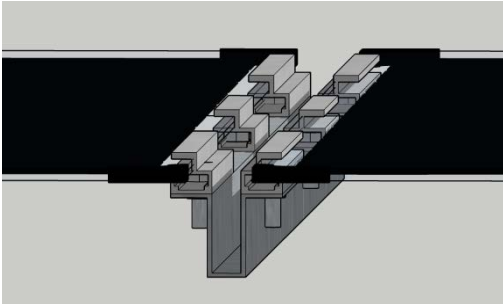
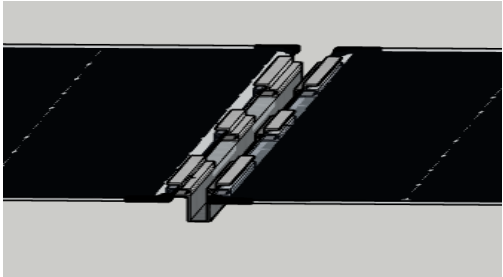
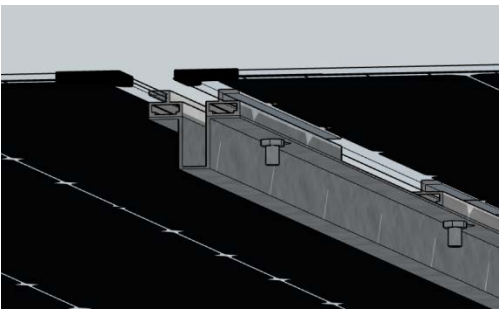
Installation Method for Bifacial Double-Glass Modules (72-piece) with Mini Frame

Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* Size of Mini Frame 300*300*300mm, a total number of 6 pieces; * Install the small frame in the fixture mounting area.</p>	 <p>* Size of Mini Frame 300*300*300mm, a total number of 6 pieces; 3 beams on the back; * Install the small frame in the fixture mounting area.</p>

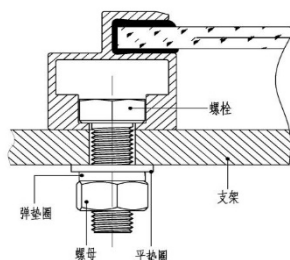
Installation Method for Bifacial Double-Glass Modules (60-half-piece) with Mini Frame

Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* Size of Mini Frame 300*200*300mm, a total number of 6 pieces; * Install the small frame in the fixture mounting area.</p>	 <p>* Size of Mini Frame 300*200*300mm, a total number of 6 pieces; 3 beams on the back; * Install the small frame in the fixture mounting area.</p>

【Mini Frame installation diagram】

<p>Step 1: Place the hex bolt into the module keying and place the assembly with the bolt on the mounting bracket.</p>	
<p>Step 2: Adjust the position of the modules, align the mounting holes, place the spring pads, washers, and then tighten the nuts.</p>	
<p>Step 3: Tighten the nut with a torque wrench.</p>	

The Mini frame and the bracket are connected with corrosion-resistant M8 bolts, and are fixed to the bracket through the mounting holes of the Mini frame, as shown below:



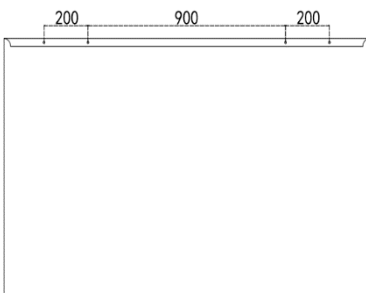
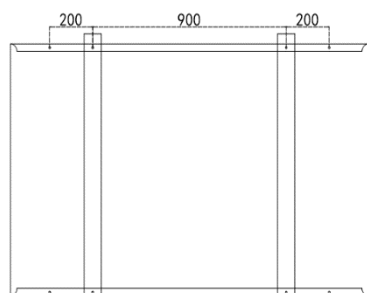
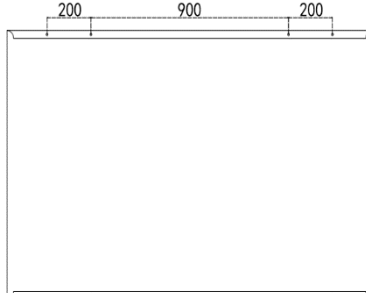
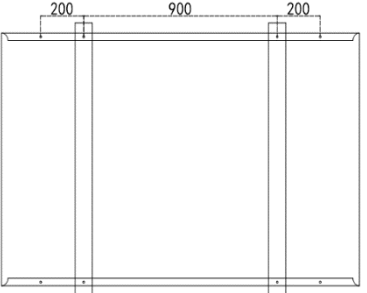
- A. The mechanical load pressure is determined by the length of the mini frame, the number of mini frames installed on each module, and the mounting method of the bracket. The mechanical system load should be calculated by a professional installer based on the system design.
- B. When designing the system, please select the reasonable number of mini frames and choose the reasonable installation method/configuration according to the mechanical load environment of the system to ensure that it meets the mechanical load requirements.

