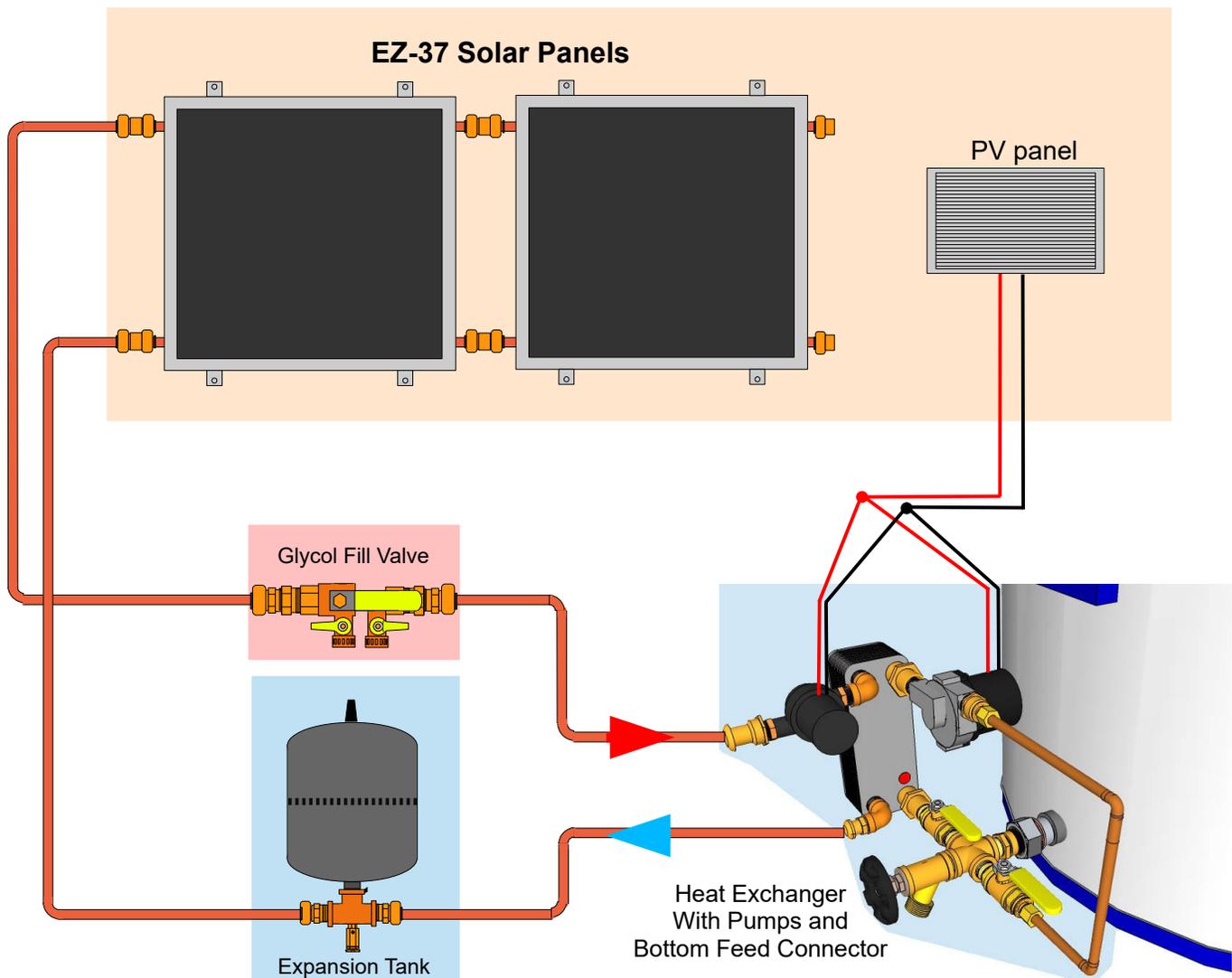




## General System Layout Sketch





## Introduction

This document describes how to install a Heliatos GH type solar water heating system. These systems use EZ-37 Solar Water Heating Panels in combination with a Stainless Steel heat exchanger. The circulation loop contains a freeze resistant non-toxic fluid. As a result there is no danger of the panels freezing and being damaged. The kit includes Dowfrost™ food rated glycol concentrate. It has to be diluted depending on the level of freeze protection required in your area. The EZ series panels are designed to be easily installed on any flat surface. They are equipped with 1/2" push-fit fittings so making reliable tight connections 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 location.**

## 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.

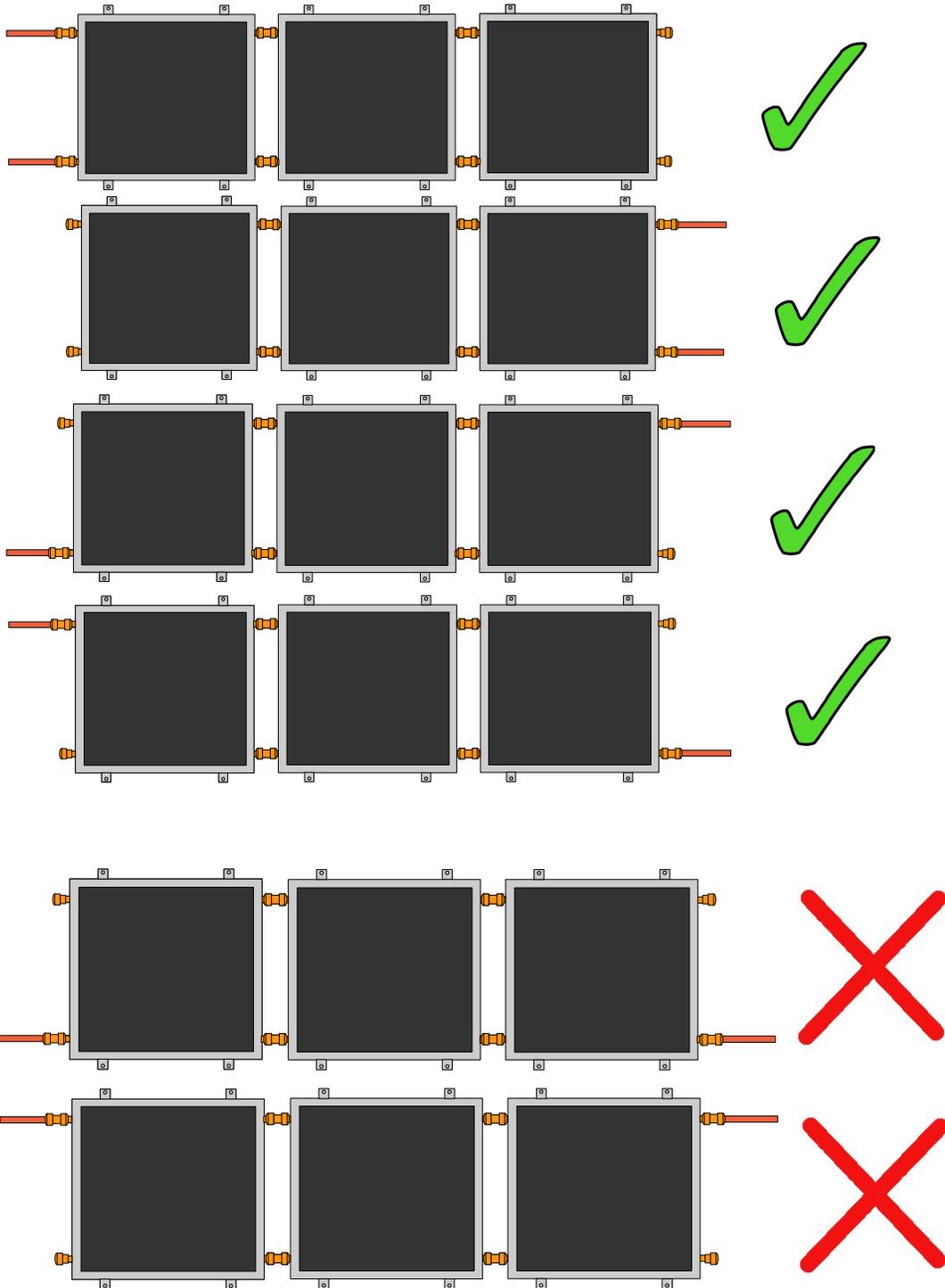
If you are using a rack to tilt your panels towards the sun, please make sure the feet all rest flat on the surfaces of the rack and all feet are securely fastened to the rack. Rack mounted panels can be subject to large wind forces.

