

INSTALLATION MANUAL

Jolywood PVT module

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1.0 Introduction

This manual contains relevant information about the installation methods and safe operation of photovoltaic & thermal modules (hereinafter referred to as "PVT modules") of Jolywood Solar Technology Co., Ltd (hereinafter referred to as "Jolywood"). Now includes the whole series of JW and part of the series of NIWA standard single glass products. The manual would be updated when new module introduced in the future. Failure to follow these safety guidelines may result in personal injury, death or property damage.

The installer must read and understand this guide before installation. Any question, please contact our customer service department or our local representative for more detailed information. The installer must follow all safety precautions in this guide, local requirements, regulations of laws or authorized agencies requirements. Before installing a solar photovoltaic system, the installer should be familiar with its mechanical and electrical requirements. The installer required relevant professional knowledge, and the system must be installed and maintained by qualified person with professional knowledge.

Please store this guide in a safe place for future reference (maintenance), which would also be useful when selling or disposing of the modules.

The PVT modules of Jolywood have passed the tests of IEC standards in certification agencies. Please rest assured that you can use them under the premise of complying with the requirements of this installation manual.

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

1.1 Declaration

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

1.2 Limitation of Liability

For any of the following injuries or losses, including but not limited to bodily injury and property damage caused by PVT module operation, system installation errors, and failure to follow the instructions of this manual, Jolywood is not responsible for that.

2.0 Safety Instructions

2.1 Warning

Before installing, wiring, operating or maintaining PVT modules, you should read and understand all safety rules. PVT modules will generate electricity when exposed under a light source environment. The generate electricity from array of multiple PVT modules would cause fatal electric shock or burns. Person without authorization and relevant training should not touch PVT modules and wiring terminals.

2.2 General safety

2.2.1

It is strictly forbidden to use PVT modules with broken glass. Damaged PVT modules must not be repaired. Contact with the surface of the PVT modules may cause electric shock. Do not

disassemble the PVT module or remove any part of the PVT module. Do not artificially gather sunlight on these PVT modules.

2.2.2

The operator of the system requires relevant professional knowledge, and the system must be installed and maintained by qualified person with professional knowledge. Persons without authorization and relevant training should not touch PVT modules and approach the installation area or PVT module storage area.

2.2.3

Do not connect the positive terminal of a single PVT module to the positive terminal of another PVT module. Please make sure that the polarity of each PVT module or module string is not opposite to other PVT modules or module strings. Please make sure that there are no gaps between the insulating washers of the joint. If there are gaps between the insulating washers, it may cause the risk of fire or electric shock.

2.2.4

According to the requirements of the National Electrical Code, the maximum system voltage should not exceed 1500V.

2.2.5

Do not install module when the PVT module is wet or windy.

2.3 Operation instruction

2.3.1

In order to avoid damage PVT module, please do not scratch or hit module, and do not use paint or adhesive on the front or back side of PVT module.

In order to ensure insulation performance of PVT modules from be damaged, please avoid scratching, cutting the cables and connectors or exposed under the sun for a long time. Do not drop PVT module or drop other things onto the PVT module surface. Do not place any heavy or sharp objects on the PVTmodule surface.

2.3.2

Please do not use water to extinguish fire when the power is on.

2.3.3

Only work in a dry environment, and only use dry tools. Do not work in a humid environment without wearing any protective measures. When exposed under the sun, no matter whether PVT module is connected or not, please do not directly touch junction box, connector, cable or other charged objects of PVT module without any protection.

2.3.4

It is forbidden to climb, step on, stand, walk or jump directly on the package or PVT module.

3.0 Unload, Transportation and Storage

Preventive measures and general safety rules:
PVT modules should be stored in the original box before installation. Please protect the package from be damaged. Transport or unpack PVT modules with recommended shipping method and unpacking procedure. In order to avoid damage, scratch or strike PVT module. Do not apply pressure directly on the PVT module during transportation. Improper transportation or installation also may damage PVT module, which is excluded from the warranty. Do not stand, climb, walk or jump on unpacked pallets of PVT

modules.

Always work under a dry environment, ensure that all PVT modules and electrical contacts are clean and dry before installation. If it is necessary to store the PVT modules outdoors for a certain period of time, always cover PVT module and ensure that the glass surface is facing down on a soft surface, preventing water from entering inside of the PVT module, preventing connectors from be damaged.

