



Commercial Solar Thermal Systems

Installation & Operation Manual SCH Collectors



⚠ WARNING:

This manual must only be used by a qualified heating installer/service technician. Read all instructions before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death, or substantial property damage.

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Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

NOTICE indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury or property damage.

1 Introduction

The SCH collector is suitable for parallel installations and inclined installations on pitched and flat roofs as well as freestanding on the ground. It is available as a single-piece large collector in sizes ranging from 65 to 130 ft² with inlet and outlet connections of .86" in diameter. Suitable mounting systems are available for various types of roofing. The SCH collector is delivered in standard lengths of 9'-10" to 19'-7" and a height of 6'-7", resulting in gross surface areas between 65 and 130 ft².

Area of use: Parallel, inclined, on roof mounting, on tiles, plain tiles, slate, Spanish tiles, tin roofing, flat roofs, and as a freestanding unit

Technical data

SCH Collector				
Type	SCH065	SCH090	SCH110	SCH130
Quantity of Glass Panels	3	4	5	6
Gross area	65.66 ft ²	87.19 ft ²	108.72 ft ²	130.24 ft ²
Aperture surface area	58.45 ft ²	77.93 ft ²	97.95 ft ²	116.90 ft ²
Absorber surface area	59.85 ft ²	79.76 ft ²	99.67 ft ²	119.59 ft ²
External Dimensions (L x W) ¹	6'-7" x 9'-10"	6'-7" x 13'-2"	6'-7" x 16'-4"	6'-7" x 19'-7"
Weight Ratings	309 lbs.	411 lbs.	513 lbs.	614 lbs.

SCH mounting hardware + hydraulic connection kits

Part-number	Description	Needed quantities for:			
		SCH065	SCH090	SCH110	SCH130
Parallel installation:					
SCA20001	Horizontal aluminum bar 10 ft	2			
SCA20002	Horizontal aluminum bar 13 ft		2		
SCA20003	Horizontal aluminum bar 16 ft			2	
SCA20004	Horizontal aluminum bar 20 ft				2
SSK20004	End bracing kit	2	2	2	2
SSK20005	Z-hook kit	2	3	3	3
Inclined (20°, 40°, 60°) installation:					
SCA20001	Horizontal aluminum bar 10 ft	2			
SCA20002	Horizontal aluminum bar 13 ft		2		
SCA20003	Horizontal aluminum bar 16 ft			2	
SCA20004	Horizontal aluminum bar 20 ft				2
SCA20005	Aluminum U-channel 10 ft	3			
SCA20006	Aluminum U-channel 13 ft		3		
SCA20007	Aluminum U-channel 16 ft			3	
SCA20008	Aluminum U-channel 20 ft				3
SSK20001	A-frame 20° inclined	2	3	3	4
SSK20002	A-frame 40° inclined	2	3	3	4
SSK20003	A-frame 60° inclined	2	3	3	4
Hydraulic connection kits: (1 array is max. 2 SCH's!)					
HYK20001	Hydr. conn. kit 2x 6.5' + plug + sensor well	1x per collector or array			
HYK20002	Hydr. conn. kit 1x 6.5'/1x 13' + plug + sensor well	1x per collector or array			
HYK20003	Serial hydr. exp. kit for stacked installation	1x per array			
HYK20004	Parallel hydr. exp. kit for side by side installation	1x per array			
HYK20005	Serial hydr. exp. kit for side by side installation	1x per array			
Mechanical connection kits: (optional for installation!)					
MCK20001	Mechanical conn. kit for side by side installation	1x per array			
MCK20002	Mechanical conn. kit for stacked installation	1x per array			
MCK20003	Cover for piping (for side by side installations)	1x per array			
Gable bracing kits: (required for non-south facing installation!)					
GBK20003	Bracing kit w/ diagonal support	1x per collector			

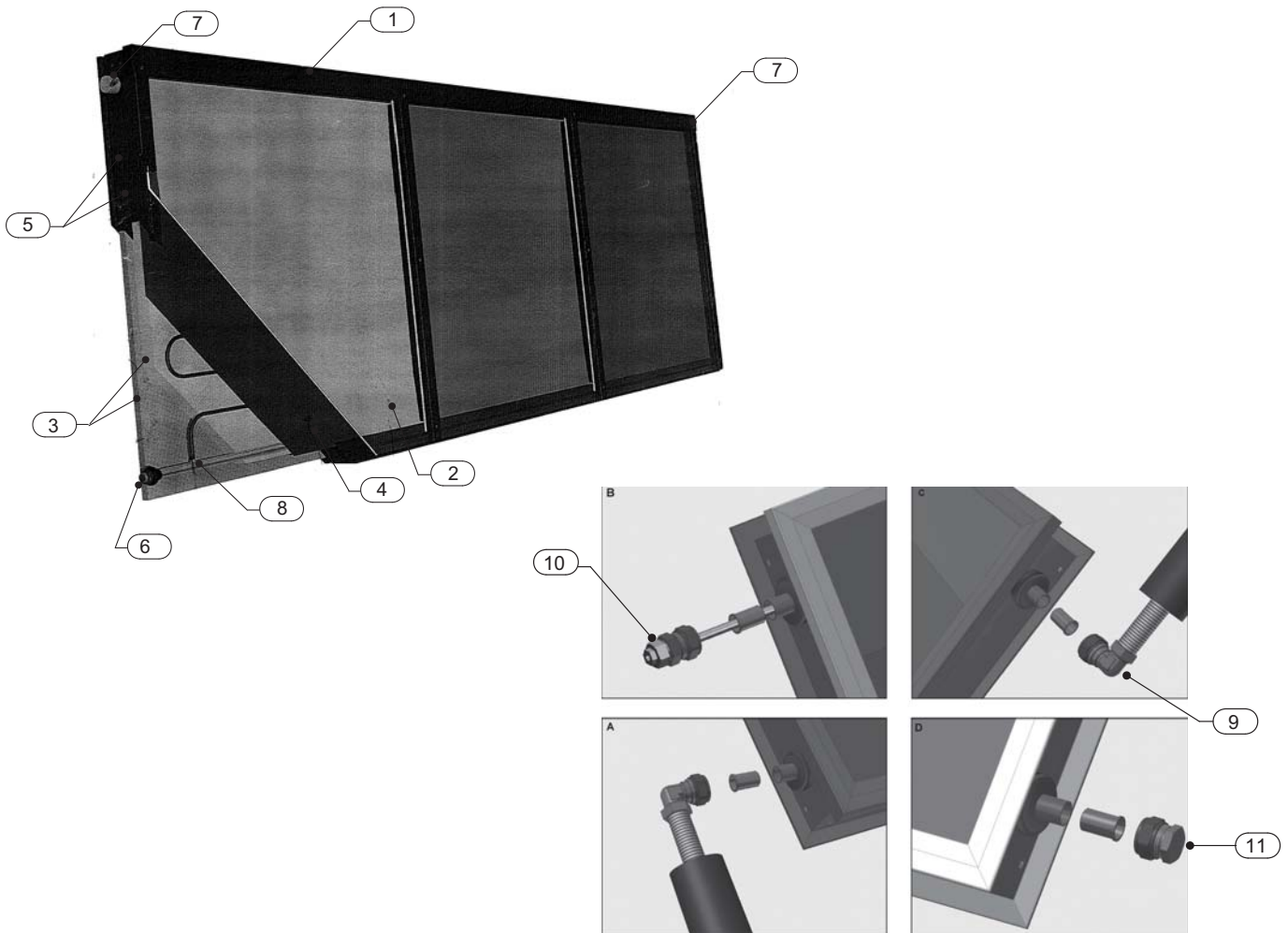
1 Introduction

How it works...

- 1. Housing**
Powder coated (RAL7016) aluminum frame structure with PU rigid foam and an aluminum rear wall.
- 2. Cover**
Prismatic solar safety glass, .15" thick, for maximum light transmission.
- 3. Insulation**
.76" heat resistant, special PU rigid foam and 1.57" mineral wool with high pressure resistance, emission free, non-flammable.
- 4. Absorber**
Full surface absorber, laser welded with highly-selective PVD coating (PVD = Physical Vapor Deposition), serpentine flow.
- 5. Collector seal**
Aluminum profile system with double temperature and UV-resistant silicone seals, emission free.

- 6. Inlet connection**
Copper pipes, .86" diameter.
- 7. Outlet connection**
Copper pipes, .86" diameter.
- 8. Absorber coils**
10 mm copper, serpentine arrangement.
- 9. Hydraulic connection kit**
Connection set with stainless steel corrugated pipe. For connecting the collector supply and return to the riser. The corrugated pipes are available in kits with 2 x 6'-7" or 2 x 13'-1" length including sensor well and plug.
- 10. Sensor well**
For measuring the collector outlet temperature directly in the fluid. The sensor well can be installed on the outlet connection as shown on the collector label. The sensor must be inserted up to the end of the sensor well.
- 11. Plug**
This plug is used on the end collector of each array to complete the water flow path.

SCH Collector



1 Introduction *(continued)*

Before getting started on your installation be sure to carefully read the preparation instructions in this section.

WARNING **Installer** – Read all instructions, including this manual before installing. Perform steps in the order given.

Have your collector(s) serviced/inspected by a qualified service technician, at least annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE When calling or writing about the collector – Please have the collector model and serial number.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Factory warranty (shipped with the collector) does not apply to collectors improperly installed or improperly operated.

- CAUTION**
- You must comply with local regulations, laws and standards of the local governing authority.
 - The frame must be capable of withstanding the local snow and wind loads and permit the correct anchoring of the collectors in accordance with all applicable local regulations.
 - The load bearing capacity of the roofing and the frame shall be specially checked or analyzed by a structural engineer.
 - The number of mounting brackets specified by the Lochinvar/TiSun manuals and parts sheets is based on an average collector load bearing per square foot. The maximum permissible collector loading per square foot may be calculated from the number of mounting brackets, taking into consideration the permissible loading on the mounting brackets. If a higher collector wind and snow loading (including snow sliding off the roof) per square foot is required, additional mounting brackets will have to be used. Roof pitches in excess of 30° also represent increased loading; additional mounting brackets must also be used for this variant.

CAUTION Lochinvar/TiSun Solar Thermal Collectors are not specifically designed for drain back installations. Consult the factory if drain back utilization is necessary.

- CAUTION**
- The mounting substructure must be capable of withstanding the local snow and wind loads and permit correct anchoring of the collectors.
 - To avoid damage to the collectors and mounting frames from snow sliding off the roof, additional snow guards must be placed in sufficient numbers around the collectors and above the collectors.
 - The collectors must be linked with a lightning arrester system and/or the building's ground system by a licensed electrician.
 - Hydraulic connection of the collectors must be performed according to Lochinvar/TiSun specifications.
 - The collector connections must not be damaged, soiled or misaligned. Take care during transport, installation, and connection of the modules. Do not remove the header protection caps at the top and bottom connections of the collector until just before installation.
 - When connecting the modules to the riser, the Hydraulic Connection Kit (corrugated pipe) supplied must be installed. Otherwise, the warranty is invalidated.
 - Always connect the collector outlet and inlet flow to each other diagonally, please follow the connection example (see FIG. 1-1 on page 6).
 - Do not twist the headers when screwing the connections together. Hold threaded connection in the desired position and tighten clamping ring union nut to torque.
 - Roof penetrations for solar piping must be adequately sealed against water ingress.
 - Use only the original sensor well supplied.
 - Use only high temperature and glycol pipe sealing materials.

CAUTION All piping should be properly insulated to avoid freezing and/or burn potential.

1 Introduction

NOTICE

- Check the materials for any damage sustained in transport and describe any damage in writing on the packing slip where necessary. This is important to process any needed freight or delivery damage claims.
- Carefully read through the relevant installation instructions before starting the installation and follow each step.
- Use only the original mounting components.
- Stainless steel screws may not be used again once they have been removed (because of the possibility of breaking).
- Any conversion or modification of the Lochinvar/TiSun product not expressly approved in writing by the manufacturer shall void the warranty.
- No liability can be accepted for damage resulting from failure to observe the installation instructions.

WARNING

Only authorized solar companies familiar with our products may handle them.

WARNING

There is a risk of injury when handling collectors and mounting accessories as these have sharp edges.

WARNING

The collector becomes very hot in the sunlight. There is a risk of burn.

WARNING

Comply with all safety regulations and applicable OSHA requirements.

WARNING

Check the load bearing capacity and stability of the substructure onto which the collector is to be installed and will need to be accessed during the installation process.

Dismantling and Disposal

- The units are dismantled in the reverse sequence of installation.
- The roofing shall be properly sealed after the mounting brackets have been removed.
- Materials shall be disposed of in an environmentally conscious manner.

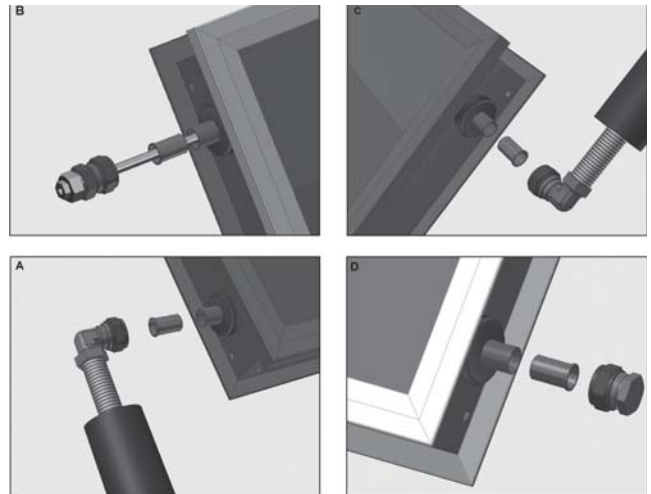
WARNING

A properly sized expansion tank must be used to avoid damage to the Solar Thermal System.

WARNING

If copper pipe is being used, all joints MUST BE brazed, no soldering allowed.

Figure 1-1 Connection Diagram



2 Location

Array options

For series and parallel connection of multiple collectors, it is advisable to calculate the pressure drop over the entire system with the aid of the enclosed documents and to install an appropriate pump if necessary. The maximum collector area per collector array connected in series is 260 ft². Be aware of pressure drop, reference the array options (FIG.'s 2-1 and 2-2).

Figure 2-1 Array Piping

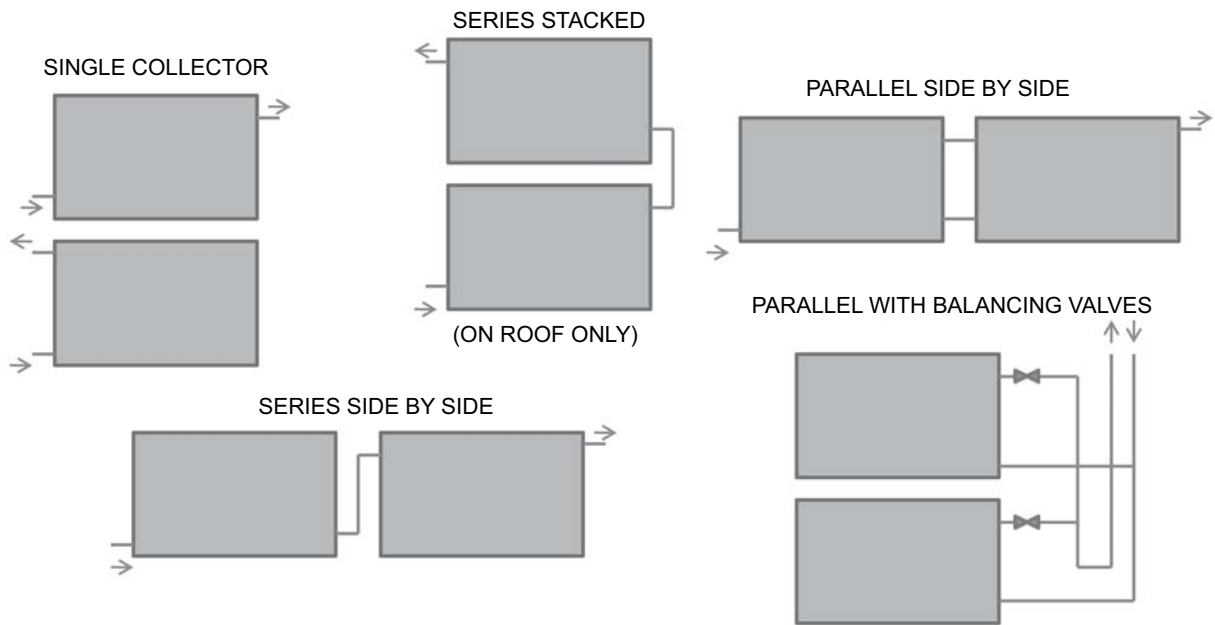
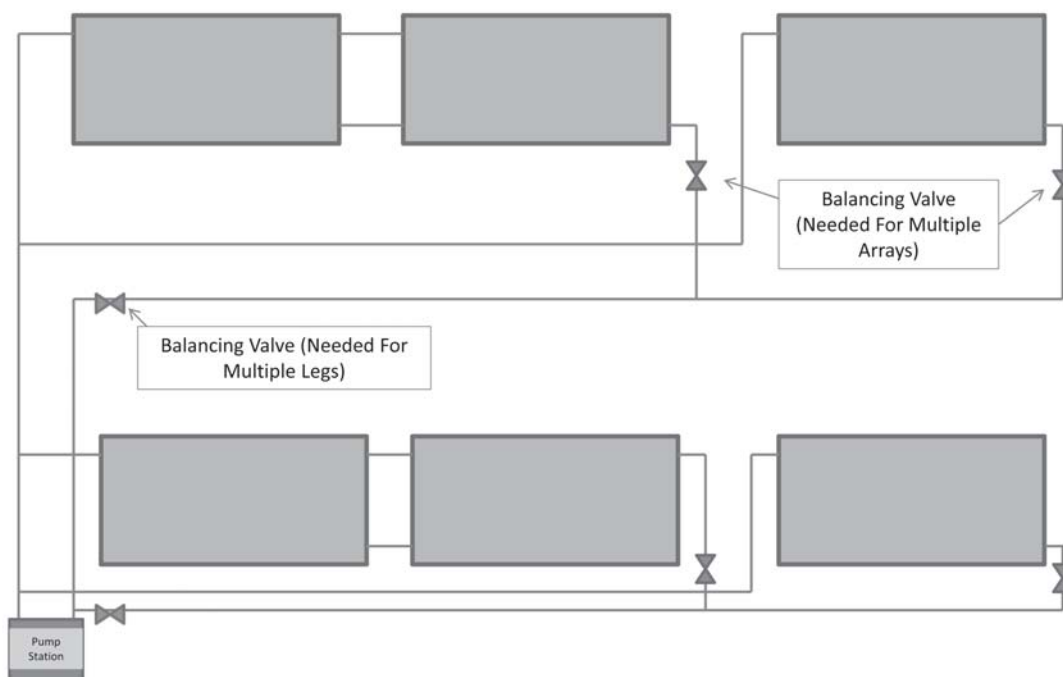


