SOLAR DHW INSTALLATION & OPERATION MANUAL

Installation and Operating Manual
for
TrendSetter Drainback Solar Hot Water Pre-heat System

Appendices Included for Systems with
Supplemental
Radiant Floor Heating

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Installing Contractor:

- The solar energy system described by this manual when properly installed and maintained meets the minimum standards established by the SRCC.
- This certification does not imply endorsement or warranty of this product by SRCC

* Model number is the Solar Rating Certification Corporation SRCC OG-300 system designation

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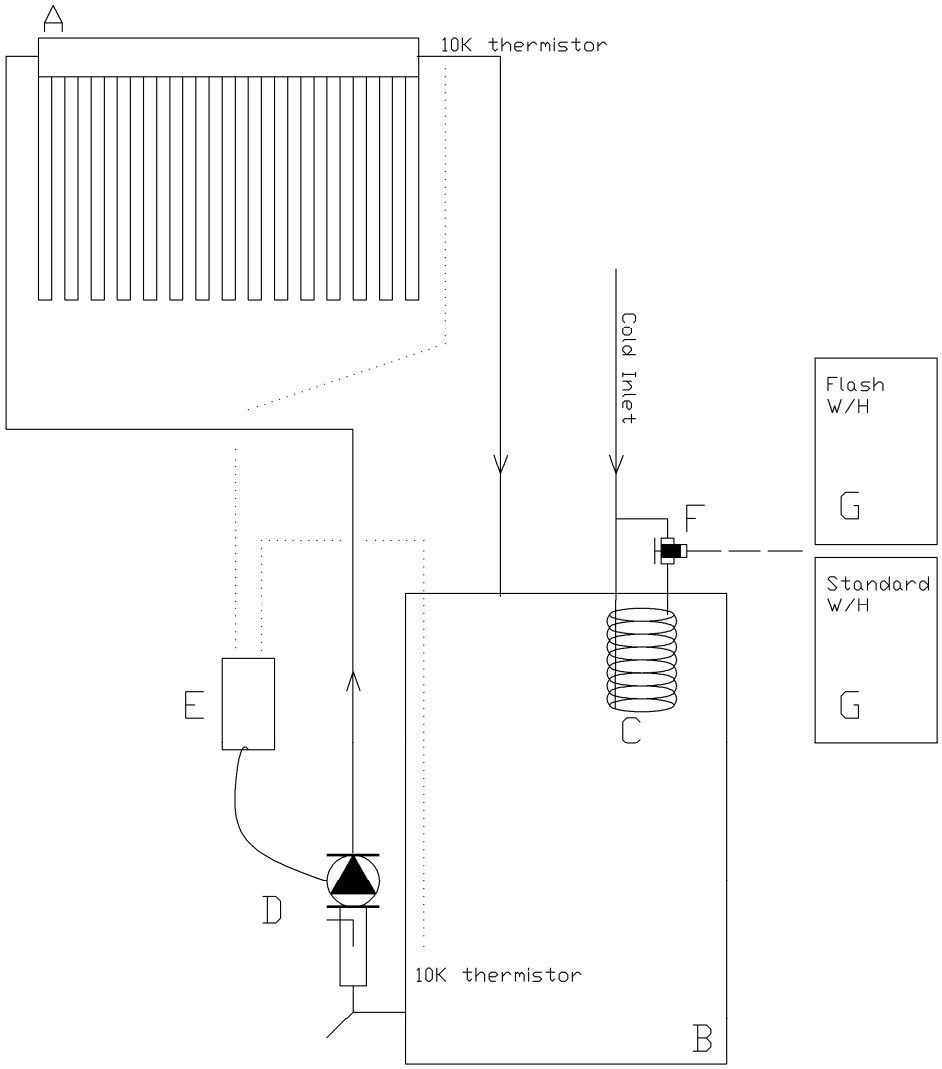
1.0 System Overview



Standard Solar Water Heating System

There are *nine* parts to the Trendsetter system.

A - Solar collectors- Apricus® Evacuated tubes

B – Solar Storage tank- Non-pressurized insulated water storage tank

C - Heat exchanger- 24 sq ft of copper finned tubing ¾" inside diameter

D - Solar pump - Pumps water through solar panels

E - Solar controller – Turns solar pump on and off automatically

F - Tempering valve- A safety device to cool down the solar hot water if necessary

G - Water heater-Use existing water heater or replace with tank-less water heater
H –Fill valve – Used to maintain water level in the solar tank
I – Vacuum breaker/breather – Allows for drain down of solar collector and atmospheric pressure in tank

The solar storage tank (B) contains tap water. One sensor is mounted at the solar collector (A) and one sensor is installed in a "dry dip tube" inside of the storage tank. When the solar collector is hotter than the water in the storage tank, the solar controller (E) powers the solar pump (D). The water is slowly circulated through the solar collector on the roof. The water in the storage tank will gradually rise in temperature. The water will rise 15°F-20°F in temperature between the time the water enters the solar collector and the time it leaves the solar collector.

When hot water is used in the house, the cold water is pre-heated as it courses through the heat exchanger (C) immersed in the solar heated water stored in the insulated storage tank. If the existing water heater is used as a back-up, the pre-heated water will reduce the energy normally needed to raise the water temperature entering the . water heater. For example, if the cold water entering the water heater is 60°F, the water heater will require fuel to raise the incoming water from 60°F - 120°F (8,617 BTU per 100 gallons). If the entering water temperature were raised to 100°F the fuel consumption would be reduced by 2/3rds. The same 100 gallons of hot water would consume only 2,878 BTU's

If a tank-less water heater replaces the conventional tank type water heater, the tank-less heater will flash on to raise the water temperature. For example if the water temperature pre-heated by the solar, is 100 ^{o}F the tank-less unit will provide just enough energy to boost the pre-heated water an additional 20 ^{o}.

If the solar water in the tank reaches very hot or even scalding hot temperatures, incoming water will be drawn through the heat exchanger in the solar storage tank and through the tempering valve (F). The scalding hot solar water will be automatically mixed with cold water at the tempering valve to supply the desired 120°F (adjustable to 140°F) water temperature to the water heater.

CAUTION: Removal of this device could cause serious burn injury. This device prevents scalding temperatures from reaching the hot water fixtures.

The *solar collectors* will provide optimum solar energy over the year if installed as close to south and tilted to equal the degrees latitude of the house location.

If radiant floor heating is combined with the solar water heating it is best to increase the slope of the solar collectors to increase the energy collection during the winter.

2.0. System Design

2.1. The TrendSetter water heating system is a drain-back freeze protected system. The water drains out of the collectors each time the solar pump turns off leaving no water in the system to freeze. A solar hot water system needs to be installed correctly to insure high efficiency and most importantly, safe and reliable operation. *The system can be modified to operate as a closed loop system filled with special non-toxic polypropolyene glycol. This will require an additional heat exchanger and expansion tank.*

2.2. The TrendSetter system has been engineered to avoid reliance on freeze valves and other components that are prone to malfunctioning. Over-engineering a system can greatly increase cost and increase the likelihood of things going wrong. If you are considering making any changes to the system please contact us at Trendsetter for assistance.

2.3. Check with your building official to assure that the system conforms to local planning regulations and general building codes.

Important Note 1: Appendix L of the Uniform Plumbing Code has been reprinted in the Appendix describing the heat exchangers used in the TrendSetter systems. This may need to be pointed out to building plan checkers or submitted with the permit application. <u>If the building jurisdiction does not recognize Appendix L, or Section 402.3 of the Uniform Solar Energy Code you must order the system with the optional double wall heat exchanger</u>.

2.4. If the pump stops on a sunny day after reaching the high temperature limit or in the event of a power failure during a hot day, the system will drain down. This will create stagnation conditions meaning the header will reach temperatures in excess of 300ºF. *This will not damage the system*, as it is designed to withstand occasional stagnation. Once the pump restarts, water will flow into the collector header pipe pushing the air out and back into the tank. You may notice an initial rumbling as the slug of superheated water will flash into steam as it contacts the hot manifold. *If you have not used elastomeric pipe insulation the insulation is likely to melt.*

APPENDIX L

ALTERNATE PLUMBING SYSTEMS

L 1.0 Scope

L 1.1 The intent of this Appendix is to provide clarification of procedures for the design and approval of engineered plumbing systems and alternate materials and equipment not specifically covered in other parts of the Code.