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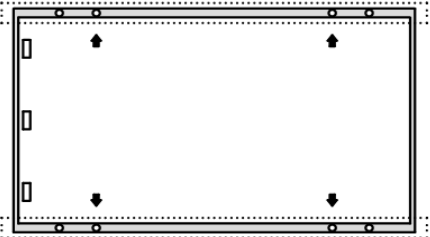
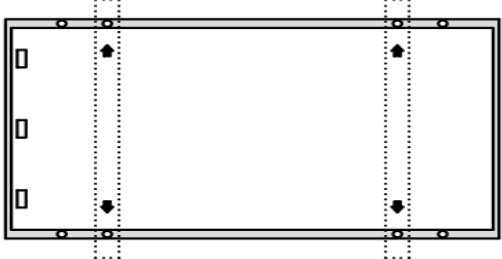
C. Installation of Modules with Full Frame (for Bifacial Double-Glass modules)

The modules with frame can be connected to the bracket system through mounting holes on the frame or fixtures.

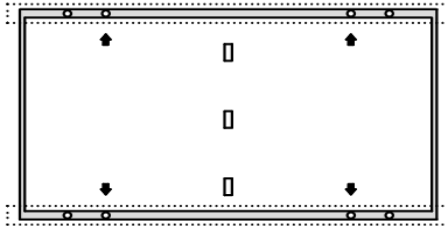
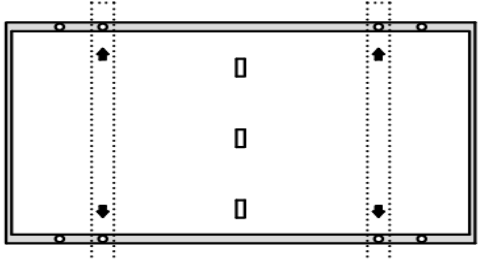
【Installation Method for Frame Modules-Bolt installation】

Installation Method for Bifacial Double-Glass Modules (60-piece) with Full Frame		
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* Install through mounting holes. * No cross beam supported.</p>	 <p>* Install through mounting holes. * Add cross beam support at 1/4 of the long side.</p>
Installation Method for Bifacial Double-Glass Modules (72-piece) with Full Frame		
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* Install through mounting holes. * No cross beam supported.</p>	 <p>* Install through mounting holes. * Add cross beam support at 1/4 of the long side.</p>
Installation Method for Bifacial Double-Glass Modules (60-piece-158.75) with Full Frame		
Installation	Load pressure	

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Method	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* The long frame is bolted with 990 mm inner four holes *C section steel is parallel to the long side.</p>	 <p>* Long frame on both sides of the use of internal four 990 mm bolt installation *C steel vertical to the long side.</p>

