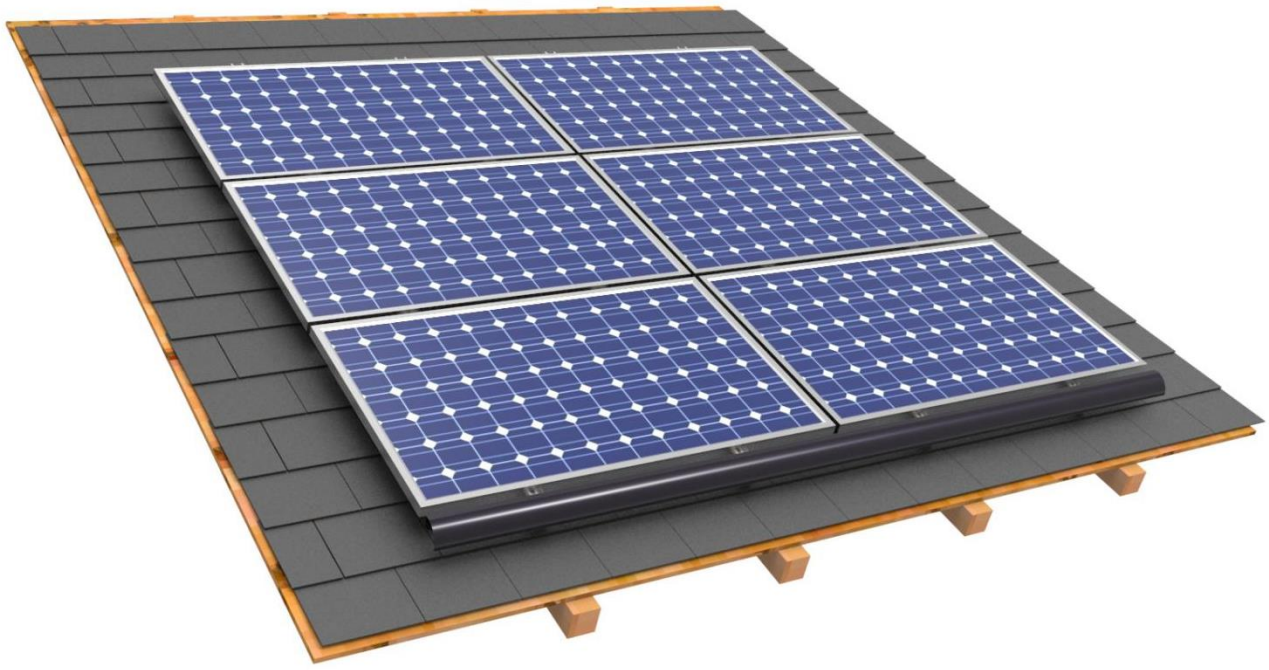
ACES

ATLANTIC CLEAN ENERGY SUPPLY LLC

# Installation Manual

## Clamp-less & Rail-less Roof Racking

## ——AR10



**Contents:**

# 1. Introduction

## 1.1 Short description

AR10 is the 2nd generation of racking system for asphalt shingle roof. It allows the modules to be mounted in landscape or portrait. This system is compact and fully bonded.

## 1.2 About this manual

This manual describes the installation of AR10 and provide necessary information regarding components, technical data and important safety warnings. Section 1, 2 and 3 provide an overview of AR10. Section 4, 5, 6 ,7and 8 tells the installation steps and dis-assembly steps. The last section provides approved modules. This racking system is suitable for any thickness of modules.

It is important to read this installation manual carefully before installation, maintenance or dis-assembly work. This manual provides the necessary information and warnings which help you finish the work safely and efficiently. If you have any questions, please contact us.

## 1.3 Installation personnel

AR10 is intended for use of qualified personnel. Qualified personnel are those who have skills, knowledge and training in the installation of PV mounting systems necessary to follow this manual in order to safely use the required tools and to carry out the required procedures.

## 1.4 Intended use

AR10 is intended for use only as a racking system for PV panels. Any other usage or usage outside the intend or scope of these manual is considered not as intended and may cause of forfeiture of the system warranty.

## 2. Technical description

### 2.1 System overview

The following is an overview of AR10's components as shown in Image 2.1.1. The main components of this racking system including Flashing plate, module holder, lag screw and optional shirt.

Note that the actual configuration of this system can be vary depending on following conditions:

* Type of roof (Substructure).

* Module layout and numbers.

* Local conditions

*Image 2.1.1*

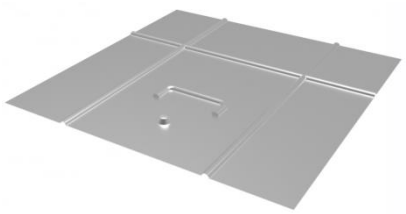
**1** Optional skirt

**2** Flashing plate

**3** Module holder

**4** Lag screw

## 2.2 Components



*Flashing plate*

*Material: aluminum*

*Module holder*

*Material: SS 304*

*Skirt*

*Material: aluminum*

*Lag screw*

*Material: SS 304, EPDM*

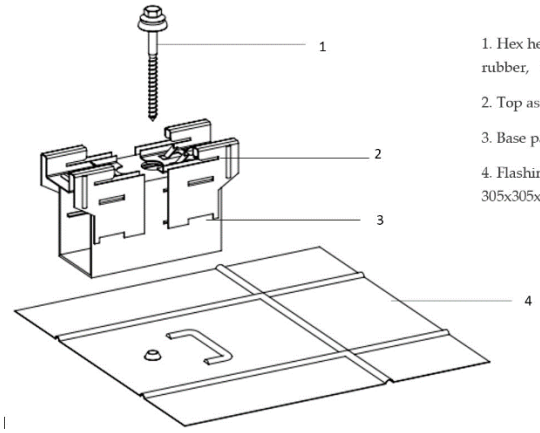
*Grounding cable*

*Material: SS304*

*Ground clip*

*Material: Aluminum 5052*

Assembly parts:




1. Hex head screw with EPDM rubber, ϕ7.93x101mm x1
2. Top assembly part x1
3. Base part x1
4. Flashing plate, 305x305x0.5mm x1

1 Hex head screw with EPDM rubber, ϕ7.93x100mm x1

2/3. Module holder

4. Flashing plate, 305x305x0.5mm x1

## 2.3 Technical data

| | |
|---|---|
| Application | Pitched asphalt shingle roof |
| Material | SS 304, aluminum 5052 |
| Module type | Framed |
| Module orientation | Landscape, portrait |
| Standards | ASCE 7-05<br>ASCE 7-10<br>UL 2703 under processing<br>ANSI/ AISC 360-05<br>IBC 2009<br>IBC 2012 |
| Wind load | 134mph |
| Snow load | 1.2KN/m2 |
| Warranty | 15 years |

## 3. Important installation information

### 3.1 Standards

AR10 has been designed in accordance to the following codes and standards:

* ASCE 7-05
* ASCE 7-10
* UL 2703 under processing
* ANSI/ AISC 360-05
* IBC 2009
* IBC 2012

### 3.2 Required tools

No tools are required during installation modules. But please safely use the correct tools as per installation steps.

