

ACR Solar International Corp.

5840 Gibbons Dr. Suite H Carmichael, CA 95608 (916) 481-7200



“Skyline 5” Closed Loop Systems

SRCC OG-300 and FSEC Rated

Note: 2, 10-01 Skyline collectors may be substituted for 1, 20-01 collector

INSTALLATION MANUAL

Version May 2016

Also See Installation Videos Available on www.SolarRoofs.com



The solar energy system described by this manual, when properly installed and maintained meets or Exceeds the minimum standards established by the Solar Rating and Certification Corporation (SRCC) for OG-300 and FSEC system ratings. The collectors meet or exceed SRCC OG-100 and FSEC minimum standards. This certification does not imply endorsement or warranty of this product by SRCC or FSEC.

(Note: Skyline is also called Fireball and is still used by some dealers)

CONGRATULATIONS!

Thank you! You have just purchased the most attractive and easiest to install active solar water heater made! We have worked on every detail to assure you that your ACR Solar water heater will completely satisfy you in its very high level of performance and dependability.



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PLEASE CALL ACR Solar WITH QUESTIONS

Toll Free USA Technical Install Help Number: (888) 801-9060

WE WELCOME YOUR COMMENTS! We have worked to make ACR Solar installation instructions easy and complete. We are always looking to make them better and **welcome** your comments and suggestions!

General Description

The Skyline5 is a Closed Loop with a 12 Volt PV panel powering a 12 volt electronic pump.

It is for Hard Freeze Climates down to -54° F or areas with bad water quality.

It is OG-300 Rated and qualifies for the 30% Federal Tax Credits as well as State and Utility Rebates.

The average system size in sunny climates for a family of 4 is 40 s/f. Cloudier and colder climates require more collector area.

This closed loop system circulates a special Non-Toxic Antifreeze solution through the collectors and then through a Heat Exchanger in the storage tank.

Official SRCC OG-300 System Ratings:

SRCC Number	Manufacturer	Brand Name	Model Number	Total Area (ft ²)	Main Volume (gal)	Aux Volume (gal)	SEF _D	SF _D
2002003B	ACR Solar International	SKYLINE SYSTEM 5	200153C80EX2TE	60.97	80.04	49.93	1.9	0.52
2002003A	ACR Solar International	SKYLINE SYSTEM 5	200152C80EX2TE	40.64	80.04	49.93	1.6	0.42
2001019B	ACR Solar International	SKYLINE SYSTEM 5	200153C80EX2TG	60.97	80.04	49.93	1	0.41
2001019A	ACR Solar International	SKYLINE SYSTEM 5	200152C80EX2TG	40.64	80.04	49.93	0.9	0.34
2000007F	ACR Solar International	SKYLINE SYSTEM 5	200154C120EX	81.29	119.93		2.4	0.62
2000007E	ACR Solar International	SKYLINE SYSTEM 5	200153C120EX	60.97	119.93		2	0.55
2000007D	ACR Solar International	SKYLINE SYSTEM 5	200152C120EX	40.64	119.93		1.6	0.44
2000007C	ACR Solar International	SKYLINE SYSTEM 5	200154C80EX	81.29	80.04		2.6	0.65
2000007B	ACR Solar International	SKYLINE SYSTEM 5	200153C80EX	60.97	80.04		2.1	0.58
2000007A	ACR Solar International	SKYLINE SYSTEM 5	200152C80EX	40.64	80.04		1.7	0.48

Note SF will vary by significantly region. You can enter your region in the SRCC Website: Solar-Rating.org, go to the Certification & Listing Directory, Systems, put in the system number you want (or by ACR Solar International) and put in the Region then press Search.

PLEASE READ ENTIRE MANUAL BEFORE STARTING INSTALLATION

The Skyline5 can be installed in straightforward situations by two experienced people in less than 8 hours. With no experience, the installation will probably take 2 people 8 to 12 hours, with added complications, like a longer pipe run or two stories, taking longer.

This Installation Manual assumes good technical experience and ability.

NOTE: The collectors may have some sharp metal edges and corners, use caution when handling the collector and remember that the copper inlet and outlet can get very hot in the sun. Cover it to reduce chances of burns and to make connecting the unions.

1.0.

Tools and Materials

ITEMS SUPPLIED BY ACR SOLAR See Components Included in section 2.1.2 for Silver, Gold and Platinum level:

- Collectors, with mounting rails, Ell brackets, Solar Feed and Return line adapters.
- Coin Vent, Pressure Relief Valve.
- PV Panel.
- Expansion tank, Pressure Gauge, "Floating Ball" Check Valve, Charging valves. Depending on level: Differential Controller with 2 sensors, switch box with and 2 Temperature Readouts or 2 temperature gauges.
- 12 Volt Pump.
- 50' 1/2" outside diameter copper solar loop lines (Gold and Platinum packages only).
- Solar loop installation parts kit including miscellaneous parts, fittings, screws, nuts, bolts, etc.,
- Mixing Valve.
- Installation Manual, Operation and Maintenance Manual and Stickers.

TOOLS AND MATERIALS NEEDED:

Overview: Everyday homeowner tools are all that are needed to assemble and install the Skyline solar loop.

Tools and Materials Needed:

- 2 large adjustable wrenches and/or wrench set (to secure collector absorber brass unions and compression fittings and to attach collector sections together using joiner strip).
- Min 18" "Monkey Wrench (best to have 2) for tank domestic water fittings.
- Teflon tape (1/2" wide to seal threaded fittings use 6 turns*).
- Ladder(s) (for roof and for access to attic as needed).
- Tape measure, Marking pencil, crayon or chalk (to mark rafters and holes on roof)
- Chalk for marking the roof and Snap Line.
- 1 1/2" inch wood bit for roof penetrations (for feed and return lines through roof).
- 7/16" socket with ratchet and 6" extension. (a powerful drill with adapter is desirable for quickly driving lags).
- 1/4" nut driver on high speed drill (to drive 1/4" self tapping screws into collector).
- Caulking gun with quality Polyurethane roofing caulk* (to fill lag holes and seal flashing to prevent leaks).
- 3/4" or 1/2" wall, 7/8" ID (about 12 feet) and 5/8" ID high temperature open cell pipe insulation for tubing.
- Charging Pump (or drill pump), 2, 5-6 gallon buckets, 3 laundry hoses to charge system with Polypropylene Glycol.
- 2 – 3 gallons of 100% Polypropylene Glycol*
- * = supplied with Platinum System.

The following Systems, Components and Options are Wholly or Partly Covered in this Manual

Note: This manual covers 20-01 collector installation, the 10-01 collector are OG-100 approved for use with this system and can be substituted 2 for 1.

Skyline 5. Complete 20 Square Foot (1.86 m²), 20" x 12' (.508 m x 3.66 m), Solar Collectors with mounting, **12 Volt PV Powered Circulator and 12 Volt PV panel.** These advanced 12V PV powered systems have matched PV Panels and Pumps for best operation. Expansion Tank, Collector Coin Vent, Pressure Relief Valve, 2 Temperature Readouts or optional 12 volt Eagle 2 Differential Controller, Mixing Valve, Install Kit, full instructions, Owners Manual. 81V080HE1 **TANK NOT SUPPLIED.**

40, 60 and 80 s/f:

Models: "200152C80EX", "200153C80EX" and "200154C80EX"

**Note: 2, 10-01 Skyline collectors may be substituted for
1, 20-01 collector SRCC OG-300 Rated Systems**

Tilt Kit (option) Tilts collectors approximately 18 degrees from existing roof angle, Other angles available on request. Tilt kits are used when a better winter angle is desired on a low pitch roof or to "re-orientate" panels to face south by running the panels up and down an East or West facing roof. See Special Instructions.

Single Panel: Collector kit with 3 Modified 24" rails with 6" legs and hardware:

(Option Code /#TK01)

Double panels: Collector kit 3 - 4' 1" x 1" Aluminum Rails with 12" legs and hardware:

(Option Code /#TK02)

Tripple panels: Collector kit 3 - 6' 1" x 2" Alum. Rails with 24" legs and hardware:

(Option Code /#TK03)

Standard Color (Default): **Musket Brown (C101)**

Free Optional Color: **Dove/Old Town (Medium) Gray (C109)** - Note: This is a no cost option.

Optional Colors Include: Colonial (light) Gray (CO102), Tahoe Blue (CO103), Colonial Red (CO104), Forest Green (CO105), White (CO106), Buckskin Brown (CO107), Beaver (medium) Brown (CO108), C.B. (medium) Blue (CO110), Spanish Green (CO111), Storm/Slate (dark) Gray (CO112), Royal Brown (CO113), Ivory (CO114), Sea Blue (CO115), Leaf Green (CO116), Pebblestone Clay (CO117), Woodbeige (CO118), Peach (great on many light orange tile roofs) (CO119), Almond (CO120), Black (CO121), Adobe Tan (CO121), Classic Cream (CO122), Bronze (CO123), Heritage Cream (CO124), Marine Green (CO125).

See Catalogue for Components For Individual Purchase:

<http://www.solarroofs.com/documents/SRC6.8.09Catalogue.pdf>

Notice: Components exposed to public traffic are maintained below 140 F or are insulated/isolated.

IMPORTANT: Do not impair enclosures functions. Do not allow vermin intrusion. Meet applicable codes and national Roofing Contractor Assoc. practices. Structural members penetrated by solar system components must meet code.

The 80 gallon Rheem, Rudd, Richmond, or Private Label Heat Exchanger tank shown below is required with your Skyline5 to meet OG-300 System Rating Requirements

Solaraide™ HE Solar Heat Exchanger, Solar Tank, or Electric Storage Water Heater



Available in 80 and 120 Gallon Models

► 6-Year Limited Tank and Parts Warranty*

- Brass drain valve
- Choice of two models...storage tank or single element water heater
- Temperature and pressure relief valve included
- Collector feed and return fittings located at front of tank for convenient installation
- Isolated tank design for better heat retention
- High efficiency heating element
- Rheemglas® tank lining resists corrosion and prolongs tank life
- Heat exchanger: copper tubing wrapped around and secured to the tank. Double wall, vented design for positive leak detection
- Cold water inlet brings cold water to tank bottom to prevent mixing with heated water
- Anode rod equalizes aggressive water action for prolonged tank life
- Cold water inlet, hot water outlet, relief valve and anode rod at top of tank for easy access and fast, economical installation
- Automatic temperature control
- Over temperature protector

* See Residential Warranty Information Brochure for complete warranty information.



TYPE	DESCRIPTION			ROUGHING IN DIMENSIONS (SHOWN IN INCHES)			ENERGY INFORMATION
	GAL. CAP.	MODEL NUMBER	ELEMENT WATTAGE UPPER	HEIGHT A	DIAMETER B	APPROX. SHIP WT. (LBS.)	APPROX. R-FACTOR
	80	81V80HE-1	4500 W*	58-3/4	24-1/2	222	R-17.3
	80	81V80HE-T	Storage only	58-3/4	24-1/2	222	R-17.3
	120	82V120HE-1	4500 W*	62	28-1/4	380	R-17.3
	120	82V120HE-T	Storage only	62	28-1/4	380	R-17.3

- * Heaters furnished with standard 240 volt AC, single phase non-simultaneous wiring and 4500 watt heating element.
- If heating elements of different wattages than those shown are demanded by zone requirements, they must be specifically requested.
- To prevent corrosion, proper pH levels in transfer fluid must be maintained.
- Solaraide models meet all current state requirements for solar storage tanks.
- The tanks are Rheemglas lined and are designed to operate up to 150 PSI.

An opening is provided for insertion of the Eagle2 "STO" sensor.

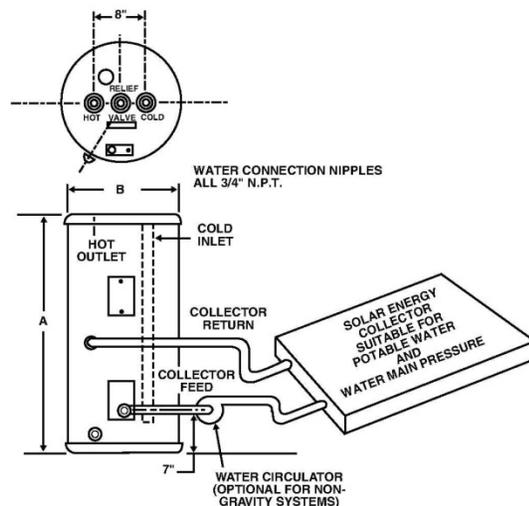


COPPER COIL DATA (Type L Copper)

Maximum pressure = 150 PSI
Maximum temperature = 185° F
Tube I.D. = 5/8"

Solaraide HE Tank Capacity	Coil Capacity Gallons	Length of Tubing Around Tank (Ft)
80 Gallons	2.2	120
120 Gallons	2.6	143

PRESSURE DROP THROUGH COIL (Feet of H ₂ O)		
Flow Rate	Head Loss (Feet)	
	80 Gallon	120 Gallon
1 GPM	1.3	1.6
2 GPM	4.8	5.7
3 GPM	10.0	12.0



In keeping with its policy of continuous progress and product improvement, Rheem reserves the right to make changes without notice.

Rheem Water Heating • 101 Bell Road, Montgomery, Alabama 36117 • www.rheem.com

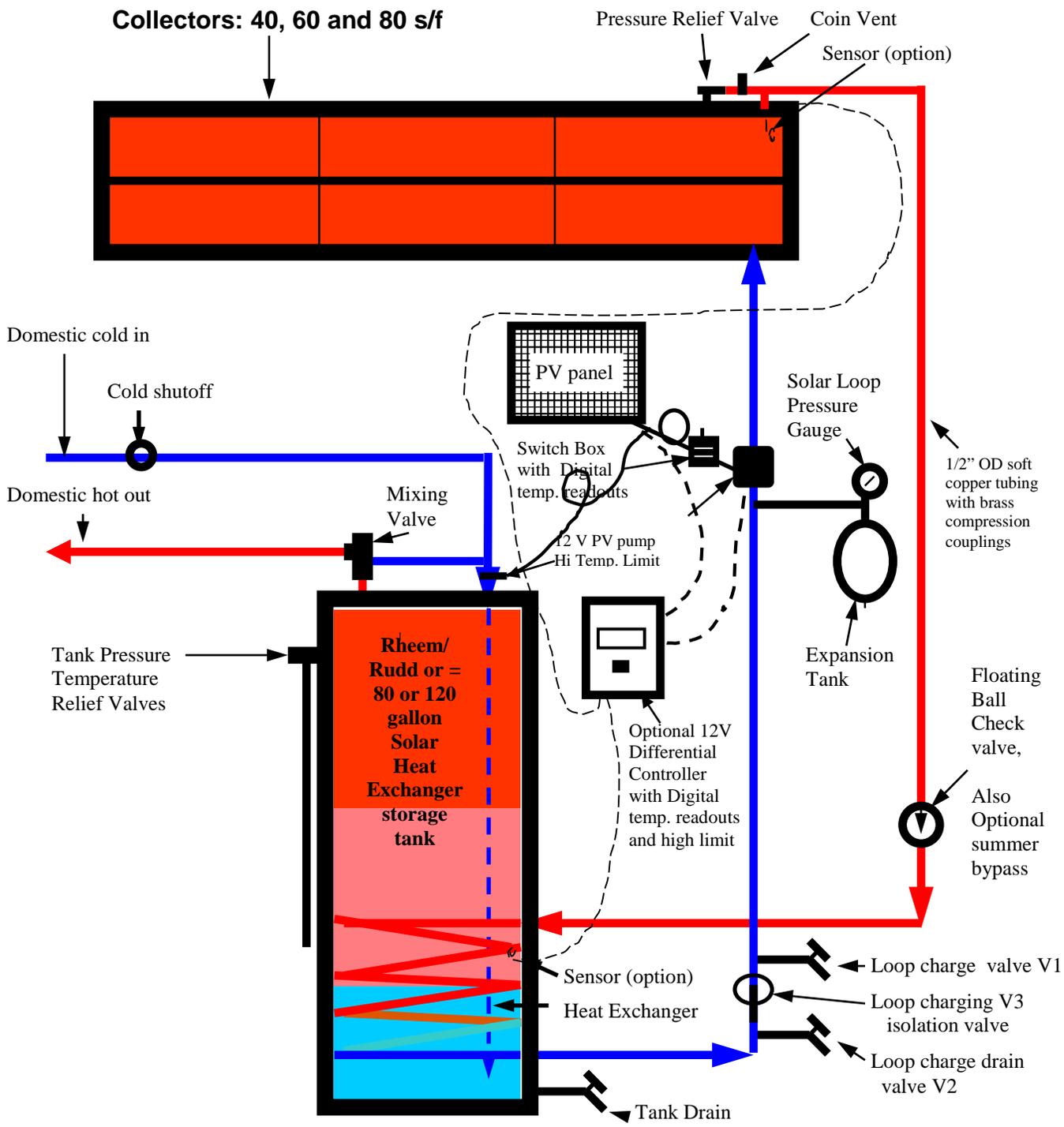
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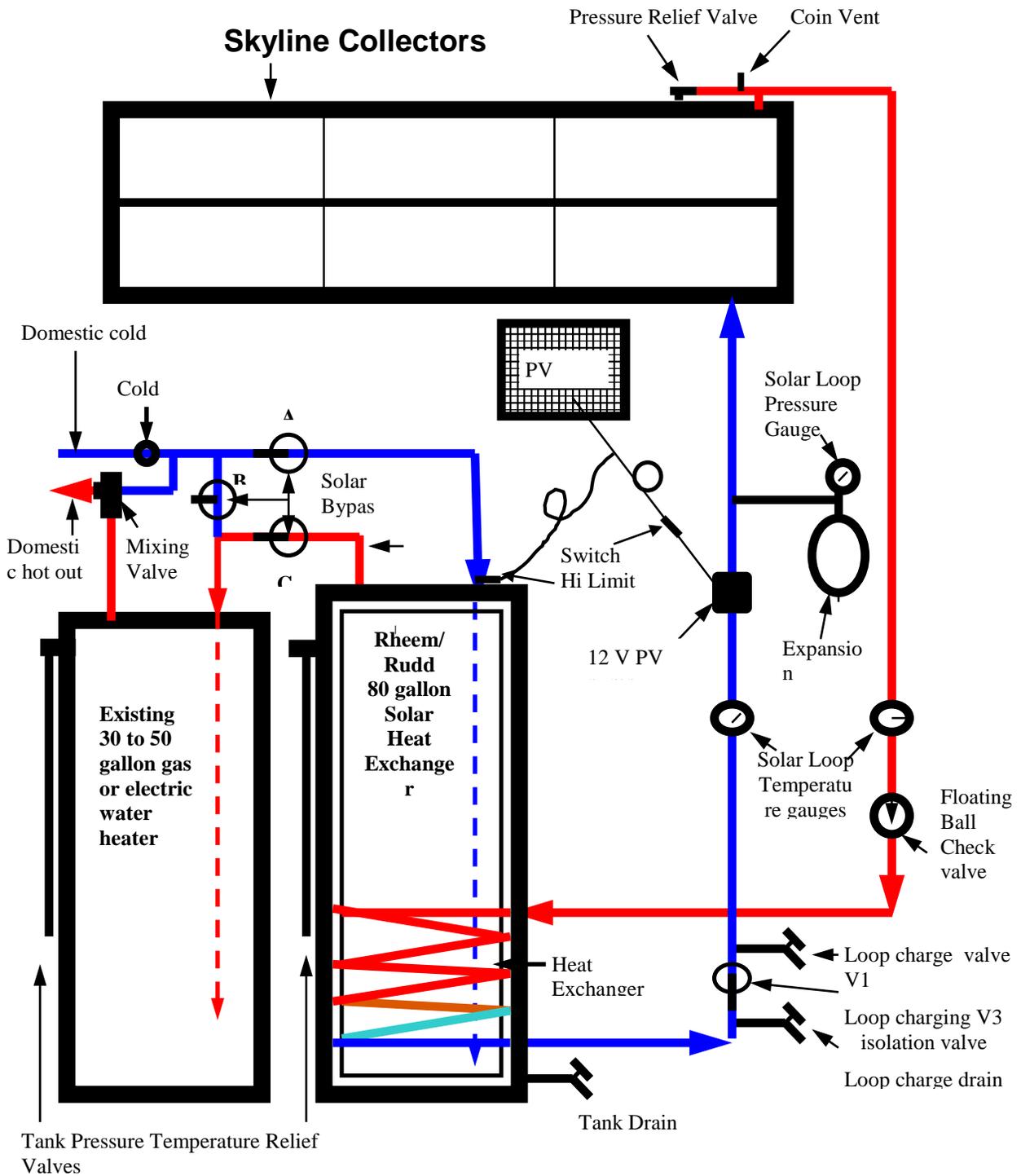
Skyline5 SRCC OG-300 Single Tank Diagram:

Models: 200152C80EX, 200153C80EX, 200154C80EX, 200152C80EX, 200153C120EX, 200154C120EX
 NOTE: 2, 10-01 collectors can be substituted for 1, 20-01 collector for OG-300 Rating



Skyline5 OG-300 2 Tank Diagram

Models: 200152C80EX2TG, 3TG, 2TE and 3TE



SRCC Required Solar Bypass Valves	
Normal Solar Operation:	A, and C are Open and B is Closed
Solar Tank bypass:	A, and C are Closed and B is

Skyline5 OG-300 Solar Water Heater Specifications

COLLECTOR

Trim & Frame Materials:	Finished 27 mil Aluminum Trim and Frame = Total 54 mil (1.37 mm).
Absorber Material:	"Black Crystal" coated - all Copper with unions.
Glazing:	.236" (6.0 mm) Twinwall Polycarbonate UV Treated
Dimension / Weight:	10-01: 72" x 20" x 3"; 19 lbs / 20-01 -144.3"x 20."x 3" 38 lb (3.67 m x 0.51 m x 0.076 m 17.24 Kg)
Fluid Capacity:	.10-01: .15 gallons / 20-01: .3 gallons
Recommended Flow Rates:	.20 to .35 GPM (0.946 to 1.324 L/min)
Maximum Working Pressure:	150 PSI (10.21 atm).
Maximum Stagnation Temp:	250 °F (121.11 °C).
Heat Transfer Fluid:	Potable water or Propylene glycol
Standard Components:	Mounting rails, mounting brackets, tech screws and lags
Color:	Musket Brown (C101 – default color) or Dove/Old Town Gray (C109) + optional colors

PV (Photovoltaic) POWERED CIRCULATOR

PV Panel:	10, 15, 20 or 30 Watt, 12volt DC
Circulator:	12 Volt - "Laing D5 or equal.

FREEZE PROTECTION

Type: Closed Loop Glycol with Storage Tank Heat Exchanger.

The ACR Solar closed loop Propylene Glycol Antifreeze heat exchange system's collector as well as feed and return lines will not be damaged by (ambient) hard freeze temperatures as low as -54 degrees F below zero with a 60/40 mixture of propylene glycol/water. The solar storage tank must be kept in an area above 32 degrees F.

CONNECTING LINES, INSULATION (standard)

Tubing:	1/2" (12.7 mm) OD copper - 50' (15.24 m)
Insulation – High Temperature:	1/2" (12.7 mm) ID 1/2" (12.7 mm) or 3/4" (19.05 mm) wall

TUBING CONNECTION METHODS (standard)

Type:	Brass Union, Compression, (Brass Fittings for Heat Exchanger)
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STORAGE TANK - Rheem / Rudd / Richmond Model Number: 81V080HE1, 82V120HE-1 (Not Supplied)

	80 Gallon Tank with wrap around Double Wall Heat Exchanger.
Fluid Used:	Propylene Glycol 1
Components Supplied:	Expansion Tank, one floating ball check valve, Temperature Gauge, fill, drain, and pressure relief valves.

CONTROL

Type:	12 Volt PV Panel operating through a Switch box with twin digital readouts or Switch with 2 temperature gauges or optional Eagle 2, 12 volt differential controller.
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Although we will make every effort to give notice, Specifications and prices subject to change without notice.

Antifreeze Data and Safety Data

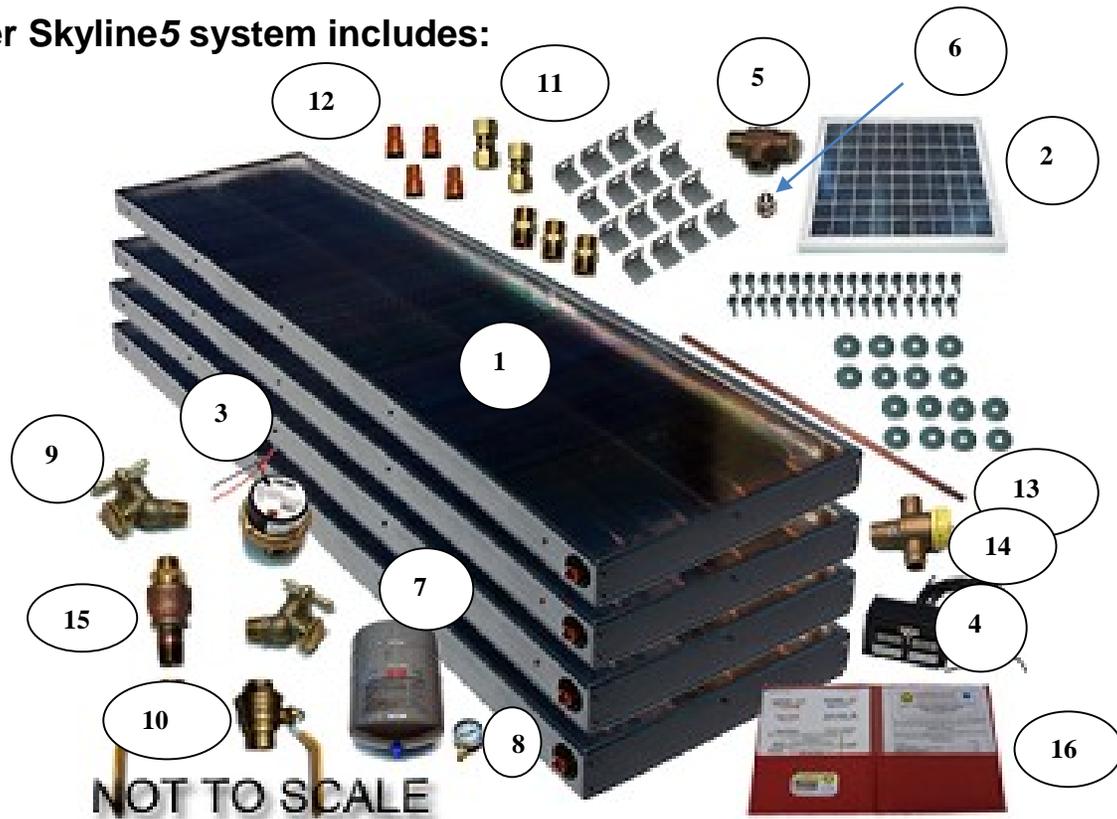
FLUID HANDLING, SAFETY AND FIRST AID:

1. Store fluid in tightly closed and properly vented containers, away from heat, sparks or open flame. Dispose of any aqueous waste at permitted landfill sites only.
2. Chemical splash goggles or full face shield must be worn when possible eye contact exists.
3. Ingestion: Give pint of luke warm water or induce vomiting if large quantity is ingested.
4. EMERGENCY PHONE: 1-800-424-9300 (CHEMTREC)

Freezing point: -28 deg F (50/50 mixture), Flash Point: 211F, Boiling point: 365 deg F, Appearance: Green, Specific Gravity: 1.04, Vapor Density: 2.6

Components Included with the Skyline5

Silver Skyline5 system includes:



1. 4 to 8 Skyline 10-01 collector (s) with all copper, “Crystal Clear” coated high performance absorber. 4 Ell mounting brackets, 4 washers and 8 tec screws are included per collector. Choice of Musket (dark) brown or Dove (medium) gray trim colors.
2. High quality 12 Volt “PV” solar electric panel matched to the power need of the system.
3. Sophisticated 12 Volt Laing D5 Electronic Circulator.
4. Two thermometers on / off switch.
5. 1, 1/2" male Adjustable Pressure Relief Valve (set to 150lb) with roof splash guard.
6. Coin Vent with adaptor to 1/2"
7. Expansion Tank
8. Solar Loop pressure gauge
9. 2 Hose bibs with 1/2" male thread
10. 1 Ball valve with 1/2" sweat fittings
11. 2, 1/2" compression unions plus one union body per additional stacked collector.
12. 4, 1/2" x 3/8" copper reducing adaptors
13. 2' of 3/8" copper tubing
14. Tempering Valve
15. Exclusive, zero resistance floating ball check valve with 1/2" male pipe thread fittings.
16. Installation Manual, Operations and Maintenance Manual, Special SRCC OG-300 Labels

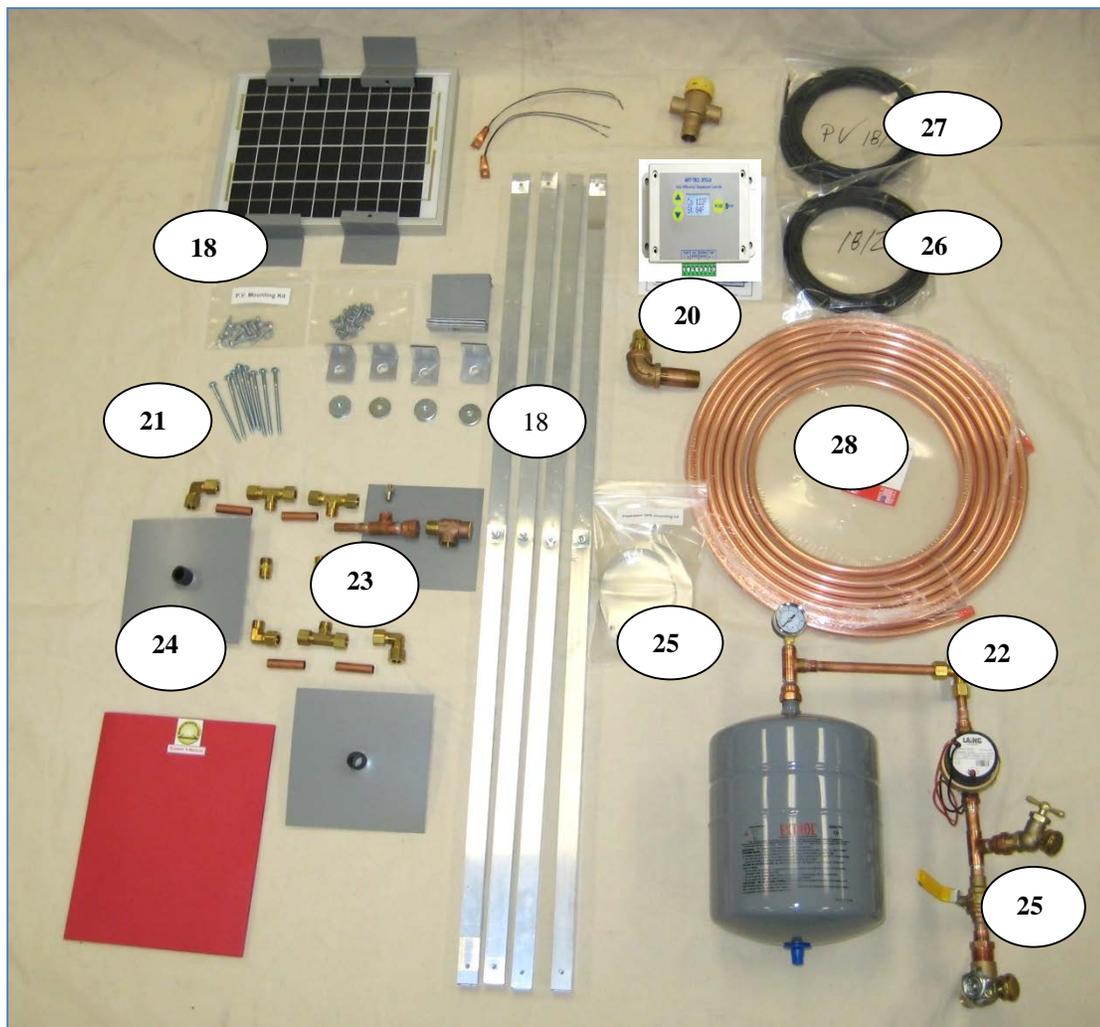
Gold Skyline5 Option (HIGHLY RECOMMENDED) Includes:

In addition to the above, the Skyline5 Gold System makes your solar loop very easy to install with the following features:

Note: Items 4, 12 and 13 are substituted with upgrades. The collector mounting system is upgraded as well

The Gold Skyline5 system Includes 1. – 16. above plus 17 - 27:

17. Choice of either 10-01 or 20-01 collectors. (NOT SHOWN)
18. Exclusive predrilled and assembled collector rail mount system with color coded "U" Brackets.
- 18A. PV Panel mounting brackets and hardware. Tilt Kits include mounting kit to collector.
19. Choice of "Stacked" or "Side by Side" collector layouts. (Not Shown – See Collector Configurations Section 5)
20. Sophisticated 12 Volt Digital Readout Differential Controller with high temperature limit
21. Roof mounting lag set or special mounting as needed for composition or tile roof.
22. Exclusive, 100% complete no-solder solar loop kit with all fittings.
23. Pre-soldered roof assembly for coin vent and pressure relief valve.
24. 2, color coded roof boots.
25. Heat Exchange Kit with charging valves for existing or added solar tank with heat exchanger.
- 25A. Expansion tank strap to tank kit.
26. 30' of sensor wire with wire nuts.
27. 25' of # 18 PV wire with wire nuts.
28. 50' of ½" OD soft copper tubing (deletes 2' of 3/8 copper tubing).

