

# Solar Power System Installation Manual

## SRS Mounting System Rectangular Modules



Printed on  
Recycled Paper

# SHARP®

SHARP ELECTRONICS CORPORATION

## **FOR INSTALLATION PERSONNEL**

---

- Please read this manual carefully before installing the system and carry out the installation procedures correctly.
- This manual does not list all precautions needed for safe work. Be sure to follow OSHA guidelines.
- This manual provides guidelines for installation, but it does not guarantee the quality of installation work. Please complete all work in a responsible and professional manner. Electrical work should be performed by a qualified electrician.

**THE SRS MOUNTING SYSTEM HAS BEEN LOAD TESTED AND VERIFIED BY A PROFESSIONAL ENGINEER. THIS INFORMATION CAN BE PROVIDED UPON REQUEST.**

# TABLE OF CONTENTS

---

<b>FOR INSTALLATION PERSONNEL .....</b>	<b>2</b>	<b>6</b>	<b>INSTALLATION WORK.....</b>	<b>21-44</b>
<b>TABLE OF CONTENTS .....</b>	<b>3</b>	6.1	Preparing shingle roof for installation.....	21
<b>1 FOR SAFE INSTALLATION WORK .....</b>	<b>4-9</b>	6.2	Checking layout.....	22
1.1 Cautions regarding installation of solar power systems .....	6	6.3	Installing the optional flashings .....	23
1.2 SRS Mounting System.....	7-8	6.4	Installing standard slider assembly.....	24
1.3 PV modules.....	8-9	6.5	Preparing tile roof installation .....	25
<b>2 POINTS TO CHECK WHEN SELECTING THE INSTALLATION LOCATION .....</b>	<b>9-12</b>	6.6	Checking layout .....	26
2.1 Condition of house where solar power system is to be installed.....	9-10	6.7	Installing tile slider assembly .....	27-30
2.2 Checking the solar power system installation location.....	11-12	6.8	System grounding .....	31
<b>3 SPECIFICATIONS.....</b>	<b>13-14</b>	6.9	Installing module support rails .....	32
3.1 Solar module and array specifications modules: ND-167U1Y / ND-187U1 / ND-187U1F .....	13	6.10	Installing front cover .....	33
3.2 ND-167U1Y / ND-187U1 / ND-187U1F module array layout dimensions .....	14	6.11	Installing the modules on the SRS mounting system .....	34-35
<b>4 PARTS .....</b>	<b>15-19</b>	6.12	Installing top cover .....	35-36
<b>5 POINTS TO CHECK BEFORE INSTALLATION WORK.....</b>	<b>19-20</b>	6.13	Installing side cover.....	36
		6.14	Connecting the solar modules .....	36-38
		6.15	Testing module strings for correct voltage .....	39
			<b>LIMITED WARRANTY.....</b>	<b>Back cover</b>

# 1 FOR SAFE INSTALLATION WORK

This system shall be installed only by individuals who have completed the SRS training course established by Sharp Electronics Corporation. Please visit our website <http://solar.sharpusa.com> to learn about Sharp training. Call us at 1-800-solar06 to find a certified installer in your area.

## SAFETY ICONS

Various safety icons appear in this installation manual and on the products it describes. These icons are categorized in the following manner, according to the consequences of ignoring the icons and handling the products inappropriately.

Make sure that you understand these icons and always read the accompanying text.



**WARNING** This indicates danger of death or serious bodily injury.



**CAUTION** This indicates danger of bodily injury or damage to property.



This icon indicates something you must never do.

## WARNING

- Do not cut or modify SRS Mounting System. Doing so is dangerous. Safety cannot be guaranteed.
- Stop work during stormy weather. Strong winds can cause you to fall or drop the solar modules.

## CAUTION

- Never step or sit on the glass surface of a solar module. The glass may break, resulting in shock or bodily injury. The module may also stop generating power.
- Always use the supplied parts to attach the solar modules and mounts.  
Use of weaker parts, such as screws that are too short, is dangerous and may cause the solar modules or mounts to fall.
- Always use the specified tools.  
The solar modules or mounts may fall if the installation is not strong enough, for example when parts are not tightened sufficiently.
- Regardless of whether you are working on a new or existing roof, never allow the sheathing to become wet. Protect the sheathing from rain during the installation. Failure to do so may cause leaks.
- Always use the specified materials.  
Use of other materials is dangerous. Materials other than specified can reduce performance and can cause leaks, shock, and so on.
- Do not modify or cut parts.
- Do not install the system in a location within 0.3 miles from the ocean or any salt water.
- Do not install in corrosive locations classified C5 by ISO.
- The SRS mounting system and modules are UL listed to standard 1703. The UL 1703 test is performed at 1.5 times the design load of 30 lbs per square foot, or 45 PSF. The SRS mounting system has been load tested by Sharp to 50 PSF. Do not use in locations subject to higher loads. Building departments often require a design safety factor of 1.5 or greater for structures. The maximum structural loading listed in this guide does not include an added safety factor.
- Protective earth grounding of the individual photovoltaic modules is achieved by securing the modules to the SRS mounting system. The Single Point Grounding instructions in section 6.8 should be closely followed, in order to ensure a reliable ground connection.
- The SRS mounting system has only been evaluated by UL for use with the photovoltaic modules listed in this manual.

# 1 FOR SAFE INSTALLATION WORK

## UL REQUIRED INFORMATION:

1. Artificially concentrated sunlight shall not be directed on the module.
2. "Rated electrical characteristics are within 10 percent of measured values at Standard Test Conditions of: 1000 W/m<sup>2</sup>, 25°C cell temperature and solar spectral irradiance per ASTM E 892 or irradiation of AM 1.5 spectrum."
3. Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of ISC and VOC marked on UL Listed modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output. Refer to Section 690-8 of the National Electric Code for an additional multiplying factor of 1.25 which may be applicable.
4. Wiring methods should be in accordance with the NEC.
5. Install wires and cables with appropriate hardware in accordance with applicable electrical codes.
6. Protective earth grounding of the individual photovoltaic modules is achieved by securing the modules to the mounting frames. The assembly instructions should be closely followed, in order to ensure a reliable ground connection.
7. The framing system shall be grounded in accordance with NEC Article 250.
8. #10 AWG copper wire is the minimum size acceptable for the primary protective ground connection to the rails.
9. A UL Listed Grounding terminal constructed of tin-plated copper or stainless steel, or steel provided with a zinc or beryllium coating, and suitable for outdoor use, shall be used with the selected grounding wire (minimum 10 AWG copper wire).
10. All of the Rails in an installation shall be provided with protective earth bonding wires when installed.
11. The framing system has only been evaluated by UL for use with the photovoltaic modules listed in this manual.

# 1 FOR SAFE INSTALLATION WORK

## 1.1 CAUTIONS REGARDING INSTALLATION OF SOLAR POWER SYSTEMS

This manual contains critical information regarding electrical and mechanical installation and safety information which you should know before starting installation.

The information in this manual is based on Sharp's knowledge and experience, however, the information and suggestions do not constitute a warranty.

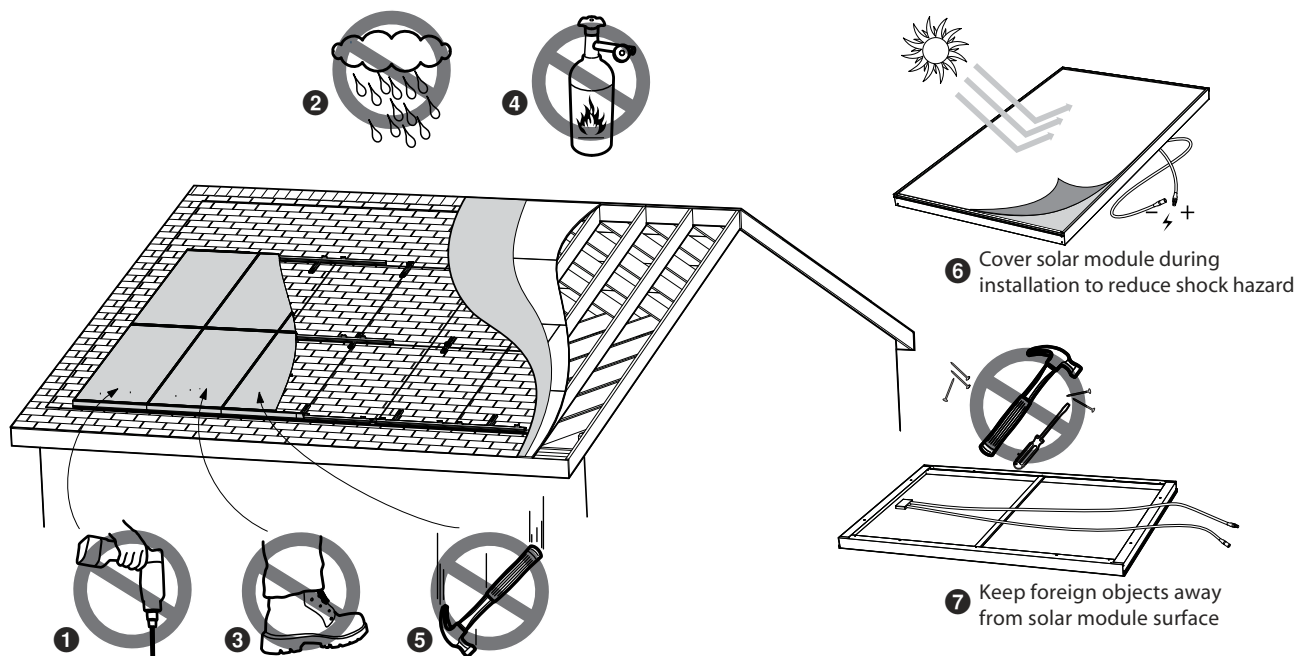
Sharp Electronics Corporation reserves the right to make changes to the product, specifications, or manual without prior notice.

Do not locate systems near coastal locations or other salt water locations or C5 locations as classified by ISO. Minimum distance is 0.3 miles from the body of water. Do not locate in a corrosion prone area. The modules and system are UL listed to standard 1703. The UL 1703 test is performed at 1.5 times the design load of 30 lbs per square foot, or 45 lbs per square foot. The system has been load tested by Sharp to 50 PSF. Building departments often require a design safety factor of 1.5 or greater for structures. The maximum structural loading listed in this guide does not include an added safety factor. Check with your local building department for code information.

### ⚠ CAUTION

- 1 Do not drill holes in frame.  
Do not cut or modify parts or rails.
- 2 Work under dry conditions with dry tools.

- 3 Do not stand or step on solar module.
- 4 Do not install near flammable gases.
- 5 Do not drop or allow objects to fall onto module.
- 6 Completely cover solar module with opaque materials when wiring to halt production of electricity.
- 7 Keep the back side of solar module surfaces free of foreign objects.
- 8 Do not use chemicals on solar modules when cleaning.
- 9 Do not wear metallic jewelry, which may cause electrical shock.
- 10 Do not touch cable electrical contacts.
- 11 Do not expose solar modules to sunlight that is concentrated with mirrors, lenses or similar means.
- 12 Consult local codes and other applicable laws and statutes concerning required permits and regulations concerning installation and inspection requirements. Install solar modules and systems according to applicable codes.
- 13 Solar modules should be installed and maintained by qualified personnel. Keep unauthorized personnel away from solar modules.
- 14 Avoid shadowing cells in order to prevent solar module hot spots and/or reduction in power.
- 15 Avoid installing modules and mounting system in high corrosion areas.



# 1 FOR SAFE INSTALLATION WORK

## 1.2 SRS MOUNTING SYSTEM

**⚠ WARNING** Always follow OSHA guidelines.

Solar modules are installed on rooftops where there is danger of personnel falling off of the roof. Scaffolding, stepladders, and ladders may be dangerous and require caution. The installation of solar modules involves work in high places; take extreme precautions to avoid falling from roof. To prevent accidents, safety regulations must be observed. Always take the following precautions to prevent accidents and injury.

### 1 Take the following precautions before starting work.

- Plan the job and visit the site before starting work.
- On site, do not work alone. Always work with at least one other person.
- Inspect power tools before using them.

### 2 When conditions make it necessary, tell workers to stop working.

- When it is raining, or there is a strong probability that it will start raining.
- Immediately after rain, and when work areas are slippery.
- When high wind conditions exist, or are expected, or when a high wind warning has been issued.
- When it is snowing, or when there is snow underfoot.
- When the condition of the scaffolding and ladders is not satisfactory.

### 3 Wear appropriate work clothes and protective equipment.

- Work clothes for both the upper and lower body should fit well and allow you to move freely.
- Always wear protective equipment such as harnesses and lifelines.
- Wear a helmet and secure it correctly.
- Wear non-slip shoes. Shoes get dirty when worn on a roof, so keep the soles clean.

### 4 Observe safety regulations for ascending and descending ladders and stepladders.

- Before use, always inspect ladders and stepladders to make sure they are in good condition.

- Choose a safe spot to anchor ladders and stepladders.
- Always work with a partner. One person should hold the ladder steady.
- Ladders from a first-story roof to a second-story roof are very dangerous. Do not set up a ladder on a roof. When there is no other choice, straddle the ridge and lay down a rubber anchor mat, and secure the ladder to the mat. Always have one person hold the ladder firmly.
- When you use a two-stage ladder, secure it with ropes or stays to prevent it from sliding sideways, and have two people hold the ladder steady.
- Use ladders with steps broad enough to permit safe work.

### 5 When working in high places, wear harnesses and use scaffolding.

- When working at heights of 6 feet or more, use scaffolds or other equipment to ensure a stable work platform.
- Scaffolds should be designed and erected by a qualified person.
- When it is difficult to erect a stable work platform, install safety nets, wear harnesses, and take other measures to prevent falls.
- Regulations mandate the use of harnesses. Fasten harnesses securely, and check that the length of lifelines is 6 feet or less.
- Attach the primary support line securely to a metal fixture installed for that purpose on a ridge or beam.

### 6 Install enclosures and covers.

- Install enclosures, guardrails, or covers at the end of work decks that are 10 feet or more above ground, at openings, and at other dangerous locations.
- When it is extremely difficult to install enclosures, guardrails, or covers, or when they must be removed to work in that location, install a safety net, wear harnesses, and take other measures to prevent falls.

# 1 FOR SAFE INSTALLATION WORK

## 7 Protect against falling objects.

- When objects are thrown down from a height of 6 ft or more, appoint a surveillance person on the ground and warn others about falling objects.
- Do not allow third parties to enter the work area during construction.
- Arrange tools and materials neatly and secure them with ropes, or use bags or other measures to prevent falling objects.

## 8 Other

- When there are electric power lines near the roof or eaves, request the power utility to take advance measures to prevent shock.
- Check the health of workers before starting work.
- Lift packaged modules by grasping both sides of the package. Do not lift by grasping the band, as the band can break.
- Never step or sit on the glass surface of a solar module.

## 1.3 PV MODULES

**⚠ WARNING** Wiring work should be performed according to the provisions of the National Electrical Code. Grounding work and wiring connections to the inverter should be performed by a qualified electrician.

Adhere to all of the NEC. Pay special attention to Article 110, Chapter 2, Article 250, Chapter 3, Articles 300 & 310, 480 & 690.

The solar array generates electricity whenever it is exposed to sunlight. Be careful when handling it. There is a danger of shock if you touch the connectors or wires of the electric cables.

### 1 Points to check before wiring.

- The solar modules generate electricity when exposed to light. You will need to wear insulating gloves.
- You will need a multimeter for volts, amps, resistance and continuity capable of measuring DC and AC up to 600 Volts and 40 Amps.
- Make sure your tools are insulated.

### 2 Wiring the solar modules.

- Never step or sit on the glass surface of the solar modules. The glass may break.
- When you install the solar modules on the rail, never allow an output cable to become caught between the rail and a module frame.
- The solar modules generate electricity when exposed to sunlight, take care not to short circuit the output cables. The cables can become overheated and their cable sheaths can melt.

- Ensure the module connectors are fully inserted. There is a risk of malfunction if they are not pushed in all the way.
- Support output cables so that there is no slack. High winds can blow slack cable against the rail, damaging the cables.

### 3 Wiring from solar arrays to the inverter (connector box).

- Follow the provisions of the National Electrical Code. Adhere to all of the NEC. Pay special attention to Article 110, Chapter 2, Article 250, Chapter 3, Articles 300 & 310, 480 & 690.
- For wiring through walls, protect the cables with metal conduits, flexible metal conduits, or other protection. Failure to do so can result in shock and short circuits. Always use conduit to protect sections of array output cables that are exposed to sunlight.  
For wiring outdoors, protect cables with PVC conduits, metal conduits or flexible conduits.
- Prevent water from entering or building up in conduit by using waterproof fittings or duct seal.
- To prevent shock, tape and label the cut ends of array output extension cables (the side opposite to the connector side) before connecting to solar module output cables. Further, tape them again after measuring the voltage of each array.
- To prevent shock when you connect the array output cables to the inverter, remove the tape one cable at a time as you connect the cables.



# 1 FOR SAFE INSTALLATION WORK

## 4 Measuring array output voltage

- See the description of how to measure the output voltage for each array.
- Make sure that all solar modules are exposed to sunlight. (Remove lightproof sheets, if present.)
- Set the volt meter measurement range to a DC voltage, greater than the expected measurement (for example 600 V<sub>DC</sub>).
- Keep the plus (+) solar array output cables away from the ends of the minus (-) cables. Dangerous arcs can occur. (The array output voltage under normal conditions (clear skies) can be very high.)

## 5 Grounding the mount

- To prevent shock, always connect a ground wire from the SRS mounting system to earth.
- Use a minimum #10 AWG ground wire.
- Follow NEC 690 grounding provisions.

# 2 POINTS TO CHECK WHEN SELECTING THE INSTALLATION LOCATION

- Check the following items before starting installation work.
- Refer to the inverter installation manual for more information about inverter installation and electrical work.

## 2.1 CONDITION OF HOUSE WHERE SOLAR POWER SYSTEM IS TO BE INSTALLED

### INSPECTION OF ROOF STRUCTURE

It is important to inspect the structural integrity of the roof and the durability of the roof materials. The SRS mounting system and solar modules require a strong base for durable and reliable operation in local environments. Always wear a safety harness when working on the roof.

Inspect the roof surface in the area of the installation for cracks, water leakage, and roofing material quality and uniformity. This is especially important if the roof is older than 10 years.

Inspect the roof for sags and other abnormalities. A sag or deep depression in the roof may indicate a structural weakness in the support system that may require correction. The following illustrations detail typical roof construction as well as old roof problems.

