SunEarth

SunSaver

SRCC OG-300 Certified Solar Water Heating System

Type: Direct AC Circulating Pump and Differential Control

Installation, Operation and Maintenance Manual

SUNSAVER
DOMESTIC SOLAR WATER HEATING SYSTEM

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

The SunSaver domestic water heating system has gone through an extensive design, technical and performance review by the Solar Rating & Certification Corporation (SRCC). The installation of your SunSaver system is intended to be executed by properly licensed and experienced professional contractors in accordance with SRCC Standard OG-300, "Operating Guidelines and Minimum Standards For Certifying", and shall conform to applicable federal, state and local regulations, codes, ordinances and standards governing the installation of solar water heating systems.

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 the SRCC.

OG-300 system certification is granted to SunEarth by the SRCC. It may not be used for any commercial purpose without prior written consent of SunEarth. SunEarth must approve any deviation from the materials and methods described in this manual in writing.

SunEarth SunSaver solar water heating systems **may not be installed in areas where the minimum ambient temperature have ever fallen below 40 degrees Fahrenheit. If the ambient air temperature is less than 41 degrees Fahrenheit then the system should be drained as outline in Section 8. SunEarth does not warranty any damage due to freezing as outlined in the collector warranty statement.**

Potable water shall be used as the heat exchange fluid. Glycols, oils and other potentially toxic heat exchange fluids are expressly prohibited for use in this system.

All component warranties, expressed or implied, are voided if anything but potable water is substituted for the specified heat transfer fluid described in this manual.

Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures above the specified limit may cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with SunEarth's instructions if the ambient temperature approaches the specified freeze tolerance limit.

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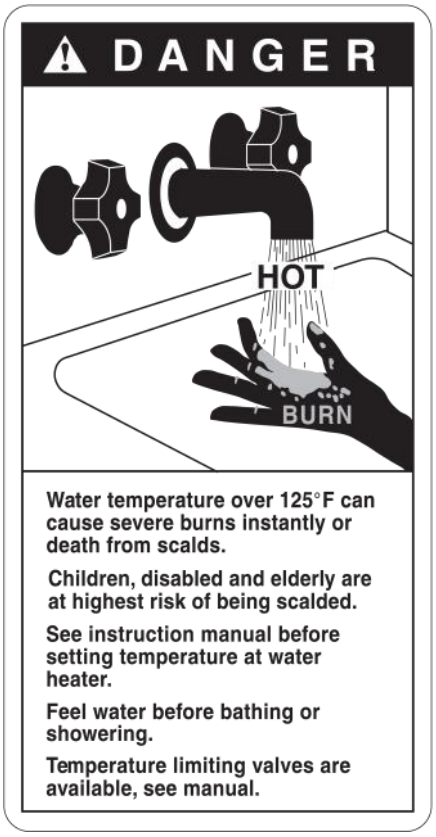
IMPORTANT SAFETY INFORMATION
READ ALL INSTRUCTION BEFORE USING

⚠ DANGER!

WATER TEMPERATURE SETTING

Safety and energy conservation are factors to be considered when selecting a water temperature setting of the water heater's thermostat. Water temperatures above 125°F can cause severe burns or death from scalding. Be sure to read and follow the warnings outlined on the label pictured below.



⚠ DANGER! **Burns from Hot Water and Steam—Use extreme care when opening relief valves, and filling storage tanks.**

The electrical element booster thermostat has been factory set at 50°C (120°F) to reduce the risk of scald injury. Adjusting the thermostat to a higher setting is not recommended. Hotter water increases the potential for Hot Water Scalds.

⚠ DANGER!: **Hotter water increase the potential for hot Water SCALDS.**

Time/Temperature Relationship in Scalds

Temperature	Time To Produce a Serious Burn
120°F	More than 5 minutes
125°F	$1^1/_2$ to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	$1^1/_2$ seconds
155°F	About 1 second

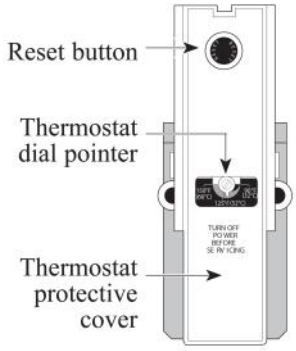
Table courtesy of Shriners Burn Institute

The chart shown above may be used as a guide in determining the proper water temperature for your home.

⚠ DANGER! **Households with small children, disabled, or elderly persons may require a 120°F or lower thermostat setting to prevent contact with "HOT" water.**

NOTICE: Mixing valves should be installed to reduce the point of use water temperature by mixing hot and col water in branch water lines. Contact a licensed installer or the local plumbing authority for further information.

The temperature of the water in the water heater can be regulated by setting the temperature dial of the adjustable surface mounted thermostat located behind the jacket access panel.



This thermostat controls the water heater's heating element only. (A separate thermostat should be utilized in monitoring the temperature from the collector).

To comply with safety regulations the thermostat is factory set at 120°F or less where local codes require.

IMPORTANT SAFETY INFORMATION
READ ALL INSTRUCTION BEFORE USING

WARNING!

For your safety, the information in this manual must be followed to minimize risk of fire or explosion, electric shock, or to prevent property damage, personal injury, or loss of life.

Be sure to read and understand the entire installation, Operation and Maintenance manual before attempting to install or operate this water heating system. It may save you time and cost. Pay particular attention to the Safety instructions. Failure to follow these warnings could result in serious bodily injury or death. Should you have problems understanding the instructions in this manual, or have any questions, STOP, and get help from a qualified service technician, or the local utility.

SAFETY PRECAUTIONS

Have the installer show you the location of the circuit breaker and how to shut it off if necessary. Turn off the circuit breaker if the water heater has been subjected to overheating, fire, flood, or physical damage or if the ECO fails to shut off.

- Read this manual entirely before installing or operating the water heating system.
- Use this appliance only for its intended purpose as described in this installation, operations and Maintenance Manual.
- Be Sure your appliance is properly installed in accordance with local codes and the provided installation instructions.
- **Do not** attempt to repair or replace any part of your water heating system unless it is specifically recommended in this manual. All other servicing should be referred to your installing contractor or local SunEarth distributor.

READ AND FOLLOW THIS SAFETY INFORMATION CAREFULLY.

SAVE THESE INSTRUCTIONS

PREFACE

Let us first offer two words of grateful appreciation. Thank You!. We sincerely appreciate your business. SunEarth also wishes to say thank you for "going solar". Solar water heating systems help to reduce our nation's dependence on polluting fossil fuels, minimize the greenhouse gas emissions associated with conventional water heating and, very importantly, lower you monthly utility costs.

Established in 1978, SunEarth is a leading U.S. solar equipment manufacturer. Our products include the industry standard Empire, Imperial, ThermoRay and Sunbelt solar water heating collectors as well as the CopperHeart integral collector storage system and SunSiphon packaged Thermosiphon systems, SunBurst all copper absorber plates, Solar Strut and RexRack mounting hardware. We also fabricate specialty collectors for unique architectural and building applications. SunEarth SRCC OG-300 certified solar water heating systems are sold by leading solar plumbing and building contractors throughout the United States.

Your SunSaver solar water heating system has been designed to meet exacting SRCC OG-300 certification requirements. The components found in your system have been selected by your installation contractor for their proven reliability, longevity and performance in your specific region of the country.

SunEarth Inc. maintains a policy of continuous review and improvement to ensure that SunSaver systems incorporate any appropriate technological advances. To ensure that products represent the current state of the art in solar water heating SunSaver systems are subject to change without notice. Please consult the SunEarth website at www.sunearthinc.com for current information and the latest manual revisions.

1) INTRODUCTION

Solar water heating systems are climate and site specific appliances. Different types of solar systems are installed around the world in accordance with regional weather and water quality conditions. System performance varies as a function of the household hot water load, average ground water, ambient air temperature, the home's roof pitch and orientation and of course the seasonal intensity of solar radiation. These variables, some of which change from home to home on the same neighborhood street will determine how much energy and money your SunSaver system will save on an annual basis.

Your SunSaver solar water heating system is known as a "forced circulation" system because is utilizes a mechanical pump to efficiently circulate the potable water throughout the system. The proper application for you SunSaver solar water heating system is above 35 degrees Fahrenheit.

This manual is intended as a basic solar water heating primer. Our goal is to familiarize you with the proper installation, operation and maintenance of your SunSaver solar water heating system. This system is required to be installed by properly licensed solar or plumbing contractors in accordance with SRCC OG-300 and all applicable national, state and local codes, ordinances and regulations governing solar water heating installations, as well as good trade practices. Failure to follow the procedures and practices described in this manual may void the manufacturer's warranty and specific component parts.

This manual covers installations utilizing one or two SunEarth solar collectors with a single solar storage tank. Frequent reference is made throughout this manual to specific component parts. The placement of each component can be seen in the system schematic Figures 3 & 4. A description of each component and its function is found in Section 10.

2) SYSTEM DESCRIPTION AND OPERATIONAL PRINCIPLE

The key components in the SunSaver solar water heating system include the SunEarth solar collector, solar storage tank, circulation pump and differential temperature controller.

The SunEarth solar collector is the heart of the SunSaver system. Simply stated, when the sun is shining, heat energy is absorbed by the solar collector's absorber plate and transferred to the potable water circulating between the solar collector and storage tank. This process is continuously repeated during the average sunny day as the temperature in the solar storage tank rises.