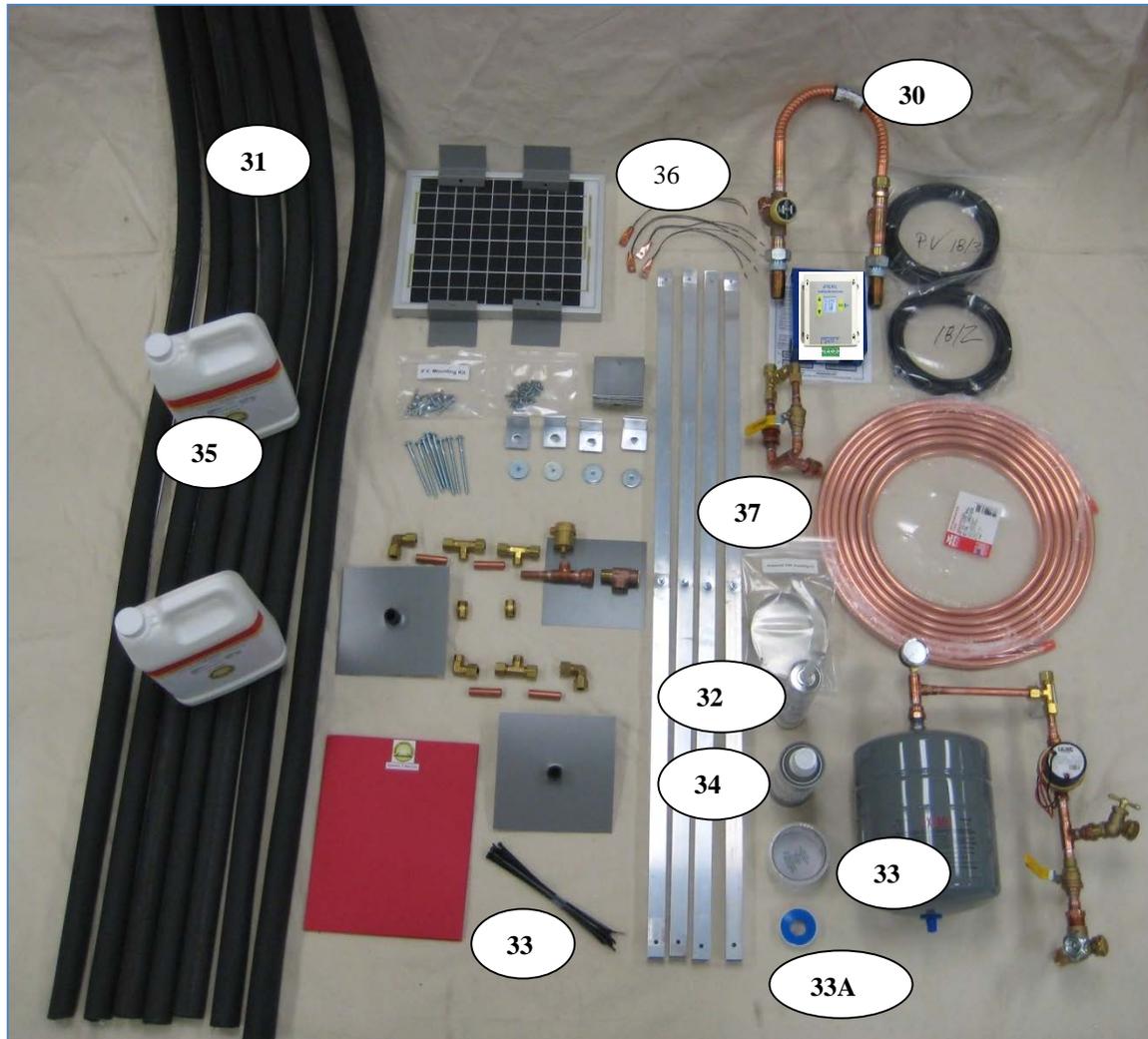


Platinum Skyline5 Option:

This is the Ultimate no solder Closed Loop system with 100% of the parts and insulation needed for a complete, professional installation including our Exclusive Skyline5 Vacation bypass valve and pre-soldered tempering valve assembly.

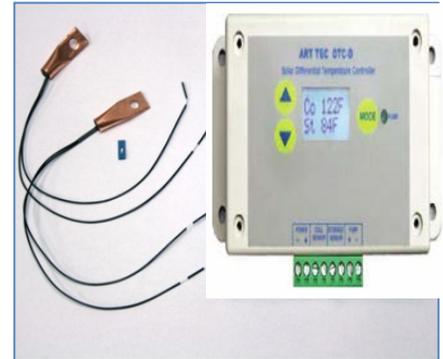
The Platinum Skyline5 system Includes 1 – 27 above plus 28 – 36 below:

29. Choice of 2 Standard and 24 Free Optional Collector Trim Colors
30. Preassembled “No Solder” Tempering Valve assembly with flex tubing connections
31. 36’ of high temperature 5/8” x 1/2” wall Insulation (up to 72’ if needed) + 6’ of 7/8 x 1/2” wall insulation.
32. Tube of high quality Polyurethane Roof Sealant.
33. Aluminum tape to cover and protect outside lines.
- 33A. Teflon Tape for threaded pipe connections.
- 33B. Tie Wraps for insulation and wires
34. Color Matched can of trim paint to paint outside aluminum insulation cover, rails, etc.
35. 1-2 Gallons of ACR Solar’s Heavy Duty Propylene Glycol (more if needed)
36. 2 additional 10 K sensors for a total of 4 Differential Controller Temperature Readouts.
37. Exclusive Vacation Check Valve Bypass.



Special Component Description Page

The ART-TEC DTC-D Solar Differential Controller is specifically designed for solar heating applications where the collector circulation pump is powered from a solar (PV) panel, or optionally, battery power or any 12VDC source. Its purpose is to ensure that the collector circulation pump is only activated if the collector is hotter than the storage tank. The differential setting is adjusted to compensate for the temperature drop of the plumbing between the collector and heat exchanger, or storage tank. The maximum temperature limit can be set for the storage tank to prevent excess temperature in the tank, the pump will shut off and optionally an audible warning can be set.



Summer Bypass Valve Assembly (BP01): This feature includes a ball valve (shown with a yellow handle) that can be opened to bypass the solar loop check valve when the tank temperatures may get to high, such as when a family goes on vacation. When the check valve is bypassed, the tank is cooled at night by what is called “Reverse Thermosyphon.” This reverse flow occurs because at night the fluid in the collectors gets cooler than the water in the tank. Cooler fluid is heavier than the fluid in the tank heat exchanger so the heavier cooler fluid wants to fall and the lighter warmer fluid wants to rise. This reverse flow will cool the tank overnight and give the collectors work to do the next day. This protects the Propylene Glycol fluid in the solar loop from stagnating too much which over time can degrade the fluid. (insulation is to be applied)



Top Tempering Valve Assembly (MVT3): This pre-soldered assembly saves a lot of time by having the Tempering valve already soldered to a flex tube assembly that connects to the top of the tank and to the hot and cold domestic lines. A flex tube and Tee assembly connects the cold water feed to the cold side of the tempering valve. Two 45 degree hot and cold 3/4” MPT connections work with standard flex lines for most applications. (insulation is to be applied)



**IMPORTANT NOTES:
BEFORE STARTING INSTALLATION
PLEASE CAREFULLY READ THIS ENTIRE MANUAL FIRST!**

CHECK WITH YOUR LOCAL BUILDING DEPARTMENT FOR CODE COMPLIANCE FOR THE INSTALLATION OF YOUR SOLAR WATER HEATING SYSTEM.

In all cases where a firewall (drywall) is penetrated, it is important to seal the hole. A good general rule is to always fill in and seal around all holes made for solar lines to prevent heat loss and to maintain fire stops.

Properly support all piping according to local code.
As a rule, support copper pipe every 6'.

SAFETY FIRST!!

USE CAUTION!!! Do not attempt to self-install without help if you have ANY back or physical limitations!!!

GENERAL WARNINGS:

Remember! A Collector in the Sun Can Be Very Hot – Cover it to Prevent Burns From Hot Copper Tubing and Very Hot Fluid Coming Out of the Tubes.

As the collector has some sharp metal edges and corners, use caution when handling the collector.

ALWAYS USE COPPER TUBING, NEVER PEX OR OTHER PLASTIC TUBING AS THEY MAY BURST FROM STAGNATION TEMPERATURES.

This manual assumes that the installer has good mechanical experience and can confidently use hand tools, building materials and adhere to safe building and installation practices. Do not install this system alone without someone knowing where you are and what you are doing at all times.

ACR Solar does not assume responsibility for any loss, or injury directly or indirectly, associated with the installation of this system.

SolarRoofs systems are easy to install; however, problems resulting from a failure to correctly install the system according to the following instructions and to maintain it according to the operation and maintenance manual are not covered by the warranty.

COLLECTOR LOCATION, ORIENTATION AND TILT

Your solar water system will be providing savings for your family for decades to come. Because the sun rises in the east, crosses over the horizon on the south and sets in the west, you want your collector to face as much to the south as possible. **Your system needs the most sun it can get!**

As long as the collector angle (known as tilt) is at least 14 degrees up from horizontal, (a typical roof angle is 22 to 28 degrees) additional tilt usually has little effect on total year round performance. **The exception** is in areas with very sunny winters (as in most areas of Colorado) where a higher angle, (facing the collector more directly into the winter sun) can help year round performance.

In most areas with **heavy winter overcast**, a solar collector's orientation on a low pitched roof can face anywhere from 45 degrees east to west of south without losing more than 8% of the energy it would have

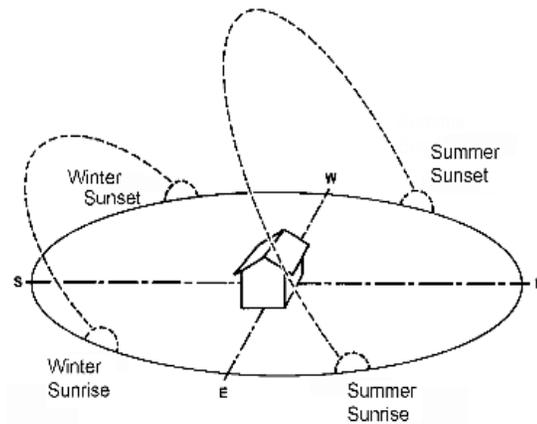
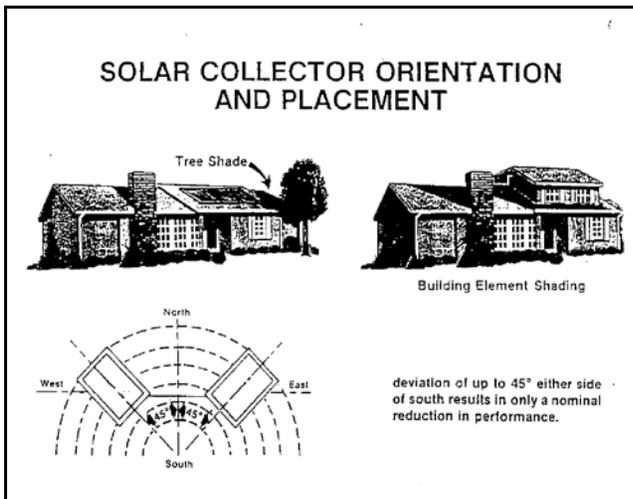
produced if it were facing directly south. At 90 degrees east to west of south the loss is closer to 20%.

Exceptions include easterly facing systems in areas with a lot of morning fog and clear afternoons where south facing or west facing would be much better. The opposite can be true if sunny mornings are very often followed by rainy afternoons.

Take these facts into consideration when locating your collector and consult with us if you have any questions.

ROOF CONDITION:

The condition of your roof should be good although one of the features of Skyline system is that removing and replacing the collector is relatively easy for re-roofing.



OVERVIEW OF THE BASIC INSTALLATION STEPS:

THE BASIC INSTALLATION STEPS

A total of 10 to 16 hours required to install, depending on situation and experience

* = supplied with Gold and Platinum Packages

1. Unpack collector, check and inspect collectors, layout all parts and get familiar with them according to the kit you purchased. Compare the parts to the list above. Separate the roof parts from the storage tank parts and prepare all tools and tool boxes for installation. If days are hot, prepare to do the collector installation early especially to prevent damaging composition shingles. See page below.
2. Collector placement on roof located, rafters located and marked, end mounting rails* with EII brackets and fender washer loosely lagged and sealed into rafters or spanner board top and bottom. If 20-01 collectors, do the same with the center rail. If U brackets are being used, loosely attach them to the rail with large fender washer.
3. Starting with the top collector, place onto mounting rail with top trim over the EI bracket so the EI bracket is between the trim and the frame, snap the bottom of the collector beneath the U bracket. (the silver package does not have U brackets and only EI brackets are used, measure carefully in from the end and pre-attach the EI bracket under the trim. Repeat the above as needed and place the bottom collectors lower trim over the EI bracket so the EI bracket is between the trim and the frame. Do not use any Tec Screws yet until the collector feed and return unions are lined up and attached.
4. Collector compression unions connecting air vent, pressure relief valve and components installed, two 1 1/2" holes drilled into roof for hot feed and cool return lines. Shingles trimmed and "Roof Boots" installed under shingles and into roof holes.
5. Collector cool feed (bottom compression fittings) and hot return lines (top compression fittings) installed through roof boots to tank area. *Eagle 2 sensor is installed 2" inside the top return hole and shielded wire run to tank area. Insulation partly installed before tubing connections are made. PV panel installed and PV wire connected and run to water heater area. Sensor and PV wire is tie wrapped to the outside of the pipe insulation run to the tank.
6. If existing tank is being replaced by the heat exchanger tank, turn off the element, drain the water, remove tank, Rheem 80 gallon Heat Exchanger tank installed with Tempering Valve. Connect to existing tank if it is not being replaced by attaching cold feed to the solar cold and the solar hot out to the existing tank cold in. Water lines connected, solar lines with charging valves appropriately connected to heat exchanger top and bottom. Pump, pressure gauge and expansion tank installed. Collector cool feed (from pump) and hot return lines connected by compression union.
7. Heat exchanger tank filled, solar loop purged of air and tested for leaks, pump wired to PV panel. Glycol loop filled, finish insulating lines, Element or gas turned back on. System detailed and labeled.

COLLECTOR CONFIGURATIONS

10 s/f Skyline 10-01 collector configurations, 40, 60 and 80 square foot arrays, stacked and side by side. 10-01 collectors can be offset (see picture below top left) where the situation requires.

Skyline 10-01 (10 s/f) Collector Configurations

Standard collectors feed / return at one end which can be Left or Right, side by side both feed / return from the Center.

Our "Skyline" 10-01 collectors are also available in flow through configurations as well as horizontal and vertical drain-back configurations upon request only. Standard collector configurations are shown below.

Optional Accessories such as mounting rails or tilt kits are available in the Shopping Cart. You may use the corresponding number (see below) to either search for the proper part in the shopping cart or to ensure you have the correct part number before adding the part to the cart (prices are shown in the shopping cart).

10-01 Stacked Configurations



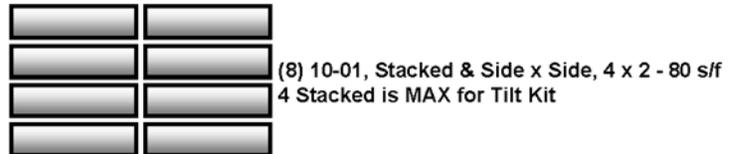
10-01 Side by Side Configurations



Optional Accessory Part#s:
Mounting Rails: MR02-4
Tilt Kit: TK02-4

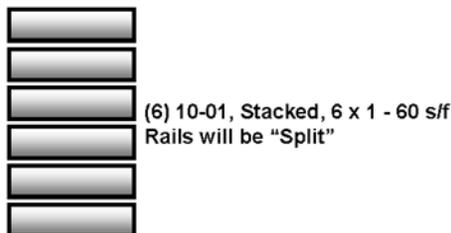


Optional Accessory Part#s:
Mounting Rails: MR03-4
Tilt Kit: TK03-4



Optional Accessory Part#s:
Mounting Rails: MR04-2
Tilt Kit: TK04-2

Optional Accessory Part#s:
Mounting Rails: MR04-4
Tilt Kit: TK04-4

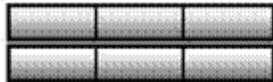


Optional Accessory Part#:
Mounting Rails: MR06-2

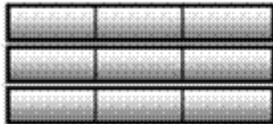
The 20 s/f Skyline 20-01 can be configured in 5 different ways:

Skyline 20-01 (20 s/f) Collector Configurations

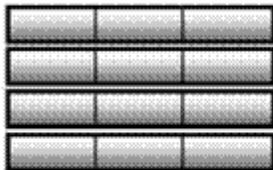
Standard collectors feed / return at one end and can be Left or Right, side by side both feed / return from the Center.



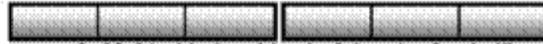
2, 20-01, 2x1 Stacked



3, 20-01, 3x1 Stacked



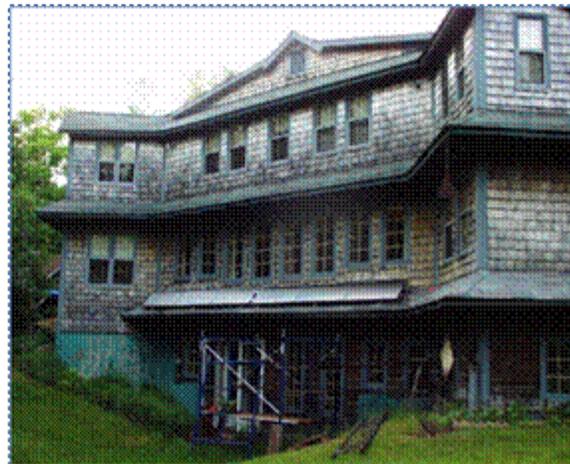
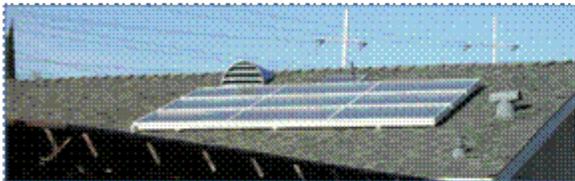
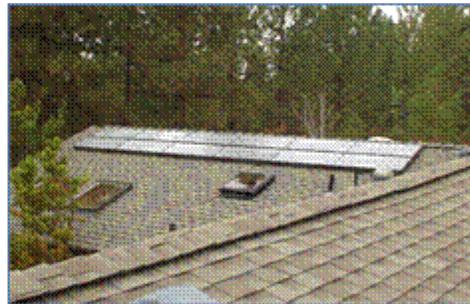
4, 20-01, 4x1 Maximum 20-01 Stacked



2, 20-01 side by side, 1x 2 (center feed all)



4, 20-01 side by side and stacked, 2x 2



COLLECTOR INSTALLATION

BE SECURE AND USE CARE!!!

