



# SolarRoofs.com Inc.

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



## System: "Fireball 20015"

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

## SRCC OG300 Rated Systems INSTALLATION MANUAL

February, 2002

The solar energy system described by this manual, when properly installed and maintained meets the minimum standards established by the Solar Rating and Certification Corporation (SRCC). This certification does not imply endorsement or warranty of this product by SRCC.

### 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.

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

**NOTE:** Installation Color Photo Sheets Accompany this Manual for You to Refer to.  
Generally drawings or diagrams are at the end of their respective sections.

**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” system 5 can be installed in straightforward situations by two experienced people in less than four hours. With no experience, the installation will probably take seven to eight hours, with added complications, like a longer pipe run or two stories, taking longer.

## **SAFETY FIRST!! See section 2.2**

This Installation Manual assumes good technical experience and ability.

**NOTE: 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, Solar Feed and Return line adapters
- Air Vent, Pressure Relief Valve
- PV Panel with mounting brackets and hardware
- Storage Tank Heat Exchanger connections with Expansion tank, Pressure Gauge, “Floating Ball” Check Valve, Charging valves, Temperature Gauge, and Propylene Glycol.
- 12 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
- 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 Fireball 2001 system.

Tools and Materials Needed:

- For Assembling a split kit or Skyline split kit model collector: Pop Rivet Gun, 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).
- Teflon tape (1/2" wide to seal threaded fittings use 6 turns).
- Quality Pipe Sealant (to seal face of brass union ends).
- 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 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, Elastomeric or Silicone roofing caulk (to fill lag holes and seal flashing to prevent leaks).
- 3/4" wall, 1/2" high temperature open cell pipe insulation for inside piping.
- 3 laundry hoses to charge system with Glycol.

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

### Price and Option List, January 2002

**UPS Delivery to Continental 48 States, System 5 \$155.00. Add \$55 delivery per additional panel.**

2, 3 and 4 collector systems are shipped assembled in a crate by motor freight.

Standard Color for all systems Musket Brown or Dove Gray. See Options for Colors.

**System 5.** Complete 20 Square Foot (1.86 m<sup>2</sup>), 20" x 12' (.508 m x 3.66 m), Solar Panel with mounting kit and Rails, **12 Volt PV Power red Circulator + Complete Rheem Double Wall Heat Exchanger Tank Connections.** These advanced 12V PV powered systems have matched PV Panels and Pumps for best operation. 2 collector system includes ElSid Circulator with 11 Watt PV Panel, A larger 12V Electronic Circulator and 21 Watt PV Panel is used for 3 or 4 collectors, with 25' of wire, 50' - 1/2" OD Copper connecting line, all line connections, Collector Air Vent and Pressure Relief Valve, 2 Temperature Gauges, Install Kit, full instructions, Owners Manual. Includes Expansion Tank and all Connections. **TANK NOT SUPPLIED** Full instructions and modified hardware included.

**Two Collectors: \$1,840    Three Collectors: \$2,540    Four Collectors: \$3,020**

**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.

**Single Panel:** Collector kit with 3 Modified 24" brackets with 6" legs and hardware:  
(Option Code /#TKSF01) Single panel tilt kit: **\$45.00**

**Double panels:** Collector kit 3 - 4' Heavy Alum. channels with 12" legs and hardware:  
(Option Code /#TKSF02) Double panel tilt kit: **\$65.00**

**Collector COLOR Options** - Optional Colors Include: Colonial Gray, Tahoe Blue(CI03), Colonial Red (CI04), Forest Green (CI05), White (CI06) as well as other attractive colors  
(Option Code /Co##): Optional Colors - Each Collector: **\$45.00**

**Components** ( for individual purchase):  
**Fireball 2001 Collector** with 6 Ell brackets: **\$480.00**  
**MVWA**, Watts Mixing Valve: **\$ 78.00**

**HE80**, Full connections for the 80 gallon Rheem / Rudd heat exchanger,  
pre-assembly with 1 floating check valve, charging hose bib ports with  
isolation valve, pressure gauge, expansion tank: **\$350.00**

**TC01, Taco 006 110V Circulator:** **\$160.00**

**ES10, El Sid 10 Watt 12V Circulator:** **\$235.00**

**HC18, Hartel 18 Watt 12V Circulator:** **\$345.00**

**PV11, UniSolar 11 Watt 12V Panel:** **\$160.00**

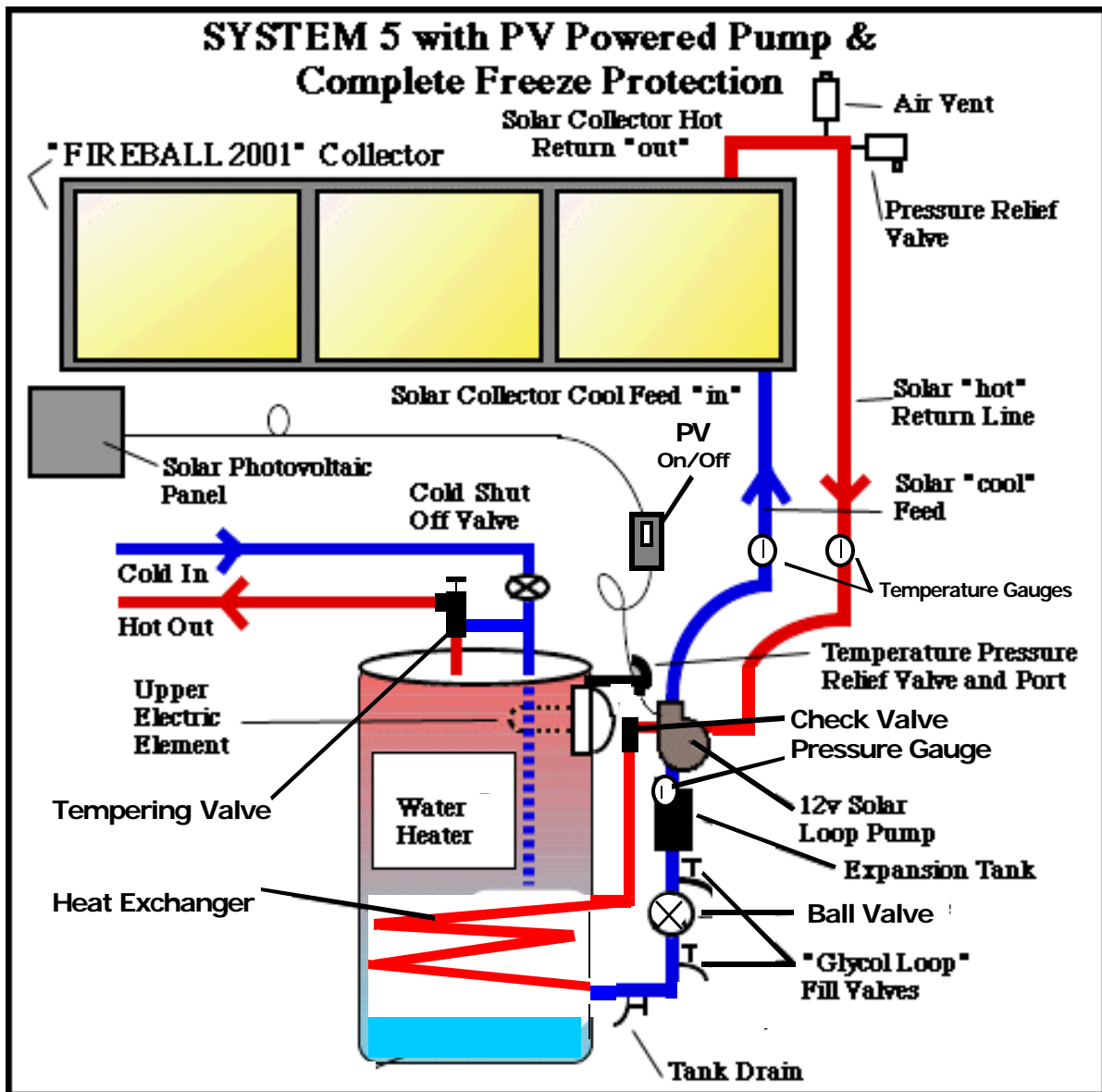
**PV21, UniSolar 21 Watt 12V Panel:** **\$240.00**