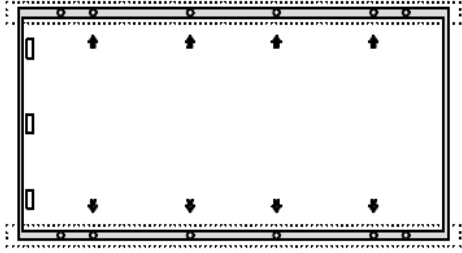
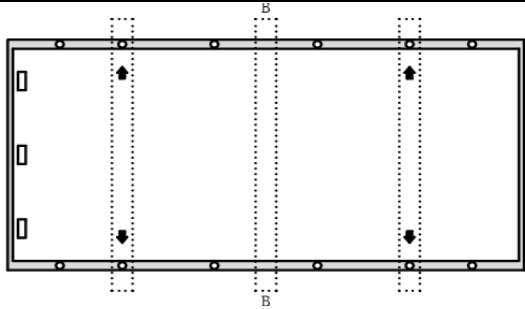
Installation Method for Bifacial Double-Glass Modules (60-half-piece-158.75) with Full Frame

Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* The long frame is bolted with 990 mm inner four holes *C section steel is parallel to the long side.</p>	 <p>*Long frame on both sides of the use of internal four 990 mm bolt installation *C steel vertical to the long side.</p>

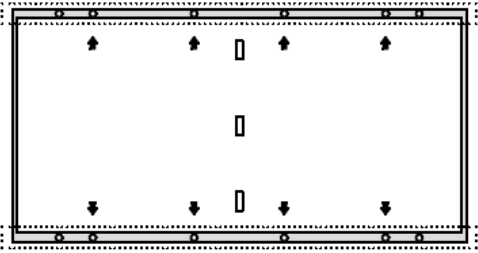
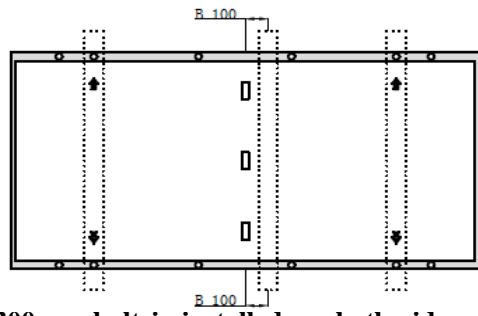
Installation Method for Bifacial Double-Glass Modules (72-piece-158.75) with Full Frame

Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm

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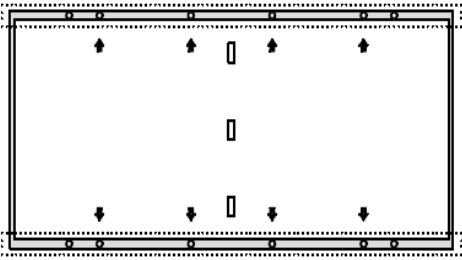
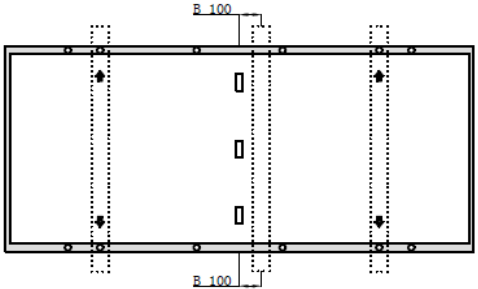
Horizontal Installation		
	<p>* The long frame is bolted with four holes (1300mm inside, 400mm in center)</p> <p>* C section steel parallel to the long side.</p>	<p>*1300mm bolt is installed on both sides of the long frame. The middle side is installed</p> <p>*C section steel perpendicular to the long frame.</p>

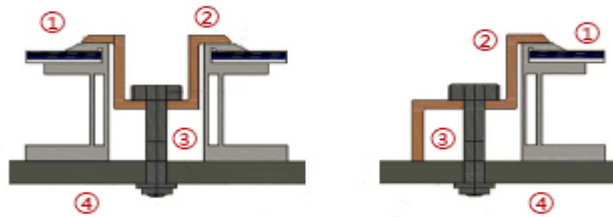
Installation Method for Bifacial Double-Glass Modules (72-half-piece-158.75) with Full Frame

Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation		
	<p>* The long frame is bolted with four holes (1300mm inside, 400mm in center)</p> <p>* C section steel parallel to the long side.</p>	<p>*1300mm bolt is installed on both sides of the long frame. B is 100 mm from the center.</p> <p>*C section steel perpendicular to the long frame.</p>