Good procedure suggests that you always secure your ladder to the gutter so it does not slip. Place blocks in the gutter so the weight of the ladder does not crush the gutter. Protect the surface of the gutter with a cloth to prevent marks.

WALKING ON THE ROOF:

Composition Roofs:

Do not damage hot composition roofs by walking on them when very hot or by walking in end of shingles or by twisting foot on the shingle.

Use soft sole shoes. Walk in the center of the shingle to prevent knocking off the brittle ends of the shingles. This care will keep the roof in good condition and prevent dangerous ball bearing like gravel and tar balls from making the roof treacherous.

Know how to walk on your roof if it is a special type such as Tile or Metal, ask your roofer or ask us.

Tile Roofs:

Stepping in the center of most Tile roof shingles will break them. Always put your weight on the last two (overlapping) inches of the tile and away from the side that overlaps the next tile (to avoid chipping off the delicate vertical overlap strip).

On barrel tile, step in valley away from overlap.

On some shingles, such as “Fire-Free”, or shake, more damage is done stepping on the end than in stepping on the center.

Shake Roofs:

Shake roofs are usually easy to walk on but use care on shake roofs to not crack or break off brittle shakes. **Shake roofs, as well as most roofs, can be treacherous when wet.** Use extra flashing where needed to get under first ½” of tar paper. Use extra calk where needed.

Always SAFETY FIRST!!! Use safety ropes and stops on a steep roof, do not install collectors in bad winds. Secure ladders, protect gutters and do no damage them.

IMPORTANT NOTES:

Mark or tape hot line at both ends to insure proper hookup.

As the 20-01 collector is 12’ long, it is important to place the line connection end so it is the shortest distance from the storage tank.

The collector can be flipped either way to be closest to your storage area. Remember that the feed line from the pump goes to the bottom collector connection and the hot return goes to the top collector connection as shown in the diagrams.

On an average, low pitch single story roof, one able person can safely install the Skyline collector. **Do not install this system alone, be sure someone knows where you are and what you are doing at all times.**

ALL ROOFS:

Never step on ridge cap or within one (1) foot of a valley – SEVERE DAMAGE CAN RESULT!

We recommend seeing the collector installation video available on the Website:

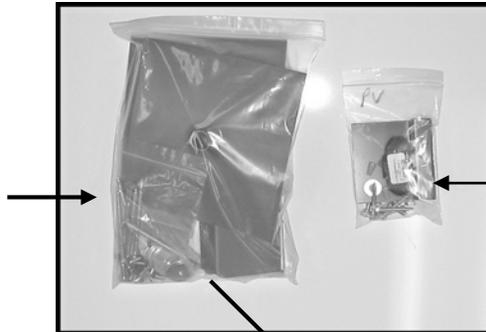
<http://www.solarroofs.com/videos.html>

Collector installation Components

Note 10-01 collectors will have 2 sets of collector brackets instead of 3

ALWAYS USE COPPER TUBING, NEVER PEX OR OTHER PLASTIC TUBING AS THEY MAY BURST FROM STAGNATION TEMPERATURES.

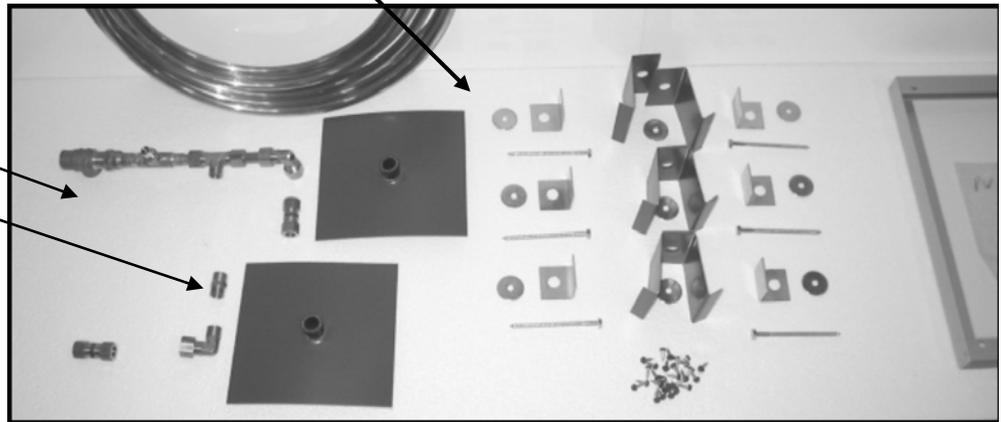
Roof Kit contains: Mounting
Ells and washers,
3.5 or 4" Lags,
Center U Brackets for 2 or
more collectors,
Color coded Tec Screws for
securing Ell brackets to
collector, Gold and Platinum
Low profile Roof Boots.



PV Parts Bag contains
Brackets and hardware.
See 9.0, Control
Component Detail.

Plumbing Kit:

Pressure Relief,
Coin (air) vent,
*Soldered adaptor,
Compression fittings,
1 Compression union
body per extra collector,
2 compression unions to
connect tubing to tank,
*50' of 1/2" OD Copper
*Gold and Platinum.



Important Instructions Regarding Installing Compression Unions

1/2" OD Compression
Union and Ell

Compression Ell →

Nut with Ring Inside →

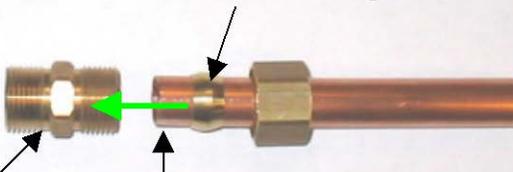


It is important to not over-tighten these fittings.

Spraying a little silicone on the threads is helpful.

A couple of turns of Teflon tape around the ring helps make sealing easier.

Nut, Ring, Union Body

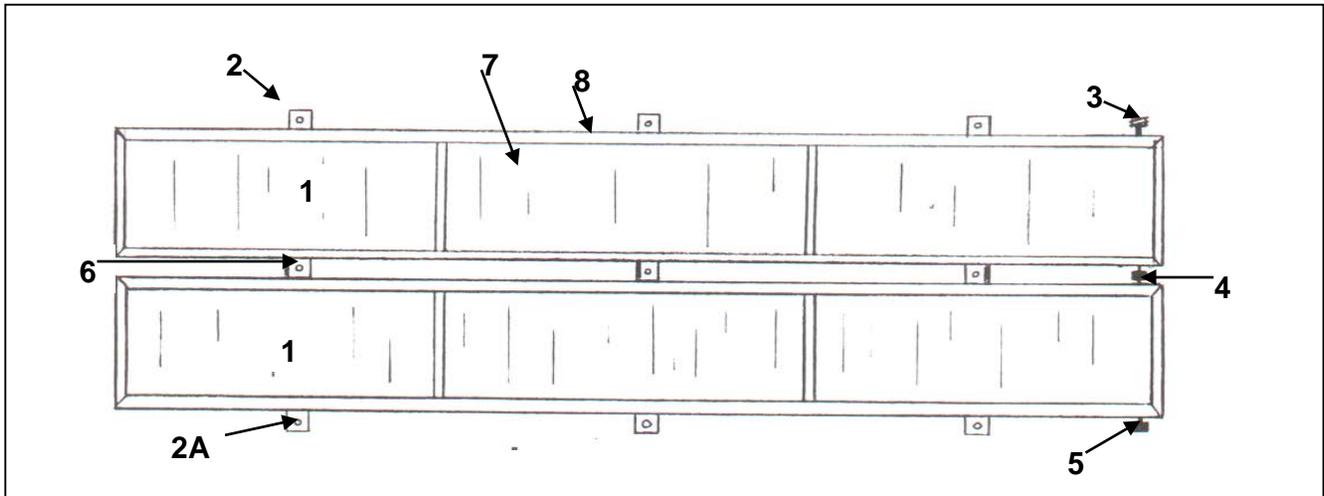


Tube must extend beyond ring about 1/4" and bottom out inside the compression body before tightening nut

Collectors mount horizontally and Collector Mounting Rails go as shown below.

Note: Custom horizontal collectors and flow thru collectors are available.

- 20-01 collector: High wind or high snow load use 3 rails, end rails ~ 12 to 24 inches in from the ends.
- 20-01 collector: low wind and low snow load use 2 rails, end rails ~ 24 to 30 inches in from the ends.
- 10-01 collectors: use 2 rails about 1foot in from the ends.



The Diagram above is a top view of two collectors installed together showing:

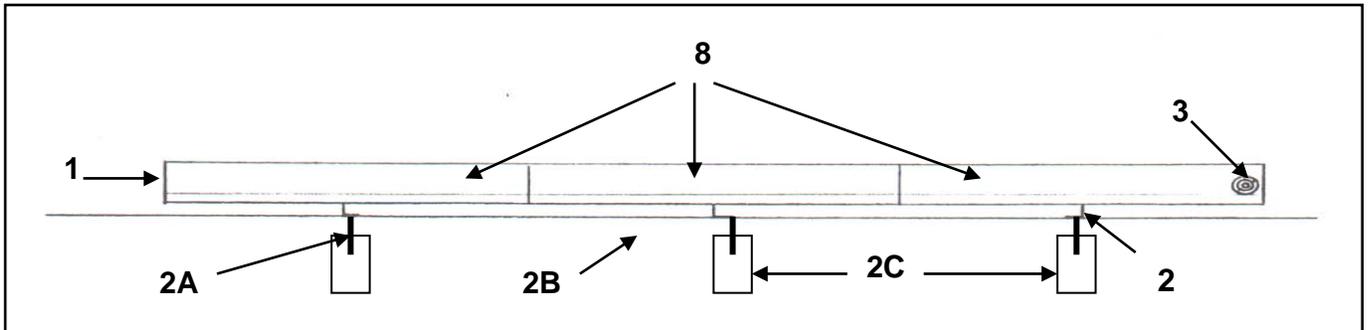
1. Two 20" x 12' Collectors mounted with connections to the right.
 2. The Mounting Rails with Mounting Brackets (3 rails and 6 Mounting Brackets plus 3 Quick Connect Clips (QCC) per additional collector set (6.), 3 two panel rails, 6 Mounting Brackets and 3 QCCs shown in this diagram).
 - 2A. Mounting Rail Lag holes top and bottom.
 3. The "Hot Out" Collector connection going to the storage tank.
 4. The between Collector connection.
 5. The "Cold In" Collector connection from the storage tank.
 6. The Quick Connect Clip bolts to the mounting rail here with the tabs overlapping the top of the collector.
 7. Collector Glazing (Polycarbonate)
 8. Collector trim sections.



Above: Allowing from 14" to 2' for collector overhang, find and mark Rafters for the Three Collector Rails, (shown in this picture are 3 rails for 3 collectors) Use a chalk line to get the 3 rails even at the bottom. Get the center rail as close to center between the end rails as possible. Using a hammer to "Sound Out" the rafters usually finds the rafters. If not, use a feeler bit (long small drill) to drill through the roof from the inside, just beside the rafter. **Be sure to squeeze caulk into all holes to seal them!**

Pre-Drill the bottom holes for the 2 end rails (which will be about 8' apart – you can use the lag itself to "pre drill"), squeeze Caulk into Lag Hole, Place end mounting rail with mounting bracket and washer over hole (above left). Drive Lags into holes but do not tighten. Carefully place the center rail along the chalk line, repeat the procedure for the end rails. Install the upper lags using the same procedure. Note: one and two collector systems have lags at the top and bottom of the rails. Three and four collectors use a center lag at the center of the end rails only. Other Quick connect clips use a carriage bolt.

2001 Side View



The above Diagram shows a side view of the Collector installed on the roof and shows:

(Refer to Color Pictures for Details of Ell Brackets)

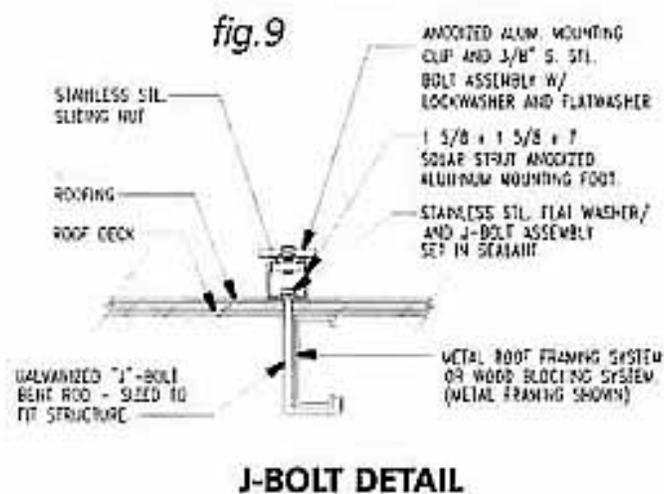
- | | |
|--|---|
| 1. Side view of a Collector. | 2C. Roof Rafter. |
| 2. Mounting Rails (3 per 20-01 collector). | 3. Collector feed or return connection. |
| 2A. Mounting Rail Lag. | 8. Collector Trim. |
| 2B. Roof sheathing. | |

LAGS AND RAFTERS:

For maximum strength, you want your mounting rail (2) lags (2A) to go into rafters. After locating the best area for the collector, “sound out” the roof for the rafters with a hammer and mark the rafter centers with chalk. On thick roofs, such as shake, you may need to drill a small hole from the underside of the roof next to the rafter to locate it from the roof and use measurements from thereon. On thin composition roofs, a good stud finder can be very helpful in finding the center of the studs.

It is best to “run the lag into the roof once, remove it, then fill the hole with caulk and run the lag with washer back in and tighten. Some installers like to pre-drill the hole with a smaller bit than the lag to prevent cracking shake shingles.

Note: For high Wind areas, use a lag into a “Spanner Board” between the rafters. For extra strength the spanner boards can be toe-nailed into the rafters. Another option is to use a “J” hook around a rafter but location options are limited with this method.



Tilt Kits:

Standing Seam Installations:

Consider using the excellent "S-5 Clamps. <http://www.s-5.com/home/index.cfm>



See Tilt Kit Instructions Addendum included in Folder Tile Roof Installations

See tile roof installation: <http://www.youtube.com/watch?v=GiJf1jgND7I>

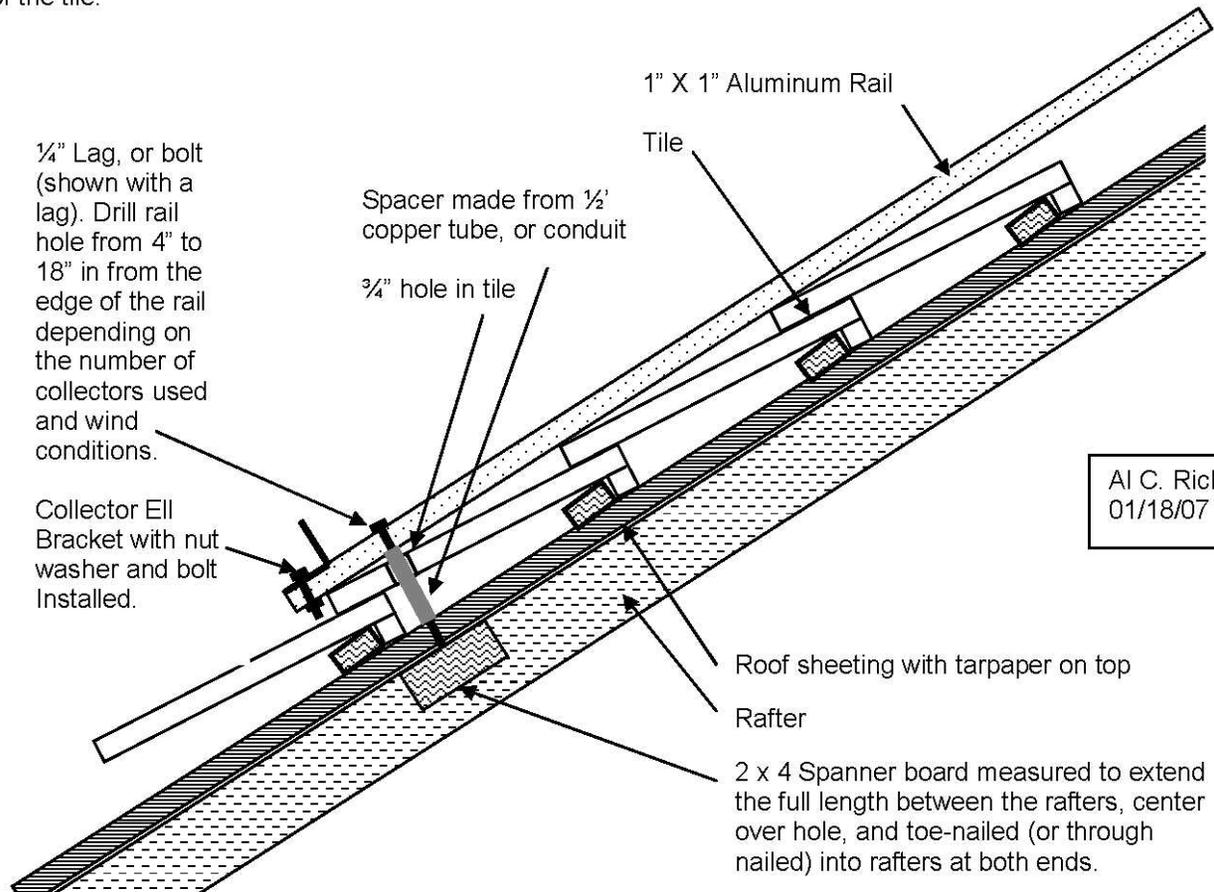


Please see drawing below. This system is the simplest design possible that supports the collectors and provides a permanent seal.

