Assembly Instructions

WARNING: HOT WATER!

STEAM AND BURN DANGER

Solar energy is extremely powerful. This is a high-efficiency solar heat collection system. Please be careful. Do not touch heated internal components. Never connect this unit to a closed system without pressure relief.

Congratulations on starting your solar heating project. You are now ready to start harvesting energy from the most powerful and abundant source in the world!

1) Begin by assembling the frame. Match corners with similar letters (“A” to “A”, “B” to “B”).

2) Set the frame piece with black plastic fittings “over*”, not under*, the two side frame pieces (Figures 1 & 2).

3) Likewise, the frame piece with *six* total holes (2 & 2 at corners and 2 on a face)) and a foam strip, is set “over” the side frame pieces.

Fig 1 (below)

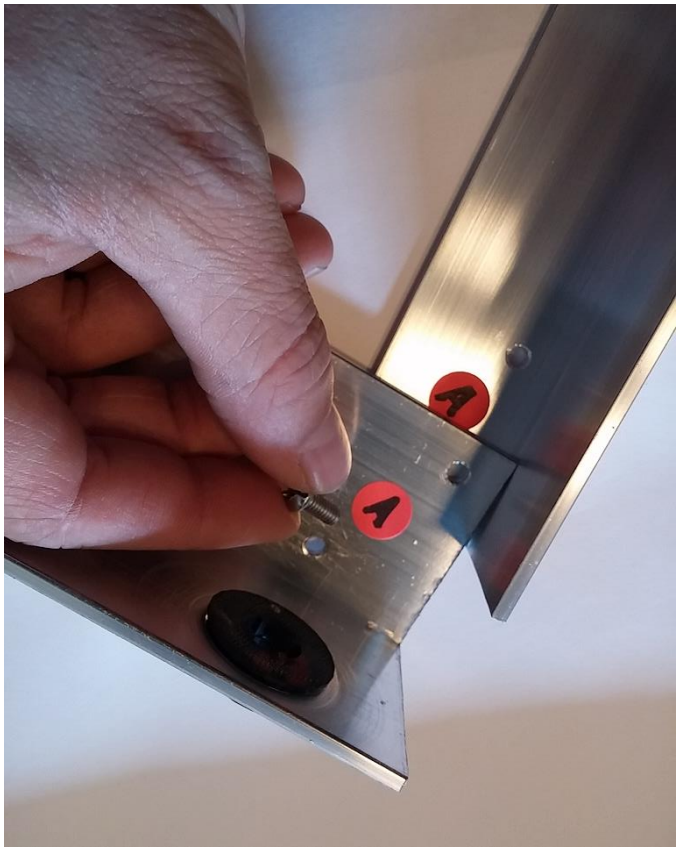
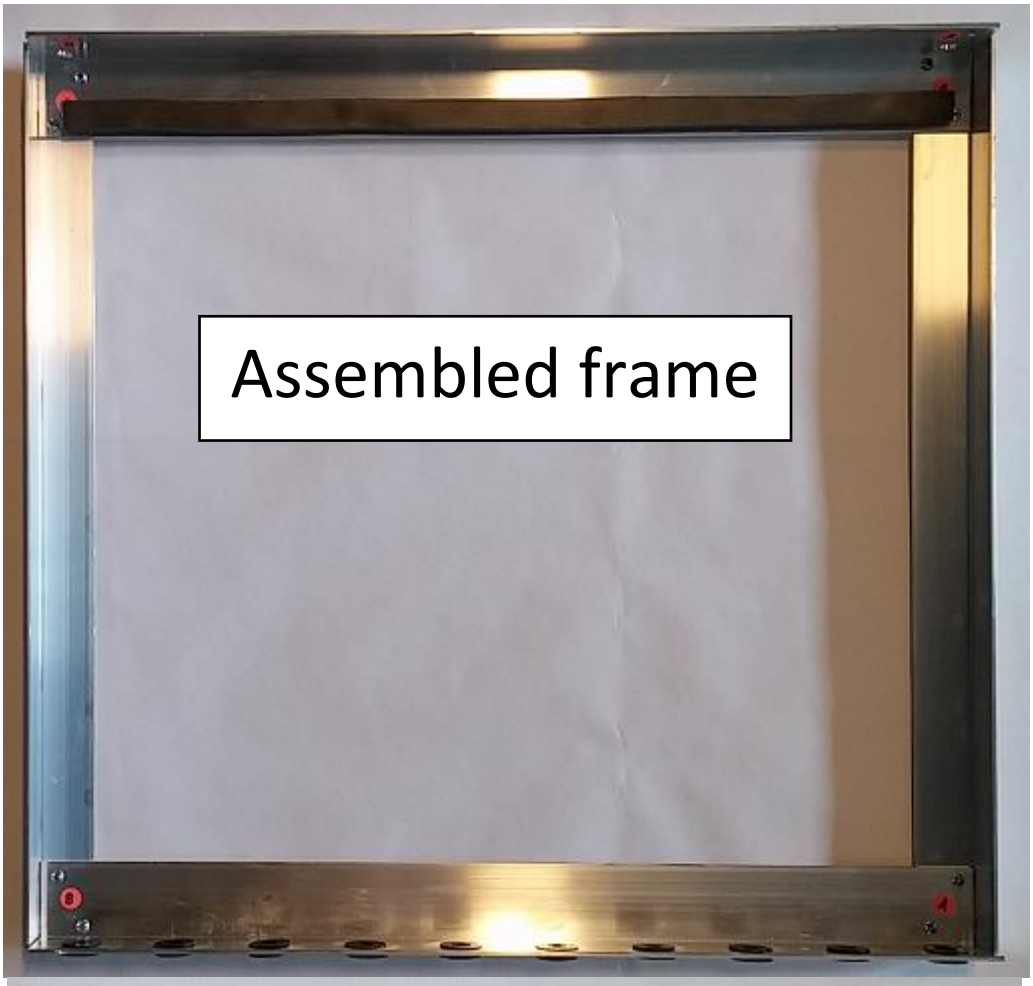
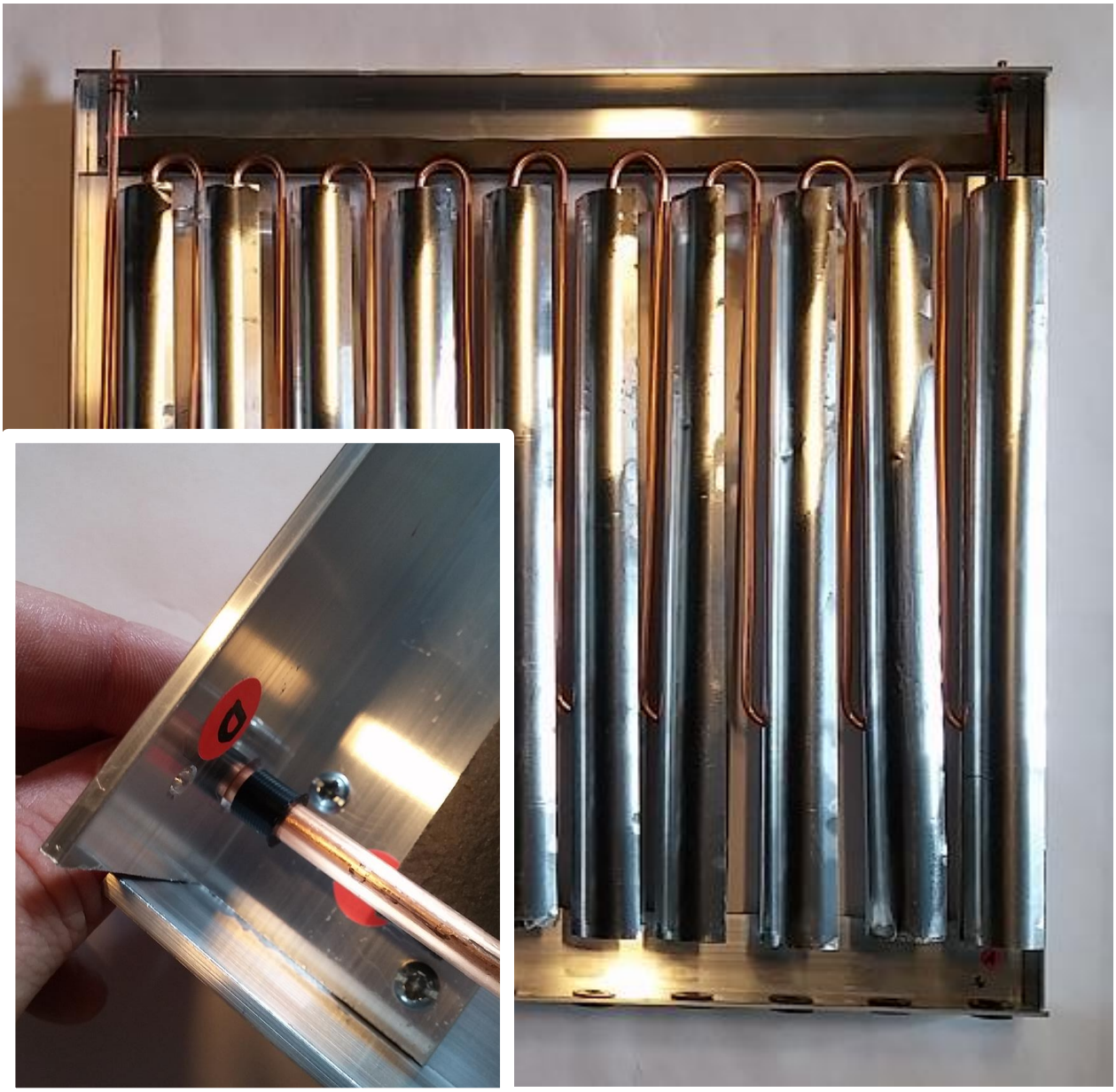