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 two pumps are connected to the PV panel with the included wire. They are not interchangeable so please follow the instructions closely when installing the pumps.



## Conncting the Panels

The panels have to be connected to each other and to the pipes going to the water heater or solar tank. The following diagrams show the possible ways to arrange the panels and connections.

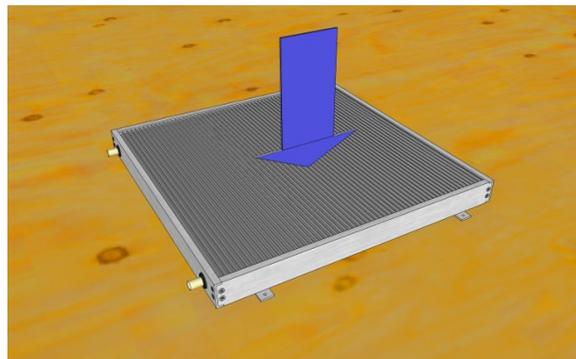


# GH-System Installation Instructions

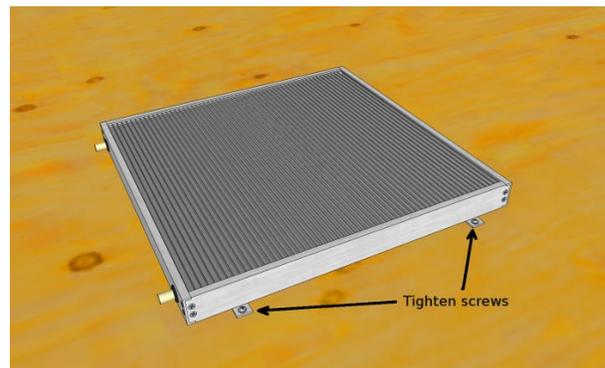
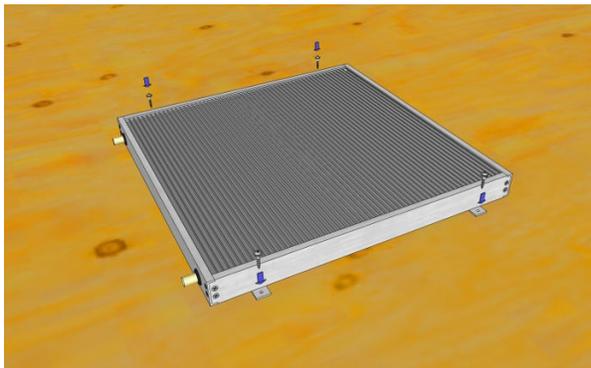


## Step 1

Unpack the panels from the box(es) and lay the first one on the installation surface.



Each panel 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.



To achieve full wind loading capability it is important to attach all tabs securely to your mounting system.

The connection between consecutive panels is formed by push-fit fittings which are included with the panels. Push-fit fittings are easy to use, fast, and have almost no chance of leaking. The kit includes four push-fit spacers which are used to make sure that the push fit fittings are pushed in the right amount.

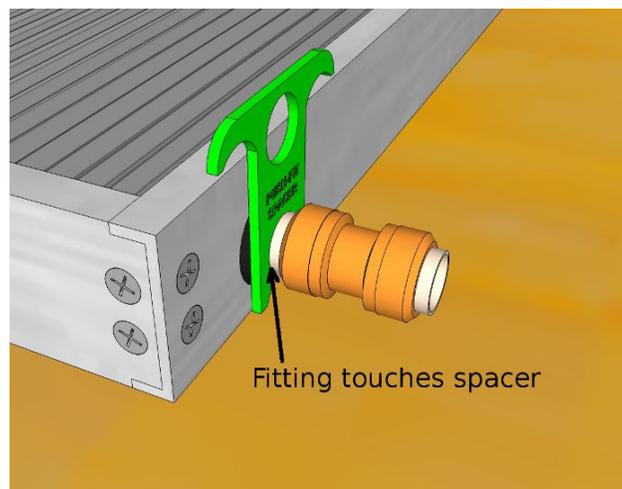
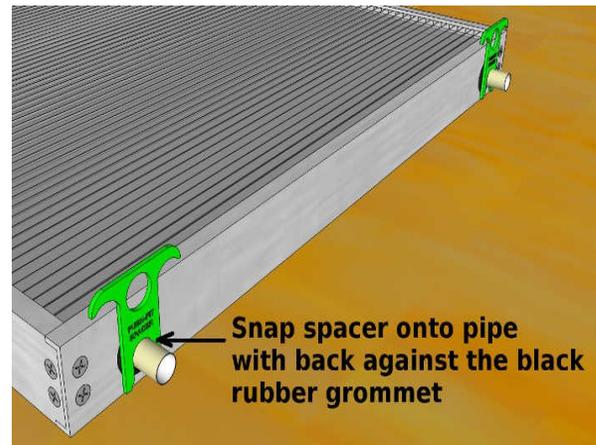
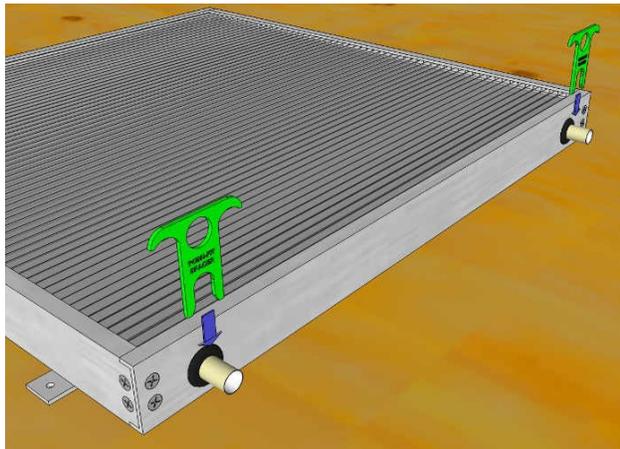
**If you don't use the spacers during assembly you will not be able to take the**

# GH-System Installation Instructions



**array apart in the future.**

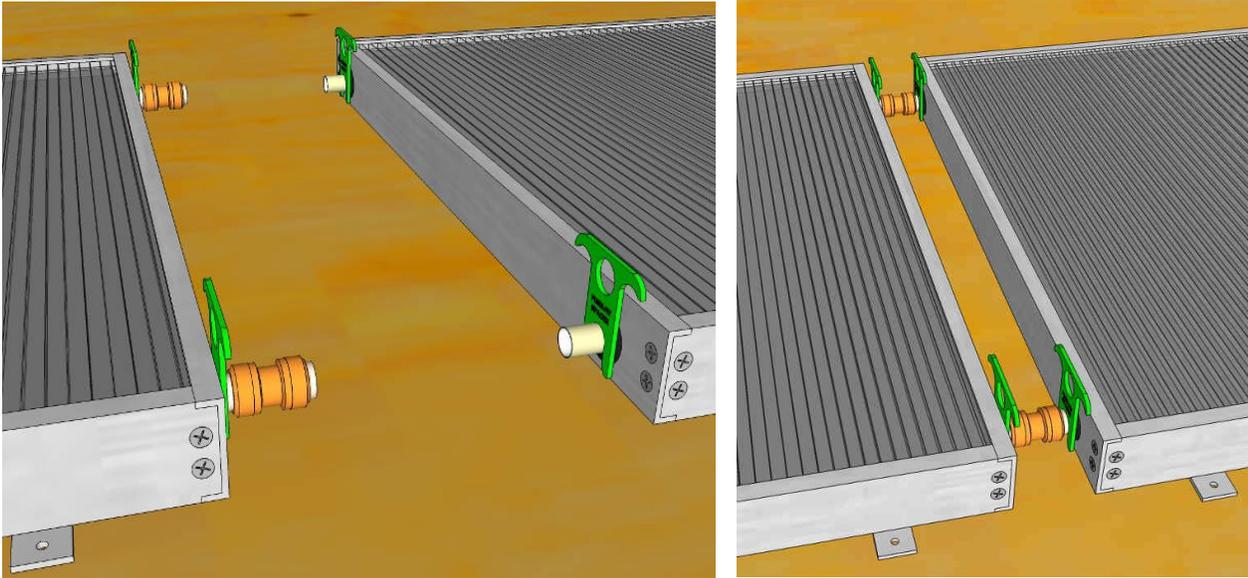
The spacers snap onto the pipes as shown in these diagrams:



With the spacers in place push two fittings onto the pipes until they touch the spacers. Please note that the fittings will slide onto the pipe with some resistance and it is important to get them well seated.