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

3.1 Marks on Outer Packaging



EU-28 WEEE
COMPLIANT

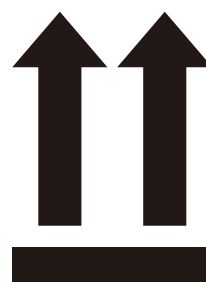
3.1.1 Prohibit discarding PVT modules randomly,
special recycling is needed



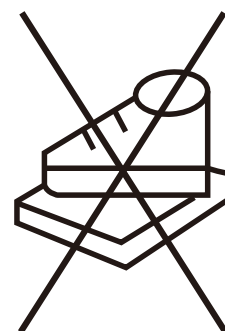
3.1.2 Protect PVT modules from rain or moisture



3.1.3 PVT modules in carton are fragile,
shall be handled with care



3.1.4 The package should be vertically up
during transportation



3.1.5 Do not step on or stand above package
or PVT module



3.1.6 Stack no more than 2 layers

3.2 Unloading Instructions

3.2.1

When unloading PVT modules from vehicle, less than 2 lots package could be lifted each time with a reasonable fixture. Before lifting, ensure that the trays and cartons undamaged, the hoisting ropes are durable. When the hoisting is near the ground, two men put carton gently on a relative flat position. Using a forklift to PVT remove modules from the truck, unloaded PVT modules should be placed on a level surface. The depth of forklift forks into the pallet shall not be less than 3/4 of the pallet length.

3.2.2

When PVT modules is temporarily stored in a project site, PVT modules should be placed in a dry and ventilated place. Do not stack modules at a project site. Cover PVT modules with a tarpaulin, the tarpaulin should be fixed by a curtain or mesh belt to protect PVT modules from moisture and rain.

3.3 Secondary Transportation and Precautions

3.3.1

If the PVT module would be transported for a too long distance or stored for a long period, it is forbidden to remove the original package. PVT modules packaged with original package could be transported by land, sea or air. During transportation, fixing the package to the transport platform to ensure it does not turn over. Taking land transportation as an example. When transported with truck, stacking up should be less than two layers, it is forbidden to cut the packaging belts of packages. There shall be no gap between pallets or between pallets and truck supports. If there is a gap, it must be filled with

fillers (inflatable bags, etc.) to prevent PVT modules from tilting and shaking during transportation.

3.3.2

It is forbidden to remove the original package when PVT modules transported at a project site. One pallet transported each time is required. During transportation, fixing package to the transport platform to ensure that the package does not tip or shift. Do not use tricycle to transport PVT modules. Do not handle PVT modules with rope during transportation, and it is forbidden to carry or drag PVT modules through the wires or junction box of the PVT modules.

3.4 Storage

Please store the PVT modules in a dry and ventilated environment and place the PVT modules on a relatively flat ground to avoid package damage or dumping due to ground deformation or collapse. Storage requirements: humidity <85%, temperature range -40 °C -50 °C.

If the PVT modules need long-distance transportation or long-term storage, do not remove the original packaging, and keep the wrapping film and packaging carton intact.

For long-term storage of PVT modules, it is recommended to store them in a standard warehouse for regular patrol inspection. In case of abnormal inclination, please reinforce them in time under the condition of ensuring personal safety.

The shelves in the warehouse shall have sufficient bearing capacity and storage space, and regular patrol inspection shall be conducted to ensure the safe storage of goods. If the PVT modules need

to be stored in the project site, it is forbidden to select the soft and collapsible ground. Instead, the hard ground or the ground with high terrain should be selected and leveled to ensure that the PVT modules will not collapse or tilt during long-term storage.

In rainy weather, please use a rain cloth to completely cover the PVT modules and pallets, and take rain and moisture-proof measures for the pallets and cartons. In case of sunshine or wind, remove the rain cloth to dry the outer packaging as soon as possible, so as to avoid collapse due to moisture deformation. It is forbidden to soak the tray in the rain to cause mildew and decay. The ground drainage measures should be taken first to prevent the ground from being soft and sinking due to a large amount of water on the ground after the rain. Unauthorized access to the PVT module storage area is prohibited.