Fig 2 (below)


Assembled frame


Copper Manifold Pipe & Fins

4) Slide ends of copper manifold pipe through the two holes in top face of frame. Position manifold where top curves of the copper pipe sit aligned with center of foam strip.



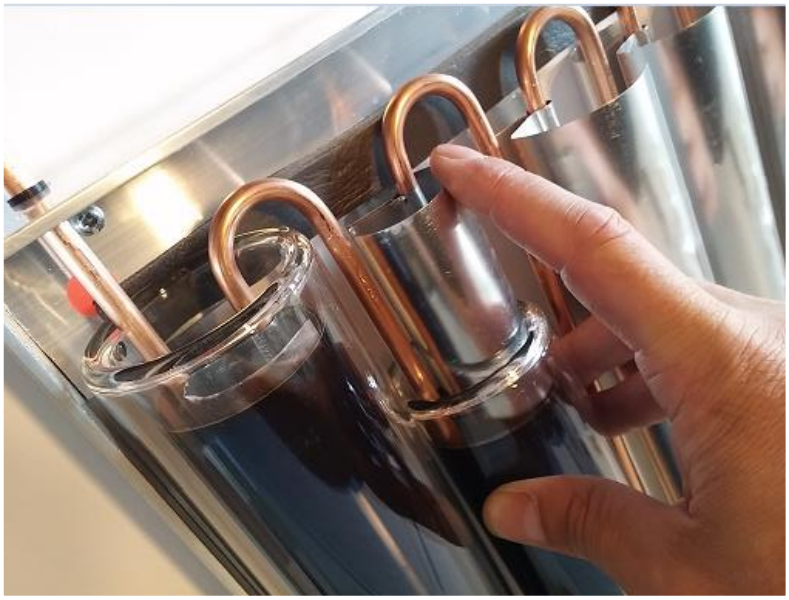
5) Slide plastic sleeves as far up as they can go through the hole in the frame. This is a general reference point for where the manifold will be positioned when assembly is complete.