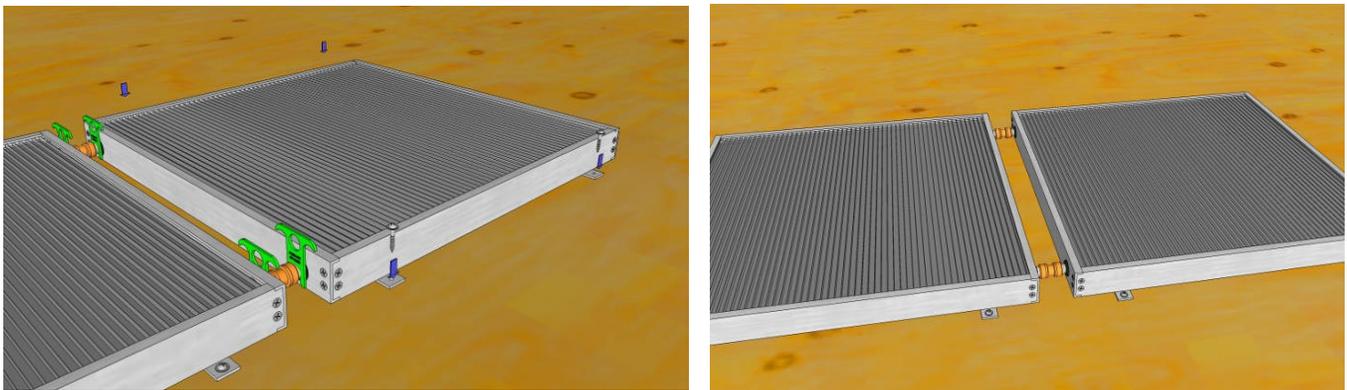
Next spacers need to be snapped onto the pipes in the second panel. With all four spacers in place the second panel needs to be pushed into the two open ends of the previous panels push-fit fittings. The fittings can be wiggled to line the pipes of the second panel up with the opening on the fittings.

# GH-System Installation Instructions



Once completely seated the fittings should be touching the spacers on both sides.

Before you remove the spacers give the second panel a slight tug away from the first to engage the push-fit locking mechanism and then fasten the second panel down. After the second panel is fastened down the spacers can be removed to be used in installing the next panel.



**Repeat these steps for all the panels you have.**

# GH-System Installation Instructions

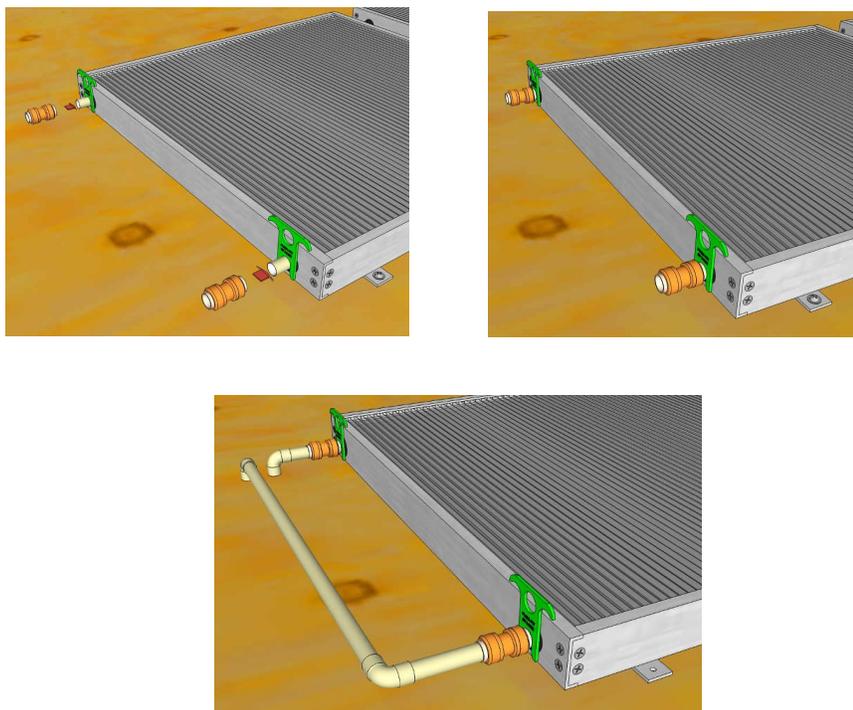


## Step 2

To connect the panel array to the water heater you can use 1/2" copper or 1/2" CTS CPVC pipe or 1/2" PEX tubing. If you are using copper pipe DO NOT solder to the panels.

Regardless of the type of pipe you use, the connections are made using the same push-fit fittings that are used for connecting panels to each other.

First put two spacers onto the pipes in the panel where you will be connecting the input and output then push on two fittings until they touch the spacers.



Next the connecting pipes can be pushed into the fittings. The proper insertion depth is close to 3/4". The spacers can be removed **AFTER** the pipes have been pushed in properly.

If you are using PEX tubing to connect to the panel array you need to put a plastic insert into the PEX tubing before you push it into the fitting. The plastic insert reinforces the PEX from the inside so that the push-fit fitting can hold on to the tubing securely.

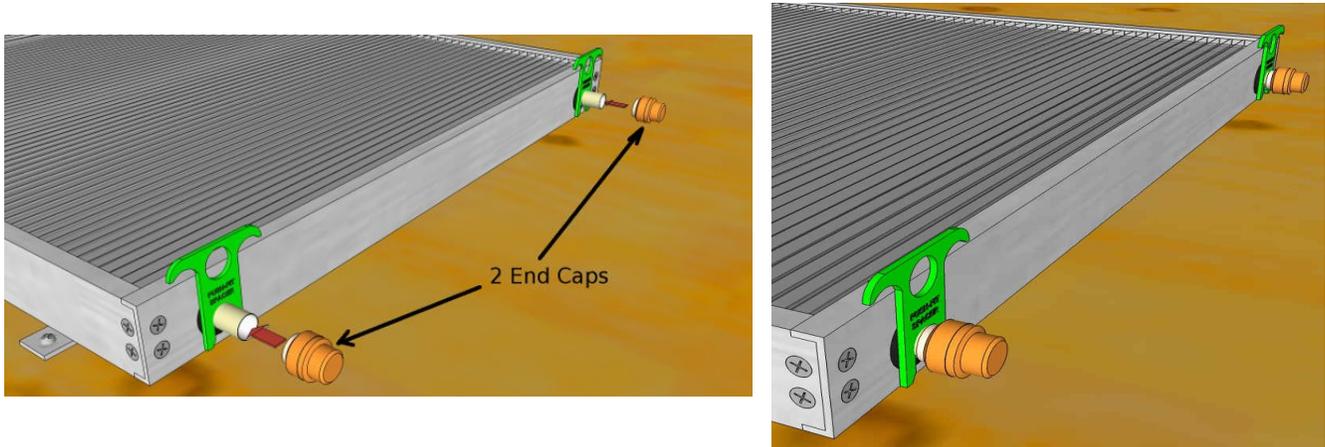


# GH-System Installation Instructions



## Step 3

You should have two remaining open pipes on the set of panels. The connection fittings kit includes two “push-fit caps” that are used to close off these remaining open pipes. As before two spacers need to be put on the pipes before the fittings are pushed on.



Once the end cap and automatic air vent are pushed in the spacers can be removed.