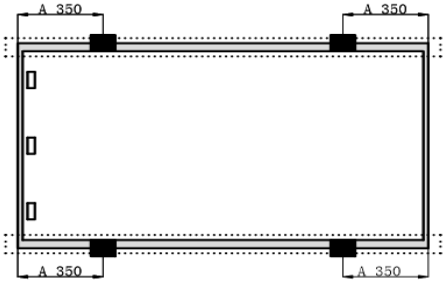
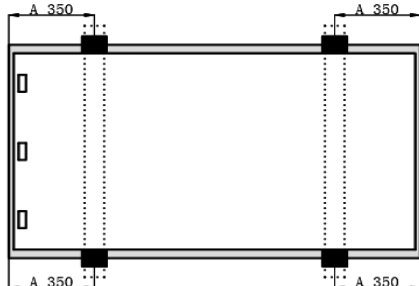
Installation Method for Bifacial Double-Glass Modules (78-half-piece-158.75) with Full Frame

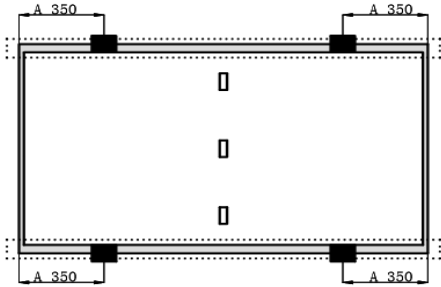
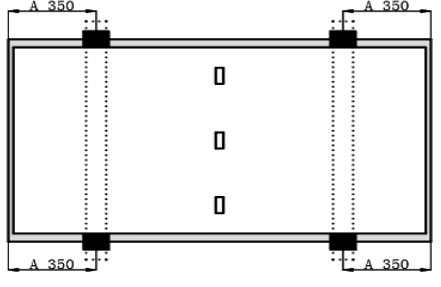
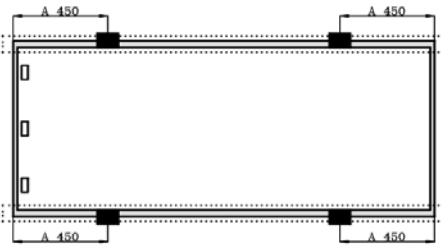
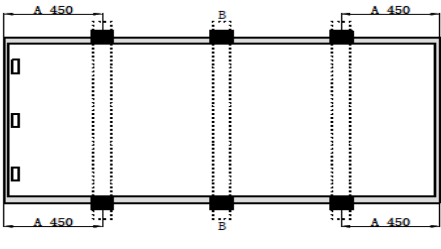
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm

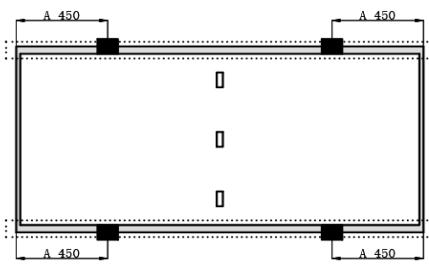
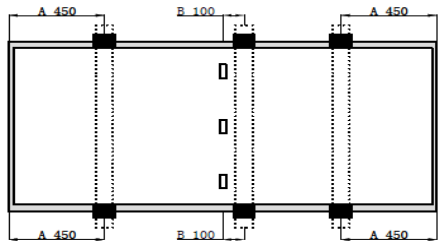
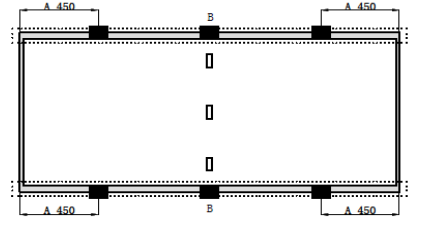
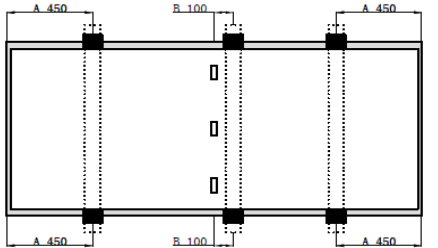
Horizontal Installation	 <p>* The long frame is bolted with four holes (1300mm inside, 400mm in center) *C section steel parallel to the long side.</p>	 <p>* The long side of the frame is bolted with 1300mm inside four holes, B is 100mm away from the center. *C section steel is vertical to the long side.</p>