Tools for installation:

| | |
|---|---|
| * Scriber |  |
| * Scraper knife |  |
| * Electric drill<br>(with 5mm’s screw and<br>13mm sleeve) |  |
| * Allen wrench(4mm) |  |
| * Tape measure |  |

## 4.Planning the module area

For installation, locate rafters that will receive a mount. The lag screw should be screwed into the rafters of the roof. The spans between lag screws will be based on module orientation, space of rafters and site conditions.

Instructions to plan the module area:

### 4.1 Clarify the meaning of each letter:

**N** The vertical distance between module holders

**S** The horizontal distance between module holders

**M** Module long frame length

**Y** Module frame profile width

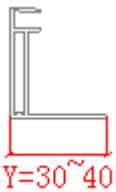
**Z** Module frame profile inside width.

### 4.2 Calculate the distance between lag screws by following formulas:

The distance between module holders is based on module dimension. When the module is in horizontal, the vertical distance "N" is based on module width and module frame profile dimension. While the horizontal distance" S" is based on module length and rafters' span. Details as shown below.

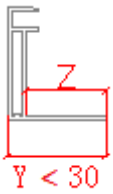
* Calculation of N(There are 2 situations):

Y=30~40mm




N=Module width+(102-2Y)

Y＜30mm




N=Module width+(60-2Y+2Z)

In this case, Y is 35mm, so,

N=990+(100-2*35)=1020mm

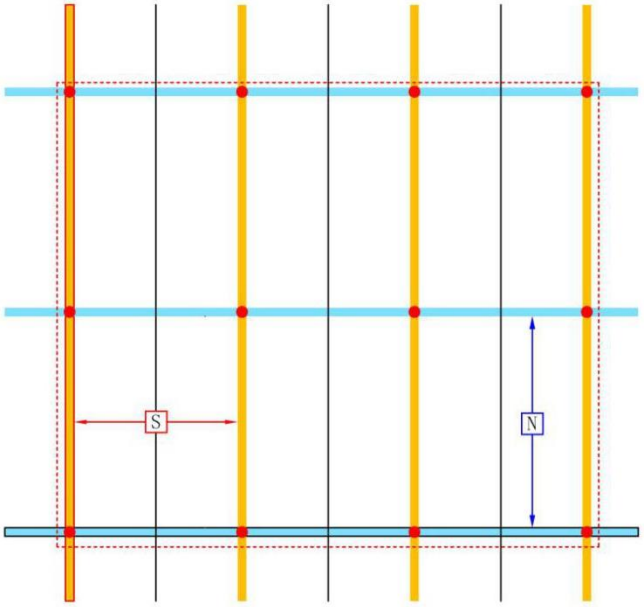



*Image 4.1*

1. Determine appropriate array location on roof.

2. Select starting course of shingles (or tiles).

3. Mark next row of attachments and repeat for remaining rows.

N 4. Equals distance between front and back penetrating holes for lag screws.

5. Locate 1st rafter closest to array edge (and inside array footprint) and mark.

6. Find next rafter for attachment based on appropriate span.

- Continue to end of array

- Mark last rafter before end or array

S 7. Span.

 8. Mark attachment points on rafters along each NS module grid line.

## 5.Installation steps

### 5.1 Snap the line

Choose the appropriate position as the starting point, Using the scriber to locate the intersections between the vertical and horizontal chalk lines that represent the locations of the module holders.

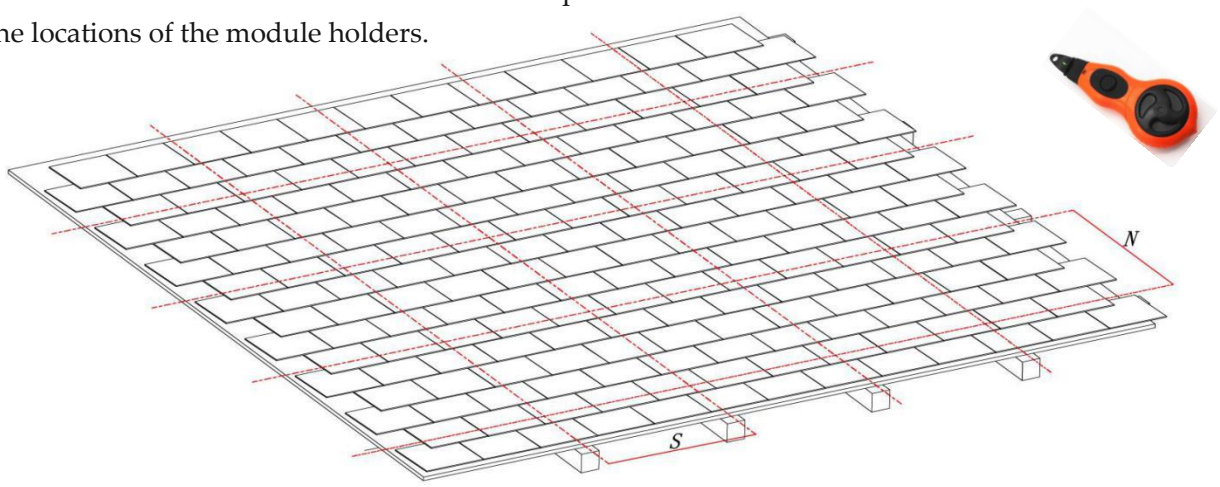



*Image 5.1*

### 5.2 Predrill the points for lag screw with auto electric drill.

Drill a 80mm deep pilot hole with a 5mm drill bit on the intersections. Make sure the drill is perpendicular to the rafter.