### INSPECTION OF THE ROOF SUPPORT SYSTEM

This may require access to the attic.

Check that all rafters, trusses and other materials are in good condition.

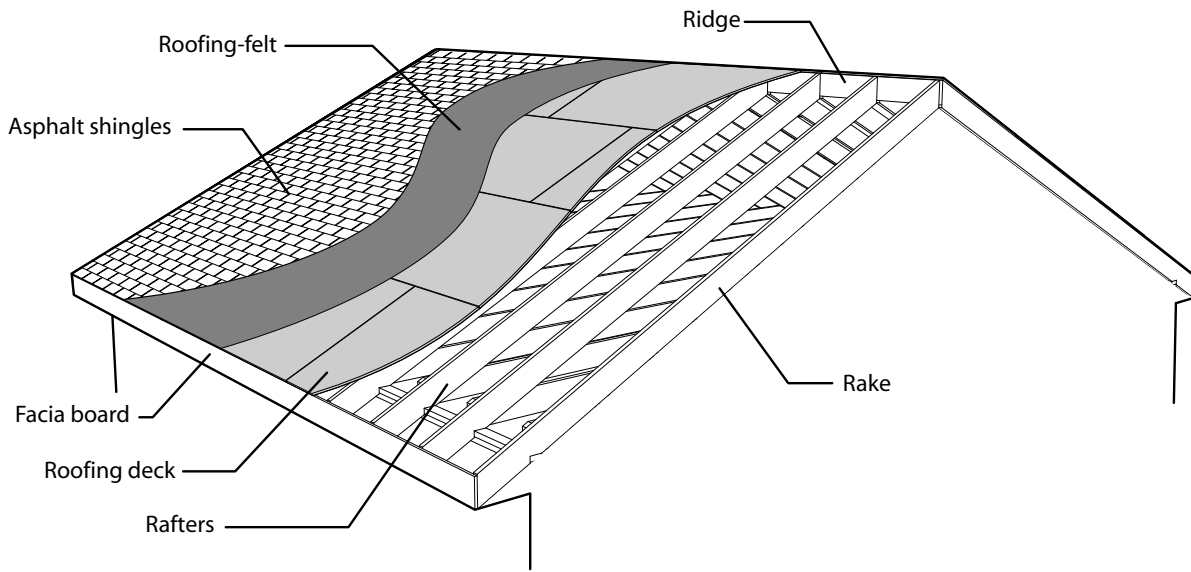
Check for indication of previous water leaks.

Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout.

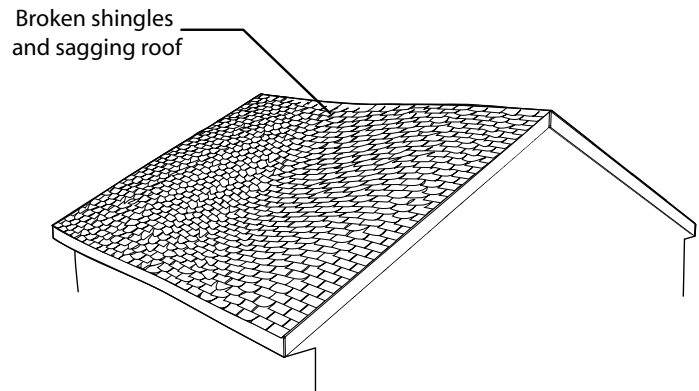
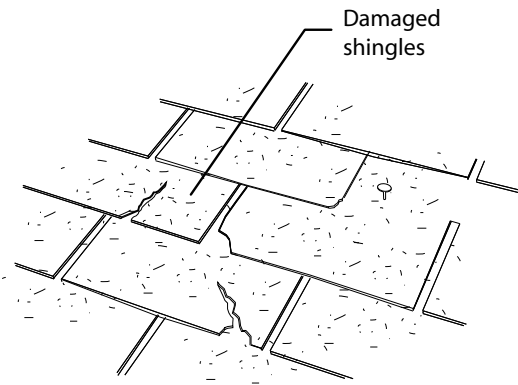
Determine the location of the electrical roof penetration and wire run, if wiring is planned for this area.

## 2 POINTS TO CHECK WHEN SELECTING THE INSTALLATION LOCATION

### EXAMPLE ROOF CONSTRUCTION



### EXAMPLES OF POOR ROOF CONDITION



## 2 POINTS TO CHECK WHEN SELECTING THE INSTALLATION LOCATION

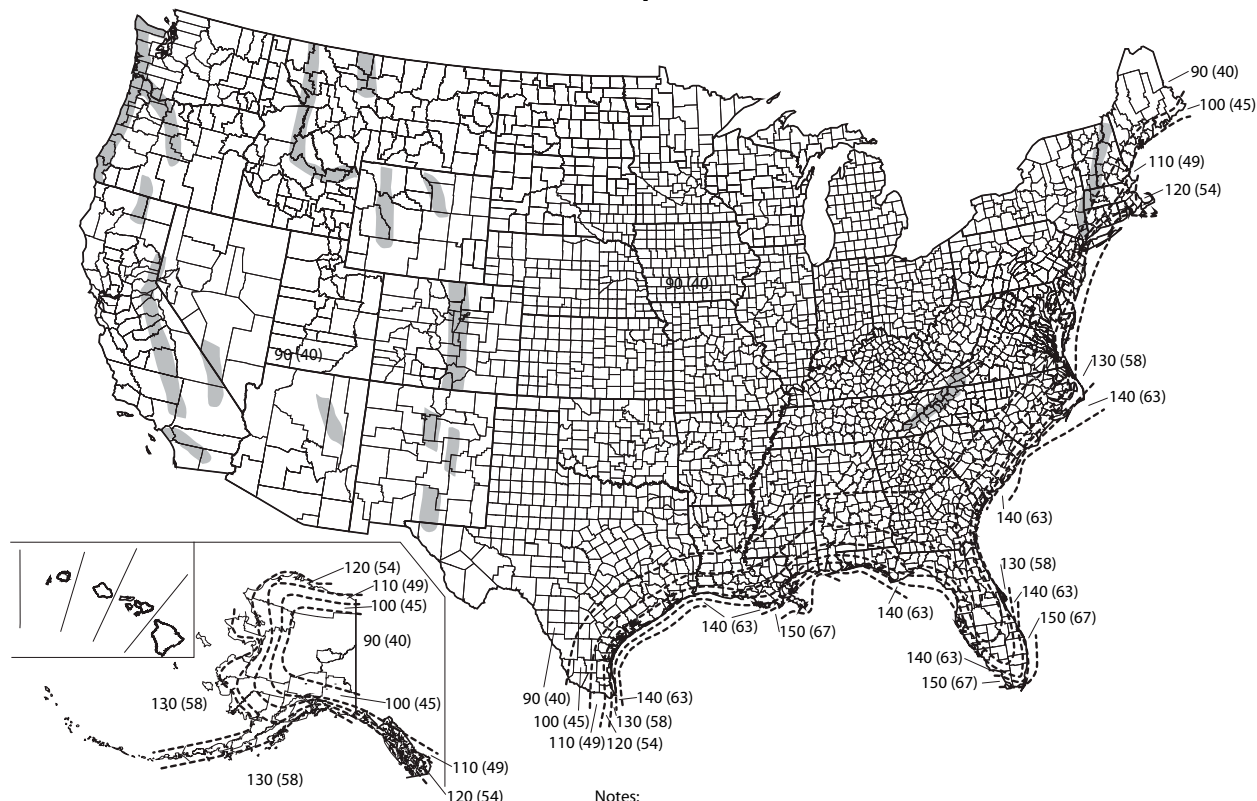
### 2.2 CHECKING THE SOLAR POWER SYSTEM INSTALLATION LOCATION

#### CODE COMPLIANT INSTALLATION

1. Determine the wind loads for the installation site. Check with your local building and safety department for the specific requirements.
2. Make certain that the roof structure can support the live and dead loads resulting from the installation of the PV array.
3. Consult with a professional engineer if additional assistance is required.
4. Determine the basic wind speed from the IBC wind speed chart (for US locations).
5. Determine the exposure category A through D (obtain latest definitions from IBC or local building code).
6. Determine total pressure by compiling basic wind speed, exposure and roof height. Check with Sharp technical support if your total pressure exceeds 45 PSF.
7. Reference the chart wind speeds to determine your design wind pressure (PSF). Determine exposure categories A through D for various roof heights.
8. Based on the loading in step 7, make certain that the roof structure can support the load.
9. The modules and system are UL listed to standard 1703. The UL 1703 test is performed at 1.5 times the design load of 30 lbs per square foot, or 45 lbs per square foot. The system has been load tested by Sharp to 50 PSF. Building departments often require a design safety factor of 1.5 or greater for structures. The maximum structural loading listed in this guide does not include an added safety factor.
10. To achieve maximum load capacity, use at least the same number of sliders as modules on each rail.

#### BASIC WIND SPEED SPECIFIED BY IBC

IBC Wind Speed Chart

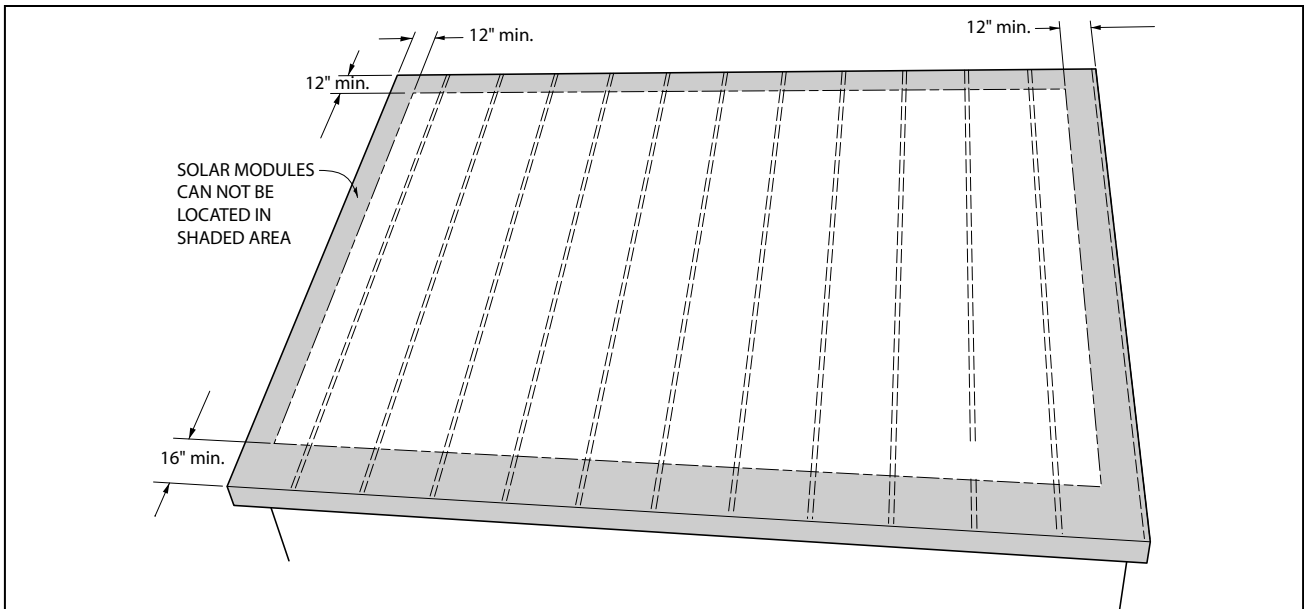


Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft. (10 m) above ground for Exposure C category.
2. Linear interpolation between wind contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

## 2 POINTS TO CHECK WHEN SELECTING THE INSTALLATION LOCATION

1. Install solar modules facing south, if possible. Installations facing east and west are also possible, although the amount of power generated will be lower. Check the roof from a southern orientation, and check for obstacles that will cast a shadow. These factors will lower the amount of power generated. Explain this to the users and obtain their consent.
2. Install in a location that has good sun exposure throughout the year. Less power is generated in shaded locations.
3. Check the following before installation.
  - 3.1 Solar modules should not be installed within 12" from the ridge or edges of the roof, nor within 16" from the eave.
  - 3.2 Installation is not possible in regions where the wind pressure exceeds 45 PSF. Check with your local building department to determine if this mounting system is in compliance. Installation is not recommended when the roof angle is less than 10 degrees or greater than 45 degrees.
  - 3.3 Installation is not possible in the peripheral shaded area of the following figure.
  - 3.4 Do not locate systems near coastal locations or other salt water locations or C5 locations as classified by ISO. Minimum distance is 0.3 miles from the body of water. Do not locate in a corrosion prone area.
4. The array must be installed at least 16" away from the eave of the roof and 12" from the sides of the roof. This border will enhance the wind load resistance of the system. Measure the perimeter of the roof surface where the array will be installed.



5. The output of a series string of solar modules is connected to the input of the inverter. Always install solar modules so that all elements of the array receive the same amount of sunlight.

The amount of power generated declines dramatically if you connect solar modules receiving different amounts of light in a string array, for example, solar modules facing east and solar modules facing south should not be connected in the same string.

Refer to the inverter installation manual for more information about the number of solar modules connected in series in a single array.
6. It may not be possible to install solar modules in the following areas and under the following conditions. For more information, contact technical support.
  - Regions with heavy snowfall - Installation is not possible in regions where maximum snow accumulation exceeds the maximum allowable load. Contact the building & safety department for more information about maximum snow accumulation.

### 3 SPECIFICATIONS

#### 3.1 SOLAR MODULE AND ARRAY SPECIFICATIONS MODULES: ND-187U1, ND-187U1F, ND-167U1Y

##### 1 Array specifications (typical examples)

Array: Layout of series connected solar modules

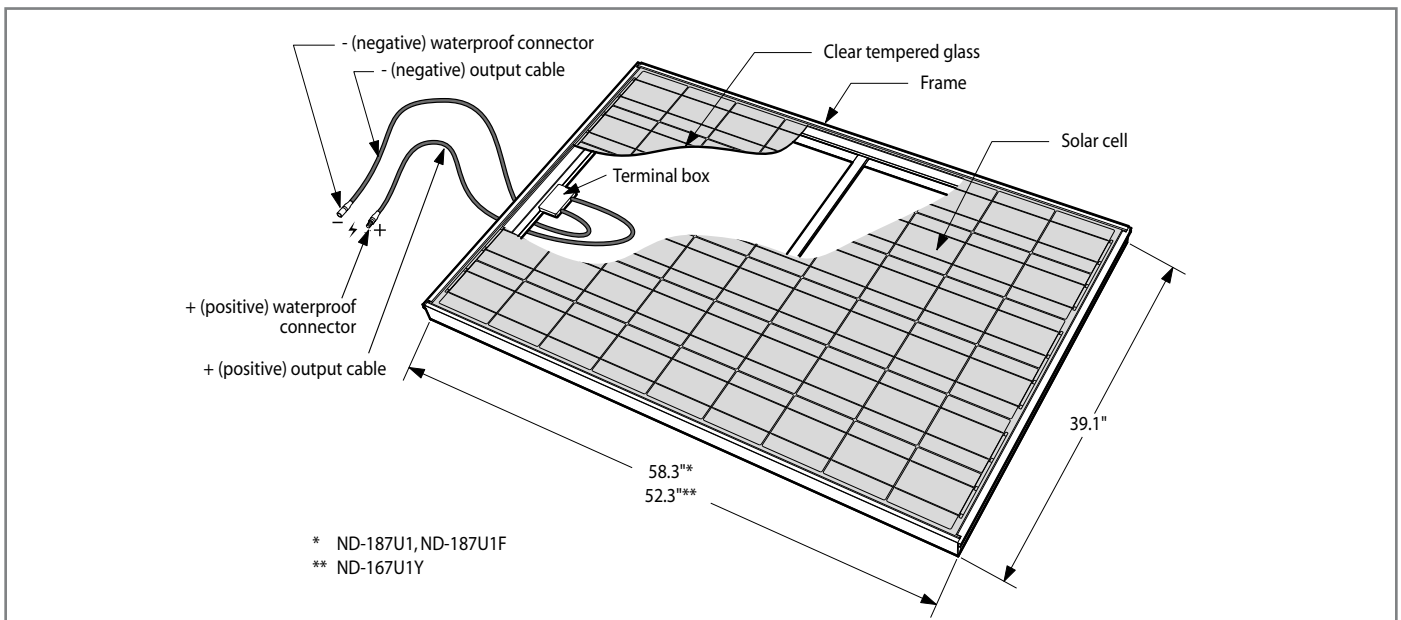
	ND-187U1				ND-167U1Y			
Quantity of Solar modules	18	20	24	27	18	20	24	27
Solar power capacity (kW) STC	3.4	3.74	4.5	5.0	3.0	3.3	4.0	4.5
Solar module area (sq.ft.)	284.9	316.6	379.9	427.4	255.8	284.2	341.0	383.7

##### 2 Individual specifications and dimensions

	ND-187U1	ND-187U1F	ND-167U1Y
Power (W) STC	187	187	167
Max. power voltage (V)	25.6	25.8	22.97
Max. power current (A)	7.31	7.25	7.27
Open circuit voltage (V)	32.5	32.7	29.04
Short-circuit current (A)	8.13	7.99	8.02
Weight (lbs)	39.6	39.6	35.27
Dimensions (in)	58.7 x 39.1 x 2.26		52.3 x 39.1 x 2.26

Rated electrical characteristics are within  $\pm 10$  percent of the indicated values of  $I_{sc}$  and  $V_{oc}$  and within  $+10/-5$  percent of  $P_{max}$  under standard test conditions (irradiance of  $100 \text{ mW/cm}^2$ , AM 1.5 spectrum, and a cell temperature of  $25^\circ\text{C}$  ( $77^\circ\text{F}$ )). Under normal conditions, a photovoltaic module may experience conditions that cause more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of  $I_{sc}$  and  $V_{oc}$  marked on UL Listed modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output. Refer to Sec. 690-8 of the National Electric Code for an additional multiplying factor of 125 percent which may be applicable. In the coverage of Canadian UL listing, installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