【Installation Method for Frame Modules—Fixture installation】
Mid & Side Press Block:


1: Frame 2: Clip 3: M8 Bolt 4: mounting rail

Installation Method for Bifacial Double-Glass Modules (60-piece-158.75) with Full Frame		
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p>* Four-point long side mounted. *C steel parallel to the long side, side press block 30 mm high, width 40-50 mm *A=350±20mm</p>	 <p>* Four-point long side mounted *C steel parallel to the long side, side press block 30 mm high, width 40-50 mm *A=350±20mm</p>

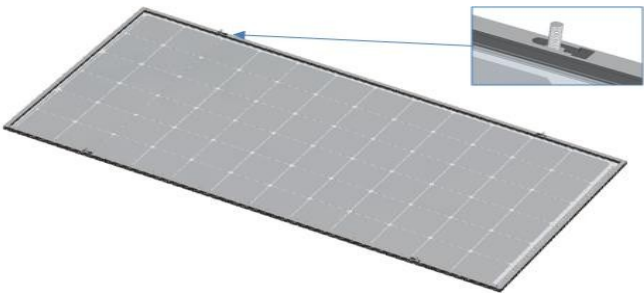
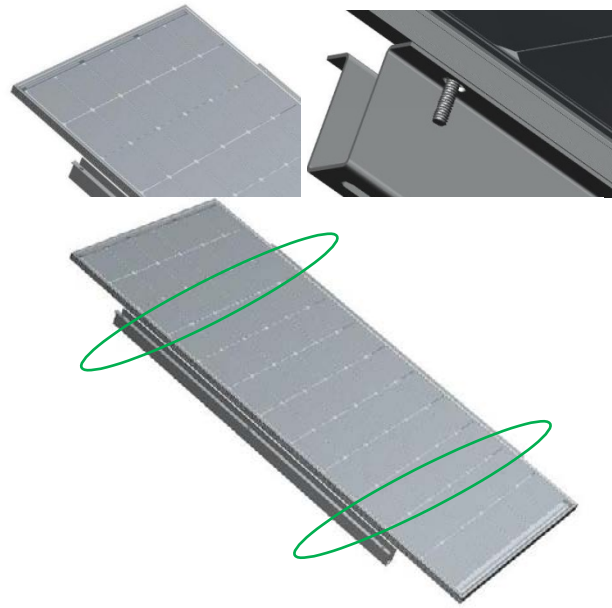

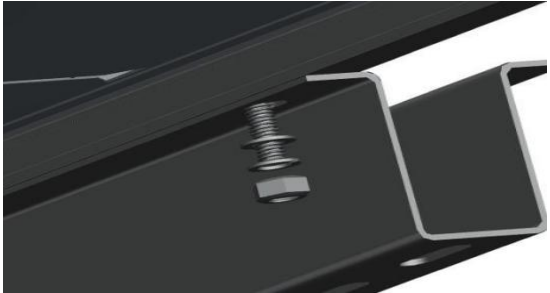
Installation Method for Bifacial Double-Glass Modules (60-half-piece-158.75) with Full Frame		
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p> * Four-point long side mounted *C steel parallel to the long side, side press block 30 mm high, width 40-50 mm *A=350±20mm </p>	 <p> * Four-point long side mounted *C steel parallel to the long side, side press block 30 mm high, width 40-50 mm *A=350±20mm </p>
	Installation Method for Bifacial Double-Glass Modules (72-piece-158.75) with Full Frame	
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p> *Four-point long side mounted *The c-section is parallel to the long side, side press block 30 mm high, width 40-50 mm *A=350±20mm </p>	 <p> *Six-point long side installation *C section steel perpendicular to the long side, side press block 30 mm high, width 40-50 mm *A=450±20mm B=1008(mid) </p>
	Installation Method for Bifacial Double-Glass Modules (72-half-piece-158.75) with Full Frame	
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass	2.5mm	2.5mm