L 1.2 The provisions of this Appendix apply to the design, installation and inspection of an engineered plumbing systems and alternate materials and equipment.

L 1.3 The Administrative Authority has the right to require descriptive details of an engineered plumbing system, alternate material, or equipment including pertinent technical data to be filed.

L 1.4 Components, materials and equipment must conform to standards and specifications listed in Table 14-1 of this Code and other national consensus standards applicable to plumbing systems and materials.

L 1.5 Where such standards and specifications are not available, alternate materials and equipment must be approved per the provisions of Section 301.2 of this Code.

L 2.0 Engineered Plumbing Systems

L 2.1 Definition. Engineered Plumbing System: A system designed for a specific building project with drawings and specifications indicating plumbing materials to be installed, all as prepared by a person registered or licensed to perform plumbing design work.

L 2.2 Inspection and Installation. In other than one- and two-family dwellings, the designer of the system is to provide periodic inspection of the installation on a schedule found suitable to the Administrative Authority. Prior to the final approval, the designer must verify to the Administrative Authority that the installation is in compliance with the approved plans, specifications and data and such amendments thereto. The designer must also certify to the Administrative Authority that the installation is in compliance with the applicable engineered design criteria.

L 2.3 Owner Information. The designer of the system must provide the Building Owner information concerning the system, considerations applicable for any subsequent modifications to the system, and maintenance requirements as applicable.

L 3.0 Water Heat Exchangers

L 3.1 Heat exchangers used for heat transfer, heat recovery, or solar heating shall protect the potable water system from being contaminated by the heat transfer medium.

L 3.2 Single-wall heat exchangers shall be permitted if they satisfy all of the following requirements:

1. The heat transfer medium is either potable water or contains only substances which are recognized as safe by the U.S. Food and Drug Administration.
2. The pressure of the heat transfer medium is maintained less than the normal minimum operating pressure of the potable water system.

   Exception: Steam complying with Section L 3.2 #1 above.
3. The equipment is permanently labeled to indicate that only additives recognized as safe by the FDA shall be used in the heat transfer medium.

L 3.3 Other heat exchanger designs may be permitted where approved by the Administrative Authority.

L 4.0 Fixture Unit Values for Bathroom Groups

L 4.1 Tables L-1 and L-2 reflect the fixture unit loads for the fixtures in bathrooms as groups, rather than as individual fixtures. Such fixtures include water closets, lavatories and bathtubs or showers. The tables reflects diversity in the use of fixtures within a bathroom and between multiple bathrooms.

L 4.2 The listed water supply fixture unit values in Table L-1 reflect the load of entire bathroom groups on the cold water service. Individual hot and cold water branch piping to the fixtures should be sized according to Chapter 6 and Appendix A.

L 4.3 The listed drainage fixture unit values in Table L-2 reflect the load of entire bathroom groups on the sanitary drainage system. Where fixtures within bathrooms connect to different branches of the drainage system, the fixture unit values for the individual fixtures shall be used, as listed in Table 7-3.

2.5 Identifying the Parts

1. Lower part of the two part high quality powder coated aluminium casing.
2. Upper part of the two part high quality powder coated aluminium casing
3. Tube Inner silicone ring seals.
4. All copper, British design and engineered heat exchanger.
5. Controller sensor pocket located each end of the heat exchanger.
6. Outer casing UV stable covers
7. Silicone UV stable seals allowing 22mm and 8mm copper pipe
8. Stainless fixings of the outer cover to the inner casing lugs.
9. Lower section of the compressed and formed rock wool insulation
10. Upper section of the compressed and formed rock wool insulation
11. Male section of two part, UV stable tube holder with fast turn screw thread
12. Female section of two part, UV stable tube holder with fast turn screw thread
13. Aluminum powder coated tube holder track.
14. Evacuated all glass tubes, high quality, latest absorber coatings.
15. Aluminum two part heat transfer fins in one length for a central HP location.
16. Stainless steel vent plate combined heat pipe positioning.
17. All copper super heat pipe.
18. Heat pipe condenser.

3.0 Solar Collector Installation

3.1 The components contained in each package are listed in the packing list, which is included with the manifold. If components from any package are missing, please contact your supplier who will have spares in stock.

3.2 The manifold box should have already been opened, as this guide is contained in that box. Please familiarize yourself with the components in the container.

3.3 Open the tube box(s), which should each contain 10 or 12 tubes. Check to make sure the evacuated tubes are all intact, and the bottom of each tube is still silver. *If a tube has a white or clear bottom, it is damaged and should be replaced.* Each evacuated tube contains a heat transfer fin. As soon as the evacuated tubes are removed from the box, please put on the rubber tube caps. This will protect the bottom tip of the glass tube from being broken*. Do not expose the tubes to sunlight until you install them,* otherwise the inner tube and heat transfer fin will become very hot. The outer glass surface will not get hot.

3.4 Unwrap the heat pipes from their packing, taking care not to bend them. If they are bent they will be difficult to insert into the evacuated tube. *The copper is soft, so if accidentally bent they can be easily straightened.* To straighten, lay the pipe on an elevated flat surface such as a table, work bench or porch, making sure that the condenser tip protrudes over the edge. This will ensure that the remainder of the pipe lays flat upon the surface. Placing both hands palms down on the pipe; roll the pipe back forth over the surface, working your palms up and down the length of the pipe. This will straighten the pipe for proper insertion. Any slight bends will straighten out once the pipe becomes heated inside of the tube.

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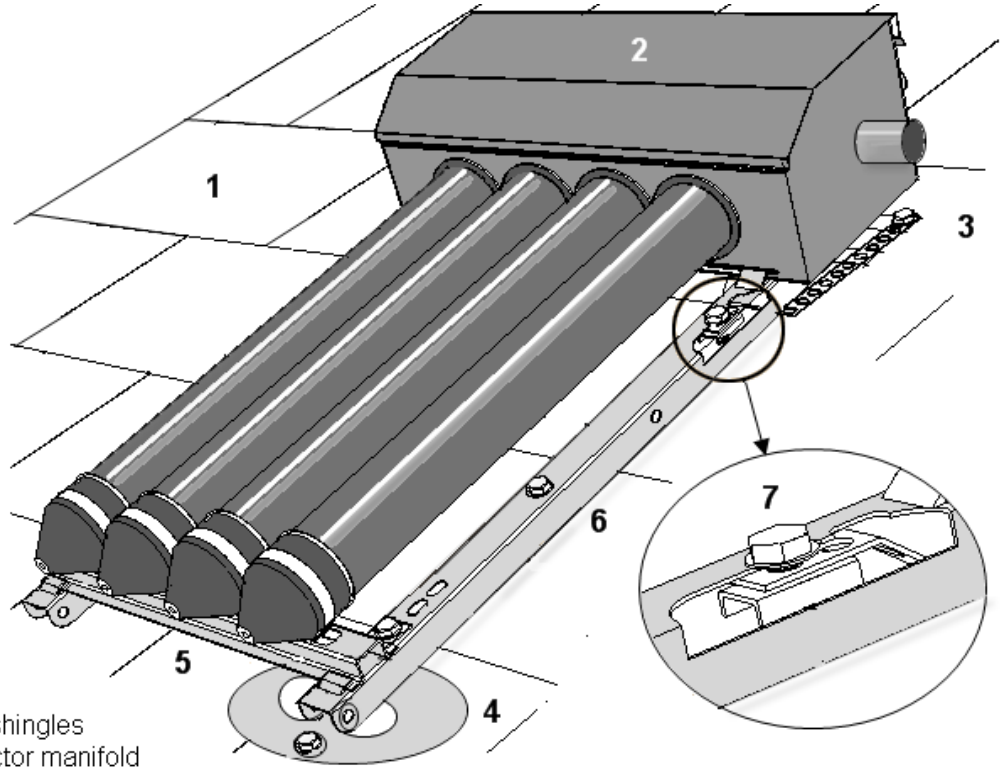
3.5 Unpack the frame. You may need to purchase some bolts or other fasteners to suit your installation surface. The fasteners required to attach the manifold and bottom track are already attached to the frame front track. In most situations only two will be required, so the third can act as a spare.