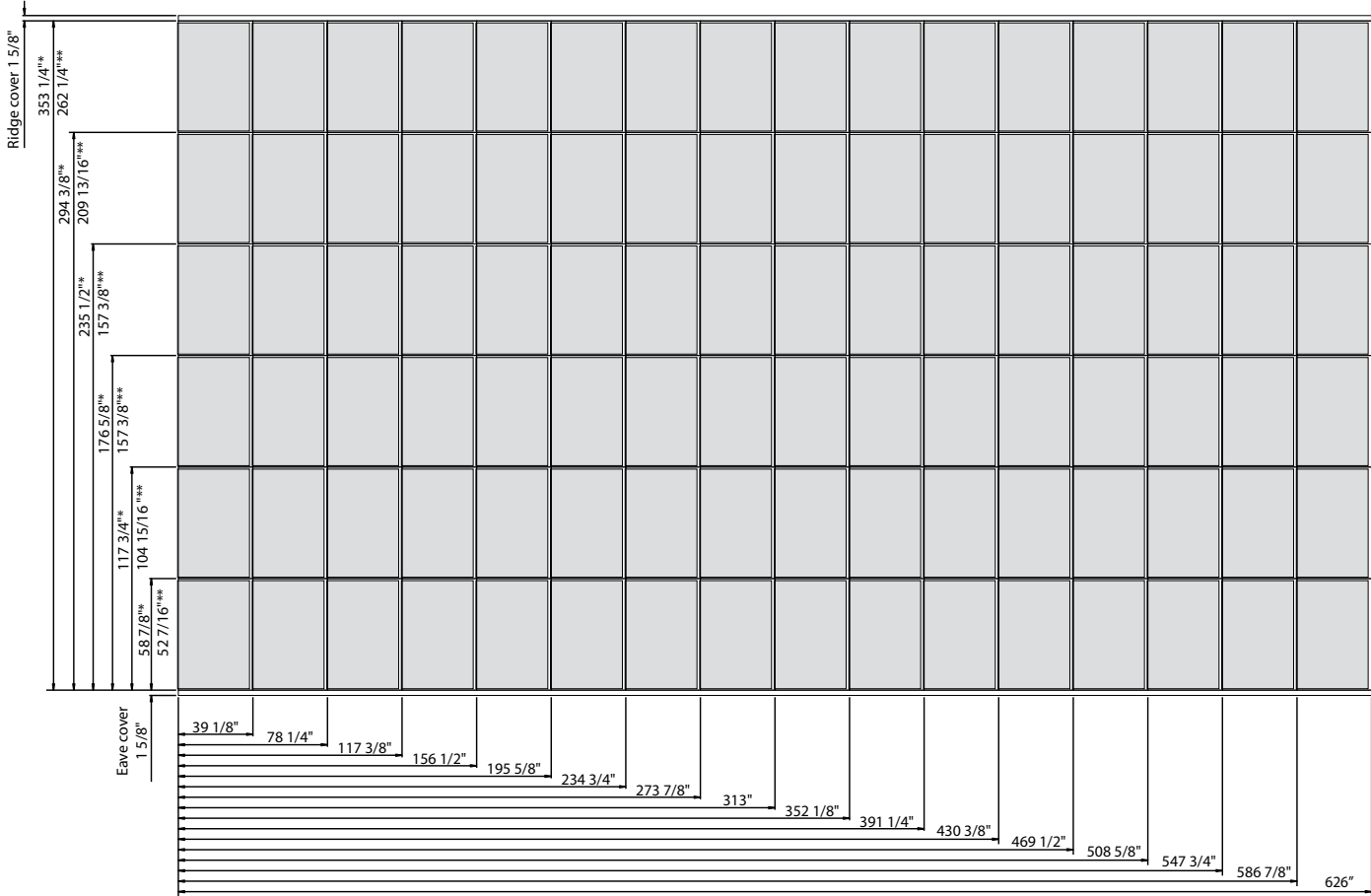
#### SOLAR MODULE



# 3 SPECIFICATIONS

## 3.2 ND-187U1, ND-187U1F, ND-167U1Y MODULE ARRAY LAYOUT DIMENSIONS

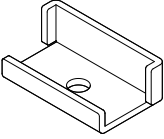
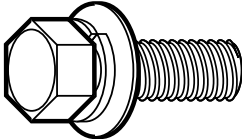
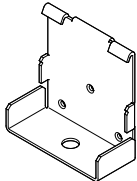
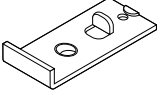
The location of the mounting feet and rails is dependent on the layout of the array. Use the following grid to determine the overall size of the array that will fit on the installation location.

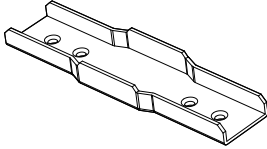
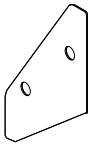
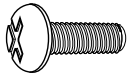


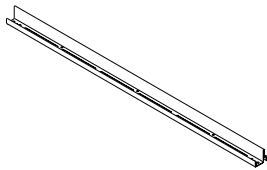
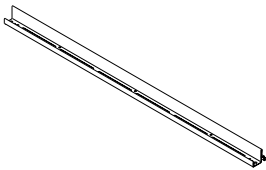
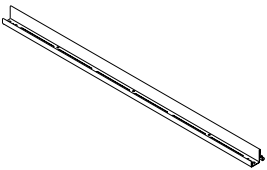
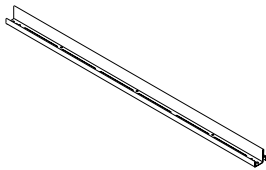
Maximum module layout (shown) is 16 wide x 6 tall. Contact Sharp for other configurations.

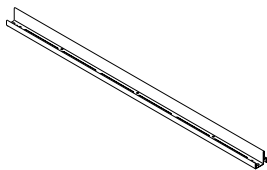
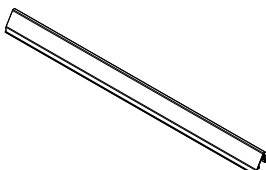
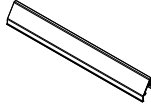
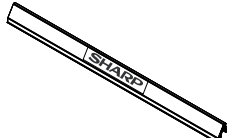
- \* ND-187U1, ND-187U1F
- \*\* ND-167U1Y

# 4 PARTS

STANDARD PARTS				
Part No.	AD804	XA52	AD801	AD105
Model name	Dock washer	M8 Bolt 20 (shown appx. size)	Module mounting clip	Threaded tab
				
Dimensions		M8 x 20 mm		
Material	Anti-corrosion coated steel	Stainless steel	Anti-corrosion coated steel	Anti-corrosion coated steel

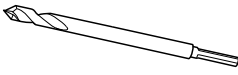
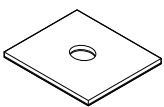
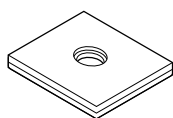
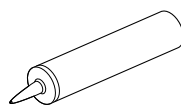
Part No.	AD101	AD802	XA05
Model name	Splice	Side cover	M4 Side cover screw (shown appx. size)
			
Dimensions			M4 x 12 mm
Material	Anti-corrosion coated steel	Aluminum	Stainless steel

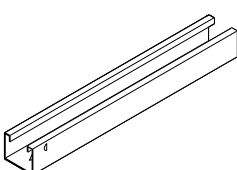
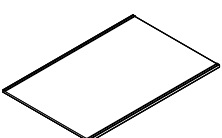
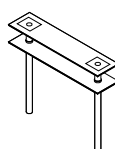
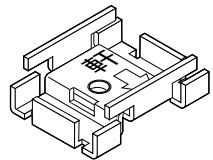
Part No.	AA801	AA802	AA803	AA804
Model name	Rail 1 in 1	Rail 2 in 1	Rail 3 in 1	Rail 4 in 1
				
Dimensions	Length: 35.98"	Length: 75.12"	Length: 114.25"	Length: 153.39"
Material	Anti-corrosion coated steel			

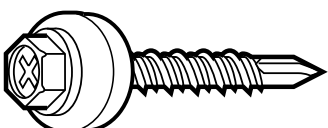
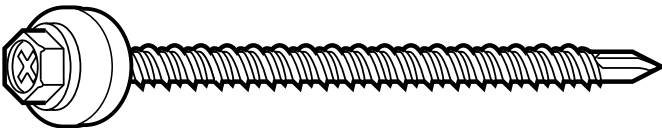
Part No.	AA805	AB801	AB802	AB803
Model name	Rail 1.5 in 1	Front cover	Front cover, half size	Front cover with Sharp logo
				
Dimensions	Length: 55.55"	Length: 39.13"	Length: 19.57"	Length: 39.13"
Material	Anti-corrosion coated steel	Aluminum		

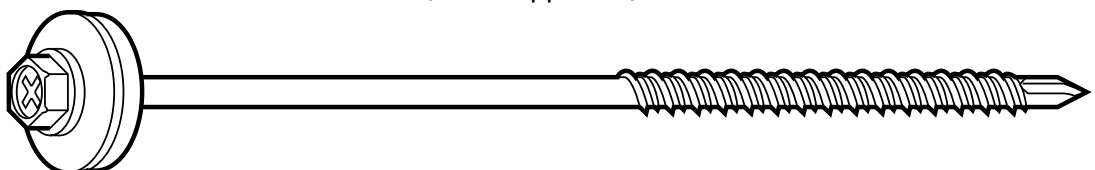
# 4 PARTS

## ROOF TILE PARTS

Part No.	AE112	AE105	AE106	AE107
Model name	Roof tile drill bit per piece (6 pcs/case)	Tile roof bottom butyl pad	Tile roof top butyl pad assy	Silicone caulking
				
Material		Butyl rubber	Anti-corrosion coated steel	Silicone

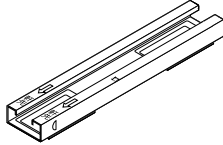
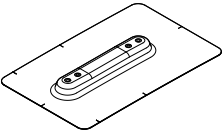
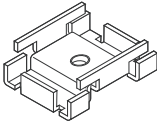
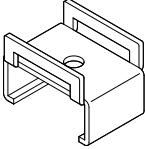
Part No.	AE110	AK111	AE104	AE102
Model name	Tile roof slider	Support AL plate	Tile roof stand off	Tile roof slider bracket
				
Material	Anti-corrosion coated steel	Aluminum	Anti-corrosion coated steel	Anti-corrosion coated steel

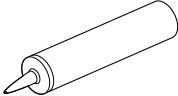
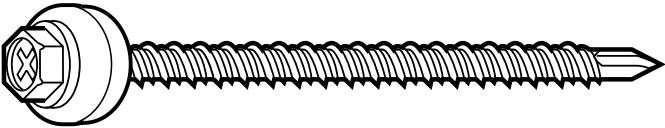
Part No.	XA27	XA02
Model name	Support AL screw 5.5 x 35 (shown appx. size)	Standard slider mounting screw 5.5 x 80 (shown appx. size)
		
Material	Stainless steel	

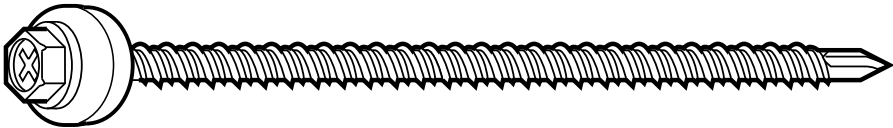
Part No.	XA50
Model name	Tile roof stand off screw 5.5 x 135 (shown appx. size)
	
Material	Stainless steel



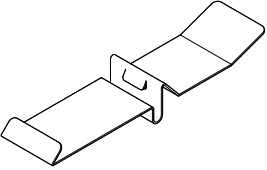

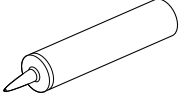
# 4 PARTS

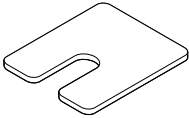
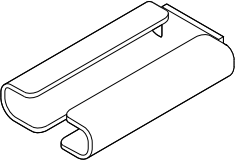
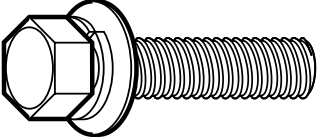
ASPHALT ROOF PARTS				
Part No.	AS801	AS804	AS105	AD805
Model name	Standard slider assembly	Mounting Flash assembly	Standard slider bottom bracket	Standard slider top bracket
				
Dimensions	11" x 2" x 1"	14" x 10" x 1.25"		
Material	Anti-corrosion coated steel		Anti-corrosion coated steel	

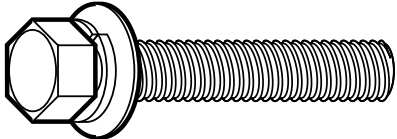
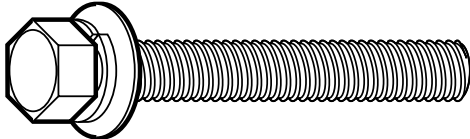
Part No.	AE107	XA02
Model name	Silicone caulking	Standard slider mounting screw 5.5 x 80 (shown appx. size)
		
Material	Silicone	Stainless steel

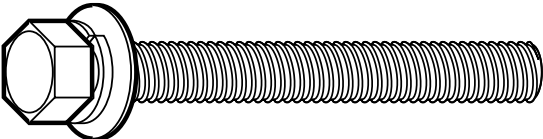
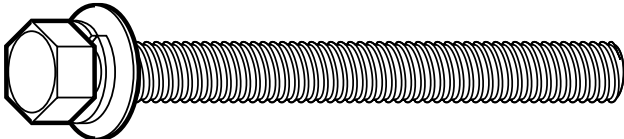
Part No.	XA58
Model name	Standard slider mounting screw w/ flashing 5.5 x 110 (shown appx. size)
	
Material	Stainless steel

# 4 PARTS

OPTIONAL PARTS			
Part No.	AD803	AD806	AE107
Model name	Cable support bar 	Cable clip 	Silicone caulking 
Material	Stainless steel	Anti-corrosion coated steel	Silicone

Part No.	AK113	AK114	XA53
Model name	0.1" shim 	0.4" shim 	M8 Bolt 30 (shown appx. size) 
Dimensions			M8 x 30 mm
Material	Anti-corrosion coated steel		Stainless Steel

Part No.	XA54	XA55
Model name	M8 Bolt 40 (shown appx. size) 	M8 Bolt 50 (shown appx. size) 
Dimensions	M8 x 40 mm	M8 x 50 mm
Material	Stainless Steel	

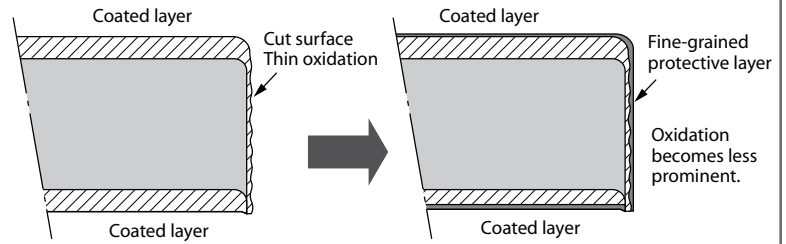
Part No.	XA56	XA57
Model name	M8 Bolt 60 (shown appx. size) 	M8 Bolt 70 (shown appx. size) 
Dimensions	M8 x 60 mm	M8 x 70 mm
Material	Stainless Steel	

## 4 PARTS

### TECH NOTE

Anti-corrosion coated steel is steel coated with a layer consisting primarily of zinc plus another metal, such as aluminum or magnesium.

After it is cut, mild corrosion develops initially at the cut surface, but then the components of the coating layer dissolve to form a stable protective layer over the cut.



## 5 POINTS TO CHECK BEFORE INSTALLATION WORK

### ⚠ WARNING

- The solar modules generate electricity when exposed to sunlight, so be careful not to short circuit the output cables. If shorted, the cables can become overheated and their cable sheaths can melt.
- Stop working when the surface of the roof is wet. There is a danger of slipping, falling, and shock.

### ⚠ CAUTION

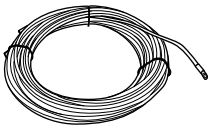
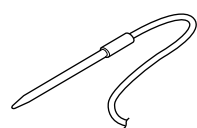
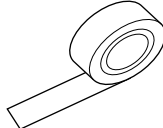
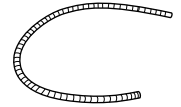
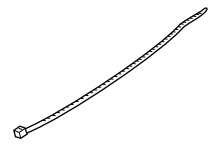
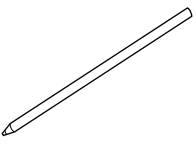
- Never step or sit on the glass surface of the solar modules. The glass may break.
- Do not twist the solar modules when you mount them (twisting should not exceed 0.1" per 4"). Failures and damage can result.
- When you mount the solar modules on the rail, never allow an output cable to become caught between the rail and a module frame. Short circuits and fire can result.

### 5.1 UNPACKING AND CHECKING PARTS

When you unpack the system, check the model names of the components of each system and check to be sure that you have the correct number of parts.

### 5.2 MATERIALS AND TOOLS YOU WILL NEED

Before starting installation work, make sure you have the following materials and tools on hand (including materials and tools for electrical work).

Suggested Materials					
Ground wire	Ground rod	Electrical tape	Flexible metal conduit (to protect electric cables)	Cable ties	Pencil
					

# 5 POINTS TO CHECK BEFORE INSTALLATION WORK

Tools	<p>Cordless drill</p> 	<p>Socket drivers 8 mm &amp; 13 mm</p> 	<p>Phillips driver bits</p> 	<p>Drill</p> 	<p>Screw driver set</p> 
	<p>Needle nose pliers</p> 	<p>Line man's pliers</p> 	<p>Wire cutters</p> 	<p>Hammer</p> 	<p>Chisel</p> 
	<p>Crimping tool</p> 	<p>Knife</p> 	<p>Tape measure</p> 	<p>Extension cord</p> 	<p>Chalk line</p> 
	<p>Gloves &amp; safety helmet</p> 	<p>Rope</p> 	<p>Tool belt</p> 	<p>Ladders</p> 	<p>Safety Harness</p> 
	<p>Safety glasses</p> 	<p>Air mask</p> 	<p>Ratchet Wrench</p> 		
Measurement	<p>Compass</p> 	<p>Calculator</p> 	<p>Solar insolation meter</p> 	<p>Digital multimeter</p> 	

# 6 INSTALLATION WORK

## 6.1 PREPARING SHINGLE ROOF FOR INSTALLATION

1. Locate roof rafters or trusses.

Here are 3 options to finding the locations:

- A. Locate and measure the locations of the rafters in the attic or at the outside eave and transfer measurements to the roof.
- B. Use a hammer or rubber mallet to tap the roof and locate the rafters. This will work with a cap sheet or composition roof.
- C. Scan the roof with a high sensitivity stud finder.

2. Once the rafters have been located, snap a vertical chalk line on every rafter to identify the location.

3. Measure up from the eave 16" (400 mm) in at least

3 locations. Snap a chalk line. This marks the location of the bottom edge of the slider feet.