4.0 Unpacking instruction

4.1 Unpacking safety instruction

4.1.1

When PVT modules unpacked outdoors, it is forbidden to work under rain, as carton would become soft and be broken. PVT modules inside of it would come out, damage or bruises may be caused to module. During windy days, special attention should be paid for safety, it is recommended not to transport PVT modules, and the unpacked PVT modules should be properly fixed.

4.1.2

The ground needs to be flat enough to ensure package could be placed horizontally and stably. Supportive tool should be used when

disassembling the carton to prevent the PVT modules from falling down.

4.1.3

Wear protective gloves during unpacking to avoid injury and fingerprints on the glass surface.

4.1.4

PVT module information could be queried from outer package, please read it carefully before unpacking.

4.1.5

Each PVT module should be lifted by two people. Do not lift module by grasping the module junction box or lead wires. Use both hands to carry PVT module, do not stack PVT modules during lifting.

4.1.6

The unpacked PVT modules must all be installed, should not be stored at the project site. It is forbidden to stack in the project site for a long time, and the number of temporarily stacked PVT modules shall not exceed 16.

4.2 Unpacking steps

4.2.1

Before unpacking, please check the product name and serial number on an A4 paper on the surface of the package, unpacking method should not be randomly changed.

4.2.2

When unpacking, cut all vertical packing belts with a blade or scissors, first cut the long side packing belt, secondly cut the short side packing belt. Remove the upper cover of the carton and take out two or three upper lifting brackets.

4.2.3

When removing PVT modules from package, two people must stand on each side of the box while lifting the module, one hand grasping the corner of the module, the other hand grasping the short side of the PVT module. When unpacking on a horizontal floor, remove PVT modules from one side to the other side of package, and then carry them. If unpacking on a non-horizontal floor, use a supportive tool to ensure package placed vertically.

4.2.4

PVT modules removed out of package are prohibited from leaning against a without reliable support or an unfixed object.

5.0 Installation

Single glass PVT modules produced by Jolywood could work for more than 30 years under proper conditions. PVT modules with an expired life should be reasonably disposed in accordance with local laws and regulations.

5.1 Installation Safety

5.1.1

The PVT modules produced by Jolywood could installed landscape or portrait, the installation must be matched with the PVT module.

5.1.2

Do not remove PVT module package before installation.

5.1.3

When installing PVT 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 PVT modules

under any rainy, snowy or windy conditions. Keep the connectors dry and clean when installing PVT modules to avoid the risk of electric shock. If the terminal of the PVT module is wet, no work could be done, otherwise electric shock may be caused. PVT modules should be installed immediately after unpacked.

5.1.4

Do not wear metal rings, wristwatches, earrings, nose rings, lip rings, or other metal materials when installing or repairing PV systems.

5.1.5

Use opaque materials to cover the PVT module completely during installation. Do not open the electrical connection or pull out the connector while the circuit is under load. Do not touch the PVT modules during installation unless necessary. Glass surfaces and brackets may have high temperature, which might lead to the risk of hazards of burns and electric shock.

5.1.6

During the installation of the PVT modules, when fastening the modules to the bracket with bolts, do not damage the back panel core and thermal insulation wool of the PVT modules. If PVT modules need to be replaced, do not damage the surrounding modules or mounting structure.

5.1.7

To prevent waste caused by excessive heat collection, when installing PVT modules, the number of connected PVT modules shall not exceed 5 for each water tank with a standard capacity of 200L.

5.1.8

When installing modules, do not work alone, and keep working with a team of two or more men.

5.1.9

After modules are installed, the cables should be fixed or tied to avoid exposed under direct sunlight after installation, which would prevent cable from aging. Low-hanging cables can cause various problems, such as electric leakage and fire.

5.1.10

The application level of module produced by Jolywood is Class A. modules with different color should be avoided from installed in the same array or roof.

5.2 Installation method

5.2.1 Mechanical installation and precautions

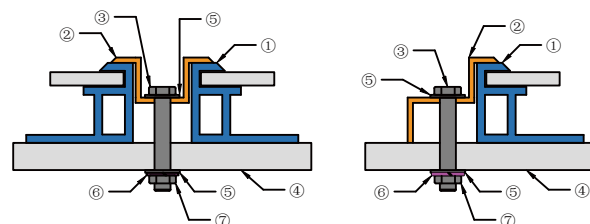
Modules could be mounted with clamps or bolts. PVT modules Installation must be carried out according to the following examples and recommendations. If the installation method is different from below methods, please consult Jolywood local technical support or after-sales, to obtain the consent of Jolywood, otherwise when the PVT modules is damaged, the limit warranty would be invalid.