The differential temperature controller is the brain of the system. The controller uses temperature sensors to consistently monitor the temperatures at the collector and at the tank. the controller automatically turns the pump on when useful heat is available at the collector and turns the pump off when there is insufficient solar heat available or the tank had reached maximum temperature. SunSaver systems are designed to provide two modes of operation. The system will, (1) serve as a preheater to your solar storage tank, or (2) bypass the solar collector and run 100% on utility or conventional fuel. The installation of an optional water heater time switch allows you to control both the frequency and duration of supplemental electric resistance water heating. Supplemental electric heat may not ne required for much of the year depending upon your specific requirements, thus providing an effective third mode of operation—100% solar.

Section 6 provides instructions for setting the system for automatic operation in each of these two modes.

In order to completely protect the integrity of the solar collector and piping, the system is designed to be drained manually, if subjected to extended periods of disuse or persistent conditions below 35° Fahrenheit. (See Sections 8.1 and 8.2)

3) INSTALLATION REQUIREMENTS—GENERAL

3.1 Permits:

The contractor shall obtain all required permits and approvals.

3.2 Codes, Ordinances and Standards:

The installation shall conform to all federal, state and local regulations, codes, ordinances and standards governing the installation of solar water heating systems. The contractor shall adhere to sound building safety and trade practices. Special consideration must be given to building code requirements for roof loading and the penetration of structural members as well as fire rated assemblies.

3.3 Shading Considerations:

The collectors must be located in an area of the roof or otherwise that will not be shaded for the majority of the day all year round. Adjacent buildings and tress should be checked for possible shading. The collector should not be shaded by any permanent obstacle between 9:00 a.m. and 3:00 p.m. on any day of the year. A shading instrument such as the Solar Pathfinder can be used for solar site analysis.

3.4 Roof and Site inspection:

Before the installation, the contractor shall inspect the condition of the roof and notify the homeowner of any existing roof damage or necessary repairs.

3.5 Structural Considerations:

The collectors must be located in a structurally sounds area of the roof. Penetrations into structural members must not compromise the structural properties of the member.

ENSURE THAT ALL STRUCTURAL MEMBER PENETRATIONS COMPLY WITH APPLICABLE CODES.

The collector mounting method must be capable of maintaining the required tilt and azimuth of the collector under the expected dead loads, winds loads, snow loads and seismic loads for the location.

3.6 Building Envelope:

Penetrations though the building envelope (including roof, walls or floor penetrations) must not impair the enclosure function and must meet applicable codes and best practices.

Roof penetrations whether for structural mounts or pipe penetrations must be sealed and leak proofed as per applicable codes and national Roofing Contractor Association practices.

Building penetrations must not allow vermin intrusion.

3.7 Fire-Rated assemblies:

Penetrations through fire-rated components must not reduce the fire resistance of the assembly below code requirements.

3.8 Building Materials:

Building materials adjacent to solar components must not be exposed to elevated temperatures.

3.9 Confirmation of Installation Site:

The homeowner and contractor shall confirm the location of all roof and other mounted components in advance of the installation.

3.10 Maintenance and Servicing

When installing the system, make sure that all the components are accessible and easy to reach. Provide for clear access to the storage tank, pump, mixing valve and other key components. If a component in the potable water side of the system may require future maintenance or service make connections with brass unions or other approved methods.

4) INSTALLATION REQUIREMENTS—SPECIFIC

4.1 Collector Orientation

The performance of solar water heating systems in the Northern Hemisphere is optimized when the collector is mounted facing True South. Performance, however, suffers very little when the collector is oriented no more than 45° East or West of True South. The collector should not be shaded by any permanent obstacle between 9:00 a.m. and 3:00 p.m. on any day of the year.

4.2 Collector Tilt

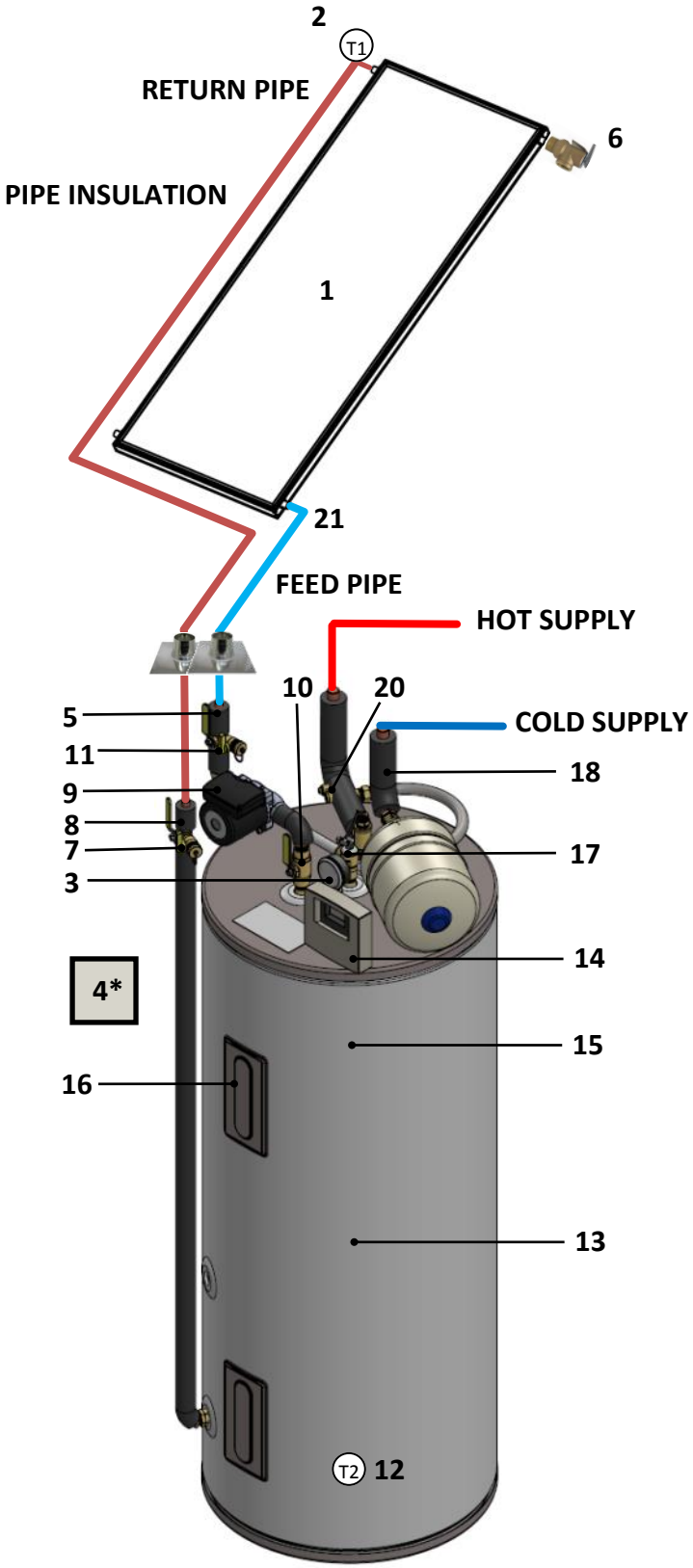
Optimal annual efficiency is achieved by tilting the solar collector at and angle that equals your latitude plus an additional 10°. This tilt angle favors the lower winter sun when the collector performance is at its lowest and minimizes overheating during the hottest summer months.

To ensure proper water drainage from the glazing the collector must be sloped from horizontal. Never mount the collector parallel to a flat roof. Use SunEarth RexRack, Landscape Rack or Universal Tilt Kit products to raise the collector to a proper angle. The minimum acceptable tilt angle from horizontal is 10°.

