



SunEarth SolarStation Flushing & Charging the System

Your SunEarth SunStation is a complete packaged unit containing all the major plumbing components that are required for any of SunEarth's Solaray AC (SRCC OG-300 certified) closed loop glycol solar systems. Once the SunStation is installed and all plumbing connections are made as described in the Installation & Operation Instructions, you are ready to flush and charge the collector loop. Proceed as follows:

YOU WILL NEED

1. CHARGE PUMP WITH SHUT-OFF SWITCH AND EXTENSION CORD



The charge pump will typically be a 1 Horsepower pump and must be capable of pumping at 10 GPM flow and 100 ft (43 psi) head. The small circulator in the SunStation is **not sufficient** to charge the system to the correct pressure or remove air bubbles from the closed loop.

2. HEAT TRANSFER FLUID (HTF): DOWFROST HD MIXED WITH DE-IONIZED WATER



To ensure maximum effectiveness for corrosion protection, the glycol inhibitor package is designed for a minimum 25-30 percent concentration of propylene glycol in water. Table 4 shows the concentrations of Dowfrost HD required to provide freeze and burst protection at various temperatures. Use the mixture most appropriate for your climate. Do not use a higher glycol to water concentration than necessary, as this will adversely impact the relative heat transfer efficiency of the HTF.

Table1.
Percent (volume) DowFrost HD Propylene Glycol Concentration Required

Temperature °F	For Freeze Protection	For Burst Protection
20	18%	12%
10	29%	24%
0	36%	24%
-10	42%	28%
-20	46%	50%
-30	50%	33%
-40	54%	35%
-50	57%	35%
-60	60%	35%

Generally, for an extended margin of protection, you should select a temperature that is at least 5°F lower than the expected lowest ambient temperature. These figures are examples only and should not be regarded as specifications. As use conditions are not within our control, neither SunEarth nor Dow Chemical guarantees that freeze damage may not occur at temperatures other than shown.

Water used to dilute the HTF must meet certain minimum standards for purity. Impurities in the dilution water can increase metal corrosion, reduce the effectiveness of corrosion inhibitors, increase inhibitor depletion rate, and cause the formation of scale and other deposits on the heat exchanger's internal heat transfer surfaces. Due to variations in municipal water quality throughout the country, distilled or deionized water should be used to mix with the glycol HTF. The HTF pH level must be maintained between 8 and 10 to minimize corrosion and glycol oxidation in the piping system.

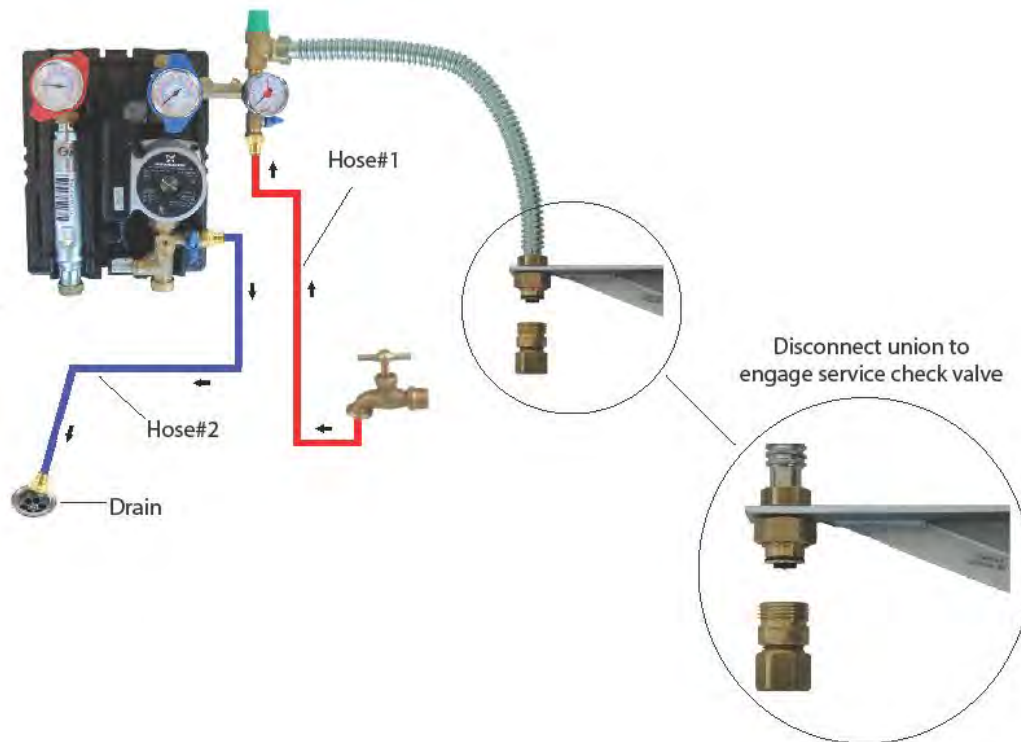
Typically 4 to 8 gallons of mixed HTF will be required depending on the size of system and lengths of pipe runs. The mixed HTF should be in a convenient container such as a 5 gallon drum or bucket.