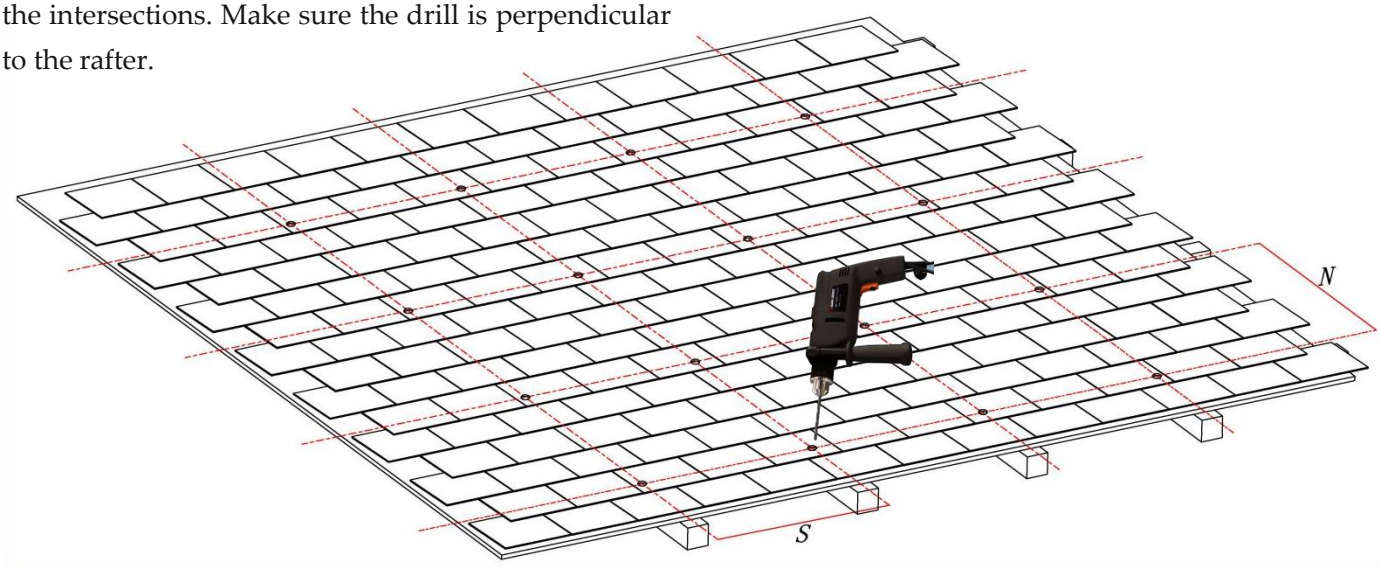


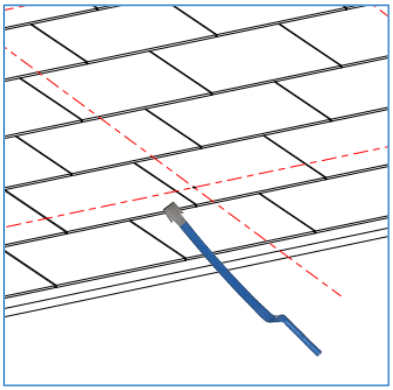

*Image 5.2*

## 5.3 Install flashing plate

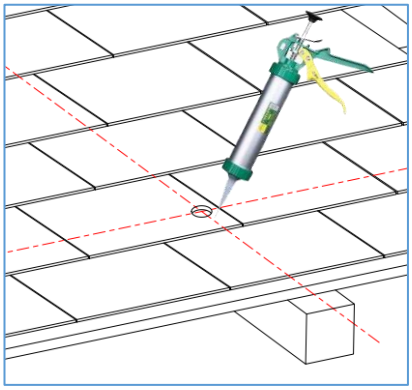
1. Shovel the asphalt tile above the points for lags by scraper knife.

2. Fill the pilot hole with a compatible roof sealant.

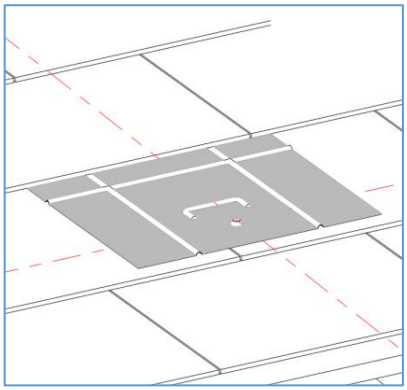
3. Check and ensure the raised portion of the flashing is facing up. Position the flashing so the hole in the flashing aligns with the pilot hole.



1. Separate the shingle tiles



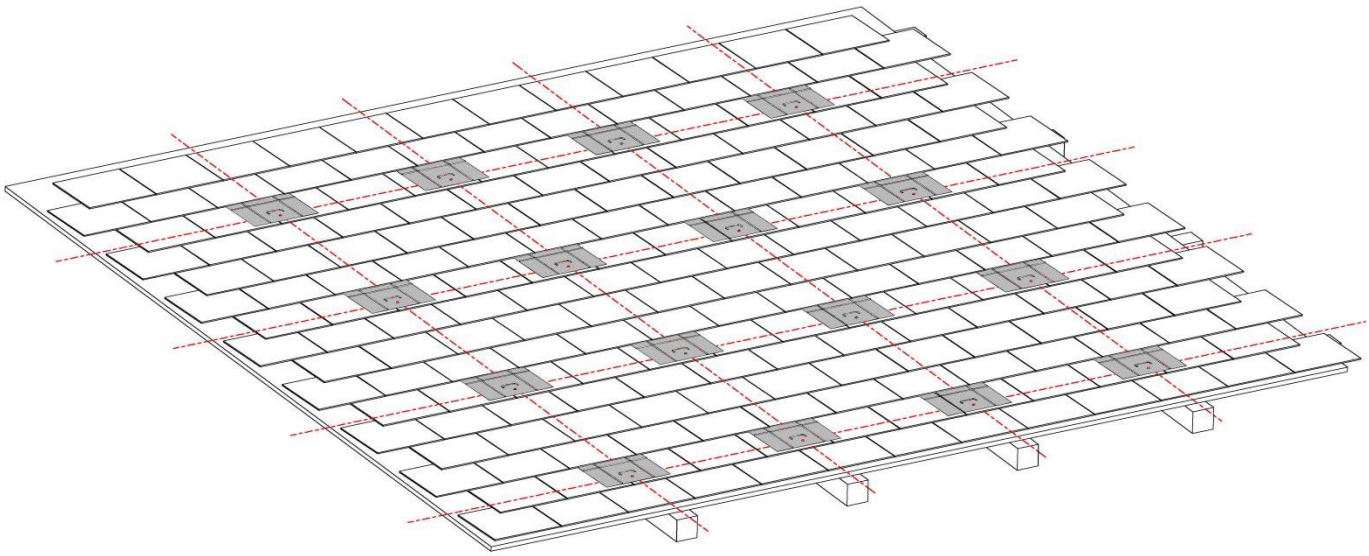
2. Fill pilot hole with appropriate sealant



Place the flashing

*Image5.3*

5.Repeat these steps to install the required flashing.



## 5.4 Install Module holder

Please following the instructions below.

1. Place the module holders assembly on the flashing plate. The movable end must in the above and the fixed end below when installation. Make sure the hole in the module holder aligns with the hole on the flashing.

2. Insert the lag screw with pre-assembled EPDM washer through the above hole of module holder . Using the auto wrench to tighten this lag screw.

3. Repeat these steps to install the other required module holders.

4.Use the string line to check if the distance between module holders equal to the distance of the “N”.

**Note:** Be careful on the rack, it may slide during screwing. And keep the tolerance between racks within 6mm. If the tolerance of one distance is more than 6mm, this two modules holders must be dis-assembled and re-installed.