COLLECTOR ORIENTATION

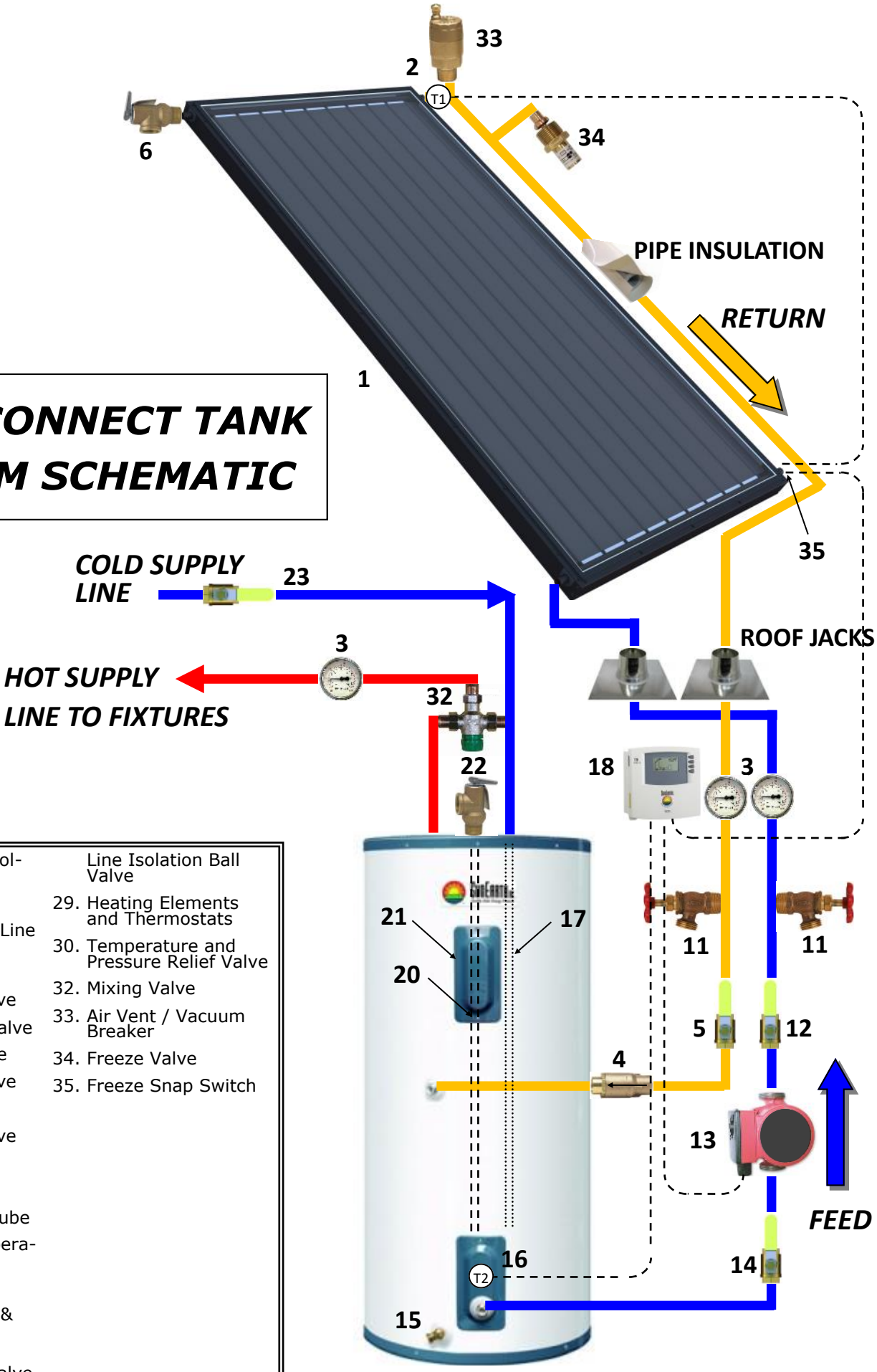
Fig.1

ISLANDER SYSTEM SCHEMATIC



1. SunEarth Solar Collector(s)
2. Collector Sensor
3. Pressure Gauge
4. Optional Element Timer*
5. Isolation Ball Valve
6. Pressure Relief Valve
7. Flush/Purge Valve
8. Isolation Ball Valve
9. Circulating Pump with Check Valve
10. Isolation Ball Valve
11. Flush Valve
12. Tank Sensor
13. Cold Water Dip Tube
14. Differential Temperature Controller
15. Anode Rod
16. Heating Element & Tank Thermostat
17. Temperature and Pressure Relief Valve
18. Cold Water Supply
19. Heating Elements and Thermostats
20. Mixing Valve
21. Freeze Snap Switch

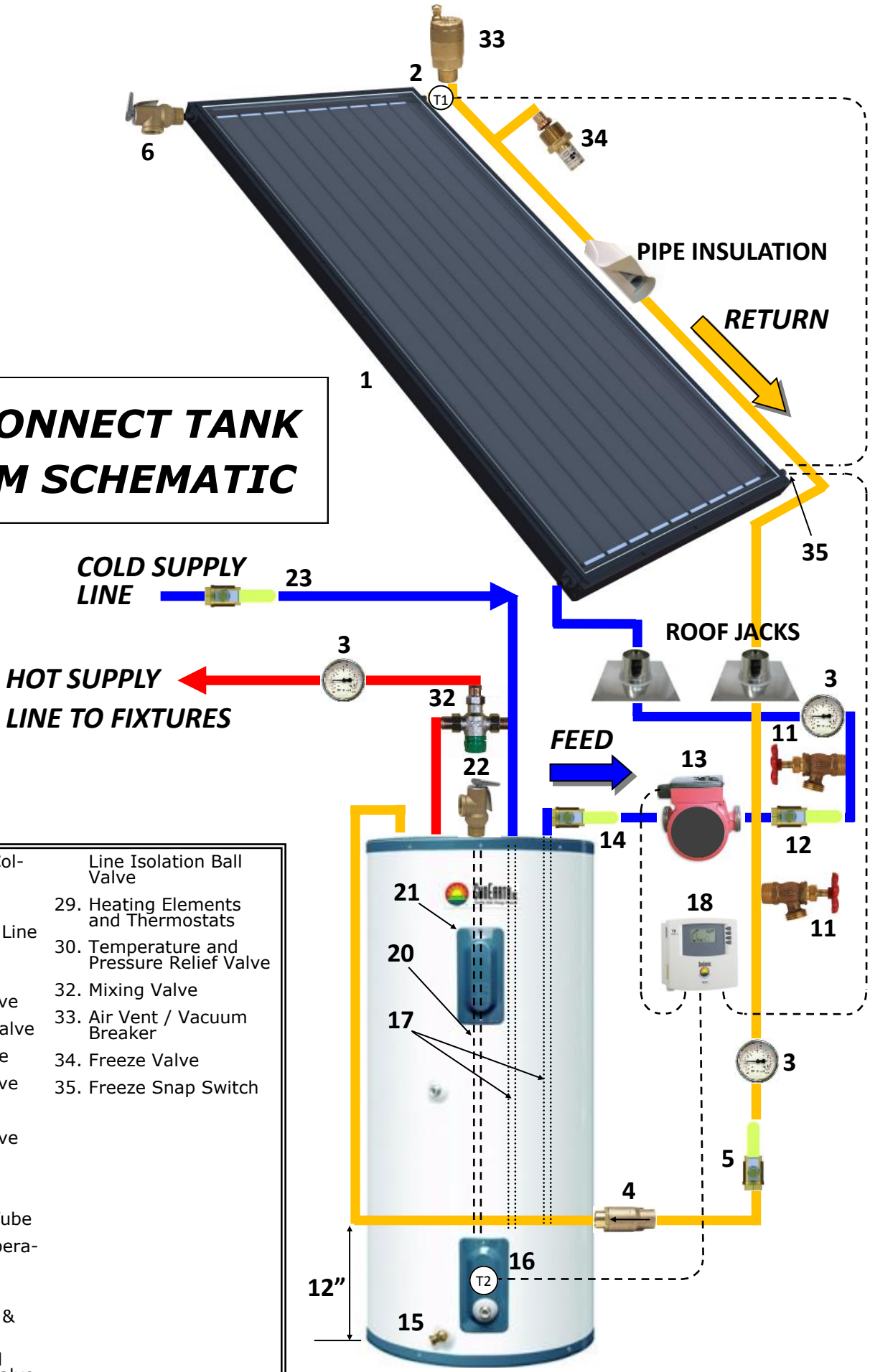
SIDE CONNECT TANK SYSTEM SCHEMATIC



1. SunEarth Solar Collector(s)
2. Collector Sensor
3. Option Tank and Line Thermometers
4. Check Valve
5. Isolation Ball Valve
6. Pressure Relief Valve
11. Flush/Purge Valve
12. Isolation Ball Valve
13. Circulating Pump
14. Isolation Ball Valve
15. Flush Valve
16. Tank Sensor
17. Cold Water Dip Tube
18. Differential Temperature Controller
20. Anode Rod
21. Heating Element & Tank Thermostat
22. Temperature and Pressure Relief Valve
23. Cold Water Supply
29. Heating Elements and Thermostats
30. Temperature and Pressure Relief Valve
32. Mixing Valve
33. Air Vent / Vacuum Breaker
34. Freeze Valve
35. Freeze Snap Switch

Fig.2

TOP CONNECT TANK SYSTEM SCHEMATIC



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33. Air Vent / Vacuum Breaker
34. Freeze Valve
35. Freeze Snap Switch

Fig.3

The solar collectors in a two collector staggered mount installation must be spaced far enough apart to prevent winter shading when the sun is at its lowest angle on the winter solstice.

4.3 Basic Mounting Procedures

The SunEarth collector in your SunSaver solar water heating system may be mounted in either a vertical or horizontal orientation on the roof (See Figures 11 & 12). Although the collector does not normally need to be drained, it is still necessary to slope the collectors slightly to allow the complete drainage if necessary. The slope is $^1/_4$" per foot of collector horizontal run.

The collector should be mounted as close to the storage tank as possible to minimize heat loss in the piping runs.

