SolarRoofs.com

5840 Gibbons Dr. Suite D Carmichael, CA 95608 (916) 481-7200
Wholly owned by ACR Solar International Corp.

System: "Fireball 20012" (110 Volt)
Models: 20012; 1C, 2C, 3C, 4C

INSTALLATION MANUAL

February 2002

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 the "Fireball 2001" water heater will completely satisfy you in its very high level of performance and dependability.

Table of Contents

PLEASE CALL SolarRoofs.com WITH QUESTIONS:
Toll Free USA Technical Install Help Number: (888) 801-9060

WE WELCOME YOUR COMMENTS! We have endeavored to make the Fireball 2001 installation instructions complete and easy to use. We are always looking to make them better and we **welcome** your comments and suggestions!

PLEASE READ ENTIRE MANUAL
BEFORE STARTING INSTALLATION

The "Fireball 2001" can be installed in straightforward situations by one experienced person in less than four hours. With no experience, the installation will probably take six to seven hours, with added complications, like a longer pipe run or two stories, taking longer.

This is a "simplified" Installation Manual and assumes good technical experience and ability. Most major parts are labeled or marked and may include specific instructions right on the part to simplify the process.

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

1.0.

Tools and Materials

ITEMS SUPPLIED BY SOLARROOFS.COM:

- ACRSI Fireball 2001 Collector, with 3 mounting rails and 6 Ell brackets per collector, + 3 Ell brackets per extra collector. NOTE: High wind area kits are available with 2 more sets of mounting rails and Ell brackets.
- Solar Feed and Return line adapters.
- Air Vent, Pressure Relief Valve, and Optional Thermal Freeze Valve on 4" stub.
- 110 Volt Differential Controller with 2 sensors, one for the collector, and one for the tank.
- Storage Tank 'Quick Connect" unit including isolation Ball Valves, Solar Loop Drain Hose Bibs and tank drain.
- 110 Volt Pump and connections.
- 50' 1/2" outside diameter copper solar loop lines.
- Solar loop installation parts kit including miscellaneous parts, fittings, screws, nuts, bolts, etc.,
- All hardware, two roof boots, 6' high temp. insulation and options.
- Installation Manual, and Operation and Maintenance Manual.

TOOLS AND MATERIALS NEEDED:

Overview: Everyday homeowner tools are all that are needed to assemble and install the Fireball 2001 system.

Tools and Materials Needed:

- Pop Rivet Gun (Only needed with Split Kits to attach collector 1/2 sections together using joiner strip).
- Teflon tape (1/2" wide to seal threaded fittings use 6 turns).
- Quality Pipe Sealant (to seal face of brass union ends).
- 2 large adjustable wrenches and/or wrench set (to secure collector absorber brass unions and compression fittings).
- 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).
- 1 1/2" inch wood bit for roof penetrations (for 2 lines through roof).
- 7/16" socket with ratchet and 6" extension. (a drill adapter is desirable for quickly driving lags).
- 1/4" nut driver on high speed drill (to drive 1/4" self taping screws into collector).
- Caulking gun with quality Polyurathane, Elastomeric or Silicone roofing caulk (to fill lag holes and seal flashing to prevent leaks).
- 1/2" high temperature open cell pipe insulation for inside piping (this is the only basic material not supplied).

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

February 2002 - Note: This price list supercedes all previous price lists - Check Web Site for updates.
"C" = collector(s) * = New 24' long "Skyline" (2CSL) joiner kit collector available for 2 collector systems.

Delivery to the Continental 48 States, $115.00. Add $55 per additional panel.
Single collectors shipped by UPS. 2, 3 and 4 collector systems are shipped fully assembled in a crate by motor freight.

System 2 110 Volt AC Circulator with Line Cord, Recirculation* Differential Control including line cord and
2 high quality sensors (deletes 12 Volt Pump, snap switch and transformer) **This system is recommended for a higher level**
of efficiency in variable weather conditions / 50' of 1/2" Copper tubing and tube connections / Existing Tank "Easy Connect" Kit with shut off and drain valves (bottom connect is standard, top connect is available at no extra charge) / Collector Pressure Relief Valve / Install Kit / 6' of outside insulation, full installation instructions and Owners Manual.

System 2 For use in completely non freeze or light freeze areas. Can be used in freeze areas when collector is fully drained before freeze.

One Collector	**(1C):**	**$1,070.00**
Two Collector	**(2C):**	**$1,550.00**
Three Collector	**(3C):**	**$2,030.00**
Four Collector	**(4C):**	**$2,510.00**

NOTE: *Recirculation freeze protection is used extensively in mild weather conditions where temperatures occasionally dips below freezing to as low as 20F for a few hours. FULLY DRAIN BEFORE HARD FREEZE (below 30F for 24 hrs)

For a higher level of Freeze Protection in light freeze areas ADD Freeze Valve Option FV01

(FV01): $65.00

Tilt Kit (option) tilts panels approximately 18 degrees or as specified from existing roof angle

Tilt kits are used when a better winter angle is desired on a low pitch roof or to "reorientate" panels to face south by running the panels up and down an East or West facing roof.

Single Panel: 3 Modified 24" brackets with 6"** legs and hardware (*modified tilt angles available)

(Option Code #**TK01**) **24" Single panel tilt kit: 45.00**

Double panels: 3 - 48" Heavy Aluminum channels with 12"** legs and hardware.

(Option Code #**TK02**) **48" Double panel tilt kit: $65.00**

Collector COLOR Options:

Optional Colors Include: Colonial Gray (CO102), Tahoe Blue (COl03), Colonial Red (COl04), Forest Green (COl05), White (COl06) as well as other attractive colors - Call or E-mail us with your needs!

(Option Code **CO###**) **Optional Colors - Each Collector: $45.00**

"Fireball 2001 System 1" Solar Water Heater Specifications

COLLECTOR (Panel)

Trim & Frame Materials:	Finished 27 mil Aluminum Trim and Frame = Total 54 mil (1.37 mm).
Insulation:	Bottom: 1" (2.54 cm) Celotex, Sides ½"
Absorber Material:	"Black Crystal" coated - all Copper with unions.
Glazing:	.236" (6.0 mm) Twinwall Polycarbonate UV Treated
Dimension / Weight:	FIREALL 2001-144.3"x 20."x 3" 38 lb (3.67 m x 0.51 m x 0.076 m 17.24 Kg) 18.4 Net s/f (1.71 m^2)
Fluid Capacity:	. 4 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
Standard Components:	3 Mounting rails, mounting brackets, tech screws and lags
Color:	Musket Brown (Cl01) + optional colors

CONTROL:
DIFFERENTIAL CONTROL

Type:	Independent Energy CM30 or Equal
Sensors:	Two 10K Sensors with wire
Turn on Differential:	8 - 24 °F (Ave. set 12 °F)
Turn off Differential:	4 °F (fixed) Recirculate on: 38°F (3.33 °C)
Storage High Limit:	110 – 230 °F Set at 180 °F (82.2 °C)
Power requirements:	105-120VAC, 50/60hz,
Output power:	115VAC, 1/3HP (248.56 W)

PUMP

115 Volt AC:	Taco 006 Bronze or equal

FREEZE PROTECTION

Type:	Dole Valve - Passive Freeze Valve for light freeze protection down to 30F
Temperature to open:	45 °F - Starts to open and drip water at 45° F.
Type:	Built in Differential Control Recirculation freeze Protection starts at 40 F
Type:	Solar Loop quick shut off ball valve and drain valve set.