**To dis-assemble the array of panels this kit includes a special tool for removing push-fit fittings from the panels. Please consult the “Push-Fit Removal Tool Instructions” in the Appendix for details.**

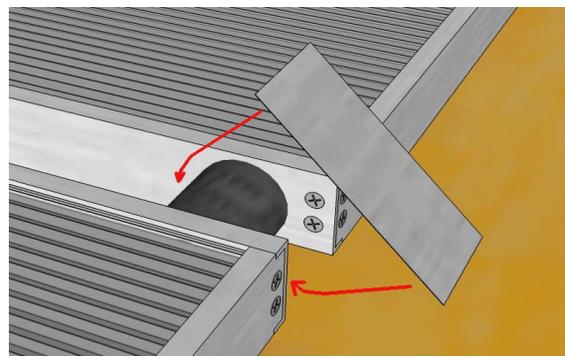
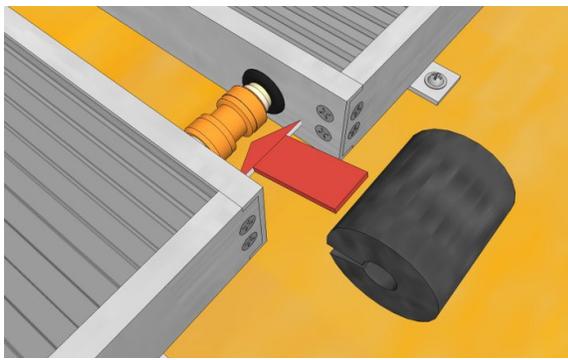
# GH-System Installation Instructions



## Step 4

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.

Install a foam sleeve over every fitting between panels as well as at the ends of the panel array. The foam sleeve that goes over the automatic air vent should protect the vent from rain but still allow for the air vent valve to dry over time.



The pipes to and from the array need to be insulated everywhere between the tank and the panel array. The insulation prevents heat loss which will cause the system to function poorly or not at all. This is true even in very hot climates because the water will be significantly hotter than even the hottest surrounding air.

### Completed Array Installation





## Bottom Feed Connector and Heat Exchanger Installation

### BEFORE YOU BEGIN

**There are three sections left to complete the installation (Bottom Feed Connector and Heat Exchanger, Glycol Fill Valve, Expansion Tank). While they are independent of each other you should familiarize yourself with all three before proceeding to make sure the plumbing installation fits all three components cleanly.**

The “Bottom Feed Connector” is designed to connect solar water heating system directly to your existing standard water heater. It's main advantages are ease of installation, efficiency, and that under most circumstances it eliminates the need for check valves and the associated increased pumping power requirements.

To install this connector your water heater must be equipped with a standard “boiler drain”. Almost all water heaters have this drain. The only exceptions are extremely small point of use heaters (2.5 gals.) and some side connecting units.

The connector and boiler drain have standard pipe threads, so during installation apply a generous amount of sealant to the threads before installation. The same is true for the heat exchanger EXCEPT that the two pumps have to be mounted using Teflon Tape on both sides of the pump. It is important to mount the TD5 pump (stainless steel body) in the correct location and to set the power selector properly. If you interchange pumps (mount the HS-17 in place of the TD5) or do not set the power level for the TD5 correctly the system will not work properly.

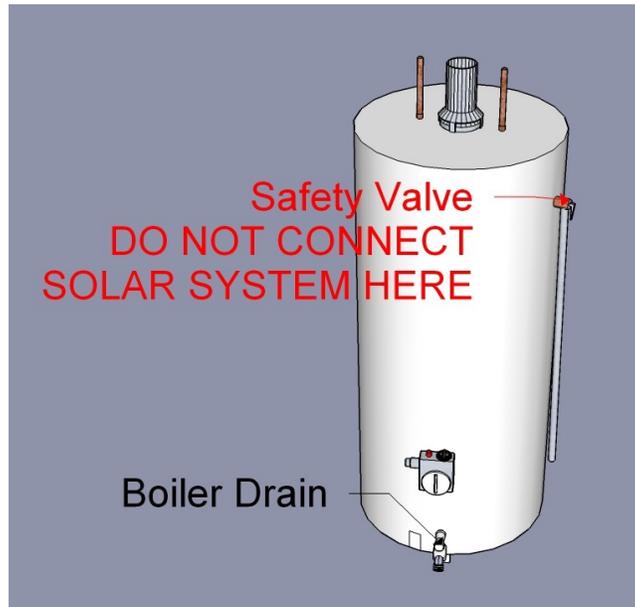
The heat exchanger mounts directly to the Bottom Feed Connector.

# GH-System Installation Instructions



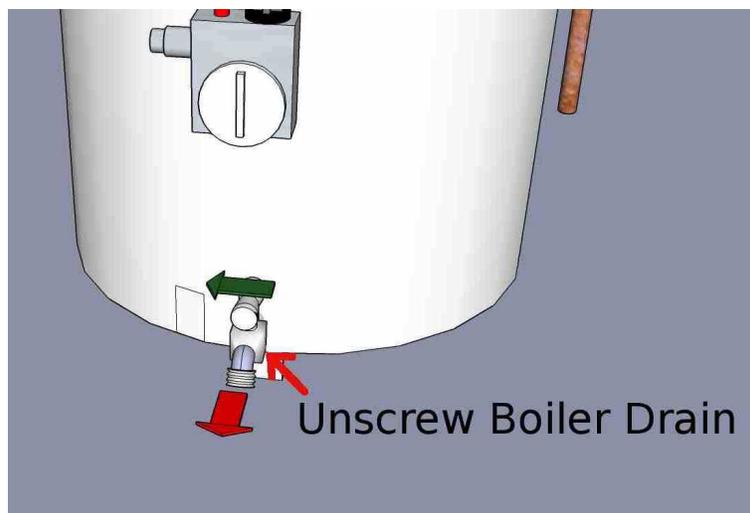
## Step 1

Turn off the water heater and locate the “boiler drain”. All standard drains are located near the bottom of the water heater. Drain the water heater using a standard garden hose.



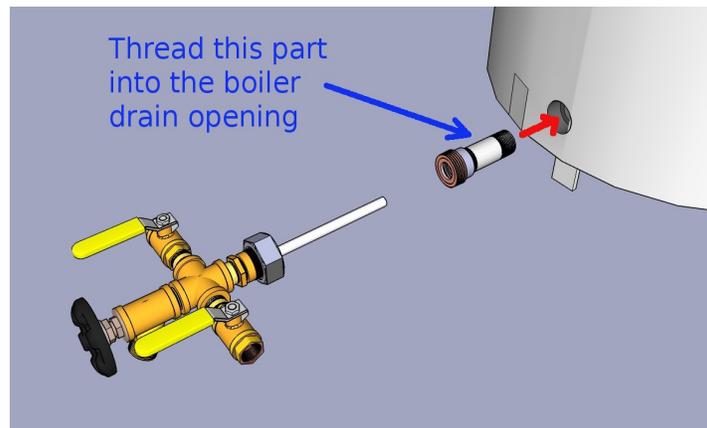
## Step 2

Once the tank is empty unscrew the drain valve to remove it from the water heater tank. The Bottom Feed Connector has a built in new metal boiler drain so the existing one will not be needed any more.



## Step 3

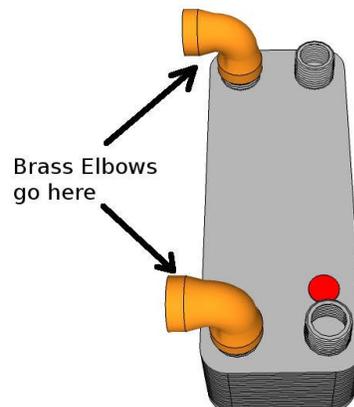
The bottom feed connector consists of 2 main parts that are held together by the large nut in the middle. First you have to separate the two parts by unscrewing the big nut. Then thread the steel part (gray metal) into the water heater where the boiler drain used to be using a generous amount of plumbing sealant (included) on the threads.



The next steps are most easily accomplished with the brass part of the Bottom Feed Connector on a workbench or table.

## Step 4 – Heat Exchanger Assembly

In this step the heat exchanger is mounted on the brass portion of the Bottom Feed Connector.