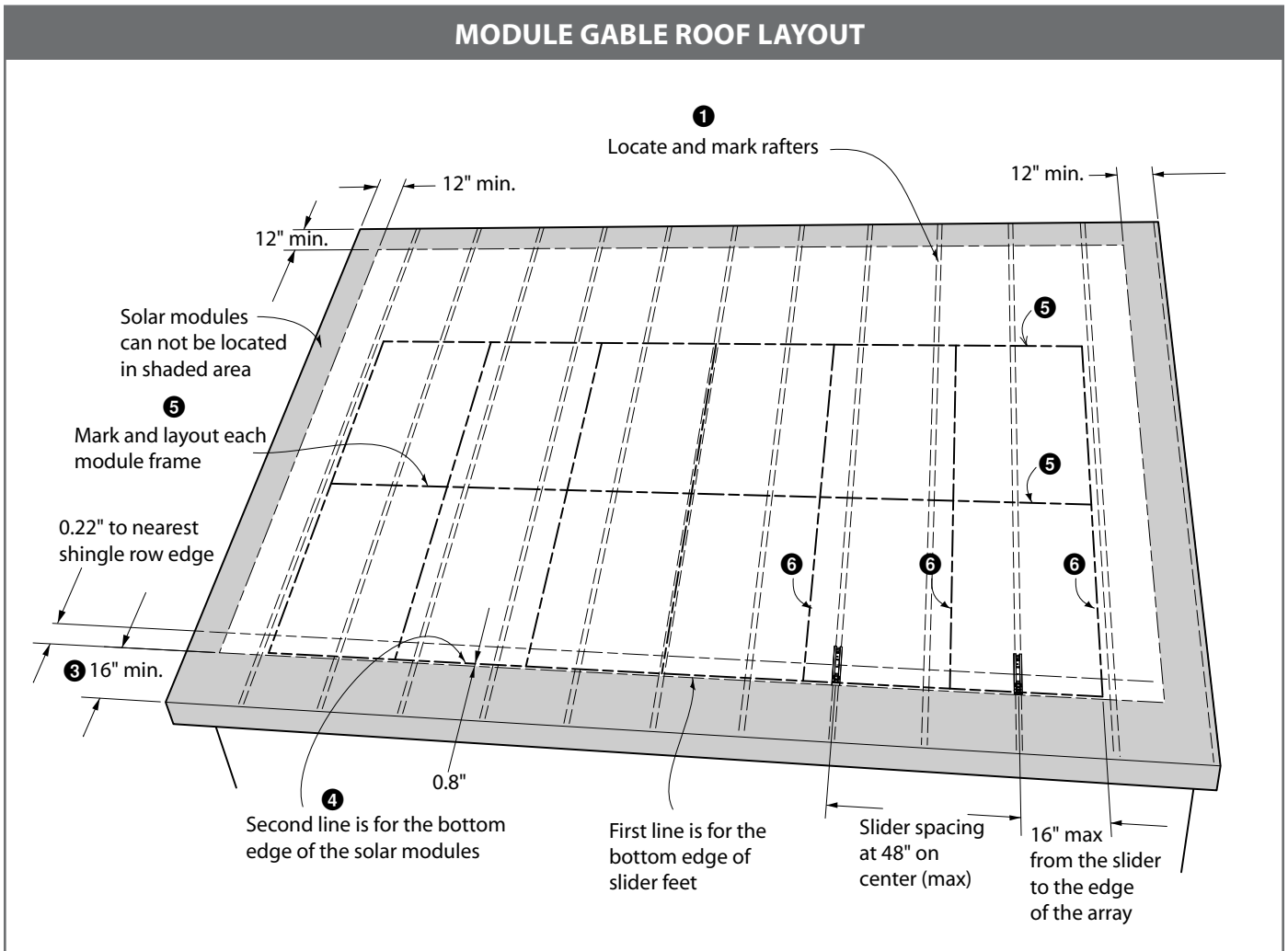
Note: This line needs to be 0.22" (5.5 mm) away from the nearest front edge of shingles.

4. Measure up from chalk line 0.8" (20 mm) and snap a new chalk line. This marks the location of the bottom edges of the modules.

5. Measure up from the module chalk line to the desired module height to form the array. Snap horizontal lines at the measured locations for each row of rail.

6. Mark and layout solar module vertical lines.

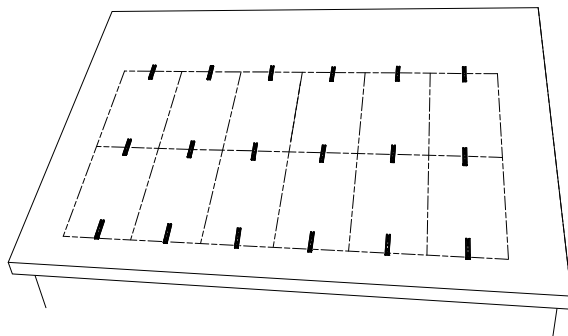
Note: modules should not fall in shaded areas.



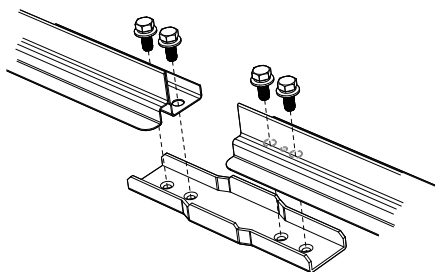
## 6 INSTALLATION WORK

### 6.2 CHECKING LAYOUT

1. Before installing sliders, check layout of rails and splices.
2. Place all sliders in desired locations, but do not install screws yet.



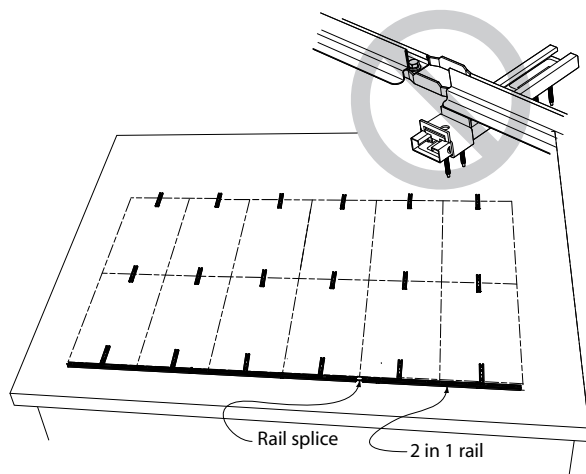
3. Pre-assemble rails and splices.



#### **CAUTION** Bolt Tightening Instructions

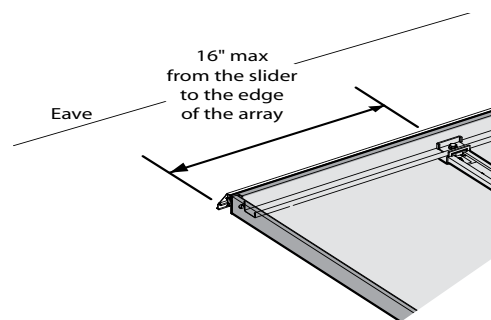
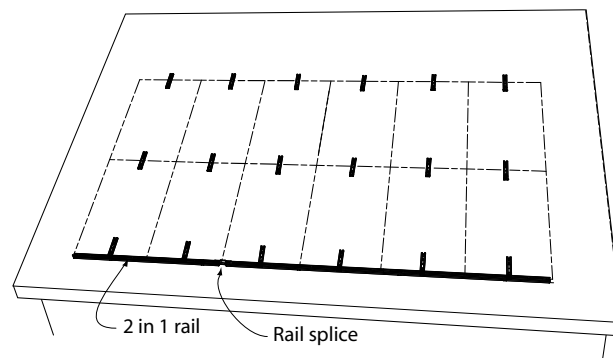
Begin tightening bolts by hand. After 5 turns by hand, use a socket driver to finish tightening. The proper torque is SI units 12.5 Nm/USA units 9.3 ft.lb.

4. Place rails with splices into position. Ensure slider locations do not overlap splices.

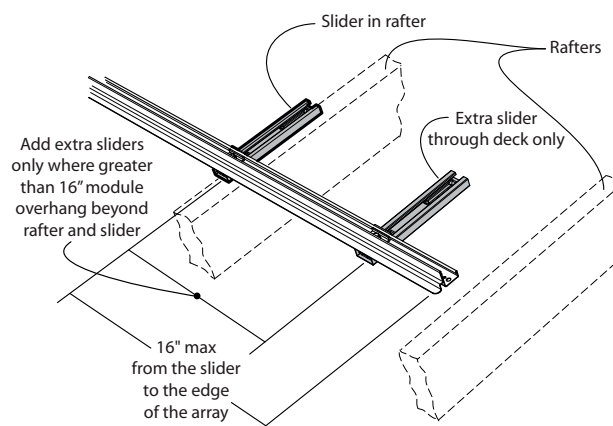
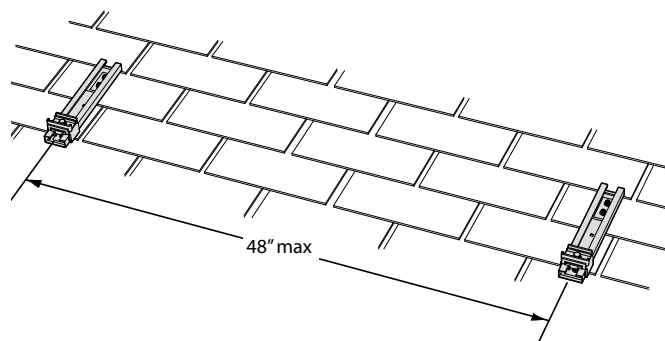


5. If these overlap or seem too close, shift rails horizontally or move sliders to next rafter or remove splices to switch the long and short rails to opposite sides. Reattach splices after rails are switched and recheck for overlap.

**CAUTION** The maximum module overhang from the slider to the edge of the array is 16".



Sliders not to exceed more than 48" on center.

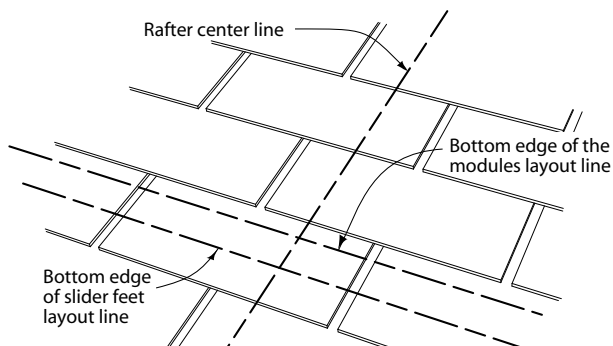


## 6 INSTALLATION WORK

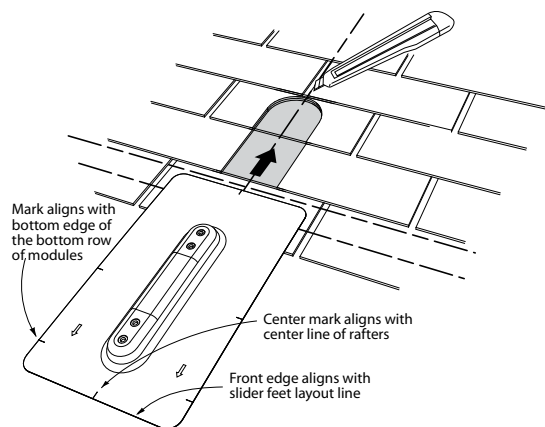
### 6.3 INSTALLING THE OPTIONAL FLASHINGS

Flashings can improve water and ice management on the roof by directing the water around the rail slider assembly. It is intended for use in new construction, re-roof, and in locations with significant precipitation. The flashings are installed under the standard slider assembly. Each flashing is similar in size to the slider assembly. The flashing has a large flange around it's perimeter to allow for integration with the surrounding shingles. There are 3 alignment marks on the flashing and identification for the orientation of the part.

1. Confirm the locations of each standard slider assembly. Follow the same rules for installation as the slider foot. The flashings located on the bottom rail (close to the eave), should be aligned with the chalk lines created in the roof layout. Flashings used to support the center rails should be centered on the rail line. The flashings located at the top rail (close to the ridge), should have minimal exposure beyond the rail.

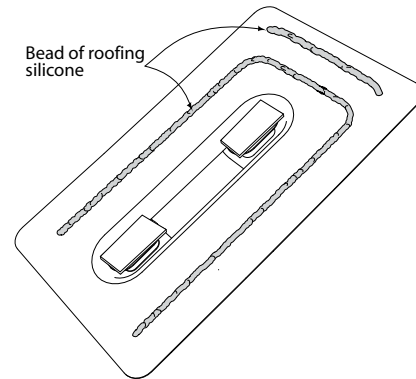


2. Dry fit the flashing in the location marked for installation. Use a utility knife to cut the surrounding shingles to assure a flush and water resistant fit. Install flashing over a layer of shingles to insure water resistance.

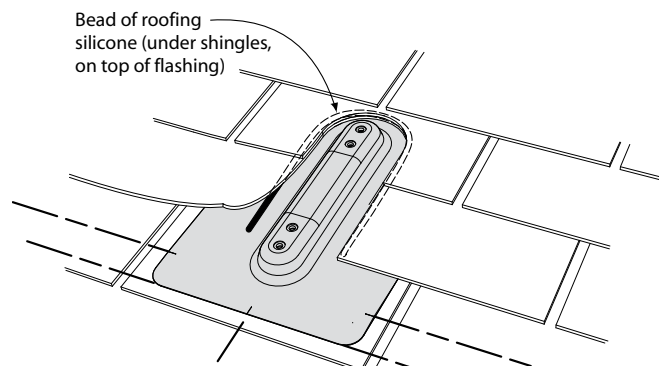


**CAUTION** The arrow on the flashing should point down to the eave side. Install flashing over a layer of shingles to insure water resistance.

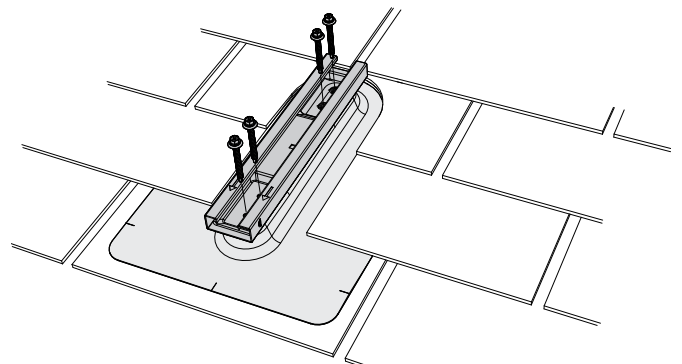
3. Invert the flashing, peel off the protective backing paper and apply a bead of roofing silicone along the top and sides in the flange area. Leave the bottom flange clear for water drainage. When shingles are cold, they become brittle and are difficult to work with. Use a putty knife to lift the shingles and slide in the flashing.



4. Apply a bead of silicone on the top and sides of the flange that contact the surrounding shingles. Press the area to create tight seal.



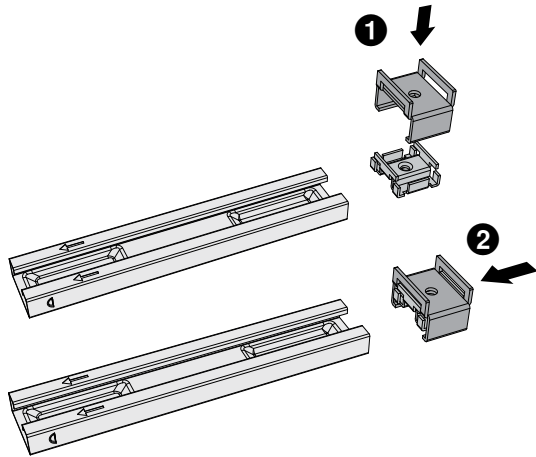
5. Peel off the backing paper from the standard slider. Place the standard slider assembly on the flashing and secure with four (XA58) 110mm flashing screws.



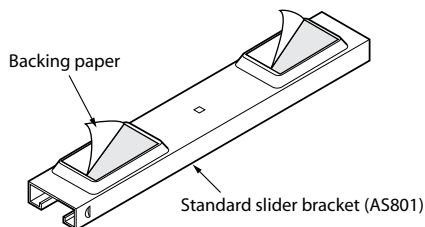
## 6 INSTALLATION WORK

### 6.4 INSTALLING STANDARD SLIDER ASSEMBLY

1. Insert standard slider top and bottom brackets into each standard slider assembly prior to installation.



2. Peel off the backing paper from the standard slider.



Each adjustable slider is equipped with 2 pre-installed butyl sealant pads. The backing paper must be removed prior to installation on the roof.

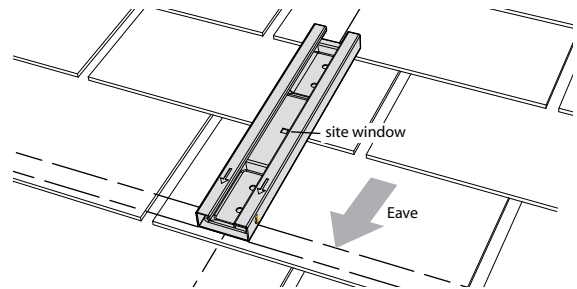
A hole is located at the center point of the slider. It can be used as the site window for locating the slider on the previously snapped chalk line.

There are 2 arrows located at one end of the slider. The arrows should be pointing towards the eave of the roof. The arrows indicate the location of indents on the slider that prevent the standard slider bottom bracket from falling out.

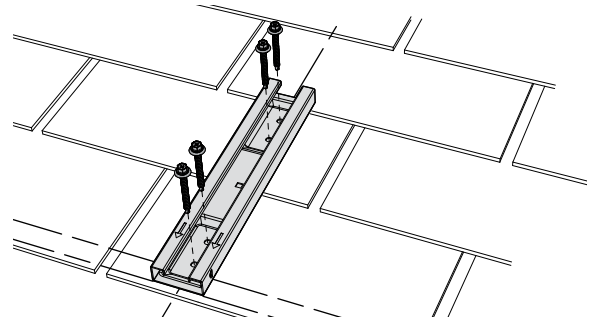
Place the slider assembly in the measured location and install the self-drilling screws at the upper and lower holes.

**CAUTION** The arrow on the standard slider assembly should point to the eave.

3. Remove any debris, and press the slider assembly into place. Site window should align with the front edge of the shingles.

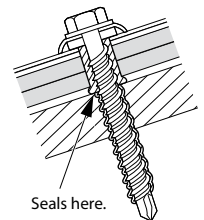


4. Install four (XA02) 80 mm self-drilling screws (using 8 mm socket) to achieve the appropriate pullout strength for the site location. Be certain to apply silicone sealant to the hole prior to installation of the screws.