CONNECTING LINES, INSULATION (standard)

Tubing:	1/2" (12.7 mm) OD copper - 50' (15.24 m)
Insulation:	High Temperature (6' (1.83 m) supplied): 1/2" (12.7 mm), 3/4" (19.05 mm) wall

TUBING CONNECTION METHODS (standard)

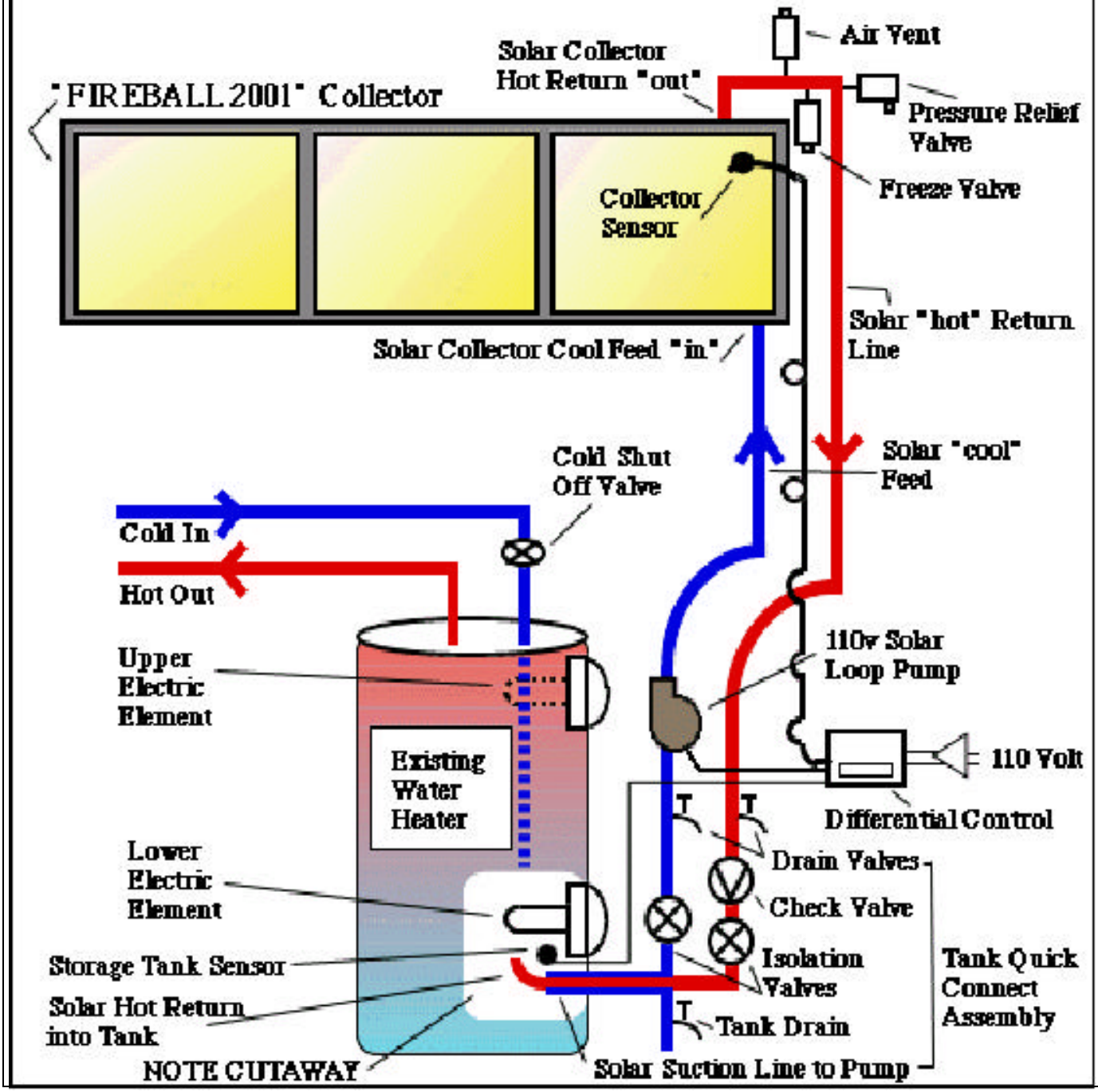
Type:	Brass Union, Compression.

STORAGE TANK (Not Supplied)

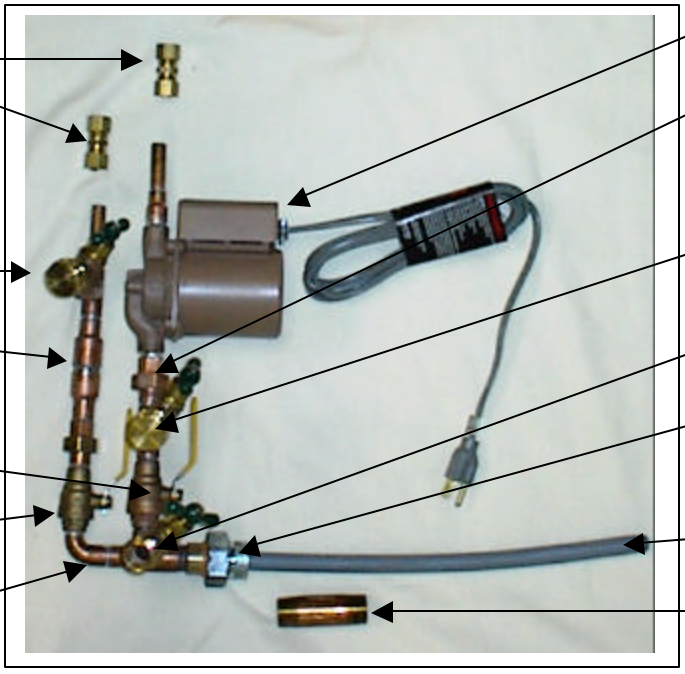
Standard Connections:	Use Existing 50 gallon minimum (189.27 L) tank for 1, 2 or 3 Collectors or 80 gallon (303 L) tank for 3 Collectors. Max. Temperature tank must withstand: 190 °F (87.77 °C) Max. Pressure tank must withstand: 150 psi (10.21 atm)

Although we will make every effort to give notice,
Specifications and prices subject to change without notice.

SYSTEM 2 with Differential Control




Pressure Relief Valve
Air Vent
Top Compression 90
Collector Sensor
Sensor wire and wire nuts
Bottom Compression 90
Bottom Roof Boot
Compression 90 for roof boot
Long Freeze Valve adapter and Freeze Valve (optional)
Top Roof Boot
110 Volt Differential Controller
(with install instructions)
Tank Sensor
110 Volt Pump
with line cord


Line to Quick connect compression unions
Hot Return line hose bib with cap
Check Valve
Cool Feed isolation valve
Hot Return line isolation valve
Quick Connect assembly
110 Volt pump
Union to pump
12 volt pump driver
Cool Feed Line hose bib with cap
Tank drain hose bib
Dialectric union adaptor to tank nipple
Hot Return line
Quick Connect to Tank Nipple

IMPORTANT NOTES:

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

SAFETY FIRST!!

USE CAUTION!!! Do not attempt to self-install without help on any two story or more building or on any roof with more than a 28 degree pitch or if you have any back or physical limitations!!!

GENERAL WARNINGS:

This manual assumes that the installer has mechanical experience and can confidently use simple hand tools, building materials and adhere to safe building practices.

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

Do not install this system alone, be sure someone knows where you are and what you are doing at all times.

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'.

The fireball 2001 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.

3.0.

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 14 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.

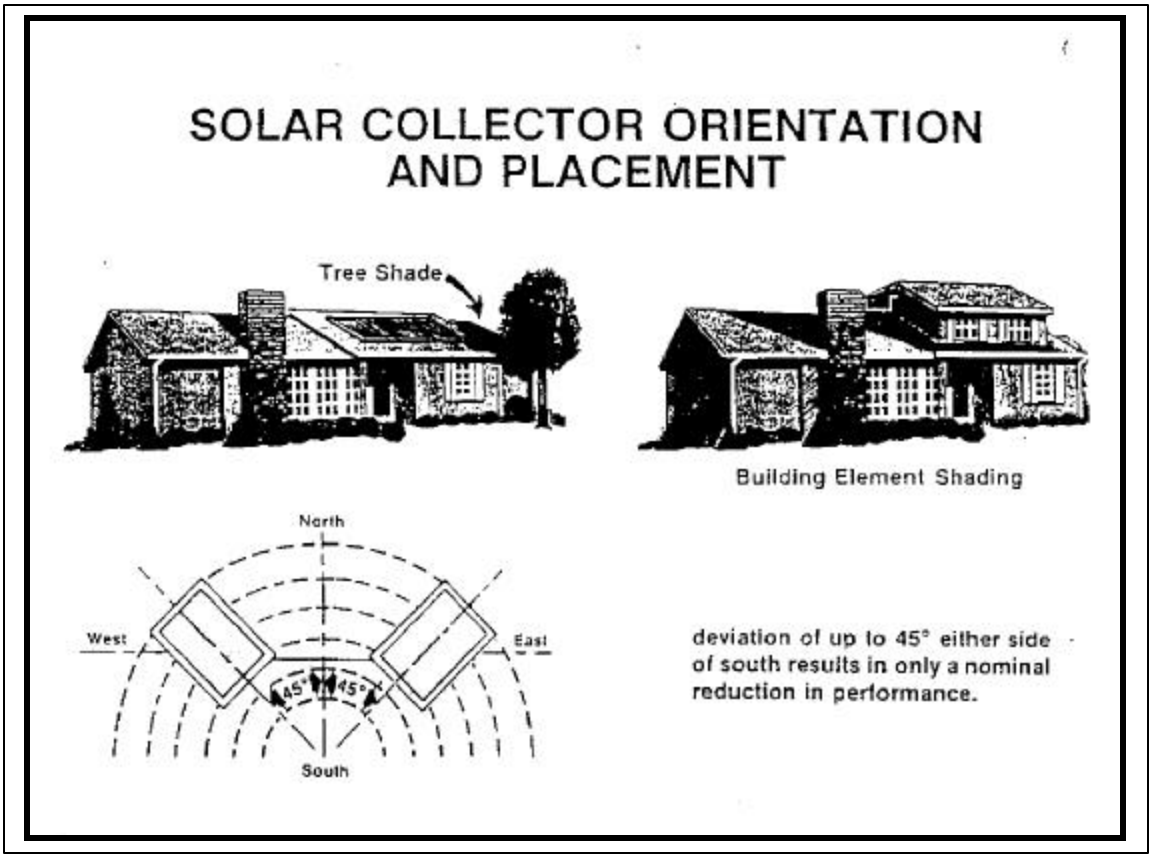
In most areas with **heavy winter overcast,** a solar collector's orientation on a low pitched roof can face anywhere from 45 degrees east to west of south without losing more than 8% of the energy it would have produced if it were facing directly south. At 90 degrees east to west of south the loss is 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 the Fireball 2001 system is that removing and replacing the collector is relatively easy for re-roofing.