Figure 2-2 Multiple Array Piping



2 Location

Installation positions

Figure 2-3 SCH Parallel Installations

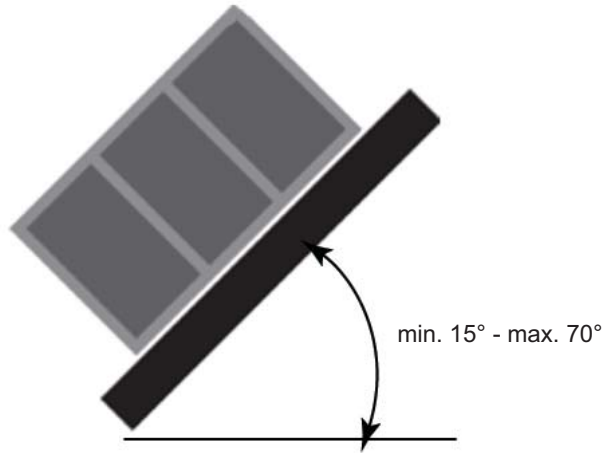


Figure 2-4 SCH Inclined Installations

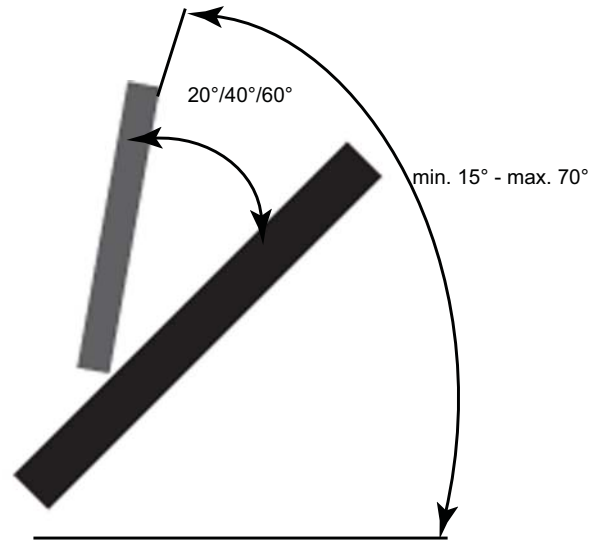
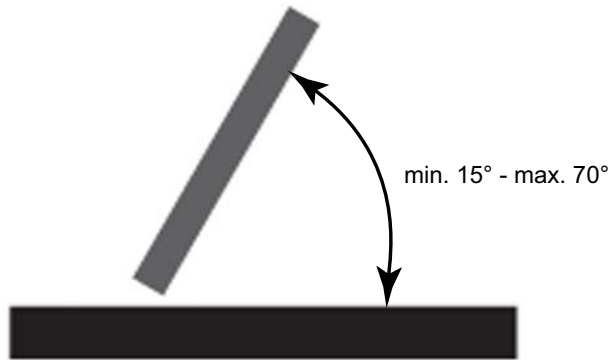


Figure 2-5 SCH Freestanding Installations



NOTICE

For best performance, it is recommended that the collectors face true south.

NOTICE

Collector incline should be at least 15° and no more than 70° for best performance.

NOTICE

It is not recommended for the collector field to deviate any further than 45° from true south.

NOTICE

Avoid installation in shaded areas. Shaded areas will reduce the performance of the solar collectors.

2 Location *(continued)*

Handling and storing

⚠ WARNING

- Installation of LOCHINVAR/TiSun SCH collectors is only allowed for professional staff.
- Local instructions, laws and standards are to be kept.
- Collectors are to be located so falling of snow and ice does not endanger any person or property.
- Use personal protection equipment (helmet, belt, security shoes) when on the roof.
- Secure tools and materials against falls.
- It is forbidden to stand under hanging load.

⚠ CAUTION

- Danger area has to be closed.
- Put ladders up properly and check stability.

NOTICE

- Check the under roof construction on the building before installation.

⚠ WARNING

- Avoid rotating movements of the load through wind. Secure load before lifting.
- Only move collectors on the given fixing loops.

⚠ WARNING

- Only loosen the crane connection when the collectors are completely fixed to the substructure.
- Pay special attention to roof-work near an electric grid. If need be, the constructor must take security precautions such as isolation, covering, etc.
- 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 more than 10 years old.
- 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.
- Check that all rafters, trusses and other materials are in good condition.

What to avoid

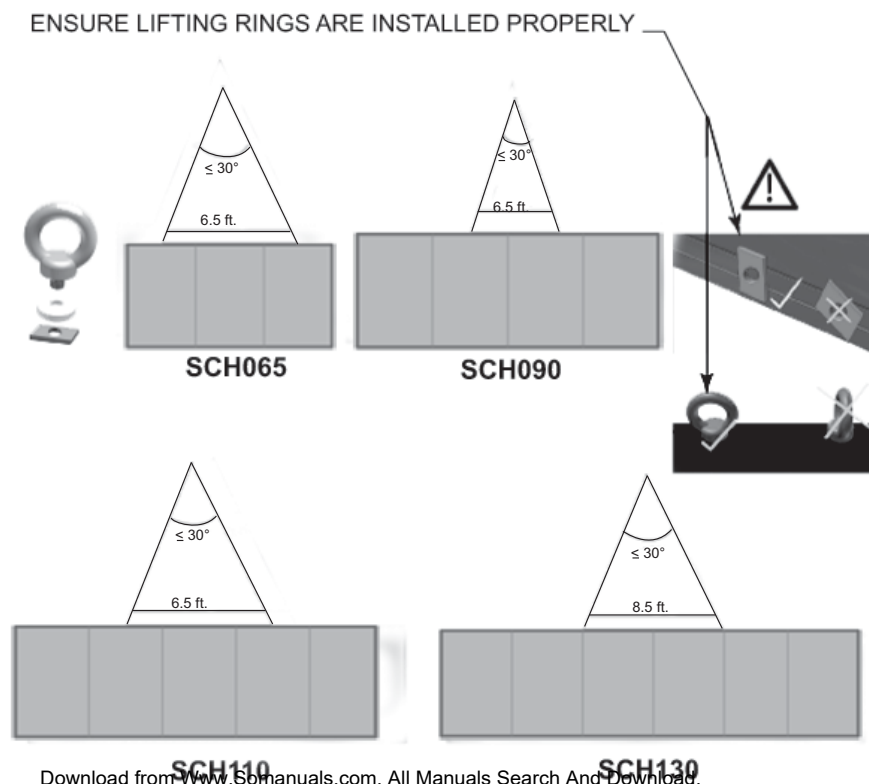
⚠ CAUTION

- Collectors are to be located such that eventual sliding of snow and ice does not endanger any person.

NOTICE

- See FIG. 2-6 for crane transportation connection points and positioning.

















Figure 2-6 Crane Transportation Connection Points and Positioning



3 Roof Attachment Installation

Roof attachment types

Table 3A Roof Fastenings - Parts

SOLAR ROOF MOUNTS		Installation Type			See Page	Description	
		Parallel	Inclined	Free-standing			
Part #	Lochinvar Name						
	SRM20001	BOLT, DOUBLE HANGER	X	X	X	13	Stainless steel attachment for universal heavy duty installations, on parallel and inclined roofs and freestanding installations on sufficiently anchored bases.
	SRM20003	ANCHOR, RAFTER, STD ROOF TILE	X	X	-	15	Stainless steel attachment for parallel and inclined installations on various types of tiled roofs. Standard installations for tile heights of up to 1.5". Package is complete with fasteners and spacers.
	SRM20004	ANCHOR, RAFTER, TALL ROOF TILE	X	X	-	15	Stainless steel attachment for parallel and inclined installations on various types of tiled roofs. Standard installations for tile heights of up to 2". Package is complete with fasteners and spacers.
	SRM20005	HOOK, FLAT TILE	X	-	-	16	Stainless steel attachment for parallel installations on plain tile, slate, and flat cement tiled roofs with pitches in excess of 30 degrees.
	SRM20006	CLAMP, JOINT	X	X	-	18	Stainless steel attachment for parallel and inclined installations on jointed tin, galvanized, or copper roofs. Additional securing cables (Lochinvar Part # SRM20012) are required for inclined installations.
	SRM20007	PLATE, FLANGE, SHINGLE, STD.	X	X	X	20	Galvanized steel attachment for parallel, inclined and freestanding installations on asphalt or elastomer roofs.
	SRM20008	PLATE, FLANGE, SHINGLE, RAISED	-	X	X	22	Galvanized steel attachment for inclined and freestanding installations on asphalt or elastomer roofs. Also recommended for flat roofs.
	SRM20009	BOLT, ANCHOR, CONCRETE W/ ADJ	-	X	X	26	Galvanized steel attachment for inclined or freestanding installations with 2.75" height adjustment. For use in applications with no more than a 5 degree inclination.
	SRM20010	BOLT, ANCHOR, CONCRETE	-	X	X	26	Galvanized steel attachment for inclined or freestanding installations with no height adjustment. For use in applications with no more than a 5 degree inclination.
	SRM20012	KIT, UNIV CABLE SECURING	-	X	-	19	Stainless steel cable set for securing collectors on inclined jointed roofs. Kit includes cable, turnbuckle, hardware for attachment to frame, and joint clamp. For inclined installations only.
	SRM20013	ATTACHMENT, ROOF CORR METAL	X	X	-	23	Stainless steel attachment for parallel and inclined installations on profiled and corrugated roofs.
	SRM20014	ATTACHMENT, WAVE ROOF SM	X	X	-	25	Galvanized steel attachment for installations on concrete corrugated roofs with 5 corrugations per meter. For parallel and inclined installations.
	SRM20015	ATTACHMENT, WAVE ROOF LG	X	X	-	25	Galvanized steel attachment for installations on concrete corrugated roofs with 8 corrugations per meter. For parallel and inclined installations.

3 Roof Attachment Installation *(continued)*

Roof attachment quantities for SCH collectors snow loading

Table 3B Parallel Installations

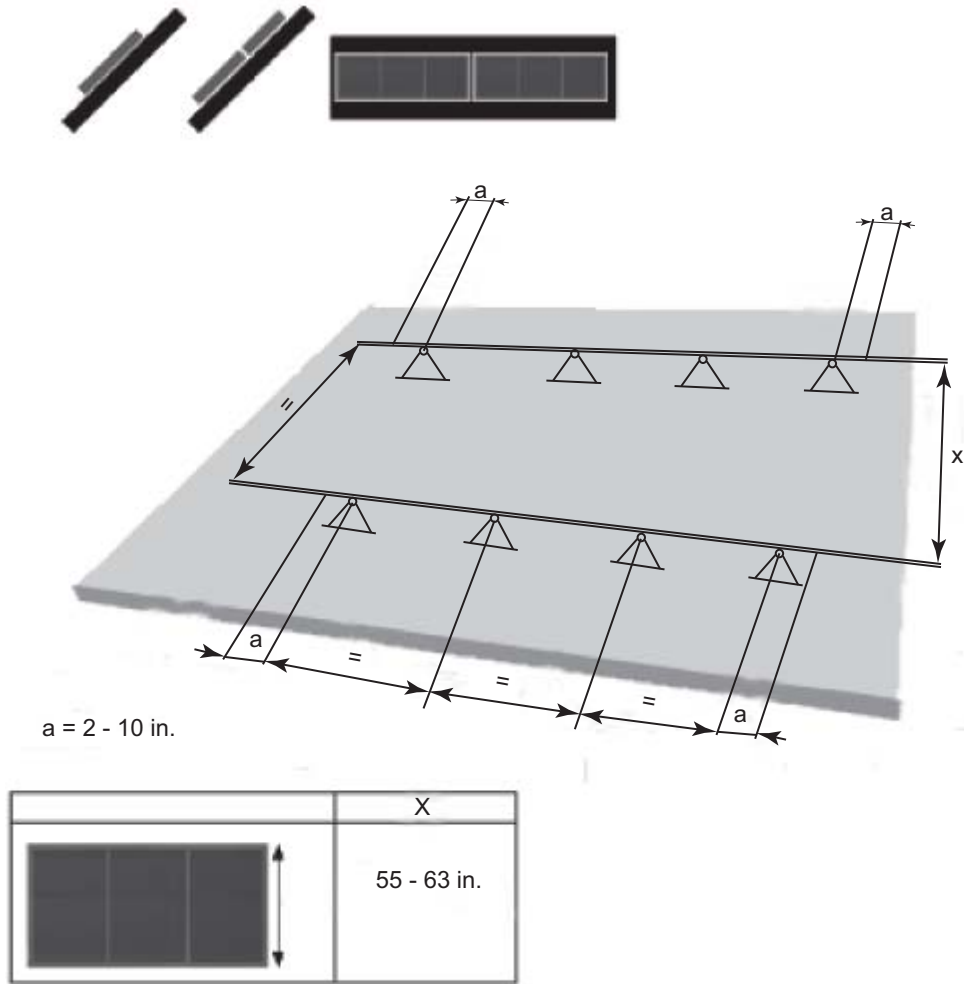
Parallel installation	SRM: 20001, 20003, 20004, 20006, 20007, 20013, 20014, 20015		SRM: 20005	
	area load up to 32 lb/sq-ft	area load up to 64 lb/sq-ft	area load up to 16 lb/sq-ft	area load up to 32 lb/sq-ft
SCH065	6	10	6	10
SCH090	8	12	8	12
SCH110	8	14	8	14
SCH130	10	18	10	18

Table 3C Inclined (20°, 40°, and 60°) Installations

Inclined (20, 40°, 60°) installation	SRM: 20001, 20003, 20004, 20007, 20008, 20009, 20010, 20013, 20014, 20015		SRM: 20006	+ 20012
	area load up to 32 lb/sq-ft	area load up to 64 lb/sq-ft	area load up to 64 lb/sq-ft	
SCH065	6	10	12	2
SCH090	8	12	14	3
SCH110	8	14	18	3
SCH130	10	18	22	4

3 Roof Attachment Installation

Figure 3-1 Spacing Distance



Spacing Distance

Equally space the center roof attachments starting in the middle, the two (2) end attachments will be spaced according to the inner measurement (start in the middle and work outwards). The remaining roof mounts should be equally spaced in between the two (2) end roof attachments.

Each collector will have its own independent substructure set. Ensure there is ample room on the chosen roof area for the number of collectors chosen.

Note: For multiple collector installations reference the Collector Mounting Section of this manual for spacing between collectors.

3 Roof Attachment Installation *(continued)*

Installation of roof attachment types

The solar thermal collectors are capable of being mounted to several different types of roofing with a wide variety of mounting hardware available from Lochinvar.

Double hanger bolt for universal fastening #SRM20001

Universal fixture for parallel and inclined installation on various roof types and freestanding installation on sufficiently anchored frames. Two hanger bolts are to be installed on the roof as vertically as possible with a spacing of 4 3/4" to 6 3/4". The two are connected by an intermediate plate.

CAUTION

- The hanger bolt must be screwed into a support capable of bearing the required static load (generally rafters).
- Install the hanger bolt using a field supplied anchoring adapter.
- The roofing must be capable of withstanding the pressure needed to compress the gasket.
- Beware of linear expansion in sheet metal that prevents a linear expansion and can cause lifting of the sheet.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-2).

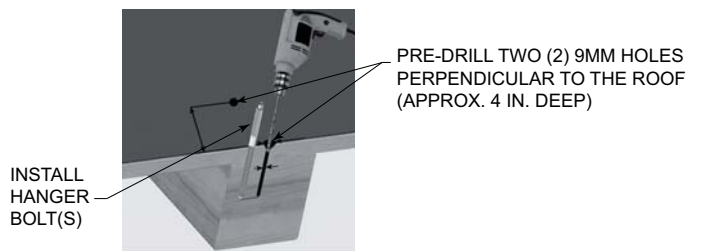
Figure 3-2 Kit #SRM20001 - Double Hanger Bolt Kit Components



Install double hanger bolt

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Pre-drill two 9mm holes, a minimum of 4 inches deep into the roof substructure (see FIG. 3-3), perpendicular to the roof with a spacing of 4 3/4" to 6 3/4".
5. Install the hanger bolts into the pre-drilled holes until the threads are level with the roof's surface.