4.0 Roof installation

4.1 If you are installing the solar collector on a sloped, tiled or shingled roof, *you can use the basic frame* that is supplied as standard with each manifold and 5" diameter feet for surface installations. *Please refer to the table below when specifying attachments to the roof.* Please disregard references to roof straps because TrendSetter does not consider the engineering documentation of the straps adequate for many jurisdictions in the U.S.

Roof Installation Diagram



1. roof shingles
2. collector manifold
3. roof strap (optional roof attachment for under shingle mounting)
4. roof mounting foot (optional roof attachment for surface mounting)
5. bottom track
6. front track (optional roof attachment point for lag bolt)
7. manifold attachment plate
8. bottom track attachment plate

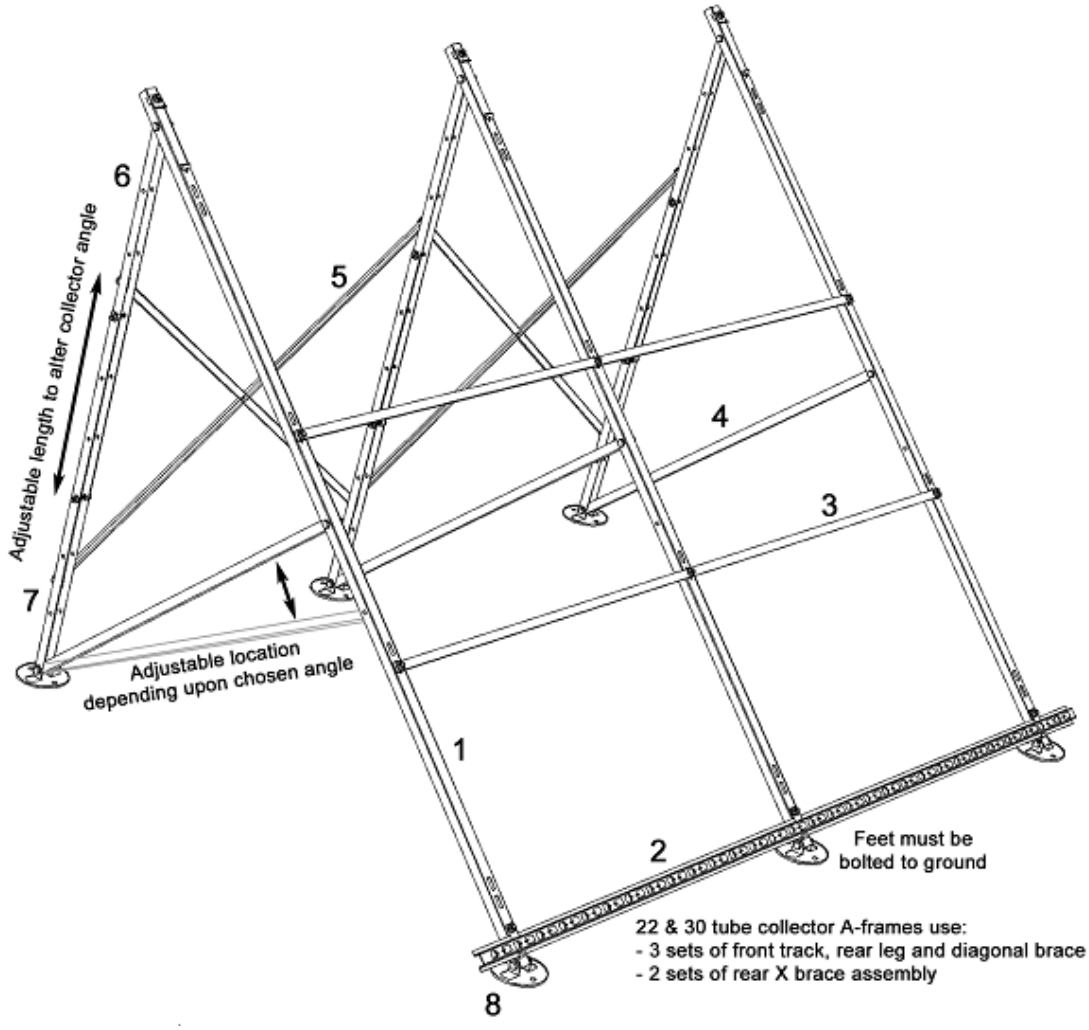
4.1.1The manifold and bottom tube track can slide left and right in relation to frame front tracks, so you have flexibility when selecting the location for the frame front tracks. *The frame front tracks should be located such that they lay flat and even on the roof in line with the roof rafters.* If possible try to locate them under the 2nd or 3rd tube from each end. By locating the front tracks directly under the evacuated tubes, the stainless steel frame will be hidden, improving the aesthetics of the installation.

4.1.2 The round feet attach to the tracks and then secured to roof with ¼" x 2-1/2" lag bolts on each foot pad. There are a total of six feet lagged down to rafters. *When installing the lag bolts first pre drill the hole; then pump urethane calk into the pre-drilled holes and then drive in the lags.*

4.1.3 Please make sure that the front tracks are both parallel and level. An uneven frame may result in damage to the system, in particular, the evacuated tubes.

4.1.4. Once the front tracks are secured, the manifold and bottom track may be attached, taking care to insure they are correctly aligned. Both the manifold and bottom track will lock into the frame, secured from above with the attachment plates that are already in place. When securing the manifold, make sure the attachment plate is held tight against the manifold, thus insuring it locks into the groove.

4.2 Adjustable A-Frame attachment is used to elevate the panels to a greater angle than the pitch of the roof.



The A-frame is very simple to assemble. Please view the diagram below and also take note of the following points.

1. Front track
2. Bottom track
3. Front brace
4. Diagonal brace
5. Rear X brace
6. Rear leg top
7. Rear leg bottom
8. Round foot

4.2.1 If you have a 30 tube collector there are three sets of front tracks and legs instead of two, as well as two sets of rear X braces.

4.2.2. For A-frames, the position of each front track is fixed, as dictated by the rear X braces and front braces. If the location of the front tracks needs to be adjusted, these two components can have additional holes drilled. The standard location of the left and right front tracks is directly beneath the second tube from each end. For 30 tube collectors, the central front track is located between the 15th and 16th tube. Most rafter layouts will be on 2'-0" centers.

4.3. *Do not install the evacuated tubes at this time. Once everything is confirmed as running correctly and leak free, you may proceed to installing the heat pipes and evacuated tubes*

5.0 Plumbing the Solar Lines

5.1. Trendsetter suggests using a minimum of 1/2"id pipe for up to 60 tubes. The flow rate for a (2) 30 tube array is approximately 1.6 gallons per minute. This would result in 1 ft of head loss per 10 feet of pipe. If the pipe run is greater than 100 feet use larger diameter pipe. *The pipe or tubing must be installed without "traps" that prevent complete draining of the tubing when the pump shuts off.* For easy installation we recommend the ROARK flexible stainless steel tubing with a special thumping tool purchased or loaned from Trendsetter. The threaded brass compression fittings are designed to make the installation easier. Elastomeric insulation can be slid over the tubing before the ends are swaged onto the tubing.

5.2. If the solar is a closed loop with polypropylene glycol under pressure (>29 psi), pressure release valves, expansion tank and/or other pressure control devices must be installed. The solar loop must not be exposed to pressure exceeding 85 psi.