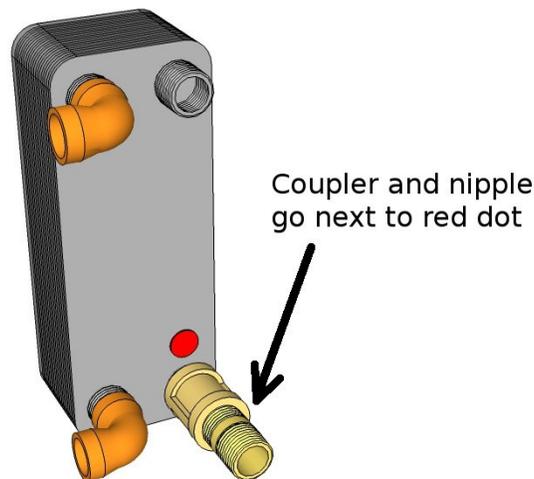


# GH-System Installation Instructions

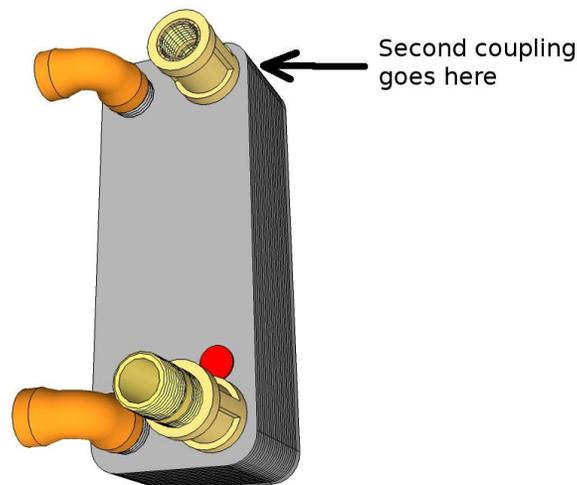


When installing the fittings and parts onto the heat exchanger the sequence is important. Changing the sequence will cause you to be unable to complete the installation. Also it is important to install the respective fittings on the right ports. If you cross ports the glycol and water loops will not be separate and your domestic water supply will be contaminated with glycol. Thread the two brass elbows onto the heat exchanger using **plumbing sealant**. If you hold the heat exchanger facing you with the red dot on the bottom right side the elbows go on the two left side ports.

Thread a hex coupling onto the port next to the red dot. Then thread a nipple into the coupling using **plumbing sealant** on both.



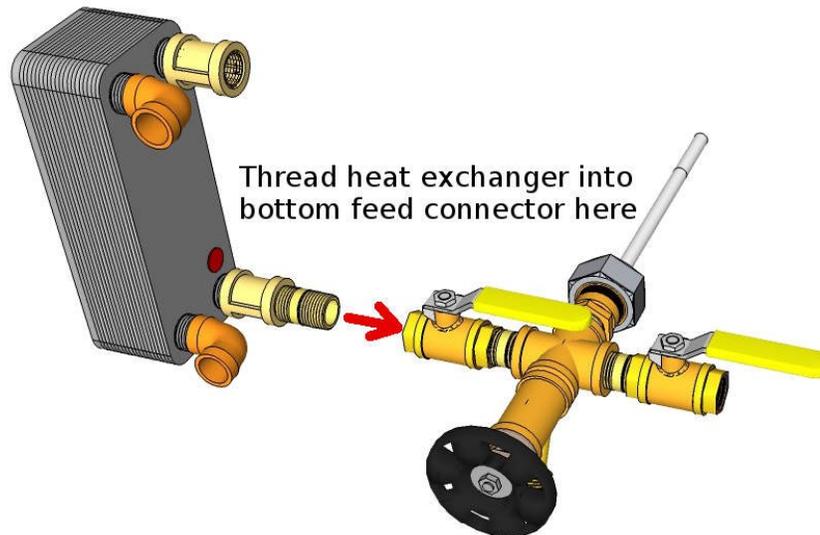
Thread another hex coupling onto the remaining port on the heat exchanger using **plumbing sealant**.



# GH-System Installation Instructions



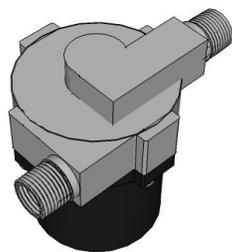
Thread the heat exchanger assembly into the cold (left) side of the bottom feed connector using [plumbing sealant](#). The nipple (near the red dot) will thread into the ball valve.



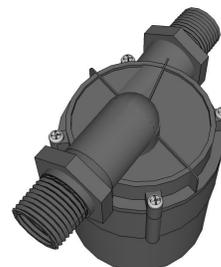
This kit includes 2 pumps. One is a TopsFlo TD5 pumps which has a full stainless body. The second is a Heliatos HS-17 which has an all black Ryton body. The TD5 pump has a small hole in the back which allows you to select the power setting. A small plastic key is included with the pump to enable you to set the setting.

**It is very important to set this pump so the arrow points between the two number 1's. If this setting is not set correctly the entire system will not function properly.**

The HS-17 does not need to be set up.



TD5

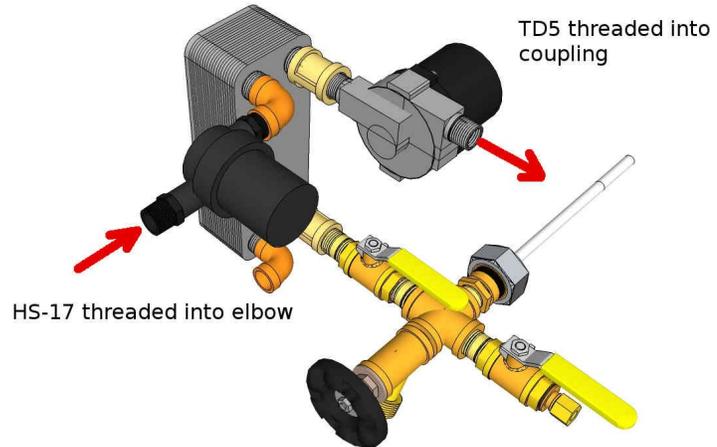


HS-17

# GH-System Installation Instructions

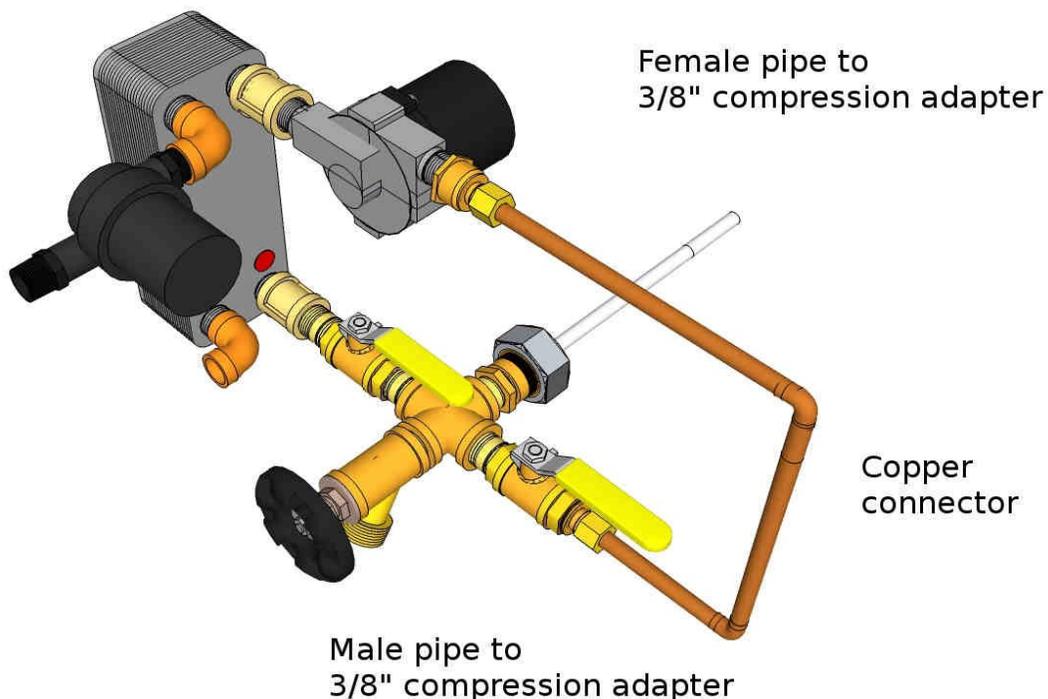


Thread the TD5 into the HEX coupling and the HS-17 into the Elbow at the top of the heat exchanger using a generous amount of **Teflon Tape**. The TD5 should pump AWAY from the heat exchanger and the HS-17 pump INTO the heat exchanger. The arrow on the pump body points towards the output side and should be in the direction of the red arrow in the illustration.