3. WASTEWATER BUCKET OR ACCESSABLE DRAIN
This should have sufficient capacity for the water used to flush the system; at least 5 gallons will be required.
4. THREE 3 CHARGE HOSES (6 – 8 FEET LENGTHS)
The hoses should have standard ¾ inch female garden hose type threaded connections.



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STEP 1 - Thoroughly flush the collector loop and check for leaks.



1. The **expansion tank should not be connected** when filling and flushing the system in order to prevent any debris from lodging inside the expansion tank chamber. The expansion tank hose should be connected to the SolarStation safety assembly with the union at the other end of the expansion tank hose disconnected (see picture insert). This will close the service check valve allowing the system to be filled.
2. Open the flow volume adjustment valve to the wide open position by turning anticlockwise with a 4mm Allen Key. This will allow for maximum flow rate when flushing the system.
3. Connect hose #1 between the mains water source and the SolarStation fill valve above the pump. Connect hose #2 to the drain valve below the pump with the other end going to the wastewater bucket or drain. The supply ball valve (Blue handle) must be in the vertical position, so that the supply check valve forces the water through the entire collector loop and out to the drain valve and hose #2. The return ball valve (Red handle) must be in the 45° position to allow full flow in either direction.
4. Open the hose bib and run mains water through the collector loop for 5 minutes to remove any flux and debris from the system (water soluble flux should have been used when soldering the collector loop plumbing). Let the water run until it is free of impurities and any air has been flushed out of the loop. You should see the waste water start to run clear without debris or bubbles after a few minutes.
5. To flush the expansion tank hose briefly push open the service check valve until water flows out. An additional jug or hose will be useful here to prevent spillage.
6. Once flushing is complete, close the drain valve and slowly close the fill valve connected to hose #1. Allow the mains pressure to bring the collector loop pressure up to the desired pressure (typically 25 to 40 PSI), then close the fill valve. If the system pressure is too high, crack open the drain valve to bleed off some water. Once stabilized, the collector loop pressure should remain fairly constant. A continuous drop in pressure is an indication of a leak in the system. Shut off the hose bib and disconnect hose #1 from the hose bib.

WARNING: COMPLETE ALL STEPS (FLUSHING AND CHARGING) WITHOUT BREAKS. ONCE THE SYSTEM IS FILLED THE COLLECTORS WILL START TO HEAT THE FLUID CAUSING AN UNCONTROLLED PRESSURE RISE IN THE LOOP. DO NOT LEAVE THE SYSTEM UNTIL THE EXPANSION TANK IS CONNECTED (STEP 2. No. 4 BELOW).

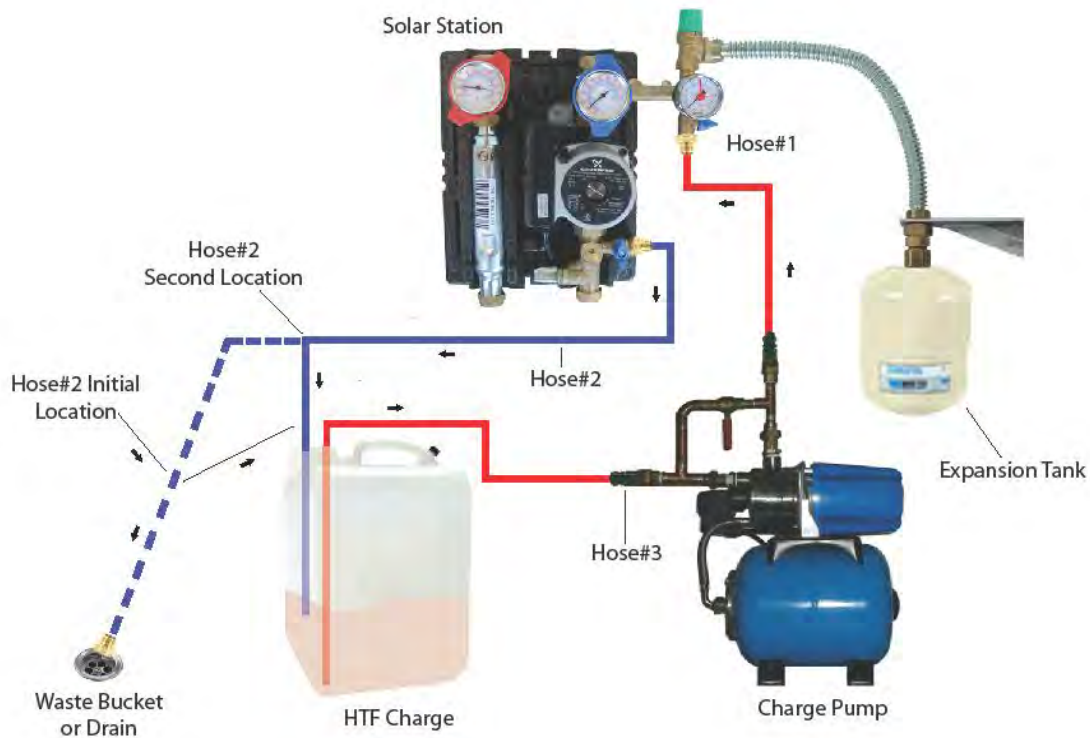
7. Burp the pump by slowly turning the supply ball valve (blue handle) to the 45° position to allow reverse flow through the pump and out of the drain hose. Return the supply ball valve to the vertical position.
8. Run the circulator pump to check for adequate flow and no leaks. Adjust both the ball valves (Red and Blue handles) to the vertical position. This will engage both check valves. Ensure that the controller is plugged into a 120V outlet and the pump is plugged into the controller outlet. Switch the controller side switch to the "on" position. This will run the pump continuously (manual mode). Run the circulator pump for 30 minutes or more while **visually inspecting the entire piping loop for leaks**. Check the flow rate of the water at the flow meter. If necessary change the speed setting of the three speed pump to generate adequate flow (do not adjust the flow balance valve at this time). Stop the circulator pump by switching the controller side switch to the "off" position. Open the manual bleed valve on the air separator to bleed off any trapped air.