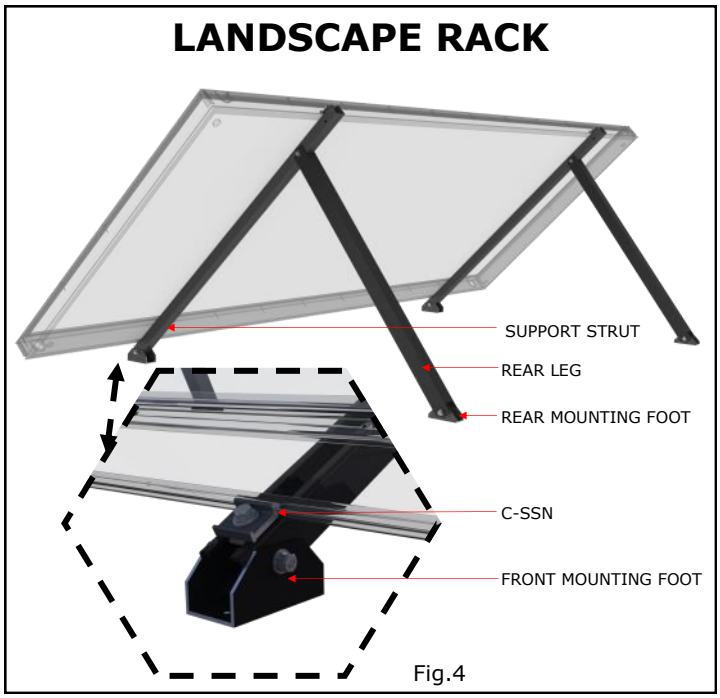


Fig.4

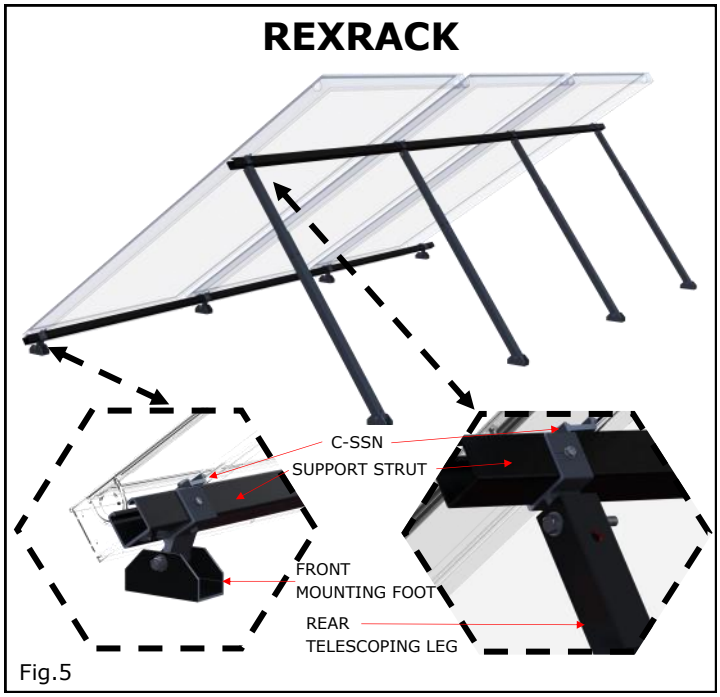


Fig.5

4.3.1 The most important structural considerations is to securely anchor the solar collector and the SunEarth mounting hardware to the structural members of the roof with stainless steel hanger bolts, lag bolts, standoff mounts or other approved roof attachment methods. The solar collector shall be attached to the mounting hardware as detailed in Figures (6-9). (Note: The drawings in the manual detail mounting hardware for the SunEarth Empire, Imperial, SunBelt and ThermoRay series collectors.)

4.3.2 The collector should be raised from the roof surface to allow for rainwater and debris to pass under the collectors and for proper ventilation of the roofing material. There should be at least $1^1/_2$" of clearance between the roof surface and the bottom of the solar collectors. Local codes may require greater clearance and shall be followed accordingly.

4.3.3 When selecting mounting hardware and fasteners it is extremely important to avoid galvanic corrosion resulting from the direct contact of incompatible metals. Use of SunEarth anodized aluminum Solar Strut mounting hardware and stainless steel lag or hanger bolts, fastening hardware is recommended. In climates subject to severe winters or high humidity use of galvanized fasteners is prohibited.

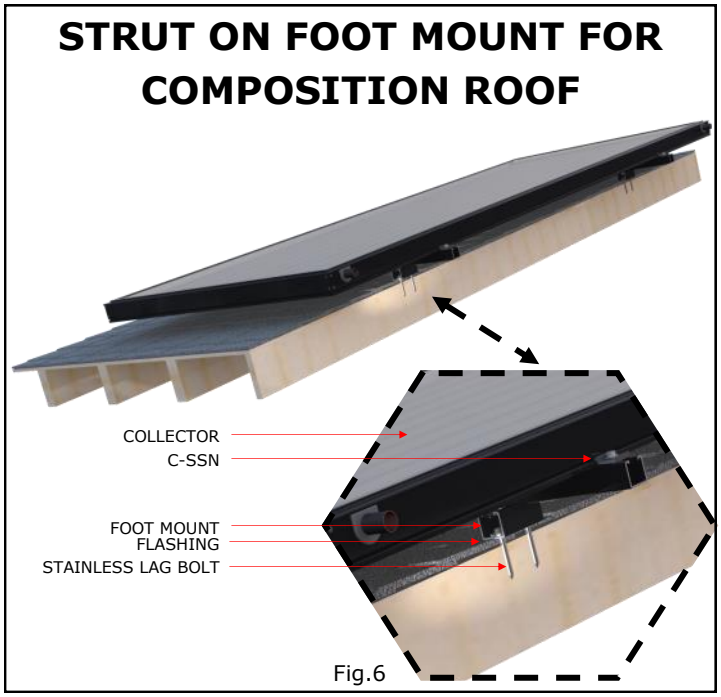
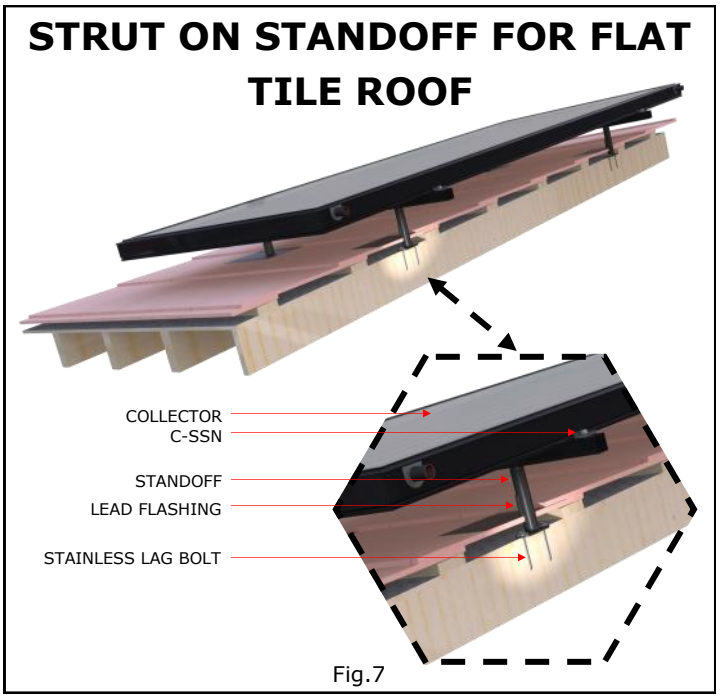
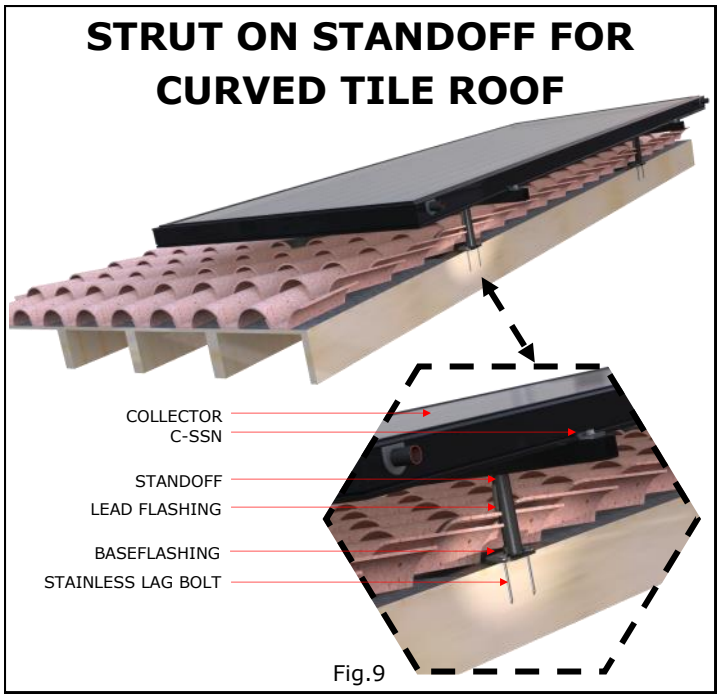
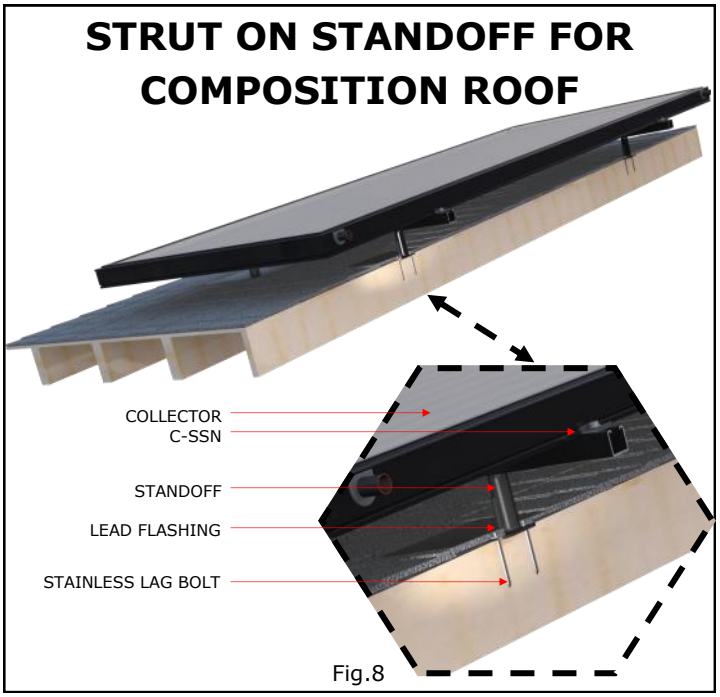


Fig.6







4.3.4 Preserving the integrity of the roof membrane is the most important roofing consideration. Ensure that all roof penetrations required to plumb

and mount the solar collectors are properly flashed and sealed in accordance with standard roofing practices and in compliance with all local codes and ordinances.