**PR75, 75 Pound Pressure Relief Valve:** **\$ 32.00**

**CV01, Floating Ball Check Valve:** **\$ 36.00**

**TR50**, 50 foot roll of 3/8" ID, 1/2" OD soft copper tubing includes 2 compression unions: **\$ 60.00**

# Fireball 2001 System 5



## “Fireball 2001” Solar Water Heater Specifications

### COLLECTOR (Panel)

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:	FIREBALL 200 -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 <sup>2</sup> )
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 or Propylene glycol
Standard Components:	Mounting rails, mounting brackets, tech screws and lags
Color:	Musket Brown (C101) or Dove/Old Town Gray (C109) + optional colors

### PV (Photovoltaic) POWERED CIRCULATOR

PV Panel:	11 or 21 Watt, 12volt DC
Circulator:	12 Volt - “El Sid”, 12 Volt Hartel, March or equal.

### FREEZE PROTECTION

**Type: Closed Loop Glycol with Storage Tank Heat Exchanger.**

The SolarRoofs.com's 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 (6’ (1.83 m) supplied):	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, (Solder for Heat Exchanger)
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### STORAGE TANK - Rheem (Not Supplied)

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

### CONTROL

Type:	12 Volt Circulator with Switch, which automatically regulates circulator operation.
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**Although we will make every effort to give notice, Specifications and prices subject to change without notice.**