The left picture shows the positioning on the tiles; upper center the hole drilled just above the end of the tile below, bottom center, the calk filled tube on the tar paper and above the lower tile; upper right, the spanner board the lag is screwed into, lower right, toe-nail detail, in this case deck screws were used.

Simplified Tile Roof Installations of Lightweight Skyline Collectors

Lightweight Skyline collectors allow for a quicker and easier method of installation on tile roofs. The following shows a simple system where a hole is drilled in the tile, a spanner installed between the rafters, and a lag or bolt used to secure the collector rail. 1 and 2 collectors need 2 holes per rail, 3 and 4 collectors in high wind areas use a center hole, offset from the carriage bolt as needed for proper location. The same general procedure can be used with tilt kit feet as well. If installing on a Barrel tile roof, always drill through the very top of the tile.



Al C. Rich
01/18/07

Directions: (note also Skyline installation manual)

Locate best placement for collectors. Place front edge of rail about 1.5" over edge of tile and check upper end of rail to be sure ell bracket is not resting on the edge of a tile, adjust as needed.

A 3/4" hole will be drilled through the roof, using a 3/4" concrete bit and a hammer drill, measure just behind the tile overlap so only one tile is drilled through. Line up and drill a hole for all points of attachment.

Measure the distance from the top of the roof sheathing to the bottom of the rail, add 1/4" to the measurement and cut a 1/2" copper tube or conduit to be a spacer to fill this gap.

Drill a smaller hole through the tarpaper and sheathing. If using a lag, use a 5/32" bit, if using a bolt use a 1/4" or 5/16" bit. Toenail in a spanner board between the rafters with the hole centered. If using a lag, be sure it is long enough to go 1 1/4" to 1 1/2" into the spanner board. If using a bolt continue the small hole in the roof through the spanner board.

Drill a 5/16 hole thru the rail at the appropriate spot. From the bottom, carefully fill the spacer tube with high quality polyurethane caulk to about 1" from the top. Place the tube in the tile hole over the small hole.

Put the lag, or bolt through the hole in the rail (do not use a washer), place into the spacer hole. Put a gob of sealant around and into the 3/4" hole to seal. Place the lag or bolt through the small hole and, if using a lag, drill into the spanner until snug and the top of the rail indents to reduce the height of the head over the rail. If using a bolt secure into place using a nut and washer, double nuts are good, indent head into rail as above.

The caulk in the tube will squeeze out and seal the roof hole. Note: if using a center hole, as needed for 3 or 4 collectors in high wind areas, do not tighten until after caulk is in all tile holes.

GETTING THE COLLECTOR ONTO THE ROOF:

Use wisdom, when pulling collectors up onto the roof, have the collector at a good angle to the roof (out at the bottom). Protecting the gutter with a heavy cloth may be a good idea. Do not lean over the edge of the roof at all, simply pull and leverage the collector up onto the roof. The assembled collector is very sturdy but avoid “twisting” it.

If the edge of the roof is over 10 feet from the ground, the

bottom of the collector may be placed on a sturdy object or someone may be needed to boost the collector up to you.

On two story houses we strongly recommend two people for safety.

A sling can be made with sturdy rope going all the way around the bottom of the collector with shorter pieces going around the collector to secure the rope in place. Be sure to secure it very well and always have a secure safety rope you can grab onto. Have the second person push the collector up the ladder while it is pulled at the top.



Protect Edge of Roof with a Tarp and Lean Collector Against Roof



Keeping your body weight over the Roof, pull the Collector Up



Move Up the Roof as you Pull the Collector Up a Foot or so at a Time.



Balance the Collector in the Center and Carry to Installation Area.



A NOTE ON MAKING TUBE CONNECTIONS:

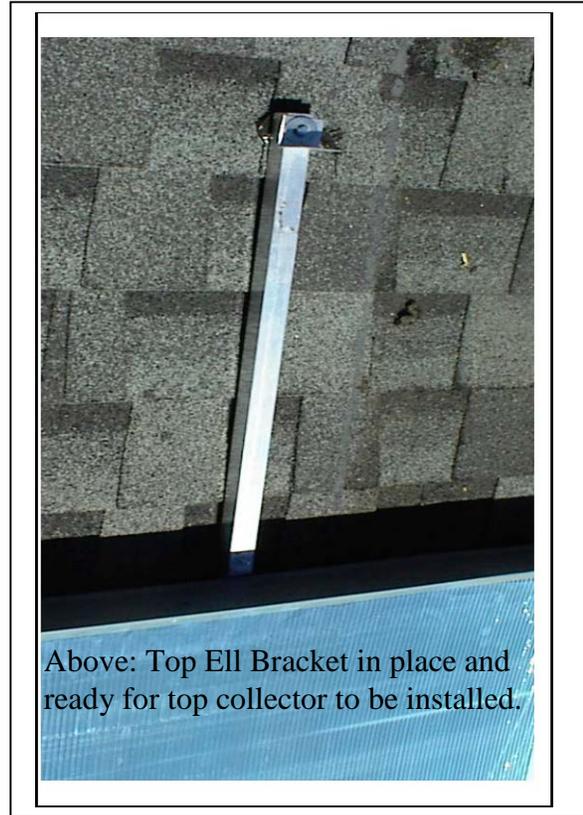
Make sure you **DO NOT** have a rafter directly under the collector feed as the feed hole is 1 and 1/2 inches below and in from the end of the collector.

MOUNTING RAIL AND MOUNTING BRACKET INSTALLATION STARTING WITH SINGLE COLLECTOR:

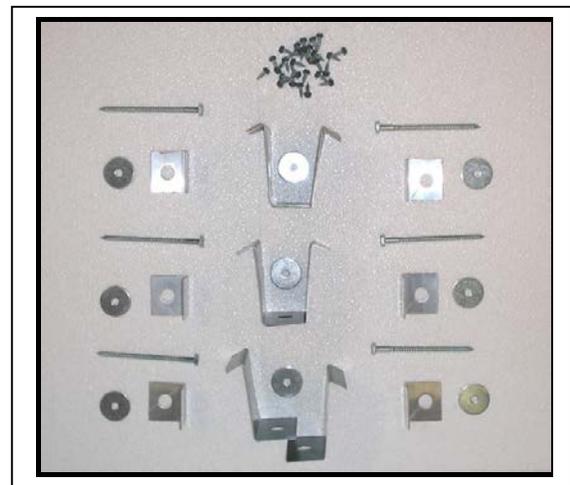
A single 20-01 collector is attached to the roof by three mounting rails and 6 mounting Ell brackets.



Position the Ell bracket **between the trim and frame so it is **CENTERED over the Lag hole**.** Install the collector onto the rails with the mounting bracket tab **UNDER** the trim and **BETWEEN** the frame. The small bend at the bottom of the trim makes inserting the mounting bracket easy. Be sure to press the collector all the way down on the mounting rail and secure with two 1/4" color coded self tap screws evenly just above the small bend in the trim. **Be sure to catch the Ell Bracket with both screws!**



Above: Top Ell Bracket in place and ready for top collector to be installed.



Above: Complete Collector mounting kit for 2 20-01 collectors. 3 Ell brackets bottom, three U bracket sets per additional collector and 3 Ell brackets top.

Note: 10-01 collector has 2 sets of each.

Two, Three and Four Panel Mounting Rails and Tilt Kit (two collector maximum per tilt kit):

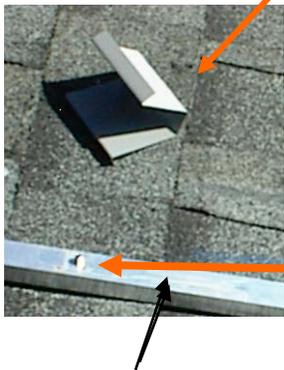
For installing two to four collectors or when two collectors are installed on the optional tilt rack, a special Quick Mount clip (6) is used between the collectors to firmly hold them onto the mounting rail. All holes are predrilled. With a tilt kit sets of 1/4" nuts, bolts and washers are supplied as needed in addition to lags to bolt the tilt kit together and secure the angle brackets.

The Quick Mount clip allows mounting of two collectors on the two panel-mounting rail or the heavy-duty tilt rail without needing to screw a mounting bracket tab into the side of the collector.

The U shaped clip with outward tabs that go over the edge of the two collectors is secured with a bolt in the center. In high wind areas, it is recommended that the clips be Tec screwed into the frame through the glazing with 2 screws.

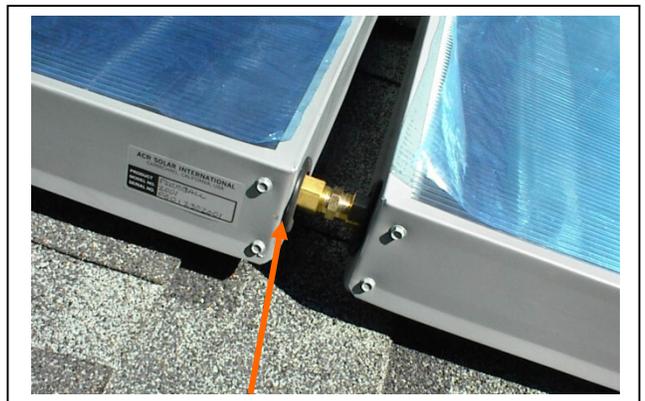
Notes on Two, Three and Four Collector Flush Mount Installations:

Place the first collector in place with mounting bracket tabs inserted for final assembly. Tighten down the lags. Place three Quick Mount clips in place over their rail lag hole locations. Partially install the lags to hold the clips loosely in place. **(you will need an extension to your lag driver to get between the collectors)**. Slip the next collector under the clips, connect the compression unions (4) so alignment is assured and then tighten down the lags. Repeat until all collectors are installed.

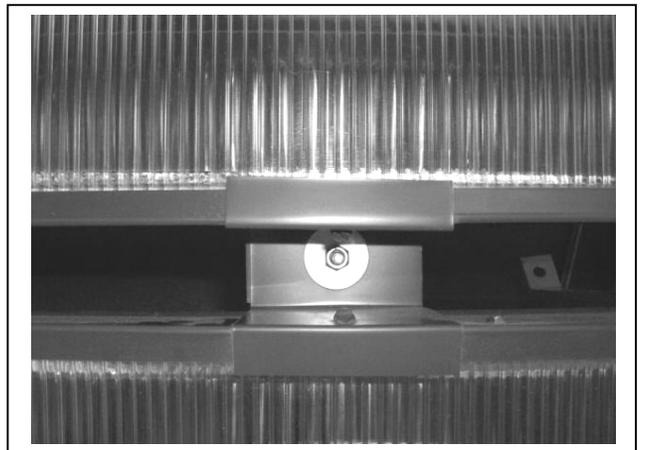


Quick Connect Clips (QCC's) are supplied in **One or Two pieces** with the single piece shown. Shown, in the top right picture above, is how they will be laid out.

To the left the U bracket is shown next to the rail with carriage bolt. **It is easiest to remove the nut before placing the collectors on the rails.**



Line up the collectors so the center union body can be installed. Using the threads on the union can help to pull out the nut on the header. It is a good idea to cover the collector with a blanket or sheet so the Nut doesn't get too hot.



Being sure the trim is pushed in, secure the U bracket with 1 tec screw going through the pre-punched hole in the bracket, trim and frame. This makes a very strong connection.

FLASHING IN UNDER SHINGLES

**For Tile and other roofs, consult with the Factory.
For Composition and Cedar Shake Installation:**

ACRSI supplies two special roof “Flashings” which are used to make a waterproof seal for the solar collector feed and return lines. These flashings easily slip under a composition or shake shingle with minimum cutting.

The tubing hole is large enough for the 1/2” od copper

pipe to easily slip through and the small space left can be easily sealed with caulk and further covered with insulation. The base of the flashing can flex and be moved in different directions.

The 8” aluminum base is usually large enough to make a watertight seal and can easily be flashed over by a larger aluminum sheet when needed. It is recommended that a 1 1/2” hole be drilled for the tubing hole.

“Roof Boot” Flashing and Waterproofing Details

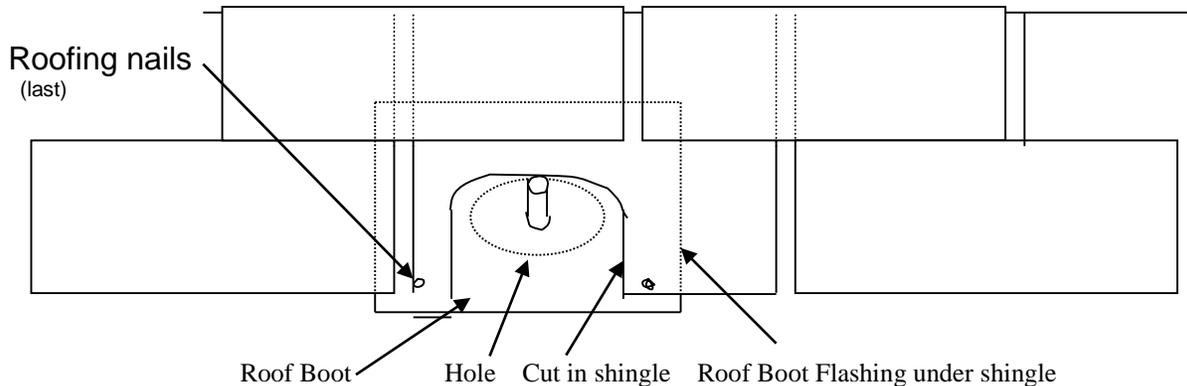
The 2 aluminum flashings supplied with the system are easily installed but require careful alignment to assure a good fit. It is recommended that up to a 1 1/2” hole be drilled to give “working room” when installing the roof boot. **Spacers are included with flush kits to make boot installation easier. Pre-fit roof connections prior to drilling (see Section 8, top and bottom connections).**

NOTE: sound out your roof to be sure no rafters are under where holes will need to be drilled!

Preposition the roof boot where it will go when the

pipes are connected to the compression 90 in its final “out” position. Mark the center of the hole, remove the fitting and place out of the way. Using a 1 1/2” hole saw or paddle bit, drill the hole. Carefully pry up the shingle and slip the Roof Boot under the shingle so water will freely flow over the roof boot.

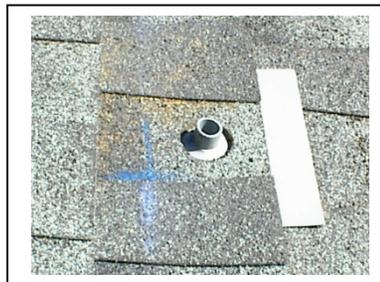
If needed, add aluminum flashing to assure a watertight installation (especially needed with Cedar Shake). Caulk the sides as needed and it is good to put two roofing nails in the bottom of the boot to secure it **AFTER** the pipes are installed and fully secured.



Note that Roof Boot is **UNDER** the shingles at the top and most of the sides so water flows over the top. The shingle is cut down from where the hole is drilled.



Use a “lifting Tool” with smooth edges to go under and lift the shingle without cutting it. Lift shingles before installing collectors.