4.0.

OVERVIEW - THE BASIC INSTALLATION STEPS:

THE BASIC INSTALLATION STEPS (3 to 8 hours required to install, depending on situation and experience)

1. Unpack collector and assemble the left and right sections into one unit as per pictures and instructions.

2. Collector placement on roof located and Leveled, rafters located and marked, end mounting rails with brackets lagged and sealed into rafters, collector placed into mounting rail brackets, center mounting rail and brackets placed, lagged and sealed into rafter, mounting rail brackets screwed into collector.

3. 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 holes.

4.Collector cool feed (bottom compression union) and hot return lines (top compression union) installed through roof boots to tank area. Sensor wire connected and run to water heater area. Insulation partly installed before tubing connections are made (do not finish over connections).

5. Water Heater Element or Gas turned off, All electrical breakers to the heater are turned off and marked "Do Not Turn On", water drained, lower drain removed, "Easy-Connect Assembly" installed, collector cool feed (from pump) and hot return lines connected by compression union. Tank sensor installed inside lower cover as low as possible squeezed under insulation against inner tank.

6. Water heater refilled, solar loop purged of air, Differential Control connected to sensor wires, snap switch and transformer. Air purged using return line hose bib, finish insulating lines, Element or Gas turned back on.

5.0.

ASSEMBLING THE COLLECTOR (applies to split kits only)
See Two Page Color Collector Assembly Sheets

Step One: Open the collector box and assemble the collector (about ½hour).

NOTE: To make assembly very easy, you will find locator marks and instructions in strategic places to guide the assembly and installation.

All important holes are predrilled and all hardware and fasteners are supplied to make the assembly and installation easy and fast.

1. Preparing the collector:

Open the collector box being careful to not cut or scratch any surfaces. Check for any shipping damage and immediately contact the shipping company (usually UPS) and us if any damage is found. Remove the two "Half Sections" from the box. Remove the center glazing, trim and other components stored in the collector cavity for shipping.

2. Joining the Collector Half Sections with the "Joiner Strips":

Line the collector half sections up end to end. Locate the two C shaped "Joiner Strips", A and B, and insert them into ONE END of the Half Sections, A side and B side as appropriate, aligning the existing holes.

Using 2 pop rivets for each side (4 total will be used per side), pop rivet through the frame wall and into the joiner strip using the predrilled and marked holes. Install the 1/2" thick insulation spacer in one end.

Align the other collector half section (A to A and B to B) and carefully insert the remaining half of the Joiner Strips into the other half section and pop rivet into the remaining four holes as before. The collector frame is now joined.

NOTE: A minor gap, left on the bottom, under the 1/2" thick insulation spacer, of the collector, serves as a vent slot for moisture to escape.

3. Join the absorber:

Remove tape holding the "floating" inlet and outlet compression unions in the collector. Allow the union nuts to be gully out exactly to the edge of the collector so the absorber is properly aligned in the collector.

NOTE: 90^0 compression unions are supplied to allow close fitting feed and return holes and can replace the straight ones supplied for shipping.

Align the four absorber unions. Place pipe sealer on the joining surfaces of the union. Taking two medium sized crescent wrenches (or open-end wrench or combination) thoroughly tighten the unions being sure to keep the absorber sections laying flat. (The absorber has already been pressure tested for leaks). Check that the "floating" inlet and outlet lines are facing straight out their respective holes, adjust as needed.

4. Install the Twin wall "Lexan" glazing:

Being very careful to keep the UV protected "Sun Side" facing up (side with foam tape). Carefully center the cover sheet side to side. Place the rough-cut end of the "Lexan" into its slot in the aluminum mullion. This will take some care and possibly some force. The "Lexan" is tough so don't worry about breaking it. Bowing the cover sheet in the middle, place the rounded finished end of the cover sheet in place in the opposite aluminum mullion.

5. Securing the Trim:

NOTE: Place trim piece "A" in its place on the "A" side. Using inward and downward force to make a good seal, screw in the supplied color-coded 1/4" hex head screws into the frame using the pre-located spots on the trim. predrilled holes (14 total, 7 on either side). Repeat for the "B" side. **The collector is assembled!**

6.0.

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:
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. For example, 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 some shingles, such as "Fire-Free", or shake, more damage is done stepping on the end than in stepping on the center. 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.**

As the Fireball 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.

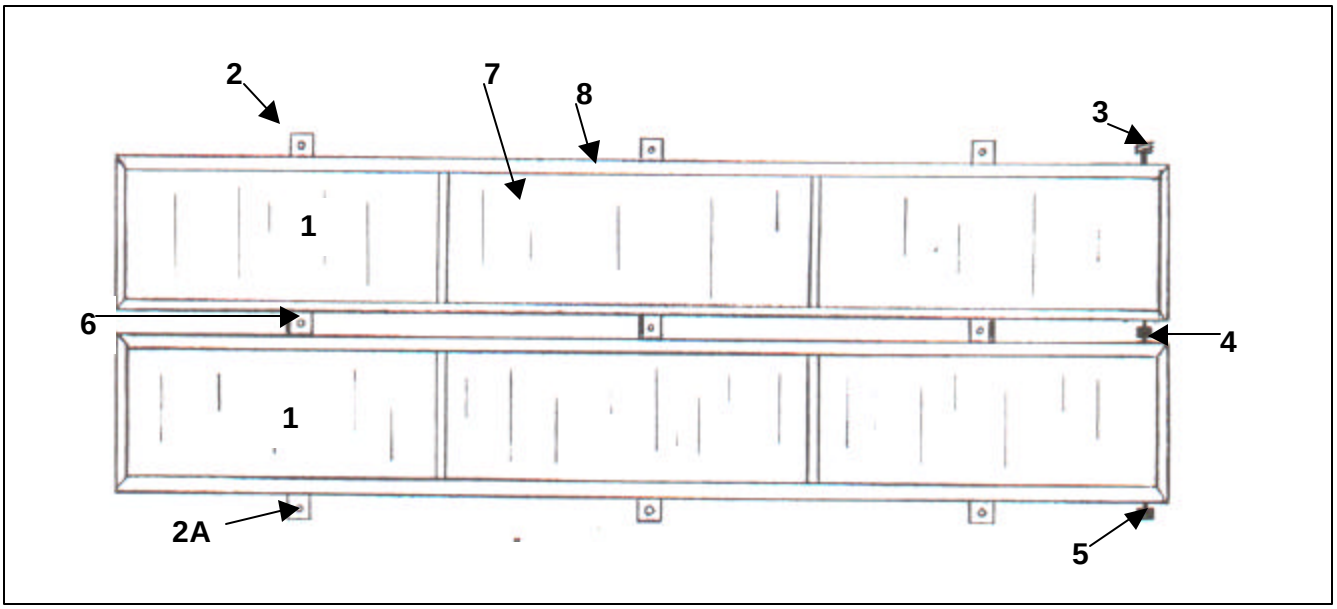
On an average, low pitch single story roof, one able person can safely install the UPS2001. **Do not install this system alone, be sure someone knows where you are and what you are doing at all times.**

The assembled collector is 12 feet long, only 20 inches wide and under 38 pounds, making it an ideal size and weight for one person to lean against the roof or gutter, go up the ladder and

simply pick up the collector and pull up onto the roof.