5.3.The lower pipe in the manifold should be used as the inlet

5.4.N*ever braze directly onto the inlet and outlet pipe – the rubber seal and glass wool will melt; instead, use the compression fittings or clamps*

5.5 Connections should be made with the special brass compression fittings

5.6 *Insulate all piping running to and from the manifold*. *Use only elastomeric pipe insulation* and protect any insulation exposed to the weather by painting or wrapping with UV protective wrapping. Insure the insulation is tight up against the manifold casing, thus preventing any loss of heat from the inlet and outlet. If possible form a watertight seal between the manifold casing and the insulation material. This will prevent water entering the temperature probe port, thus reducing the possibility of oxidation of the copper sensor port and/or sensor probe.

5.7 Run #18 gage sensor wire from the collector sensor to the controller mounted on the system. Secure the wire to the outside of the pipe insulation with nylon strap ties.

6.0 TrendSetter Solar Water Heating Tank Placement

6.1 When moving the tank, two people and/or a hand truck is required. *The tank should always remain upright*. If placed on their side, the heat exchangers may become distorted or rub against the liner. The storage tanks have varying footprints ranging from 30" x 30" for a 55 or 100-gallon tank to a 38" x 54" for a 300-gallon tank. Standard tank bodies are 52" tall including the lid. The tank-less water heater may be mounted for convenience directly on top the solar tank, or in a suitable location adjacent to or nearby the solar tank*. It is the responsibility of the installer to insure that clearances are maintained according to the installation manual supplied with the water heater.* The closer the storage tank is to the water heater and the solar panels the more efficient the system will operate. The solar storage tank may be turned with the pump facing front or side; whichever is most convenient to the plumbing layout. No valves, vents or other restrictions are to be placed in either the solar supply or return piping. *It is important that the solar supply and return lines are sloped back to the tank. Be sure that there are no "TRAPS" where water can settle. Trapped water may stop drain-back action and cause a freeze in the lines.*

Storage tank specifications: ….*Typical TS100 Series*

Insulation - 3" high density Expanded Polystyrene
Exterior surface – white embossed aluminum with baked on enamel finish,
Frame: Thermally broken aluminum extrusions
Fasteners: Stainless steel
Max internal temperature: 180ºF
Maximum internal pressure: atmospheric
Minimum ambient temperature: -60ºF
Approximate fluid capacity: 105 gallons
Weight empty 225 lbs
Weight full 1,225 lbs
Floor Load 196 lbs/sq ft distributed

6.2 The Trendsetter tank uses an internal, *single wall corrugated stainless heat exchanger* with riffled surface designed for turbulent mixing. A variety of purposes can be served by installing additional heat exchangers. Spa heating, closed loop radiant floor heating or converting the drainback solar to closed loop solar other applications using an extra heat exchangers.

6.3 Connect the solar return line to the return fitting on the top of the tank

6.4 Install the Taco pump with two bolts onto the flange provided on the solar pump module.

6.5. Install the top flange and connect to the solar supply line plumbed down from the roof.

6.5 Connect the solar return line to the inlet provided on the top of the tank marked solar return.

7.0 Install the Solar Control

7.1 The controller is typically mounted on the tank within a few feet of the pump. It may be mounted on a wall. The controller must be near an outlet to power system.

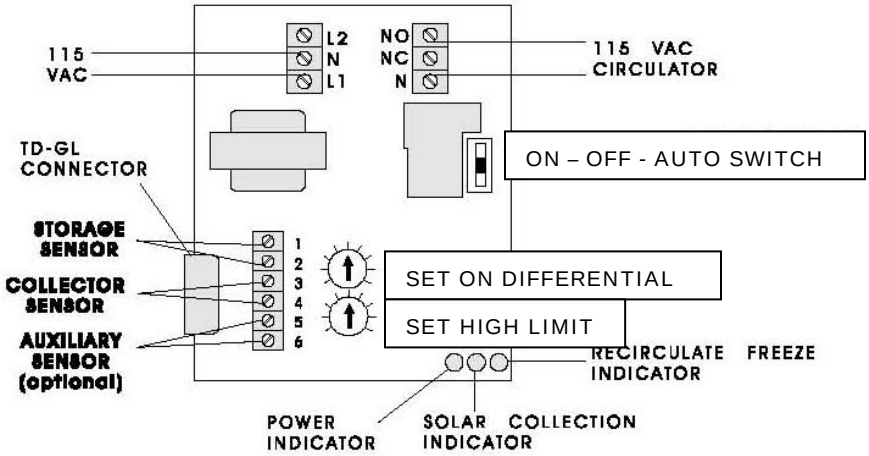
7.2 Remove the cover by backing out two screws on the face of the controller

7.3 Connect the solar sensor wire from the roof to locations 3 & 4 as shown on the diagram

7.4 Connect the tank sensor wire to locations 1 & 2.

7.5 Set the high temperature limit to 160ºF and the differential to 20 degrees.

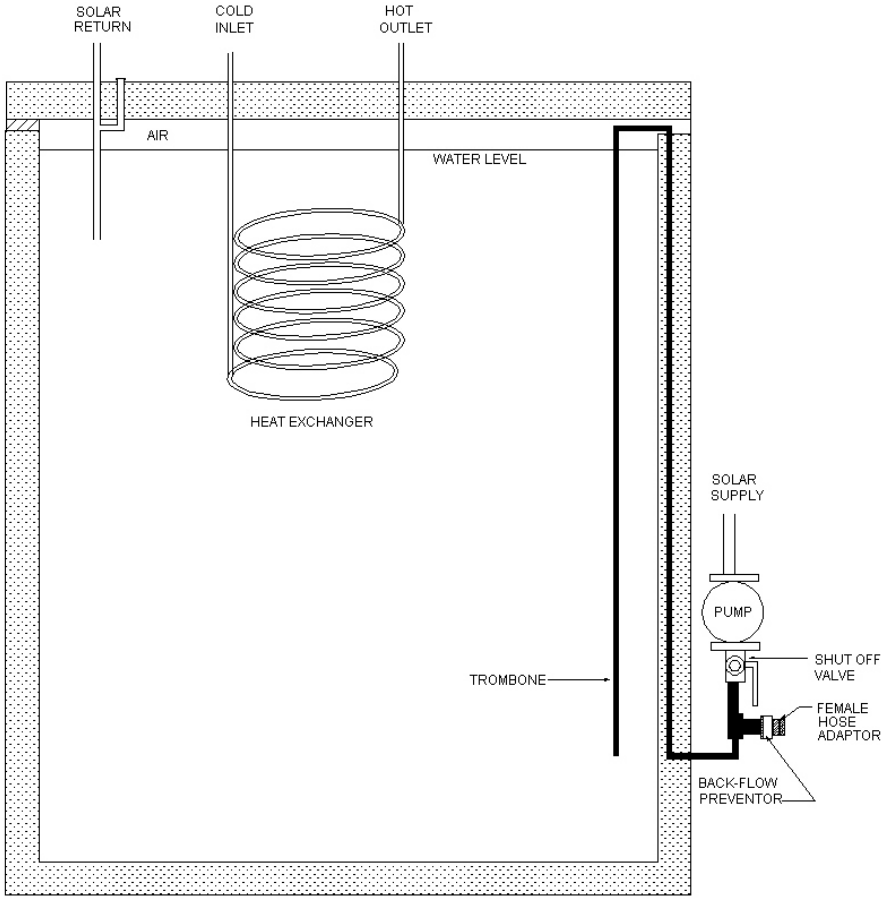
7.6 Plug the pump into the control but *do not plug in the control at this time*



Note: Trendsetter currently uses a basic Goldline differential controller. This controller uses 10k sensors. If you wish to substitute your own controller with other than a 10k sensor please note this on your order and send us the exact sensors that are compatible with your brand of controller. These sensors will be installed inside of your tank.

8.0 Filling the Solar Storage Tank

The storage tank is filled through the hose fitting beneath the side-mounted pump at the base of the tank. There is a shut off valve above the fill port. A special female hose adaptor is supplied to accept the male hose end. *Also supplied with the adaptor is a back flow preventor/vacuum breaker. This device is required by the plumbing code to prevent cross connection with the fresh water supply*.