The static load of the PVT module depends on the way of module installed. The mechanical load should be calculated by the professional system designer based on actual conditions and environmental. Moreover, it does not withstand the excessive force generated by the thermal expansion of the support structure. The drain hole should not be blocked under any conditions during installation or use.

The drain hole should not be blocked under any conditions during installation or use.

5.2.2 Installation of PVT modules (installation with clamps)

Middle and side clamp:



①Frame ②Clamp ③Bolt

④Mounting rail/Purline

⑤Flat Washer ⑥Spring Washer ⑦Nut

a) It is recommended to use a clamp that can hold at least the M8 bolt, the clamp shall not be malfunctioned due to deformation or corrosion during the loading process;

b) It is recommended to use a clamp with length of $\geq 60\text{mm}$ and thickness of $\geq 4\text{ mm}$, aluminum alloy 6063-T5, $R_{p0.2} \geq 225\text{ MPa}$, $R_m \geq 265\text{ MPa}$. (The clamp shall be selected to guaranty the PVT module installation reliability, recommended torque range is for reference only);

c) The clamp must overlap the A surface of PVT module frame by at least 8 mm, but not more than the width of the A surface. The clamp shall not come into contact with the front glass of the PVT module and shall not deform the PVT module frame. Please also make sure to avoid shading effects from the PVT module clamps;

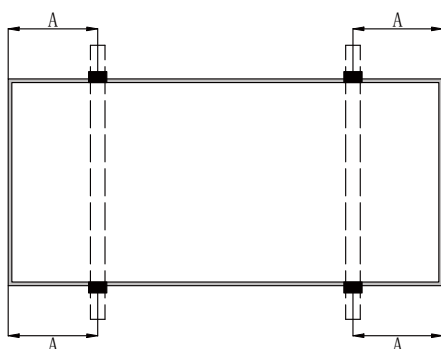
d) For the installation of mounting rails/purline parallel to the frame, the frame must overlap the rails completely or the overlapping distance must over 20mm;

e) The tensile strength of all bolts and nuts should not be less than 700MPa, the torque applied by

all bolts and nuts is recommended to be 16~20 N·m, for detailed torque values, please consult your installer or bracket supplier.

f) When choosing the clamp installation method, please ensure that there are at least four clamps on each PVT module, and the clamps need to be installed symmetrically. The different mounting positions of the clamps affect the maximum load capacity of the PVT module.

Clamp installation method and corresponding static load:



Four-point long side installation

Mounting rail/purline perpendicular to the long side

Installation	Four-point long side installation
Module version	Mounting rail/purline perpendicular to the long side
HT144N-R0	A=440±30 +5400/-2000

Remarks::

The unit of load is Pa, and the unit of A from the position of the pressing block is mm.

5.2.3 Grounding

5.2.3.1

All PVT module frames and brackets must be properly grounded in accordance with the

appropriate National Electrical Code. The grounding conductor or grounding wire could be made with copper, copper alloy or other material, which should also be in accordance with the requirements of corresponding National Electrical Code. The grounding conductor must be connected to the ground through a suitable grounding methods.

5.2.3.2

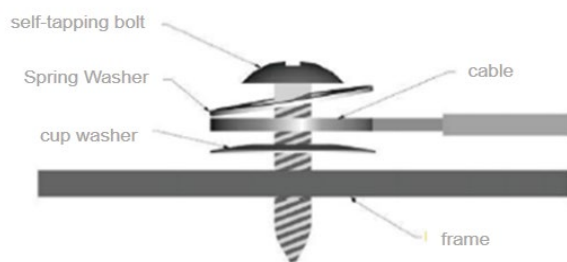
A grounding bolt can be used on each side of the frame of the PVT module for grounding.

5.2.3.3

Please ensure that the grounding bolt penetrates the anodized surface of the PVT module frame. Or remove the anodized layer prior to making the grounding connection. The frame is in an insulated state after the anodizing process, so this step is necessary for proper ground contact. Anti-oxidation compounds should be applied to the bare aluminum surface for protection. If the material of the supporting structure differs from that of the frame (aluminum), an insulating layer shall be used to prevent galvanic corrosion.