Thickness		
Horizontal Installation	 <p> * Four-point long side mounted *The c-section is parallel to the long side, side press block 30 mm high, width 40-50 mm *A=350±20mm </p>	 <p> * Six-point long side installation *C section steel perpendicular to the long side, side press block 30 mm high, width 40-50 mm *A=450±20mm B is 100 mm from the center </p>
Installation Method for Bifacial Double-Glass Modules (78-half-piece-158.75) with Full Frame		
Installation Method	Load pressure	
	+2400Pa/-2400Pa	+5400Pa/-2400Pa
Glass Thickness	2.5mm	2.5mm
Horizontal Installation	 <p> * Four-point long side mounted *The c-section is parallel to the long side, side press block 30 mm high, width 40-50 mm *A=450±20mm B=1090(mid) </p>	 <p> * Four-point long side mounted *The c-section is parallel to the long side, side press block 30 mm high, width 40-50 mm *A=450±20mm B is 100 mm from the center </p>

NOTE: The modules with full frame is mounted vertically under an environment with a load of +5400/-2400Pa (2 crossbeams are placed along the short side). Under a load of +2400/-2400Pa, it is acceptable to select either horizontal or vertical installation.

【Frame assembly installation diagram】

Step 1: Insert the bolts and place the bolts into the frame mounting chute.	
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<p>Step 2: Connect to the bracket</p> <ol style="list-style-type: none"> 1. Lift the assembly and place the screws inside the frame into the top two mounting holes on the bracket. (The module mounting terminal block is facing up.) 2. Install the holes in the lower part one by one. 	
<p>Step 3: Push the module to the mounting position. When pushing the module up, make sure that the two screws at the bottom of the module are not in the slot.</p>	
<p>Step 4: Tighten the screws, put the flat washers, spring washers, nuts in turn, and tighten the nuts with tools to complete the installation of the four holes. (16N•m~ 20N•m)</p>	

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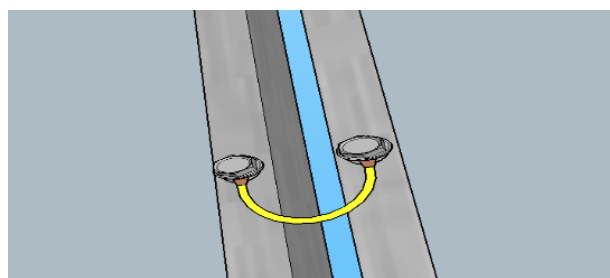
The full-frame modules can be mounted through the mounting holes on the back. Secure the modules to the bracket with bolts. It is recommended to mount with M8 nuts, bolts, washers and spring washers.

5.2.2 Grounding (for Bifacial Double-Glass Modules with Full Frame)

- A. All module frames and mounting brackets must be properly grounded in accordance with the appropriate National Electrical Code. Proper grounding is achieved by continuously connecting the module frame and all metal structural members together using a suitable grounding conductor. The grounding conductor or grounding wire can be copper, copper alloy or other material used as an electrical conductor in accordance with the requirements of the corresponding National Electrical Code. The ground conductor must be connected to the ground through a suitable grounding electrode.
- B. Jolywood's frame assembly can be grounded to the metal frame of the module using a grounding device listed by a third party. The equipment must be installed in accordance with the instructions given by the grounded equipment manufacturer.
- C. Please visit <http://www.jolywood.cn/> to view the "Product Catalog" link for detailed grounding hole locations and dimensions.
- D. The electrical contact is formed by penetrating the anodized coating of the aluminum frame and tightening the ground screw (together with the star washer) to the appropriate torque of 25 lbf.in. A properly sized ground wire (solid bare copper wire according to American Wire Gauge 6 to 12) should be selected and mounted under the connecting bolt.