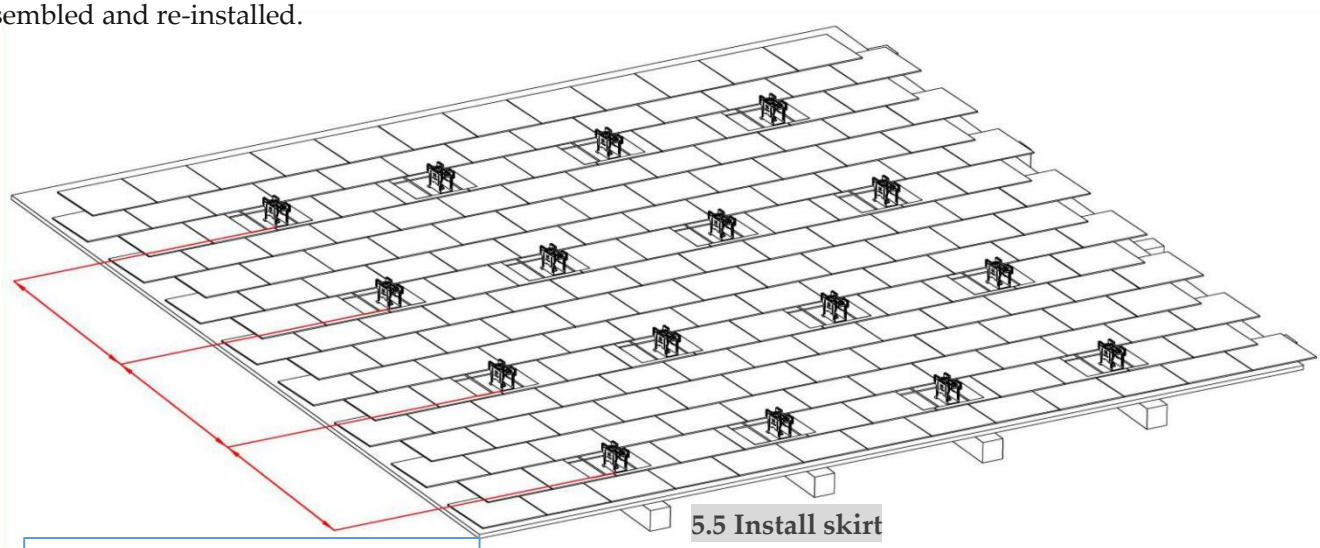
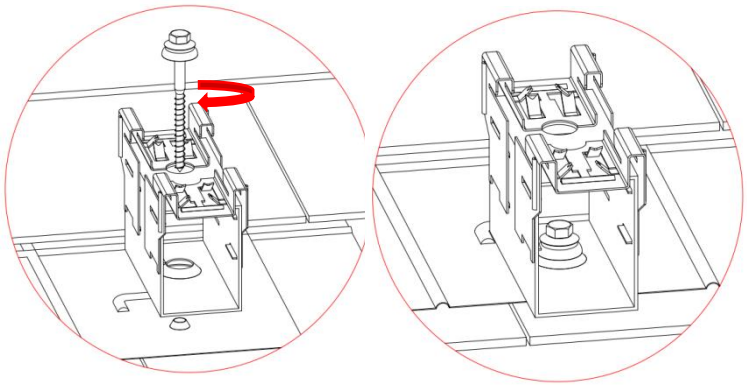


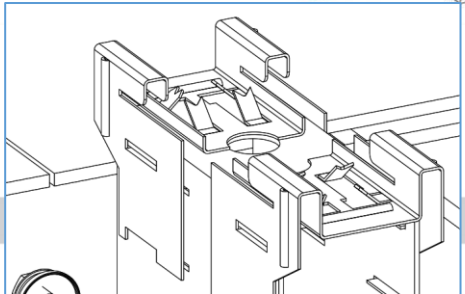
*Image5.4.1*



Drill and tighten the screw

*Image 5.4.2*

## 5.5 Install skirt



Movable end

Fixed end

This step can be omitted if customer does not choose to have it on the racking system. The followings are the instructions about how to install the skirt.

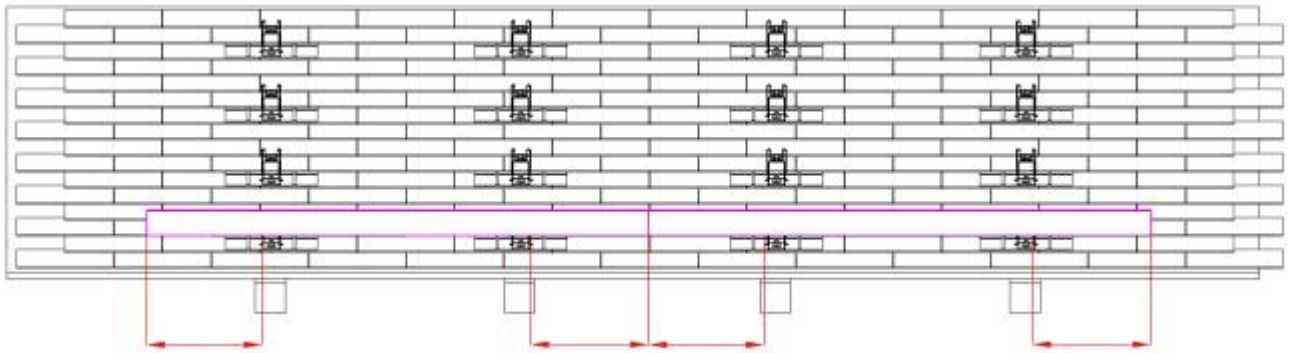
1.The assembly location of the skirt is on the bottom row of the module holders .

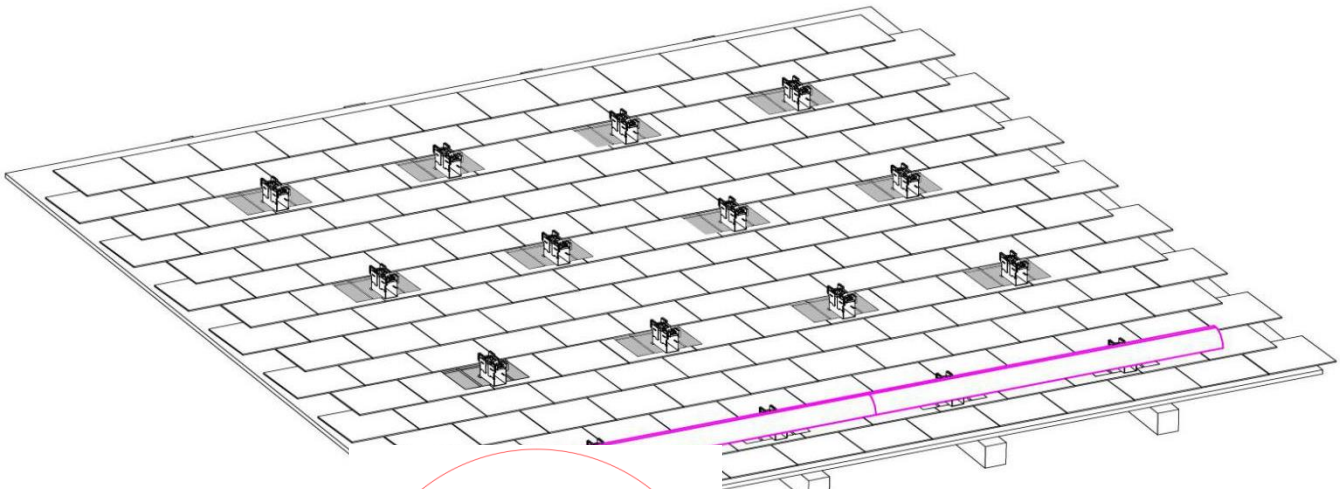
2.Adjust the position of skirt to keep the length from sides to mount base is same.