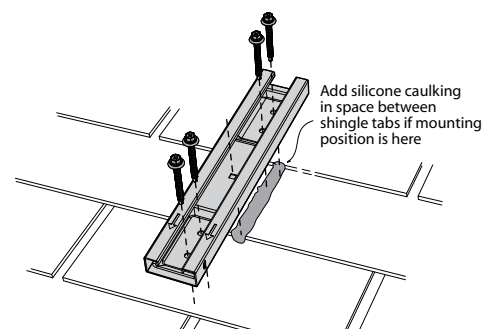


#### TECH NOTE : DURABLE AND WATER FAST BUTYL RUBBER

Butyl rubber is used as filler in the concrete joints of dams. As shown at right, it twists around the mounting screw and seals the hole in the roofing felt and sheathing.



**CAUTION** If slider is positioned on top of the space between shingle tabs, fill the void with the supplied silicone caulking.





## 6 INSTALLATION WORK

### 6.5 PREPARING TILE ROOF INSTALLATION

1. Locate roof rafters or trusses.

Tip: here are 3 options to finding the locations.

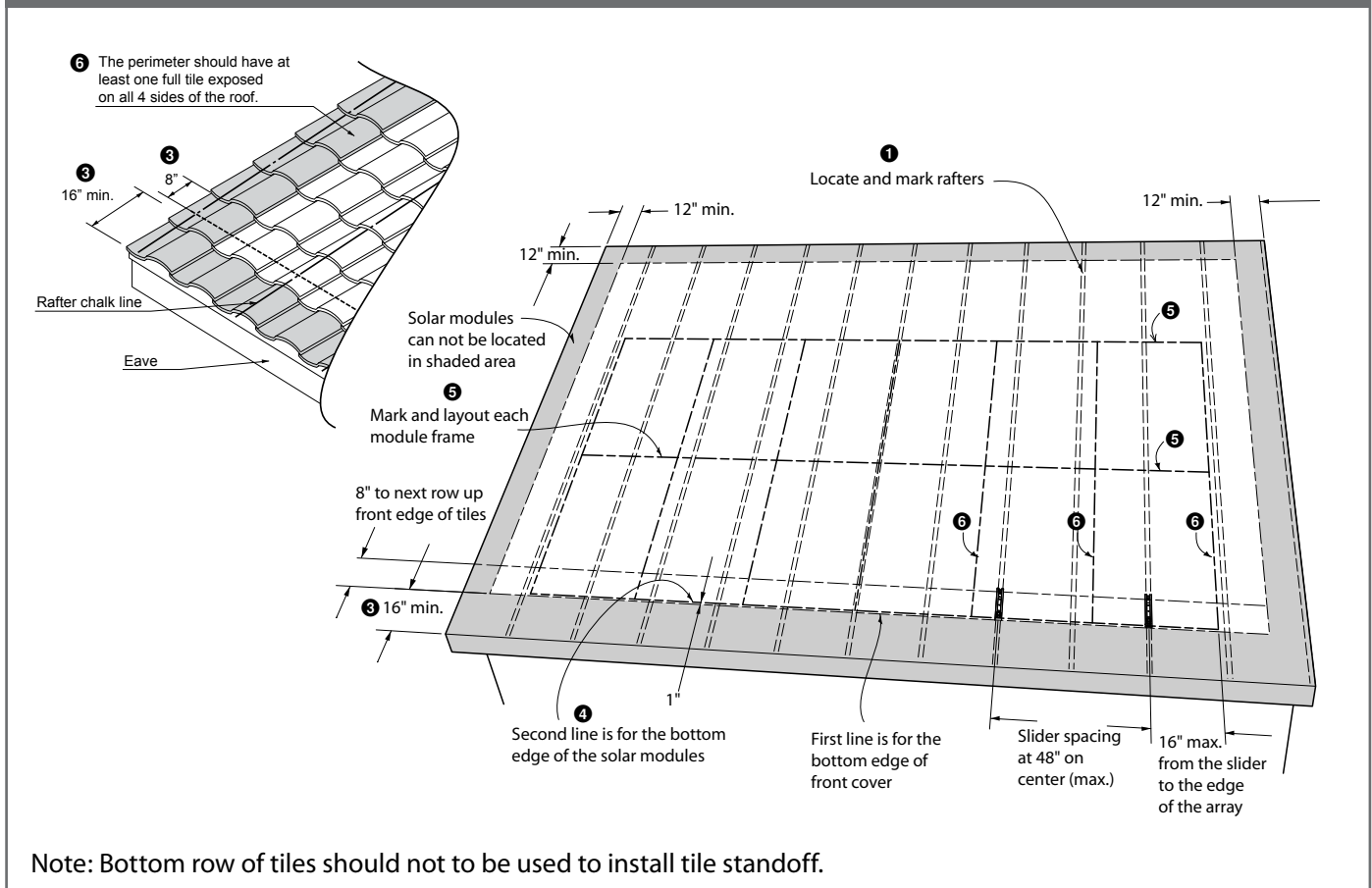
- A. Locate and measure the locations of the rafters in the attic or at the outside eave and transfer measurements to the roof.
  - B. Use a rubber or leather mallet to tap the roof and locate the rafters. This will work with a cap sheet or composition roof.
  - C. Remove a few tiles and scan the roof with a high sensitivity stud finder.
2. Once the rafters have been located, snap a chalk line on every rafter to identify the location.
  3. Measure up from the eave 16" (400 mm) in at least 3 locations. Snap a chalk line. This marks the location of the bottom edge of the front cover.

Note: This line needs to be 8" away from the next row up front edge of tiles. The bottom rail (eave) should be centered in the 2<sup>nd</sup> course of tile. Do not install rail in the 1<sup>st</sup> course of tile, it is too close to the edge.

When using 167 Watt modules, install the next rails 3 courses higher than previous rail. When using 187 Watt modules, install the next rails 4 courses higher than previous rail.

4. Measure up from chalk line 1" and snap a new chalk line. This marks the location of the bottom edges of the modules.
  5. Measure up from the module chalk line to the desired module length to form the array. Snap horizontal lines at the measured locations.
  6. Mark and layout solar module vertical lines.
- Note: modules should not fall in shaded areas.
7. Tile attachment is designed for use with a minimum thickness of 15/32" roof deck and minimum rafter size of 2" x 4".
  8. Tile attachment is designed for use with flat concrete tile, low profile S tile, and medium profile S tile.
  9. The roof tiles must be able to fit within the 4 inch gap between the deck and the rail.

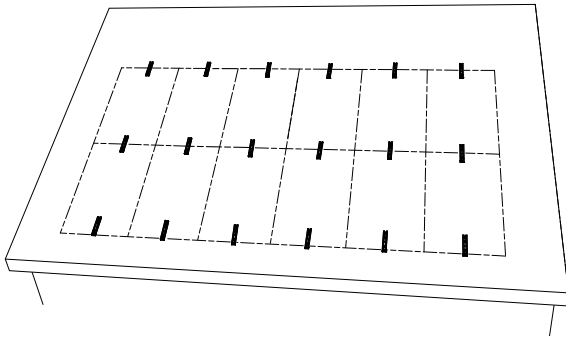
### MODULE GABLE ROOF LAYOUT



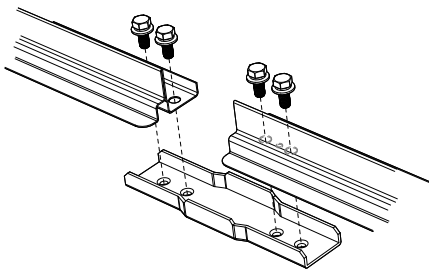
## 6 INSTALLATION WORK

### 6.6 CHECKING LAYOUT

1. Before installing sliders, check layout of rails and splices.
2. Place sliders on all tiles that were identified to be drilled for tile standoffs.



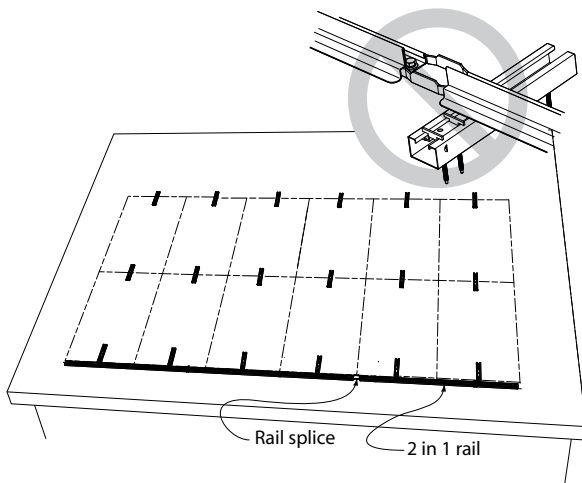
3. Pre-assemble rails and splices.



#### **CAUTION** Bolt Tightening Instructions

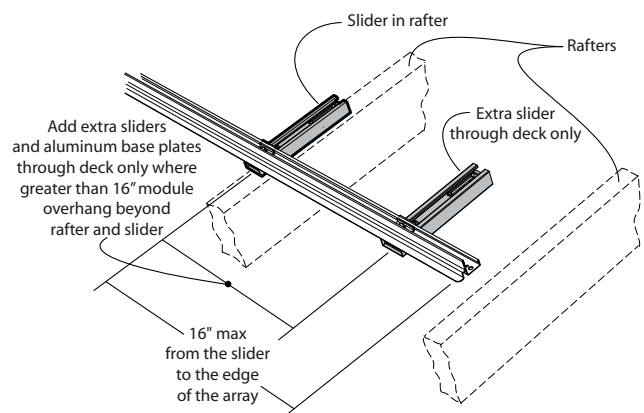
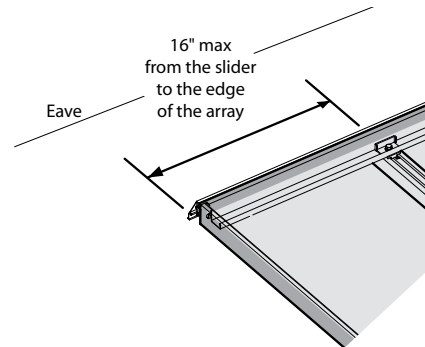
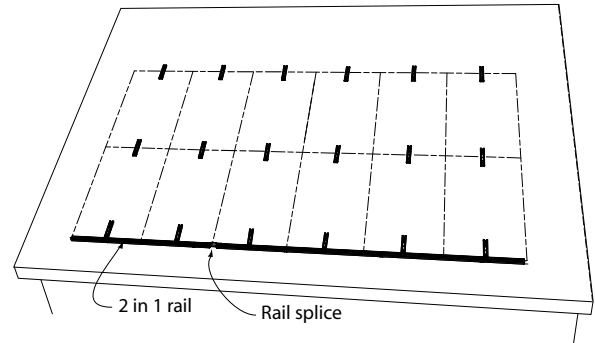
You must begin tightening bolts by hand. After 5 turns by hand, use a socket driver to finish tightening. Proper torque (SI units 12.5 Nm) (USA units 9.3 ft.lb)

4. Place rails with splices into position. Ensure slider locations do not overlap splices.

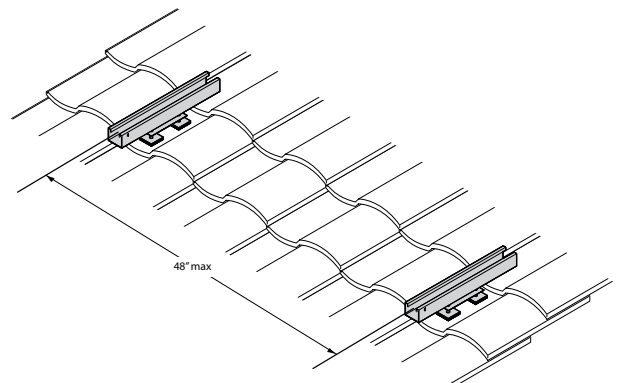


5. If these overlap or seem too close, shift rails horizontally or move sliders to next rafter or remove splices to switch the long and short rails to opposite sides. Reattach splices after rails are switched and recheck for overlap.

**CAUTION** The maximum distance from the slider to the edge of the array is 16".



Sliders not to exceed more than 48" on center.

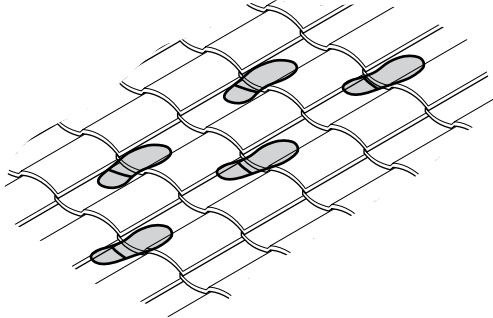


# 6 INSTALLATION WORK

## 6.7 INSTALLING TILE SLIDER ASSEMBLY

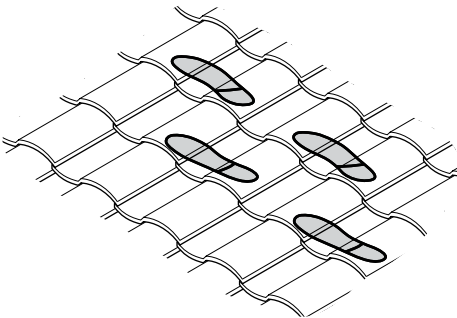
Note: Foot placement for tile roof.

Walking up and down roof



Balance weight in pan where tiles overlap

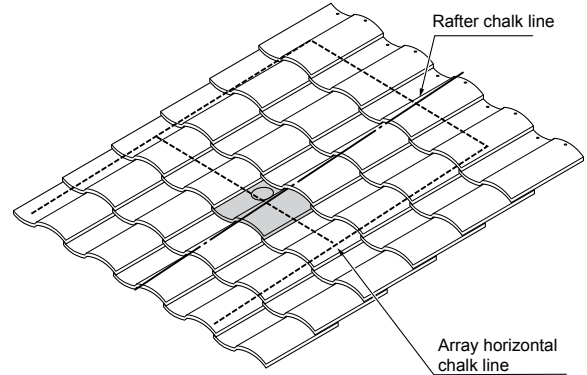
Walking across roof



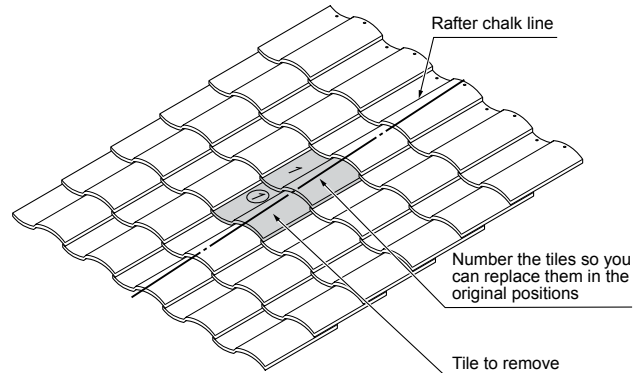
Spread weight across two tiles

- Toe on top of tile 1
- Arch on pan overlap
- Heel on top of tile 2

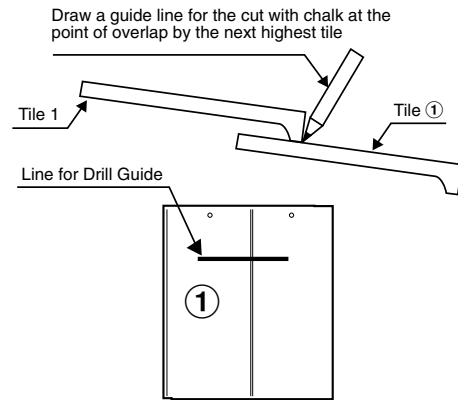
1. Identify the locations for the roof tile sliders so that each slider is located in the valley of the tile.



2. Number two tiles, one above the other. The lower tile will be removed to install the aluminum support plate.

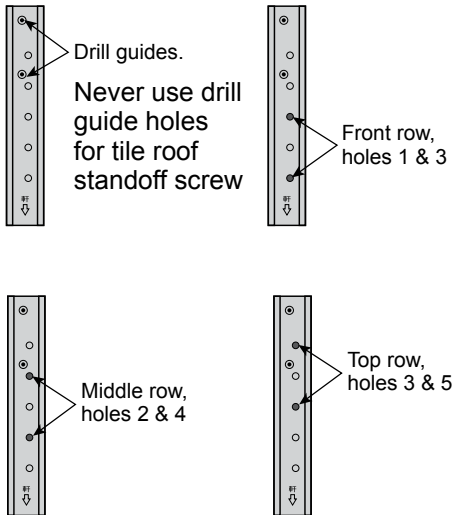
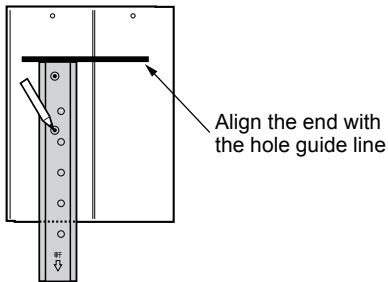
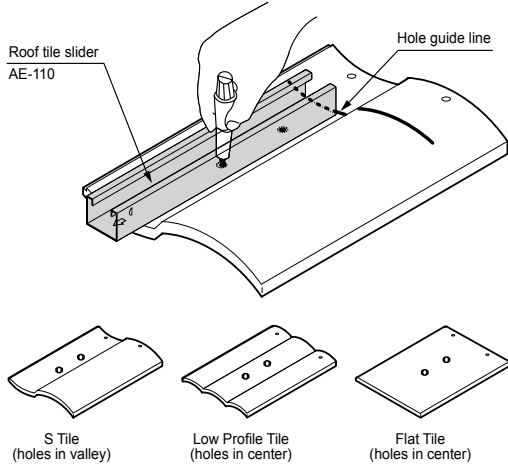


3. Mark the edge of the upper tile on the lower tile to insure proper alignment upon assembly.



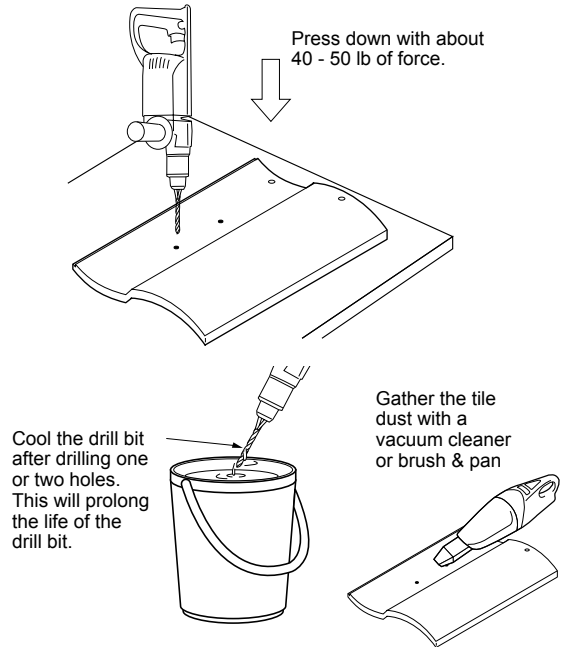
## 6 INSTALLATION WORK

- Remove the lower tile from the roof.
- Place the roof tile slider on the lower tile and align with the horizontal line marked above. Mark two holes for roof tile stand off.



