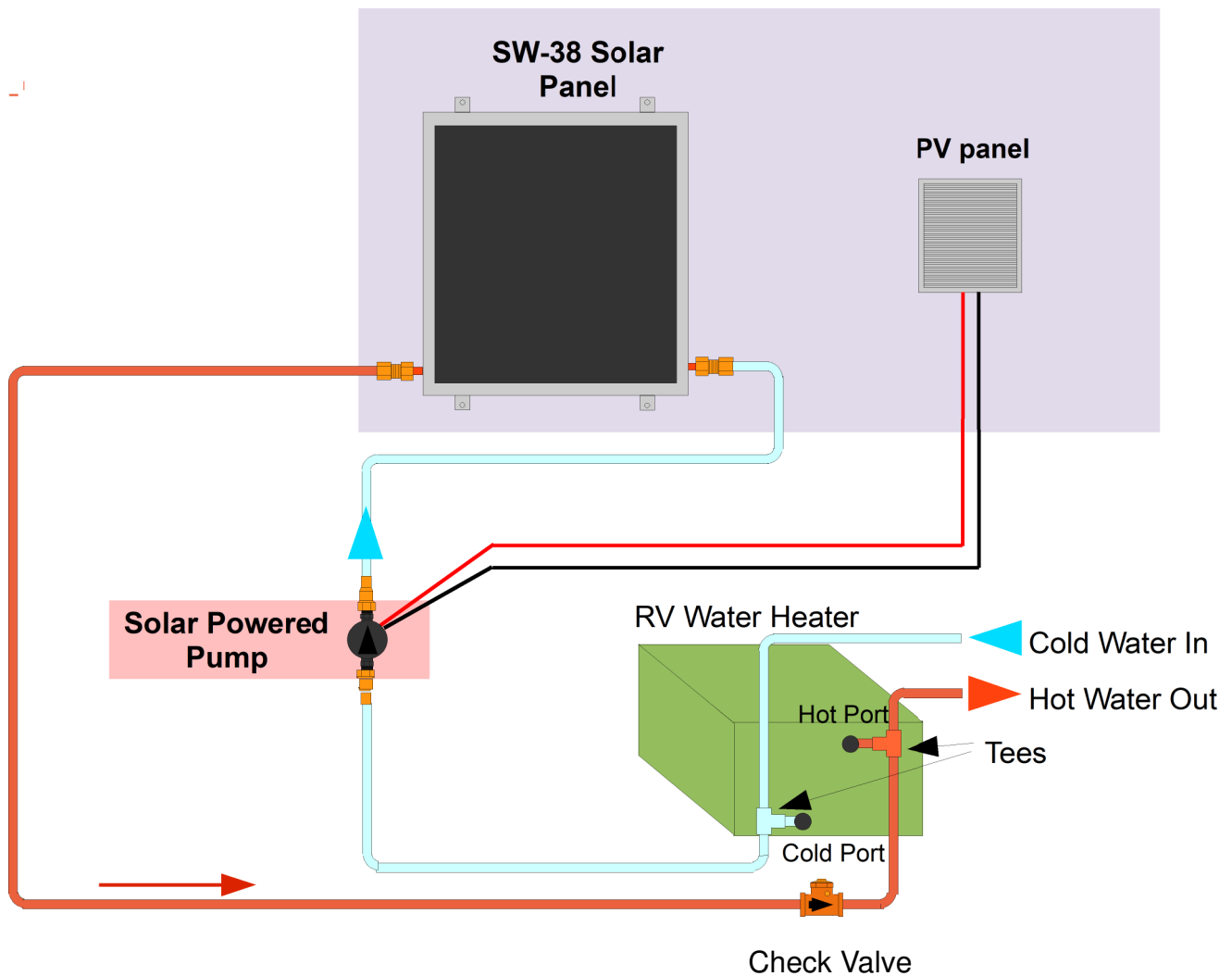
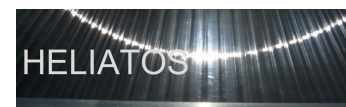


## General System Layout Sketch





## Introduction

This document describes how to install a Heliatos RV or Boat type solar water heating system. These systems use SW-38 or MH-38 Solar Water Heating Panels to directly heat water that is circulated through. These panels are designed to be easily extremely robust yet lightweight to stand up to mobile use. They are equipped with 3/8" compression fittings so making reliable tight connections between panels and to included 3/8" PEX tubing is easy and fast. No soldering or special tools are required.

**It is the installer's responsibility to assure that the panels themselves as well as the method and place of installation are in full compliance with all applicable regulations. Please consult the datasheet for the panels you are considering and assure that they are permissible and appropriate for your application.**

## Surface Preparation and PV Panel Location

In general, the surface you are planning to use for your installation should be fairly flat. Our panels are unique in that they can accommodate a base that is up to 1/4" uneven under each panel. Because of the special polycarbonate glazing they can flex a small amount without damage. The panels are equipped with four "feet". Each foot has a hole that is sized for a #8 deck screw. If you are mounting the panels to a surface that is suitable for using exterior deck screws, they are ready to install out of the box. However, if you require bigger bolts, you will have to enlarge the holes with a drill. Do not make the holes larger than 1/4", as the feet will not have sufficient strength to hold the panels down.