## Antifreeze Safety Data - Sierra Antifreeze-Coolant

### 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

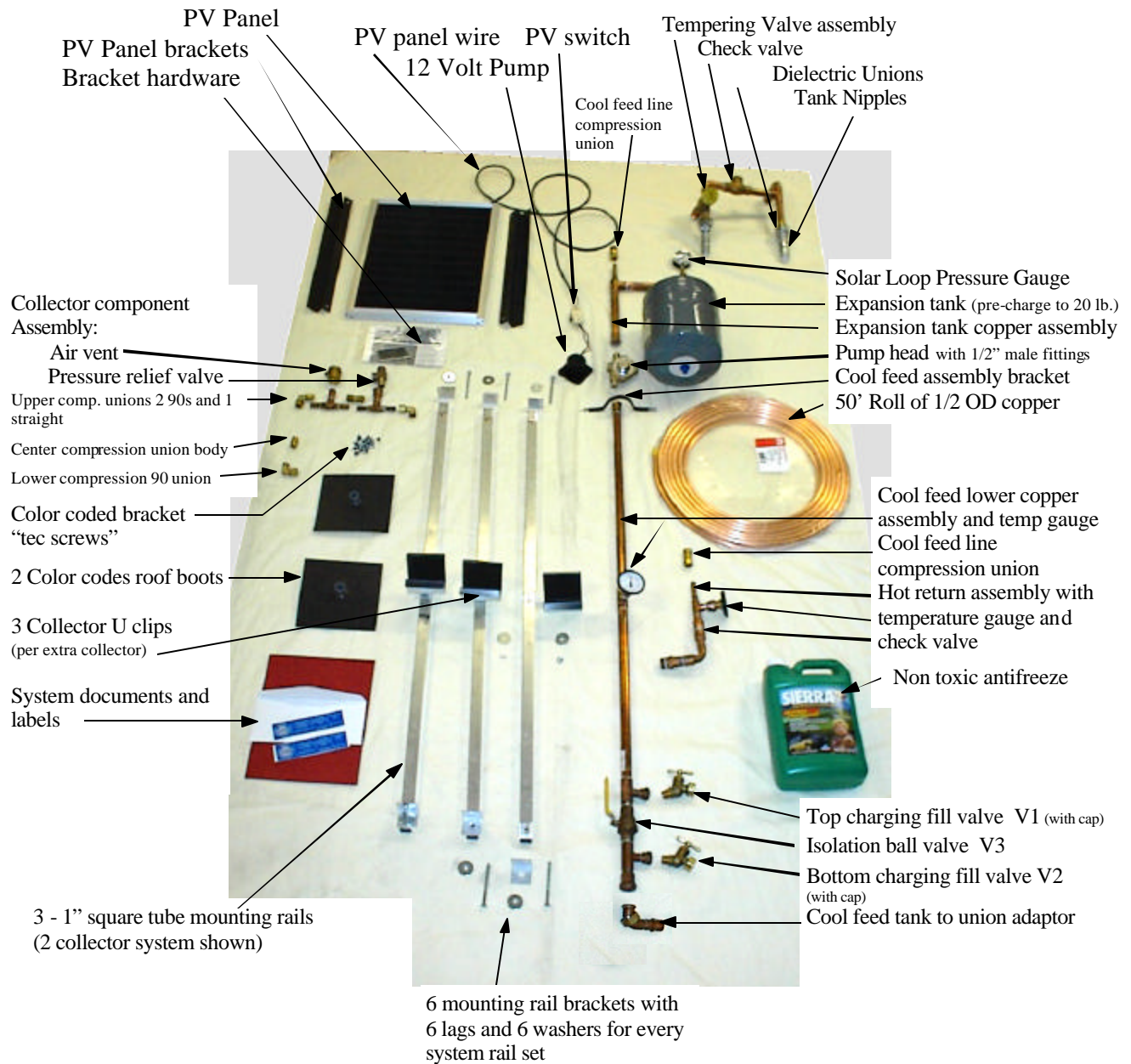
Boiling point: 365 deg F

Appearance: Green

Specific Gravity: 1.04

Vapor Density: 2.6

## Components Included with the "Fireball 2001" System 5



**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 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.**

## 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

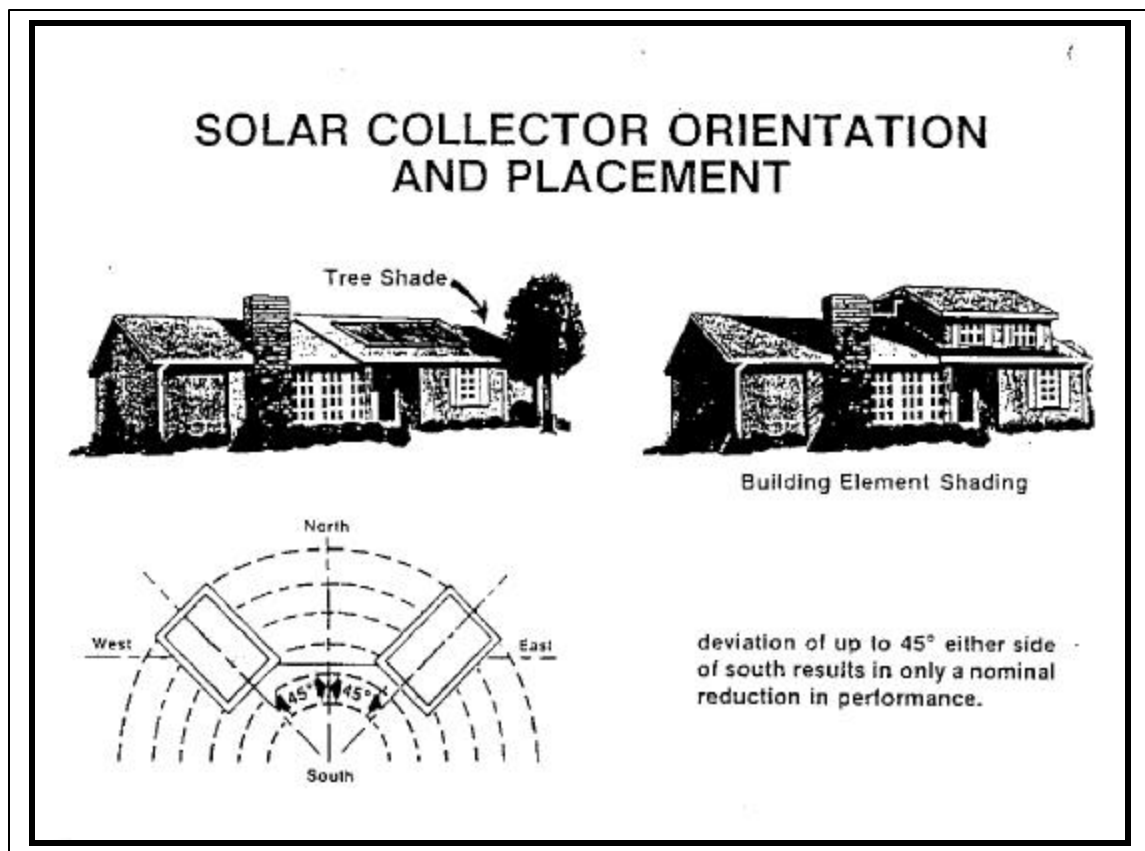
produced if it were facing directly south. At 90 degrees east to west of south the loss is closer to 20%.

**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.



## **OVERVIEW - THE BASIC INSTALLATION STEPS:**

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

1. Unpack collector, for split kits, assemble the collector left and right sections into one unit as per pictures and instructions. Note: not shown, the 24' collector has a center mullion that needs to be attached to the collector after joining the unions. Two 6' sheets of Lexan glazing go into either side of it.
2. Collector placement on roof located, 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. PV panel installed.
4. Collector cool feed (bottom compression union) and hot return lines (top compression union) installed through roof boots to tank area. PV wire connected and run to water heater area. Insulation partly installed before tubing connections are made. PV panel installed.
5. Water Heater Element turned off, water drained, lower drain removed, Rheem 80 gallon tank with heat exchanger installed. Water lines connected including installation of the Mixing valve. Solar lines with valves 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.
6. Water heater refilled, solar loop purged of air, pump wired to PV panel. Glycol loop filled, finish insulating lines, Fill Tank, Element turned back on.

## **ASSEMBLING THE COLLECTOR (Split Kits Only – see supplied pictures)**

### **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 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:

If used, remove the tape holding the "floating" inlet and outlet compression unions in the collector. Allow the unions to be out exactly to their ends so the absorber is properly aligned in the collector.

NOTE: 90° 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. Neatly fold down and flatten the bent absorber tabs so they cover the tubing and union as much as possible.

### 5. Install the Twin wall "Lexan" glazing:

Being very careful to keep the UV protected "Sun Side" facing up. **The glazing is clearly marked as to which side is to be UP. Remove the back protective film before installing.** 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.

### 6. Securing the Trim:

Place trim piece "A" in its place on the "A" side. Using inward and downward force to make a good seal against the EPDM gasket, 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. Collector is assembled.

## COLLECTOR INSTALLATION

## 6.0.

### 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.

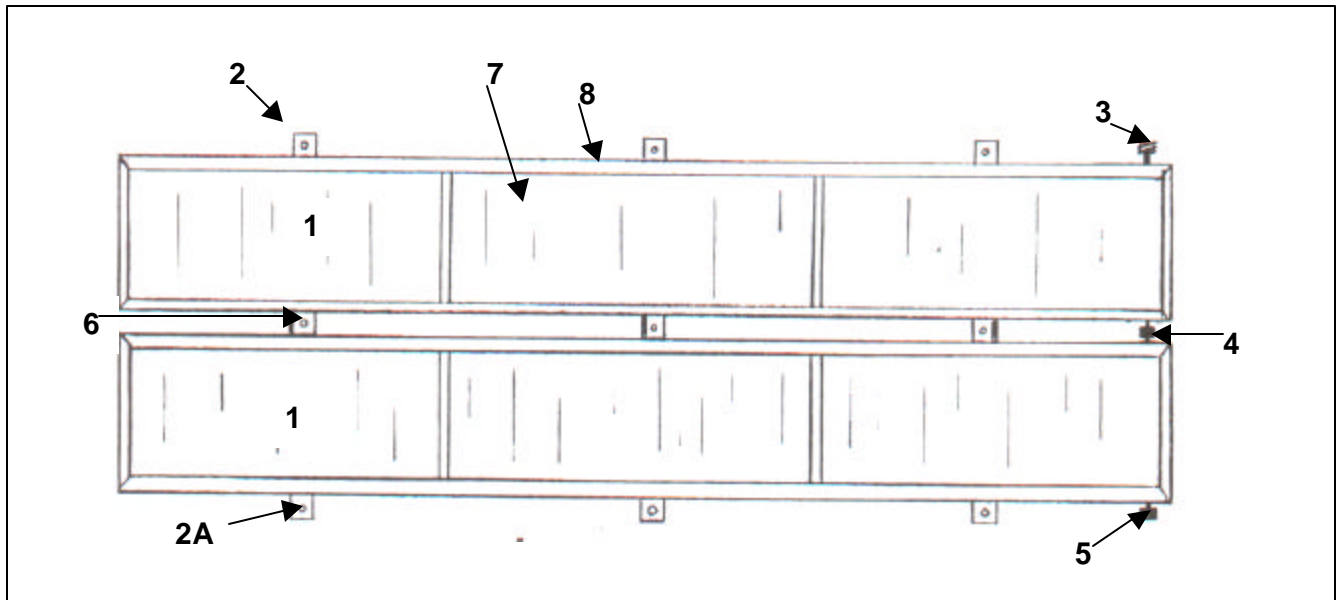
The collector can be flipped either way to be closest to your storage area. Remember that the feed line from the pump goes to the bottom collector connection and the hot return goes to the top collector connection as shown in the diagrams.