4.3.5 If the region is subject to hurricane conditions, additional steps may be required to secure the collector and mounting hardware to the structural members. In certain areas of the country, local building codes may require collector wind load testing or prescribe specific mounting procedures. Consult you local building department regarding any special considerations for your area.

4.4 Collector Loop Plumbing

The collector loop must be plumbed using copper piping and copper, brass, bronze or stainless steel fittings. Lead-free solder shall be used. Use of galvanized steel, CPVC, PVC, PEX or any other type of plastic pipe is prohibited. The collectors can produce temperatures that will melt plastic piping.

The collector loop pipe sizing must be adequately sized to handle the design flow rates for the collectors. SunEarth recommends $^{1}/_{2}$" nominal diameter pipe sizes for single collector systems and $^{3}/_{4}$" nominal diameter pipe for two collector systems. It may be necessary to increase the pipe size for longer pipe runs or reduce the pipe size for shorter runs or higher efficiency pumps. The pipe must be large enough that the velocity of the water does not exceed 4 ft./s. Hot water flowing at over 4 ft./s in a pipe will erode the pipe and reduce system life.

When more than one collector is used in the system, the collectors should be plumbed in a reverse return piping arrangement in order to maintain equal flow through all collectors in the array. Where reverse return piping is not possible flow balancing valves must be installed to ensure that the difference in flow rates between collectors is no more than ± 10%.

Piping in new solar installations can be covered with dirt, grease, solder flux or other impurities. A thorough cleaning is required after all the connections are completed. Carefully review the cleaning procedures in "Flushing the System" outlined in Section 4.13

All vertical piping between the storage tank and the collector shall be supported at each story or at a maximum of ten feet (10'). Horizontal pipe runs should be supported to allow complete drainage of the system if necessary, the required slope is $^{1}/_{4}$" per foot sloped to drain.

Horizontal piping roof runs shall be secured and supported providing at least $1^{1}/_{2}$" clearance from the roof.

Standard best piping practices shall be followed as described in the Uniform Plumbing Code.

International Plumbing Code or other recognized code or standard. Plumbers tape or tube strap is required. The pipe insulation should not be compressed or crimped by the strapping material.

Allowance should be made for expansion and contraction of piping due to changes in temperature of the water and piping. Use flexible pipe supports and avoid long straight piping runs. Soft copper coils are recommended, if hard copper is used include bends and elbows to allow for expansion such as swing joints at the collector inlet and outlet.

The installation of all horizontal and vertical piping shall not reduce the performance or rating of any structural member or fire rated assembly. Adhere to all applicable local codes and ordinances.

4.5 Pipe Insulation

WARNING: HOT PIPES MAY CAUSE BURNS IF TOUCHED. ENSURE THAT ALL PIPES AND FITTINGS ACCESSIBLE TO THE PUBLIC ARE WELL INSULATED. COMPONENTS ACCESSIBLE TO PUBLIC TRAFFIC MUST BE KEPT BELOW 140°F OR CLEARLY LABELLED WITH AN APPROPRIATE WARNING.

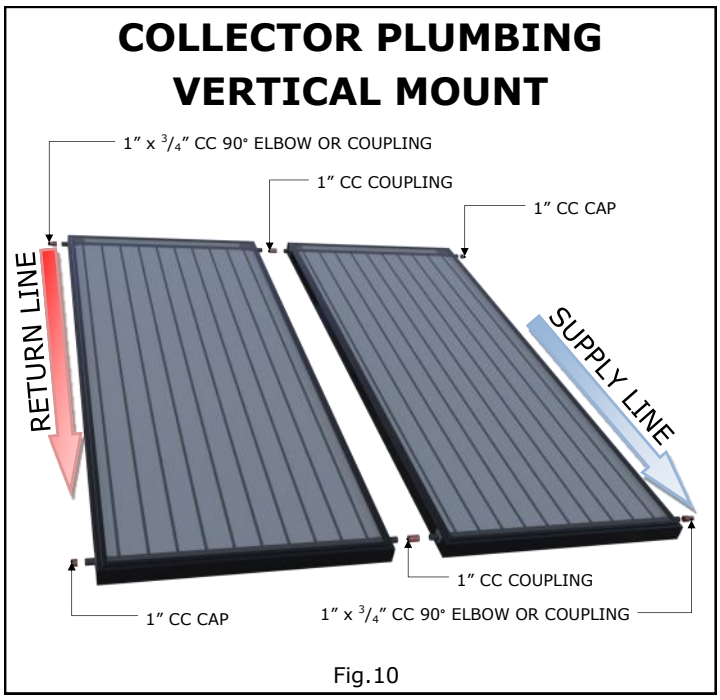


Fig.10

The collector loop piping, plus any interconnecting hot water piping shall be well insulated with high quality flexible closed cell insulation to minimize heat loss. The insulation shall have a maximum operating temperature of 220°F or higher. The wall thickness of the pipe insulation should be not less than $^{1}/_{2}$". When it comes to pipe insulation the rule is simple: thicker is better.

To the extent possible, slide the insulation material over the pipe without cutting or taping. All butt joints must be sealed with contact adhesive. The use of rigid polyethylene pipe insulation is prohibited. The temperatures generated by your collector in the summer months or under stagnation conditions can melt this type of material.

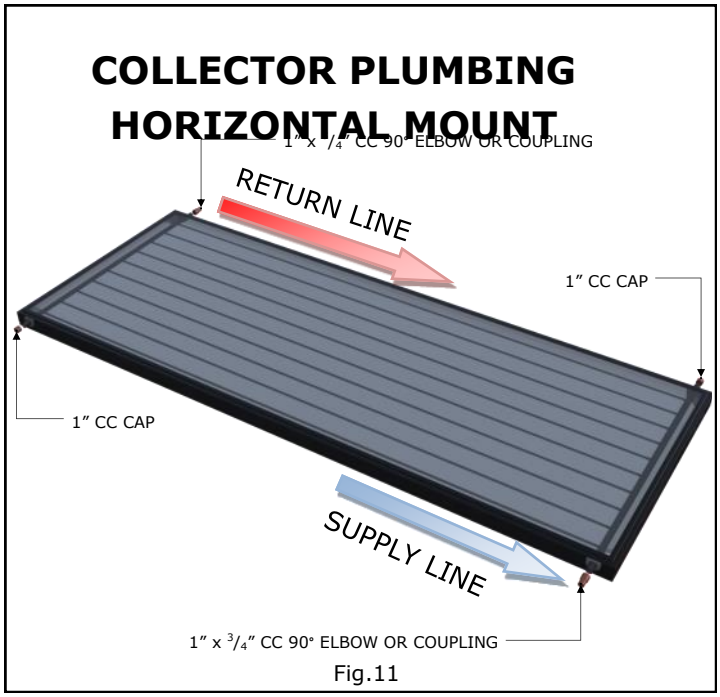


Fig.11

Any above ground exterior pipe insulation is subject to UV degradation and must be jacketed, wrapped with aluminum foil tape, or painted with two coats of high quality water-based acrylic resin coating as supplied by the insulation manufacturer.

4.6 Control System

4.6.1 Differential Controller

The differential controller must be installed in an accessible location so that the user interface, typically an LCD screen, can be seen. Switches on the controller must be labeled and accessible. Always follow the controller manufacturers wiring instructions when installing differential controllers. Control system inputs; such as signals from the temperature sensors or flow meters shall be connected to eh appropriate low voltage terminals. Controller output to the pumps will be medium voltage, 110 VAC or 220 VAC. Medium voltage power to the pump may be supplied by a line cord from the pump to an outlet in the controller or hard wired from the controller medium voltage terminals to the pump. Wiring must comply with standard electrical practice and all applicable electrical codes for the jurisdiction having authority, this may require the use of conduit for medium voltage wiring.

The differential controller must have a provision to manually turn the pump on and off (manual override) so that the pump operation can be checked at any time and the pump can be manually stopped if required for maintenance or troubleshooting purposes.