If you are using a rack to tilt your panels towards the sun, please make sure the feet all rest flat on the surfaces of the rack and all feet are securely fastened to the rack. Rack mounted panels can be subject to large wind forces.

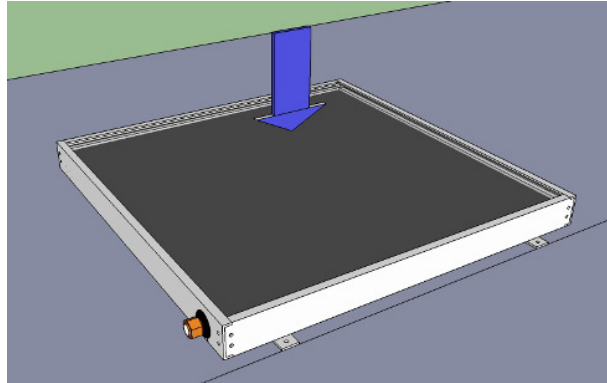
The PV (electric) panel that powers the pumps should be installed such that it gets the same sun as the water heating panels. This assures that the pumping power and heating are balanced. The panels themselves are strong enough to remain outside the RV at highway speeds, however the installer has to assure that the mounting can support the very large forces present due to air flow.

# RV/ Boat System Installation Instructions



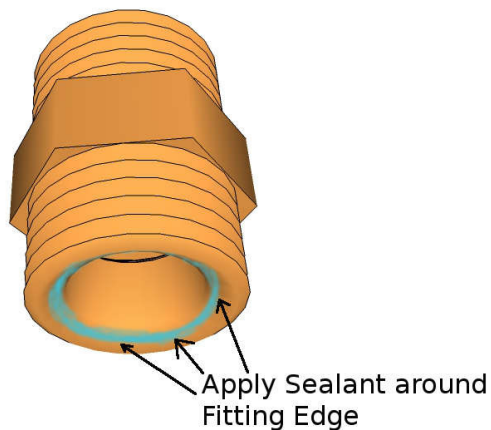
## Step 1

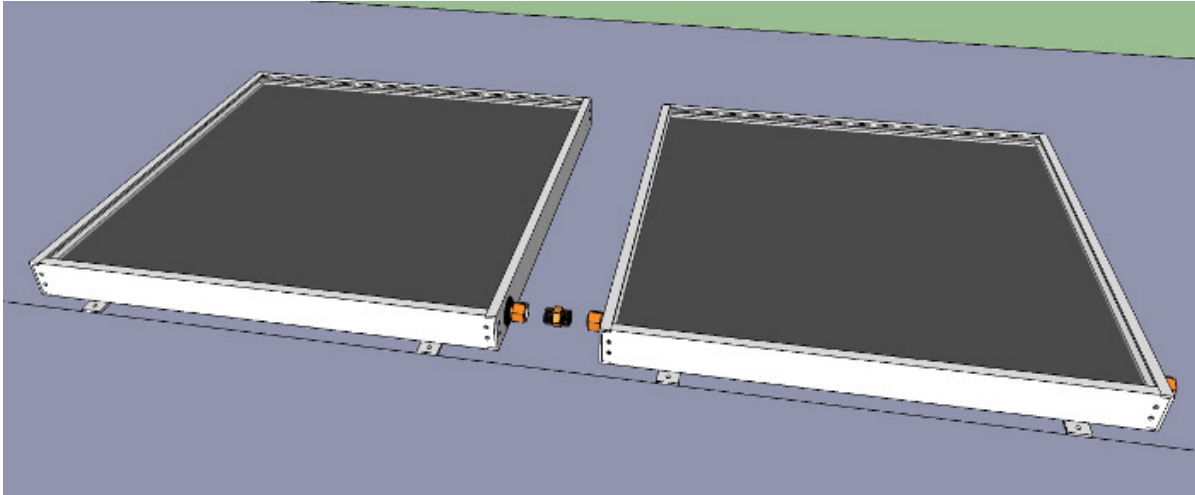
Unpack the panels from the box and lay them on the installation surface next to each other. Each panel is connected to the next with a compression union. The compression nuts that are pre-installed onto the tube in the panels thread onto the two ends of these unions.