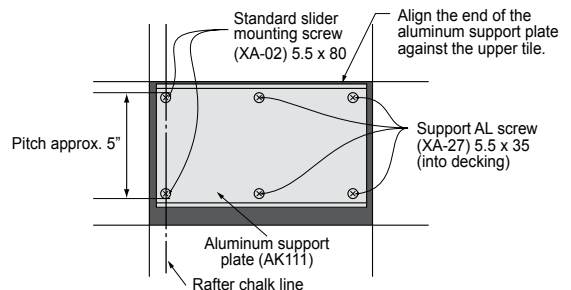
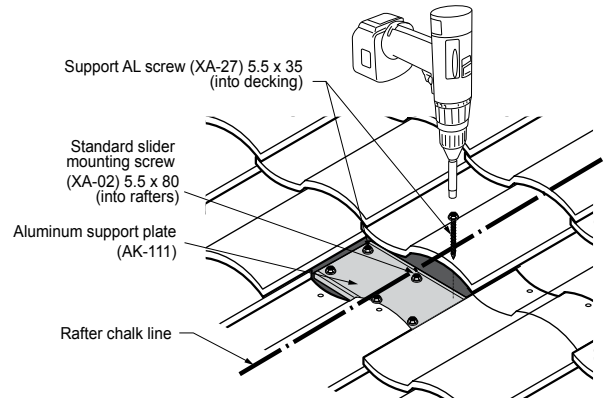
- Drill 2 holes using supplied drill bit (AE112). A high speed drill (approximately 1000 rpm) is required for this process. Exert a pressure of 40 to 50 lb. Make certain to dip the tip of the drill in water after drilling

each hole. This will cool the drill bit. Clean any debris and dust after drilling.



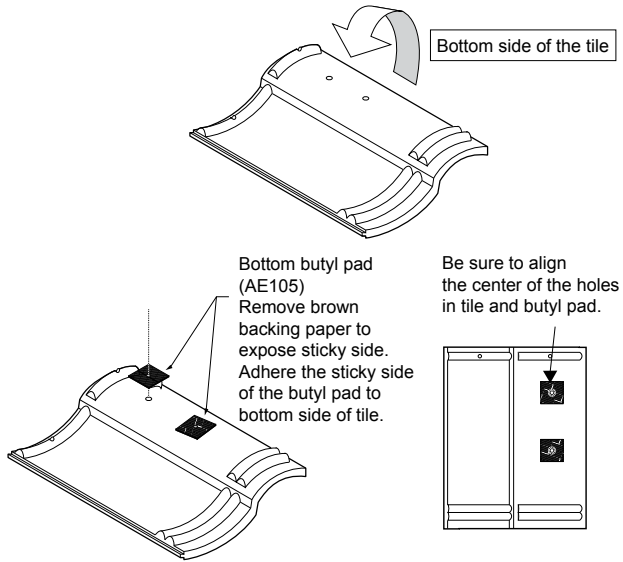
**CAUTION** Drill holes on the ground for safety reason.

- Locate the rafter and place the aluminum support plate on the deck. Install two 80 mm screws (XA02) through the plate, spaced ~ 5" apart, into the rafter. Install four 35 mm screws (XA27) through the plate and into the deck. The screws should be spaced equally along the upper and lower edges of the plate.

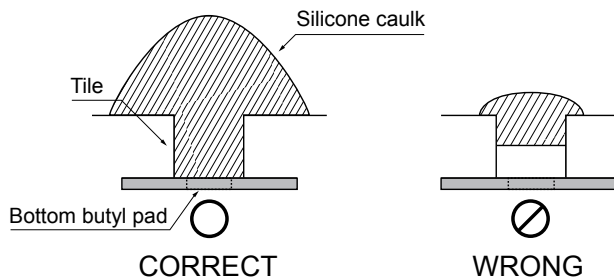
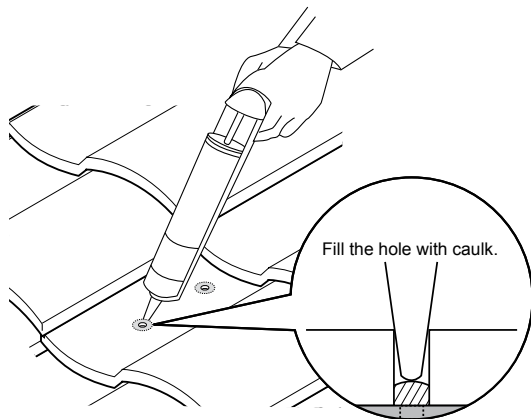


## 6 INSTALLATION WORK

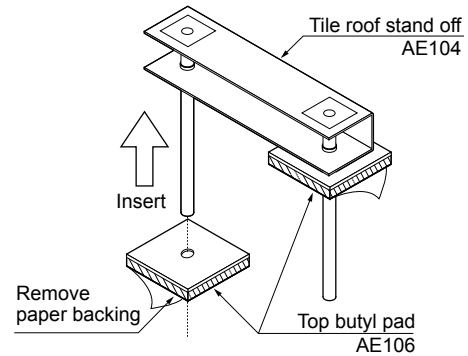
8. Place 2 butyl pads under the holes drilled in the tile. The butyl should be located on the underside of the tile. Reinstall the tile on to the roof according to the locations marked previously.



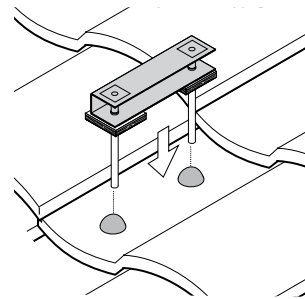
9. Inject Sharp supplied silicone caulk (AE107) into the holes to form a dome. The dimensions of the dome are ~ 0.75" in height and 1.5" in diameter.



10. Insert 2 top butyl pads onto the tile standoff legs.

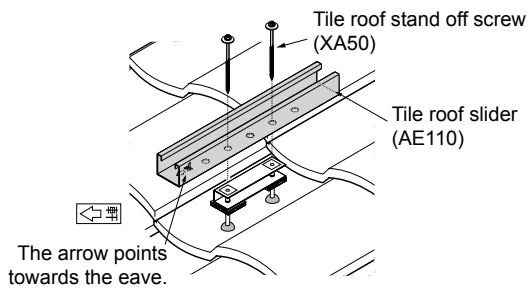
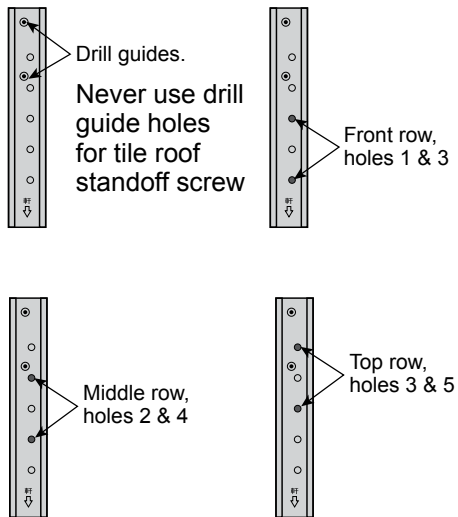


11. Insert the tile roof stand off into the drilled holes until it rests on top of the aluminum support plate.

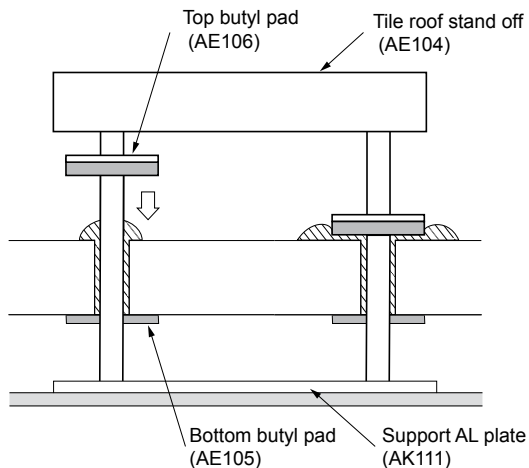


## 6 INSTALLATION WORK

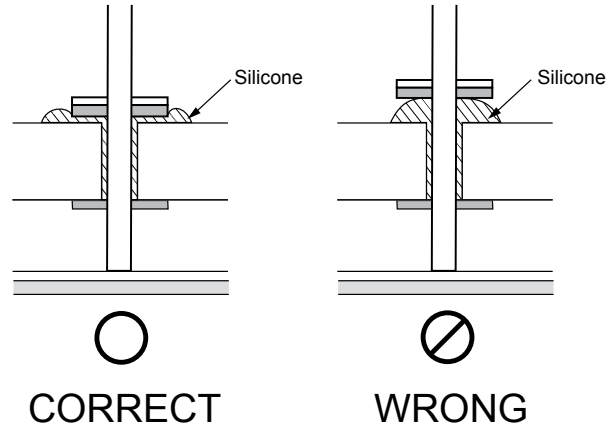
12. Place the tile slider over the standoff and secure with two 135 mm screws (XA50).



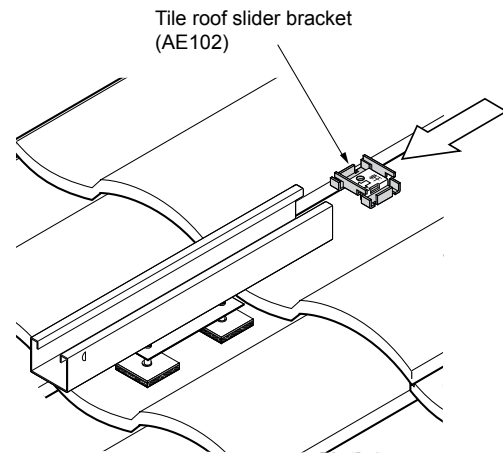
13. Push the top butyl pad into the silicone dome. Make sure that the silicone caulk forms a bead around the butyl pad.



**Notice:** Butyl pads should be pushed down after sliders are secured to stand off with two 135 mm screws (XA50).



14. Insert the roof tile slider bracket (AE102) and prepare for rail installation.



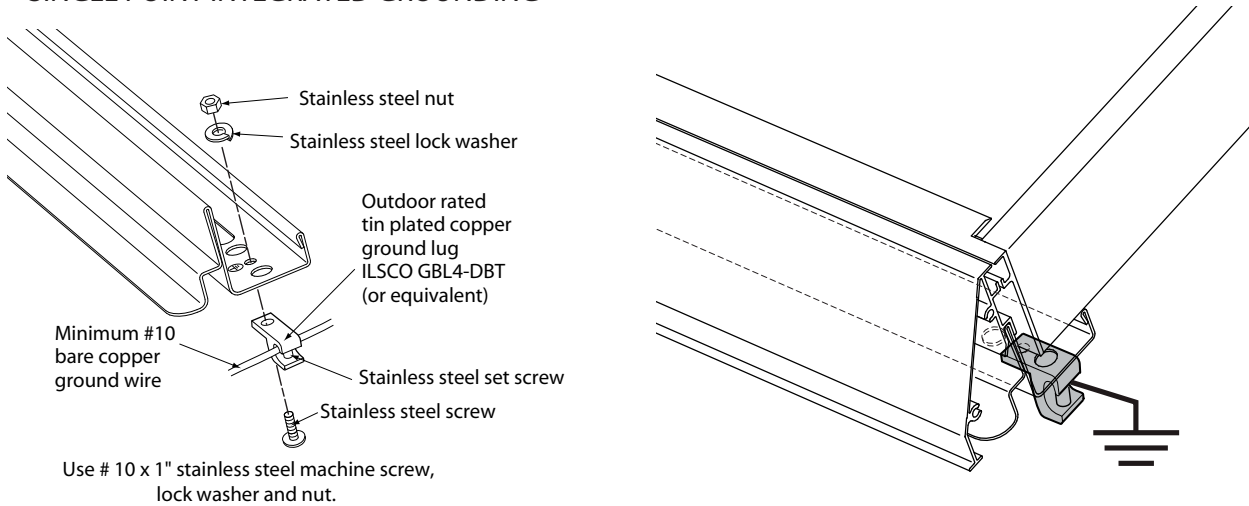
Repeat this process for all of the tile standoffs.

## 6 INSTALLATION WORK

### 6.8 SYSTEM GROUNDING

SRS utilizes single point integrated grounding. Use a minimum #10 AWG ground wire for this purpose. The equipment grounding conductor will continue down to the DC disconnect, inverter and AC service equipment.

#### SINGLE POINT INTEGRATED GROUNDING

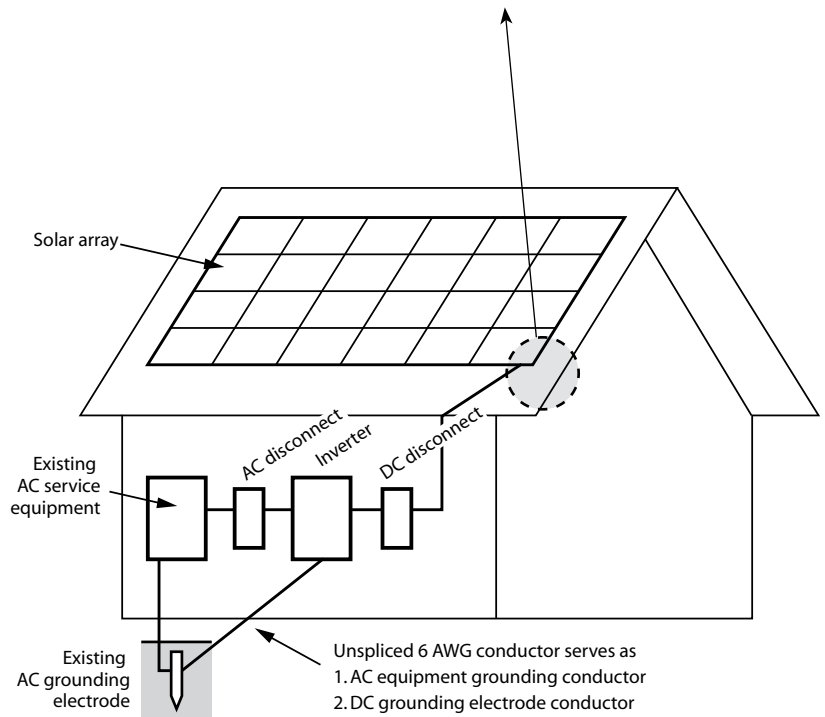


Continuous equipment grounding of modules and mounting system is provided by the Module Mounting Clips.

Ensure that every sub array is grounded and that during replacement or repair, removal of the last module breaks the ground path.

This can be achieved by installing grounding hardware on either end of bottom rails.

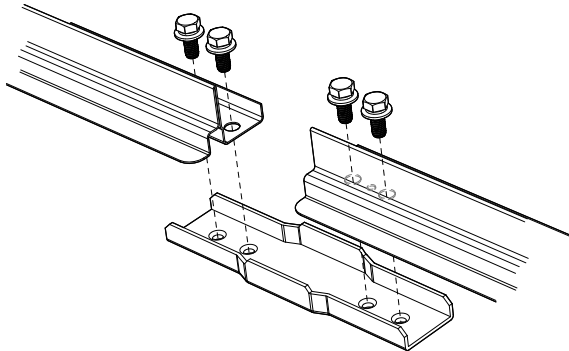
1. Install outdoor rated ground lugs or ring terminals with ground wire (per above drawings). Use the marked ground hole on either end of the rail.
2. Connect a minimum # 10 AWG solid conductor copper, ground wire to the ground lug or ring terminal.
3. Connect the end of the equipment grounding conductor in the array junction box
4. Connect the equipment grounding conductor to the DC disconnect, inverter, and AC service equipment.
5. Connect the ground wire from the inverter to a grounding electrode.



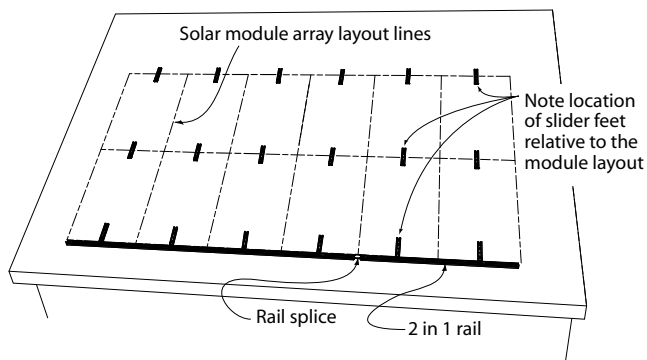
## 6 INSTALLATION WORK

### 6.9 INSTALLING MODULE SUPPORT RAILS

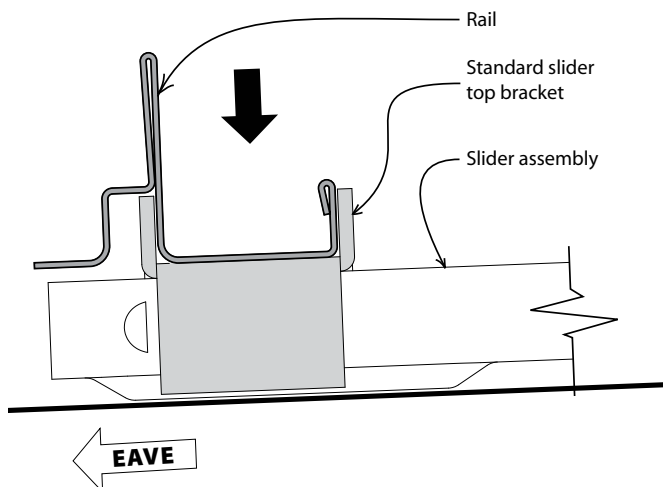
1. Create appropriate rail length by incorporating rail splice kit. Place splice under rails to be joined and fasten using 4 M8 bolts (XA52). Hand tighten 5 turns and use a 13 mm socket wrench to tighten to appropriate torque.