8.1 Assemble the hose adaptor and back flow preventor onto the inlet beneath the pump on the tank and connect the garden hose to the tank, open the hose fitting at the tank, turn the ball valve to the horizontal position (closed). (See solar pump module picture above)

8.2 Fill the tank up to within two inches of the bottom of the lid as indicated on the float gauge. *Do not overfill*. Close the hose bib; turn the ball valve to the vertical position (open). Check for leakage around the pump flanges and tighten if necessary.

Important Note:

Filling the tank by this method also fills the neck of the trombone. This is essential for the pump to remain flooded.

Use the fill valve at the top of the tank only to maintain the water level after the tank has been filled properly through the trombone.

An optional automatic fill valve may be purchased if the homeowner does not want to occasionally maintain the tank level

In cases where the drain-back occurs from an unusually high panel installation, *in rare cases*, the momentum of the water draining back may over shoot the neck and cause the neck to empty. This will cause the pump to cavitate the next time it is required to pump water. *This can be prevented by installing a swing check valve with a 3/8" hole in the flap above the pump. This reduces the velocity of the water being drained-back.*

8.3 To drain the tank, connect the hose to the hose bib, open the valve. When draining the tank do not drain the tank unless the water has had a chance to cool.

9.0 Test the system before installing the tubes.

9.2 Plug the solar controller into a power outlet. The red power indicator light should light.

9.3 Turn the slide switch to the *on position.* The second (middle) red light should turn on and the pump should start. Listen for the water returning from the panels on the roof.

7.4 Check the system for leaks

10.0 Install the collector sensor

10.1 Apply grease to the 4" sensor and slid it into the 1/8" diameter sensor well located on the end of the manifold.

10.2 The connection from the sensor wire to the sensor leads is extremely critical. It is recommended to use the proper size butt connectors with heat shrink tubing.

Note: Make sure that this connection is not subject to direct weather because it will deteriorate over time.

11.0 Evacuated tube and heat pipe installation

The heat pipes and evacuated tubes simply need to be plugged into pockets in the manifold. Note that each evacuated tube contains a heat transfer fin. This serves two purposes: first, to hold the heat pipe in place against the side of the tube; and second, to enhance heat conduction to the heat pipe.

11.1 Precautions

11.0.1. Always wear gloves when handling the various solar collector components. All efforts have been made to make the metal components safe to handle, but there may still be some sharp edges.

11.0.2 Be careful handling the evacuated tubes as they will break if knocked heavily or dropped. Wear gloves if handling any broken glass.

11.03 *With the heat pipe installed in the evacuated tube, and good sunlight, the heat pipe condenser can reach temperatures of nearly 400ºF. At this temperature touching the heat pipe will result in serious burns, so please take care when "experimenting" with, or "demonstrating" the evacuated tube and heat pipes.*

11.2. Install tubes.

11.2.1The heat pipes (17) must first be inserted into the fin (15) inside of the glass tube (14) before the assembled tube may be installed into the copper heat exchanger (4) inside of the manifold. The heat pipe must be pushed into the fin until the heat pipe condenser (18) is contacts the thin metal vent plate (16).

11.2.2 *Smear a thin layer of silicone thermal grease on the heat pipe condenser (bulged end).*

11.2.3 Holding the heat pipe close to the condenser, push the heat pipe into the header port. Use some force to make sure the heat pipe is inserted fully and therefore tight. Please note that the contact between the heat pipe and the port needs to be tight in order to ensure good heat transfer. Under normal use, once the heat pipes are installed you should never have to remove them again, but they can be pulled out if ever required (the use of a pair of pliers may be required). There is no need to use thermal grease on the length of the heat pipe prior to insertion into the evacuated tube.

11.2.4. Secure the evacuated tubes to the bottom track using the plastic retainer (12) and screw cap (11).

11.2.5. Clean each evacuated tube with a liquid glass cleaner and cloth/paper.

12.0 Turning the system on

10.1 Plug the pump into the controller if you have not yet done so and plug the controller into a power outlet. The power light on the controller should light.

10.2 Test the controller by moving the slide switch to the on position. The center light on the controller should light and the pump should become energized. After a moment you should hear water returning from the solar panel. *Carefully check the plumbing for leaks.*

10.3 Once you are sure the system is leak tight, turn the slide switch on the controller to AUTO and replace the cover.

10.4 The system will operate automatically when the sun shines on the solar panels.

13.0 Maintenance of the system includes the following tasks:

13.1 Regular rain should keep the evacuated tubes clean, but if particularly dirty they may be washed or hand washed with soapy water or glass cleaning solution. *Do not clean during the sunny conditions.*

13.2 During autumn, leaves may accumulate between or beneath the tubes. Remove these leaves maintain optimal performance

13.3 If a tube is broken it should be replaced as soon as possible to maintain maximum collector performance.

13.4 Keep track of the water level inside the tank by periodically checking the level gauge mounted on the lid. The system seldom needs make up water. Add make up water by the same method used to fill the tank.

13.5 Water in the storage tank may change in ph level over time. Acidic water will react with the copper heat exchanger if left unattended. C*hange the tank water every two years; Refer to section 6 for the proper procedure*

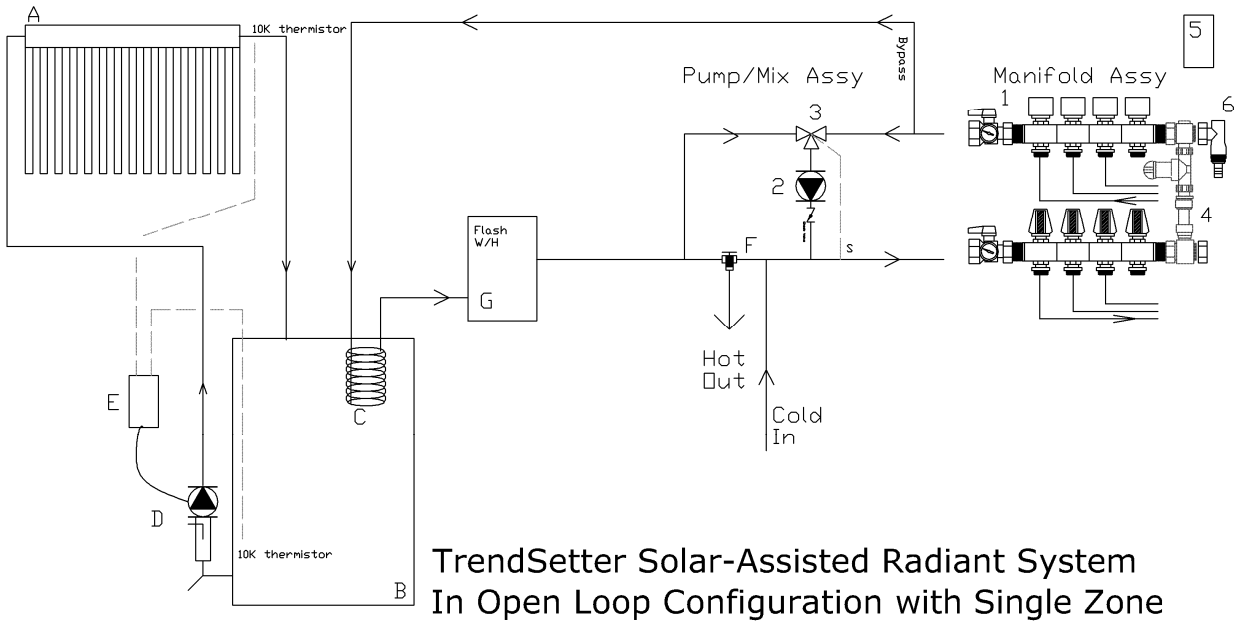
13.6 To replace a tube: remove the tube attachment strap, slide existing tube out and carefully pick up any glass pieces. Wear protective gloves when handling the broken tube. Replacement tubes should already have heat transfer fins inserted. Slide the new tube into place taking care to guide the heat pipe into the slot between the fin and glass wall. If you need to remove the heat pipe, *remember to reapply the silicone thermal grease to the heat pipe condenser*. When you remove the tube, the rubber ring in the manifold casing may pop out. Return this ring into place before inserting the new tube.