Figure 3-3 Pre-Drill 9mm Holes Into Substructure



6. Slide the hanger bolt seals over the machine threads until the seal is touching the roof's surface (FIG. 3-4A).
7. Slide the washer (M12) on top of the hanger bolt seal (FIG. 3-4A).
8. Thread the hex nut with flange (flange side down) onto the washer, compressing the washer and hanger bolt seal to the roof (FIG. 3-4B).
9. Install the second hex nut with flange (flange side up) until the hex nut reaches the desired substructure height (FIG. 3-4B).
10. Slide the hanger bolt plate onto the flange of the hex nut installed in Step 9 (FIG.'s 3-4A and 3-4B).
11. Install the remaining hex nut with flange (flange side down) to the top of the double hanger bolt plate. Tighten and secure both hex nuts (top and bottom) to the double hanger bolt plate.
12. Make certain all double hanger bolt plates are facing the same direction.

3 Roof Attachment Installation

Figure 3-4A Install Double Hanger Bolt Components

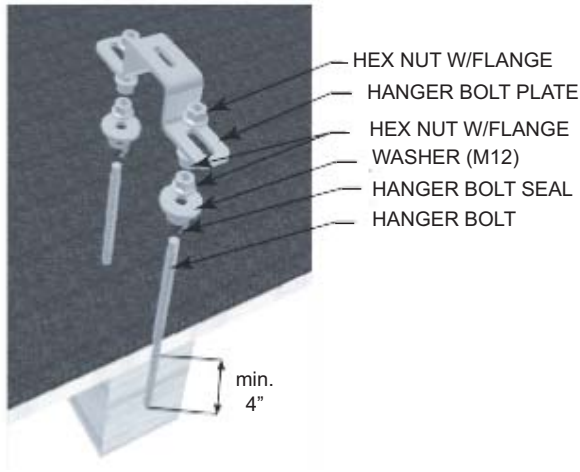


Figure 3-5 Install Hex Bolt(s)

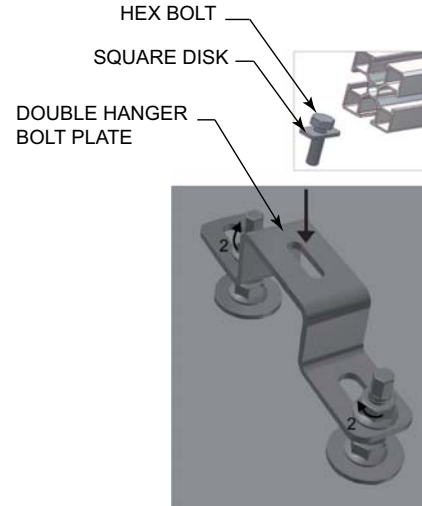
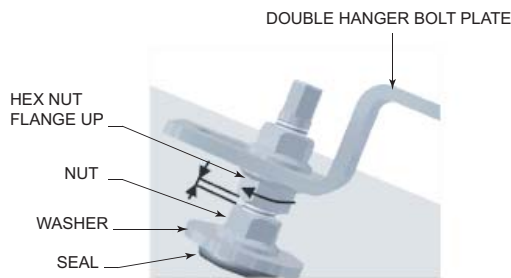


Figure 3-4B Compress Washer and Hanger Bolt Seal



13. Slide the square disk onto the hex bolt (see FIG. 3-5).
 14. Install the hex bolt with square disk attached into the opening of the double hanger bolt plate as shown in FIG. 3-5.
- Note:** Do not tighten hex bolts until ready to install on the collector substructure.
15. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 14 (FIG. 3-5).

16. Repeat Steps 4 - 15 until installation is complete.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

3 Roof Attachment Installation *(continued)*

Rafter anchor for roof tiles #SRM20003 & #SRM20004

The rafter anchor is used for parallel and inclined mounting on tiled roofs with a roof pitch of at least 15° and an area loading greater than 6 lb/ft². Can be used for various types of roofing tiles.

CAUTION

- The anchors must be screwed into a support capable of bearing the required static load (generally rafters or concrete).
- Complies with the requirements of DIN1055.
- Roof batten height at least 1".
- The gap between rafter anchor and top edge of the tile must be at least 3-5mm. Under no circumstances may the rafter anchor be in contact with the tile (if the overall height of roof batten and tile do not match, the lower height must be packed out).

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-6).

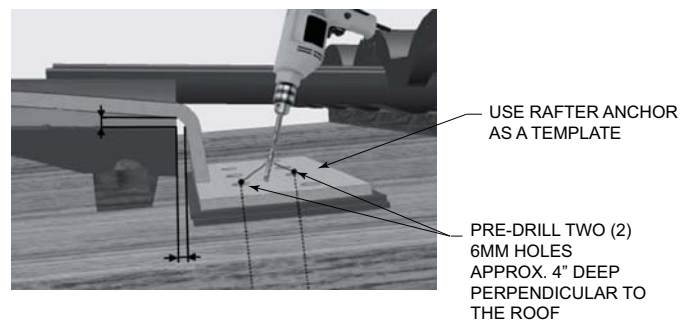
Figure 3-6 Kit #SRM20003 & #SRM20004 - Rafter Anchor Kit Components



Install rafter anchor

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Number two (2) tiles, one above the other. The upper tile will be removed to install the rafter anchor.
5. Mark the edge of the upper tile on the lower tile to ensure proper alignment upon assembly.
6. Using the rafter anchor as a template, pre-drill two (2) 6 mm holes, approximately 4 inches deep into the roof substructure (see FIG. 3-7), perpendicular to the roof.

Figure 3-7 Pre-Drill 6mm Holes Into Roof Substructure



7. To achieve the recommended 3 - 5 mm clearance above the tile, place the spacer plate(s) (provided in the kit) between the rafter anchor and the roof substructure if necessary (FIG. 3-8).
8. Place the rafter anchor on the spacer plate (if used).
9. Place the heavy duty washers over the holes pre-drilled in Step 6.
10. Install the wood screws through the washers and rafter anchor into the roof substructure.

Note: It may be necessary to grind the upper tile to assure a better fit (FIG. 3-9).

3 Roof Attachment Installation

Figure 3-8 Install Rafter Anchor

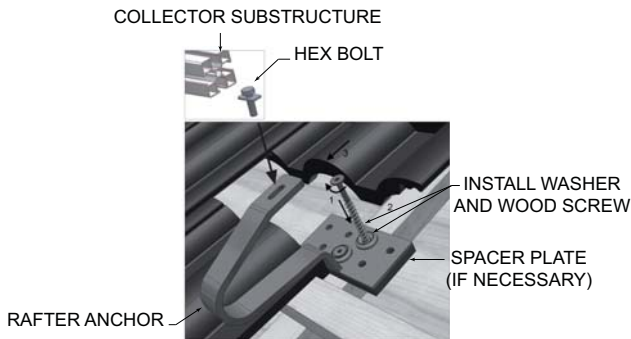
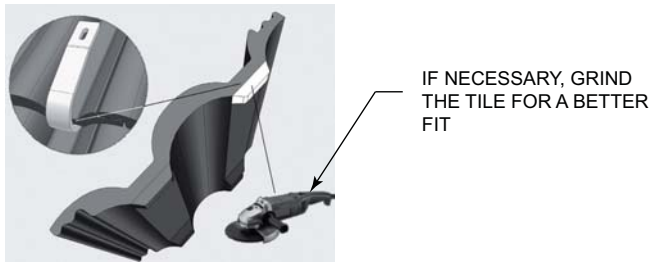


Figure 3-9 Grind Tile (if necessary)



11. Slide the square disk onto the hex bolt (see FIG. 3-8).
 12. Install the hex bolt with square disk attached into the opening of the rafter anchor as shown in FIG. 3-8.
- Note:** Do not tighten hex bolt until ready to install on the collector substructure.
13. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 12.
 14. Repeat Steps 4 - 13 until installation is complete.
 15. Replace tiles removed in Step 4.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

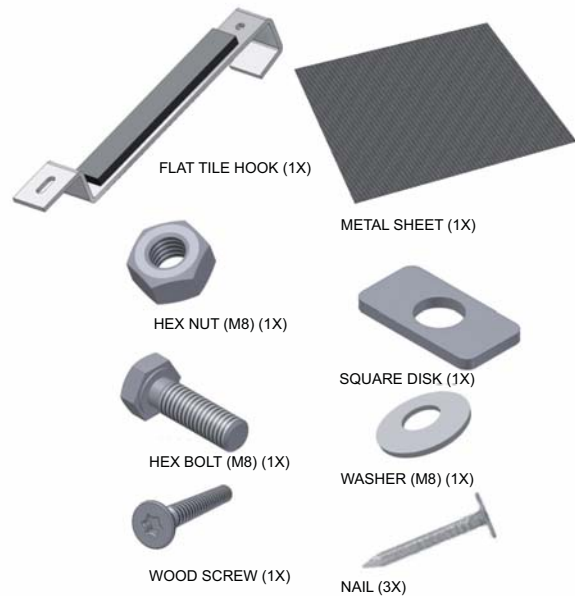
Flat tile hook #SRM20005

The flat tile hook is only used for parallel installation on plain tiled roofs (generally steep roofs with a pitch of over 30°), the hooked ends are hung over the roof battens and screwed in place, an inclined collector installation is not possible here.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-10).

Figure 3-10 Kit #SRM20005 - Flat Tile Hook Kit Components



3 Roof Attachment Installation *(continued)*

Install flat tile hook

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Number two (2) tiles, one above the other. The top tile will be removed to install the flat tile hook.
5. Remove the top tile from the roof (set aside for reassembly).
6. Place the tiled roof hook over the roof batten of the bottom tile (FIG. 3-11).
7. Place the metal sheet provided in the kit under the flat tile hook (FIG. 3-11). Using the nails provided in the kit, secure the metal sheet to the roof substructure (FIG. 3-11).
8. Secure the tiled roof hook to the roof substructure using the screws provided in the kit (FIG. 3-11).
9. Replace the tile removed in Step 5.

Note: It may be necessary to grind the top tile to assure a better fit (FIG. 3-12).

Figure 3-11 Install Flat Tile Hook and Metal Sheet

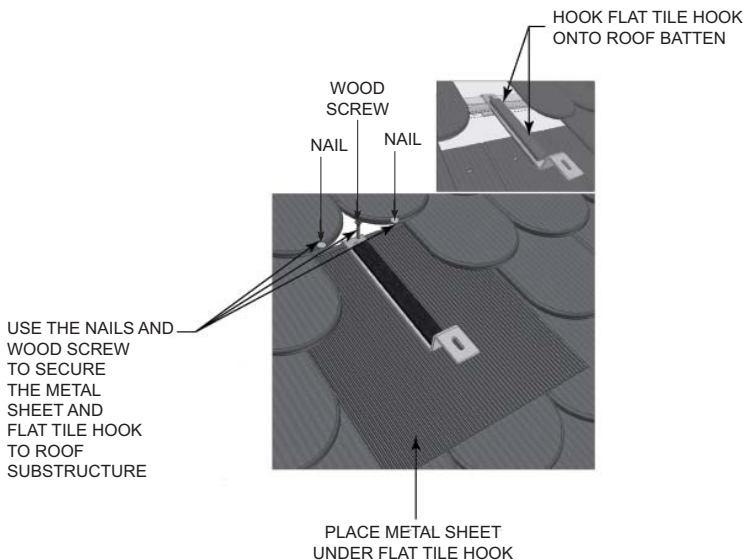
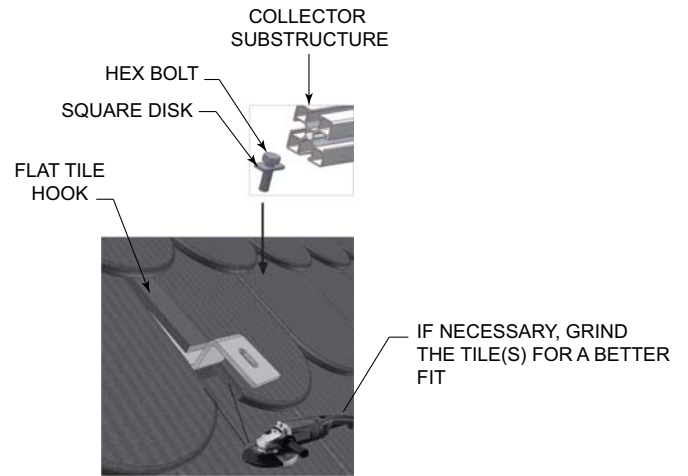


Figure 3-12 Grind Tile(s) (if necessary) / Install Hex Bolt



10. Slide the square disk onto the hex bolt (see FIG. 3-12).
11. Install the hex bolt with square disk attached into the opening of the flat tile hook as shown in FIG. 3-12.

Note: Do not tighten hex bolt until ready to install on the collector substructure.

12. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 11.
13. Repeat Steps 4 - 12 until installation is complete.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

3 Roof Attachment Installation

Joint clamp #SRM20006

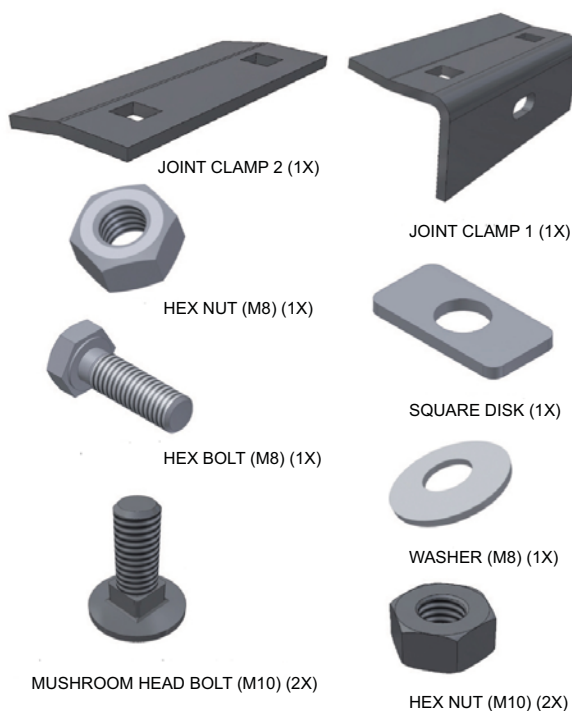
The joint clamp is only used for parallel and inclined mounting on folded-seam tin roofs with galvanized or coated sheet steel, or copper, reference the Universal Cable Securing Kit on page 19.

- CAUTION**
- Not recommended for titanium-zinc sheet due to danger of cracks at low temperature.
 - Do not reuse any stainless steel screws as there is a risk of breakage.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-13).

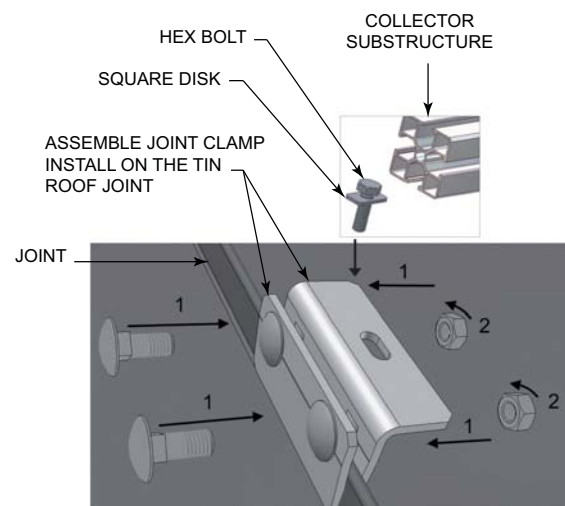
Figure 3-13 Kit #SRM20006 - Joint Clamp Kit Components



Install joint clamp

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B and 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Assemble joint clamp as shown in FIG. 3-14 (be sure to loosely assemble the screws on the joint clamp assembly).
5. Place the joint clamp assembly at the appropriate location on the joint of the tin roof.
6. Tighten the screws on the joint clamp to 26 ft./lbs.

Figure 3-14 Assemble / Install Joint Clamp & Hex Bolt



7. Slide the square disk onto the hex bolt (see FIG. 3-14).
 8. Install the hex bolt with square disk attached into the opening of the joint clamp as shown in FIG. 3-14.
- Note:** Do not tighten hex bolt until ready to install on the collector substructure.
9. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 8.
 10. Repeat Steps 4 - 9 until installation is complete.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

3 Roof Attachment Installation *(continued)*

Universal cable securing kit #SRM20012

For securing inclined collectors on tin joint roofs comprising a guy cable, turnbuckle and hardware for collector frames and joint clamp for guy cable tensioning. Material: stainless-steel.

Joint clamp for cable set is required for mounting the guy cable set on joint tin roofs with galvanized or coated sheet steel or sheet copper (one in each guy cable set). The guy cable set is fastened to the joint clamp. **Note:** The joint clamp can also be used with a 1" pipe provided on site as an additional snow guard above the collector (does not replace the snow guard system provided on site which is a requirement).

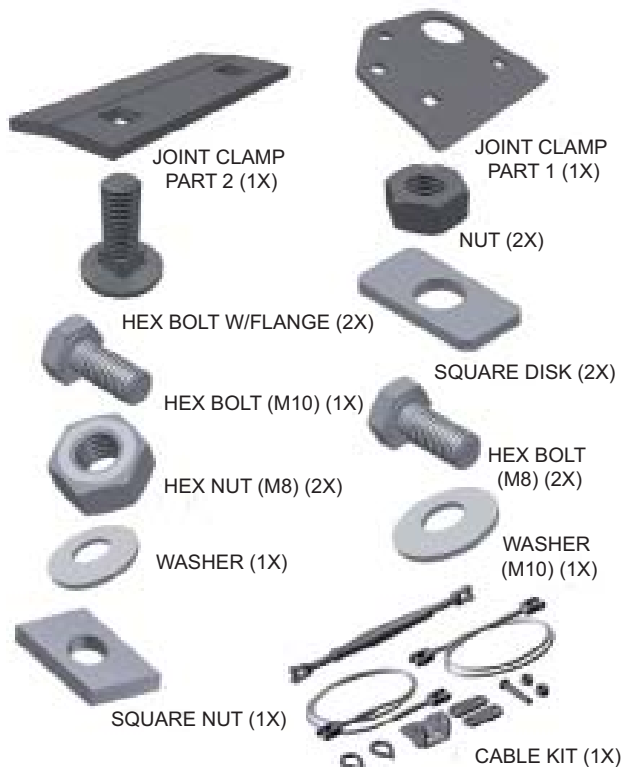
CAUTION

- Not recommended for titanium-zinc sheet due to danger of cracking at low temperatures.
- Do not reuse any stainless steel screws as there is a risk of breakage.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-15).