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

Two Collector Fireball 2001 Top View

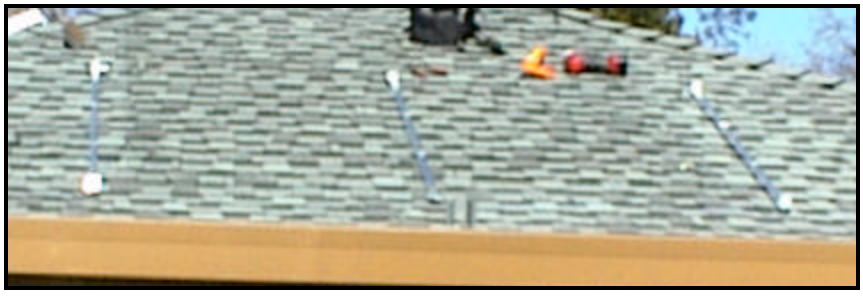


The Diagram above is a top view of two collectors installed together showing:

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.

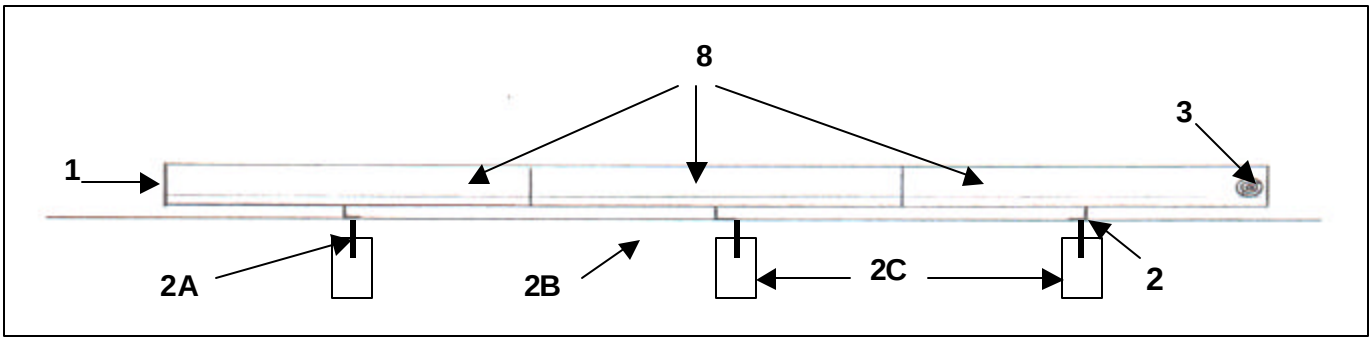
3. The "Hot Out" Collector connection going to the storage tank.
4. The between Collector connection.
5. The "Cold In" Collector connection from the storage tank.
6. The Quick Connect Clip bolts to the mounting rail here with the tabs overlapping the top of the collector.
7. Collector Glazing (Lexan)
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 calk 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 proceedure for the end rails. Install the upper lags using the same proceedure. Note:)ne 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 carrage bolt.

Fireball 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.
2. Mounting Rails (3 per collector).
2A. Mounting Rail Lag.
2B. Roof sheathing.
2C. Roof Rafter.
3. Collector feed or return connection.
8. Collector Trim sections.

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.

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.

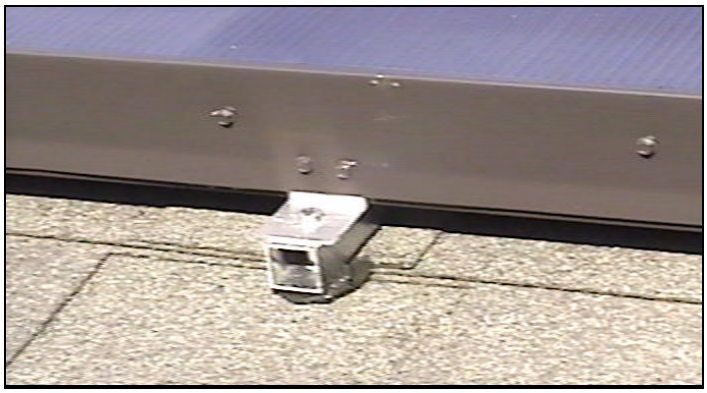
A sling can be made with sturdy rope going all the way around the bottom of the collector with shorter pieces going around the collector to secure the rope in place. Be sure to secure it very well and always have a secure safety rope you can grab onto. Have the second person push the collector up the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

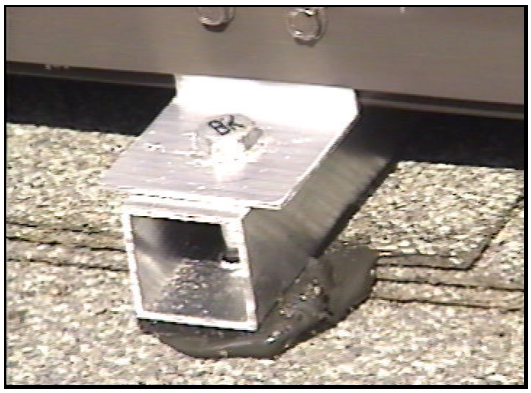
Protect Edge of Roof with a Tarp and Lean Collector Against Roof

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.





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 tab with both screws!** Repeat the proceedure for the center assembly and then tighten all lags to finish mounting the collector.

A NOTE ON MAKING TUBE CONNECTIONS:

The tube connections top and bottom shown in top view as 3 & 5, are made at the top and bottom of ONE end of the collector. The connections can be at either end of the collector simply by placing the collector end left or right. When two or more collectors are used they also connect at the same end (4).

Make sure you do not have a rafter directly under the collector feed as the feed hole is 1 and ½inches below and in from the end of the collector.

MOUNTING RAIL AND MOUNTING BRACKET INSTALLATION STARTING WITH SINGLE COLLECTOR:

A single collector is attached to the roof by three "mounting rails and 6 mounting Ell brackets" (2).

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.

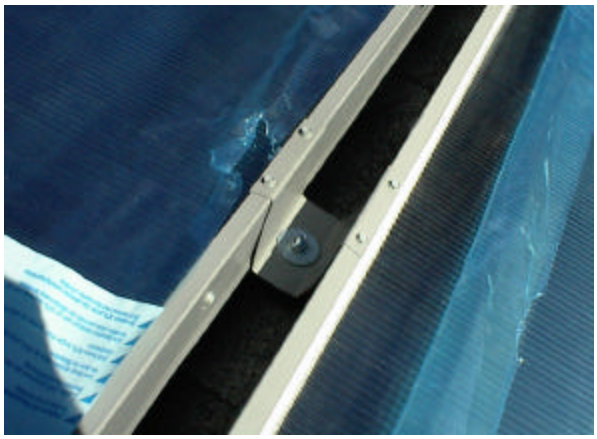
The Quick Mount clip allows mounting of two collectors on the two panel-mounting rail or the heavy-duty tilt rail without needing to screw a mounting bracket tab into the side of the collector.

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.

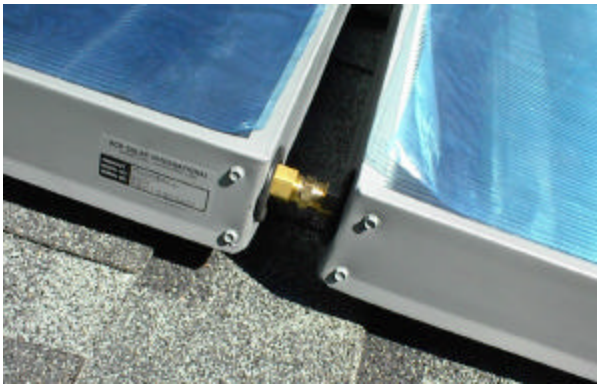
Notes on Two, Three and Four Collector Flush Mount Installations:

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) shown above laid out as to how they will go and individually to the left next to the rail with carriage bolt. It is easiest to remove the nut before placing the collectors on the rails.



Being sure the trim is pushed in, secure the U bracket at the top on both sides with 2 tec screws going through the bracket, trim and glazing. This makes a very strong connection.