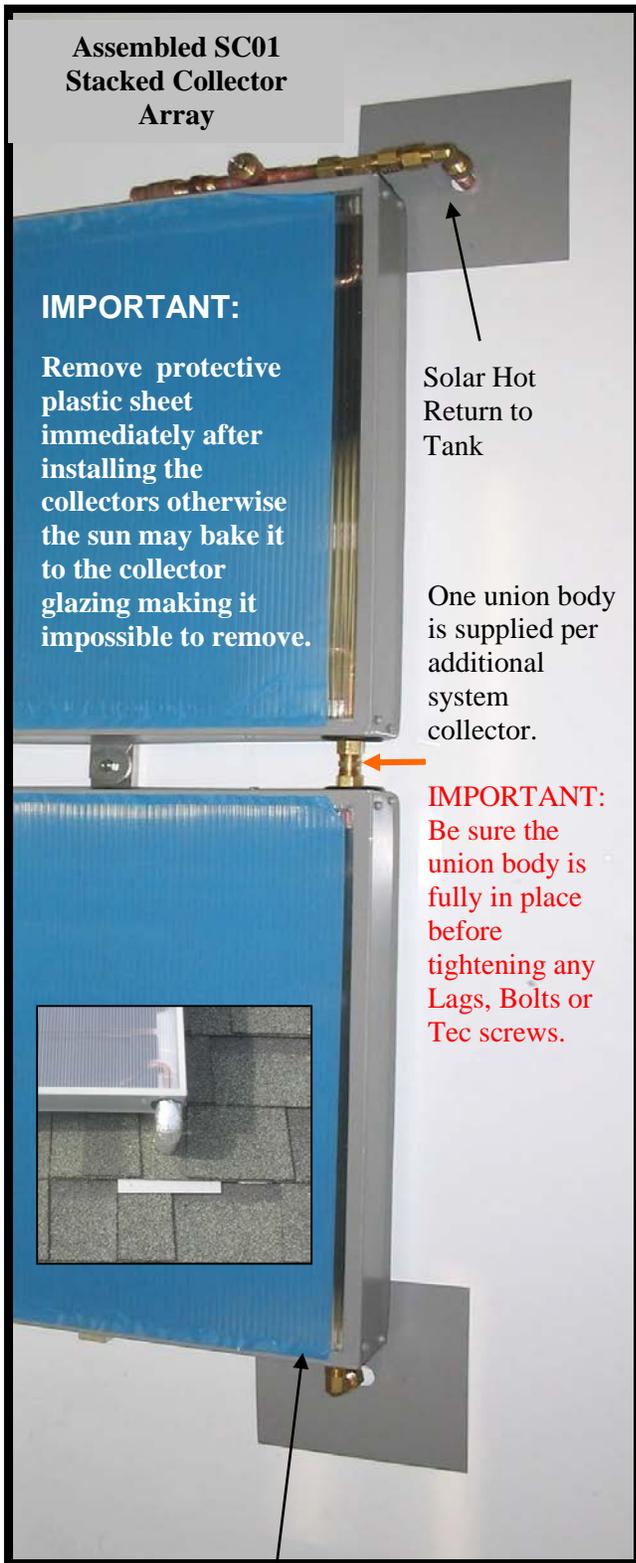
Drill a 1 1/2” hole 1 1/2” in and centered 2” below the edge of the collector. Slip flashing under shingles.



Properly placed, the feed line is right above the flashing tube hole. The edge of the collector is 1 1/2” above the lower edge of the rails.

SC01 Stacked Array Installation Kit

Loosely assemble your kit, per the following pictures, to locate the exact location of your roof penetrations and then follow the flashing and roof boot installation instructions.

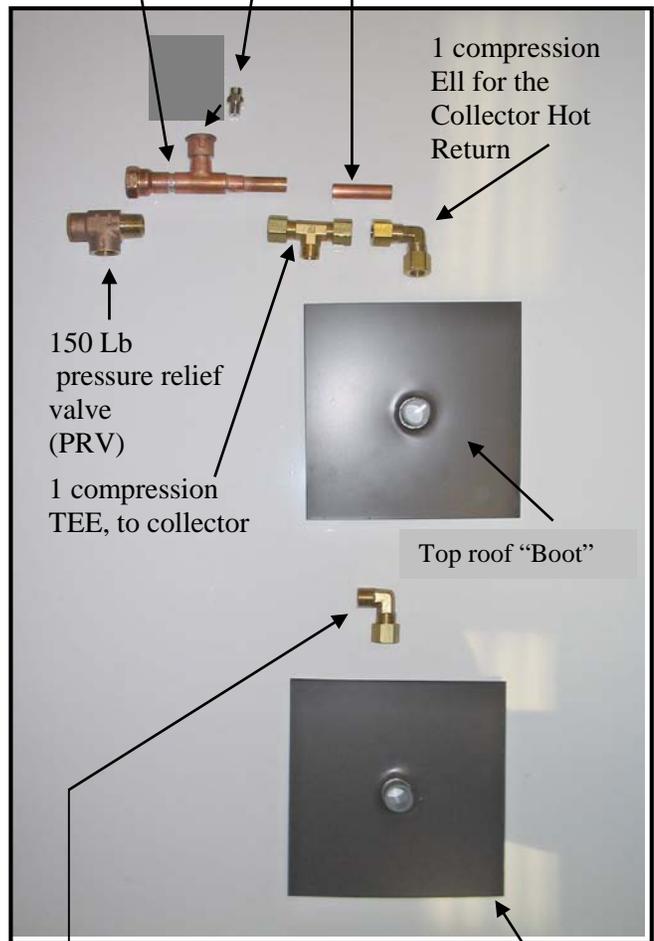


SC01 - Stacked Collector Array Installation Kit

Pre-soldered adaptor for Pressure Relief Valve and Coin Vent

Coin Vent (Normally Shut Tight)

2" stick of 1/2" OD copper

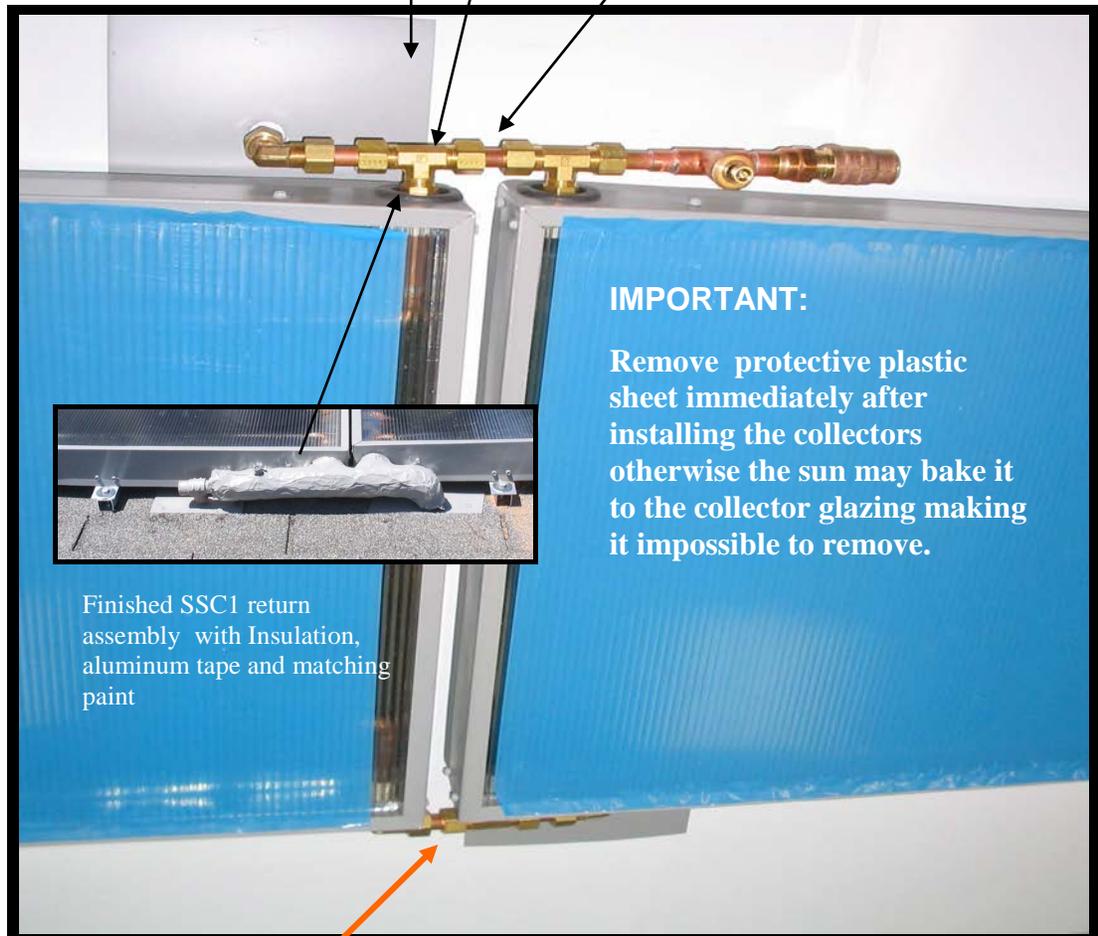


1 compression Ell for the feed.

SSC1 Side by Side Collector Installation Kit

IMPORTANT SSC1 TIP: Before installing the last Left collector, lift shingle for the flashing to go under See: "Roof Boot" Flashing and Waterproofing Details.

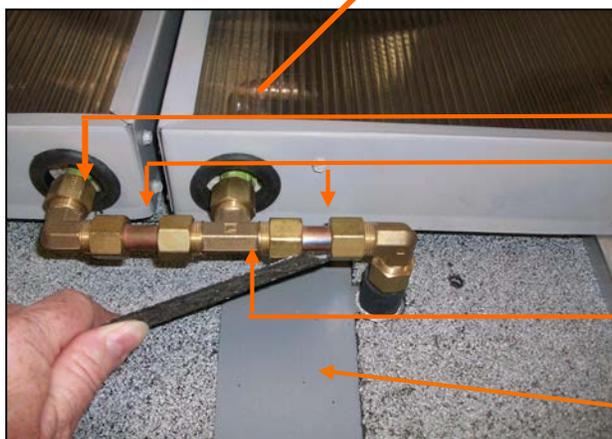
The SSC1 is the same as SC01 with addition of a Tee and 2" stick of copper for 2nd collector.



IMPORTANT:

Remove protective plastic sheet immediately after installing the collectors otherwise the sun may bake it to the collector glazing making it impossible to remove.

Finished SSC1 return assembly with Insulation, aluminum tape and matching paint



The SSC1 Feed has an additional Ell, 2 copper sticks and a Tee for the second collector.

Note that roof boot can be hidden by the shingles for an attractive appearance.

Making Line Connections – See Pictures Above

Parts description primarily Apply to Gold and Platinum Levels

Line connections are easily accomplished using brass compression connectors.

When using compression connectors, be sure a small amount of tubing material is showing on the outside of the ring and that you use a small amount of Teflon Tape on the joining surfaces before tightening. Be sure no tape gets inside the tubing. **See Section 6.**

Preparing the Collector

Pull the Absorber tubes fully out of the inlet and outlet holes. The absorber fins should line up side beside in the collector.

Vital: Be sure tubes line up before putting Mounting Tec Screws into the Collector!

Collector Connections:

See 6.0.

Collector Top Connection:

At the collector top connection, connect a Tee compression fitting. Attach the pressure relief valve and air vent in the end of the Tee. Pressure relief should face down and the air vent up. The copper tubing may be installed into the Compression Tee, through the hole in the flashing later filled with caulk and insulated.

Tighten, but do not over tighten the connections. Be sure the line with the pressure relief and other valves on it are parallel with the roof. As mentioned, the pressure relief valve should be tightened so it faces down directly onto the roof, onto the supplied aluminum splash sheet, for safety. The coin vent must face directly up, it is normally closed tight and is used for manually releasing trapped air in the top of the system.

Bottom Connection of Collector:

When the end of the union is flush with the edge of the collector, alignment in the collector is correct.

Temporarily put in the 90° compression union at this point and drill a 1 ½” hole directly below it for the roof boot flashing to be installed.

Gently lift the edge of the shingle with a pry bar or trowel, cut the shingle as needed and slide the roof boot flashing into place. The copper tubing will be installed through the hole in the flashing later and insulated.

NOTE: The hole in the side of the collector will be covered with insulation as a final step. All insulation over fittings is done last, after the system is pressurized and all fittings checked for leaks.

Paint outside insulation with Latex paint or cover with aluminum tape to protect it from UV degradation.

The 50’ roll of ½ OD copper tubing (see below) is easily unrolled and straitened by placing it on the ground and unrolling it as you lightly step in the unrolled portion.

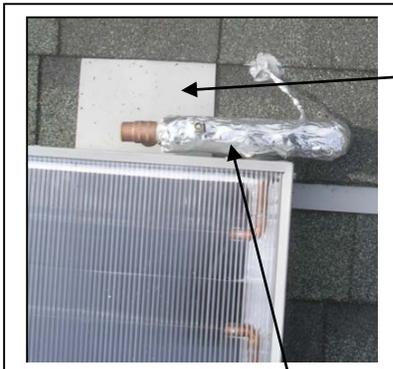
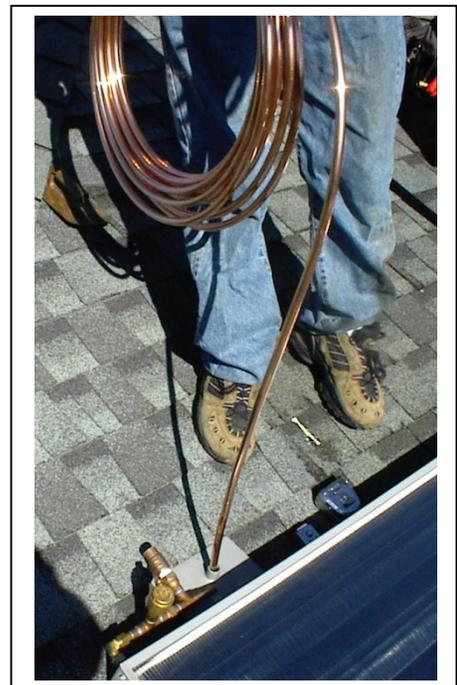
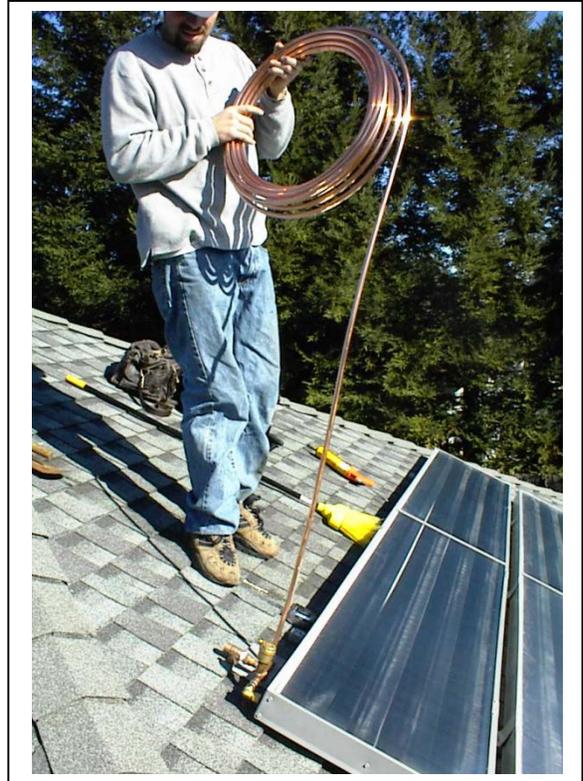
It is sometimes easiest to feed the pipe down through the roof boot flashing and into the tank area.

A variety of techniques can be used depending on the situation such as needing to pull the pipe through an attic where it may need to come up from the bottom and be fed through the roof.



To prepare for the pipe runs, straighten the copper lines by putting a foot on the end and carefully unroll the tube and keep the line straight.

Carefully unroll the tubing through the roof boot into the attic. If available, have a partner guide the tubing to the tank being very careful not to kink the line. When working alone, it may be easier to unroll the tube in the attic or first floor and send the tubing up and through the roof boot from the attic.



SRCC requires a splash plate under the pressure relief valve shown here glued to the shingles under the outlet.

Fully insulate all lines. Press about 1/2" of supplied high temperature insulation into grommet hole to fully seal. Covering the insulation with aluminum tape and painting is recommended. Be sure to overlap top over bottom like the shingles for good water shedding.

DETERMINE THE BEST PIPE RUN

COORDINATE THE PIPE RUN WITH THE BEST SOUTH FACING COLLECTOR LOCATION FOR THE SHORTEST RUN. ALWAYS USE COPPER TUBING, NEVER PEX OR OTHER PLASTIC TUBING AS THEY MAY BURST FROM STAGNATION TEMPERATURES.

IMPORTANT: SLOPE all lines to DRAIN! It is important that all pipes between the collectors maintain a 1/4" per foot drop to prevent traps and assure that all fluid drains when the drain valves are opened.

COMMON RUNS

In many one-story homes, the run is a simple matter of going up into the garage rafter area and to the roof or going through a wall or ceiling into the attic.

Common pipe runs to the basement include runs adjacent to air return chases, plumbing and vent lines and through closets. **In a two story house runs can be challenging; however, it is amazing how often a good solution is at hand.**

CHASES: Look for pipe, fireplace and duct chases with room around them. The pipes can often be dropped down next to a duct, especially in a one-story house, in just a few minutes.

CLOSETS: Sometimes the easiest way to run the pipes is through closets (look for "stacked" closets in a two-story house). Since 1/2" copper pipes are fairly flexible, drilling through even many shelves with an angle drill is easy as alignment does not have to be precise.

NOTE: Copper pipes get harder, even brittle with multiple bending, bend your pipe as little as possible for the easiest installation! Unroll the soft copper in smooth even strokes and be sure the connections for the collector are above the roofline so no water could get into the house if the connection leaks.

DRYWALL: It is sometimes necessary to cut drywall at the floor or ceiling level in order to cut the holes in a fire stop. Usually this hole can be made out of sight in a closet. After sealing the fire-stop, it may be desirable to make the remaining drywall removable by putting a simple frame around it and placing it back in place with a few finish nails.

INFILTRATION AND FIRE STOPS: In all situations, remember that infiltration is one of the main sources of

energy loss in a house. In no way should the installation of a solar system contribute to this loss! ALWAYS seal up any holes made in the house envelope especially in the attic and fire stops. Fire stops must be properly put back in place so their important function is preserved. Converting to copper pipe for two feet on either side of the fire stop may be required in some areas.

STORAGE: You will need to purchase a Rheem Storage Tank, 80 Gallon with heat exchanger, Model # RH-81V080HE1 or 120 gallon model # 82V120HE-1.