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:

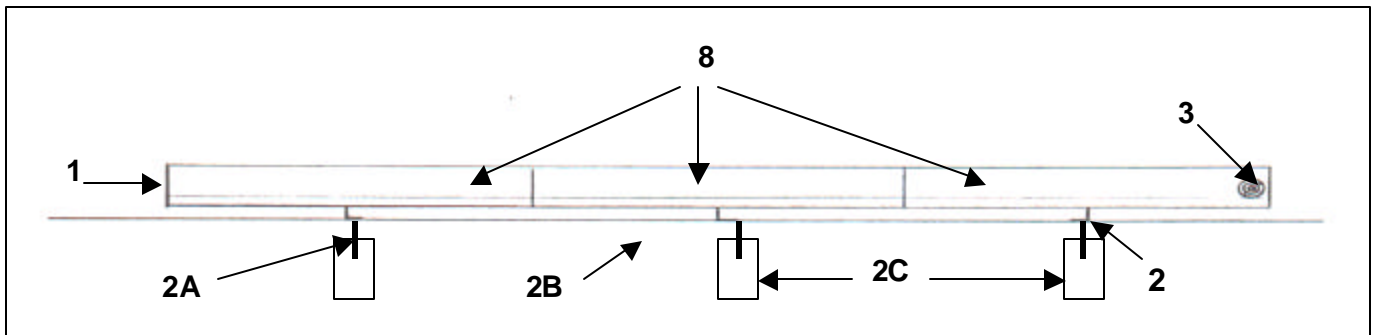
1. Two 20" x 12' Collectors mounted with connections to the right.
  2. The Mounting Rails with Mounting Brackets (3 rails and 6 Mounting Brackets plus 3 Quick Connect Clips (QCC) per additional collector set (6.), 3 two panel rails, 6 Mounting Brackets and 3 QCCs shown in this diagram).
  - 2A. Mounting 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 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.

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

### 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



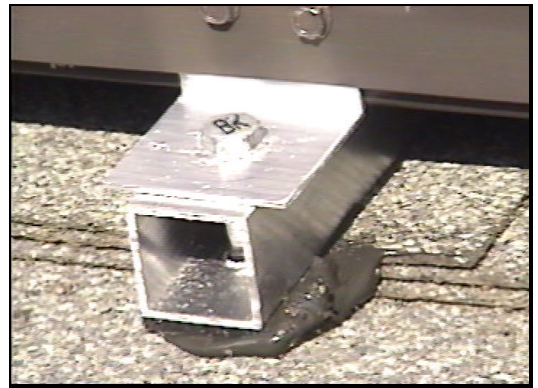
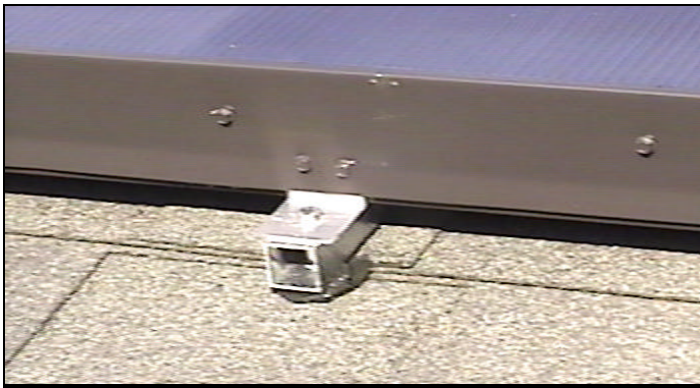
Keeping your body weight over the Roof, pull the Collector Up



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 procedure 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 1/2 inches 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.

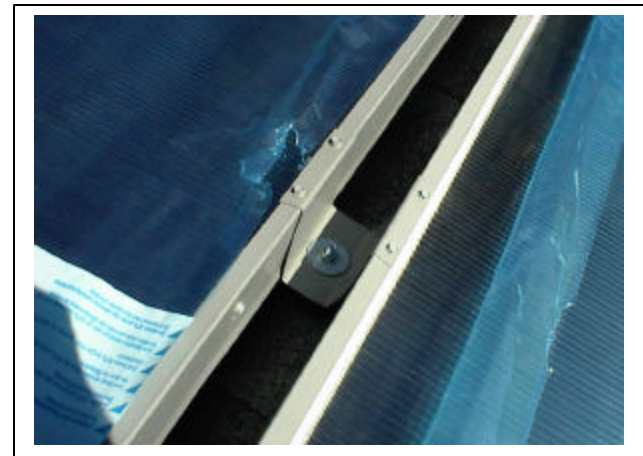
The U shaped clip with outward tabs that go over the edge of the two collectors is secured with a bolt in the center. In high wind areas, it is recommended that the clips be Tec screwed into the frame through the glazing with 2 screws.

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

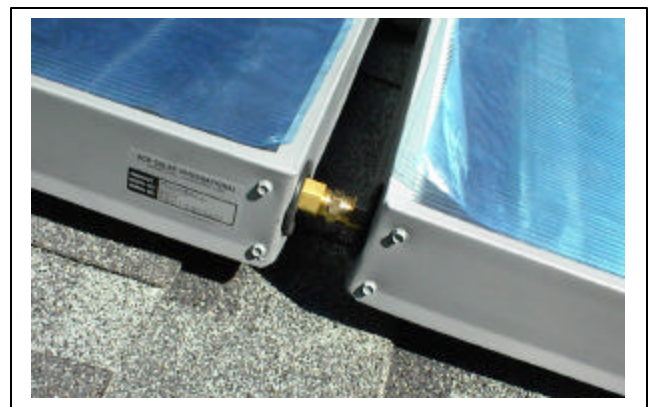
Place the first collector in place with mounting bracket tabs inserted for final assembly. Tighten down the lags. Place three Quick Mount clips in place over their rail lag hole locations. Partially install the lags to hold the clips loosely in place. **(you will need an extension to your lag driver 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 1/2” hole be drilled for the tubing hole.