Line up the collectors so the center union body can be installed. Secure the nut to the outside while it is still on the ground so it is not "lost" inside the collector.

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 6" 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 ½" hole be drilled for the tubing hole.

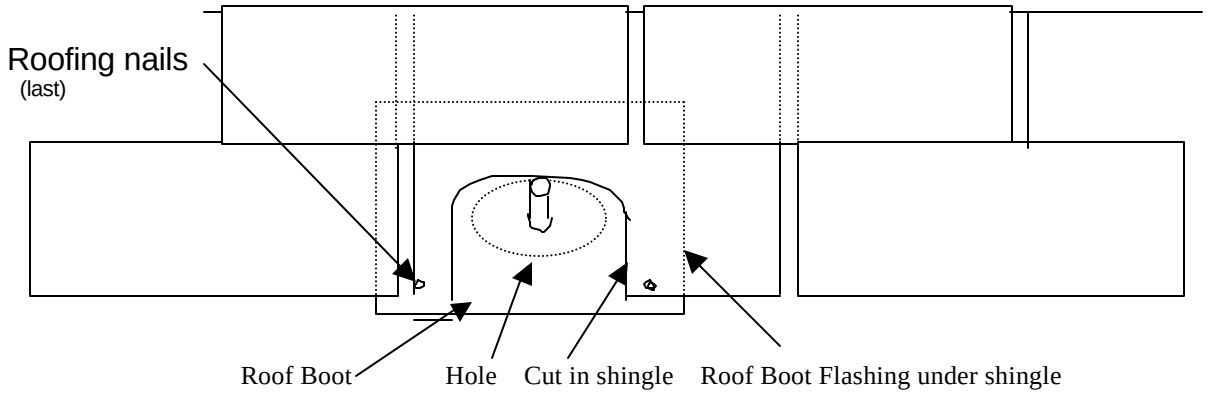
"Roof Boot" Flashing and Waterproofing Details

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 1½ " 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 ½" 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 ½" hole 1 ½" 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 ½" above the lower edge of the rails.

DETERMINE THE BEST PIPE RUN FIRST

COORDINATE THE PIPE RUN WITH THE BEST SOUTH FACING COLLECTOR LOCATION FOR THE SHORTEST RUN.

IMPORTANT: SLOPE all lines to DRAIN! As one form of freeze protection of your SRCC OG300 rated system is draining the collectors, it is important that all pipes between the collectors maintain a 1/4" per foot drop to prevent water traps and assure that all water drains when the drain valves are opened on the "Quick Connect".

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 often a good solution is at hand.** Consult with an experienced solar installer if challenged with the installation.

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 firestop, 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.

STORAGE: You need a storage tank that is at least 50 gallons with a one and two collector system and at least 80 gallons with the three collector SRCC system. 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. **You will need to turn the 220 volt power to the tank element off at the Breaker to the tank. Be Sure to mark it with a label "Do Not Turn On" for protection until you are completely finished.** Competely drain the tank, remove the old drain and install the tank "Quick Connect" components.

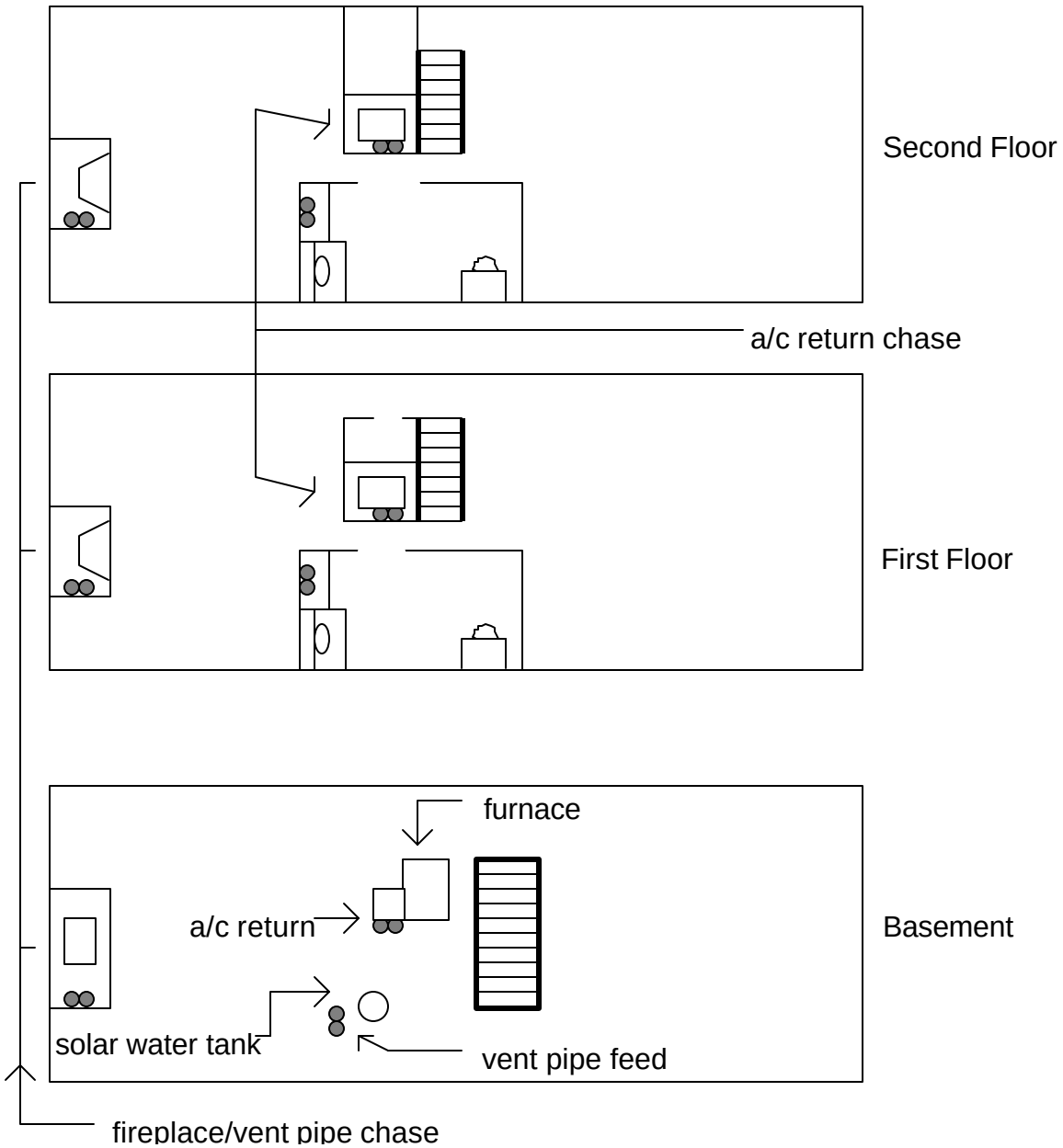
The larger the water heater the better. For larger families, or for situations where there is a small water heater, adding a low cost 50-gallon or larger water heater and using it only for the solar can be a good idea. Plumbing will be required. SRCC OG300, rated systems must have their lower elements disconnected. Have **a qualified person** disconnect the lower element. You will then only be using the top element for backup. If this does not work well during the winter, first try using water efficiency such as low flow showerheads and aerators and/or have a **qualified person** add a 220v switch to the bottom element.