Set the maximum tank temperature to the desired maximum temperature, this temperature must be lower than the rated maximum temperature of the tank an associated components. When the solar loop heats the tank to the temperature, the pump will shut off

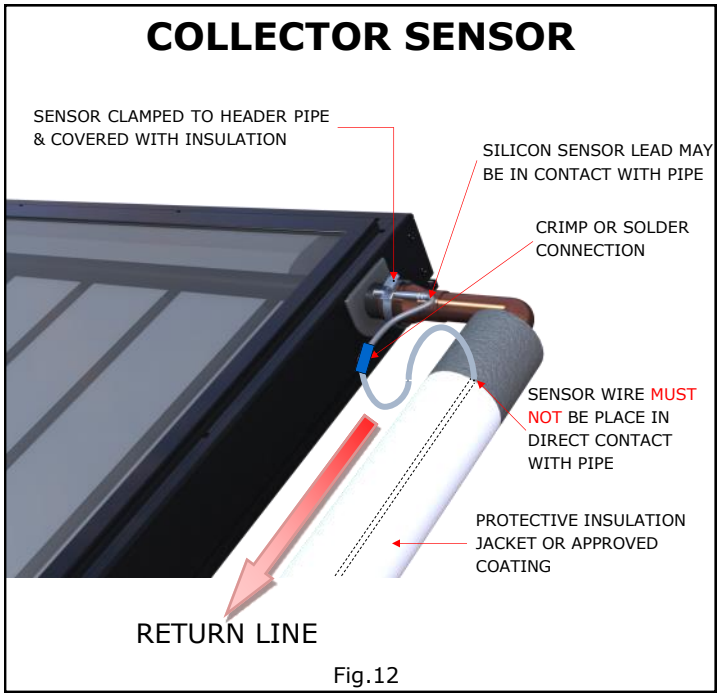


Fig.12

preventing further heat gains to the solar tank.

4.6.2 Collector Sensor Placement

The collector sensor shall be located on the solar loop return line as close to the collector as possible. Sensors are typically accurate to $\pm^{1}/_{2}$°F if properly installed and weatherized. The collector probe sensor shall be attached to the SunEarth collector header pipe either with a stainless steel hose clamp or by inserting the probe sensor into a thermal well in contact with the fluid near the outlet header pipe.

It is recommended that the connection between the silicon sensor lead and low voltage sensor wiring be made inside the attic, a NEMA 4X junction box or some other indoor space. When using wire nuts to make the connection, the crimped brass cap on the end of the sensor should be removed and the wire stripped before inserting into the wire nut for connection. Where connections from the sensor lead to the low voltage wiring is made at an exposed location the connection should be crimped and insulated with heat shrink or soldered and insulated with heat shrink. Wire nuts or screw connectors should not be used in exposed locations due to the likelihood of corrosion which will result in a compromised electrical connection. Thoroughly wrap and weatherize the insulation with electrician's tape or insulation tape as provided by the manufacturer. See Figure 12 for collector sensor installation detail.

If an electrical potential exists between the roof and ground, this may induce current in the collector sensor wire. This current will result in a false signal being received by the controller and hence incorrect temperature measurements. To prevent this current the collectors absorber plate and piping should be independently earth grounded. This will provide a separate path to ground from the roof which does not interfere with the sensor readings.

Grounding can be achieved by running a separate ground wire to the collectors or ensuring that the pipe in the solar loop is grounded and that there are no electrical discontinuities between the grounding point and the collectors absorber. Grounding of the collector & roof piping is especially important in locations that often experience electrical storms and electrical atmospheric activity.

4.6.3 Low Voltage Wiring

The low voltage wiring used in to connect the sensor lead to the controller shall be a minimum 18 AWG. The wiring should be bare or tinned copper, two conductor, stranded, PVC insulated, with a PVC UV rated jacket suitable for exterior use. In locations that often experience electrical storms and electrical atmospheric activity the low voltage sensor wire should also be shielded with the shielding grounded.

Low voltage wire shall be rated for the full ranges of temperatures expected in the location, typically wire is rated up to 160°F. The low voltage sensor wire must not be in direct contact with the pipes as the wire insulation may melt when in contact with a hot pipe. Low voltage sensor wire must be run OUTSIDE the pipe insulation. Where the low voltage wire is run in an exposed location, it should be run OUTSIDE the pipe insulation but UNDER the insulation jacket or wrap to protect the wire from UV exposure.

4.7 Installing the Solar tank

In plumbing the solar storage tank make sure that all the components are accessible and easy to reach. Provide for clear access to the storage tank, pump, mixing valve and other key components. Use only brass, copper and stainless steel fittings in plumbing the solar storage tank. the use of galvanized fittings, CPVC, PVC or other plastic pipe is prohibited. Di-electric nipples may be required by the (Authority having jurisdiction) AHJ.

Hard copper connections to the city cold water supply line and the home hot water feed lines are recommended. The gaskets in standard water heater flex hose connectors can become brittle and compressed over time and begin leaking on the water heater. If not detected in a timely manner even a small drip or leak may cause serious damage to the tank's electrical components or, in extreme cases, may cause the tank to leak from the outside in.

Tank plumbing is required to provide for the isolation of the solar storage tank from the city cold water supply line by means of an isolating ball valve (COMPONENT 23, FIGURES 2; 3).

The differential controller shall have a screen readout to show temperatures of the collector and storage tank. Otherwise, line thermometers shall be installed in the collector supply and return lines to allow for a simple diagnostic check of proper system operation. On a sunny day the hot water return line should be approximately 5°F—12°F warmer than the water in the

collector supply line. Compare the temperature readings in the two line thermometers (COMPONENT 3, FIGURES 2; 3).

A high quality thermostatic mixing valve is a required component in all SRCC certified systems and should be plumbed in line with brass unions connections for ease of future repair or replacement (COMPONENT 32, FIGURES 2; 3). The mixing valve shall be standard ASSE 1017 approved.

The temperatures generated by your SunSaver system will vary throughout the year. On sunny days the end of the day solar tank temperatures may range between 110°F to 180°F depending upon the season and hot water demand. The mixing valve referenced above blends the hot and cold water supplies to deliver hot water to your fixtures at a safe, controlled temperature.

WARNING: SCALDING CAN OCCUR WITHIN FIVE SECONDS WHEN WATER TEMPERATURES APPROACH 140°F THE MIXING VALVE SHALL BE ADJUSTED BY YOUR CONTRACTOR TO PROVIDE WATER TO YOUR FIXTURES AT NO MORE THAN 122° F.

The cold water supply line to the solar storage tank shall be insulated with a minimum $^1/_2$" wall to a minimum distance of 5' behind the storage tank, or to the wall if closer than 5'.

4.8 Tank Sensor Placement

Figure 13 details the proper placement of the solar storage tank sensor. The tank sensor shall have good thermal contact with the tank wall in order to accurately measure the temperature of the water at the bottom of the tank. It is recommended that the sensor be installed in a brass or copper thermal well screwed into the lower sensor port in the tank.

Thoroughly weatherize the wire connections in accordance with section 4.6.2.

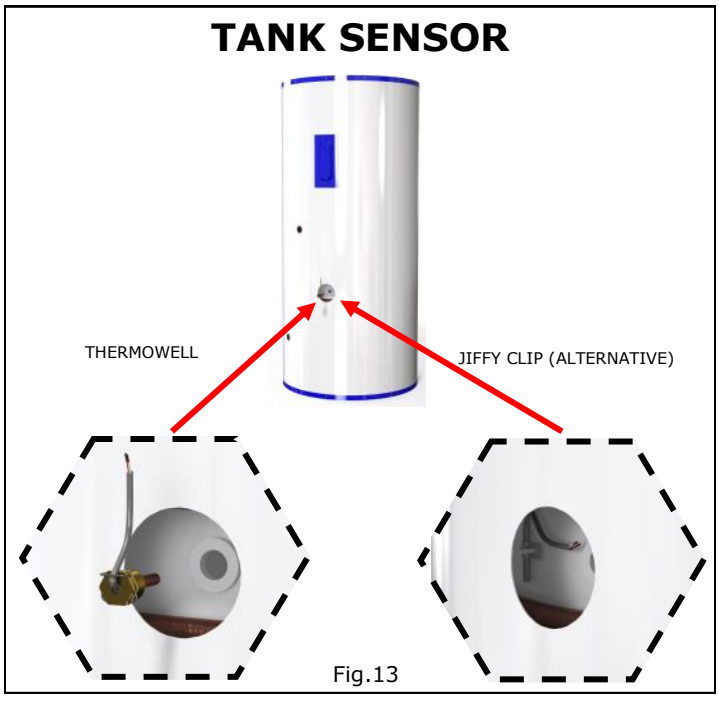


Fig.13

4.9 Tank Insulation

Conventional back-up electric water heaters have insulation values between R-12 and R-20. the R value expresses the thermal resistance of the tank insulation. The higher the "R-value" the more effective the insulation is at preventing heat loss. The use of any solar storage tank with an R value belowR-12 is prohibited.

The storage tank should not be placed directly on an un-insulated floor or concrete slab, in order to prevent moisture damage to the base of the tank and reduce the heat loss to the floor. The tank should be raised off the floor on a pad.

4.12 Electrical and Wiring Requirements

When the electric element is used as the auxiliary heat source a properly licensed contractor shall make the 230 VAC electrical connection to the water heater or storage tank. If your solar contractor is not allowed by law to make these connections consult a licensed electrician.

Never activate the circuit breaker controlling the electrical heating element until the solar storage tank is completely filled with water. This will prevent "dry firing" and destruction of the heating element.

SunEarth recommends the use of a 115 VAC differential control with a factory installed six foot line cord. The installation requires one 115 VAC outlet to be located neat the solar storage tank. The circulation pump line cord is then plugged into the receptacle on the controller. A 230 VAC control and circulation pump may be substituted where appropriate.

4.13 Flushing the System

Once the components are plumbed you are ready to fill the solar storage tank and solar loop with water.

Proceed as follows:

4.13.1 STEP 1— Close the tank isolation valves (COMPONENT 5 & 14, Figures 2; 3)Fill the solar tank with water and check that there are no leaks.