5.2.3.4

If the supporting structure is non-conductive, a dedicated grounding cable must be connected to the frame of each PVT module via an appropriate fastening system. The fastening system must be connected to a cable with a minimum diameter of 2.5mm². Please ensure that each PVT module is properly grounded in accordance with the requirements of the local government. The recommended grounding bolt assembly is shown in the following diagram.



Self-tapping bolt	M4-M4.5
Spring washer	M4-M4.5
Cup washer	M4-M4.5
Star washer	M4-M4.5
Cable	6-12AWG

Remark: When using self-tapping bolts for grounding, the cup washer is only used for buffering and can be replaced by any M4-M4.5 washer.

Recommended Grounding Connections

Incorrect grounding of PVT modules will reduce system performance and invalidate the limited warranty of the PVT modules. For optimal performance, PVT modules can only be used in combination with power-insulated inverters, where the negative pole of the PVT module array protected by a fuse is grounded.

5.2.4 Electrical Installation

All wiring should be performed by a qualified and trained person in accordance with local regulations and procedures. PVT modules could be connected in series to increase the operating voltage by inserting the positive plug of one module into the negative plug of another module. Always ensure that the contact points are corrosion-resistant, clean, and dry before wiring modules. If the polarities of PVT modules connected wrong, may lead to irreparable damage. Before PVT modules connected in

parallel, please check the voltage and polarity of each PVT module array. If the polarity of products is opposite or voltage difference greater than 10V founded after measurement, please check the configuration of PVT module array before its access to power grids.

All cables and connectors used to connect the DC system must have similar (or higher) level. It is suggested that all cables should run in proper cable ducts and should be located away from the water-prone area.

Each PVT module has two standard output cables with a plug-and-play connector on each terminal. Jolywood PVT modules are equipped with a DC copper cable with a cross-sectional area of 4mm², system voltage 1500V DC, insulation layer maximum work temperature up to 90°C, also UV-resistant. All cables used to connect the DC system must have similar or high level. It is required that all wiring and electrical connections should be comply with the appropriate National Electrical Code.

Under certain conditions, a PVT module may produce more current or voltage than its Standard Test Conditions rated power. As a result, the PVT module short-circuit current under STC should be multiplied by 1.25, and a correction factor should be applied to the open-circuit voltage (see the following table), when determining component ratings and capacities. Depending on your local regulations, an additional 1.25 multiplier for the short-circuit current (giving a total multiplier of 1.56) may be applicable when sizing conductors and fuses.

Lowest Expected Ambient Temperature (°C/°F)	Correction Factor
24 to 20 / 76 to 68	1.02
19 to 15 / 67 to 59	1.04
14 to 10 / 58 to 50	1.06
9 to 5 / 49 to 41	1.08
4 to 0 / 40 to 32	1.1
-1 to -5 / 31 to 23	1.12
-6 to -10 / 22 to 14	1.14
-11 to -15 / 13 to 5	1.16
-16 to -20 / 4 to -4	1.18
-21 to -25 / -5 to -13	1.2
-26 to -30 / -14 to -22	1.21
-31 to -35 / -23 to -31	1.23
-36 to -40 / -32 to -40	1.25

Alternatively, a more accurate correction factor for the open-circuit voltage can be calculated using the following formula: $CVoc = 1 - \alpha Voc \times (25 - T)$
 T (°C) is the lowest expected ambient temperature at the system installation site.

αVoc (%/°C) is the voltage temperature coefficient of the selected module (refer to corresponding datasheet)

Please confirm the final fuse selection with the qualified design institutes and fuse manufacturer. The maximum series fuse rating value on the products' datasheet provided by Jolywood should be used for reference only.

5.2.5 Wiring

In order to ensure PV system could operation smoothly, when connecting PVT modules or connecting loads (such as inverters batteries, etc.), ensure that the polarity of the cables is properly connected (Figure 1 and Figure 2). If modules are not connected properly, the bypass diode may be damaged. Modules could be

connected in series to increase voltage. Connecting 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 modules. Modules could be connected in parallel to increase current (shown in Figure 2). Connecting modules in series in Parallel by inserting the positive terminal of one module into the negative terminal of the next module. The number of modules connected in series or in parallel needs to be reasonably designed according to the system configuration. All instructions above must be followed to meet the Jolywood Warranty valid conditions.