## “Roof Boot” Flashing and Waterproofing Details

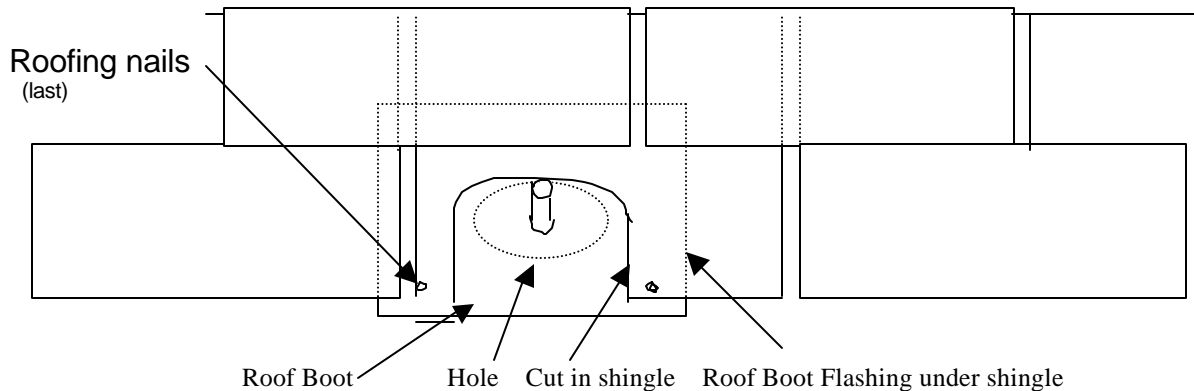
The 2 aluminum flashings supplied with the system are easily installed but require careful alignment to assure a good fit. It is recommended that up to a 1 1/2” hole be drilled to give “working room” when installing the roof boot. **Spacers are included with flush kits to make boot installation easier. 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.

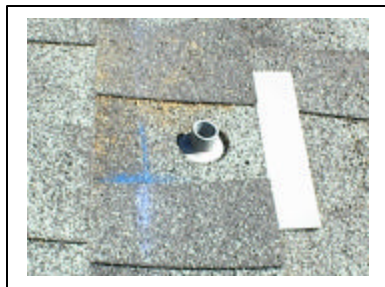
If needed, add aluminum flashing to assure a watertight installation (especially needed with Cedar Shake). Caulk the sides as needed and it is good to put two roofing nails in the bottom of the boot to secure it AFTER the pipes are installed and fully secured.



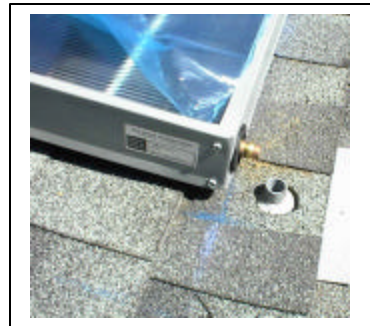
Note that Roof Boot is UNDER the shingles at the top and most of the sides so water flows over the top. The shingle is cut down from where the hole is drilled.



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.

## DETERMINE THE BEST PIPE RUN

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

**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 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. Converting to copper pipe for two feet on either side of the firestop may be required in some areas.

**STORAGE:** You will need to purchase a Rheem Storage Tank, 80 Gallon with heat exchanger, Model # RH-81V080HE1.

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.

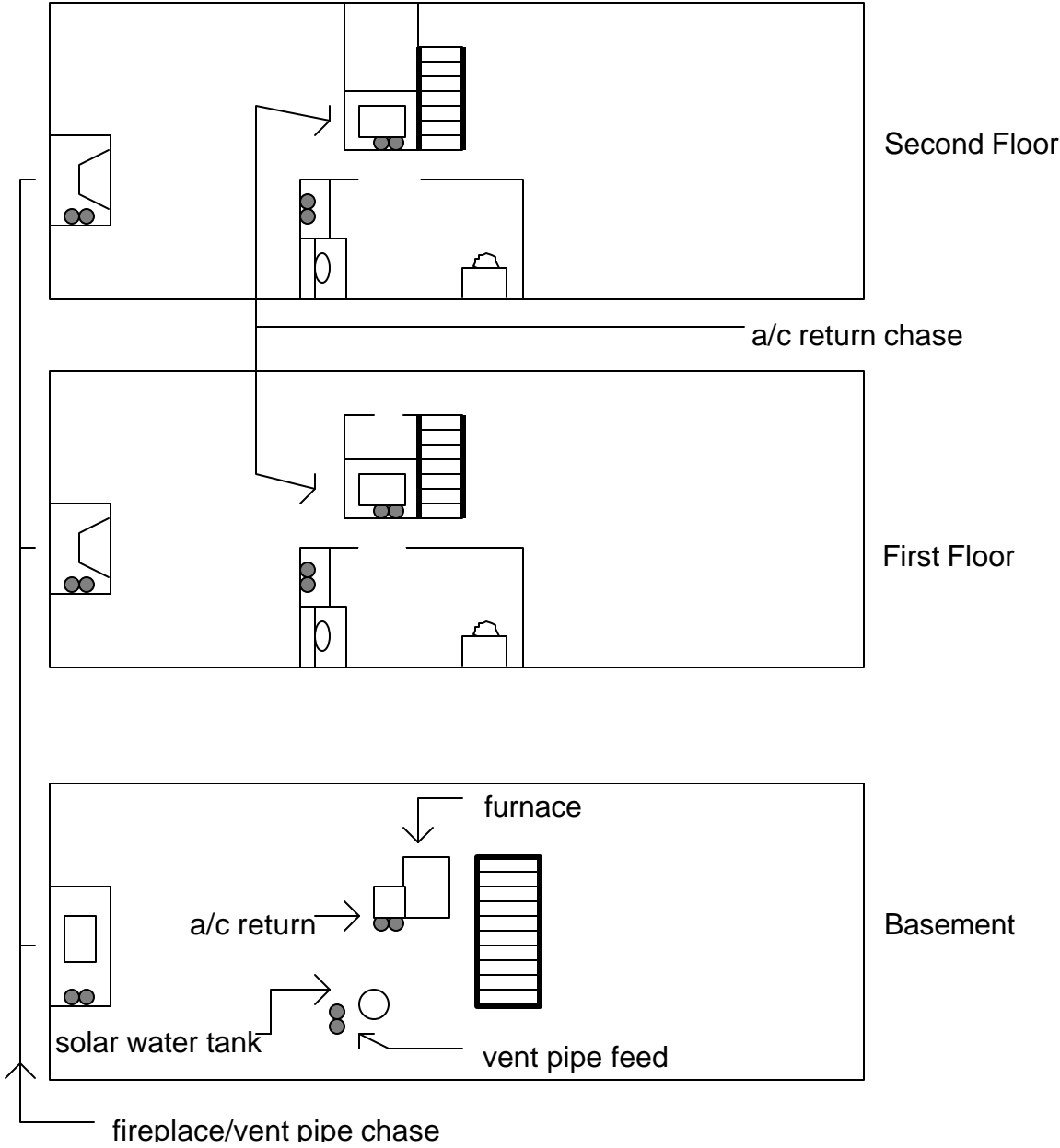
Try turning the power off during sunny summer days. You should have ample Hot water with 1 panel for a family of 3 and with 2 panels for a family of 4 or 5 on clear summer days.