Figure 3-15 Kit #SRM20012 - Universal Cable Securing Kit Components



Install cable securing kit

1. Install the anchor bracket on the A-frame using the hex bolt, square disk, washer, and hex nut.
2. Assemble the joint clamp as shown in FIG. 3-17 (be sure to loosely assemble the screws on the joint clamp assembly).
3. Place the joint clamp assembly at the appropriate location on the joint of the tin roof.

Figure 3-16 Attach Cable Fastening Bracket to A-Frame

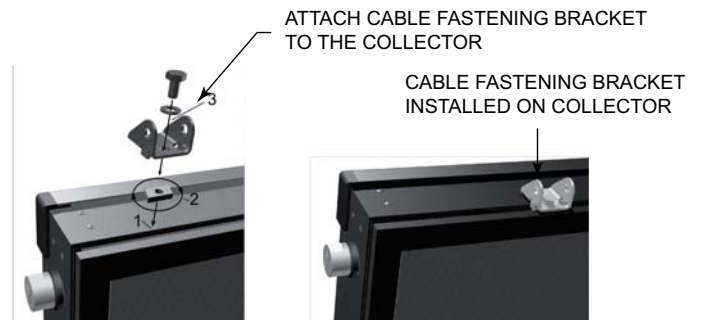
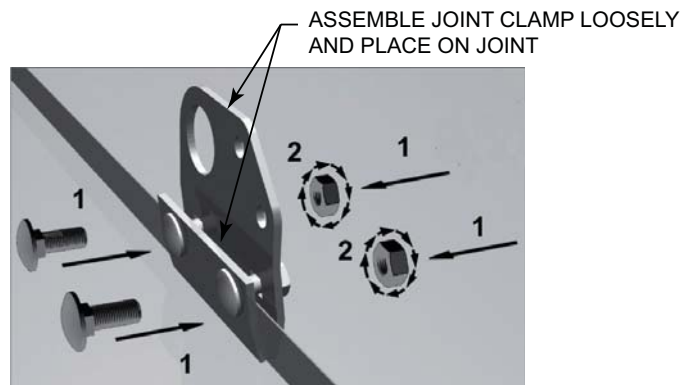


Figure 3-17 Assemble Joint Clamp



3 Roof Attachment Installation

- Choose a cable orientation to ensure proper degree of angle (see FIG. 3-18).
- Install the steel cable on the A-frame bracket using the pin and pin clip provided in the kit (see FIG. 3-19).

Figure 3-18 Cable Orientations

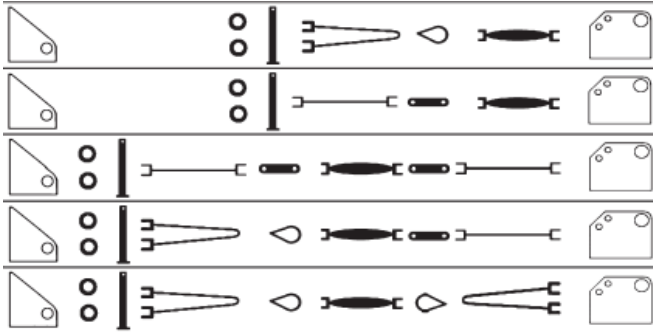
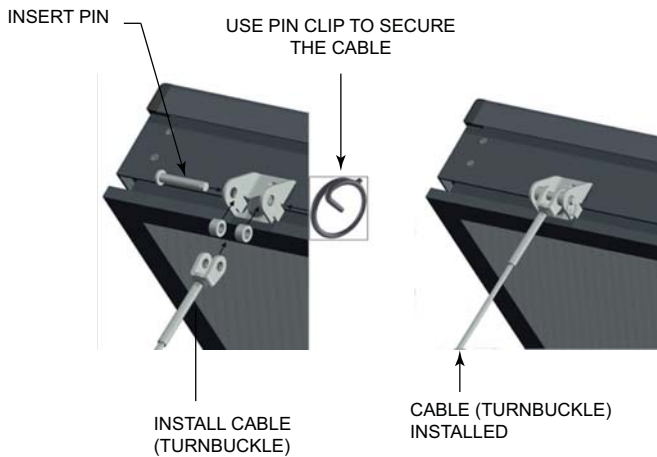


Figure 3-19 Install Steel Cable on A-frame

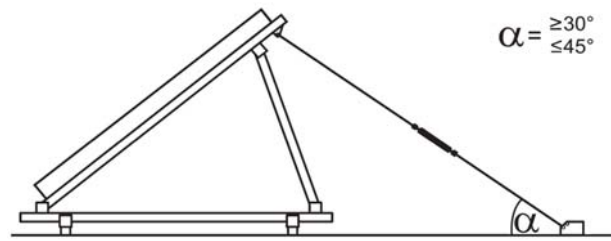


- Attach the steel cable to the joint clamp (fashioned after the cable orientations in FIG. 3-18).

NOTICE Extend turnbuckle to its fullest extent.

- Before tightening the joint clamp, set the angle of the cable to greater than or equal to 30°, but less than or equal to 45° (see FIG. 3-20).
- Tighten the joint clamp.
- Use the turnbuckle to tighten the cable.

Figure 3-20 Cable Angle



Flange plate shingle (standard)
#SRM20007

The standard flange shingle plate is used for parallel and inclined installations on asphalt and elastomer roofs.

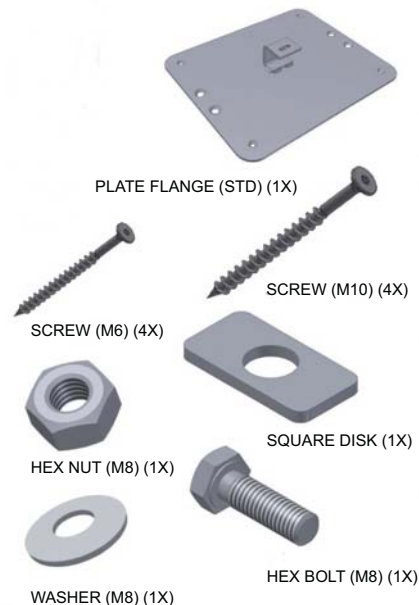
CAUTION

- The plates must be screwed into a support capable bearing the required load (generally rafters or concrete).
- Once installed, the plates must be sealed to the roof sheet material (see FIG. 3-24), and only then can the collector be fitted.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-21).

Figure 3-21 Kit #SRM20007 - Flange Shingle Plate (Standard) Kit Components



3 Roof Attachment Installation *(continued)*

Install flange plate shingle (standard)

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Caulk (field supplied) around the perimeter of the flange plate (FIG. 3-22).
5. Using the flange plate as a template, place the flange plate on the roof and drill four (4) 6 mm holes as shown in FIG. 3-23. Install the larger screws provided in the kit into the 6mm holes securing the flange plate to the roof (caulk around screws before tightening).
6. Install the four (4) remaining smaller screws in the perimeter of the flange plate as shown in FIG. 3-23 (caulk around screws before tightening).
7. Cover flange plate with roofing material, sealing it to the roof (FIG. 3-24).

Figure 3-22 Caulk Around Perimeter of Flange Plate

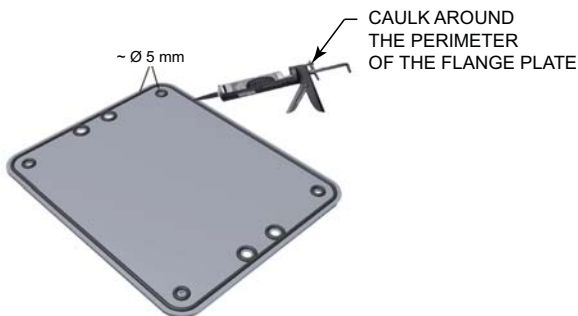


Figure 3-23 Drill Holes and Attach Flange Plate

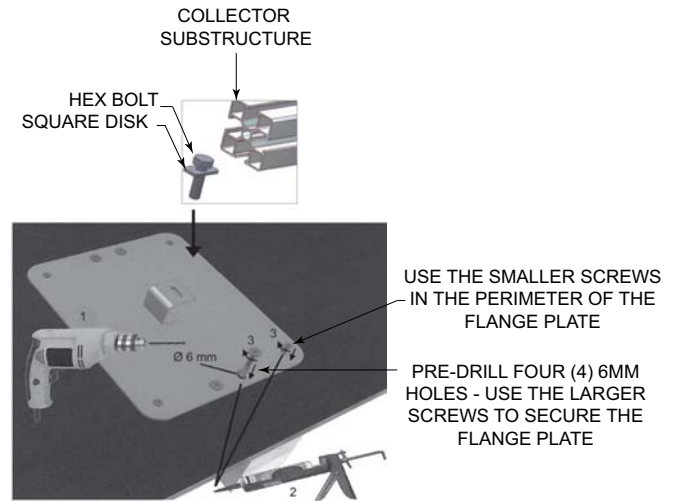
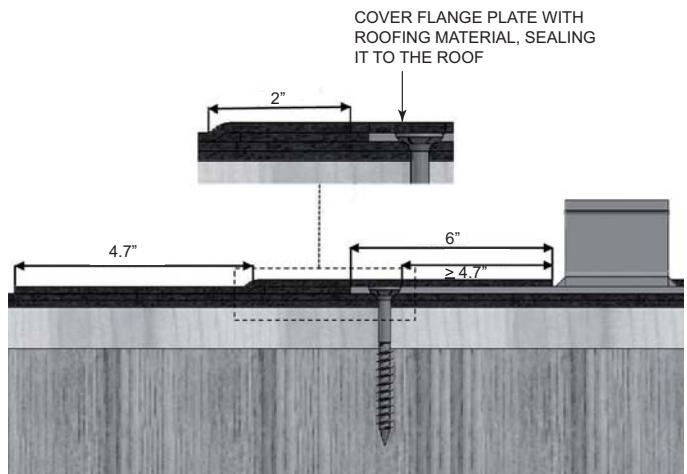


Figure 3-24 Cover Flange Plate with Roofing Material



8. Slide the square disk onto the hex bolt (see FIG. 3-23).
9. Install the hex bolt with square disk attached into the opening of the flange plate as shown in FIG. 3-23.

Note: Do not tighten hex bolt until ready to install on the collector substructure.

10. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 9.
11. Repeat Steps 4 - 10 until installation is complete.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

3 Roof Attachment Installation

Flange plate shingle (raised) #SRM20008

The raised flange shingle plate is used for inclined installations on asphalt and elastomer roofs; also suitable for flat roofs.

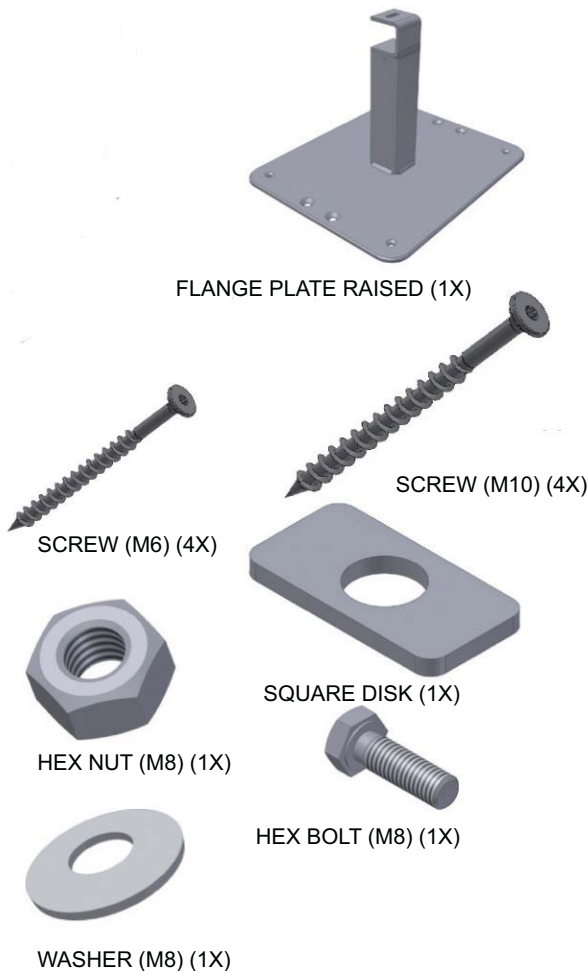
CAUTION

- The plates must be screwed into a member capable of bearing the required static load (generally rafters or concrete).
- Once installed, the panels must be sealed to the roof sheet material (FIG. 3-28), and only then can the collector be fitted.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-25).

Figure 3-25 Kit #SRM20008 - Flange Plate (Raised) Kit Components



Install flange plate shingle (raised)

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Caulk (field supplied) around the perimeter of the flange plate (FIG. 3-26).
5. Using the flange plate as a template, place the flange plate on the roof and drill four (4) 6 mm holes as shown in FIG. 3-27. Install the larger screws provided in the kit into the 6mm holes securing the flange plate to the roof (caulk around screws before tightening).
6. Install the four (4) remaining smaller screws in the perimeter of the flange plate as shown in FIG. 3-27 (caulk around screws before tightening).
7. Cover the flange plate with roofing material, sealing it to the roof (FIG. 3-28).

Figure 3-26 Caulk Around Perimeter of Flange Plate



3 Roof Attachment Installation *(continued)*

Figure 3-27 Drill Holes and Attach Flange Plate

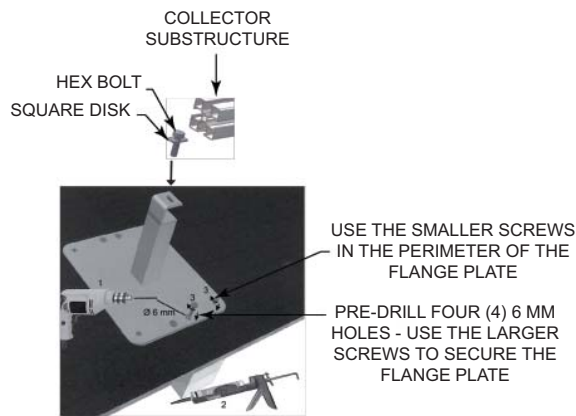
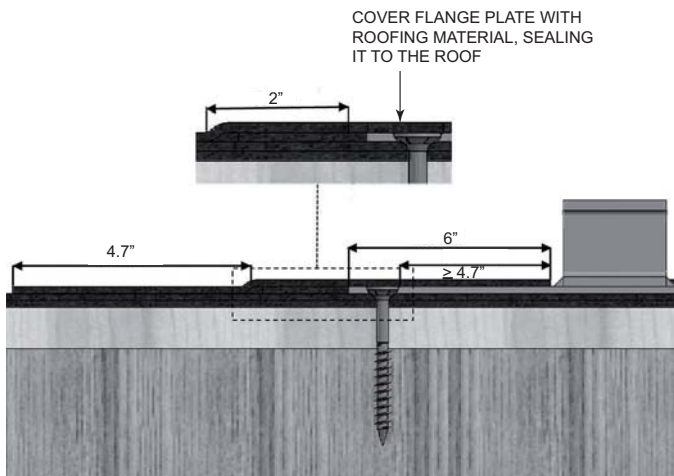


Figure 3-28 Cover Flange Plate with Roofing Material



8. Slide the square disk onto the hex bolt (see FIG. 3-27).
9. Install the hex bolt with square disk attached into the opening of the flange plate as shown in FIG. 3-27.

Note: Do not tighten hex bolt until ready to install on the collector substructure.

10. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 9.
11. Repeat Steps 4 - 10 until installation is complete.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

Corrugated metal roof attachment #SRM20013

The corrugated metal roof attachment is used for parallel and inclined mounting on profiled or corrugated sheet metal roofs. The console is mounted above the mounting screws of the profiled or corrugated sheet metal. The two sealing screws are first screwed onto the underlying mounting screw of the sheet. The sealing is done before the console is mounted using the sealing pads supplied. The sections are fixed to the section connectors on the console.

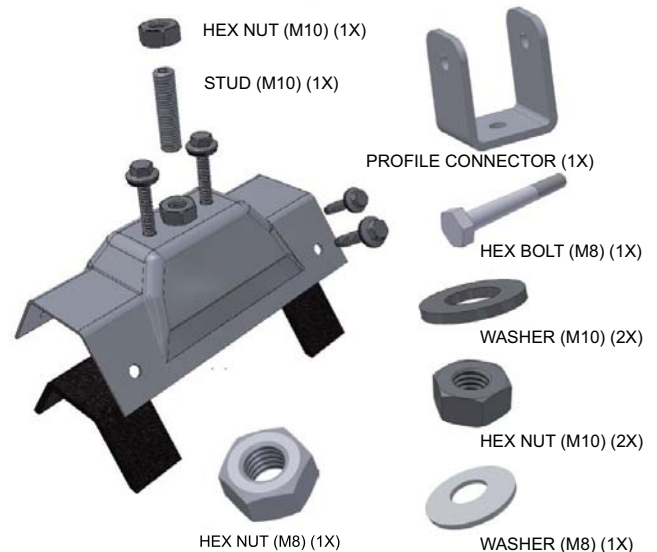
CAUTION

- The console must be ordered to fit the relevant profiled or corrugated sheet metal.
- The mounting screws supplied with the console must be appropriate in type and length for the particular roof construction.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-29).