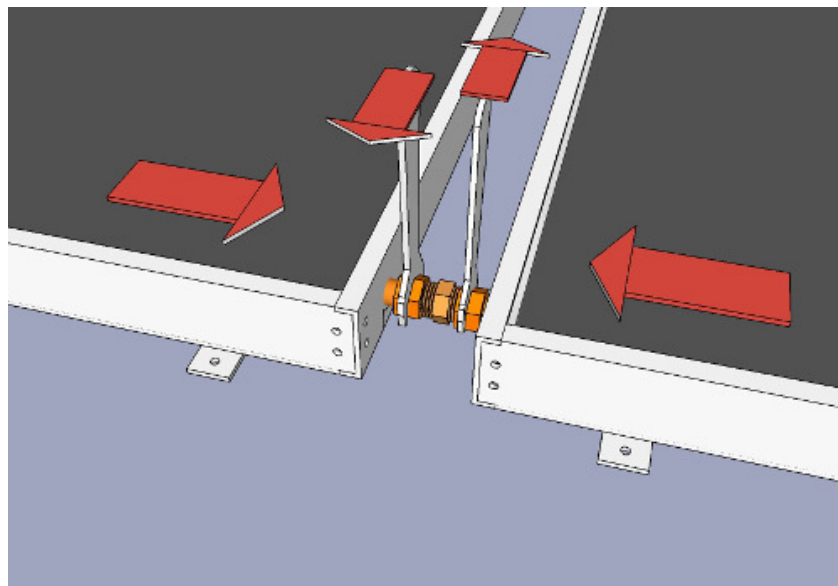
## Step 2

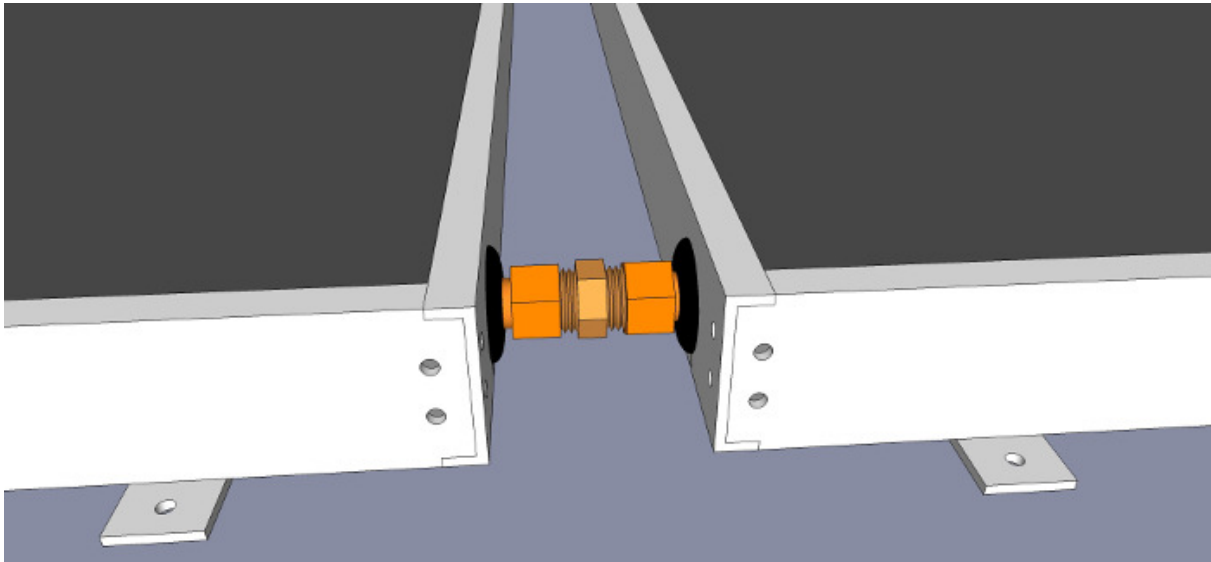
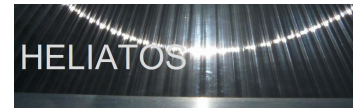
In this step (only applies if you have more than one panel) you connect the panels to each other. The connection is formed by the included compression unions. First some sealant has to be applied to the union. You should put a ring of sealant around the inside lip of both sides of the union as shown in the illustration.





Start threading the union into the nuts on one panel and hand tighten only to allow some flexibility when lining up the panels. Bring the panels close to each other so the nuts on the second panel can be threaded onto the union, hand tighten. Slightly tighten the nuts on both sides. Not much torque is needed to form a tight seal. Once all the panels are connected further tighten each nut by about 1 turn.