WARNING: THE NEXT STEP MUST BE CARRIED OUT THE SAME DAY. DO NOT LEAVE THE COLLECTOR LOOP FILLED WITH WATER OVER NIGHT OR YOU RISK FREEZING THE LOOP AND BURSTING THE PIPES.



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STEP 2 – Charge the System with Heat Transfer Fluid



1. In a 5 gallon bucket, mix the heat transfer fluid (HTF) using appropriate percentages of de-ionized water and DowFrost HD propylene glycol as per Table 1. As a general rule you will need between 4 and 8 gallons of mixed heat transfer fluid to fill the system, more fluid may be needed if the piping runs are long, if in doubt keep extra fluid on hand.
2. Connect hose #1 between SolarStation fill valve above the pump and the charge pump outlet. Keep hose #2 connected to the drain valve below the pump with the other end going to the drain or large container. Connect hose #3 to suction side of the charge pump; the other end of hose #3 must be immersed in the HTF at the bottom of the bucket so it can draw in the HTF without sucking in any air. The supply ball valve (Blue handle) must be in the vertical position, so that the supply check valve forces the HTF through the entire collector loop and out to the drain valve and hose #2. The return ball valve (Red handle) must be in the 45° position to allow full flow in either direction.
3. Open both drain and fill valves, run the charge pump to force the HTF into the collector loop and push the water out to drain. The level of HTF in the bucket will drop as fluid is drawn out. Do not allow the bucket to run dry or the suction hose to draw in air, if there is insufficient HTF in the bucket, close the drain valve, stop the charge pump and add more fluid to the bucket. When coloured HTF starts to discharge from hose #2, transfer hose #2 from the waste bucket or drain to the charge bucket. HTF will now circulate through the system; the fluid level in the bucket will stabilize. Continue to circulate the fluid through the loop forcing any air out through the drain hose until no more bubbles can be seen at the charge bucket.

WARNING: HOSES WILL JUMP VIOLENTLY WHEN AIR BUBBLES ARE PURGED. KEEP HOLD OF THE HOSES DURING FLUSHING.

4. Ensure that the expansion tank is charged to the correct pressure for your system (typically 20 – 40 psi). If necessary, pre-charge the air side of the expansion tank using the Schroeder valve to approx. 2 PSI less than the desired collector loop pressure i.e. for a 30 PSI design loop pressure, pre-charge the expansion tank to 28 PSI. Once the expansion tank is charged to the correct pressure, **connect the expansion tank to the system** and complete flushing of the system. The expansion tank connection hose should be bent downwards to allow any air to bubble out of the expansion tank leg and into the main flow to be purged.
5. Once all air is completely purged from the loop and the fluid in the bucket is running clear, close the drain valve. The charge pump will now start to pressurize the loop. Use the bypass valve on the charge pump to control the pressure in the collector loop. Once the correct pressure has been achieved, close the fill valve and shut off the charge pump. If the pressure is too high, a little fluid can be bled off by briefly cracking the drain valve.
6. Adjust both the ball valves (Red and Blue handles) to the vertical position. This will engage both check valves. Switch the controller side switch to the “on” position. This will run the circulator pump continuously (manual mode). Adjust to correct flow rate by using the speed selector on the pump and the volume adjustment valve.
7. Run the circulator pump for 30 minutes or more to circulate the HTF then bleed off any air from the manual air vent at the top of the air separator. If a lot of air is discharged, it may be necessary to re-pressurize the loop with the charge pump.
8. Switch the controller to the “auto” position, the system is now operational.
9. Return after approximately 1 week of operation, check the loop pressure (loss of pressure indicates a leak). Check that the flow rate is still correct, bleed off any air from the manual air vent. Re-pressurize with HTF if necessary.