Figure 3-29 Kit #SRM20013 - Corrugated Metal Roof Attachment Kit Components



3 Roof Attachment Installation

Install metal roof attachment

1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Attach the rubber seals provided in the kit to each end of the metal roof attachment as shown in FIG. 3-30.
5. Place the metal roof attachment on top of an existing fixing point of the metal roof (FIG. 3-31).
6. Using the metal roof attachment as a template pre-drill two (2) 6.5 mm holes into the top of the metal roof attachment (see FIG. 3-31).
7. Install hex bolts into pre-drilled holes as shown in FIG. 3-32.
8. Install the four (4) self tapping screws provided in kit into each side of the metal roof attachment (FIG. 3-32).
9. Insert the stud (all thread) into the center of the roof attachment.

Figure 3-30 Install Rubber Seals



Figure 3-31 Pre-drill 6.5 mm Holes

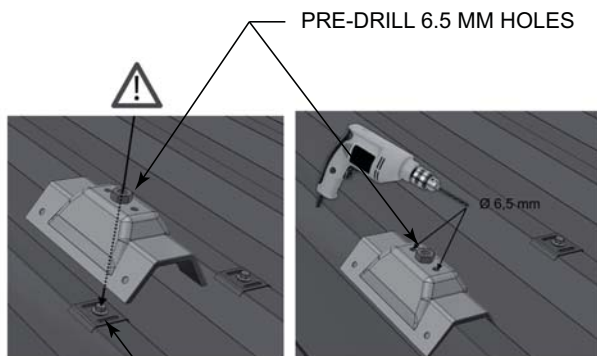
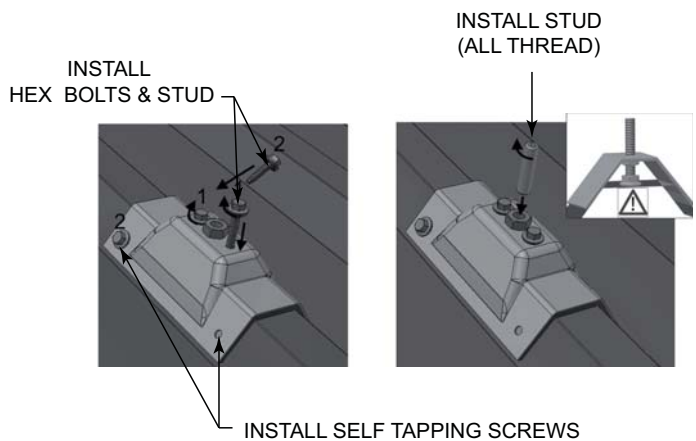
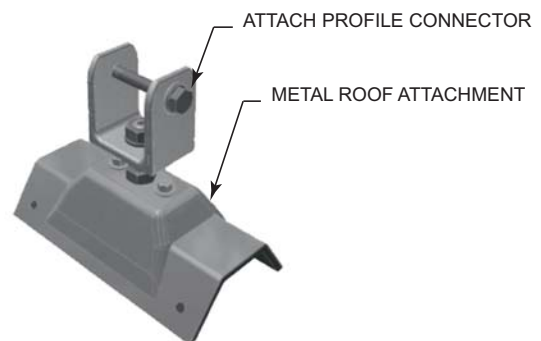


Figure 3-32 Install Hex Bolts and Stud



10. Attach the profile connector to the stud using the washers and hex nuts provided in the kit (FIG. 3-33).
11. Drill a 6.5 mm hole into the horizontal bar.
12. Place the horizontal bar into the profile connector installed in Step 10.
13. Using the remaining bolts and washers secure the horizontal bar into the profile connector.

Figure 3-33 Install Profile Connector



3 Roof Attachment Installation *(continued)*

Wave roof attachment #SRM20014 & #SRM20015

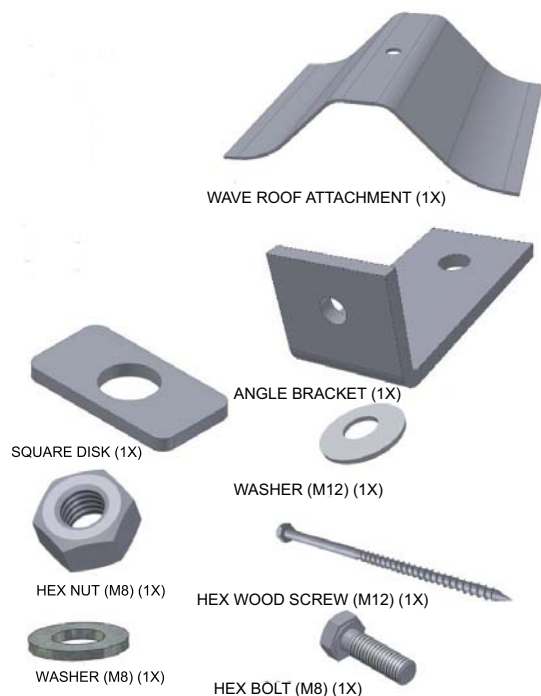
The wave roof attachment is for parallel and inclined mounting on corrugated cement roofs. The wave roof attachment is screwed to the load-bearing wooden frame using mounting screws and then sealed with caulk. The horizontal bars are then screwed to the angle bracket that has been bolted to the wave roof attachment.

- CAUTION**
- Various sizes: Profile 5 corrugations per meter; profile 8 corrugations per meter.
 - The wood screws must be screwed into a member capable of bearing the required static load (generally rafters). Longer wood screws are necessary if the roof construction is higher (e.g. roof insulation).

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-34).

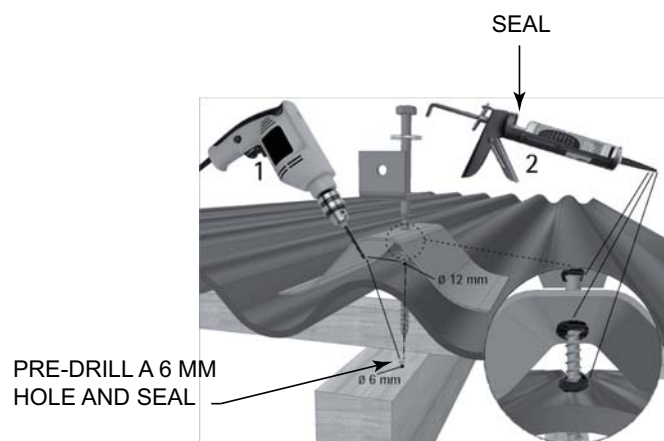
Figure 3-34 Kit #SRM20014 & #SRM20015 - Wave Roof Attachment Kit Components



Install wave roof attachment

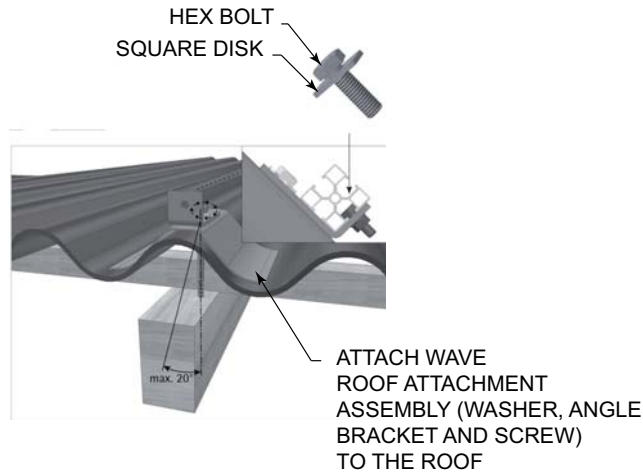
1. Determine roof type. Inspect the structural integrity of the roof and the durability of the roof materials.
2. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
3. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
4. Using the wave roof attachment as a template, place the wave roof attachment on the roof and pre-drill a 6 mm hole as shown in FIG. 3-35.
5. Caulk (field supplied) inside the 6 mm hole pre-drilled in Step 4 (FIG. 3-35).
6. Place the wave roof attachment, angle bracket and washer over the 6 mm hole on the roof (FIG. 3-36). Insert the screw through the washer and angle bracket into the 6 mm hole securing the wave roof attachment to the roof (caulk around screws before tightening) (FIG. 3-35).

Figure 3-35 Pre-Drill 6 mm Hole and Seal



3 Roof Attachment Installation

Figure 3-36 Attach Wave Roof Attachment Assembly and Hex Bolt



7. Slide the square disk onto the hex bolt (see FIG. 3-36).
 8. Install the hex bolt with square disk attached into the opening of the wave roof attachment as shown in FIG. 3-36.
- Note:** Do not tighten hex bolt until ready to install on the collector substructure.
9. Thread the hex nut (M8) and washer (M8) onto the bottom of the hex bolt installed in Step 8.
 10. Repeat Steps 4 - 9 until installation is complete.

Install hex bolt onto collector substructure (reference Section 4 - Collector Installation)

Anchor bolts for concrete with or without height adjustment #SRM20009 & #SRM20010

Anchor bolts are used for inclined and freestanding mounting on concrete. The anchor bolt is inserted at least 2 1/4" into the 10 mm hole pre-drilled in the concrete. The aluminum profile with a 10.5 mm clearance hole is threaded over the bolt and fixed with a washer and nut.

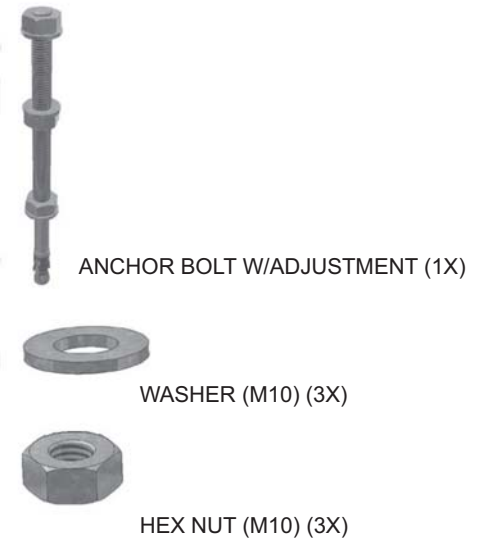
CAUTION

- There are two (2) models of concrete anchor bolts, one with adjustment and one without. The adjustable dimensions are up to 2 3/4".
- The anchor bolt may have a maximum deviation from vertical of 5°.

Unpacking and checking parts

When unpacking the system, check the model names of the components of each system and check to be sure you have the correct number of parts (see FIG. 3-37).

Figure 3-37 Kit #SRM20009 & #SRM20010 - Anchor Bolt Kit Components

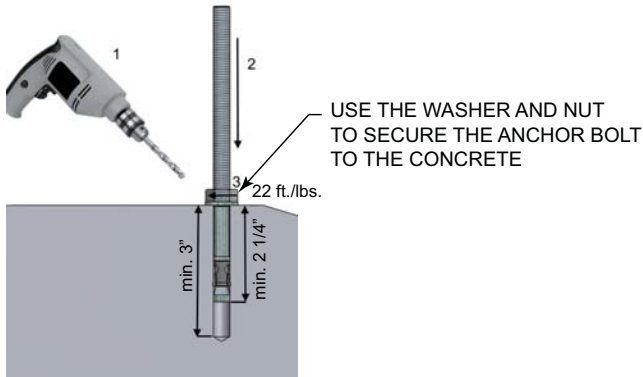


Install anchor bolt

1. Determine the number of collectors needed for the installation and the number of required roof attachments from Table 3B or 3C on page 11.
2. Determine collector connection points (spacing). Measure the spacing of the rafters or trusses to confirm the dimensions and prepare for the system layout (reference the Roof Attachment Spacing Section on page 12).
3. Pre-drill a 10 mm hole a minimum of 3 inches into the concrete (FIG. 3-38).
4. Place the anchor bolt into the pre-drilled hole using a field supplied hammer.
5. Use the washer and nut provided in the kit to secure the anchor bolt to the concrete as shown in FIG. 3-38.

3 Roof Attachment Installation *(continued)*

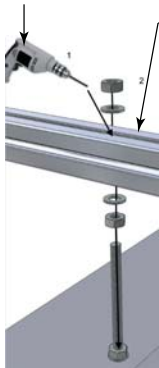
Figure 3-38 Pre-Drill 10 mm Hole & Attach to Concrete



6. Place the second nut and washer on the anchor bolt at the desired height (if using the anchor bolt with adjustments).
7. Drill a 10.5 mm hole in the horizontal bar (see FIG. 3-39).
8. Place the horizontal bar onto the anchor bolt and use the remaining washer and nut to secure the horizontal bar to the substructure as shown in FIG. 3-39.

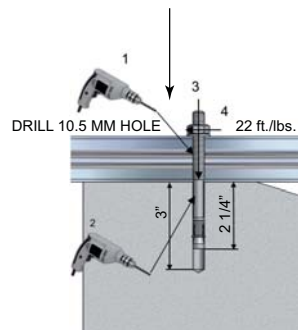
Figure 3-39 Attach Horizontal Bar

DRILL 10 MM HOLE



ATTACH HORIZONTAL BAR

HORIZONTAL BAR
INSTALLED ON ANCHOR BOLT



4 Collector Installation

Horizontal bar lengths

Figure 4-1A Horizontal Bar Lengths

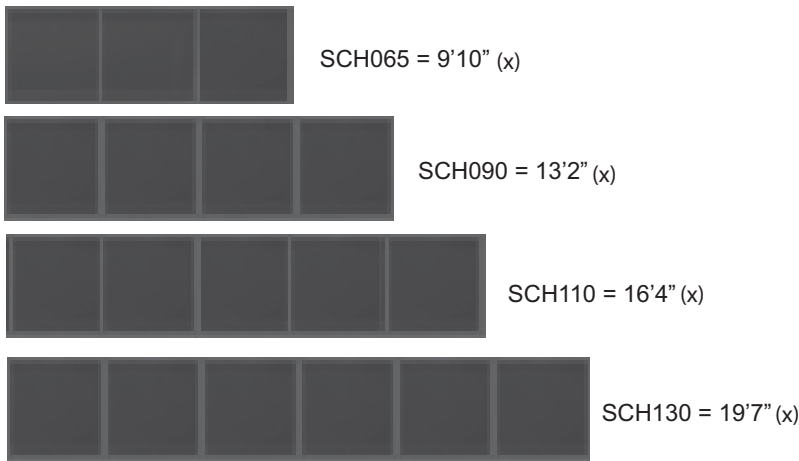
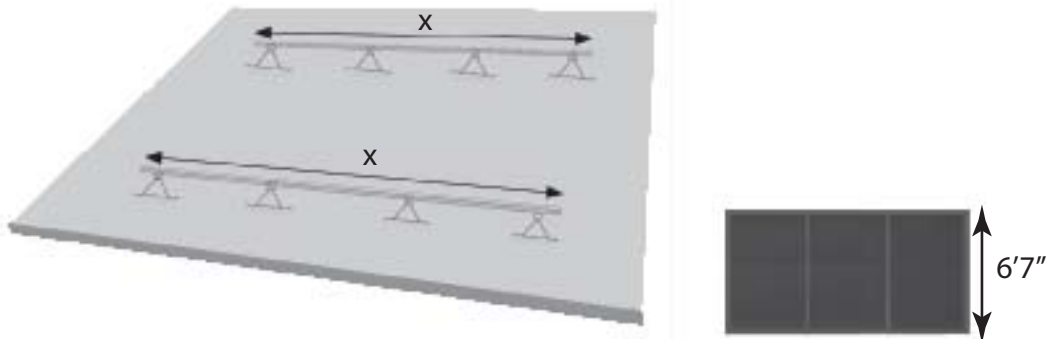
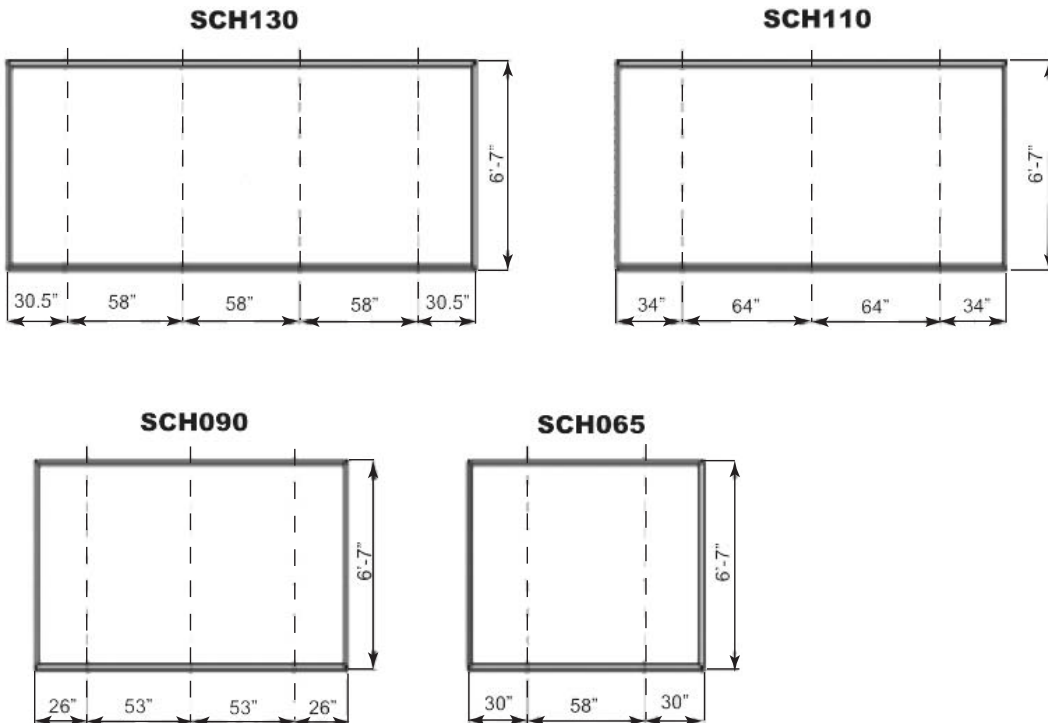


Figure 4-1B Spacing Information for Location of A-frames for Inclined Installations



4 Collector Installation *(continued)*

SCH parallel mounting instructions

1. Install roof attachments (see the Roof Attachment Section on pages 13 - 27 of this manual).
2. Install the horizontal bar(s) (FIG.'s 4-2A and 4-2B) using the square disk, hex bolt, and washers provided in the kit.