12.0 Trouble shooting

Problem	Issue	Solution
Pump runs but does not pump water and dry running pump becomes very hot.	Pump is not primed because Trombone is empty	Re-prime by following instructions in section 8 above.
Pump runs but does not pump water up to solar panels	Height of solar panels too high for pump to reach collectors and return water to tank	Install next size pump.
Pump pumped initially but loses prime sometimes requiring periodic re-priming	Rare problem occurring mostly in high collector installation when drain-back overshoots and empties the trombone.	Install a swing check valve above the solar pump with a 3/8" hole drilled in the flap. This will slow the water draining down through the pump after the pump shuts off.
Pump cycles on and off frequently during solar operation		
The power light is off	The plug is out of the wall or the circuit breaker is popped	Plug in the controller or reset the circuit breaker. Continuous or frequent circuit breaker interruptions may be a symptom of a larger problem. If this condition persists call an electrician to diagnose the problem
The power light is on it is sunny and the solar indicator light #1 is off and no pumping occurs	The sensor wire connections are corroded or disconnected or the storage sensor has shorted or the GL-30 controller has failed or the pump has failed	Remove the cover. Set the switch to on, if the pump runs turn the switch back to "auto". Remove the collector sensor and replace it with a jumper. Remove the storage sensor. If it runs replace the storage sensor with a new one. You can also test the sensor with an ohmmeter. If it still does not run the GL-30 controller is defective
The power light is on it is a sunny day and the solar indicator light #1 is on but the pump does not turn on	The pump is not receiving power from the controller	Remove the cover. Set the GL-30 switch to on, if the pump does not run remove the pump cover and jump across the snap switch protecting the pump from running dry. If the pump runs remove the snap switch and replace at a later time. Turn the GL-30switch back to "auto"
The pump light is on all the time and the pump runs continuously even at night	The sensor wire connections are corroded or disconnected or the collector sensor has shorted of the GL-30 controller has failed	Remove the cover. Set the switch to on, if the pump runs turn the switch back to "auto". Remove the storage sensor and replace it with a jumper. Remove the collector sensor. If it runs replace the collector sensor. You can also test the sensor with an ohm-meter. If it still does not run the GL-30 controller is defective
The power light is on and the pump is hot and stops pumping or squeals	The pump has run dry and the over temp snap switch has cut the power to the pump. The pump has lost	There is a leak in the piping to or from the solar panels. Repair the leak in the pipes to and from the solar panels and refill the tank through the fill assembly. Reset overheat snap switch if one is

	prime	installed

Appendix A: Solar Water Heating Combined With Single Zone Radiant Floor Heating



SINGLE ZONE - There are *seven* additional parts to the radiant floor system

#1 Master stainless steel manifold- Distributes and regulates flow to individual radiant floor loops
#2 System pump - Circulates hot water through the floor
#3 Mixing valve -Controls supply water temperature in the floor by sensing supply and return temperatures
#4 Pressure By-pass valve – One adjusts proper flow through the manifold
#5 Thermostat – Activates radiant floor part of system when space heating is required
#6 Purge and vent assembly- Expels air from the system during fill and operation
#10 PEX tubing- Distributes the heat to the house from the hot water coursing through tubing in the floor

This system combines solar water heating *plus* an efficient space heating system. The amount of solar contribution will vary with the size of the solar water heating system selected. When the *thermostat (5)* calls for heat, the system *pump (D)* starts pumping water. The water is split by the *supply manifold (1)* into loops of *PEX tubing (10)* and returns through the *return manifold (1)* with the flows being balanced by viewing the flow meters on the manifold. The *mixing valve (3)* monitors the temperatures of the water entering the tubes in the floor and the temperature of the returning water. The valve blends the water returning from the floor with make-up hot water from the *tank-less water heater (G)*. The cooler return water enters the *heat exchanger (C)* in the *solar tank (B)* to absorb available solar heat before returning to the *tank-less water heater* which may be required to further elevate the water temperature. The *pressure by-pass valve (4)* on the manifold is set regulate the total flow through the floor by proportioning the pressure and allowing a measured amount water to return to the system without circulating through the tubes in the floor.

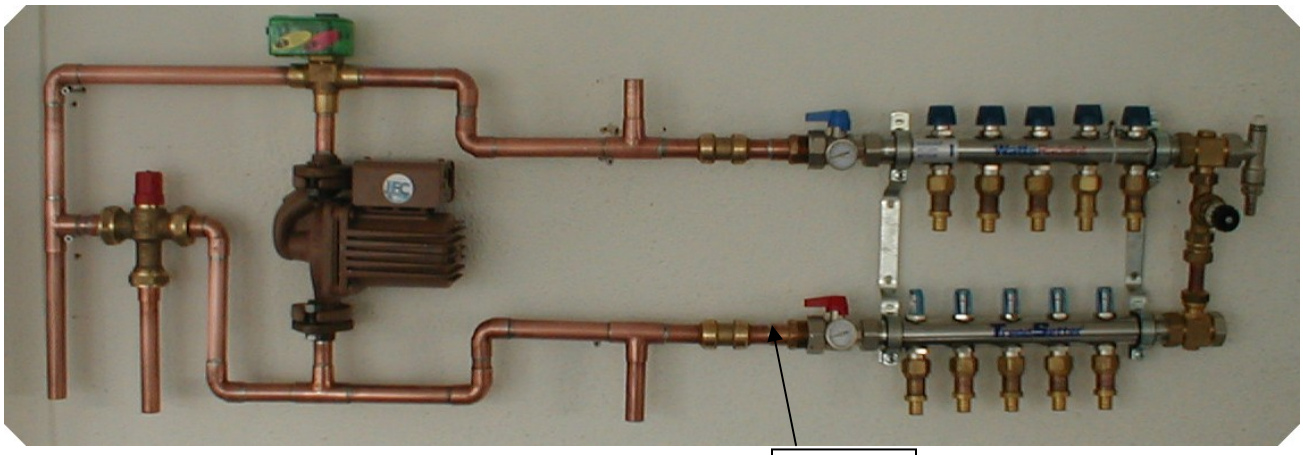
SINGLE ZONE RADIANT FLOOR HEATING PARTS

Circulation Module

FLOOR RETURN TO COLD IN
SIDE OF THE HEAT EXCHANGER

Manifold Assembly

SPLIT



16.1 Remove the “stainless steel master manifold assembly” from the box. Note that the supply and return assemblies on the left include isolation valves with integral temperature dials. On the right end of the manifold is a differential pressure by-pass and vent assembly.

16.2 Remove the “circulation module” from its box. As shown above, the couplings of both modules are spaced equally to be connected together by simply threading the threaded unions on the manifold with the male threaded fittings on the circulation module. In applications where the stainless steel header and the circulation module are located in different places the two parts can be un-coupled and joined by ¾” piping.

16.2 Connect the “tempered out” connection to the hot water plumbing of the house as you would with any hot water heater

16.3 Connect the “cold in” from the house as you would any hot water heater

16.4 Connect the “hot out” from the tank-less water heater to the fitting on the module as shown.

16.5 Connect the “floor return” from the top leg of the manifold to the cold in side of the heat exchanger in the solar tank.

16.6 Strap the 10K sensor to the floor supply lines at a convenient location on the floor supply pipe.

Note: the thermometers at the red and blue isolation valves will be used to observe the temperatures of supply and return water during the system start up.