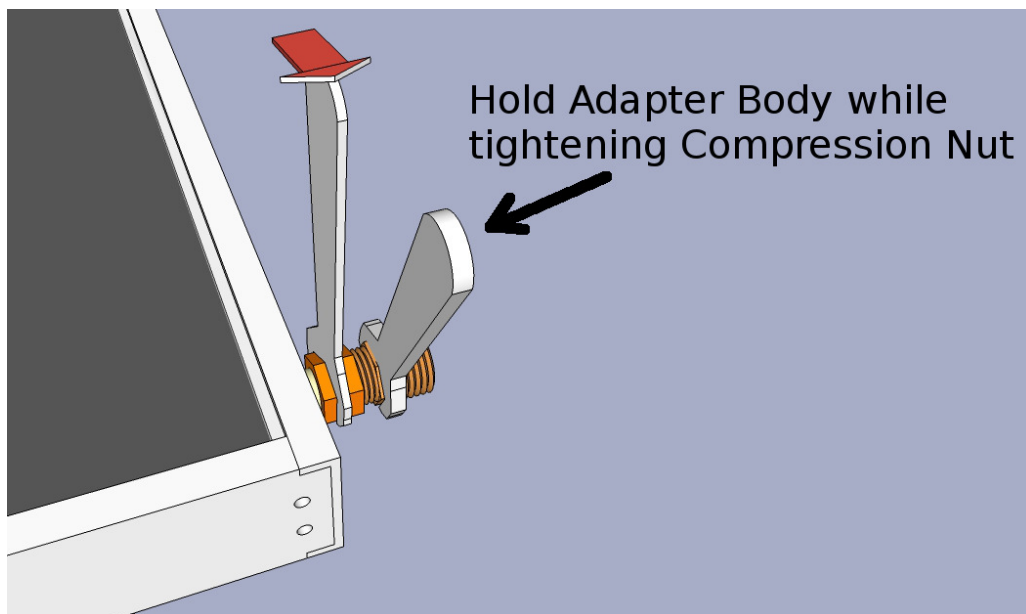
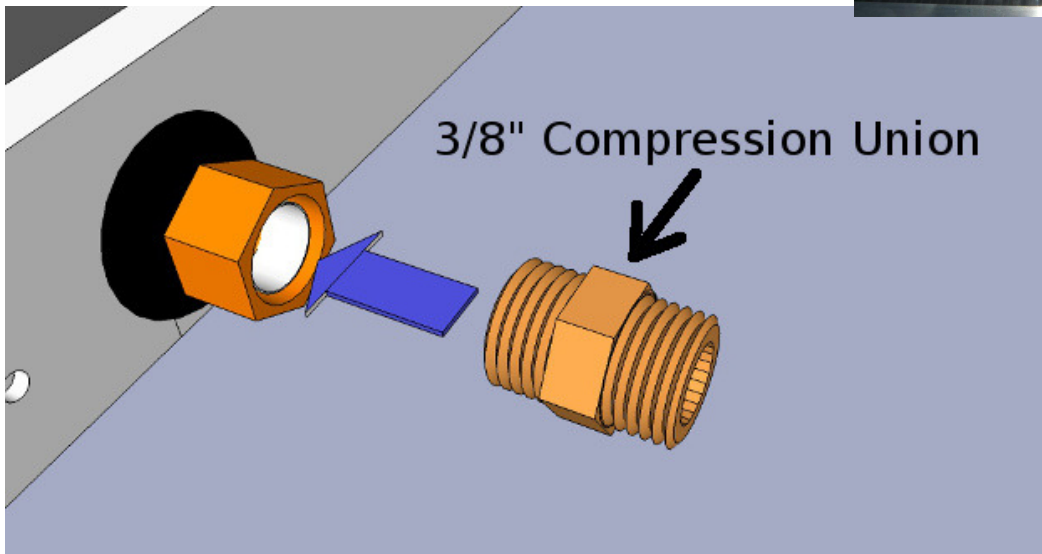
**Repeat steps 1 and 2 for all your panels**

### **Step 3**

This installation manual assumes that you have one of our Connection Fittings kits. These kits contain all the fittings needed to make the connection, but since all the components use standard fittings it would also be possible to obtain all the parts at a local home improvement center or plumbing supply.

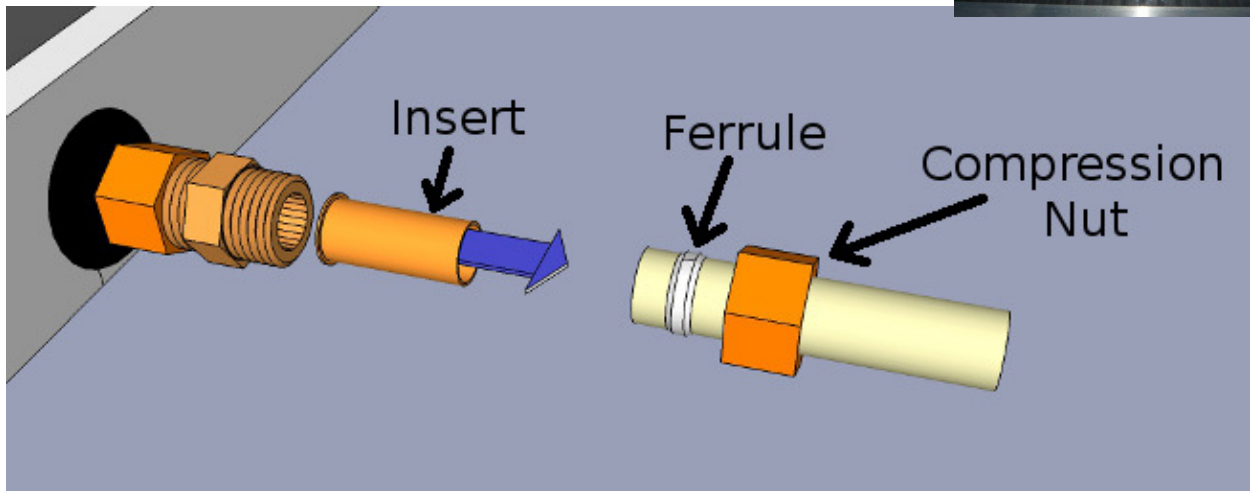
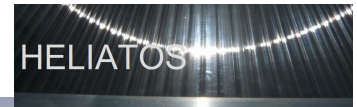
The direction of flow through the array of panels does not matter. It can go from left to right or the other way around.