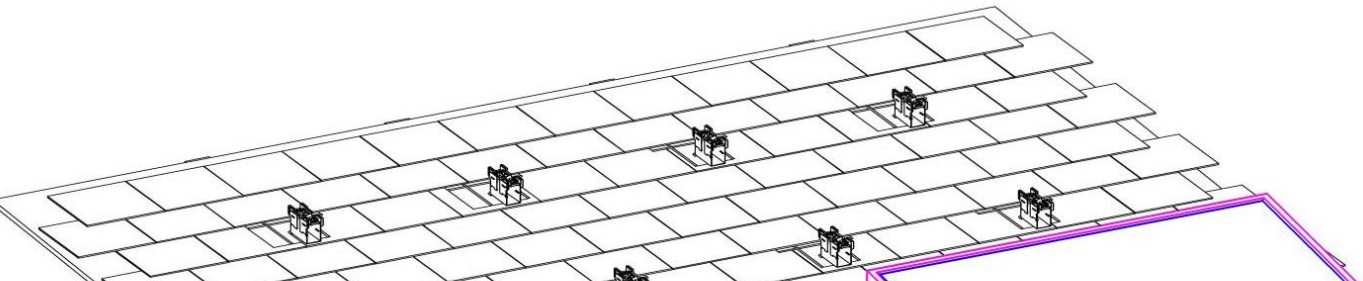
3.Then slot the bottom horizontal frame of the skirt into module holder

4.Continue installing the remaining skirts to make sure the modules will be complete protected.

Clip the skirt frame into the slot of the module







1. Before install the modules, please make sure the movable end and the fixed end are separate.

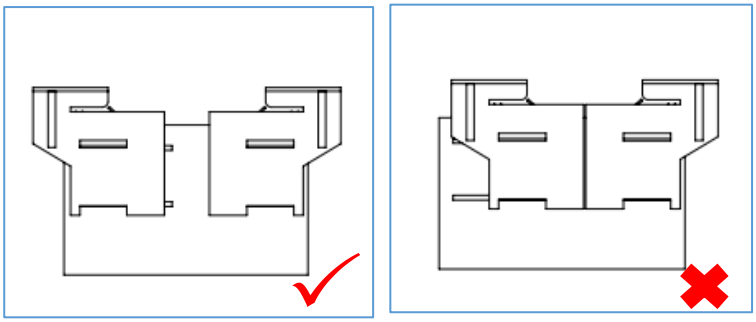


*Image5.6.1*

2. Put the module on the module holder, keep the module downward side on the groove of the module .And at the same time, the module upward side will be on the embossment of module holder as picture shows.

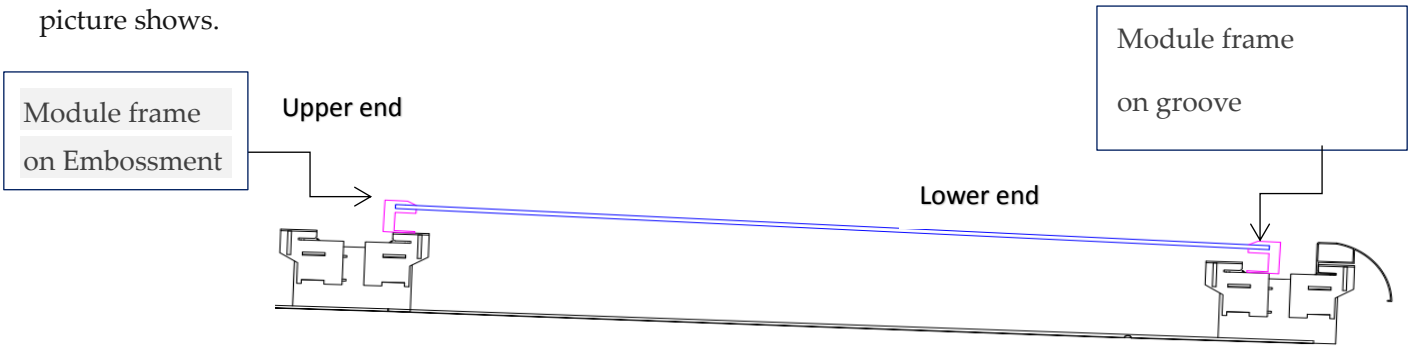
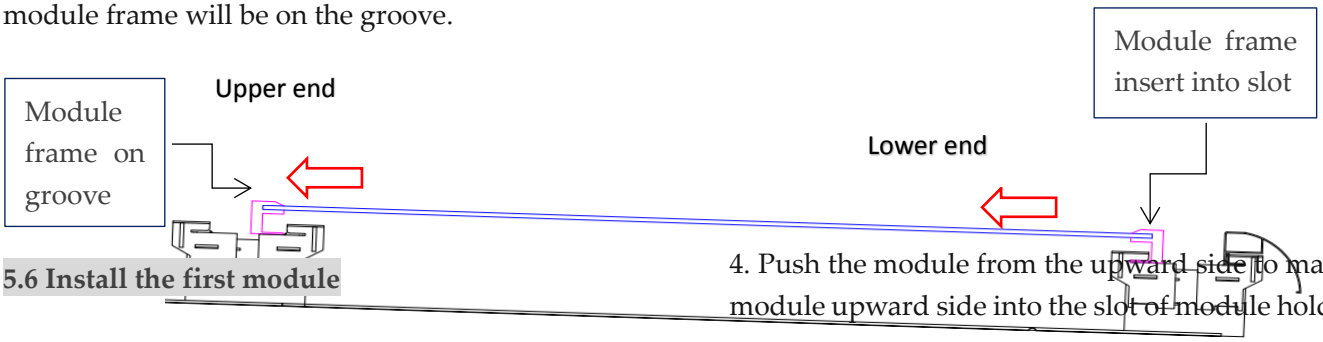



*Image5.6.2*

3. The installer must stand on the upper end Then p the upward side of module along with the upward direction of roof ,So the downward module frame will be into the slot of module holder while the upward module frame will be on the groove.




**5.6 Install the first module**

4. Push the module from the upward side to make the module upward side into the slot of module holder.As

*Image5.6.3*

the movable end will slide to close the fixed end, the downward module side will not slide out the slot of the module holder