Figure 4-2A Install Horizontal Bars

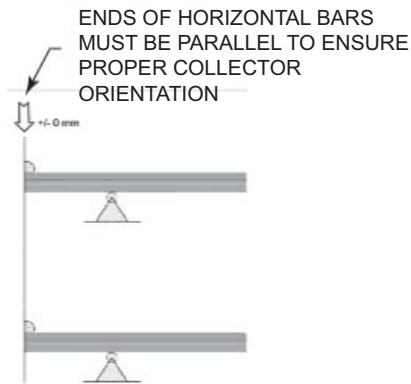
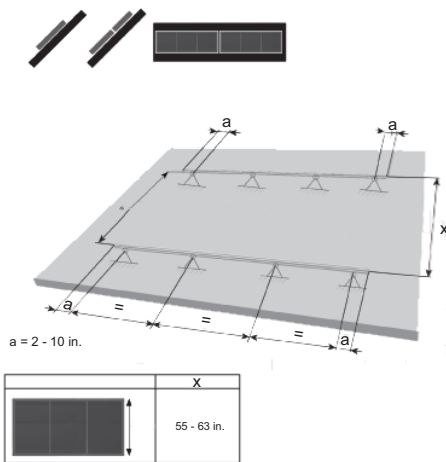
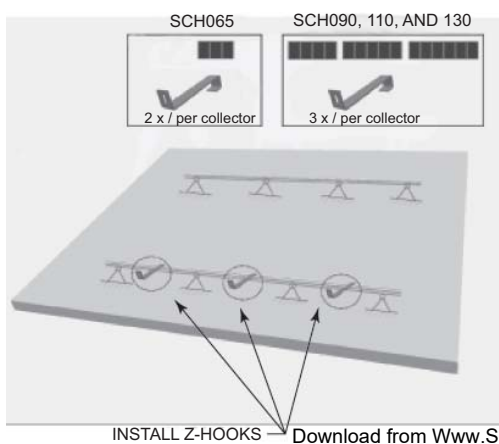


Figure 4-2B Spacing



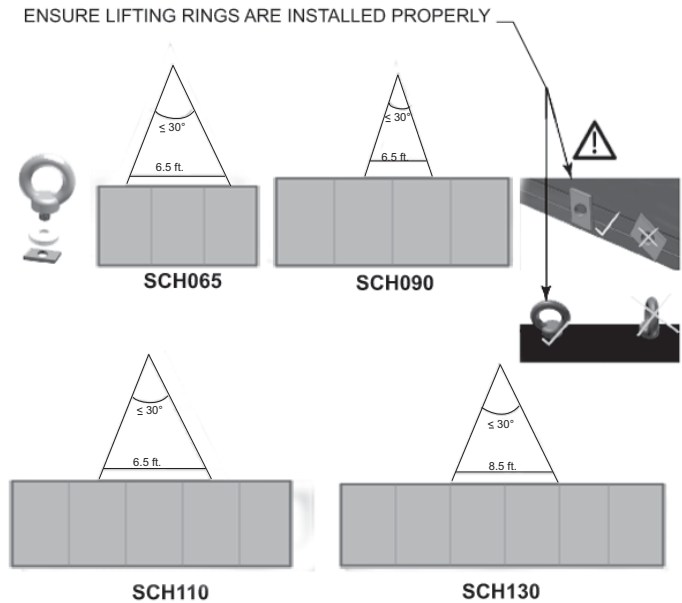
3. Install the Z-hooks per FIG. 4-3 using the specified number of brackets.

Figure 4-3 Install Z-Hooks



4. Ensure lifting rings are installed and properly spaced as per FIG. 4-4.

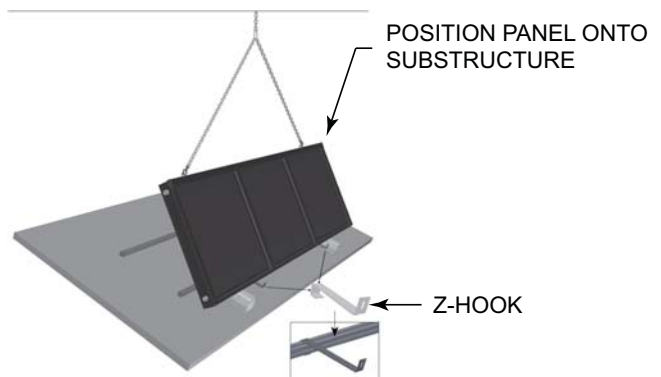
Figure 4-4 Lifting Rings



5. Position the collector onto the substructure and hanger brackets (FIG. 4-5).

WARNING Only loosen the crane connection when the collectors are completely fixed to the substructure.

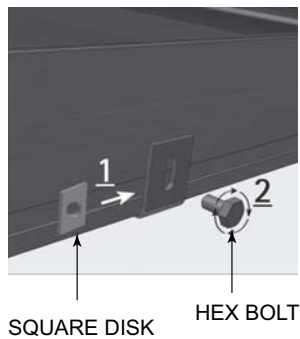
Figure 4-5 Position Collector On Substructure



6. Secure the collector to the Z-hook(s) using the square disk and hex bolt provided in the kit (FIG. 4-6).

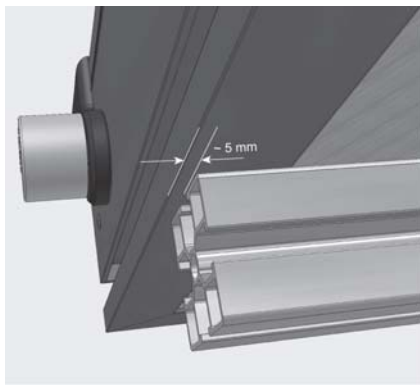
4 Collector Installation

Figure 4-6 Secure Collector



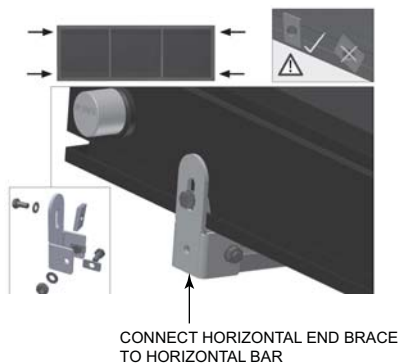
- Position the collector on the horizontal bars so that the collector overhangs approximately 5mm (.2") (FIG. 4-7).

Figure 4-7 Position Collector on Horizontal Bars



- Connect the horizontal end brace to the collector using the square disk, hex bolt, washer and nut on each side of the collector (FIG. 4-8).

Figure 4-8 Connect Horizontal End Brace to Collector



- For *stacked series installations* repeat steps for the top collector and install self tapping screws and spacers to separate the top collector from the bottom collector as shown in FIG. 4-9.

NOTICE

Go to Step 12 for instructions on *side by side installations*.

Figure 4-9 For Stacked Series Installations - Use Self Tapping Screws and Spacers



- Install top collector on the horizontal bars and slide it onto the spacers (FIG. 4-10). Repeat Steps 7 and 8 for the top collector.

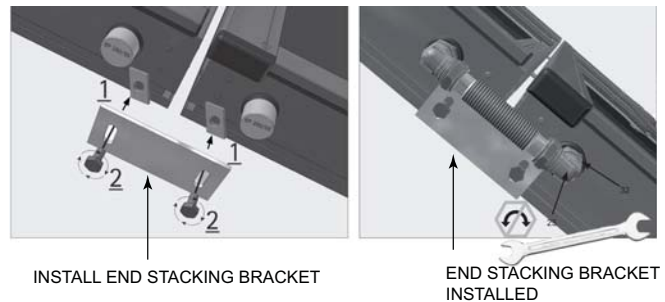
Figure 4-10 Install Top Collector

INSTALL TOP COLLECTOR



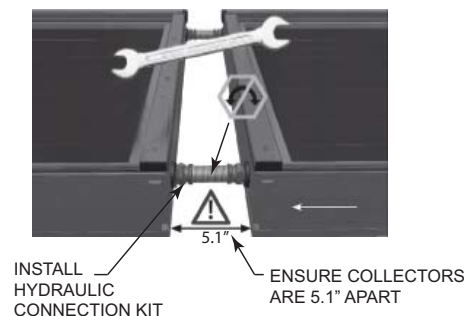
- Install end stacking brackets (FIG. 4-11).

Figure 4-11 Install End Stacking Bracket(s)



- For *side by side installations* repeat Steps 1 - 8 and install horizontal hydraulic connections (see FIG. 4-12).

Figure 4-12 Install Horizontal Hydraulic Connections on Side by Side Installations



NOTICE

Make certain collectors are 5.1" apart.

4 Collector Installation *(continued)*

NOTICE

The Mechanical Connection Kit is an optional kit available through the manufacturer.

- Remove the collector railing and install the Mechanical Connection Kit (FIG.'s 4-13 and 4-14). Note: Be sure to bend the tabs down on the Mechanical Connection Kit.

Figure 4-13 Remove Collector Railing

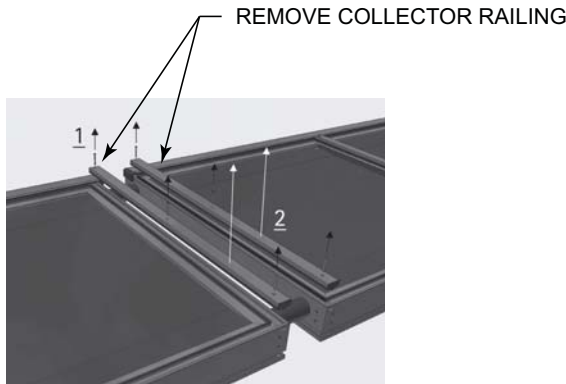
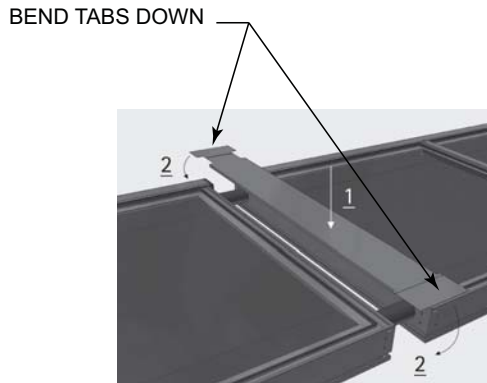
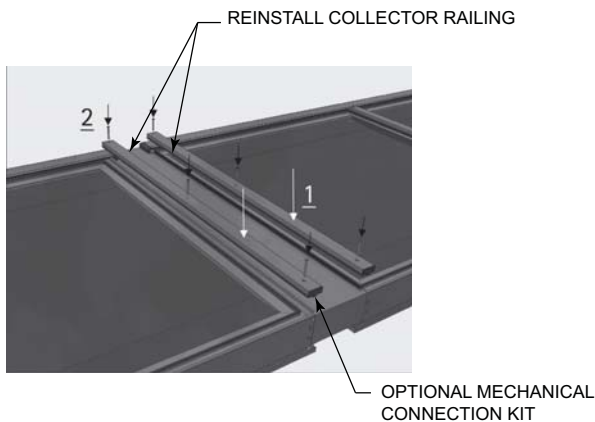


Figure 4-14 Install Mechanical Connection Kit



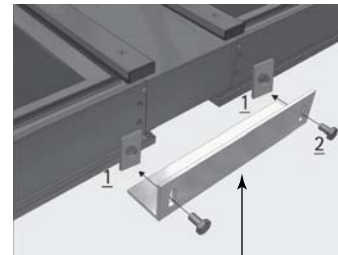
- Reinstall the collector railing removed in Step 13 (FIG. 4-15).

Figure 4-15 Reinstall Collector Railing



- Install the side by side bracket using the square disks and hex bolts provided in the kit (FIG. 4-16).

Figure 4-16 Install Side by Side Bracket



INSTALL SIDE BY SIDE BRACKET

- Install the plug, sensor well and hydraulic connections to complete the installation (see FIG.'s 4-17, 4-18 and 4-19).

Figure 4-17 Install Plug



Figure 4-18 Install Sensor Well

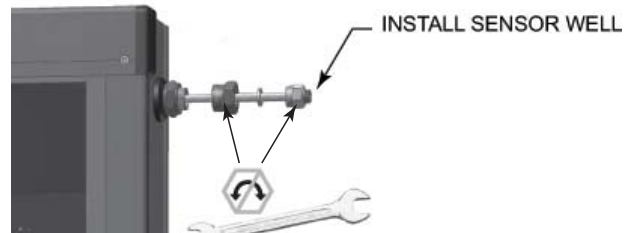
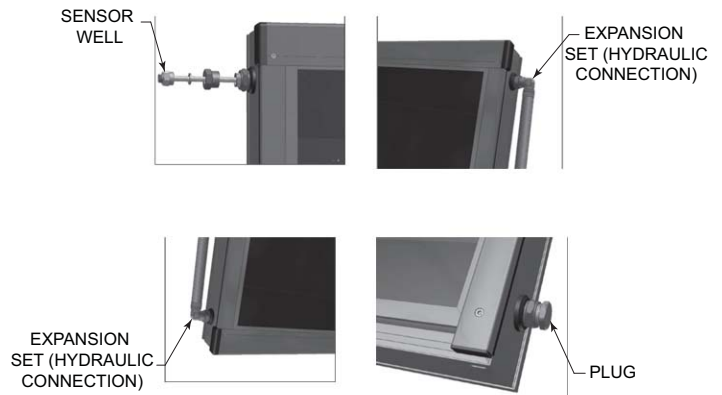


Figure 4-19 Install Hydraulic Connections

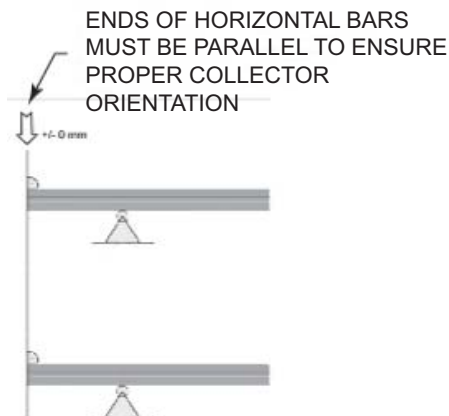


4 Collector Installation

SCH inclined / non-south facing roof mounting instructions

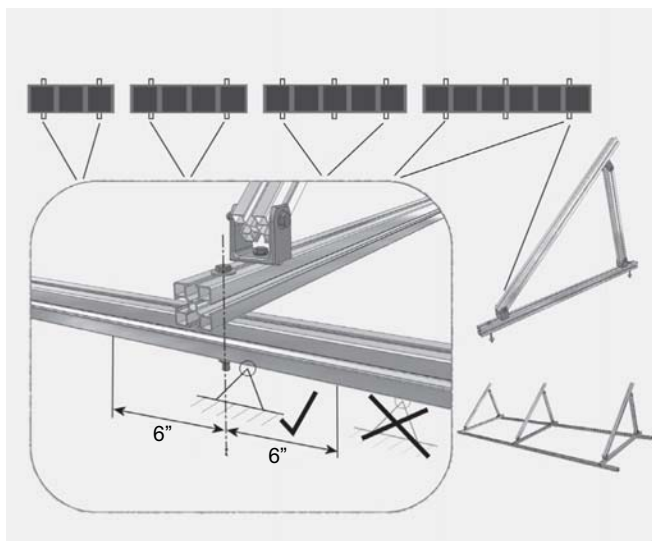
1. Install roof attachment (see the Roof Attachment Section on pages 12 - 26 of this manual).
2. Install the horizontal bar(s) (FIG. 4-20) using the square disk, hex bolt, and washers provided in the kit (reference the Roof Attachment Spacing Section on page 11 of this manual).

Figure 4-20 Install Horizontal Bars



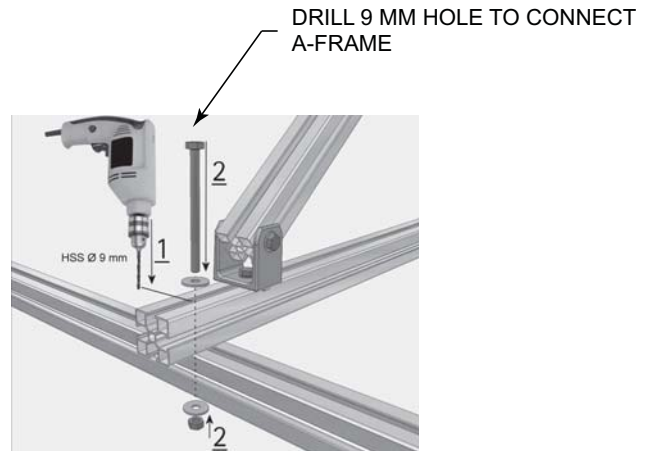
3. Assemble A-frame.
4. Position A-frame to horizontal bars within 6" of the roof attachments as shown in FIG. 4-21.