17.0 Wiring

17.1 Remove the cover of the Taco 011 pump. After removing the pump cover, compare to the diagram shown here. The power connections are connected to the “LINE” (black) and “NEUTRAL” (white)

17.2 Install the 24 volt thermostat in a convenient location according to the instructions included in the box. Run the thermostat wires to the pump. Connect thermostat wires to terminals 1 & 2

17.3 Connect low voltage output terminals 3 & 4 to the C and R terminals on the valve

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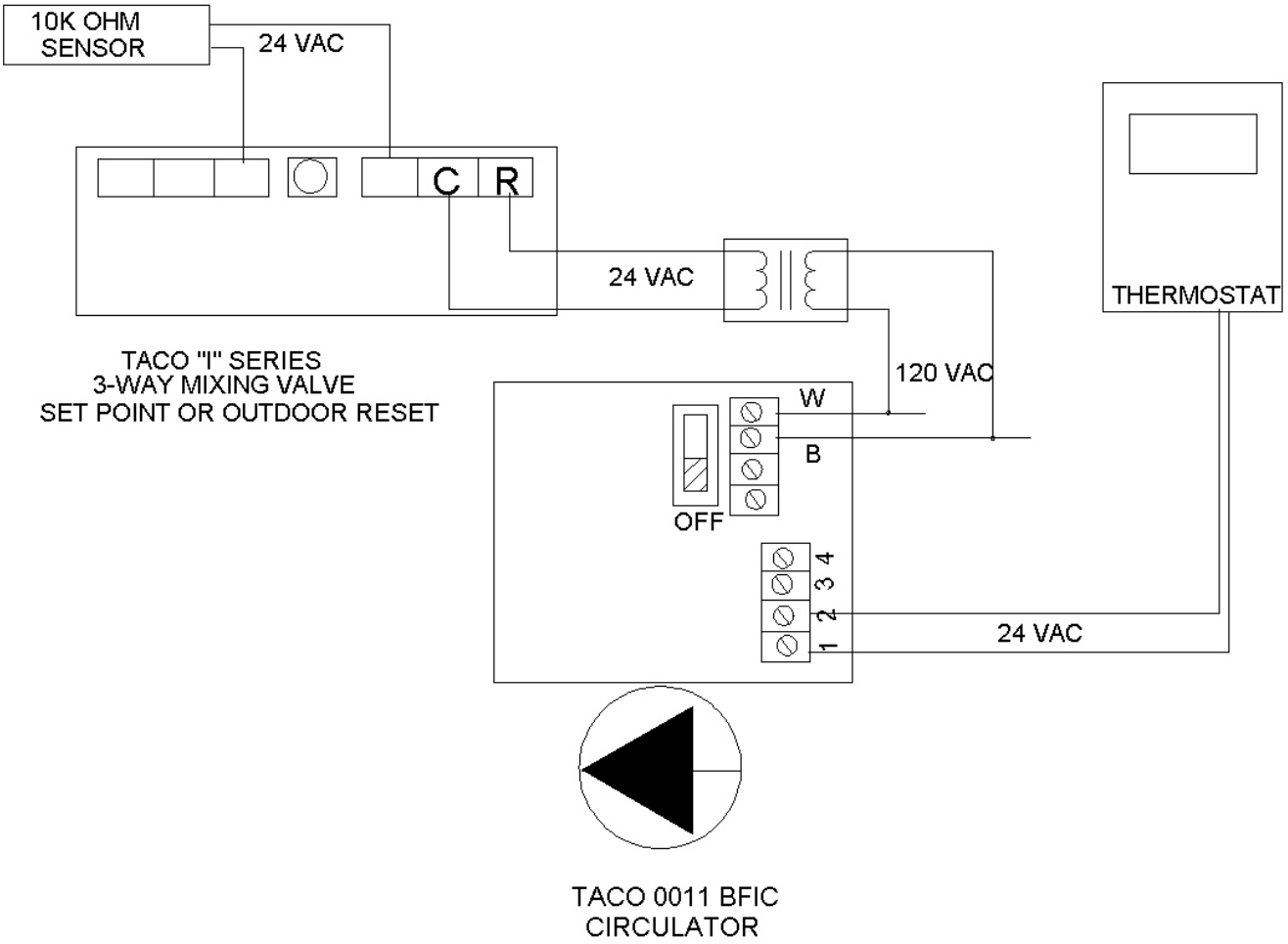


18.0 System Start-Up

18.1 Turn on the water pressure to the system and purge the air from the pipes and check for leaks.

18.3 Open the pressure bypass valve by turning clockwise to the highest number.

18.4 Open the mixing valve on the circulation module by turning to the coolest setting.

18.5 Turn the thermostat on to request heat. This should start the pump and energize the mixing valve.

18.6 Turn the pressure bypass valve counter clockwise until the flow meters register flow.

18.7 Balance the flows in the loops by removing the blue plastic caps and turning the balancing valves with the key provided. Set flows initially to about 1 GPM. Covered floors will require more flow than uncovered floors.

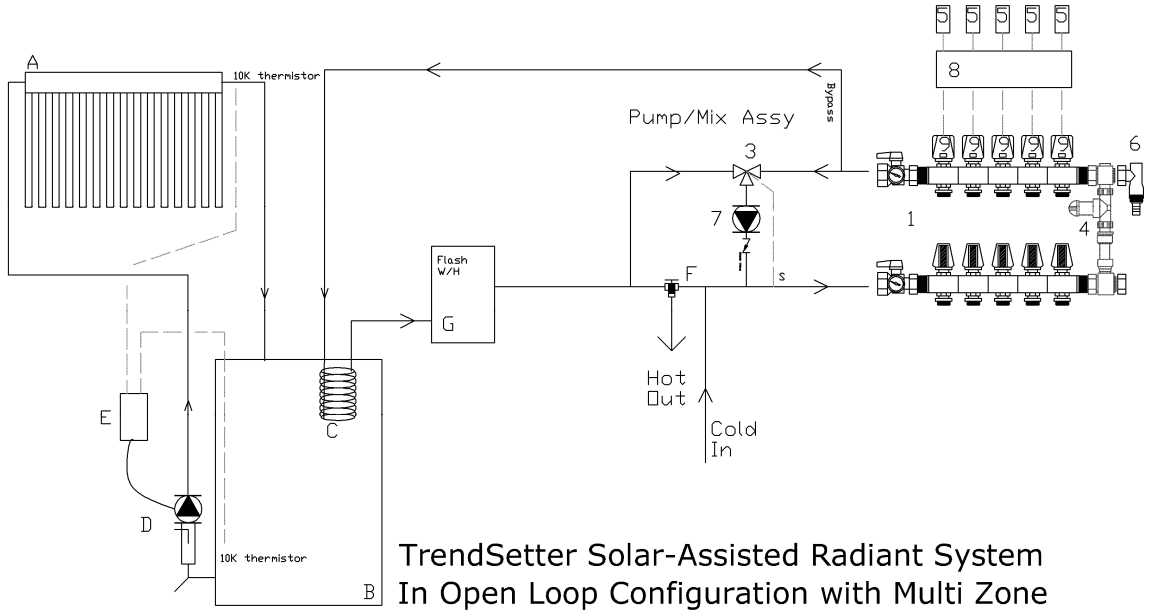
18.8 Observe the thermostat on the supply port of the manifold. The supply temperature will be the output temperature of the Takagi which is factory set to 122ºF. If heating a concrete slab installers may want to run the system at this elevated temperature to shorten the warm up time. *If heating a wood floor be careful not to run the floor surface temperature over 85ºF.*

18.9 After warm up, adjust the supply temperature to the lowest temperature that will sustain a comfort level (on a cold day) in the room with the most insulative floor covering. i.e. carpet. This is done by turning the mixing valve clockwise to restrict the flow from the Takagi and increase the flow recalculating from the return loop.