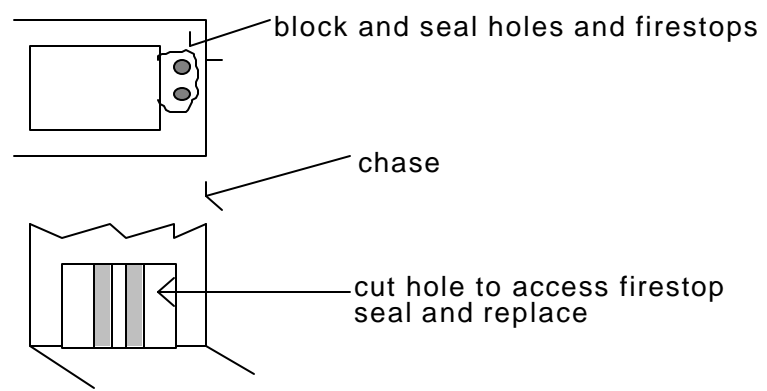
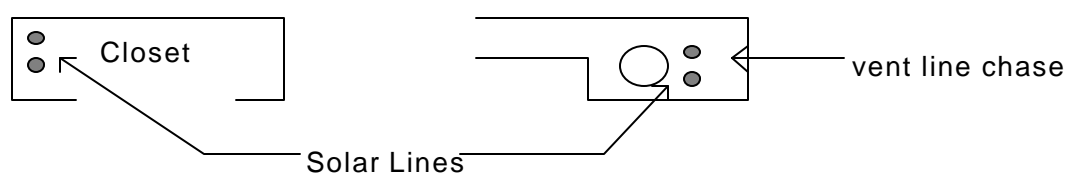
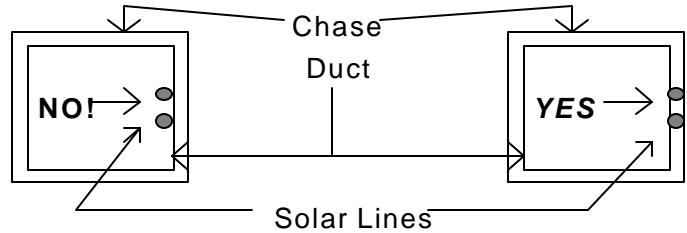
**INSULATION: INSULATION OF EXPOSED COPPER PIPES IS NEEDED.** A MINIMUM 1/2" R-2.6 (closed-cell insulation)\* IS NEEDED AND 3/4" R-4.5 OR BETTER IS RECOMMENDED. Check your state and local codes to see if any greater thickness is required ESPECIALLY IF REBATES OR INCENTIVES ARE INVOLVED.

**Determining The Pipe Run (birds eye view)**

\*Look for the following:

Note: ●● = solar pipe run





## Making Line Connections

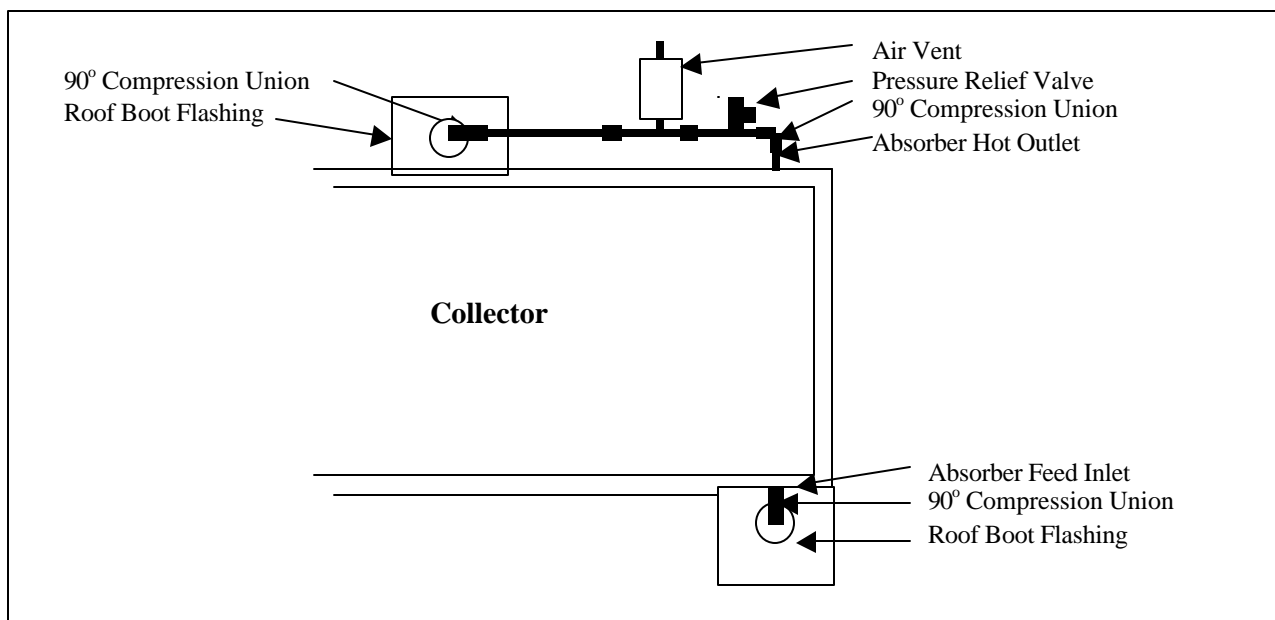
Line connections are easily accomplished using the supplied brass compression connectors.

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.

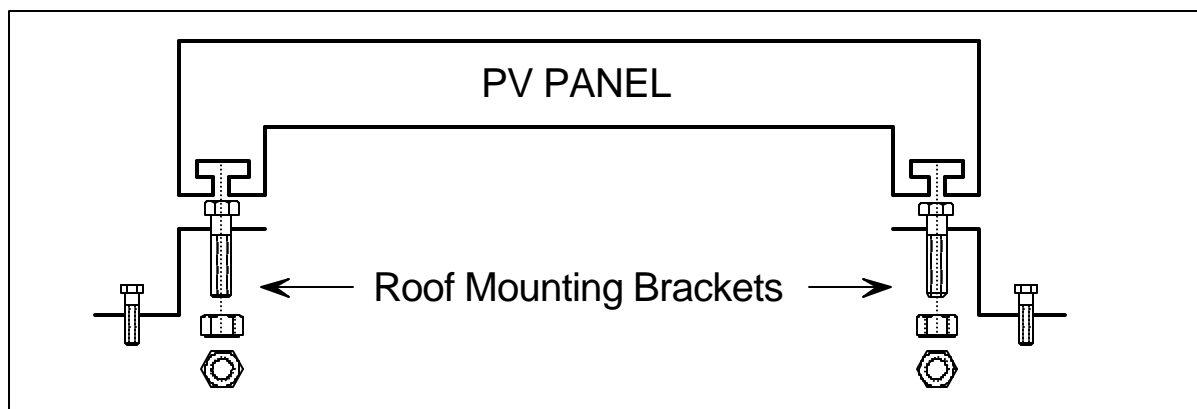
### Preparing the Collector

The following connection are usually made behind the

### Collector Connections:



### PV PANEL INSTALLATION



### 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 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.

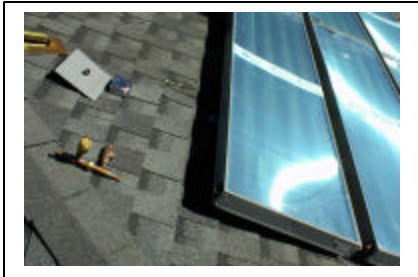
**NOTE: The hole in the side of the collector will be covered with insulation as a final step. All insulation over fittings is done last, after the system is pressurized, to allow for checking for leaks and tightening the unions as needed.**

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

The 50' roll of 1/2" OD copper tubing is easily unrolled and straightened 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.