Figure 4-21 Mount A-frame to Horizontal Bars



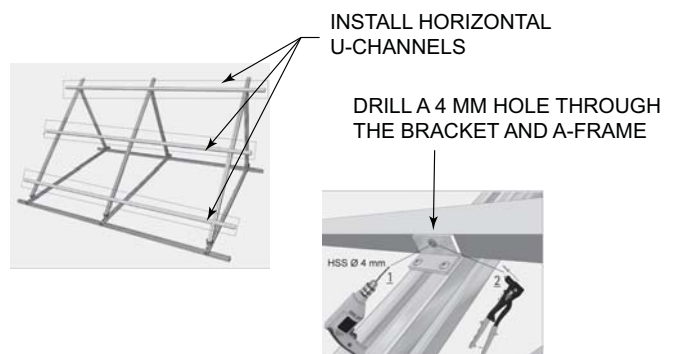
5. Drill a 9 mm hole through the horizontal bar(s) and A-frame(s), use the bolts, washers and nuts provided in the kit to attach the A-frame(s) to the horizontal bar(s) (see FIG. 4-22).

Figure 4-22 Drill 9 mm Hole in Horizontal Bar(s)



6. Repeat Steps 3 - 5 for each A-frame making sure all A-frames are square and aligned with each other.
7. Install three (3) U-channel supports (FIG. 4-23). Drill a 4 mm hole through the bracket and U-channel, use pop rivets to attach the U-channels perpendicular to the A-frame.

Figure 4-23 Install Horizontal Supports

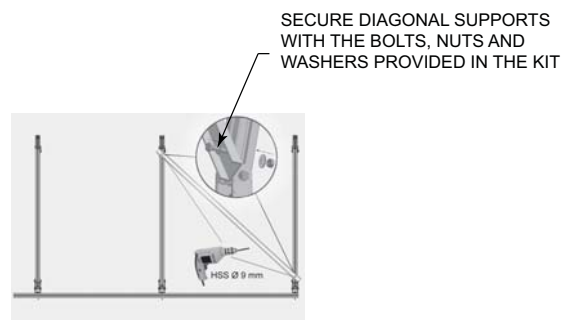


NOTICE

Diagonal supports are needed on non-south facing installations ONLY.

8. In the case of a non-south facing installation install diagonal supports (see FIG. 4-24). Drill a 9 mm hole through the support and the A-frame. Secure the diagonal support using the bolts, washers, and nuts provided in the kit.

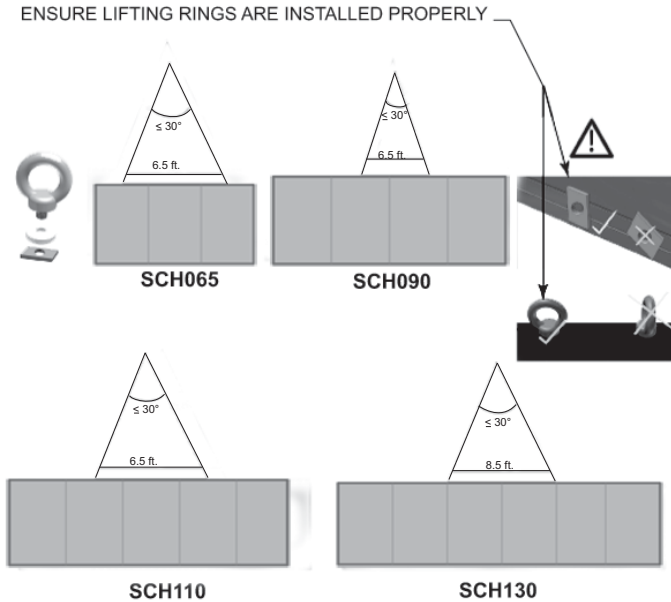
Figure 4-24 Install Diagonal Supports



4 Collector Installation *(continued)*

9. Ensure lifting rings are installed and spaced properly per FIG. 4-25.

Figure 4-25 Lifting Rings



10. Position the collector onto the substructure (FIG. 4-26).

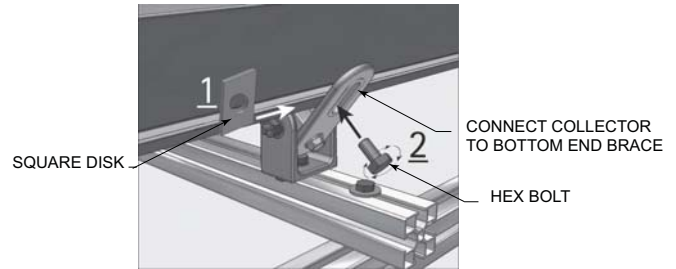
WARNING Only loosen the crane connection when the collectors are completely fixed to the substructure.

Figure 4-26 Position Collector On Substructure



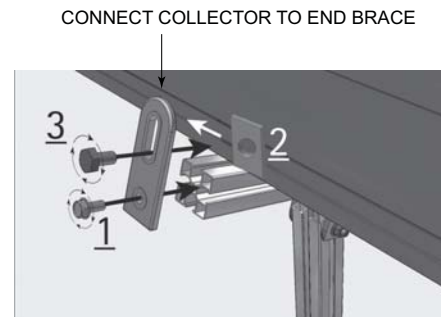
11. Connect the collector to the bottom end brace using the square disk and bolt provided in the kit (FIG. 4-27). Do not tighten.
12. Position the collector on the U-channels so that the collector overhangs approximately 5 mm (.2") (FIG. 4-26). Tighten square disk.

Figure 4-27 Connect Collector to Bottom End Brace



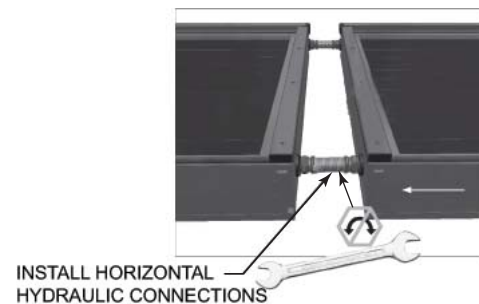
13. Install the top end brace using the bolt provided in the kit (FIG. 4-28).
14. Connect the collector to the end brace using the square disk and bolt provided in the kit (FIG. 4-28).
15. Ensure all bolts are tightened.

Figure 4-28 Install Top End Brace



16. For *side by side installations* repeat Steps 1 - 15 and install horizontal hydraulic connections (see FIG. 4-29).

Figure 4-29 Install Horizontal Hydraulic Connections



NOTICE The Mechanical Connection Kit is an optional kit available through the manufacturer.

4 Collector Installation

17. Remove the collector railing and install the Mechanical Connection Kit (FIG.'s 4-30 and 4-31). Note: Be sure to bend the tabs down on the Mechanical Connection Kit.

Figure 4-30 Remove Collector Railing

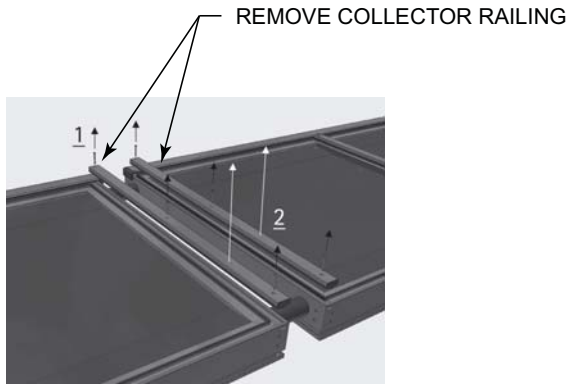
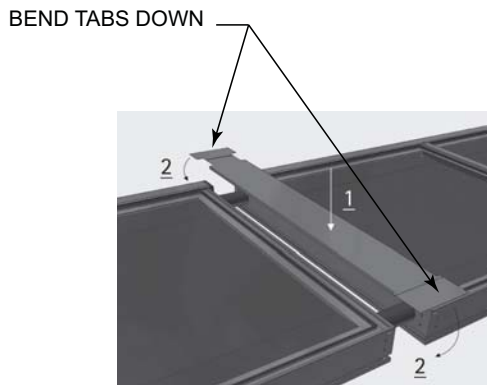
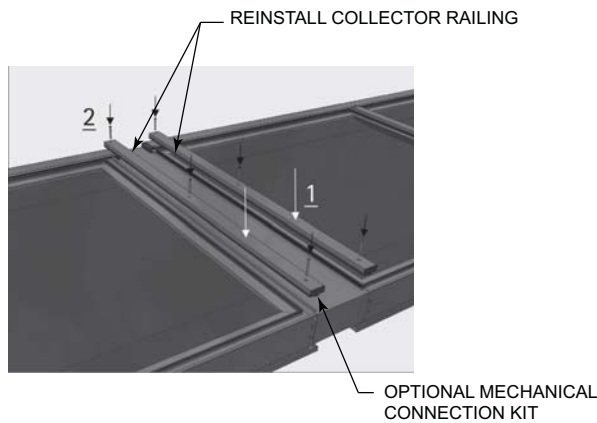


Figure 4-31 Install Mechanical Connection Kit



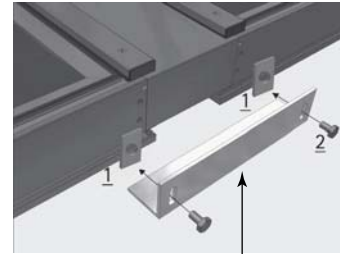
18. Reinstall the collector railing removed in Step 17 (FIG. 4-32).

Figure 4-32 Reinstall Collector Railing



19. Install the side by side bracket using the square disks and hex bolts provided in the kit (FIG. 4-33).

Figure 4-33 Install Side by Side Bracket



INSTALL SIDE BY SIDE BRACKET

20. Install the plug, sensor well and hydraulic connections to complete the installation (see FIG.'s 4-34, 4-35 and 4-36).

Figure 4-34 Install Plug

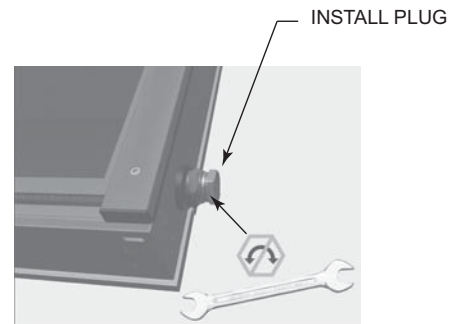


Figure 4-35 Install Sensor Well

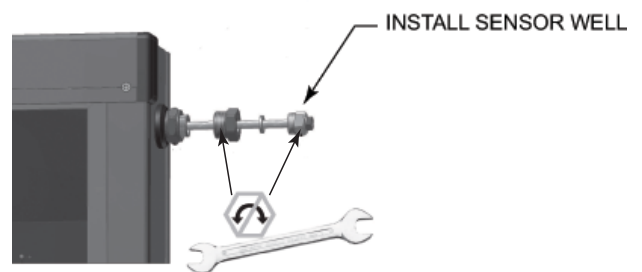
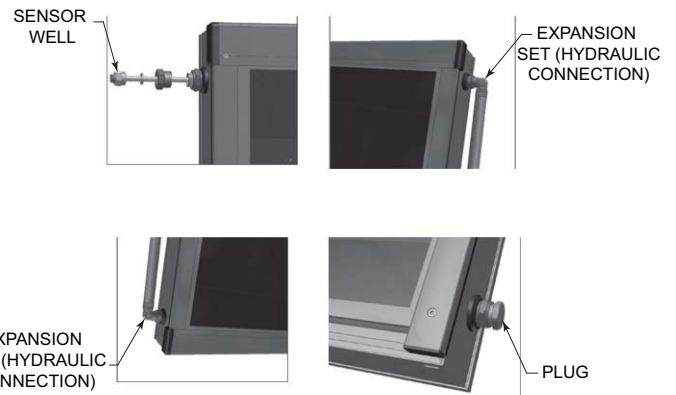


Figure 4-36 Install Hydraulic Connections

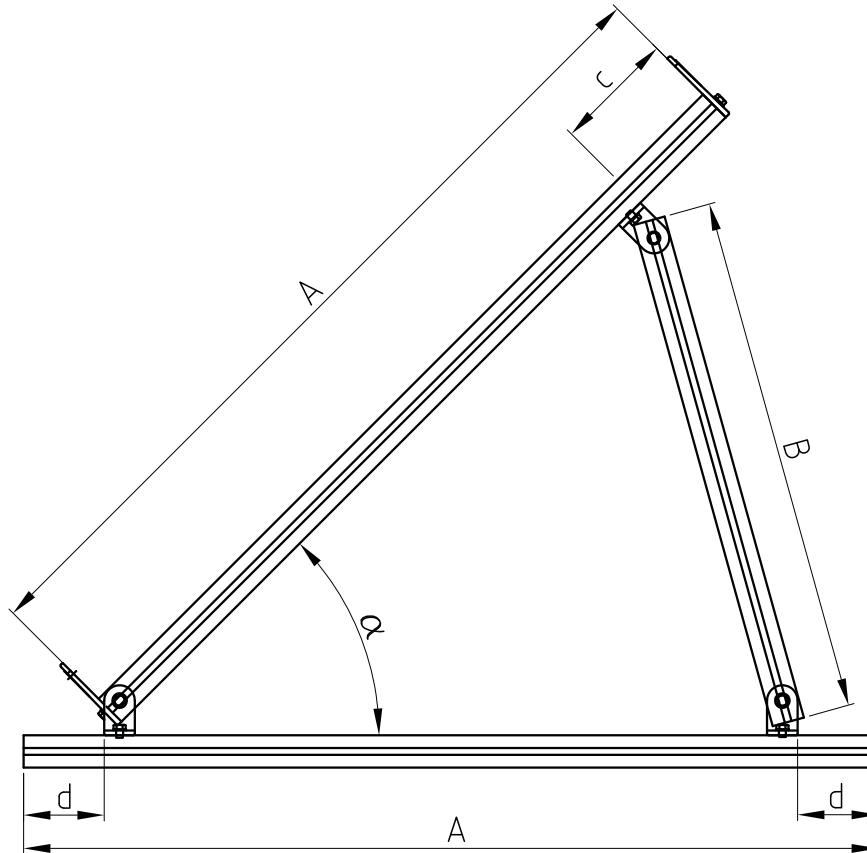


4 Collector Installation *(continued)*

SCH A-frame dimensions

Table 4A Inclined and Non-South Facing Installations

α	A	B	c	d
20°	6 ft. 7 in.	24 in.	6 in.	4 in.
40°	6 ft. 7 in.	47 in.	7 in.	4 in.
60°	6 ft. 7 in.	69 in.	8 in.	4 in.



4 Collector Installation

Table 4B SCH Mounting Hardware + Hydraulic Connection Kits

Part-number	Description	Needed quantities for:			
		SCH065	SCH090	SCH110	SCH130
Parallel installation:					
SCA20001	Horizontal aluminum bar 10 ft	2			
SCA20002	Horizontal aluminum bar 13 ft		2		
SCA20003	Horizontal aluminum bar 16 ft			2	
SCA20004	Horizontal aluminum bar 20 ft				2
SSK20004	End bracing kit	2	2	2	2
SSK20005	Z-hook kit	2	3	3	3
Inclined (20°, 40°, 60°) installation:					
SCA20001	Horizontal aluminum bar 10 ft	2			
SCA20002	Horizontal aluminum bar 13 ft		2		
SCA20003	Horizontal aluminum bar 16 ft			2	
SCA20004	Horizontal aluminum bar 20 ft				2
SCA20005	Aluminum U-channel 10 ft	3			
SCA20006	Aluminum U-channel 13 ft		3		
SCA20007	Aluminum U-channel 16 ft			3	
SCA20008	Aluminum U-channel 20 ft				3
SSK20001	A-frame 20° inclined	2	3	3	4
SSK20002	A-frame 40° inclined	2	3	3	4
SSK20003	A-frame 60° inclined	2	3	3	4
Hydraulic connection kits: (1 array is max. 2 SCH's!)					
HYK20001	Hydr. conn. kit 2x 6.5' + plug + sensor well	1x per collector or array			
HYK20002	Hydr. conn. kit 1x 6.5'/1x 13' + plug + sensor well	1x per collector or array			
HYK20003	Serial hydr. exp. kit for stacked installation	1x per array			
HYK20004	Parallel hydr. exp. kit for side by side installation	1x per array			
HYK20005	Serial hydr. exp. kit for side by side installation	1x per array			
Mechanical connection kits: (optional for installation!)					
MCK20001	Mechanical conn. kit for side by side installation	1x per array			
MCK20002	Mechanical conn. kit for stacked installation	1x per array			
MCK20003	Cover for piping (for side by side installations)	1x per array			
Gable bracing kits: (required for non-south facing installation!)					
GBK20003	Bracing kit w/ diagonal support	1x per collector			

5 Hydraulic Connections

Hydraulic connection kits

The hydraulic connection kits are used to connect the collector to the main pipework. The hydraulic connections kits consist of two (2) flexible corrugated stainless steel pipe with insulation, sensor well, plug and support sleeves.

Hydraulic expansion kits

The hydraulic expansion kits are hydraulic connections between collectors in one array. The hydraulic expansion kits consist of two (2) nipples with compression rings and unions.

Note: Hydraulic connections and expansion kits are included with the substructure material.

⚠ WARNING Brazing ONLY, no soldering. When brazing you must protect the stainless steel connection to the copper to ensure that the temperature does not rise above 302°F.

⚠ WARNING A properly sized expansion tank must be used to avoid damage to the Solar Thermal System.