6) Gently pinching the silver fins, slide a glass vacuum tube onto each of the 10 manifold sections (Figures 1, 2 & 3). Position pointy ends of tubes loosely in the plastic fittings (Figure 4).

Fig 2 (Above)

Fig 1 (Left)

Fig 3 (Below)



Don’t worry that the tube tips are loose in the plastic fittings now. Later, you can adjust and reposition them.

Fig 4 (Left)

7) Attach front plate of frame to top frame piece. Two holes line up near where copper pipe penetrates top of frame. Attaching these two nuts can be tricky. Hold the nut to the bolt with your fingertip while turning the bolt with a screwdriver.

8) Push the plastic end caps onto the open ends of the frame top.

Nice work. Now you're cookin!

Operating Specifications

How hot can the array make my water?

-Transfers solar power to water flowing inside at a rate of 165 watts (a photovoltaic panel same size only yields 40 watts of electrical power)!

-In other words, for example, you can increase the temperature of 5 gallons of water a full 54'F (30'C) in 4 hours of sunlight, or raise that much water over 100'F from its starting temperature in 8 hours.

-At a flow rate of 5 gallons per hour you can expect to see a temperature rise of 36'F (20'C) from the water going directly into and directly out of the array. The rise will be lower if the flow rate is faster. If you flow the water more slowly, the temperature rise through the array will be greater.

-The conditions under which the above performance is defined were in direct sun in June with clear skies in Seattle, WA USA, at latitude 47'. Performance may be even better at lower latitudes or higher altitudes.

Operating Notes

Position: Set the array so sun shines directly onto its surface, perpendicular to the sides of the tubes. It doesn't need to be exact. Getting the angle of the array within 20 degrees of a perfect perpendicular angle to the sun will get you over 95% of available heat energy.

Max Time In Sun: Find a spot where shadows will be least likely to cover the array, and where it will get the maximum possible hours of sunlight per day.

Slow Flow Is OK: There is little benefit to flowing water quickly through the array, in terms of collecting heat. A flow rate of even five gallons per hour is sufficient to "cool off" the insides of the glass tubes and harvest the incoming solar heat.

Slower Flow Means Higher Temp Jump: The slower your water flows, the more *total time* each unit of water spends inside the array collecting solar energy. So, the lower your flow rate, the higher the difference in temperature between your input and output water.

Insulate Your Hoses! Make sure to insulate your intake and output hose lines/pipes. A long hose is like a radiator and you will lose a lot of your heat if the hot water travels a long distance through an uninsulated pipe before stored or used. Pipe insulation can be found at any hardware store and is very affordable.

WARNING! Stagnation: This collector is extremely efficient. If the water flow stagnates (does not run) the inner components of the array may heat up to 300'F. This may cause water inside to turn to steam and increase in pressure. Always have a pressure relief somewhere in the system the array is connected to. When new water is pumped into a very hot stagnated array, steam can jet out the downstream opening until the array is cooled. Do not put your hand or body where steam may vent, and do not touch the hot internal components.

Max Temp Output vs Max Solar Energy Absorbed: There is no problem in designing a system to generate very hot water for direct use of some sort out of the array. Getting the hottest possible water out of the array is a good goal for some projects. However, for maximum heat harvesting efficiency, starting with colder water can help "soak up" the heat from inside the tubes, meaning, though your output water may not be as hot if you start with colder water, you would have transferred slightly more solar energy into it for a given flow rate than compared to working with warmer intake water. The point is simply that for pre-heating or space heating systems where max output *temperature* from the array isn't the specific goal and simply absorbing the max solar energy *is*, working with very cold intake water can be just fine.