Do this by opening the cold water isolation valve to the solar tank (COMPONENT #23, FIGURES 2; 3) AND OPENING A HOT WATER OUTLET, SUCH AS A FAUCET, UNTIL THE WATER RUNS FREELY. When the tank is filled, inspect all threaded connections and solder joints for leaks.

4.13.2 STEP 2—thoroughly flush all impurities out of the collector loop and check collector loop for leaks.

Begin by connecting a washing machine type hose to the return purge valve (COMPONENT#11, FIGURES 2; 3) and fill the collector loop with water. The isolation ball valve (COMPONENT #5, FIGURES 2; 3) remains closed at this point. While the hose is still connected to the return purge valve and the water is running, open the supply purge valve (COMPOPNENT #11, FIGURES 2; 3) and let the water run out until it is free of impurities or debris that might have entered the solar loop as the components were plumbed. Water soluble flux

should be used when soldering pipe joints in the collector loop in order to facilitate system flushing. Run the water long enough to eliminate any air bubbles that may be trapped in the system.

Close the return purge valve. The collector loop now has been subjected to city pressure. The PRV should not discharge. Slowly open the tank isolation valve (COMPONENT #14, FIGURES 2; 3) and allow any impurities or debris through the supply purge valve when all impurities have been purged close the supply purge valve.

Slowly open the tank isolation valve (COMPONENT #5, FIGURES 2; 3) and open the return purge valve allowing impurities or debris through the return purge valve when all impurities have been purged close the return purge valve.

Make a final inspection of the collector plumbing connections to ensure that there are not leaks anywhere in the collector loop piping.

4.13.3 STEP 3—Run circulator pump to check pump operation and force any trapped air toward the air vent

until all air has been eliminated from the collector loop.

After you have determined the integrity of the entire piping system, turn on the circulating pump. Do this by setting the manual switch within the controller to the "on" position. Run the pump for a full five minutes and carefully check to ensure there is proper fluid flow and that all the air has been purged from the collector loop. An inexpensive flow meter such as those manufactured by Blue White Industries or Letro is recommended as an optional system component. A flow meter allows you to monitor and adjust the flow rate through the piping.

Set the controller to the "off" position.

5) SYSTEM START-UP PROCEDURES

Throughout the installation procedures outlined above, emphasis has been placed on the correct method for plumbing and wiring the components, checking for plumbing leaks, pressurizing the collector loop and eliminating any trapped air that can impact fluid quality and pump performance. Having completed these tasks it is time to start up you SunSaver solar water heating system.

When filling the solar storage tank it is recommended that a hot water fixture in the home be opened to eliminate air as the tank is filling. Once the tank is full and all air has been purged, close the hot water fixture and again check all of the plumbing for leaks.

Proper operation of the circulation pump can be determined by turning the system control to the "**ON**" position. The pump should begin to circulate. During this stage any air trapped in the collector and solar loop will be automatically purged through the air vent installed on the outlet of the solar collector(s).

NEVER ACTIVATE THE ELECTRICAL HEATING ELEMENT UNTIL THE TANK IS COMPLETELY FILLED.

When the system is determined to be leak free and operational, set the differential controller to the "**AUTOMATIC**" setting. This will activate your circulating pump when the temperature differential between the collector and the tank is sufficient to provide useful heat. The SunEarth controller will switch the pump on when the differential is 16°F. The controller will switch the pump back off when the differential falls to 8°F. The controller also allows you to limit the maximum solar storage tank temperature if desired.

The SunEarth controller maximum tank default setting is 140°F. This setting can be adjusted as described in the controllers instruction manual.

6) TWO MODES OF SYSTEM OPERATION

6.1 Solar Preheat

Set the tank thermostat to the lowest acceptable temperature setting. If the solar heated water entering the tank is warmer than the thermostatic set point, the electric heating element will not come on. If your system has an operational time switch on the heating element, you may preset the timer to turn the heating element on and off at specified times throughout the day if desired. The timer is usually set to only allow the element to come on in the late afternoon and night after the solar collectors are no longer able to provide useable heat. The time switch also can be overridden so that you operate on 100% solar power when conditions allow.

6.2 100% Utility Power

Leave the circuit breaker to your solar storage tank on and close the isolation ball vales in the collector loop (COMPONENT #, FIGURES ##). In this mode of operation you must turn off the circulation pump by changing the setting to "**OFF**". Failure to turn off the pump can quickly damage the pump motor, shaft, bearings or impeller.

7) SYSTEM SHUT DOWN AND ISOLATION PROCEDURES

Your SunSaver solar water heating system is designed so that the key components can be easily isolated for emergency repairs or routine maintenance. By shutting a single valve you can isolate the entire system from the pressurized cold water supply (COMPONENT 23, FIGUREs 2; 3). In the case of a storage tank or fitting leak immediately shut this valve and call you installation contractor for service.

The collector loop can be isolated from the solar storage tank by closing isolation ball valves (COMPONENT 14 ; 5, FIGURES 2; 3). Turn the circulating pump off by setting the controller to the "**OFF**" position.

8) VACATION RECOMMENDATIONS AND PROCEDURES

Solar water heating systems can reach very high temperatures when there is no daily hot water usage. If a

short summer vacation is planned, the SunEarth differential temperature controller has a vacation function which, when activated, will dissipate heat at night. See the controller instruction manual to activate this function. Remember to de-activate this function upon your return!

During extended summer vacations (4 weeks or more) it is advisable to either cover the solar collectors with an opaque material or to manually drain the collector loop. SunEarth recommends that you cover the collectors if practical.

If you choose to drain the collector loop follow the steps below. **The collector loop must be drained if ambient temperatures are below 41°F.**

8.1 Turn the controller to the "off" position (COMPONENT 18, FIGURES 2; 3).

8.2 Connect one end of a garden hose to the purge/ drain valve (COMPONENT 11, FIGURES 2; 3) and place the other end in a bucket or drain. Close the collector loop isolation valves (COMPONENTS 5; 14, FIGURES 2; 3). Open the purge/drain valve and the fill valve and gravity will drain the water from the collector loop.

8.3 If the electric water heater is installed with an optional time clock controlling the water heating element make sure the clock is not preset to go "**ON**" during your absence. If you have a time switch, deactivate per the instruction manual.

When you return home follow the start up procedures outlined in this manual to resume using your solar water heating system.

9) MAINTENANCE AND TROUBLESHOOTING

The following procedures are intended to optimize the performance of your SunSaver solar water heating system and also to extend the life of the primary components.

9.1 The most important component in your system, at least from a longevity standpoint, is often ignored and never seen. We are referring to the sacrificial "anode rod" installed in your solar storage tank (COMPONENT 20, FIGURES 2; 3). Typically constructed from magnesium, anode rods are installed in "glass lined" water heaters and storage tanks to inhibit corrosion.

As the name implies, the "sacrificial" anode rod is consumed so that the tank lining is not. At a certain point in the process, the anode rod is no longer completely effective and the corrosive processes begin to eat away the tank's glass lining. In time the solar storage tank, like any other water heater, will being to leak. The process is not reversible and the tank must be replaced.

System temperatures and water quality affect the rate at which the anode rod is consumed. In general, the higher the average system temperature, the faster the rate of corrosion. By changing the anode rod after the fifth year of system operation, and every three to five years thereafter, it is possible to extend the life of the solar storage tank.

9.3 The solar storage tank also should be flushed annually to minimize sediment build up on the bottom of the tank. If you live in an area with high mineral content in your water, flush the tank on a semi-annual basis. Disconnect the power to the solar tank and the

circuit breaker or time switch (if present) before flushing. Turn the controller to the off position.

Open the flush valve on the bottom of the solar storage tank (COMPONENT 15, FIGURES 2; 3) and drain a sufficient volume of water to eliminate the sediment. After flushing make sure the tank is completely full of water before restoring power to the thermostat and heating element. Turn the controller to the "**ON**" position.

9.4 If you live in a dusty climate it is a good idea to wash off the dirt that settles on the collector glass once a month. NOTE: Ensure that the collector glass is cool before cleaning. When the collector glass is clean it allows the collector to maintain a high level of thermal performance.

9.5 Check the exterior pipe insulation annually and patch or repair any exposed surfaces or degraded areas. Repaint as necessary with high quality exterior latex paint.

9.6 In the unusual instance of collector glass breakage, the glass should be replaced immediately. This will reduce the likelihood of water accumulating inside the collector and deteriorating the insulation. Contact you installation contractor.

9.7 If it's been a sunny day and you don't have hot water, make sure that the controller is set in the automatic position. If the controller is properly set and the pump has not been running, unplug the line cord from the controller receptacle and plug the pump directly into a nearby 115 VAC outlet. If the pump does run the problem may be located in the controller or one of the temperature sensors. Contact you installation contractor.

9.8 If you have a full tank of hot water before bed and the solar storage tank is cold in the morning, the check valve (COMPONENT 4, FIGURES 2; 3) may not be seating correctly and should be cleaned or replaced. Also make sure that the circulating pump is not running at night. If the pump is running and the controller displays questionable temperatures at the collector or tank (i.e. 180°F tank and 45°F collector), check both sensors using a resistance meter to see if they are correctly calibrated. If you find a defective sensor replace it immediately.

9.9 If the weather is poor and the auxiliary heating element will not fire, the bright red reset button on the thermostat may have to be depressed to be reset. Single tank systems have one heating element to be reset (COMPONENT 21, FIGURES 2; 3).