Modules connection:

Place the toothed washers, washers, and grounding wires in turn, and screw the screws into the grounding holes to connect the two adjacent modules.



5.2.3 Electrical Installation

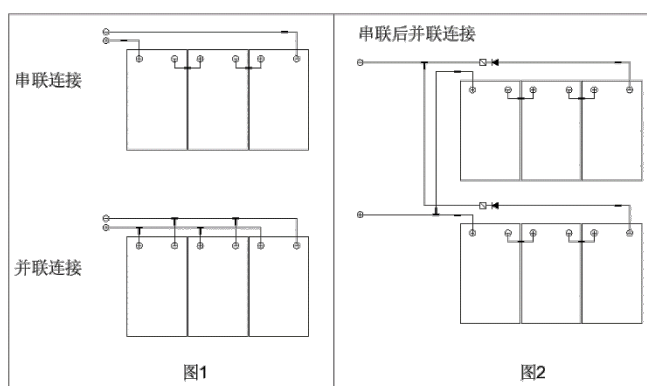
All wiring should be performed by qualified and trained personnel in accordance with local regulations and procedures. The modules can be connected in series to increase the operating voltage by inserting the positive plug of one module into the negative socket of the next module. Always ensure that the contact points are corrosion-resistant, clean, and dry before wiring modules. If the polarities of the modules are connected wrong, they may cause irreparable damage. Before connecting in parallel, be sure to check the voltage and polarity of each module array. If you want to measure the reverse polarity or different values exceeding 10V between the test module array, be sure to check the configuration of module array before wiring.

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- A. All cables and connectors used to connect the DC system must have similar (or higher) parameters. That is suggested that all cables should be run in proper cable ducts and should be located away from the water-prone area.
- B. Each module has two standard 90°C blackout output cables with a plug-and-play connector on each terminal. Jolywood’s modules are equipped with a DC copper cable with a cross-sectional area of 4 mm², rated voltage 1500V DC, insulation resistance up to 90°C and UV-resistant, and all cables used to connect the DC system must have similar or better parameters. We require all wiring and electrical connections to comply with the appropriate National Electrical Code.

Wiring

In order to ensure the normal operation of the system, when connecting modules or connecting loads (such as inverters, batteries, etc.), observe that the polarity of the cables is properly connected (Figure 1 and Figure 2). If the modules are not connected properly, the bypass diode may be damaged. Modules can be wired in series to increase voltage. Connect the modules in series by inserting the positive terminal of one module into the negative terminal of the next module. Figure 1 shows the serial connection of the modules. Modules can be connected in parallel to increase current (shown in Figure 2). Parallel connection is to connect the wiring from the positive terminal of one module to the positive terminal of the next module. The number of modules connected in series and parallel needs to be reasonably designed according to the system configuration. All instructions above must be followed to meet the Jolywood’s Warranty conditions.



5.2.3.1 Fuse

When installing the fuse, connect its rated maximum DC voltage to each non-grounded pole of the array (in other words, if the system is not grounded, connect the fuse to the positive and negative terminals).

- A. The maximum rating of the fuses connected in series with the array is typically 20A, but the actual module-specific ratings are available on the product label and product data sheet.

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- B. The fuse rating also corresponds to the maximum reverse current value that the module can withstand (when an array is shielded, the array is loaded into other parallel module arrays to generate current), thus affecting the number of parallel connected arrays.
- C. It is forbidden to connect two or more strings in parallel and then connect the fuses.

6 Maintenance of modules

6.1 Module visual inspection and replacement

The modules in the PV array should be regularly inspected for damage. If damage is found, the same type of modules must be replaced, such as broken glass, broken cables, damaged junction box, etc., resulting in functional and safety failure of the modules.

Well-designed solar systems require minimal maintenance, but some simple steps can be taken to improve system performance and reliability.