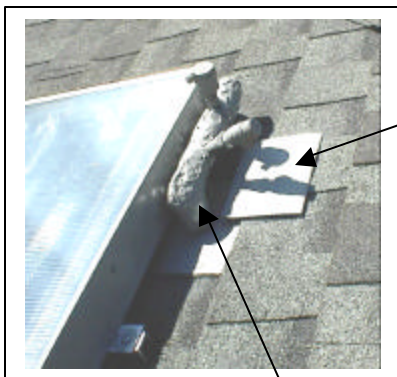
To locate the return line hole, place the 90 degree compression union on the upper tube and snug up. Place the upper return assembly with air vent, pressure relief valve into the 90. Center absorber in collector and make a mark 1" in front of the end of the tube. Drill a 1 1/2" hole centered on the mark.

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 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  $\frac{1}{2}$  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.



## CONTROL COMPONENT DETAILS

**Photovoltaic (PV) panel:** Place the PV panel on the same plane as the collector. Attach the PV panel to the brackets with the supplied nuts and as shown. Screw

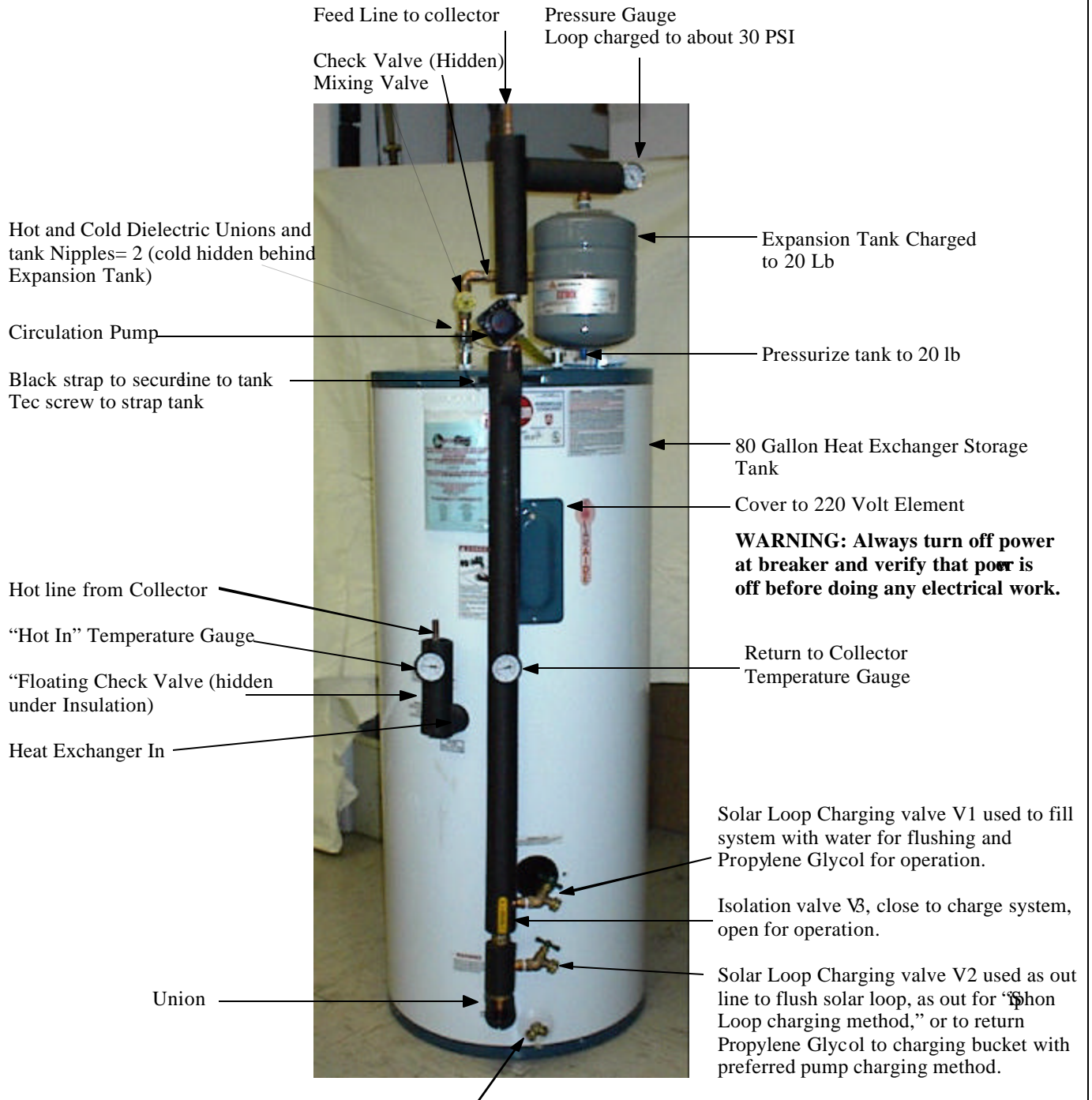
brackets to roof with supplied long tec. Screws. Seal the roof penetrations with a quality sealant. Note: Some PV panels are supplied with 4 short brackets instead of 2 long ones



**Pump Connections:** The PV pump is simply wire-nutted to a sensor type wire, which in turn is wire-nutted to the PV panel through the on - off switch.

The on off switch can be attached to a wall or the side of the tank with the self adhesive tape preferably near the pump.

# Finished Fireball 2001 Rheem / Rudd 80 Gallon Tank Installation



Tank Drain Line, 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

## TANK CONNECTIONS for SYSTEM 5

### Installing the Heat Exchanger Connections

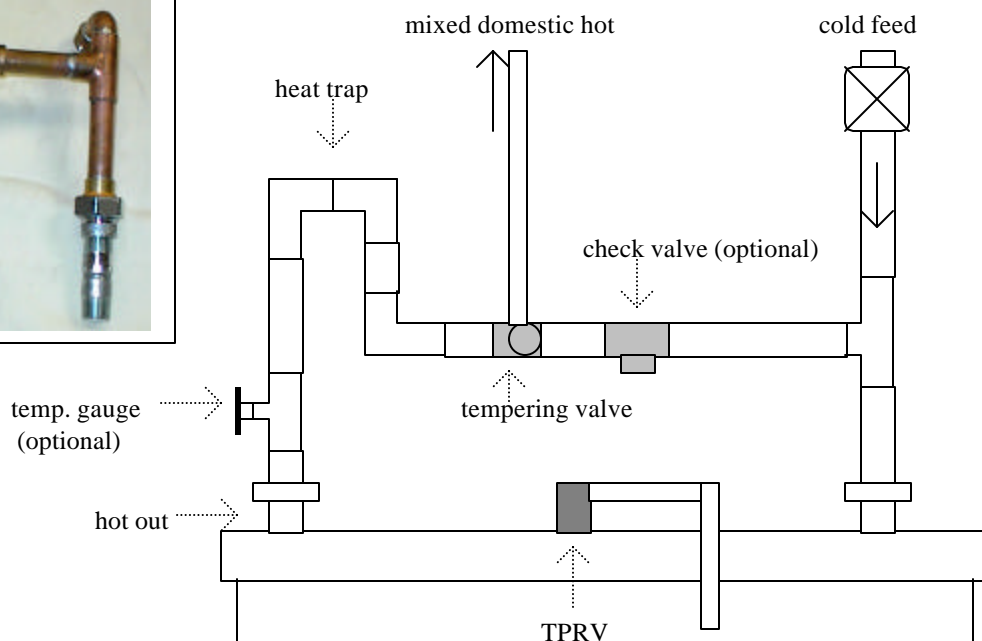
Refer to 2.1.2. for Individual Components.