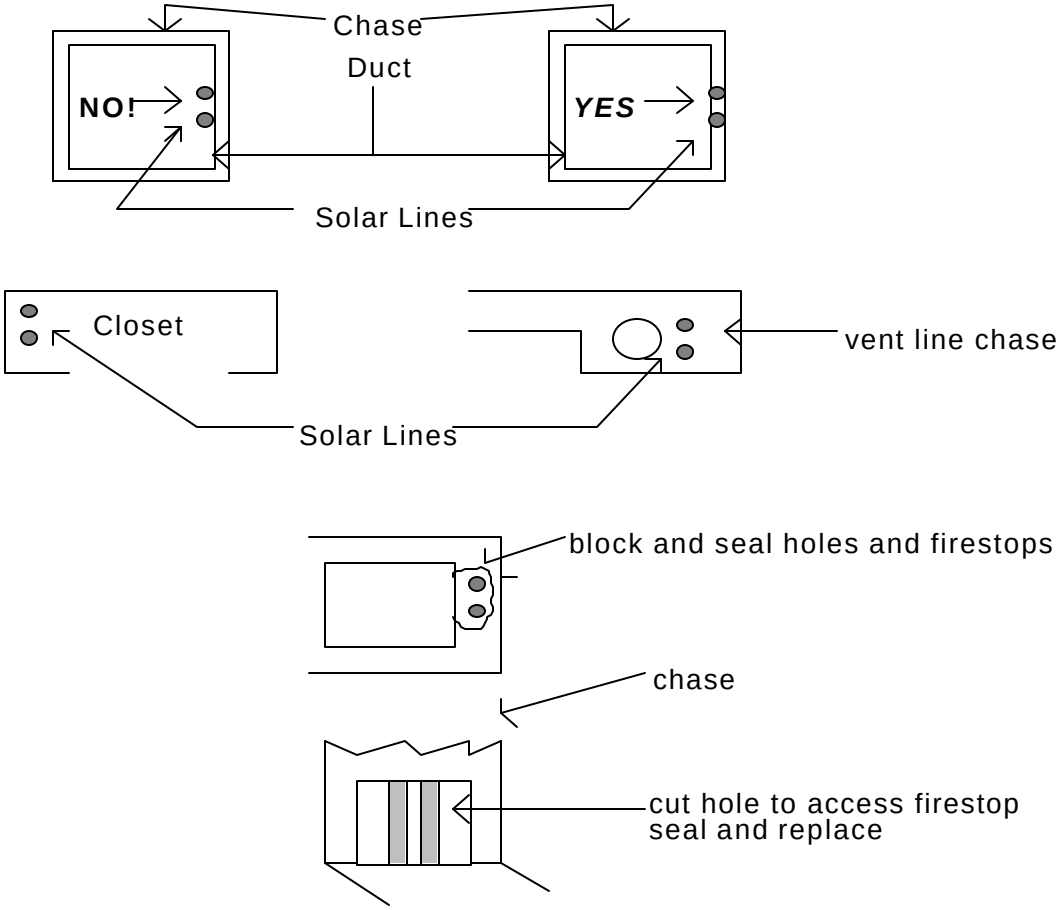
Another good plan is to have a **qualified person** install a 220v timer set to heat the water for two hours before you get up in the morning and for two hours before you get home from work. Try turning the power off during sunny summer days. You should have ample Hot water with 1 panel for a family of 1-3 and with 2 panels for a family of 4 or 5 on clear summer days.

INSULATION OF EXPOSED COPPER PIPES IS NEEDED. A MINIMUM 3/4" R-4.5 OR BETTER High Temperature open cell insulation IS REQUIRED for SRCC OG300 systems.

Determining The Pipe Run (birds eye view)

*Look for the following: Note: = solar pipe run




Chase
Duct
NO!
YES
Solar Lines
Closet
vent line chase
Solar Lines
block and seal holes and firestops
chase
cut hole to access firestop
seal and replace

Making Line Connections

Line connections are easily accomplished using the supplied brass compression connectors.

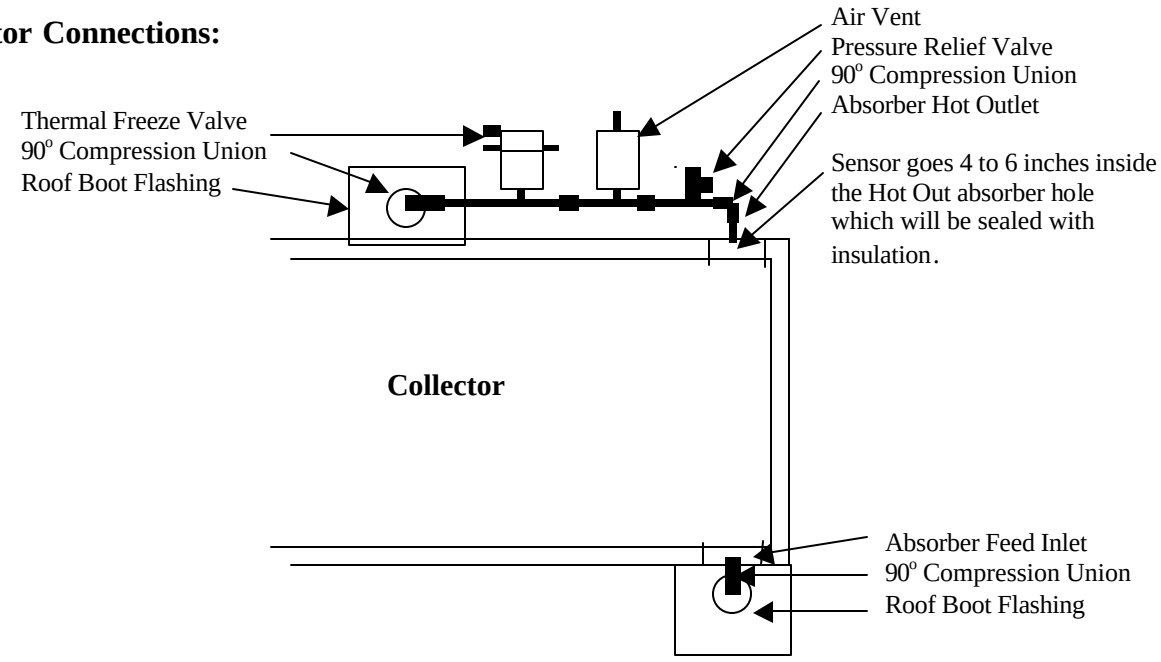
When using compression connectors, be sure a small amount of tubing material is showing on the outside of the ring and that you use a small amount of sealing material on the joining surfaces before tightening.

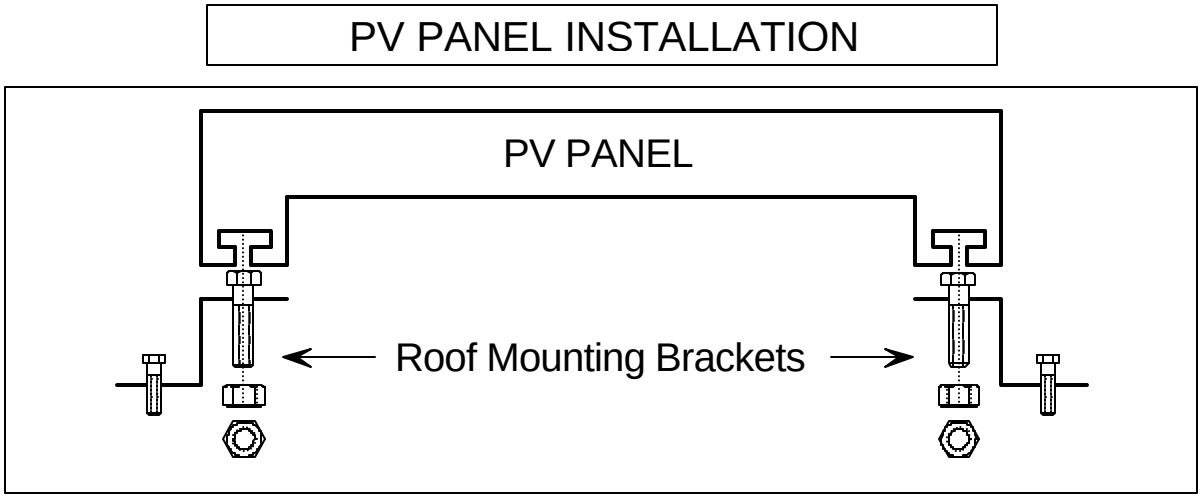
Preparing the Collector

The following connection are usually made behind the collector so they are hidden as much as possible unlike the diagrams which show the parts off the end of the collector for illustrative purposes.

If you have not already done so, pull the aluminum tabbed tape off the top and bottom absorber connection and pull the absorber ends union out. The absorber fins should line up side beside in the collector**.**

Collector Connections:





Collector Top Connection:

At the collector top connection, connect the supplied 90°-compression fitting. (An extension is supplied with flush mount kits to make installation easier)

Attach the pressure relief valve unit, then the air vent (appearance may vary from pictures).

A clean way to install is to put in a 90°-compression union at this point and drill a 1 1/2" hole directly below it for the roof boot flashing to be installed. Cut the shingle as needed and slide the roof boot flashing into place.

The copper tubing will be installed into the union and 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. The pressure relief valve should be tightened so it faces down directly onto the roof, onto the supplied aluminum splash sheet, for safety. The air vent must face directly up, with no tilt, for proper operation.

Bottom Connection of Collector:

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

If a straight union is installed for shipping purposes, it will usually be removed and replaced with a 90° union. Use the straight unions for the tank end connections.