You will need room to work around it and space for the solar hardware, usually a foot on the drain side of the heater is adequate. Install the tank connection components.

The Rheem Storage Tank is equipped with a top element only. To enhance your DHW efficiency, during the winter, first try using low flow showerheads and aerators and/or add a 220v switch to the top element. Another good plan is to use a 220v timer set to heat the water for two hours before you get up in the morning and for two hours before you get home from work.

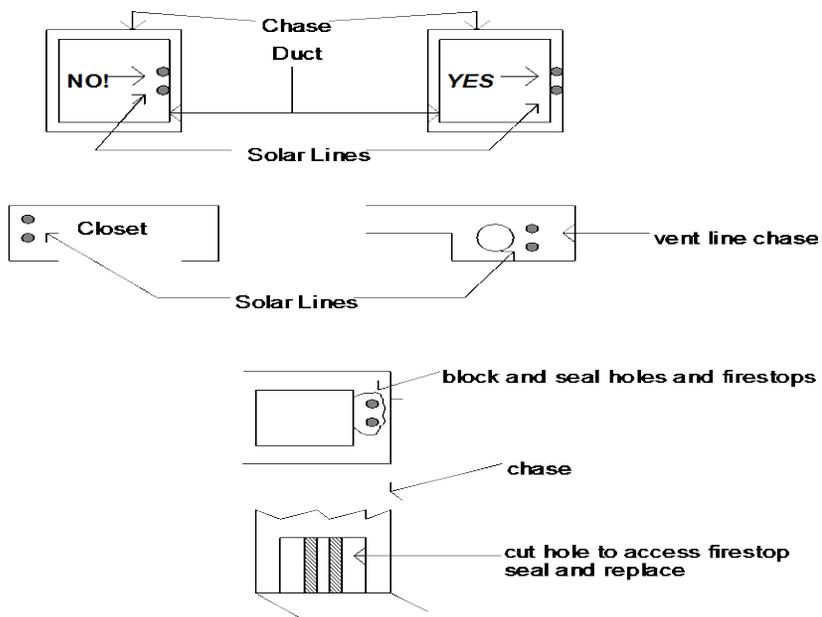
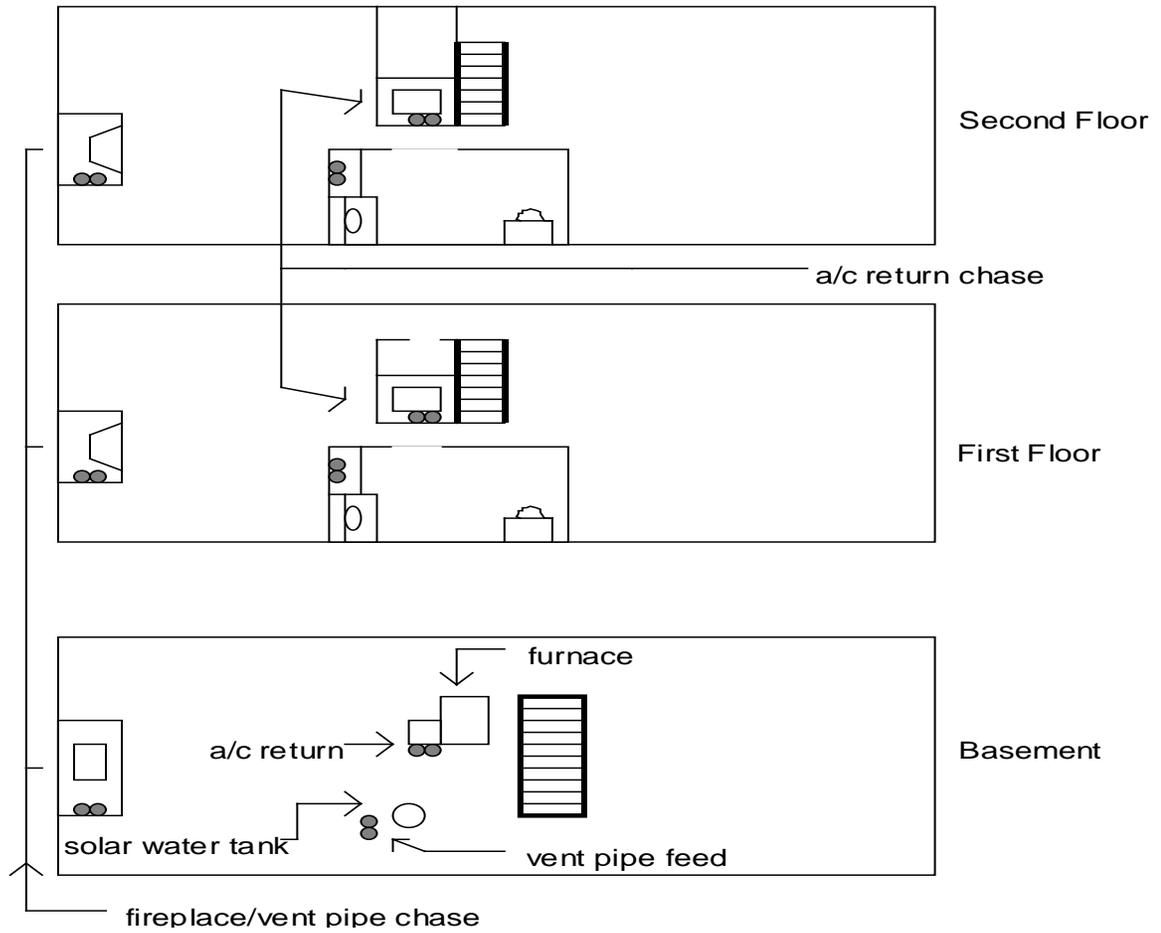
Try turning the power off during sunny summer days. You should have ample Hot water with 2 panel for a family of 3 and with 3 panels for a family of 4 or 5 on clear summer days.

INSULATION: INSULATION OF EXPOSED COPPER PIPES IS NEEDED. A MINIMUM 1/2" R-2.6 (closed-cell insulation)* IS NEEDED AND 3/4" R-4.5 OR BETTER IS RECOMMENDED. Check your state and local codes to see if any greater thickness is required ESPECIALLY IF REBATES OR INCENTIVES ARE INVOLVED.

Determining The Pipe Run (birds eye view)

*Look for the following:

Note: ●● = solar pipe run



TANK CONNECTIONS for SKYLINE5

SolarRoofs.com

Rheem / Rudd / Richmond Model Number 81V080HE180 Gallon



Heat Exchanger coil is wound around the tank as shown.

80 or 120 Gallon Heat Exchanger Storage Tank

Platinum Pre-soldered Tempering Valve assembly

Silver Twin Digital readout and on/off switch



Hot Return line from Collector

"Differential Control"

"Floating Check Valve"

Platinum Summer Bypass

Heat Exchanger In

Solar Loop Pressure Gauge

Expansion Tank

Before putting any fluid in the solar loop, Check to see that Expansion Tank is charged to 12 Lb. Charge glycol loop to 24, pounds, (about the maximum a drill pump will go to) or 10 to 12 pounds more than the Expansion tank was charged to. After charging, pressurize the loop by filling the Expansion tank with air to 50 pounds of pressure. This helps to prevent high temperature stagnation boiling.

Expansion tank factory set to 12 Lb.

Heat Exchanger Out

Tank Drain, can also be used to dilute Glycol to 50/50, as well as to flush and pressurize solar loop.

Be sure to connect a hose and open this valve and flush out the bottom of the tank at least every 6 months

* = Gold and Platinum

If it is desirable to have the expansion tank and pump higher or above the tank, this can be accomplished by making an extension (like a long nipple) made from a 1/2" or 3/4" copper tube and two 3/4" copper by 1/2 male pipe thread (1/2" or 3/4 C x 1/2" MPT) adaptors on each end. This piece can then replace the 6" nipple between the Expansion tank Brass Tee and V1.

It does not matter if the pump is above or below the Expansion tank



Cover to 220 olt Element

WARNING: Always turn off power at breaker and verify that power is off with a tester before doing any electrical work.

Return to Collector

Circulation Pump Laing D-5

Solar Loop Charging valve V1 used to fill system with water for flushing and Propylene Glycol for operation.

Isolation valve V3, close to charge system, open for operation.

Solar Loop Charging valve V2 used as out line to flush solar loop, as out for "Siphon Loop charging method," or to return

Propylene Glycol to charging bucket with preferred pump charging method.

Installing the Heat Exchanger Connections

The parts description primarily apply to Gold and Platinum Levels.

1. The threaded brass fittings are installed using at least 6 tight turns of Teflon Tape or Teflon pipe dope.
2. **Heat Exchanger IN (Hot Return):** Connect and tighten 3/4" brass nipple or adaptor to the Hot Return Fittings (with or connect to check valve) to the TOP, Hot In Heat Exchanger fitting as shown. The Platinum system Summer Bypass is installed in a similar way. The Silver will need a 90, 3/4" adaptor and 3/4" male adaptor.
3. Connect the Collector Hot Return Line to the short Hot Return Tank Fitting.



Silver



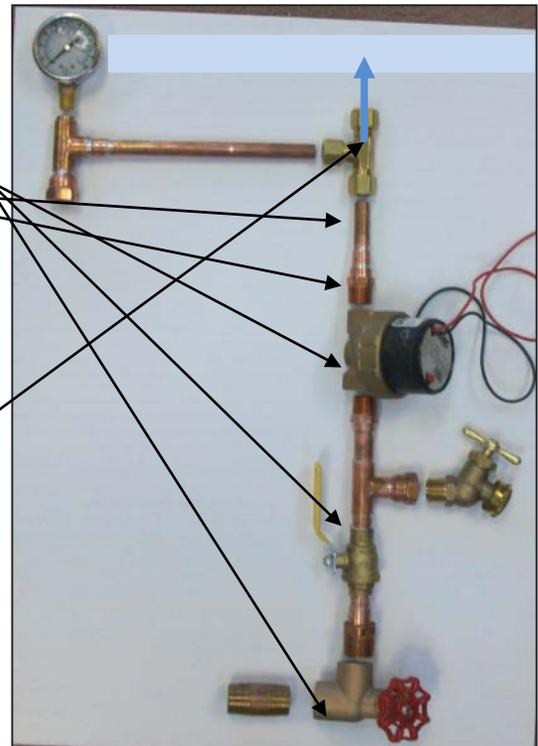
Gold



Platinum

- 3) **Heat Exchanger OUT (Collector Feed):** Starting at the bottom heat exchanger OUT, connect and tighten the 3/4" brass nipple, , attach the brass V2 hose bib adaptor with the 3/4" female fitting facing up, attach the charging assembly comprising of the 3/4" to 1/2" brass adaptor, V1 charging valves, V3 ball valve, then the pump (install with the driver removed using care with the O ring when replacing), threaded adaptor, compression tee, expansion tank and pressure gauge assembly line, as shown. Connect the bronze Pump housing with the arrow up.

- 4) If using non split insulation, put insulation on the feed and return lines prior to connecting lines to tank.
- 5) Connect the Collector feed line to the tank's pump feed line using the 1/2" compression Tee.
- 7) Connect the tank hot and cold lines and Mixing Valves per the diagram below.



- 8) Charge the system by following the procedures in Section 11.0 below.
- 9) Insulate all water lines including the last 5' of cold water line as accessible with R-2.6 or greater insulation.

Before insulating the lines, pressurize the solar loop with water and thoroughly test for leaks.

Tempering (Mixing) Valve Installation

Only the tempering valve is supplied with silver and gold the kit unless the Platinum option is ordered. The picture below is of one of several Platinum Option configurations and is supplied for illustration.

NOTE: The supplied Skyline5 mixing valve (which automatically allows cold water to mix into the hot water) is required for SRCC OG-300 and can be installed by your plumber. There are many ways to install the mixing valve as long as the ports are correct.

The New Skyline Platinum Tempering valve configuration shown below has the Tempering valve on the cold side which keeps the valve cooler.

The pictures to the right is of a Platinum Pre-soldered Mixing Valve which is an option on Silver and Gold systems. Actual Valve may vary.

Other configurations we have been using include a pre-designed unit, please follow instructions included in the kit.

Fully insulate all lines including 3' of the cold line, or until it goes into the wall.



Important Note: Due to the shortage of Small PV Modules, there will be variations of the actual PV modules and Wattages shipped.

9.0.

CONTROL COMPONENT DETAILS

Photovoltaic (PV) panel: Place the PV panel on the same plane as the collector. If you have a tilt kit you may need to fabricate a tilt assembly for the PV panel.

Attach the PV panel to the brackets with the supplied nuts and as shown.

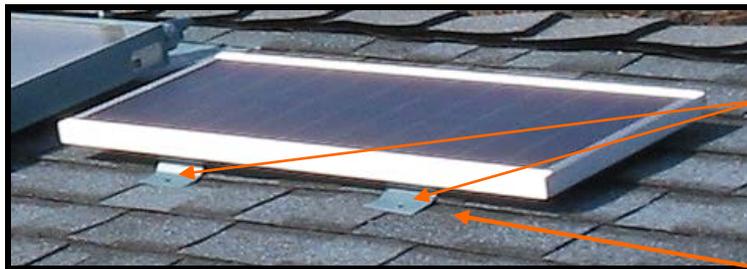
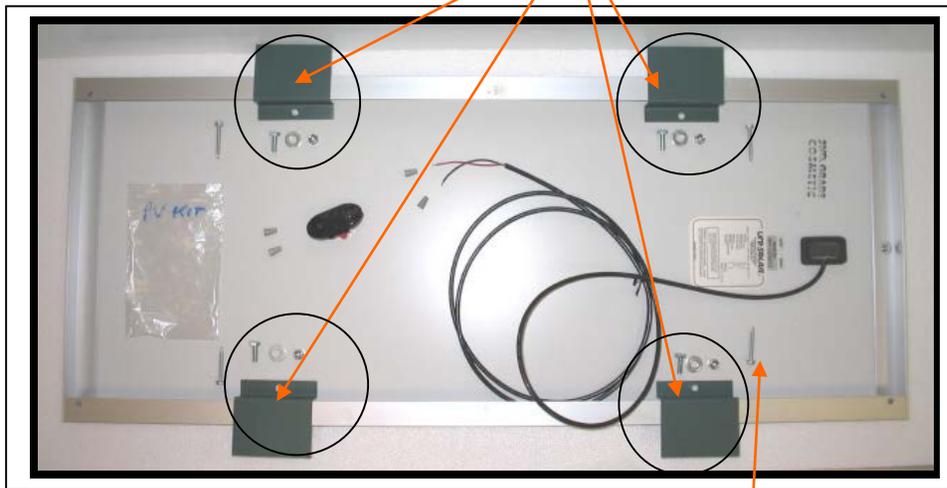
Screw brackets to roof with supplied long Tec Screws.

The PV brackets are bolted to the PV panel through existing holes in the frame of the PV panel with the supplied bolts, washers and nuts. (Note brackets may be 2 longer instead of 4 short brackets.)

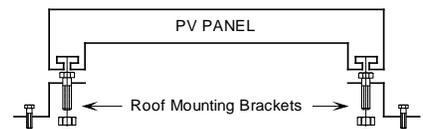
Seal the roof penetrations with a quality sealant.

Wire nuts are supplied to connect the PV wire to the supplied wire, which then goes to the digital readout switch or the 12 volt Eagle 2 differential controller. The pump is switched through the negative side.

Silver PV Parts Bag



Long Tec Screws, go through the PV bracket and into Roof. Be sure to put a dab of calk under the bracket where the Tec screw will go through the roof.



Tilt Kits may be supplied with collector mount PV kits. The Ell mounting rail is connected to the collector with 2 Ell brackets and is Tec screwed to the back of the collector:



Ell Brackets

Tec Screws



Skyline5 Silver Temperature Readout and

(see second page below for Gold and Platinum Differential Controller)

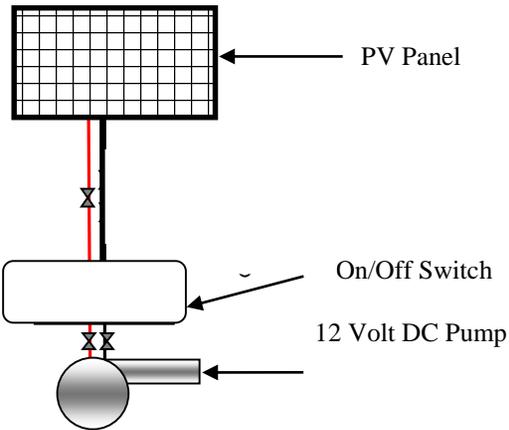
SILVER SYSTEM UPDATE: TEMPERATURE GAUGES HAVE REPLACED DIGITAL READOUT

PV Wire: DO NOT ALLOW THE PV WIRE TO TOUCH THE PIPE! IT WILL MELT AND SHORT OUT!

Drill a small hole under the panel, run the PV wire most of the way through it, seal with caulk (lifting a shingle a little before drilling can help) and put PV panel in place over it.

Pump Connections: The PV panel wire is simply attached to a 14 to 18 gauge wire using wire nuts. It is then attached to one of the Temperature Readout Box switch wires, and the other wire is connected to the 12 Volt pump using wire nuts. Simply connect the PV wire (always red + to red +) to one lead and the other lead to the pump.