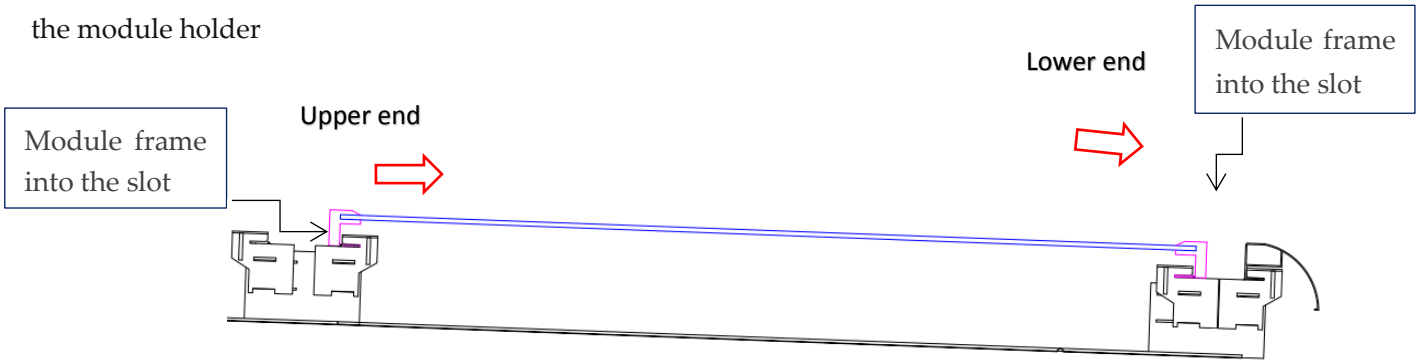
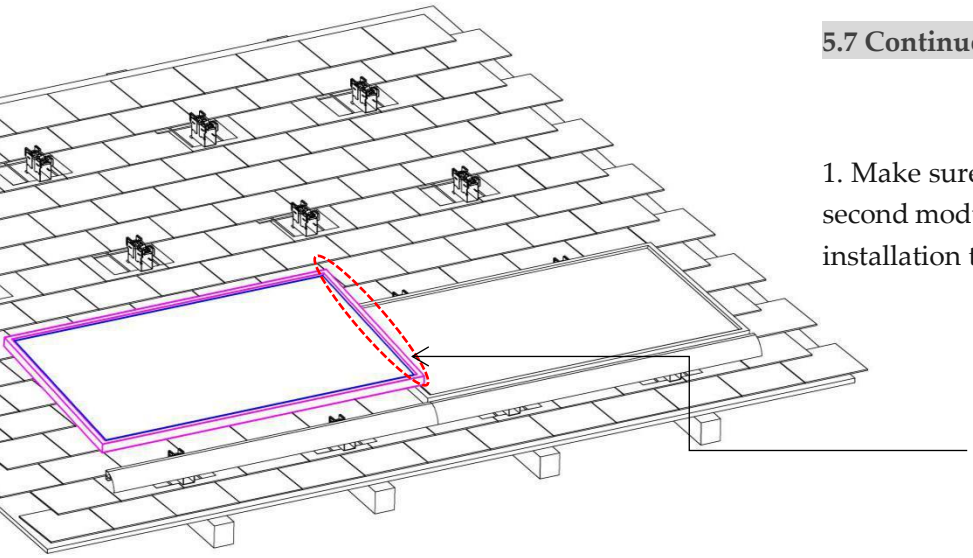



*Image5.6.4*



## 5.7 Continue to install the other modules

1. Make sure the gap between the fist module and the second module is 15mm. Then use the same method to installation the rest of modules.

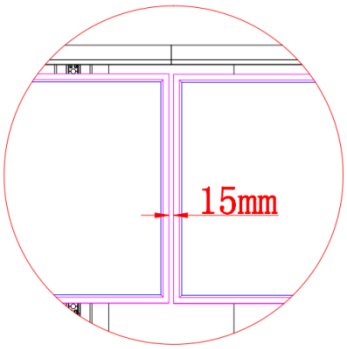
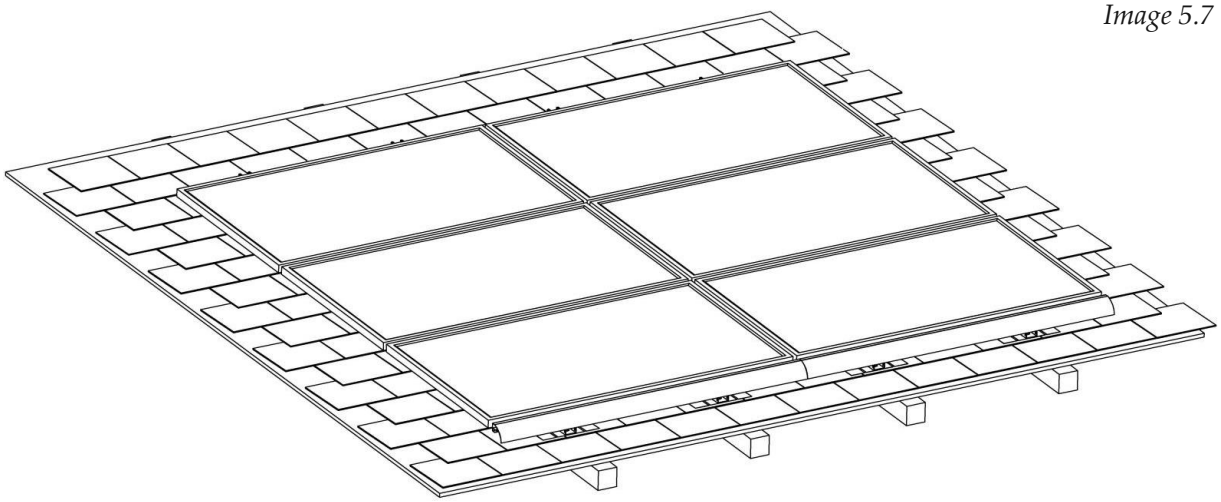



*Image 5.7*



## 5.8 Install grounding clip and copper wire.

The grounding for this system is very easy. Because each module of a column are conductive by impaling(from the spine of module holder) on the coating of module frame. So what the install need to do are only two steps, to install the grounding cable and install the grounding clip. The detailed installation position of the grounding cable and the grounding clip, please see the image below:

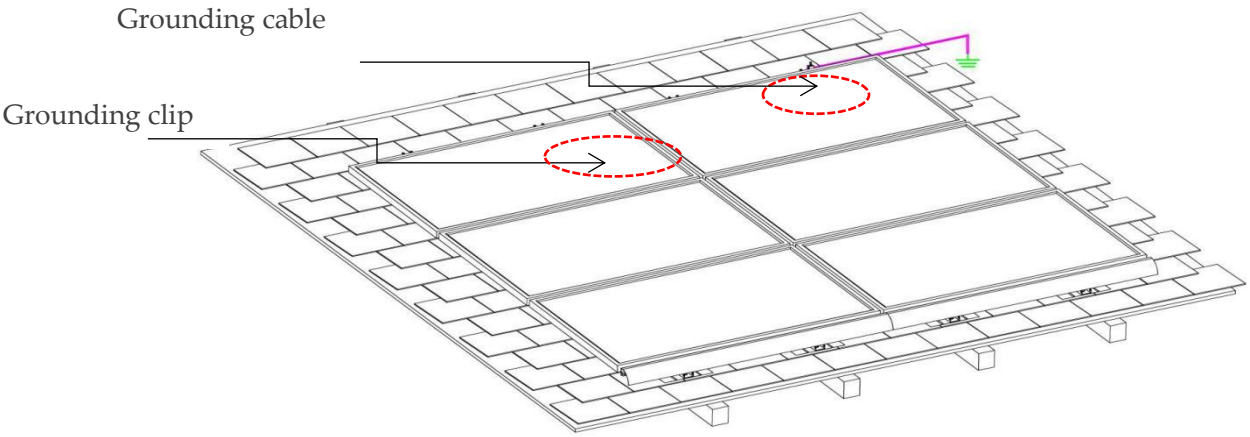



*Image 5.8.1*

Install the grounding cable.