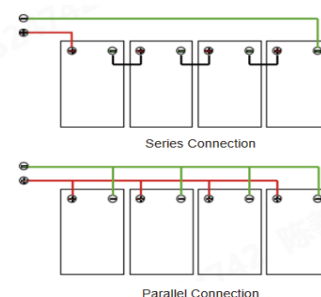


figure 1

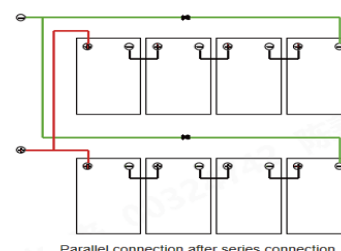


figure 2

5.2.6 PVT module pipeline connection

Adjacent PVT modules are connected via corrugated pipe connectors. It should be observed and ensured that the corrugated pipes are connected correctly (as shown in Figure 3)

by joining their adjacent male threaded ports. The male threaded port at the top edge of the first PVT module and the male threaded port at the bottom edge of the last PVT module should be connected with pipe plugs to prevent the antifreeze from leaking out. The male threaded port at the bottom edge of the first PVT module and the male threaded port at the top edge of the last PVT module are directly connected to the water tank. During the connection process, it is necessary to ensure that each connection port is in a completely closed state to prevent liquid leakage.

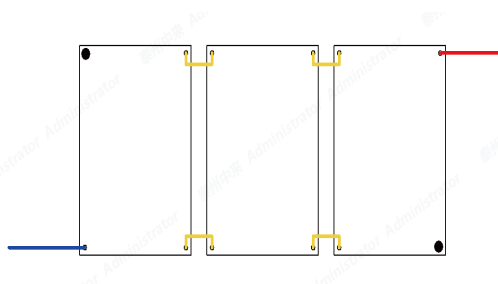
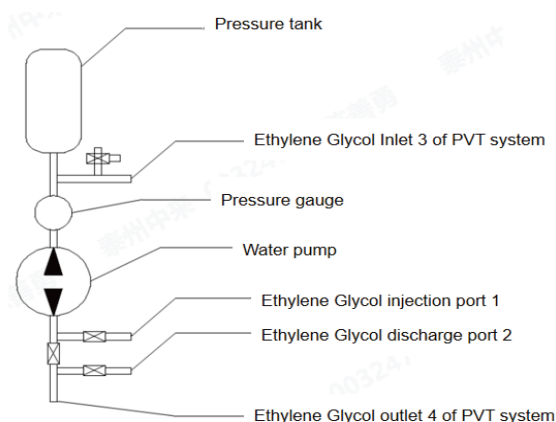


figure 3

5.2.7 Ethylene glycol circulation system



Composition of the PVT system: It mainly consists of photovoltaic modules, heat exchange water tanks, water pumps, medium fluid, water, etc. When the PVT modules generate electricity under solar radiation, they will produce additional heat. The PVT system uses the water pump to circulate the medium fluid from the modules back to the water tank, taking away the heat generated by the modules. In the water tank, the water in the tank is heated through heat exchange tubes, thus realizing the energy conversion process of photoelectricity + photothermal.

Steps for fluid replacement in the PVT system:

1. After ensuring that the installation of PVT modules is completed, install the PVT system as shown in the above diagram.

2. To reduce the impact on the heat collection of the PVT system, wrap insulation cotton around the exposed corrugated pipes.

3. After installation, start the water pump, open the valves of ethylene glycol injection port 1 and discharge port 2, and close the valve of ethylene glycol outlet 4 of the PVT system.

4. Inject the solution through ethylene glycol injection port 1. When ethylene glycol solution is discharged from discharge port 2, it indicates that the circulation of ethylene glycol solution in the PVT system has been completed. Then close the valve of discharge port 2.

5. Open the valve of ethylene glycol outlet 4 of the PVT system, continue injecting the solution for about 20 minutes, and then close the valve of ethylene glycol injection port 1.

6.0 Maintenance for PVT Modules

6.1 PVT Module Visual Inspection and Replacement

PVT modules in array should be regularly inspected to check damage modules. If damage PVT module is founded, it must be replaced with same type one. Such as broken glass, broken cables, damaged junction box, etc., which would lead to functional and safety failure of PVT modules.