First thread one 3/8" compression union into the nuts on the two end panels (left and right) and hand tighten. Apply sealant as in step 2.

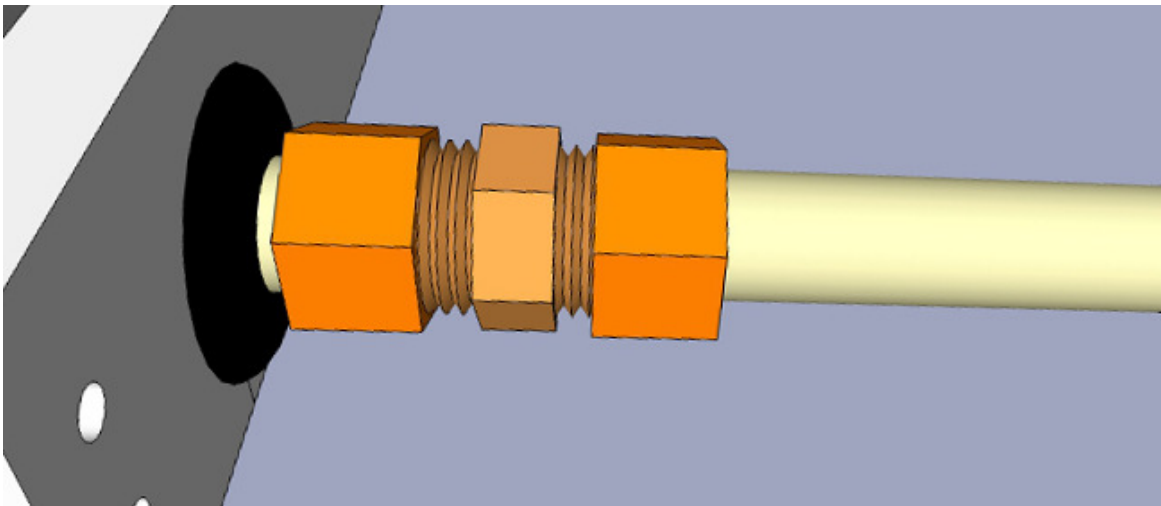


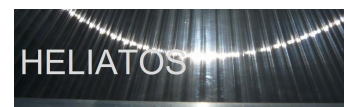
Next slide a compression nut onto both tubes followed by a nylon ferrule ferrule (ring). Insert a brass insert into the end of the PEX tubing to give it the extra strength needed for a good seal with compression fittings.

## RV/ Boat System Installation Instructions



Finally push the tubes into the 3/8" compression unions and thread the compression nuts onto the union. Hand tighten and then tighten an additional turn.

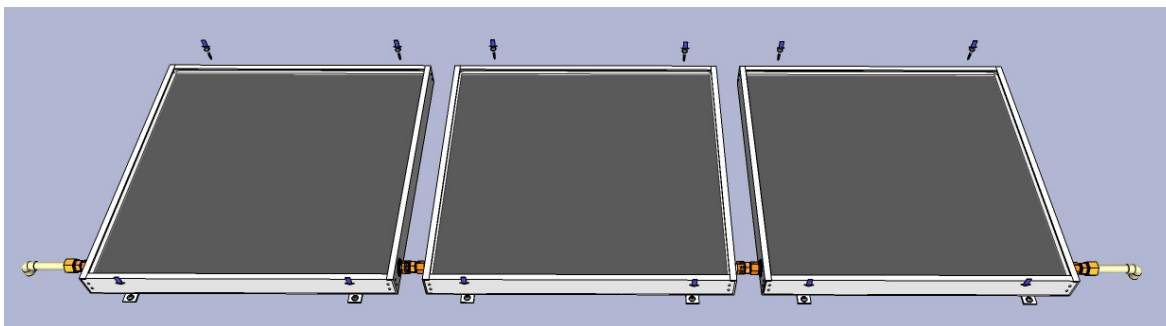
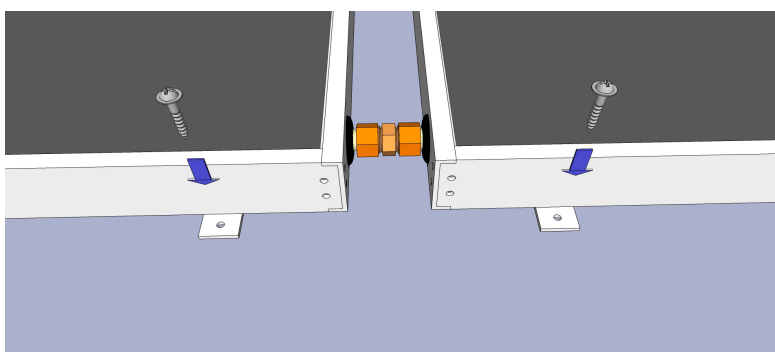




## Step 4

The panel array has to be securely tied down. This is especially true if it is mounted on a rack or on rails so that wind can catch the panels from below. We show a simple set of deck screws here, but depending what method you are planning to use you should follow the directions provided with your mounting hardware.