**On the HS-17 please use a wrench on the thread you are installing, NOT the one on the opposite side of the pump. The pump cannot withstand tightening torque.**

Thread the 3/8"OD Compression to 1/2" Male Pipe Adapter onto the first pump and the 3/8"OD Compression to 1/2" Male Pipe Adapter into the right ball valve on the Bottom Feed Connector. Then install the Copper Tube Connector as shown in the diagram.

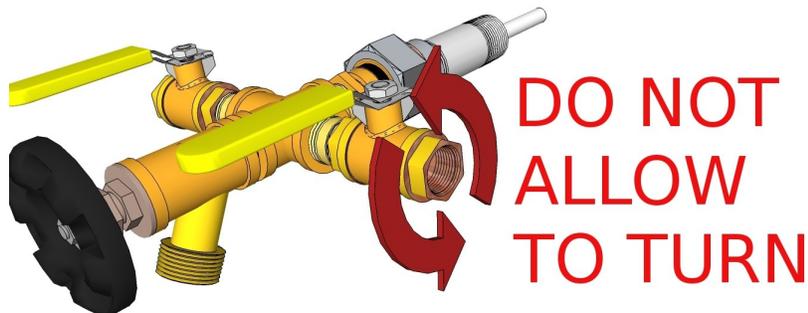


# GH-System Installation Instructions

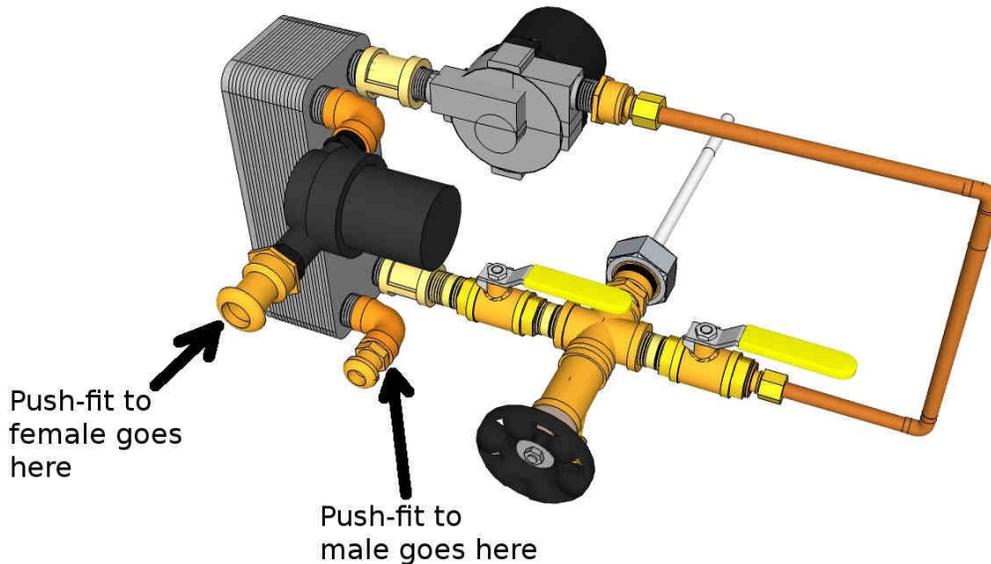


## Installation Warning:

When tightening the 3/8"OD compression to 1/2" male pipe adapter to the ball valve on the hot side of the Bottom Feed Connector DO NOT allow the ball valve to rotate. It is important to prevent rotation of the ball valve with a wrench while tightening fittings to it.

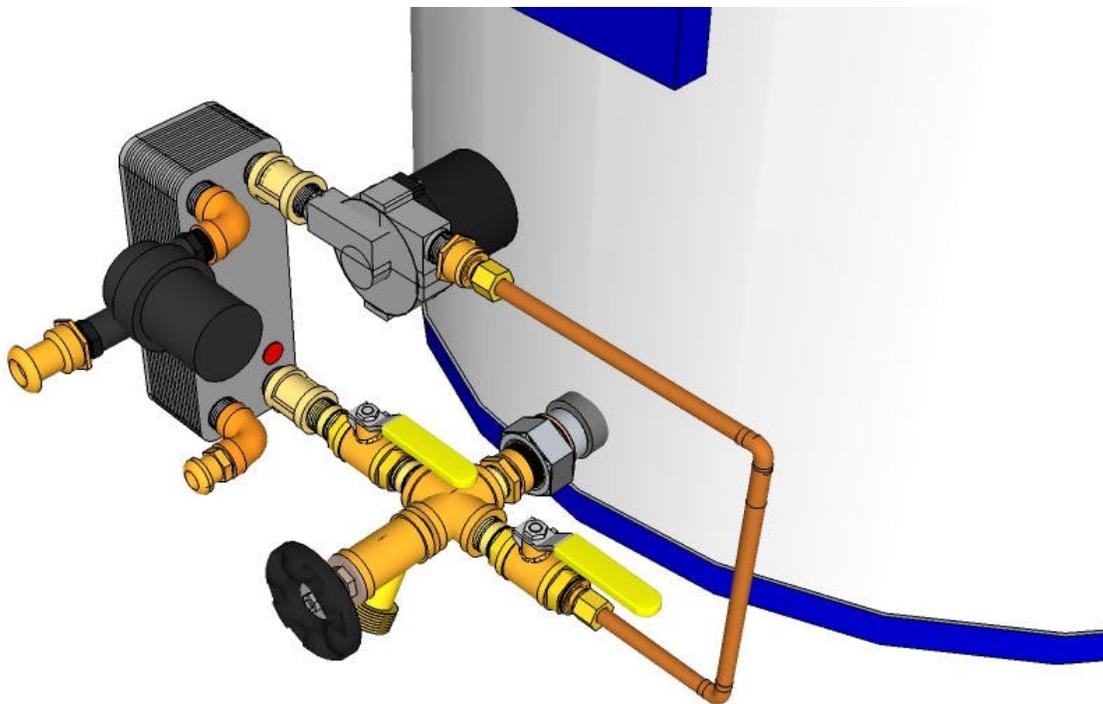
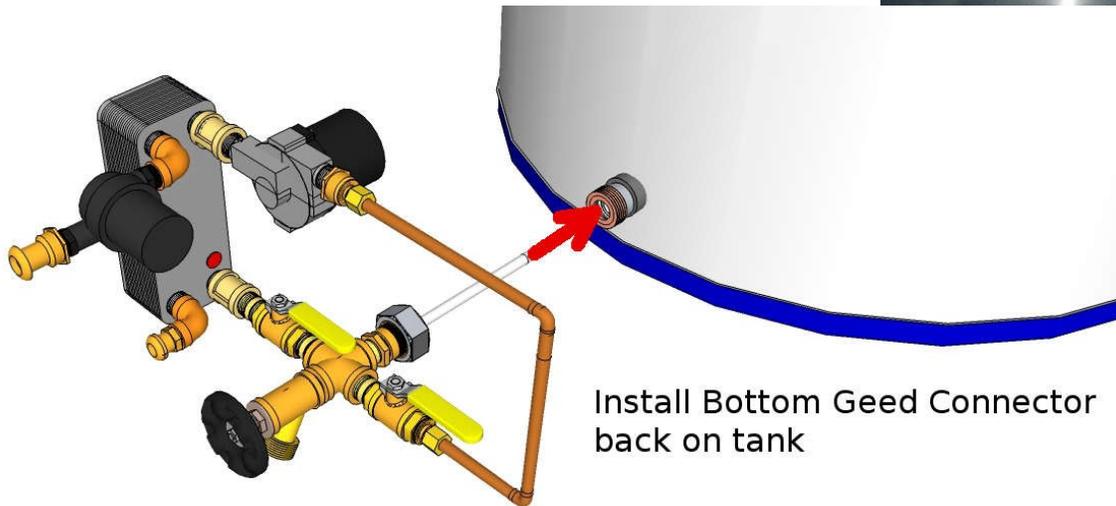


Finally the two push fit adapters can be installed. The push fit to female adapter goes on the second pump and the push fit to male fitting goes in the lower elbow.