The ground cable is use to connect the horizontally adjacent modules , Because there are two clips on the ends of the grounding cable .To install the grounding cable, please insert the clip into the slot of the module frame.

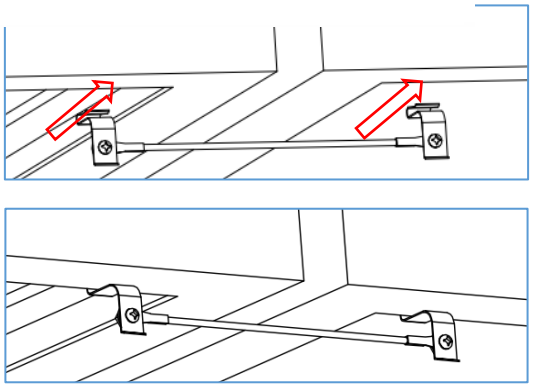
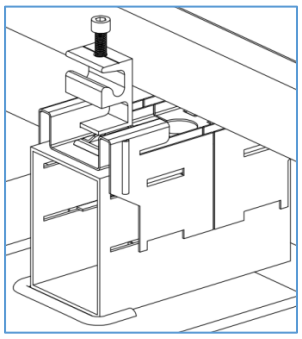
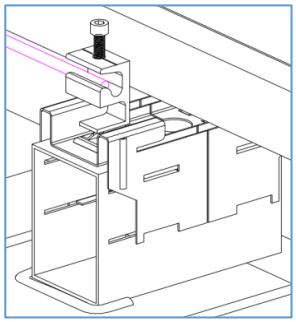


*Image 5.8.2*

1. Install the grounding clip

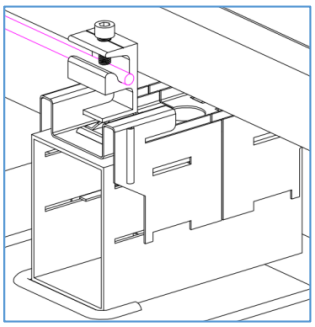


1.Slot the ground clip to the groove of module holder as shown in Image



2.Put the cooper wire through

the grounding clip



3.fix the top screw by 4mm Allen key.

*Image 5.8.3*

## 6. Dis-assembly the mounting kits.

### 6.1 Introduction of the removal tools

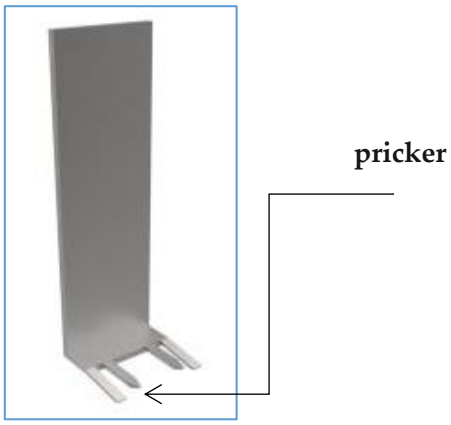
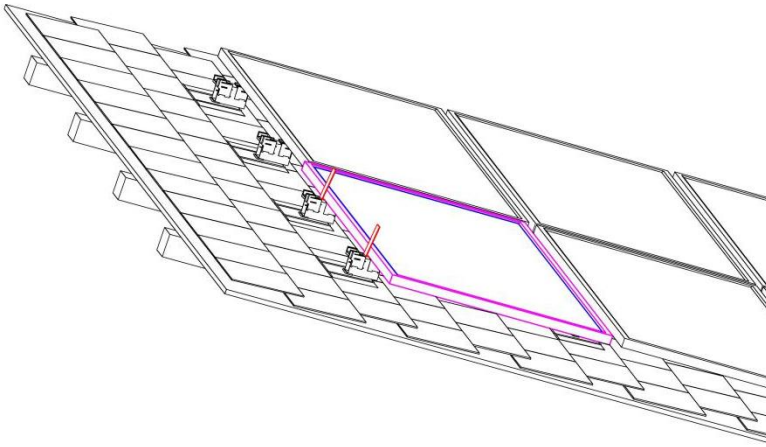



*Image6.1*

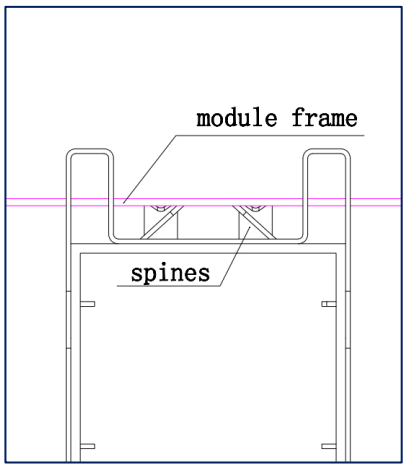
1. This removal tool is specifically designed for this no rail , no clamp mounting kit. It is a L shape tool with two prickers, the width of the tool is matching with the width of the module holder groove. It helps the dis-assembly work much easier.

### 6.2 Steps of dis-assembly

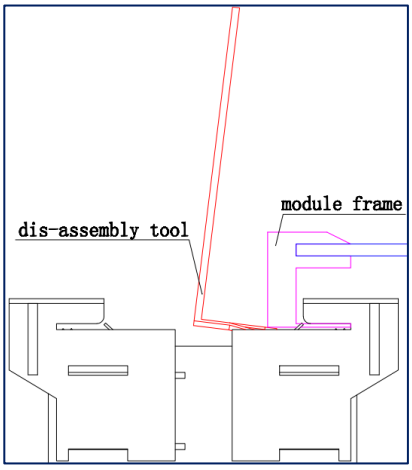


1.Find the module that need to be removed,Than start the dis-assembly work from the fixed end site of the module holder.

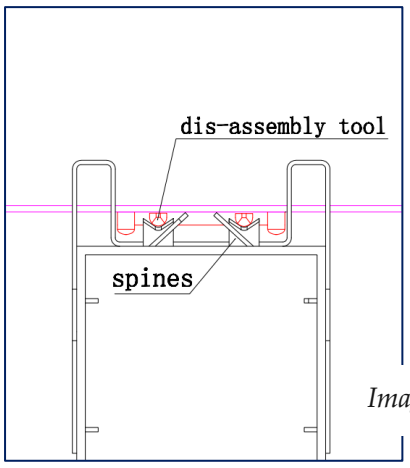
2.. Insert the pricker of the removal tools between the module holder and the module frame, so that the prickers will pressure on the spines of the module holder and the spines will be separated with the module frame.




1.Before prickers are inserted




2. Insert the prickers into the fixed end of the module holder.




3.The prickers make the modules separated from the spines on the module holder

*Image6.2.2*

3..Keep the removal tool between the module holder and module frame. At this time the module holder at lower end is fitted closely.