Please remember that these panels are very light so that under no circumstances can you rely on their weight to hold them in place.



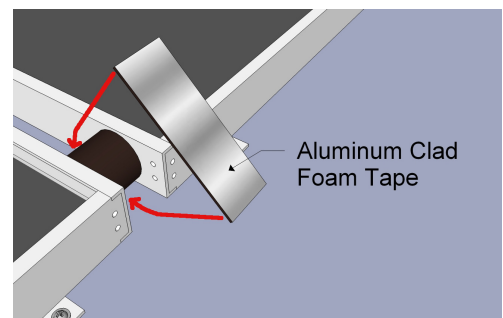
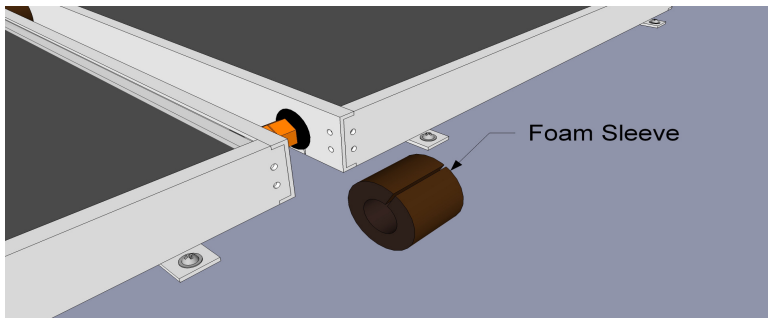
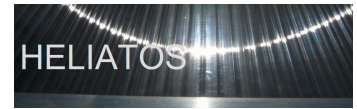
Mounting directly on a flat surface as well as on racks or rails is accomplished in a similar way. To achieve full wind loading capability it is important to attach all tabs securely to your mounting system.

## Step 5

The exposed fittings and pipes have to be insulated next. This can be done by surrounding each joint with a foam or fiberglass sleeve. If you are using plastic foam a piece of aluminum adhesive tape should be wrapped around the foam sleeve to prevent rapid UV degradation.

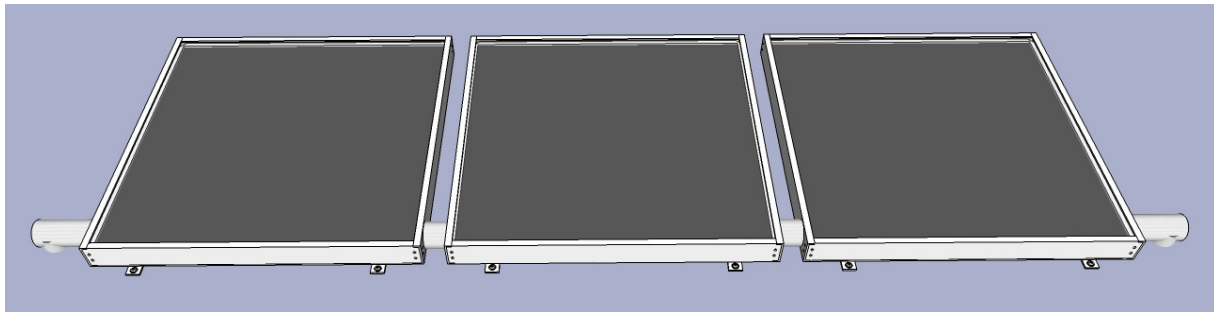


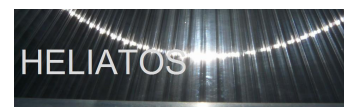
# RV/ Boat System Installation Instructions



Install a foam sleeve over every fitting between panels as well as at the ends of the panel array.

## Completed Array Installation



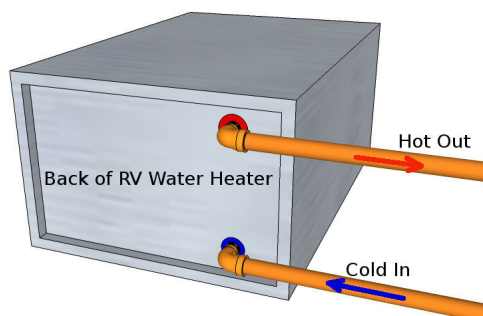


## System Connections

The RV/ Boat System solar water heater is designed to connect directly to the water heater. This means that the water from the heater tank circulates through the panel(s) to be heated up by the sun.

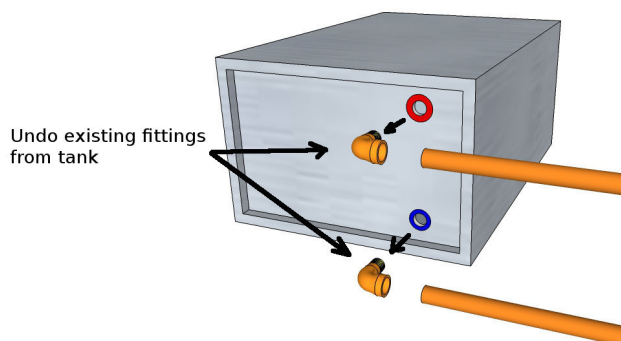
All RV/ Marine water heaters have a cold input and hot output connection. The following diagrams show a water heater that has a rectangular shape, which is most common, but some also are cylindrical. Both connections are usually 1/2" NPT (US Standard) female threads.