- 1) The fittings are installed onto the tank heat exchanger inlet and outlet using at least 6 turns of Teflon.
- 2) Connect and tighten the short Hot Return Fitting (with the temperature gauge and check valve) to the TOP Heat Exchanger fitting.
- 3) Connect and tighten the short adaptor to the BOTTOM Heat Exchanger fitting and then connect the long Feed line with the charging valves and temperature gauge to it via the union. Connect the bronze Pump housing (arrow up) to the top of the long line.
- 4) Install the "Expansion Tank" and Pressure Gauge onto the plumbing tee as shown and then to the Pump housing.
- 5) The PV pump is simply connected to the switch which is then connected to the PV panel wires.
- 6) Connect the Collector feed line to the tank feed line using compression unions (or solder coupling).
- 7) Connect the Collector Hot Return Line to the short Hot Return Tank Fitting.
- 8) Connect the tank hot and cold lines and Mixing Valves per the diagram 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.**

**See following sheet for instructions on pressure testing and charging the Glycol Loop.**

### Mixing Valve Installation



**NOTE: A mixing valve (which automatically allows cold water to mix into the hot water) is required for SRCC OG300 and single tank systems and can be installed by your plumber.**

Mount the sheet titled "Important Warnings and Instructions" onto the tank.

Cut out and place the labels with their corresponding components

# Charging the “Fireball 2001” Rheem HE System Non-Toxic Propylene Glycol Solar Loop\*

**NOTE: A CHARGING PUMP IS RECOMMENDED**, use the following method if one is not available and only when freezing weather is not a threat.

\*Use non-toxic Propylene Glycol only, never use Ethylene Glycol (Antifreeze)

**NOTE: You will need 2 Laundry hoses** (these can be "borrowed" from the washing machine).

**Charging the solar loop is done through "Charging Valves", V1 and V2 using V3 to control flow: This simple procedure uses gravity to fill (charge) the solar loop with Glycol.**

V1, the Fill Valve is where water enters to fill the solar loop and “flush” the system after which the glycol mixture enters by siphon from the "charging bucket" to fill the solar loop.

V3 acts as a block to force water and glycol up to the collector, through the entire loop and out V2. When "Flushing" or "Charging" V3 is to be Closed, in operation V3 is to be Open.

V2, is called the Purge Valve because, when open, it allows water used to flush the system to exit and purge air from the solar loop carrying any contaminants with it. When closed, after flushing and no more air is in the loop, the system is pressurized through V1 allowing the loop fittings to be checked for any leaks prior to charging the loop with glycol. Glycol can then be charged into the loop using a charging pump or the siphon method described here.

## SIPHON LOOP CHARGING TECHNIQUE (or use charging pump if available)

Connect a laundry hose to the Tank Drain and connect it to V1. Close V3 and fill the solar loop with water through V1 and allow water to flow out a hose connected to V2 to flush the solar loop. Close V2, allow pressure to build to 30 pounds, close V1 and check the system for leaks. **Keeping the loop full of water**, disconnect the V1 hose from the Tank Drain and insert it into the bottom of a 5 gallon bucket with at least two gallons of a 50/50 mix of glycol and water. **Fill the hose with water so no air is in it.** Elevate the bucket as high as possible. **It is important not to get any air in the loop.**

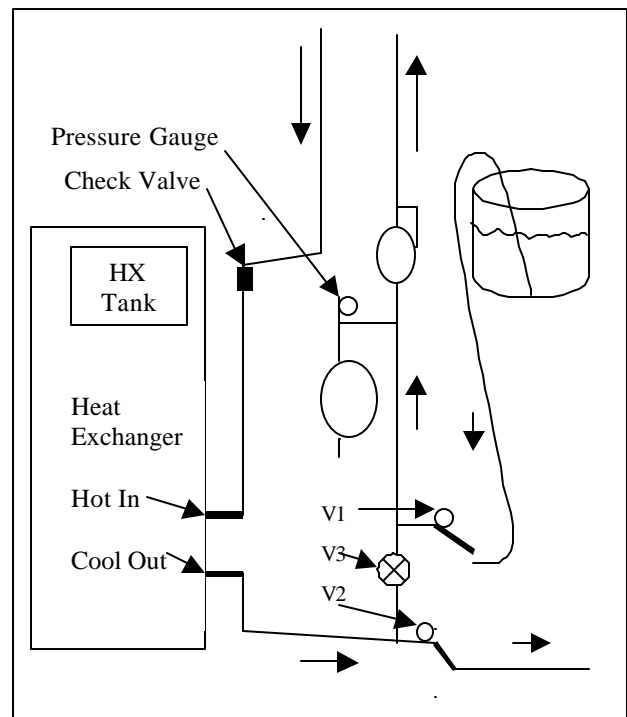
Open V2, have its hose drain to as low a point as possible then open V1. Glycol should then flow into the loop. **Be sure to not let any air into the system by preventing the gallon container of glycol from fully emptying, add water as needed.** When Glycol starts to flow out V2, Close V2 then V1.

Reconnect the V1 laundry hose to the Tank Drain. Loosen the connection at V1. **With V1 closed, slowly add water until all air is out of the laundry hose, tighten the hose onto V1 and with water still slowly flowing open V1.**

Add water through V1 until the pressure gauge reads 28 –30 pounds, close V1. Be sure air vent cap at the top of the solar loop is loose. Open V3 valve so solar loop is open to circulate.

Turn the pump on and check for circulation. If the sun is out, the solar return line should get hot. If the pump sounds loud, air is probably in the system and it is “cavitating”. “Bump” the pump by turning it off and on until the air leaves the pump and goes out the air vent. Your system is “Charged.”

Call (888) 801-9060 if you have any problems charging the system.



**We Hope Your installation Went Smoothly!!**

**PLEASE CALL [SolarRoofs.com](http://SolarRoofs.com) WITH  
QUESTIONS OR COMMENTS:**

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

**Thank You and Now Enjoy the Savings!**

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**11.0.**

**QUESTIONS AND ANSWERS:**

**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 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?**

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