Now the entire front end of the bottom feed connector with attached heat exchanger and pumps can be installed on the tank. Please make sure the rubber gasket inside the large nut is in place correctly.

# GH-System Installation Instructions

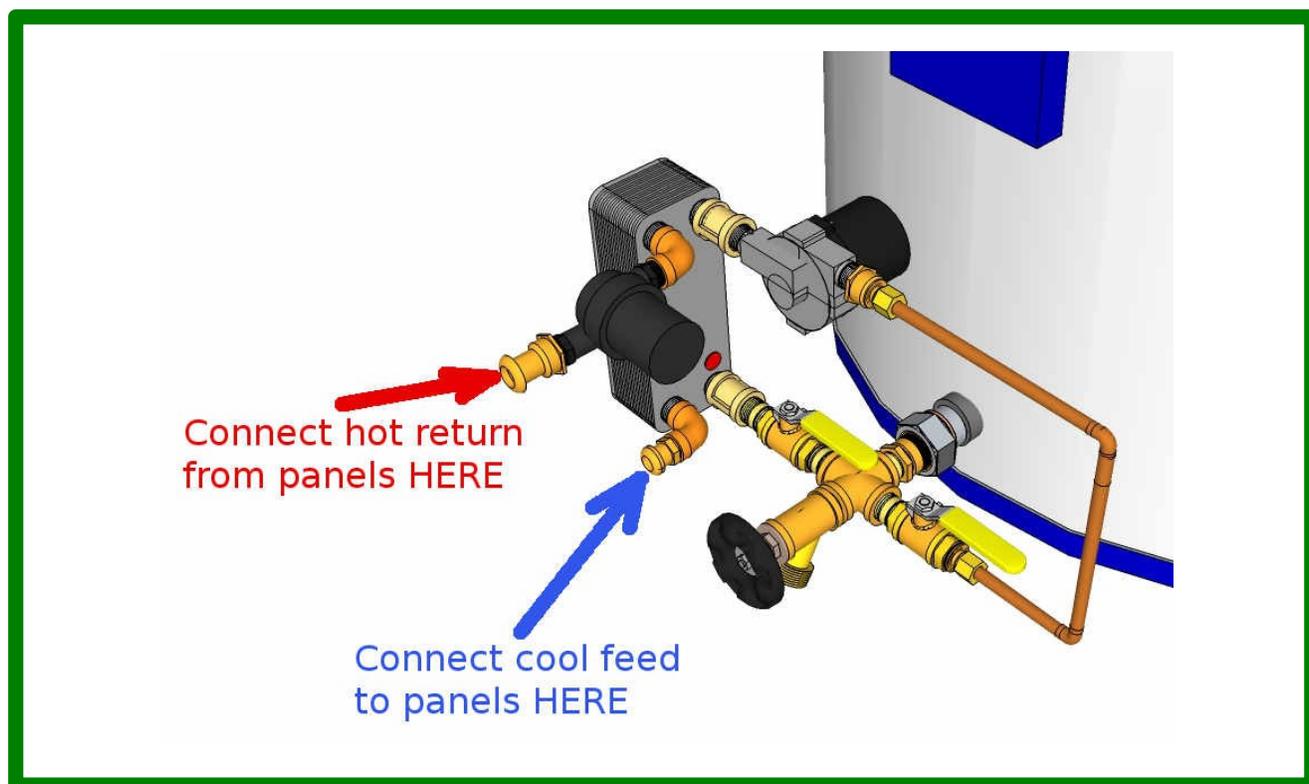


Once the bottom feed connector assembly with heat exchanger and pumps is installed on the tank you can start re-filling the tank. As the tank is filling please keep checking the various fittings for leaks.



## Step 5 – Connecting Pipes from Panel Array

The next step is to insert the pipes going to the panels into the push fit adapters. If you are using piping that is not flexible, especially copper please make sure that the weight of the piping does not rest on the pump. The line going to the array with the cooler glycol connects at the bottom of the heat exchanger using the push fit adapter. The line coming back with the solar heated glycol connects at the top to the push fit fitting on the second pump. The two elbows can be rotated somewhat to make connection easier. You can now open the two valves on the bottom feed connector to pressurize the water loop and check for leaks. Open the valve on the left first and then the valve on the right. The water loop simply goes through the TD5 pump and the water connector (copper tube) back to the bottom feed connector. Sometimes it can be helpful to slightly loosen the compression fitting near the TD5 pump to let air that may be trapped in the water loop out. You will not have to repeat this after the first time. **Completed Bottom Feed Connector and Heat Exchanger Installation with Ball Valves in OPEN position**

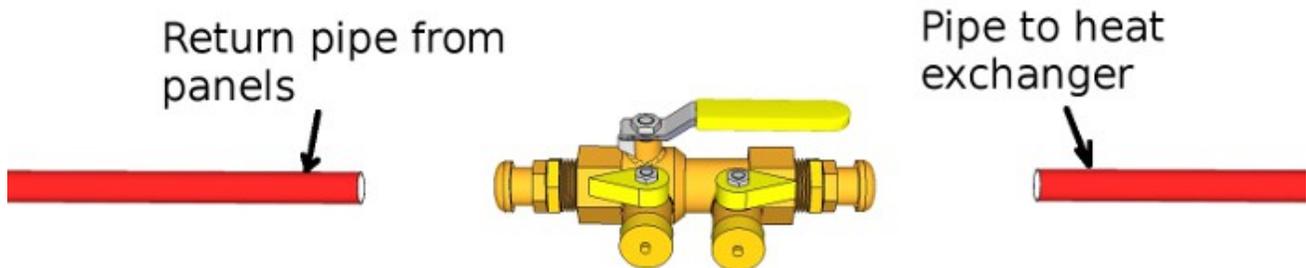




## Step 6 - Installing the Glycol Fill Valve

The installation of the Glycol Fill valve is described in the instructions that are included in the box with the item itself.

While it can be installed anywhere on the hot return line it is worthwhile to choose the location carefully. Using this valve involves pouring the glycol in a bucket or similar container and extending two two foot hoses (included with the item) into the glycol in the bucket. Therefore it makes sense to locate the fill valve in a place that makes this process easy. Usually this would be on the hot return line close to where it connects back to the heat exchanger so that the bucket can be set on the ground near the water heater.



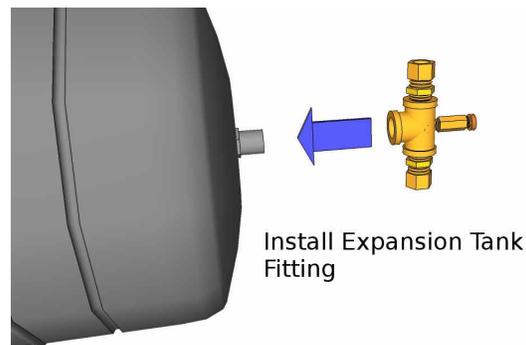
## Diluting the Included Glycol

The level of freeze protection can be selected by the dilution of the included DOWFROST Glycol.

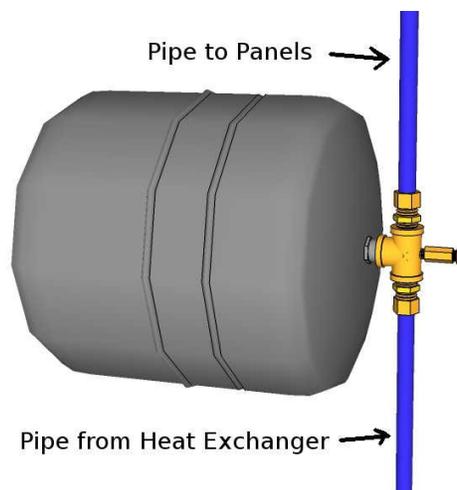
Freeze Protection to	Dilution
-30°F	Mix 1 part DOWFROST with 1 part water
5°F	Mix 1 part DOWFROST with 2 parts water
20°F	Mix 1 part DOWFROST with 4 parts water

## Step 7 - Installing the Expansion Tank

Install the expansion tank inline with the cool feed line going TO the panels. The fittings kit includes an expansion tank fitting with 25psi pressure relief valve. First thread this fitting onto the expansion tank using [sealant](#). The pressure relief valve is included in the system to conform to regulations regarding using a single walled heat exchanger. Our heat exchanger is made from alloy 316 stainless steel and therefore cannot corrode, should some unforeseen event cause a breach between the potable water and glycol side the over-pressure of the potable water side will open this pressure relief valve and cause the glycol to be expelled rather than the glycol entering the potable water.