The following steps apply to most standard water heaters found in RV's however RV water heaters are not standardized to the extent that residential ones are. If you find that your unit is substantially different or the following installations instructions do not apply to your existing RV water heater please contact us with as many details about your installation as possible (photographs are most helpful). We will work with you in finding the easiest way to connect your system.



### Step 1

Unthread the two connections from the main tank. This will expose the two 1/2" female threads in the tank.



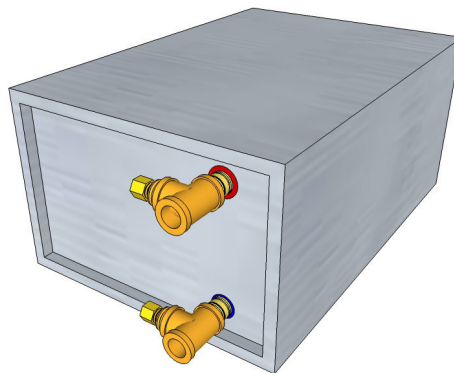
# RV/ Boat System Installation Instructions



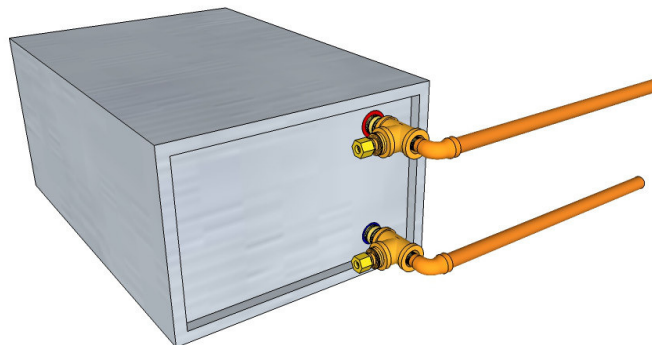
Thread 1/2" brass nipples into the 2 brass tees as shown (one nipple into each tee). Next thread the two 3/8" compression to male pipe adapters into the tees. Use Teflon tape on both connections.



Next thread the two assemblies into the hot and cold port of the water heater.



Now you can connect the original cold input and hot output lines to the tees that were just installed.

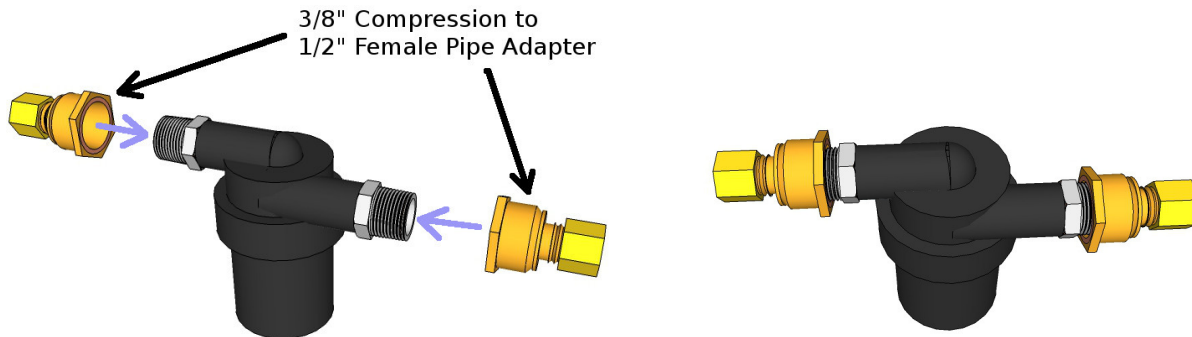


## Step 2

# RV/ Boat System Installation Instructions

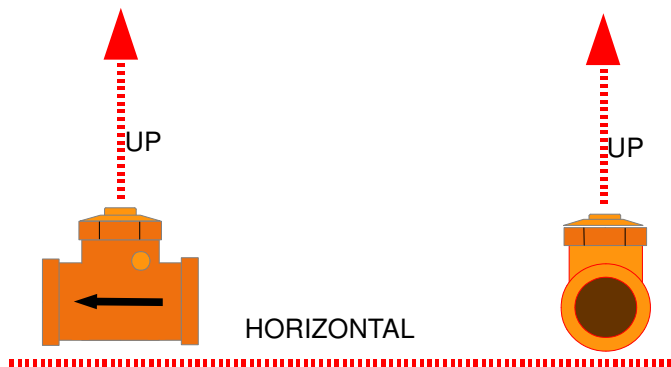


To prepare the pump thread two 3/8" compression to 1/2" female pipe adapters onto the two sides of the pump.