Figure 5-1 SCH Hydraulic Expansion Kit



Figure 5-2 Expansion Kits - Stacked

CONNECTION EXPANSION SET, STACKED COLLECTOR IN SERIES



Description

Set for hydraulic connection of two collectors stacked, in series. Ready-to-fit corrugated stainless-steel pipe with two (2) soldered elbow joints for .86" copper pipe. Center-to-center distance 9 1/4". The collector outlet of the lower collector is connected to the inlet of the upper collector. The corrugated pipe absorbs and compensates for thermal expansion. Rubber insulation, temperature-resistant to 347°F, is fitted on the corrugated pipe. Two plugs are included in the scope of delivery for closing the remaining header ends. The compression ring and nut are already fitted on the collector.

NOTICE

Do not exceed 260 ft² for the collectors connected in this way. Be aware of pressure drop (see the Recommended Flow Chart on page 38). Use a more powerful solar pump if necessary.

5 Hydraulic Connections

Figure 5-3 Expansion Kits - Side by Side, Parallel

CONNECTION EXPANSION SET, SIDE BY SIDE, PARALLEL



Description

Set for hydraulic connection of two (2) collectors side by side. The set consists of two (2) pieces of corrugated stainless-steel pipe with one compression ring at each end and insulation. The headers of the left and right collectors are connected using these corrugated stainless steel pipes. The corrugated pipe absorbs and compensates for thermal expansion. The distance of 5.1" between the collectors must be maintained precisely. Once the installation is complete, the insulation supplied is pulled over the corrugated pipe and fixed in place with the adhesive tape included in the set. The insulation is suitable for temperatures up to 347°F and resistant to UV radiation.

NOTICE

Do not exceed 260 ft² of collector area. Be aware of pressure drop (see the diagram on page 38). Use a more powerful solar pump if necessary.

Figure 5-4 Expansion Kits - Side by Side, Serial

CONNECTION EXPANSION SET, SIDE BY SIDE, SERIES



Description

Set for hydraulic connection of two (2) collectors side by side, in series. Ready-to-fit corrugated stainless-steel pipe (DN20) with two (2) soldered elbow joints for 22 mm copper pipe. Used to make the connection side by side. The corrugated pipe absorbs and compensates for thermal expansion. Rubber insulation, temperature resistant to 347°F, is fitted on the corrugated pipe. Two (2) plugs are included in the scope of delivery for closing the remaining header ends. The compression ring and nut are already fitted on the collector.

NOTICE

Do not exceed 260 ft² of collector area. Be aware of pressure drop (see the diagram on page 38). Use a more powerful solar pump if necessary.

Expansion kits that are side by side in series are known to have a high pressure drop. A pressure drop calculation is recommended.

NOTICE

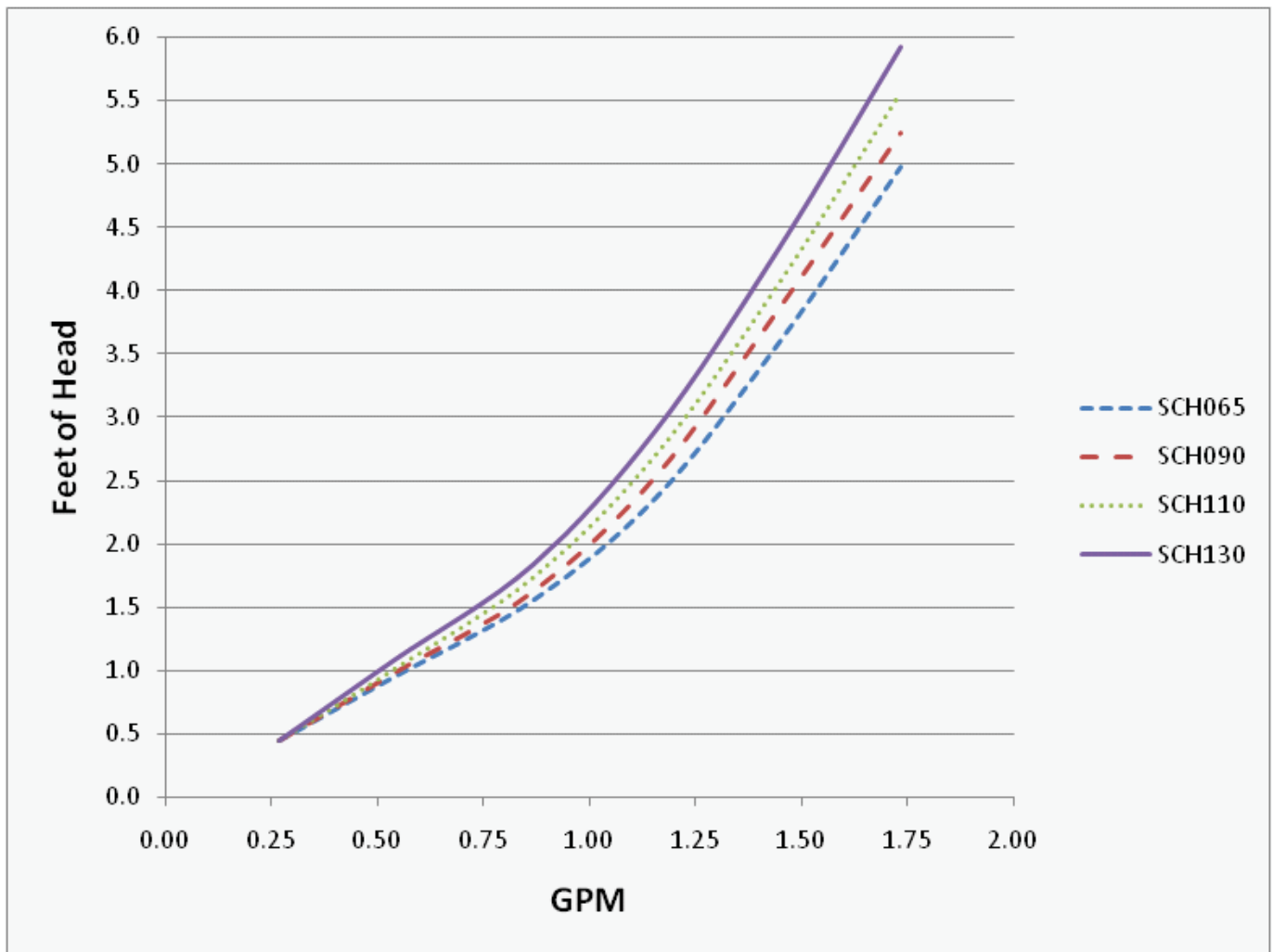
If using a series connection, it is strongly recommended that a calculated pressure drop be done to ensure proper pump installation.

5 Hydraulic Connections *(continued)*

Figure 5-5 Pressure Drop Chart

MODEL NO.	RECOMMENDED FLOW (GPM)	PRESSURE DROP (FT OF HD)
SCH065	0.656	1.06
SCH090	0.872	1.66
SCH110	1.090	2.51
SCH130	1.300	3.59

NOTICE The above chart references recommended flow per collector. Lochinvar recommends .01 GPM per square foot of collector area in each array.



6 System Start-up

Start-up

Check/control water chemistry

CAUTION

Do not use petroleum-based cleaning or sealing compounds in the system. Damage to elastomer seals and gaskets in the system could occur, resulting in substantial property damage.

Test/replace freeze protection fluid

1. For systems using freeze protection fluids, follow fluid manufacturer's instructions.
2. Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer's instructions.

Freeze protection

1. Determine freeze protection fluid quantity using system water content, following fluid manufacturer's instructions. Remember to include expansion tank water content.
2. When using freeze protection fluid with automatic fill, install a water meter to monitor water makeup. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.
3. The freeze protection set points may be lowered when freeze protection fluid is used (see the Lochinvar Solar Differential Control Manual).

Glycol

Aqueous solutions of Dowfrost HD fluid are designed to provide freeze/burst and corrosion protection, as well as efficient heat transfer, in water-based, closed-loop heating and air-conditioning systems.

Dowfrost HD fluid has an operating temperature range of -50°F to 325°F; with fluid freeze protection to below -60°F and system burst protection to below -100°F. The fluid contains corrosion inhibitors that are specially formulated for HVAC systems to keep pipes free of corrosion without fouling.

Thermal protection

WARNING

Thermal expansion tanks should be sized to account for 1.5 times the solar system circuit volume.

WARNING

A properly sized expansion tank must be used to avoid damage to the Solar Thermal System.

WARNING

The expansion tank may be hot, ensure scalding does not occur.

In heated water systems, a warning instruction must be provided by the operator near the expansion tank, if persons are endangered by excessive surface temperatures.

WARNING

Failure to heed these instructions, especially the safety instructions, can result in the destruction of and defects on the expansion tank, endanger persons, and impair the operation.

Final checks before starting the system

- Read the Lochinvar/TiSun Differential Control Installation and Operation Manual to familiarize yourself with differential control operation. Read this manual and follow the proper steps to start system.
- Verify the collector and system are full of water and all system components are correctly set for operation.
- Verify electrical connections are correct and securely attached.

WARNING

All piping should be properly insulated to avoid freezing and burn potential.

Filling, flushing and bleeding

- There is one fill valve with hose connection for filling, flushing and draining the solar system on both the safety group and sensor measurement section.
- Connect the pressure hose (forward flow) to the safety group's filling connection under the pressure gauge and open fill/flush valve.
- Connect the flushing hose (return) to the flushing connection on the sensor measuring section and open fill/flush valve.
- Refer to "Operation, multi-function ball valve and check valve" on page 38.
- Open the supply ball valve (by turning the red thermometer handle counter-clockwise until it stops).
- Close return ball valve (by turning the blue thermometer handle clockwise, until it stops).
- If necessary, the supply and return check valve can be opened by moving the thermometer handles to the 45° position.
- Put sufficient solar liquid in the tank of a filling and flushing pump (not supplied). The mixing ratio should be adapted to local conditions in terms of freeze protection.
- Fill the solar system via the filling and flushing pump and then flush the solar circuit for at least 15 min. to purge all of the air out of the circuit.
- Close the fill/flush valve (return) with the filling and flushing pump running and increase the system pressure to 60 psi. The system pressure can be read at the pressure gauge.

6 System Start-up (continued)

- Close the fill/flush valve (forward flow) and switch off the filling and flushing pump.
- Open return ball valve (by turning the blue thermometer handle 90° counter-clockwise until it stops).
- The solar system features an air separator. Open the bleeder valve until the solar liquid exits free of air bubbles.
- Only if collector bleeder is installed: Bleed the system on the collector until the solar liquid exits free of bubbles.
- If necessary, increase the test pressure again to 60 psi and check the system for leaks. If the pressure gauge shows the pressure dropping substantially, you have a leak in the system.
- Set the operating pressure to 60 psi as prescribed by the system manufacturer.
- Start up the circulation pump at maximum speed and allow liquid to circulate for at least 15 min.
- Remove the filling station hoses and screw the caps on the flushing and filling valves.
- Check the system again for leaks. Use the red and blue thermometer handles to fully open the forward flow and return ball valves.
- Activate speed control on solar control unit. The highest speed level should be set on the pump (phase control).

Note: The minimum speed set on the solar control unit must not fall below the pump's minimum nominal speed. Note instructions for pump and solar control unit.

- Once the installation settings have been completed and checked, fit the solar station's front insulation shell.
- Refer to the collector manufacturer's recommendations for minimum flow requirements.

Clamp ring screw connections

- Cut the copper pipe to length and deburr.
- First, slide the clamp ring nut over the pipe, then clamp the ring itself.
- Insert the prepared pipe into the screw connection until its stop is reached.
- Tighten clamp ring nut by hand.
- Use open-ended wrench to tighten clamp ring screw connection (approximately 33 ft. lb.), retighten if necessary.
- When tightening the clamp ring screw connection, use two wrenches—using one wrench to prevent the pumping station from turning.

Flat seal screw connections

- All pre-fitted solar station screw connections are firmly tightened in the factory so that they do not need to be retightened.

Torque levels when tightening flat seal screw connections using AFM 34 flat seals, s = 2mm.

- 3/4" screw connection 26 Ft. lb
- 1" screw connection 40 Ft. lb
- 1 1/4" screw connection 66 Ft. lb
- 1 1/2" screw connection 96 Ft. lb

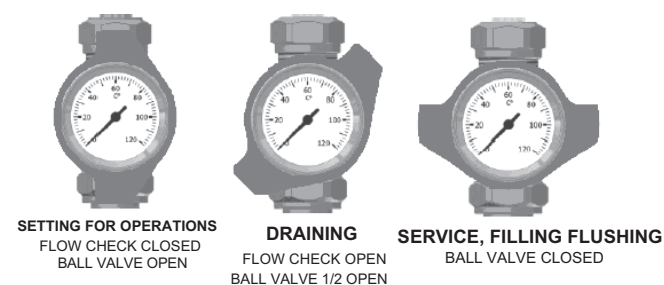
Operation, multi-function ball valve and check valve

- The forward flow ball valve must be open for filling, flushing and bleeding solar systems with a filling and flushing pump. The return ball valve should be closed.
- Both flow checks should be opened in order to bleed the solar system (thermometer handles in 45° position).
- The two multi-function ball valves must be fully open in order to bleed the solar system (turn the red and blue thermometer handles counter-clockwise until the stop is reached).

Figure 6-1 Forward flow multi-functioning instruments



Figure 6-2 Return multi-functioning instruments



7 Maintenance

⚠ WARNING

Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the solar components. Failure to perform the service and maintenance could result in damage to the solar system. Failure to follow directions in the manual and component literature could result in severe personal injury, death or substantial property damage.

⚠ WARNING

The solar heating system should be inspected annually only by a qualified service technician. In addition, the maintenance and care of the solar collection system explained in the following pages must be performed to assure maximum system efficiency and reliability. Failure to service and maintain the solar system could result in equipment failure.

⚠ WARNING

Turn off power to electrical components before any service operation on the solar system except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

These maintenance items must be performed annually to ensure proper operation of the solar collection system.

Address reported problems

1. Inspect any problems reported by the owner and correct before proceeding.

Freezing and boiling points of Aqueous Solutions

Freezing Temperature, °F	% Glycol by Volume	Boiling Temperature, °F
26	10	212
19	20	213
8	30	216
-7	40	219
-28	50	222

Fluid installation

Follow these installation procedures:

1. Clean new or lightly corroded existing systems with a 1% or 2% solution of trisodium phosphate in water prior to the installation of industrially inhibited propylene glycol fluid.
2. Extensively corroded existing systems should be cleaned by an industrial cleaning company and all corroded components should be replaced.
3. Use only quality water in solution with the propylene glycol fluid. Use water with low levels (less than 25 ppm) of chloride and sulfate, and less than 50 ppm of hard water ions (Ca++, Mg++). Distilled or deionized water is recommended.

System design considerations

Avoid use of automatic water make-up systems to prevent undetected dilution of the propylene glycol and possible contamination of the water system.

Technical data

Typical Properties of Dowfrost HD Fluid*

Composition (% by weight)

Propylene Glycol	94
Performance Additives	6

Color Fluorescent Yellow

Specific Gravity
15/15°C (60/60°F) 1.053 - 1.063

pH of Solution
(50% glycol) 9.5 - 10.5

Reserve Alkalinity (min.) 15.0 ml

*Typical properties, not to be construed as specifications. Complete sales specifications are available on request.

7 Maintenance *(continued)*

Typical properties of Aqueous Solutions+
(Glycol percentage by volume)

Physical Property	Temp. °F	30% Glycol Solution	40% Glycol Solution	50% Glycol Solution
Thermal Conductivity Btu/(hr•ft²)(°F/ft)	40	0.247	0.225	0.204
	180	0.279	0.249	0.221
	325	0.268	0.238	0.210
Specific Heat, Btu/(lb•°F)	40	0.894	0.847	0.794
	180	0.947	0.916	0.878
	325	1.002	0.987	0.965
Viscosity, Centipoise	40	5.75	9.63	14.28
	180	0.68	0.85	1.08
	325	0.31	0.39	0.40
Density, (lb/ft³)	40	65.30	66.03	66.68
	180	62.60	63.09	63.50
	325	57.89	58.18	58.41

Solar circuit

1. Verify all system components are correctly installed and operational.
2. Check for leaks - inspect all water lines for signs of leakage and correct any problems found.
3. Check System Pressure - monitor system pressure as the circuit heats up (during testing) to ensure that the pressure does not rise above the designed system pressure. Excessive pressure rise indicates expansion tank sizing or performance problems. See the expansion tank manufacturer's instruction manual for required maintenance. See the expansion tank manufacturer recommendations for sizing and pressure settings.
4. Check Relief Valve - Inspect the relief valve and lift the lever to verify flow.

⚠ WARNING

Before operating any relief valve ensure that it is piped with its discharge in a safe area to avoid severe scald potential.

5. Check Freeze Protection Fluid - ensure that the heat transfer fluid has the proper concentration of glycol as recommended in this manual.
6. Remove any air that may have accumulated in the system.
7. Check Flow Rate - ensure that the minimum recommended flow rate can be achieved as described in this manual.
8. Visually inspect the dirt separator (if installed) and clean if necessary.

Collector

1. Visually inspect the collectors to ensure that they are in proper working condition.
2. Visually inspect the collector substructure to ensure that no components have become loose or disconnected.
3. Visually inspect the collector piping to ensure that there are no leaks.
4. Visually inspect roof penetrations to ensure that environmental elements can not enter the building.
5. Visually inspect the piping insulation to ensure the proper orientation around piping.

Pump / control function

1. Check to ensure that the pump station is in working order and creates the minimum flow recommended in this manual.
2. Check control sensors to ensure that they are fully inserted into the appropriate sensing well.
3. See pump manufacturer's recommendation for required maintenance procedure.

Control settings

1. Check sensor readings to ensure that the values being displayed are accurate.
2. Check control settings to ensure that they are programmed per the control specification.
3. See controller manufacturer's recommendations for the required maintenance procedure.

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