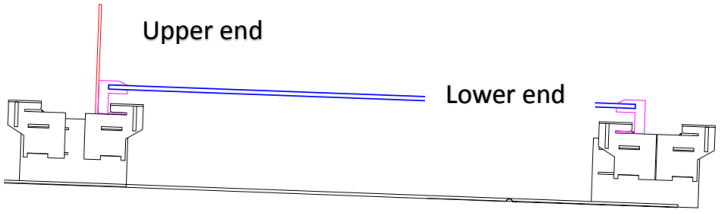



*Image 6.2.3*

4..Pull the module upwards. Due to the module holder at lower end is movable, when the module is pulled up, the movable end of the module holder also will be pull up so that the lower end of module frame will not slide out of the slot. Meanwhile, due to the module holder at upper end is fixed, the module frame will slide out from the slot.

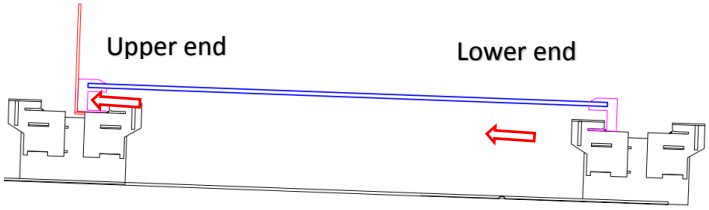



*Image 6.2.4*

5..Slightly raise and push the module down to make the movable end and the fixed end of the module holder fixed closely. Insert the removal tool between the module frame and the module holder .

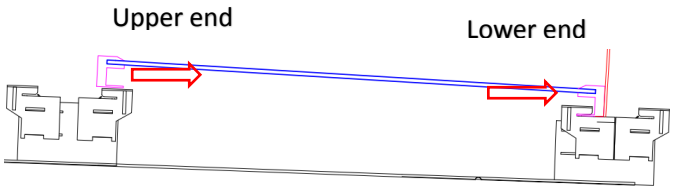



*Image 6.2.5*

6..Push the module to make the frame slide out from the slot of the movable end of the module holder.

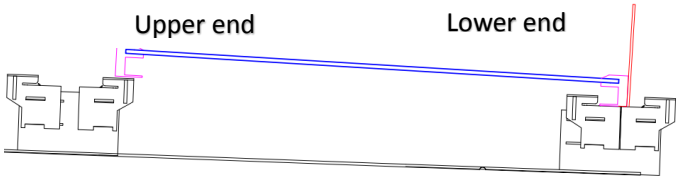
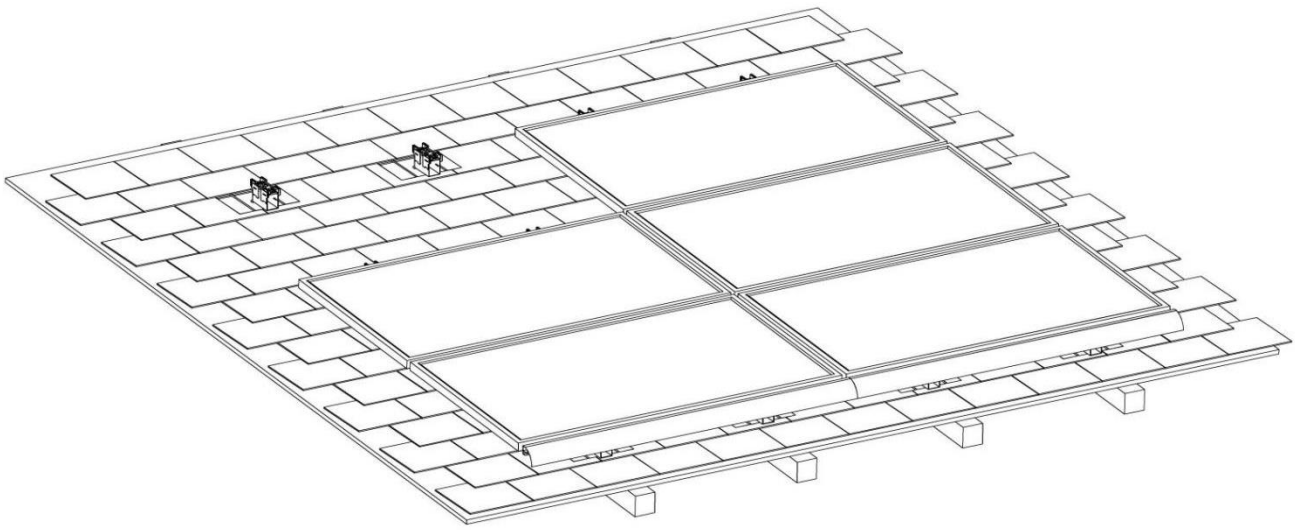



*Image 6.2.6*

7. with this steps, the installer can removal any piece of module that need to be replaced.



## 7.Approved Modules

| |
|---|
| **LG Solar Mono X, Mono X Ace & Mono X NeON 35mm:** |
| LGXXXS1C-G3, LGXXXS1C-A3,LGXXXS1C-B3, LGXXXS1K-G3, LGXXXS1K-A3, LGXXXS1K-B3, LGXXXN1C-G3, LGXXXN1C-A3, LGXXXN1C-B3, LGXXXA1C-B3 |
| **LG Solar Mono X, Mono X Ace & Mono X NeON 40mm** |
| LGXXXS1C-G4, LGXXXN1K-G4, LGXXXN1C-G4, LGXXXA1C-G4 |
| **Trina Solar** |
| TSM-XXX-PA05.05, TSM-XXX-PA05.08, TSM-XXX-PD05.05, TSM-XXX-PD05.08 |
| **Yingli Solar YGE 60 Cell & YGE 72 Cell** |
| YLXXXP-29b 35mm, YLXXXP-29b 40mm |
| **Suniva Optimus Series 35mm** |
| Black OPT XXX-60-4-1B0, Black OPT XXX-60-4-1B1,Silver OPT XXX-60-4-100, Silver OPT XXX-60-4-101 |
| **Hanwha Solar HSL 60 & HSL 72** |
| HSL60P6-PB-0-XXXT, HSL60P6-PB-0-XXXTW, HSL60P6-PB-0-XXXTB, HSL60P6-PB-4-XXXT, HSL60P6-PB-4-XXXTW, HSL60P6-PB-4-XXXTB, HSL60P6-PB-1-XXX, HSL60P6-PB-1-XXXB, HSL72S-4BB-1-XXXB |
| **Canadian Solar** |
| CS6P-XXXP, CS6P-XXXM, CS6X-XXXP, CS6P-XXXM All Black, CS6U-XXXP, CS6U-XXXM |
| **Jinko Solar Standard, Eagle, & Smart** |
| JKMXXXP-60 , JKMXXXP-72, JKMXXXPP-60, JKMXXXPP-72, JKMXXXM-60, JKMXXXM-72 |
| **Renesola 156 Series, Clarus, Virtus, & Virtus II** |
| JCXXXS-24/Bb, JCXXXF-24/Bb-b, JCXXXS-24/Bb-b, JCXXXM-24/Bb, JXXXM-24/Bbv, JCXXXM-24/Bb, JCXXXM-24/Bbh |
| **Hyundai Solar RG-Series,MF-Series & MG Series** |
| HiS-MXXXRG, HiS-SXXXRG,HiS-SXXXMF,HiS-MXXXMG, HiS-SXXXMG |

# SOLAR MOUNTING SYSTEM SPECIALIST

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