18.10 Reduce the flows in the various loops to achieve comfort with the floor covering in the corresponding radiant loops. An inferred temperature meter available at most hardware store for under $69 will be very useful for achieving a balanced system. *A maximum surface temperature for comfort where there is prolonged foot contact with the floor is 85º.*

NOTE: It may take days of observation and tweaking to achieve the *perfect balance* but once achieved the system will be "*tuned"* to the house and will achieve maximum energy efficiency. Take the time to tune the system right …*it's worth the energy*

Appendix B: Solar Water Heating Combined With Multi Zone Radiant Floor Heating

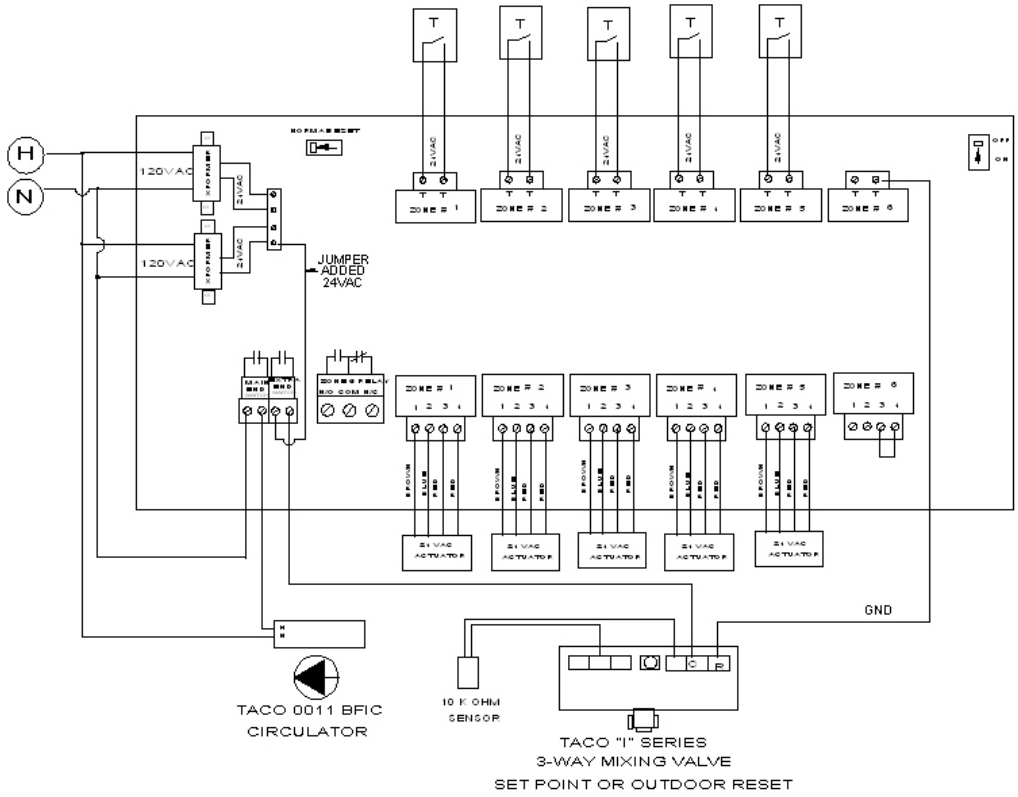


MULTIPLE ZONE SYSTEM – There are *three* additional parts to the multi-zone system

#7 Circulation pump – Circulates water through the floor (different model than single zone system)
#8 Zone valve controller – Accept input from multiple thermostats
#9 Zone valve actuators – Actuators activated by the controller to regulate temperatures in different heating zones of the house

The system *"wakes up"* when one or more of the *thermostats* (5) show a demand for heat. The difference between the multi and single zone system is that the individual loops are now individually monitored and controlled by separate thermostats. Each zone uses *zone actuators* (9) to turn on and off individual zones as demanded by each thermostat input. Additional branches may be required within a single loop depending on the configuration and area of each separate zone. For example if a single zone covers an area of 500 square feet, that loop would require two branches. That is if the tubing were placed 8-9" on center, 700 lineal feet of tubing would require two 350' branches. The zone valve controller (8) supplies power to the thermostats, zone valves and circulation pump.

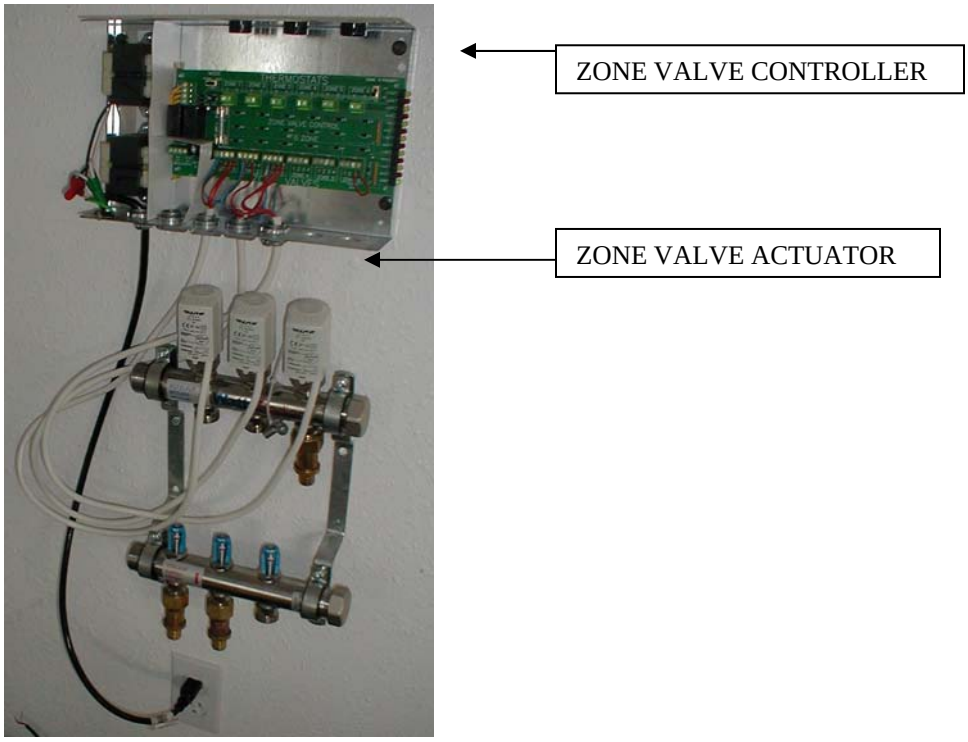
ELECTRICAL DIAGRAM FOR MULTI ZONE SYSTEM



Appendix B: Solar Water Heating and Multi Zone Radiant Floor

Follow all of the instructions in Appendix A with the following changes:

1. The circulation pump receives its power from a zone controller.
2. The thermostat(s) now connect to the zone controller.
3. Zone actuators are used to open or block the flow to individual circuits



LIMITED LIFETIME WARRANTY ON TRENDSETTER STORAGE TANKS

Scope of Coverage

This warranty applies to Trendsetter Industries, thermal storage tanks used for the purpose of providing solar pre-heated water. It extends to the original purchaser and any subsequent owners at the same location.

Warranty

Trendsetter Industries warrants the tank and tank liner against defects in materials, workmanship and leakage under normal use and service for the lifetime of the purchaser and is transferable to successive homeowners. All other components including stainless steek heat exchangers, tank level gages, anti-scald and auto-fill valves are warranted for a period of five years from the date of initial installation. Trendsetter Industries agrees to remedy any defect in workmanship, materials, installation or equipment malfunction when such defects become evident. Trendsetter Industries will, at its option, field-inspect the system to verify failure, establish probable cause of failure and determine corrective action within a reasonable time. Upon determination of tank or liner failure, owner will return the liner or other failed components to TrendSetter at the owner's expense. The tank or liner will be repaired or replaced and returned freight pre-paid to owner. Labor costs are not included with this warranty.

Exclusions

THE ABOVE WARRANTY DOES NOT APPLY TO THE FOLLOWING CONDITIONS.

1. Those conditions resulting from a defect in a component part, which is not part of the tank supplied by TrendSetter Industries, and listed in the installation manual.
2. Damage of any sort or nature resulting from abuse, misuse, neglect, vandalism, accidents or fire, abnormal weather conditions, acts of God, utility power spikes or other causes beyond the control of TrendSetter Industries.
3. Conditions resulting from repair or alteration by anyone other than the original equipment manufacturer or person duly authorized by TrendSetter Industries. For such repair or alteration made by unauthorized personnel, no warranty is extended.
4. TrendSetter Industries makes no warranties as to the application of the tank to or performance use of the tank in any particular system application.
5. **TrendSetter Industries shall not be liable for consequential damages or any incidental expenses or loss of revenue resulting from any breach of the above express warranty**.

To receive warranty service please contact TrendSetter Industries toll free 1-800 492-9276 or your installation contractor.