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

6.1.1

Maintenance should be carried out at least once a year by trained person. As system voltage is so high, that maintenance person should always wear rubber gloves and insulated boots. Removing all possible shading of the solar array, which would affect power generation of the module array.

6.1.2

Check if the installed hardware is securely in place.

6.1.3

Check if all array fuses in each of the non-grounded poles are working properly.

6.1.4

If PVT module is damaged (glass breakage), it is need to be replaced. PVT module must be replaced with same type one. Do not touch the

live parts of the cables or connectors when replacing PVT modules. Use appropriate safety guards (insulation tools, insulated gloves, insulated boots, etc.) when handling modules.

6.1.5

Cover the front surface of PVT Modules with an opaque material. PVT modules exposed under the sun could be extremely dangerous, as high voltages could be generated.

6.1.6

Module junction boxes is equipped with bypass diodes to minimize module heating and current loss.

6.2 Connector and Cable Inspection

6.2.1

Check if all cables are securely connected. It is suggested that all cables should run in proper cable ducts and should be located away from the water-prone area.

6.2.2

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 properly tightened; check all cables to make sure they are tight.

6.2.3

It is forbidden to use WD-40 or various organic solvents to wipe all parts of the junction boxes, wires, and connectors.

6.2.4

The dust proof plug should not be removed in advance, it can only be removed during installation.

6.3 Cleaning

The amount of electricity produced by a solar module is proportional to the amount of light reach on surface of it. A dust covered PVT module produces relatively lower power, so it is important to keep PVT module clean.

a) The PVT module should be cleaned under the irradiance of less than 200W/m^2 . Avoiding cleaning water with great different temperature from air to avoid cracking. Hard water needs to be softened. The water remains should be removed from glass surface after cleaning.

b) It is strictly forbidden to clean PVT modules under special weather: wind level greater four, heavy rain or heavy snow.

c) During cleaning, the water pressure on the surface of module glass shall not exceed 4MPa , and the module is not allowed to withstand additional external force.

d) During cleaning, it is strictly forbidden to step on the modules, splashing water to the back of the PVT modules or cables. Ensure that connectors are clean and dry to prevent electric shock and fire hazard. Steam clean machines are strictly prohibited; soft parts, Cloth and mild detergent and water should be used. Do not put PVT modules directly into the water. Serious thermal shocks also could damage PVT modules.

e) The difficult-to-clean substances such as oil on the surface of PVT modules, use a non-friction

neutral liquid cleaner. Do not use any organic solvent containing alkali or acid. Do not use corrosive solvents or wipe the PVT modules with a hard object.

f) If you are not sure whether the array need to cleaned, first select a column of particularly dirty array to begin cleaning. If the power generated increased less than 5%, cleaning is usually not required. The above verification should be carried out only under a stable sunshine rate (sunny, strong sunshine, no cloud).

g) The back of the PVT module usually does not need to be cleaned; If you need to clean the back of the PVT module, ensure that the cleaning liquid does not penetrate into the bottom layer of the material.

h) Regularly trim the vegetation to prevent shading created on the PVT module surface, which would decrease power generation.

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 $\mu\text{S/cm}$;

Total dissolved solids: $\leq 1000\text{ mg/L}$;

Water hardness: 0-40 mg/L;

Non-alkaline water must be used, use demineralized water when conditions are available.

Note: when using robot clear modules, Jolywood recommends using soft plastic brush. Module damage, poor appearance and power degradation caused by improper robot clear are not within the warranty scope of Jolywood;

6.3.2 PVT module inspection after cleaning

6.3.2.1

The overall appearance of PVT modules is clean, bright and free of stains. The surface of PVT module should no ash accumulation; there is no obvious scratch on the surface of PVT module. No cracking occurs on the surface of PVT module.

6.3.2.2

The PVT module brackets are not tilted or bent after cleaning, the PVT module terminals are not disconnected.

6.3.2.3

After modules cleaned, complete the PVT module cleaning record.

6.3.3 Troubleshooting

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

7.0 Technical Issues or Claims

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

b) Please send mail to service@jolywood.cn to contact Jolywood after-sales service team.

Our technical service representatives will contact you within 5 working days.

c) Please download the specifications or data sheets for modules from <http://www.jolywood.com/>.