PV to Pump Connection Diagram

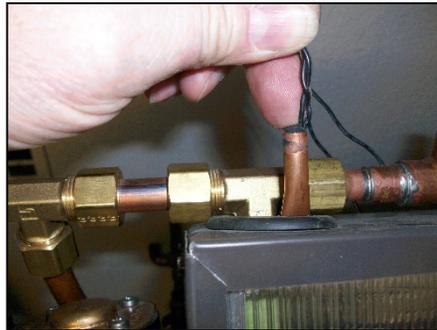


Gold and Platinum – ART-TEC, PV Powered Differential Controller

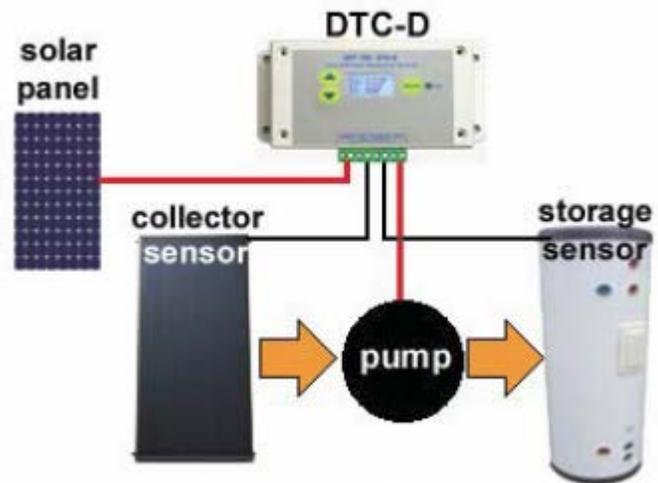
What it does: A differential controller electronically senses temperature differences using 2, 10K thermistors (sensors), it is not a thermostat. Whenever the collector is 12 degrees F or more hotter than the temperature in the bottom of the tank, the controller turns on the pump. When the difference gets to 4 degrees F or less, it turns the pump off. (The differential On is adjustable)

Features: - PV POWERED from 0 VDC to 22 VDC with SMART power management at very low PV power levels. "A must" for soft PUMP starts and smooth controller operation. - Large easy-to-read 40 character (20x2) backlit LCD display showing every parameter measured and controlled by the microprocessor. - Two industrial 400°F (204°C) rated 10 K thermistors with +/- 1°F accuracy are included. - Two auxiliary thermistor inputs for optional sensors that can be located up to 1000' away. - Selectable overrides for low temperature shut down or freeze protection modes for safe operation. - adjustable High temperature limit and open loop system freeze protection.

Installation involves installing 2 sensors from the SENSORS block, one from COL to a location just inside the outlet collector hole under the absorber, and the other, STO, at the bottom of the tank against the wall of the storage tank as shown. The PV panel will be connected to the PV + and – with the PV + being common with the Pump+. The Pump Negative wire is switched through the right block SS Relay (SS RLY). EG = shield to Earth Ground. Set RELAY to AUTO



Relay Switch / COL and STO Sensor Block



See Instructions that come with the ART-TEC DTC-D.

Set Differential ON to 12 degrees F

Set Hi Limit to 170 F

PV Panel

12 Volt Pump

IMPORTANT NOTES:

Inside the round hole: Mount tank sensor by pushing it under the insulation next to the inner steel tank shell. Install round black cover.

Use shielded wire for the sensors and 18 gauge or thicker wire for the PV panel.



11.0.

Charging the Solar Loop with Propylene Glycol

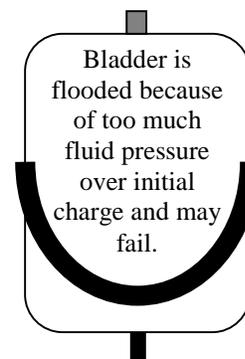
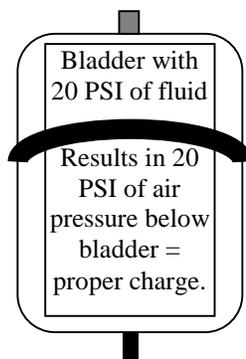
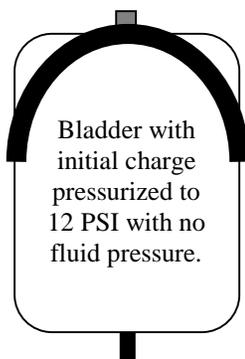
**It is VITAL to follow the Instructions below EXACTLY!
Check the pressure in the Expansion Tank BEFORE Charging.**

Items Needed: Two - 5 gallon buckets, 2 or 3 gallons of 100% Propylene glycol (which will be mixed from 30 to 50% with water - use bottom tank drain) charging pump, 3 laundry hoses, air pressure gauge and compressor or tire pump.

1. You will need 2 or 3 gallons of Propylene Glycol, Sierra brand or equal, can be picked up at most Auto Parts Stores and Other brands are available at Camping centers where it is used to freeze protect plumbing.



2. **To Properly charge the Solar Loop, it is VITAL to not charge greater than 10 pounds more fluid pressure in the bladder side expansion tank than the original air pressure charge. Charging with fluid to more than 10 pounds over air pressure will flood the Expansion tank with fluid and the bladder may burst, a condition not covered under Warranty. First: Check the Pressure in the Expansion tank at the air fill valve on the bottom to be sure it is about 12 pounds (lb), if not, fill to 12 lb. (the system will be charged to 20 – 22 lb) with fluid and topped off at 48 to 50 lb. with air (see 7.)**

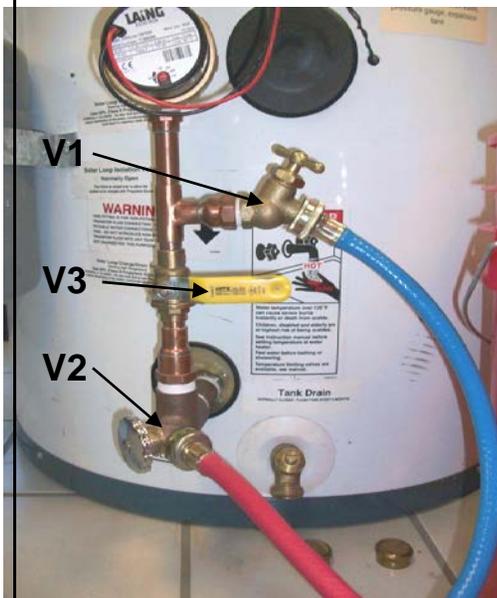


The diagrams above show the importance of a proper fluid charge in the Expansion Tank. After a proper charge the Expansion Tank is filled through the air fill valve with air to 50 PSI to increase the fluids boiling point in stagnation conditions. **A compressor and tire pressure gauge is needed to do this.**

3. You can use a low cost hand drill pump like that shown in the picture to the right. Be sure to use it with a 110 Volt high 1,600 rpm speed drill to get to 20 - 24 pounds of pressure.

PROFESSIONAL INSTALLER NOTE: A more powerful 110 Volt pump is recommended like Grainger's Dayton 4CB57 pump. When using a more powerful pump, it is recommended to fill the expansion tank with air to 30 pounds, charge the solar loop with fluid to 40 pounds and then finish off with air to 50 lb.





4. The first step (not shown) is to flush the solar loop and check for leaks. Hook a laundry hose from the hose bib at the bottom of the storage tank to the top charging port hose bib **V1**. Use a large screwdriver to turn tank hose bib on and off.

Connect a garden hose or laundry hose to hose bib **V2**, have the other end of the hose go to a drain, bucket or outside.

Close the ball valve **V3** between **V1**, and **V2** Open tank hose bib all the way, open **V1** and run water full pressure through the system to flush any debris out of the solar loop.

Close **V2**, build to 40 pounds, close **V1**, and check for leaks at all connections. (40 pounds is OK for this short period) After, leave water in solar loop and bring pressure down to 20 pounds.

Caution: In cold weather, do this process only if it is sunny and Glycol is going to be put in system soon!

5. With 3 laundry hoses, connect **V1** to the pump outlet, and the second hose from the glycol bucket to the pump inlet and the third hose from **V2** into the 2nd bucket as shown. **V3** must be closed.

Fill the glycol bucket with 4-5 gallons 50/50 water / glycol mix. (In less cold areas as low as a 30/70 glycol water mix is OK)

Open **V1** and let water in loop back through the hoses out to clear all air out of the hoses into the glycol bucket. This also primes the pump if needed. Turn on the pump, holding onto the hose in the 2nd bucket (so it doesn't fly around!) open **V2**.

Watch for either the glycol to come out of **V2** hose or for the glycol to be within 4 inches of the bottom of the glycol bucket and quickly switch the **V2** hose into the glycol bucket.

IT IS VERY IMPORTANT THAT NO AIR GET INTO THE SOLAR LOOP, (it will cavitate the solar loop pump)

If needed, add more glycol to maintain a good mixture.

6. We want to be sure all air is out of the solar loop so when you switch the **V2** hose into the Glycol bucket, the "Purge Cycle" is started. Being very careful to keep both hoses low in the fluid and not too close to each other, run the pump for about 5 minutes to be sure all air is clear from the solar loop.

Close **V2** and build pressure to about **20 - 22 lb.** (if the pump is not strong enough, use a laundry hose (completely purged of air) to build pressure in the solar loop to 20 lb.) **You want about 8 - 10 lb more pressure in the loop than the Expansion tank is set for.** Close **V1** and open **V3**. Run the solar pump to see if hot glycol is coming down the lines, **CAUTION, it could be VERY HOT!**

7. Finally, pressurize Expansion tank with air to 50 lb. This is to increase the boiling point of the system (your solar loop pressure gauge will also read 50 lb.) – Your Loop is Charged!



FINAL SYSTEM CHECKOFF:**Roof Area:**

- All Lines are as neat and out of site as possible
- All compression unions tight
- All holes deep filled with Silk a flex
- All lags tight
- Collector "Hard pulled" to check lags
- All tec screws are in – DO NOT STRIP!
- Insulation tight in collector holes
- Insulation neatly "roof layered" with foil
- Foil, air vent and bottom rails painted
- Roof penetrations water tight and neat
- Exposed wires painted or preferably covered
- PV panel neatly trimmed and centered
- Roof area is completely clean and undamaged

Tank area:

- Lines are neatly laid out with no leaks
- Pump is in right direction, running quietly and temperature is rising on the return line
- Expansion tank charged to 40 LB
- System charged to 50 LB and is circulating

- Ceiling and or wall holes calked
- Lines run neatly and look good
- Insulation tight, lightly compressed
- Insulation fully tie wrapped
- PV circulator has wires exposed with wire nuts
- easily accessible and removable for testing
- Hi temp pump snap switch installed
- Tank earthquake strap tight and tank braced
- Labels installed
- Caps on loop hose bibs
- Tank element is set to 145F
- Tempering valve is set to center position
- Element is in
- Water Heater breaker is clearly marked

Pipe Run:

- All lines are neat and strapped where needed
- (at least every 6 feet)
- Lines are out of customers way
- All lines insulated, tie wrapped and labeled with large label on tank with install date

INSTALLERS:

BE SURE HOMEOWNER HAS HOT WATER!! CHECK FROM INSIDE THE HOUSE – DO NOT LEAVE WITHOUT CHECKING!!!

FINAL DETAILS:

Mount the sheet titled "**Important Warnings and Instructions**" onto the front of the tank,
Peel the backing off and place the supplied labels with their corresponding components.

We Hope Your installation Went Smoothly!!

**PLEASE CALL ACR Solar WITH
QUESTIONS OR COMMENTS:**

Toll Free USA Install Help Number: (888) 801-9060

Thank You and Now Enjoy the Savings!

12.1.

QUESTIONS AND ANSWERS:

HOW LONG WILL MY PROPYLENE GLYCOL LAST?

Quality Propylene Glycol has a life expectancy of up to 10 years but should be checked for deterioration and acid buildup in the 5th year using standard Litmus paper. Buffers can be added to extend life.

HOW DO I GET THE MOST EFFICIENCY FROM MY SOLAR WATER HEATER?

An easy method to increase storage efficiency is to have a 220-volt timer installed by an electrician.

It will activate the element for 3 hours in the early morning (say from 5AM to 8AM) for showers etc. and on again in the early evening (say from 4PM to 10PM) for evening use if solar gain hasn't been good that day.

This increases the solar efficiency by not allowing the element to come on during hours of solar gain as well as keeping it off during non-use nighttime hours.

Ideally, it is most efficient to completely turn off the electricity in sunny weather.

WHAT ABOUT FREEZE PROTECTION?

The ACR Solar closed loop Propylene Glycol Antifreeze heat exchange system's collector as well as feed and return lines will not be damaged by (ambient) hard freeze temperatures as low as -54 degrees F below zero, with a 60/40 mixture of propylene glycol/water.

The solar storage tank must be kept in an area above 32 degrees F.

WHAT ABOUT HIGH TEMPERATURES?

The Skyline collector will not be damaged by stagnation in ambient temperatures as high as 120 F.

SRCC and FSEC Collector Certifications And SRCC System 5 Certifications

	<p>This product certified by Solar Rating and Certification Corporation c/o FSEC, 1679 Clearlake Road Cocoa, FL 32922</p> <p>SRCC Document OG-300 Conformance to HUD UM 100</p>	<p>ACR Solar International 5840 Gibbons Dr. Carmichael, CA 95608</p> <p>Model No.: Fireball 2001 Gross Area: 1.897 m² (20.10 ft²) Serial Number:</p>	<p>Mildly Cloudy Day Rating in Category C</p> <p>12 MJ/day 11 Mbtu/day</p>
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<h3 style="margin: 0;">SOLAR COLLECTOR CERTIFICATION</h3>	<p style="font-size: small;">FLORIDA SOLAR ENERGY CENTER 1679 Clearlake Road Cocoa, FL 32922-5703</p> 									
<p>FSEC 00030 MANUFACTURED BY: ACR Solar International Corp. 5840 Gibbons Dr., Suite G Carmichael, California 95608</p> <p style="text-align: right;">MODEL # Fireball 2001</p> <p style="text-align: right;">SERIAL #</p> <p>has been tested for thermal performance and meets the minimum standards established by the Florida Solar Energy Center as directed by Section 377.705 Florida Statutes.</p> <p style="text-align: center; font-size: small;">THERMAL PERFORMANCE RATINGS*</p> <table style="width: 100%; font-size: x-small;"> <tr> <td>Low Temp. (35°C, 95°F)</td> <td>19,000 kJ/day</td> <td>18,100 Btu/day</td> </tr> <tr> <td>Intermediate Temp. (50°C, 122°F)</td> <td>15,600 kJ/day</td> <td>14,800 Btu/day</td> </tr> <tr> <td>High Temp. (100°C, 212°F)</td> <td>7,000 kJ/day</td> <td>6,600 Btu/day</td> </tr> </table> <p style="font-size: x-small;">*Based on an assumed standard day for Florida.</p>	Low Temp. (35°C, 95°F)	19,000 kJ/day	18,100 Btu/day	Intermediate Temp. (50°C, 122°F)	15,600 kJ/day	14,800 Btu/day	High Temp. (100°C, 212°F)	7,000 kJ/day	6,600 Btu/day	<p>GROSS COLLECTOR AREA: 1.865 m² (20.07 ft²) COVER PLATE AREA: 1.720 m² (18.52 ft²) COLLECTOR LENGTH: 3.658 m (12.00 ft) COLLECTOR WIDTH: 0.510 m (1.67 ft) COLLECTOR WEIGHT: 17.2 kg (38.0 lb) FLUID CAPACITY: 1.8 L (0.5 gal) REC. FLOW RATE: 34 Liquid mL/s (0.5 gpm) TEST PRESSURE: 1103 kPa gauge (160 psig) MAX. WIND LOAD: 2394 Pa (50 psf) THERMAL PERFORMANCE EFFICIENCY (ASHRAE 93-86) Y INTERCEPT: 60.4</p> <p>SLOPE: 373 $\frac{\text{Watts}}{\text{m}^2 \cdot ^\circ\text{C}}$ $\left(66 \frac{\text{Btu}}{\text{ft}^2 \cdot \text{hr} \cdot ^\circ\text{F}} \right)$</p> <p style="font-size: x-small;">INCIDENT ANGLE MODIFIER, AXIS 1: 0.21 AXIS 2: N/A</p>
Low Temp. (35°C, 95°F)	19,000 kJ/day	18,100 Btu/day								
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	<p>This product certified by Solar Rating and Certification Corporation c/o FSEC, 1679 Clearlake Road Cocoa, FL 32922</p> <p>SRCC Document OG-300 Conformance to HUD UM 100</p>	<p>ACR Solar International 5840 Gibbons Dr. Carmichael, CA 95608</p> <p>System Model 200152C80EX</p>	<p>Solar Energy Factor 1.6</p> <p>System Serial No. _____</p>
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	<p>This product certified by Solar Rating and Certification Corporation c/o FSEC, 1679 Clearlake Road Cocoa, FL 32922</p> <p>SRCC Document OG-300 Conformance to HUD UM 100</p>	<p>ACR Solar International 5840 Gibbons Dr. Carmichael, CA 95608</p> <p>System Model 200153C80EX</p>	<p>Solar Energy Factor 2.0</p> <p>System Serial No. _____</p>
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	<p>This product certified by Solar Rating and Certification Corporation c/o FSEC, 1679 Clearlake Road Cocoa, FL 32922</p> <p>SRCC Document OG-300 Conformance to HUD UM 100</p>	<p>ACR Solar International 5840 Gibbons Dr. Carmichael, CA 95608</p> <p>System Model 200154C80EX</p>	<p>Solar Energy Factor 2.4</p> <p>System Serial No. _____</p>
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