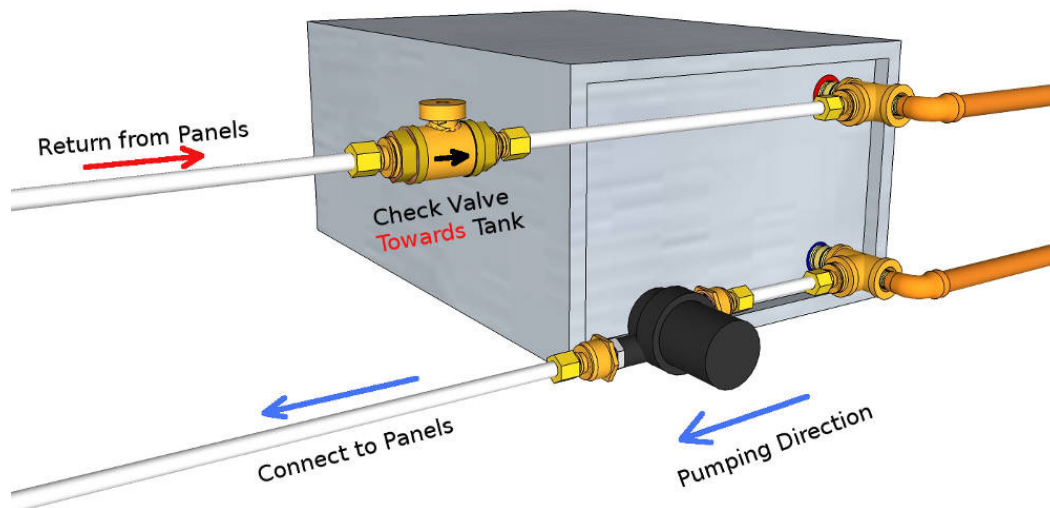
## Step 3

Prepare the check valve by threading two 3/8" compression to 1/2" male pipe adapters into the check valve using a generous amount of **Teflon Tape** on the two adapters. The final orientation of the check valve is important, as this is a gravity operated check valve. Please make sure that when the installation is complete the top of the check valve points straight up as shown here:



## Step 4

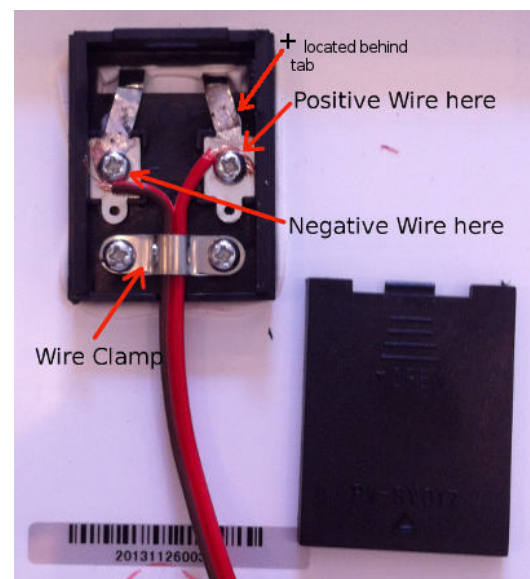
Now all the fittings are ready to be connected. The system diagram on the front page of this document shows the general layout of the connections. Near the water heater the pump has to be connected to the tee on the cold port. The return line from the panels needs to be connected to the tee on the hot port.

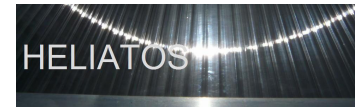


The small PV panel has to be mounted next to the water heating panel(s) and is used to power the pump. This way the pump will provide flow that is proportional to the amount of sunshine which also supplies the heat into the water heating panels. The PV panel has a small terminal box on the back. After opening it you can connect the included wire, red to the positive terminal and brown (or black) to the negative side.

The pump comes with a red and a black wire. Connect the red wires together using the included wire nuts and connect the brown (or black) wire to the black one on the pump.

The PV panel has a small terminal box on the back. After opening it you can connect the included wire, red to the positive terminal and brown (or black) to the negative side.





## General Installation Hints

- After everything is in place and the connections are made the air has to be bled out of the system. Make sure the RV's pressure system is working and there is water pressure in the lines. Loosen one of the fittings near the top of the system by the panels a little. Air will start escaping. After most of the air is expelled water will start dripping out, re-tighten the fitting. It may be necessary to repeat this procedure after a few days of operation once. After this you will not need to repeat again.
- No matter how warm the climate at your location the insulation of all exposed fittings / pipe is extremely important. Even small exposed areas will cause a lot of the solar heat to be lost. **The system WILL NOT FUNCTION PROPERLY until ALL the insulation is installed.**
- Please observe the polarity of the pump. Reversing the polarity can quickly destroy the electronics in the pump.
- If the water does not get hot within a reasonable time (one or two hours) the problem is most likely that there is still a significant amount of air in the system. With good sunshine feel the fittings on the panels and then near the water heater. If the panel fittings are much hotter than the ones near the water heater repeat the air bleeding procedure.
- With any persistent problems please call (661)-7SOLAR7 (9am to 5pm pacific time) or email [support@heliatos.com](mailto:support@heliatos.com) for tech-support.