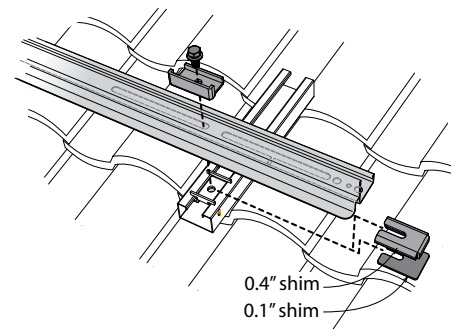
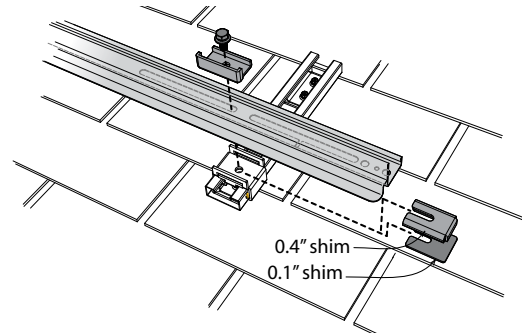
Note: Do not place two 1 in 1 rail splices next to each other.



2. Place rail on standard slider top bracket.



3. Insert M8 bolts (XA52) through dock washer (AD804) and fasten to standard slider bottom bracket.



4. Use shim kit to level the height of the rail on the roof. Place shim between rail and standard slider top bracket. Slide the shim into the bolt so that it is fully engaged.

Note: There are two types of leveling shims, 0.1" (AK113) and 0.4" (AK114). You will need to use bolts of different lengths, according to the total thickness of the shims. Refer to the following table.

Total thickness of leveling shims (inches)	Bolt length
0.08 to 0.47	M8 x 30
0.47 to 0.87	M8 x 40
0.87 to 1.26	M8 x 50
1.26 to 1.65	M8 x 60
1.65 to 2.05	M8 x 70

AK114 0.4" Shims	Bolt length
1	M8 x 30
2	M8 x 50
3	M8 x 60
4	M8 x 70

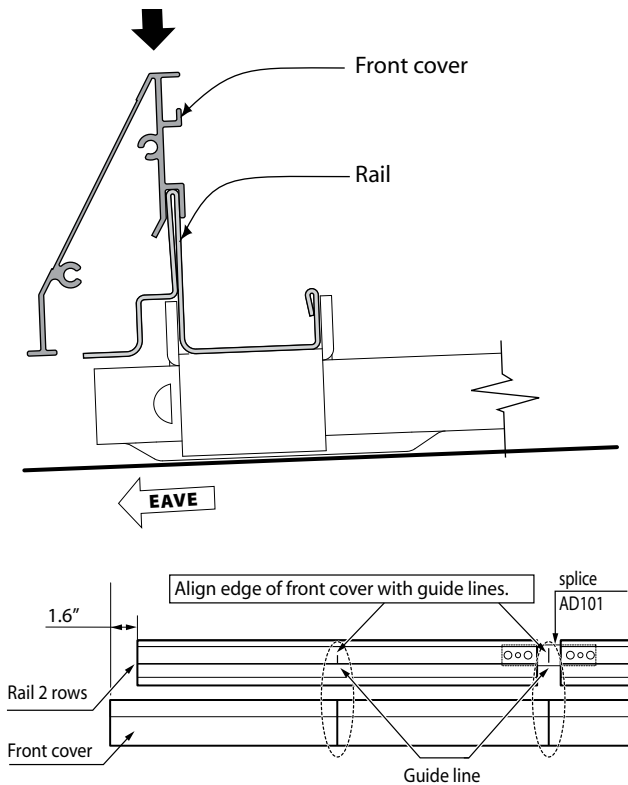


## 6 INSTALLATION WORK

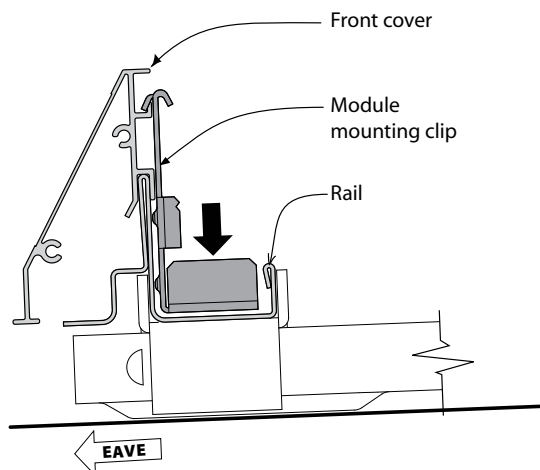
### 6.10 INSTALLING FRONT COVER

Prior to the installation of the bottom row of modules (located close to the eave of the roof) a front cover is installed to provide a finished appearance.

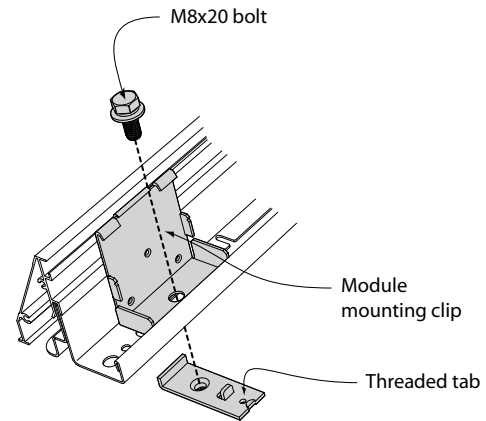
1. Place each front cover over the top of the support rail as shown below.



2. Place a module mounting clip (AD801) into the support rail. Make certain that the lip of the module clip captures the front cover as shown. Each module clip should be located approximately 8" (200 mm) in from the edge of the solar module.



3. Insert an M8 bolt through the clip and rail, and secure to threaded tab (AD105).

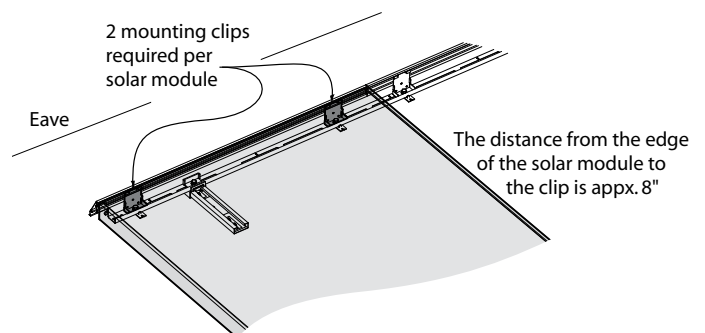


#### **CAUTION** Bolt Tightening Instructions

Begin tightening bolts by hand. After 5 turns by hand, use a socket driver to finish tightening. The proper torque is SI units 12.5 Nm/USA units 9.3 ft.lb.

Protective earth grounding of the individual photovoltaic modules is achieved by the securement of the modules to the mounting frames. The assembly instructions should be closely followed, in order to ensure a reliable ground connection.

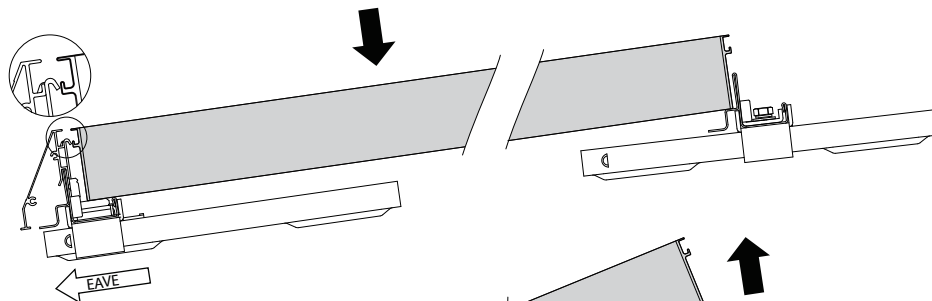
Note that 2 clips are required on each rail for each rectangular solar module. Securing the solar modules is important to the system durability.



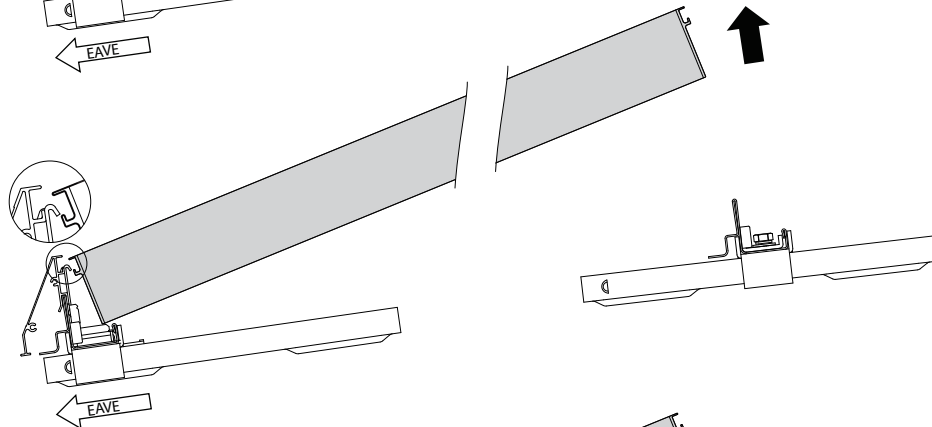
## 6 INSTALLATION WORK

### 6.11 INSTALLING THE MODULES ON THE SRS MOUNTING SYSTEM

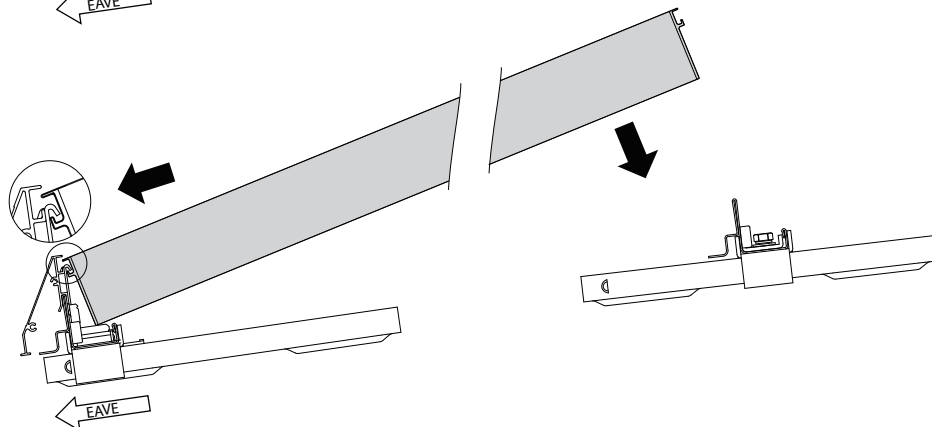
1. Stand at the ridge side of the roof and face the eave. Place the solar module on the rail so that it fits between the high points of the rail.



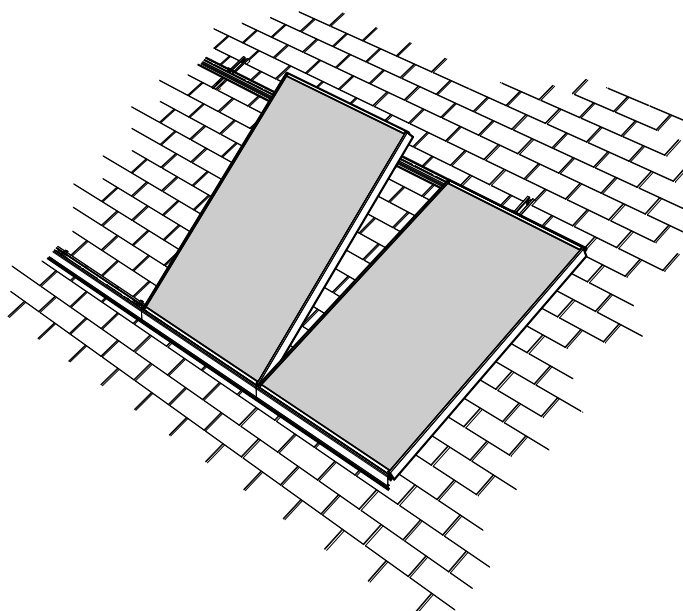
2. Lift the solar module at side facing the ridge of the roof. The solar module will slide forward slightly and will engage the locking clip (as shown).



3. Push the solar module forward and rotate down to fully engage the locking clip (as shown).



4. Install all of the solar modules in the row using the same procedure.



## 6 INSTALLATION WORK

5. Install entire row of modules.

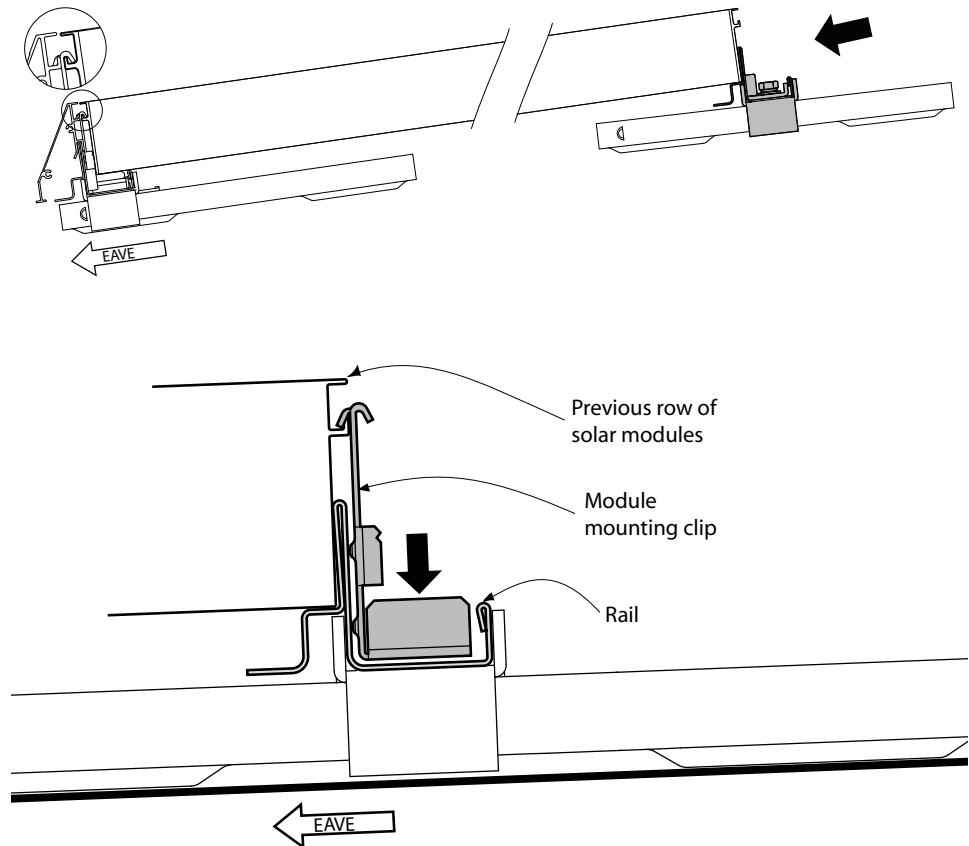
6. Push the rail towards the eave of the roof to tighten the fit of the row of modules. This will eliminate all gaps between the modules and rails.

7. Tighten the rail bolts to fully secure the solar modules and rail.

8. Place the module clips (AD801) on the rail. Two clips are required for each rectangular module.

Secure each clip with an M8 bolt and AD105 threaded tab.

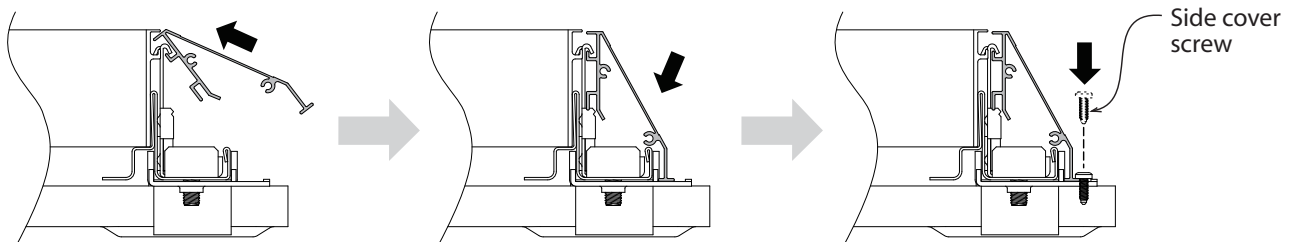
Continue this process until all rows have been installed.



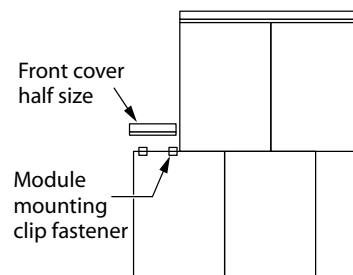
### 6.12 INSTALLING TOP COVER

1. Place rail cover at an angle to engage the rail clip.

2. Rotate the rail cover to fully engage the rail clip.



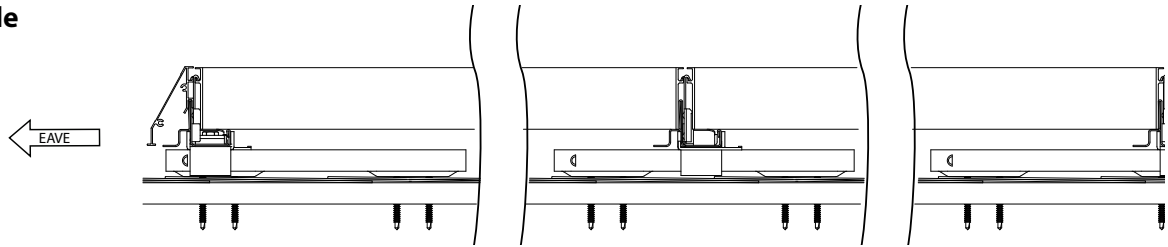
3. Insert the screw into the threaded tap and screw into place.