- A. Maintenance should be carried out at least once a year by trained personnel; at maximum operating voltage not less than 1500V DC, maintenance personnel should always wear rubber gloves and wear insulated boots during work, removing all possible shielding of the solar array and affecting the power generation performance of the module array.
- B. Check if the installed hardware is securely in place.
- C. Check that all array fuses in each of the non-grounded poles are working properly.
- D. If the module is damaged (glass breakage or scratches on the back glass), it needs to be replaced. Modules must be replaced with the same type. Do not touch the live parts of the cables and connectors when replacing modules. Use appropriate safety guards (insulation tools, insulated gloves, insulated boots, etc.) when handling modules.
- E. Cover the front surface of the assembly with an opaque material. Modules exposed to the sun can be extremely dangerous to generate high voltages.
- F. Jolywood's PV module junction box is equipped with a bypass diode to minimize module heating and current loss.

6.2 Connector and Cable Inspection

- A. Check all cables to verify that they are securely connected; It is recommended that all cables be operated in an appropriate pipeline and that the location should be kept away from the easy catchment area.
- B. Check the electrical, grounding, and mechanical connections every 6 months to ensure that they are clean, safe, free from damage, and rust-free; ensure that the mountings are properly tightened; check all cables to make sure they are tight.

6.3 Cleaning

The amount of electricity produced by a solar module is proportional to the amount of light that falls on it. A battery-blocked module produces relatively little power, so it is important to keep the modules clean.

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- A. The PV module should be cleaned under the irradiance of less than 200W/m² to avoid the difference between the water temperature and the air temperature used in the cleaning to avoid cracking; the hard water needs to be softened, the modules are cleaned, and the glass surface remains. The water is dried.
- B. It is strictly forbidden to clean PV modules under meteorological conditions where the wind is greater than 4, heavy rain or heavy snow.
- C. When the pressure water is cleaned, the water pressure on the surface of the module glass shall not exceed 700 kPa (14619.80 lb / ft²), and the module is not allowed to withstand additional external force.
- D. During the cleaning of PV modules, it is strictly forbidden to step on the modules, splashing water to the back of the modules and cables, and ensure that the connectors are clean and dry to prevent electric shock and fire hazard; steam cleaners are strictly prohibited; soft parts should be used when cleaning modules. Cloth and mild detergent and water, do not put the modules directly into the water. Take care to avoid serious thermal shocks that could damage the modules.
- E. The surface of the PV module has difficult-to-clean substances such as oil. Use a non-friction neutral liquid cleaner. Do not use an organic solvent containing alkali or acid to clean the modules. Do not use corrosive solvents or wipe the PV modules with a hard object.
- F. If you are not sure if you need to clear the array or section, first select a column of particularly dirty arrays to begin cleaning. If the improvement percentage is less than 5%, cleaning is usually not required. The above verification should be carried out only with a constant sunshine rate (sunny, strong sunshine, no cloud).
- G. Regularly trim the vegetation to prevent its shadow cast from affecting the power generation performance of the module array.

6.3.1 Water quality requirements

PH: 5 ~7;

Chloride or salt content: 0 - 3,000 mg/L

Turbidity: 0-30 NTU

Conductivity: 1500~3000 μs/cm

Total dissolved solids: ≤1000 mg/L

Water hardness: 0-40 mg/L

Must use non-alkaline water, use demineralized water when conditions are available

6.3.2 Module inspection after cleaning

- A. The overall appearance of the visual module is clean, bright and free of stains; the surface of the module is sampled for ash accumulation; there is no obvious scratch on the surface of the module; no cracking occurs on the surface of the module.

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- B. Whether the module bracket is tilted or bent after cleaning; whether the module terminals are disconnected or not.
- C. After the PV module is cleaned, complete the PV module cleaning record.

6.3.3 Troubleshooting

If it does not work after installation, please notify the installer immediately.

7 Technical issues or claims

If you have any questions about technology or claims, please contact the installer.

Please visit <http://www.jolywood.cn/> to contact Jolywood's after-sales service team.

Please submit the Customer Feedback Information Form at <http://www.jolywood.cn/>. Our technical service representatives will contact you within 5 working days. The required username and password will be sent via the Customer Service link.

Please download the specifications or data sheets for the modules at <http://www.jolywood.cn/>.