Put in the 90o compression union at this point and drill a 1 ½" hole directly below it for the roof boot flashing to be installed.

Cut the shingle as needed and slide the roof boot flashing into place. The copper tubing will be installed into the union and the hole in the flashing later filled with caulk 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, to allow for checking for leaks and tightening the unions as needed.

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 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.

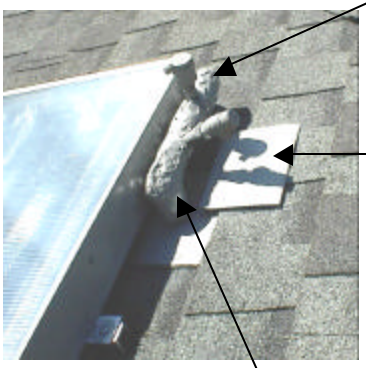
A variety of techniques can be used depending on the situation such as needing to pull the pipe through an attic where it may need to come up from the bottom and be fed through the roof.

To locate the return line hole, place the 90 degree compression union on the upper tube and snug up. Place the upper return assembly with air vent, pressure relief valve into the 90. Center absorber in collector and make a mark 1" in front of the end of the tube. Drill a 1 ½" hole centered on the mark.

Slip the flashing under the PRELIFTED shingles as shown.

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 carefull 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.



Snap switch and optional freeze switch would be placed about 4" inside hole

You can install a splash plate under the pressure relief valve shown here glued to the shingles under the outlet.

Fully insulate all lines. Press about ½" of supplied high temperature insulation into grommet hole to fully seal. Covering the insulation with aluminum take and painting is recommended. Be sure to overlap top over bottom like the shingles for good water shedding.

Freeze valve not shown would be placed at end before going through roof.

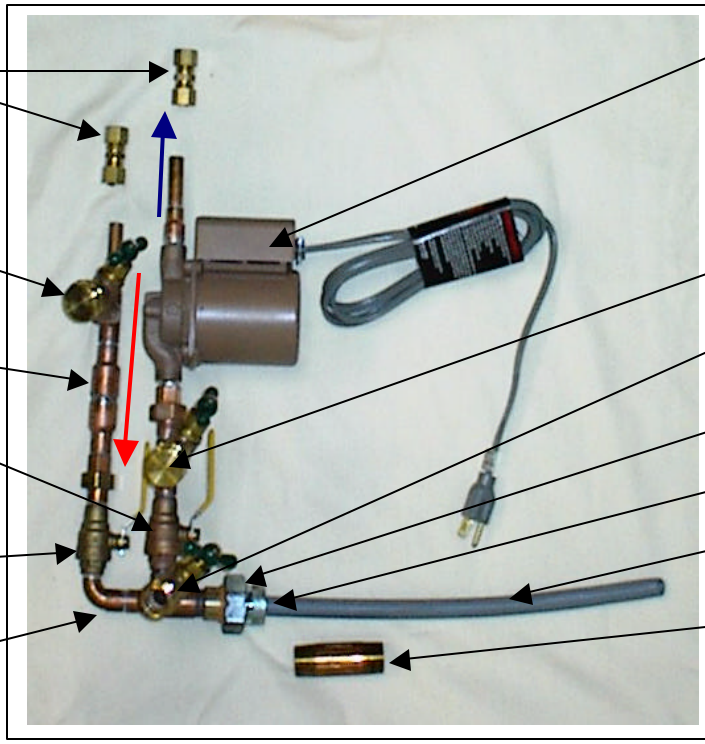
TANK CONNECTIONS

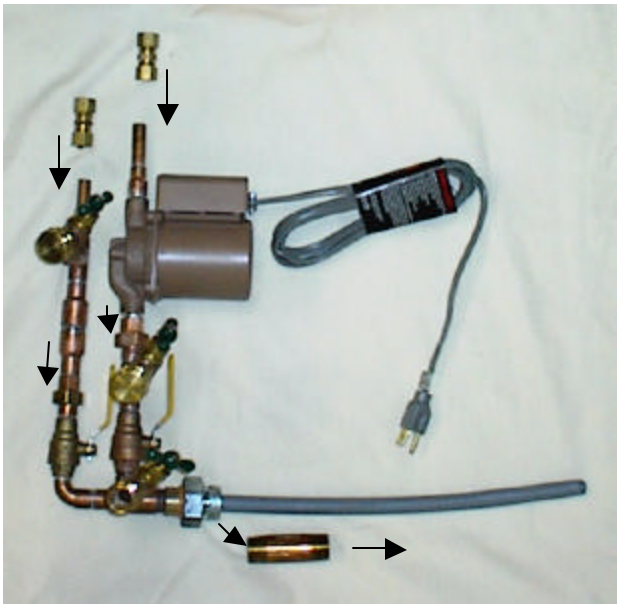
The Tank connection is made by the following steps (see Pictures):

1. Turn off Gas supply or turn Water Heater Element **off at the Breaker to the tank. Be Sure to mark it with a label "Do Not Turn On".**
2. Drain the water completely from the water heater **(CAUTION! It could be hot!).**
3. Remove the lower drain hose bib completely from the tank.
4. Teflon tape and carefully slip the "Easy-Connect Assembly" through the drain hole and tighten the two fittings.
5. Install the Pump unioned assembly and the return unioned assembly onto the "Easy-Connect Assembly".
6. Cut and connect the collector cool feed and hot return lines using the unions supplied.
7. Refill the Water heater, open the isolation ball valves, check for leaks at the tank and on the roof. Tighten, but **DO NOT OVERTIGHTEN,** as needed.
8. Purge the solar loop of air, by opening the "purge" hose bib on the hot return line until all air is out of the system.
9. Install the PV panel on the roof at the same angle as the collector and wire the PV panel into the circulator using supplied wiring diagram. Check for good circulation, only about .25 GPM is needed and the hot return isolation ball valve can be used to slow the flow. Proper flow can be determined when the Ball in the return check valve rattles only slightly.
10. Turn Electric Element or Gas back on.
11. Finish insulating, attach labels according to diagram and support the lines and You're Done!

Installing the "Fireball 2001" Easy Connect Fittings to the Existing Water Heater

Note: Tank "Top Connect Kit" is two parts with the hot return dip tube part screwing into the tank "hot" port and the pump side collector feed side part screwing into the tank "cold" port. Line connections are the same.

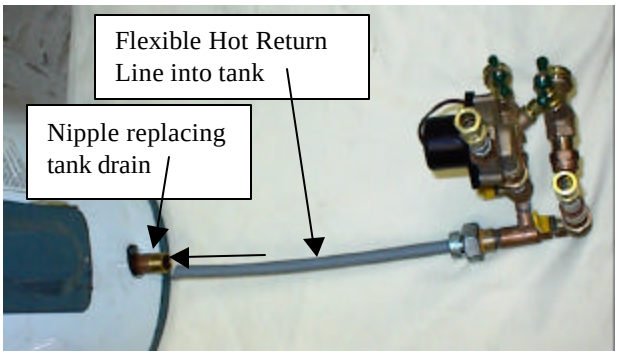




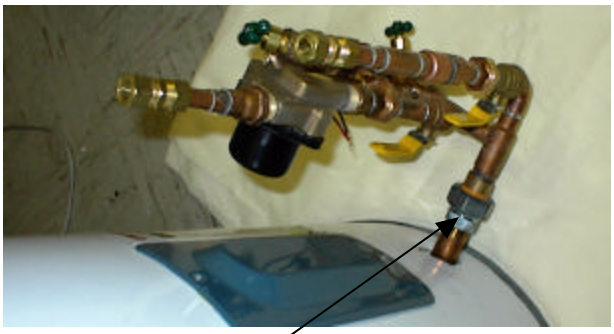
Quick Connect (QC) Base will be installed and tightened onto Dielectric union first and then the above components will be installed as shown.