Once the expansion tank fitting has been installed you can install the tank inline on the pipe carrying the cooler glycol from the heat exchanger to the panels. The location along this line is not important.



## Step 8 – Connecting the Pumps to the PV Panel

The 25W PV panel has to be mounted next to the water heating panel(s) and is used to power the pumps. This way the pumps will provide flow that is proportional to the amount of sunshine which also supplies the heat into the water heating panels.

Both pumps have to be connected to the same PV panel with the included wire. 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.

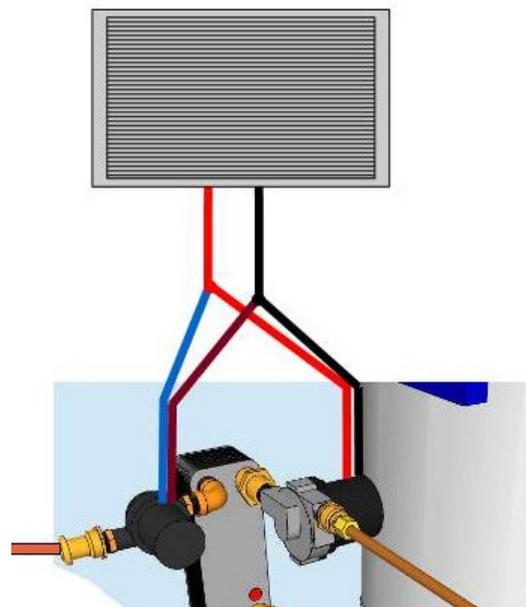
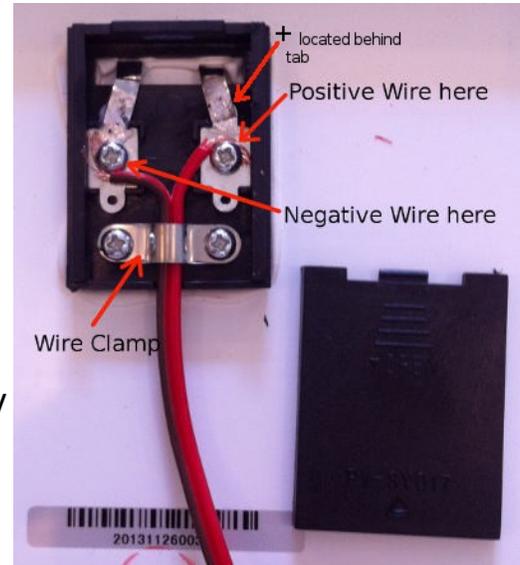
The red (positive) wire goes to the right terminal and the black (negative) wire goes to the left terminal as seen in the picture.

The polarity symbols in the junction box are very small and behind the tabs.

The TD5 pump comes with a red and a black wire. The red wire is the positive side and the black one the negative side.

**The HS-17 pump has a blue and a brown wire. The blue wire is the positive side and the brown one is the negative side. Reversing the polarity on the HS-17 will immediately destroy the electronics in the pump.**

Connect the red wire from the TD5, the blue wire from the HS-17 and the red wire from the PV panel together, and then connect the black wire from the TD5, the brown wire from the HS-17 and the black (or brown) wire from the PV panel together using the included wire nuts.

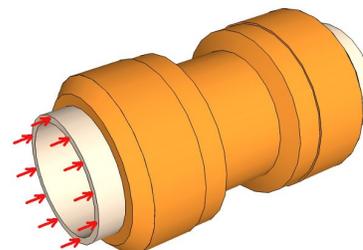




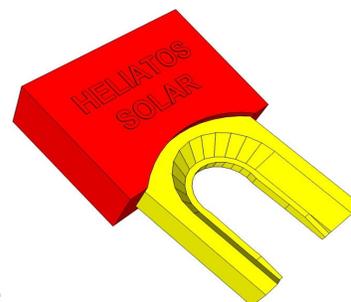
## Appendix

### Push-Fit Removal Tool Instructions

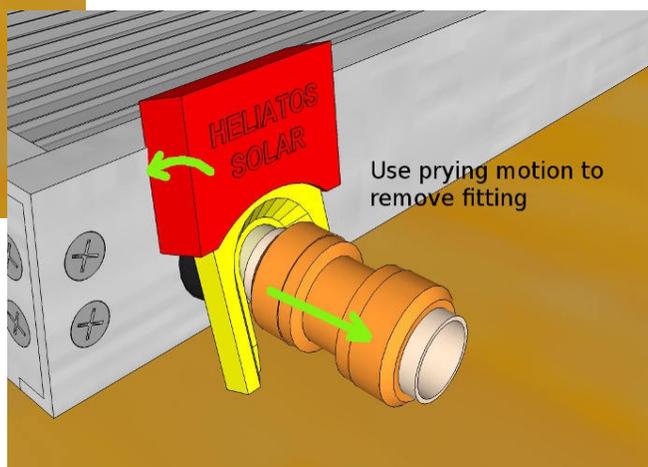
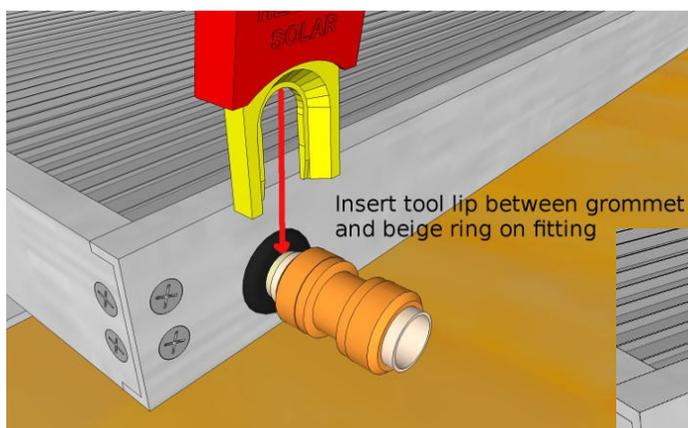
Push-fit fittings will hold on the the pipes after installation, but they contain a feature that allows them to be released and removed. To release the lock the beige plastic ring has to be pushed inward as shown in the diagram.



Pushing in this ring is not easy especially when the fittings are installed between two panles which is why we include a specially designed tool.



To unlock the fittings and remove them slide the tool onto the pipe so the lip in the yellow part is between the beige ring and the black rubber grommet.



Once the lip of the tool is securely between the grommet and the ring you can start prying the fitting away from the grommet



## Troubleshooting

A properly sized system should be able to supply most of your normal hot water needs during sunny times. Some of the causes of insufficient heat are listed here, but if you have checked these and are still having problems please call us at (661)-7SOLAR7 (9am to 5pm pacific) or email [support@heliatos.com](mailto:support@heliatos.com) for tech-support.

Problem	Symptom	Solution
Insufficient insulation	Fittings at the end of panel array and at bottom feed connector and in tank all at similar temperatures but water in tank does not heat up much	Install insulation on all pipes in the solar loop, no matter how warm the climate.
Air In the glycol loop, no circulation	Fittings at the end of panel array get very hot, but fittings at heat exchanger do not heat up	Re-fill the glycol loop using the glycol fill valve
Air in the water loop, no circulation	Heat exchanger gets very hot but water in tank doesn't heat up much	Slightly loosen compression nut on upper compression fitting (on water connector) to let air escape. Re-tighten once water starts to drip out
Pump(s) not running, no circulation	Cannot feel a slight vibration when touching the pump, no slight pump sound	Check pump polarity and TD5 selector switch setting, check wiring from PV panel
Pump noisy	Pump makes screeching sound and stops running	Pump noises are due to air in the pump or incorrect orientation of the pump. Make sure pump is installed horizontally. Eliminate air in glycol loop and water loop.
Bottom Feed Connector "Short Circuit"	Fittings at the end of panel array and at bottom feed connector and heat exchanger get very hot but water in tank does not heat up	Contact us for a replacement unit

**The lower you set the gas or electric control of the water heater the more benefit you derive from the solar heater.**