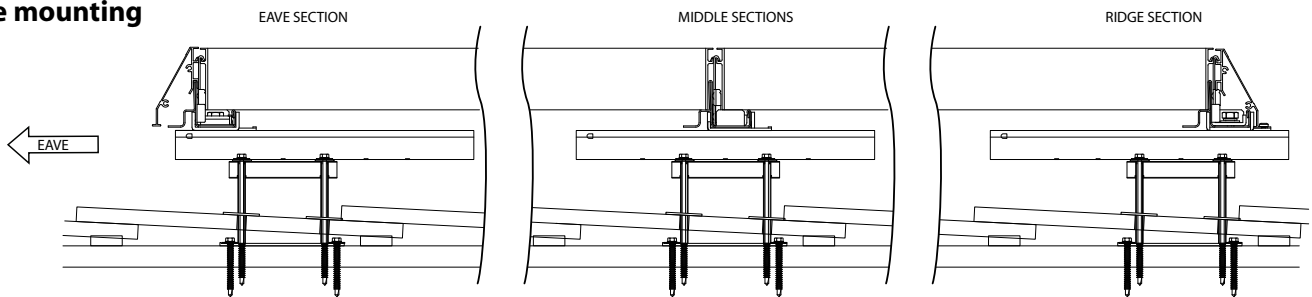
Note 2 clips to secure front cover

## 6 INSTALLATION WORK

### Asphalt shingle



### Tile mounting



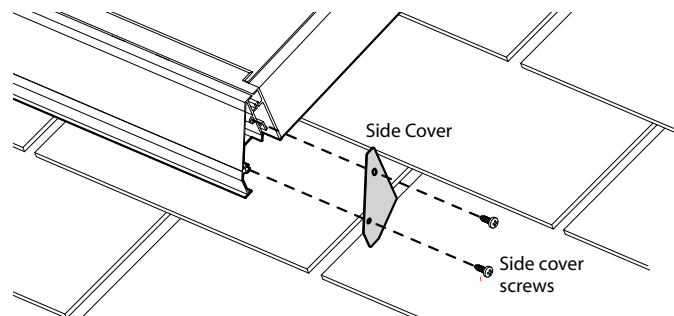
SRS cross section

### 6.13 INSTALLING SIDE COVER

Attach the side covers to the open ends of the rail covers.

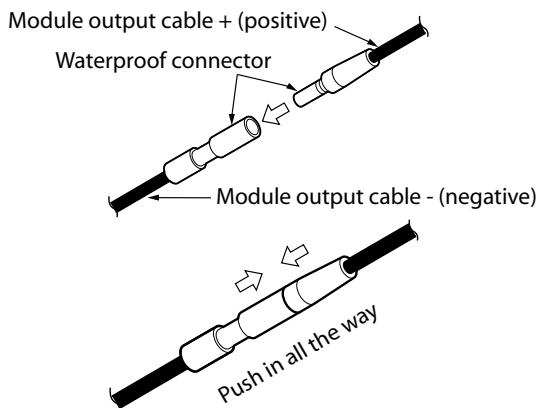
Use two side cover screws to secure each cover.

To save time, install side covers prior to installing rail covers.



### 6.14 CONNECTING THE SOLAR MODULES

1. Connect each module according to the solar array connection examples.
2. There is a cable + (positive) and a cable - (negative) on the back side of each solar module. Connect the waterproof connectors on these cables, making sure to push the connectors all the way in.



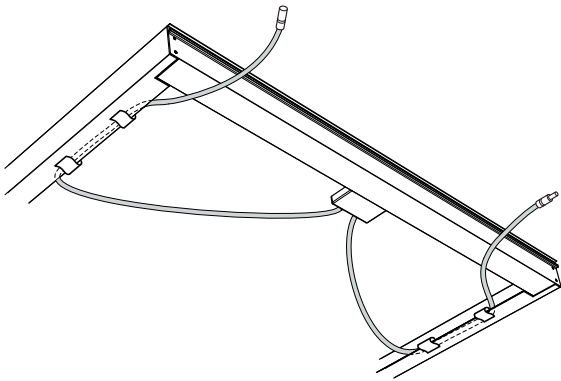
**CAUTION** Be sure to always push the connectors all the way in. Loose connections can result in heat, burns, and other damage.

3. On the first solar module, connect the positive home run cable to the positive array output cable, and connect the negative cable to the positive cable of the second solar module.

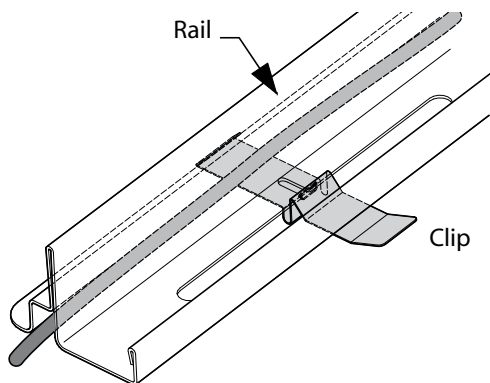
On the second solar module, connect the negative cable to the positive cable of the third solar module. Continue until you have series connected the appropriate number of modules for the desired voltage.

## 6 INSTALLATION WORK

- When you have made direct connections between the specified number of solar modules, use a digital multimeter to measure the voltage and current output of the array. Do this for each string, and record the measurement results.
  - This information is needed to check for solar module wiring mistakes, and it will also be needed by the electrician who makes the connections to the inverter.
- Organize the cables between solar modules. Bundle the cables so that they do not touch the roof, and use optional cable clips (AD806) to fasten them to the rear side of the module frame. Leaves and other debris can be caught around cables that are allowed to touch the roof, and over the years loose dirt can build up, potentially causing the roof to leak.



Use the optional cable clips (AD806) to secure wire to the module frame. Push clips onto the module frame where needed. Push wire into clip to secure.



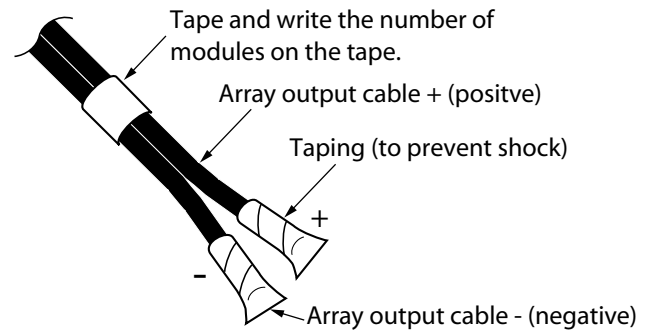
Use the optional cable support bars (AD803) to secure wire under the rail. Locate wires under rail and snap bar into rail as shown above.

- If the array cables stretch between rows, connect by running them underneath the rail.

**⚠ WARNING** Protect the terminals of the array output extension cables by covering them with insulating tape.

High voltage is generated between output cables whenever sunlight strikes a solar power array. There is a danger of shock.

- Tape the output cables for each string together, and write the number of solar modules in the array on the tape, so that it can be understood by the electrician who makes the connections to the inverter.



- Tape the + (positive) and - (negative) cable ends separately.

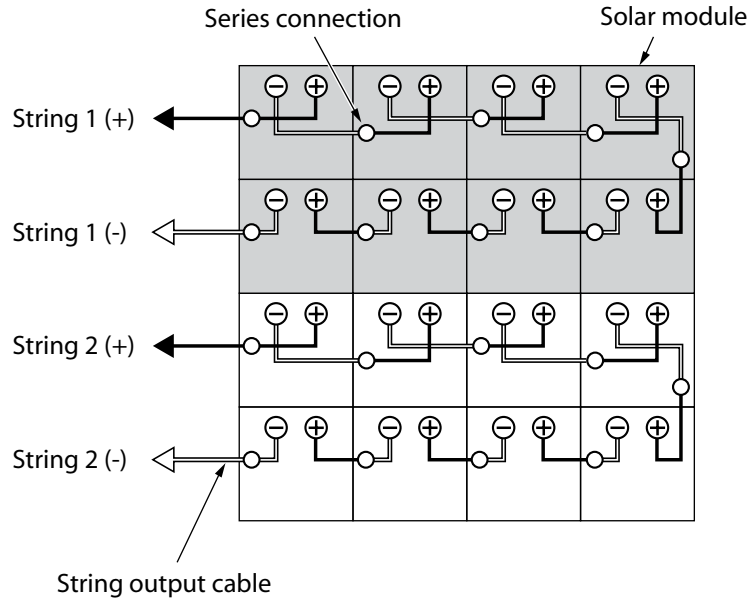
**⚠ CAUTION** Follow the provisions of the NEC. Electric cable can deteriorate or be damaged if not protected.

When cabling is installed outdoors or passed through walls, protect it with metal conduit, flexible metal conduit, or other protection. Failure to do so can result in shock or short circuits.

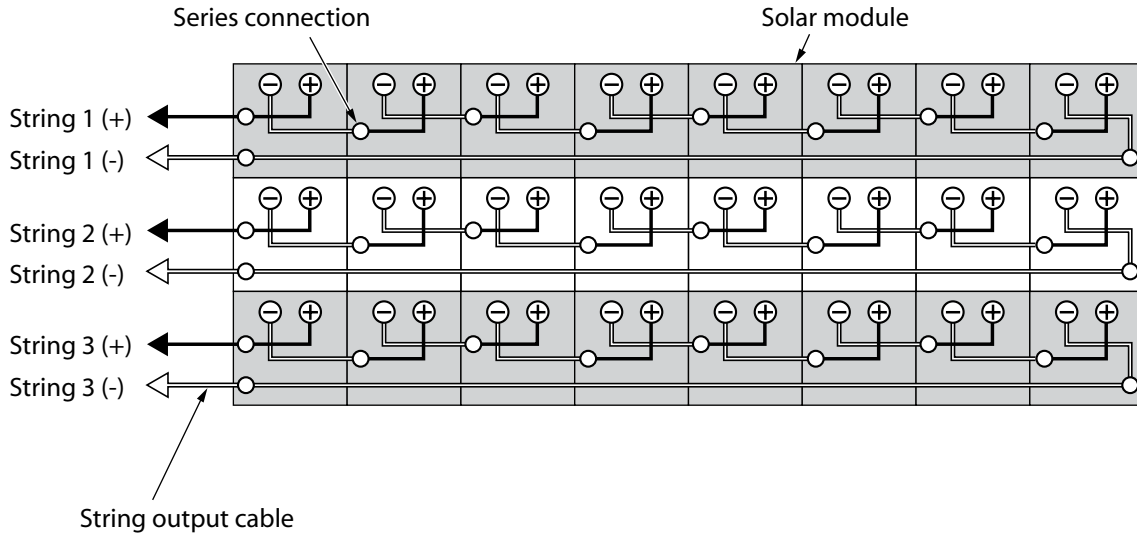
- Always protect the array output cables with conduit wherever they touch the roof or are exposed to direct sunlight.

# 6 INSTALLATION WORK

## BELOW ARE ILLUSTRATIONS OF TYPICAL SERIES STRING WIRING CONNECTIONS



Solar module connections example, 4 rows, 4 columns;  
each string has 8 modules connected in series.



Solar module connections example, 3 rows, 8 columns

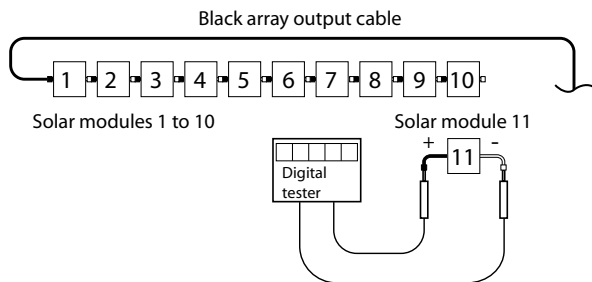
## 6 INSTALLATION WORK

### 6.15 TESTING MODULE STRINGS FOR CORRECT VOLTAGE

Note: The examples in this section show values for ND modules. The voltage will differ for other modules.

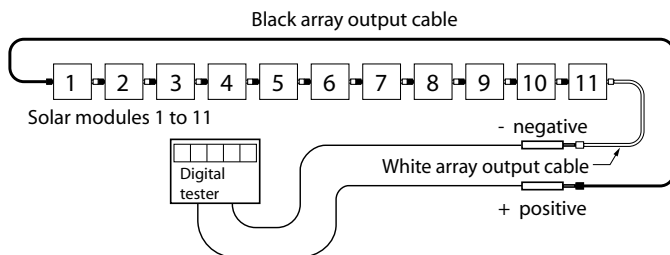
For an array of 11 modules, directly connect the first 10 solar modules and measure in the following order.

1. Measure the voltage of the 11<sup>th</sup> solar module.



Switch the tester to DC (50 V<sub>DC</sub> range) and measure. The voltage will vary depending on the amount of sunlight, but the value should be from 30 to 35 V<sub>DC</sub>.

2. Next, connect the 11<sup>th</sup> solar module to the 10<sup>th</sup> solar module. Switch the tester to DC 600 V<sub>DC</sub> range and measure. Measure the voltage at the ends of the - (negative) array output cable connected to the 11<sup>th</sup> module, and the + (positive) array output cable connected to the 1<sup>st</sup> solar module.



The voltage will vary depending on the amount of sunlight, but it should measure, about 360 V<sub>DC</sub>. Be careful of shock.

3. Check the measurements

- Multiply the value measured for a single solar module in step (1) by the number of solar modules.

Example: 32.5 V<sub>DC</sub> x 11 modules = 357.5 V<sub>DC</sub>

- Compare this value to the measured value (e.g. 360 V<sub>DC</sub>) for the whole array. The string wiring is correct if the difference is 9 V or less.

Difference between (voltage of 1 solar module x N) and (voltage of whole array) less than 9 V.

N: number of solar modules in 1 string.

- If the difference is greater than 9 V, repeat the measurement. If you obtain the same result, check for incorrect wiring.

# LIMITED WARRANTY

SHARP ELECTRONICS CORPORATION ("Sharp") warrants this Sharp brand product ("Product"), ONLY TO THE FIRST CONSUMER PURCHASER (defined as the first consumer that purchases Product for its own installation) to be FREE FROM DEFECTIVE MATERIAL AND WORKMANSHIP for 10 years from the date of original retail purchase. ("The Warranty Period"). This Limited Warranty shall cover parts and labor.

THIS LIMITED WARRANTY IS VALID ONLY IN THE FIFTY (50) UNITED STATES, ALL UNITED STATES TERRITORIES AND CANADA.

This Limited Warranty may be transferable upon sale of the Product or overall system so long as the Product remains installed in its original location during the Warranty Period. Any such transfer will not cause the beginning of new warranty terms, nor shall the original terms of this Limited Warranty be extended.

PRODUCT MODEL NUMBERS COVERED BY THIS LIMITED WARRANTY:

AA-801, AA-802, AA-803, AA-804, AA-805, AB-801, AB-802, AB-803, AD-101, AD-105, AD-801, AD-802, AD-803, AD-804, AD-805, AD-806, AE102, AE104, AE105, AE106, AE-107, AE110, AE112, AK111, AK-113, AK-114, AS-105, AS-801, AS-803, AS-804, XA-02, XA-05, XA-10, XA-15, XA-52, XA-53, XA-54, XA-55, XA-56, XA-57, XA27, XA50 and XA-58. This Limited Warranty covers the specific models and does not constitute a warranty for the entire system.

(Be sure to have this information available when you need service for your product)

## WHAT IS NOT COVERED:

This Limited Warranty **does not cover:**

1. Product which has been damaged, defaced, or subjected to modification, misuse, tampering, negligence, abnormal service or handling, Acts of God;
2. Product which the serial number or model number has been altered, tampered with, defaced, or removed;
3. Product that has been installed, repaired or serviced by a non-Sharp mounting structure certified contractor or servicer or has been installed, repaired or serviced in a manner other than that outlined in Sharp's Solar Power System Installation Manual;
4. Mechanical failure due to corrosion;
5. Product that has been installed in, or at any time during the course of the Warranty Period falls within, an area where the mechanical load pressure exceeds 50 PSF, or in a location with abnormal environmental conditions including but not limited to acid rain and chemical buildup;
6. Abnormal external corrosion, discoloration, or other cosmetic changes that do not affect the Product's structural integrity;
7. Damage that occurs during shipment;
8. Consumable parts; and
9. Product which has been moved from its original installation.

There are no express warranties except as listed above.

THE DURATION OF ANY IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY, IS LIMITED TO THE DURATION OF THE EXPRESS WARRANTY HEREIN.

THE WARRANTIES DESCRIBED HEREIN SHALL BE THE SOLE AND EXCLUSIVE WARRANTIES GRANTED BY SHARP AND SHALL BE THE SOLE AND EXCLUSIVE REMEDY AVAILABLE TO THE FIRST CONSUMER PURCHASER. CORRECTION OF DEFECTS, IN THE MANNER AND FOR THE PERIOD OF TIME DESCRIBED HEREIN SHALL CONSTITUTE COMPLETE SATISFACTION OF ALL LIABILITIES AND RESPONSIBILITIES OF SHARP TO THE FIRST CONSUMER PURCHASER WITH RESPECT TO THE PRODUCT AND SHALL CONSTITUTE FULL SATISFACTION OF ALL CLAIMS, WHETHER BASED ON CONTRACT, NEGLIGENCE, STRICT LIABILITY, OR OTHERWISE. IN NO EVENT SHALL SHARP BE LIABLE, OR IN ANY WAY RESPONSIBLE, FOR ANY DAMAGES OR DEFECTS IN THE PRODUCT WHICH WERE CAUSED BY REPAIRS OR ATTEMPTED REPAIRS PERFORMED BY ANYONE OTHER THAN AN AUTHORIZED SERVICER, NOR SHALL SHARP BE LIABLE OR IN ANY WAY RESPONSIBLE FOR ANY DIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Some states do not allow the exclusion of incidental or consequential damages or limitations on how long an implied warranty lasts, so these limitations or exclusions may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

## WHAT WE WILL DO:

If this Product is found to be defective, Sharp will, at its option, repair the Product or replace it with a new or remanufactured equivalent at no charge to the Purchaser during the Warranty Period. Such repair and replacement services shall be rendered by Sharp or its authorized agents during normal business hours at Sharp authorized service centers. Parts used for replacement are warranted only for the remainder of the Warranty Period.

Replacement Product shall be as closely compatible with or equivalent to the Product as possible from Sharp's then-existing product line or inventory. The repair, replacement of the Product, or the supply of additional Product does not cause the beginning of new warranty terms, nor shall the original terms of this Limited Warranty be extended. Any replaced Product shall become Sharp's property.

## WHAT YOU MUST DO FOR WARRANTY SERVICE:

Call Sharp toll free at **1-800 SOLAR06 ((800) 765-2706)** with proof of purchase to begin the return merchandise authorization process. You may be required to ship your Product to Sharp. If you ship the Product, be sure it is prepaid, insured and packaged securely. This Limited Warranty does not include the costs of de-installation or reinstallation for product being repaired or replaced under this Limited Warranty.





**SHARP**<sup>®</sup>

**SHARP ELECTRONICS CORPORATION**  
SOLAR ENERGY SOLUTIONS GROUP • 5901 BOLSA AVENUE • HUNTINGTON BEACH, CALIFORNIA 92647

SESG-SRS-01-29-2008