Tips: A little dab of pipe dope onto the OUTER surface of unions will help in sealing them, **do not get dope any into lines as pipe dope can Jam driver rotor!**

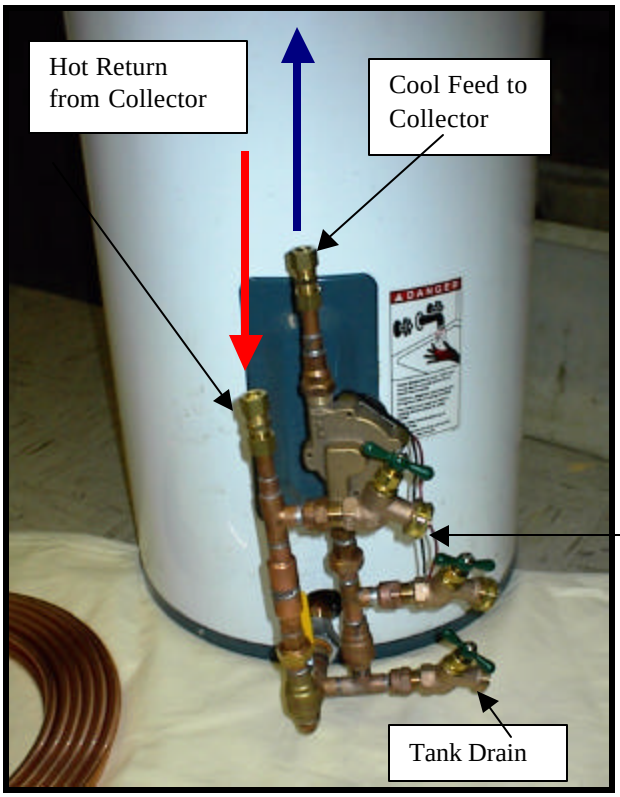
Note: Some Drawings show 12 volt pump, installation is the same.



Remove old tank drain. Teflon tape nipple, (at least 6 turns) install and tighten nipple. Quick Connect assembly is then inserted into tank through nipple.



Tighten Dielectric Union and install QC components (except Driver Head) onto QC Base, close isolation valves. Tank can now be filled with water if needed.



Connect the collector cool feed and hot return lines using the unions supplied.

Refill the Water heater, open the isolation ball valves, check for leaks.

Purge the solar loop of air, by opening the “purge” hose bib on the hot return line into a bucket or hose until all air is out of the system. Recheck for leaks.

Note: Hot Return hose bib can face to left or right.

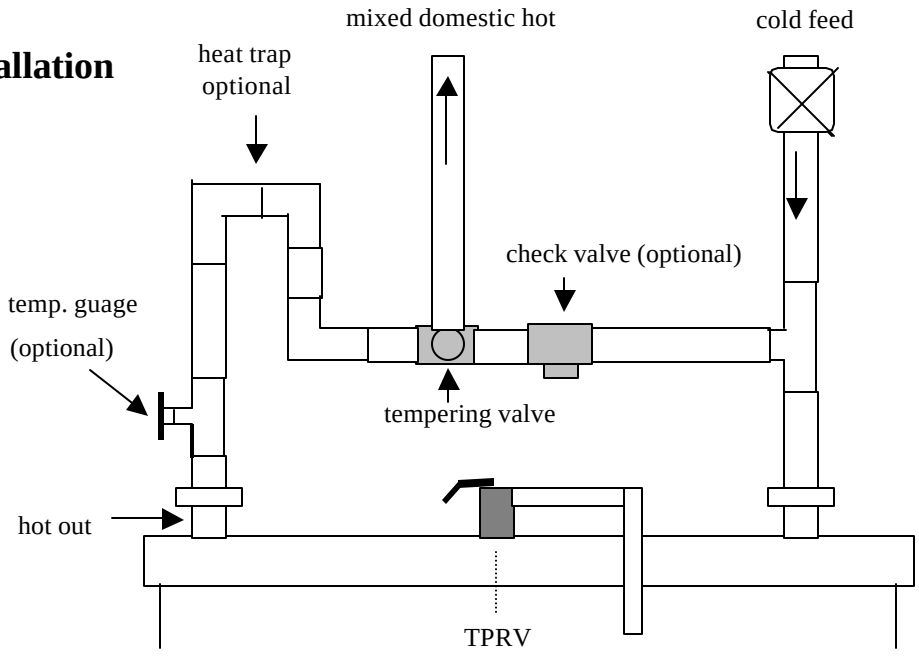
Install Pump Driver (screws go through Pump Head into Driver)

Connect Pump Driver wiring.

Optional Mixing Valve (Note: mixing valve only is included with system 3 and 5, suggested installation shown below, check valve is optional):

A mixing valve to prevent dangerously high temperatures by automatically allowing cold water to mix into the hot water **is Required for SRCC OG300 and can be installed by your plumber.**

Mixing Valve Installation



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

CONTROL COMPONENT DETAILS

Recirculation Freeze Protection:
Recirculation freeze protection is accomplished in the Independent Energy Differential Control by placing the J2 jumper in the "IN" position – **see GoldLine instructions included with the control.**

When the collector sensor reaches 40F the control will turn the pump on. Recirculation freeze protection which is used extensively in mild weather conditions where temperatures occasionally dip below freezing (to as low as 20F for a few hours).

Pump Connections: Wiring your System 2 is simple, just place the differential control in a convenient to see location, plug in the 110 volt pump and then plug the differential control into a 110 volt outlet.

Sensor Installation:

Collector
Place the collector sensor 4 to 6 inches inside the collector hot out hole, after system has been pressure tested, seal this hole with insulation. Connect the leads to a connecting wire and connect those wires to the collector sensor connections in the differential controller.

Storage Tank
With an Electric water heater, remove the lower element cover and, as low as possible, squeeze the sensor in between the inner storage tank shell and the insulation. Connect the leads to a connecting wire and connect those wires to the storage sensor connections in the differential controller.

We Hope Your installation Went Smoothly!!

PLEASE CALL SolarRoofs.com with Questions or comments:

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

Now Enjoy the Savings!

1.0

QUESTIONS AND ANSWERS:

HOW DO I GET THE MOST EFFICIENCY FROM MY SOLAR WATER HEATER?
As a standard electric water heater usually has two elements, having an electrician disconnect the lower element will increase the efficiency of the solar system. This is because of what is know as "The First Law of Solar", which is "Keep It Cool". In other words, the lower the temperature a collector can work at, the greater its efficiency and the more energy it can deliver.

Street water is usually 55 to 60 degrees F but an element at the bottom of the tank will heat this water electrically to at least 110 degrees F nearing the collector must do its job starting at 110 degrees F rather than 55 or 60 degrees F. It is easy to see that more electricity will be used. When disconnecting the lower element it is important to be aware that you will have less continuous supply of water on cloudy days because only the upper element is heating the water. By "staging" the use of water (not having two showers going at once, etc.), the element has time to "recover" the water temperature on cloudy days, so this problem is easily overcome.

Another 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 greatly 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?

All open loop system (street pressurized water in the collector) collectors, components and lines, whether they include freeze protection devices or not, are not covered for freeze damage and their solar loop should be fully drained in hard freeze conditions.

Open loop (collector continually open to street pressure water), serpentine copper absorber collectors with "Thermal Freeze Valves" are generally considered to be protected in light and very infrequent (1 to 4 times per year) freeze conditions for temperatures as low as 30 degrees F.

Serpentine copper absorber collectors with "Thermal Freeze Valves" and Recirculation freeze protection are generally considered to be protected in light and infrequent (4 to 12 times per year) freeze conditions for temperatures as low as 20 degrees F as long as 110v power remains on.

The "serpentine" absorber in "Fireball 2001" horizontal mount collectors is less likely to freeze than a "parallel flow" absorber with multiple risers. This is because water flows through only one tube in a serpentine absorber unlike a parallel flow absorber where the flow could be unequal to non existent in some of the tubes.

A "Thermal Freeze Valve" starts to open at about 45 degrees F allowing a small amount of water to flow out on the roof thus causing water to flow up from the bottom of the storage tank, through the absorber, and out onto the roof as long as temperatures remain low.

A "Thermal Freeze Valves" including Recirculation freeze protection system also causes water to flow out onto the roof as above but in addition causes the pump to continuously circulate water at a greater rate of flow in the entire solar loop from the bottom of the tank and back to the lower part of the tank as long as the power is on. Naturally the lower part of the tank can get very cold in the process. Having the element on gives further protection in freezing temperatures.

If unusual freeze conditions are predicted, it is recommended that the solar the pump turned off, solar loop isolation valves be dosed, the solar hose bibs opened and fully drained into a bucket. After this, connect a short section of laundry hose to the "hot return line" hose bib and blow into it until all residual water in the absorber is out and air flows freely out the "cool feed line" hose bib. See Installation Manual as well as Operation and Maintenance Manual for further details.

WHAT ABOUT HIGH TEMPERATURES?

The Fireball 2001 collector will not be damaged by stagnation in ambient temperatures as high as 120 F.