DANGER: NEVER REMOVE THE PROTECTIVE ACCESS PLATE ON THE XTERIOR OF THE SOLAR STORAGE TANK WITHOUT DISCONNECTING THE 230 VAC POWER SUPPLY AT THE CIRCUIT BREAKER.

After the circuit breaker has been turned off, remove the access plate in the storage tank and depress the red reset button on the thermostat. If it clicks when depressed the heating element should fire immediately when you reconnect the circuit breaker. If the reset button does not click and you do not have hot water after one hour, the heating element or thermostat may be defective. Contact you installation contractor for service.

10) SYSTEM COMPONENTS PARTS

See Figure # for the location of the specific components numbered below.

1. SunEarth Solar Collector(s): Absorbs the sun's heat energy and transfers this heat to the water circulating through the collector.
2. Collector Sensor (T1): Wired to the system controller. Works in conjunction with the tank sensor to automatically turn the circulating pump on and off at preset temperature differentials.
3. Optional Tank and Line Thermometers: Used t o determine proper system operation. Line thermometers will show and approximate 5°F-12°F temperature difference between the collector supply and return lines on sunny days. In a single tank system the tank thermometer will read the temperature of the water after the mixing valve feeding the fixtures.
4. Check Valve: This valve is installed to stop or minimize convective evening heat loss in the system. The heat in the solar storage tank will rise through the collector loop piping in the evening into the much cooler solar collector and dissipate heat unless prevented from doing so by a check valve. Check valves are also sometimes referred to as one way valves or non-return valves. A separate check valve is not required if there is and integral check valve within the pump.
5. Isolation ball valve: Used in conjunction with component No.14 to isolate the solar collector loop from the solar storage tank.
6. Pressure relief Valve: Will discharge water from the collector loop at the PR valve setting (typically 150 PSI). The PRV protects the collector and all components in the collector loop from pressures in excess of the PRV pressure setting.
11. Drain/Purge Valve: Used to purge air from the loop and drain the collector loop.
12. Isolation Ball Valve: When closed in conjunction with No.14 will isolate the circulation pump for repair or replacement.
13. Circulating Pump: Circulates water through the collector loop.
14. Isolation Ball Valve: used in conjunction with component No. 5 to isolate the solar collector loop from the storage tank.
15. Flush Valve: used to drain the solar storage tank and to flush sediment from the tank on an annual basis.
16. Tank Sensor (T2): Wired to the controller. Works in conjunction with the collector sensor to turn you circulating pump on and off at preset temperature differentials.
17. Cold Water Dip Tube: Forces incoming city cold water to the bottom of the solar storage tank to prevent mixing with the warm water at the top of the tank.
18. Differential Temperature Controller: Automatically turns the circulating pump on and off when there is sufficient heat to be gained from the solar operation. The controller also may be set to limit high temperature build up in the solar storage tank.
20. Anode Rod: the "sacrificial" anode rod is installed in your solar storage tank to prevent corrosion to the tank lining by neutralizing aggressive water action. Anode rods have a finite life and require periodic replacement depending on annual tank temperatures and water quality. Determine a replacement schedule with you installation contractor.
21. Heating Element & Tank Thermostat: the solar storage tank is equipped with an auxiliary 4500 watt, 230 VAC electrical heating element. The thermostat controls the temperature setting of the auxiliary heating element.
22. Temperature and Pressure Relief Valve: Universally required by the plumbing code on water heaters. Will automatically release and dump water at either 150 PSI or 210°F in temperature.
23. Cold Water Supply Line Isolation Ball Valve: When open allows potable water to fill the solar storage tank or back-up water heater. When closed isolated the solar storage tank and back-up water heater from the cold water supply line.
32. Mixing Valve: Automatically blends hot water from the solar storage tank with incoming city cold water to an acceptable set point. A mixing valve must be installed on every SunSaver solar water heating system.

11) ESTIMATED COMPONENT LIFE

You can expect a long and useful like from the primary components in your SunSaver solar water heating system by adhering to the routine service and maintenance tips provided above.

The SunEarth solar collectors have a design life of 25 to 30. The solar storage tank should last 12 to 20 years in most areas provided the anode rod is periodically replaced. The circulating pump and differential control should last 10 to 15 years before needing replacement. Like EPA mileage estimates for automobiles, these component design lives represent average figures for system components installed in the United States. Life of your components may vary.

To obtain warranty service, please see the completed Appendix F in the back of this manual with your installation contractor contact information or contact SunEarth Inc. for the name of an authorized service agent near you.

12) SYSTEM OPERATING PARAMETERS

12.1 Temperature Differential

The temperature difference between the collector outlet sensor (T1) and the solar tank sensor (T2) is a good indicator that the system is operating correctly. During the middle of the day, when the pump is running the normal operating differential will be 4°F—40°F.

If the solar tank reaches its maximum temperature the pump will stop. If this happens during the middle of the day the collector temperature will rise rapidly while the tank temperature will remain static. In this case a temperature differential of up to 300°F is not unusual.

APPENDIX A

SUNSAVER APPROVED COMPONENTS

Solar Collectors – SunEarth Liquid Flat Plate Collectors

Make	Series	Model Numbers
SunEarth	Empire, Paint	EP-21 EP-24 EP-32 EP-40 EP-24-0.75 EP-32-0.75 EP-40-0.75 EP-24-1.5 EP-32-1.5 EP-40-1.5
SunEarth	Empire, Chrome	EC-21 EC-24 EC-32 EC-40 EC-24-0.75 EC-32-0.75 EC-40-0.75 EC-24-1.5 EC-32-1.5 EC-40-1.5
SunEarth	SunBelt	SB-24-0.75 SB-32-0.75 SB-40-0.75
SunEarth	Imperial, Chrome	IC-32 IC-40
SunEarth	Imperial, Selective	IS-32 IS-40
SunEarth	ThermoRay	TRB-32 TRB-40

Collector Mounting Hardware

Make	Series
SunEarth	SolarStrut; RexRack; Flush Mount Kit; Universal Tilt Kit; Land-scape Rack

Install mounting hardware per SunEarth manuals, standard residential drawings, and/or plan sets.

Storage Tank

Make	Series	Model Numbers
SunEarth	SunEarth	SU80U-1* SU120U-1*
Any Equivalent UL Listed Tank		

**Includes auxiliary 4.5 kW heating element, suitable for one or two tank systems.*

Differential Temperature Controller

Make	Series	Model Numbers
SunEarth		SETR0301U; SETR0502U; SETR0603mcU SETR A501 T; SETR A502 TT; SETR A503 TTR
Steca		TR0301U; TR0502U; TR0603mcU TR A501 T; TR A502 TT; TR A503 TTR
Independent Energy	Goldline	GL-30-X216; GL-30-X217
or Approved Equal		

APPENDIX A

Circulator Pump

The circulator pump shall be a wet rotor small circulator with a stainless steel, brass or polymer body and a metal or polymer impeller. The pump motor shall be induction or permanent magnet ECM driven. The pump shall be rated for: maximum fluid temperatures of no less than 180°F and pressures of no less than 125 PSI. The maximum rated amperage shall be no more than 1.5 Amps and the maximum rated power draw shall be no more than 135 Watts.

Thermostatic Mixing Valve

The thermostatic mixing valve shall have a bronze, brass or stainless steel body with a rated maximum working temperature no less than 200°F and a rated maximum working pressure no less than 125psi. The range of temperature set points shall be at least 18ºF (10ºC) and shall include a set point of 120ºF (50ºC). The Thermostatic Mixing valve shall be third party listed and certified to one of the following ASSE standards: ASSE 1016; ASSE 1017; ASSE 1070.

Ball Valves

Ball valves shall be of bronze, brass or stainless steel construction. Maximum working temperature shall be no less than 200°F and maximum working pressure shall be no less than 125 psi.

Three-Way Valves (Optional)

Three-Way valves shall be of bronze, brass or stainless steel construction. Maximum working temperature shall be no less than 200°F and maximum working pressure shall be no less than 125 psi.

Boiler Drains (A.K.A. Charge Valves; Fill Valves; Drain Valves; Purge Valves)

Boiler Drains shall be of bronze, brass or stainless steel construction. Maximum working temperature shall be no less than 200°F and maximum working pressure shall be no less than 125 psi.

Pressure Relief Valve

The pressure relief valve shall be of bronze, brass or stainless steel construction with a pressure setting of 150psi. The pressure relief valve shall be set to discharge at a pressure below the maximum design pressure of all other components in the collector loop.

Check Valve (A.K.A. Non-Return Valve)

The check valve may be a standalone component or may be integral to the circulator pump. The check valve shall be spring type of bronze, brass or stainless steel or polymer construction. Maximum working temperature shall be no less than 200°F and maximum working pressure shall be no less than 125 psi.

Air Vent

The air vents shall be of bronze, brass or stainless steel construction. Maximum working temperature shall be no less than 200°F and maximum working pressure shall be no less than 125 psi.

Thermometers (Optional)

Thermometers shall be dial or scale type and shall have a metallic body and casing and a glass lens. The range of measurement shall be not less than 30°F to 200°F with an accuracy of +/- 2%. An electronic temperature sensing system may be used in place of dial or scale thermometers (see below).

Temperature Sensors (Electronic)

An electronic temperature sensing system may be used in place of dial or scale thermometers. Temperature sensors shall be shall be of metallic construction and have a maximum temperature rating not less than 200°F. Temperature reading may be via digital readout, LCD screen, internet or other electronic device. The temperatures may be read at the differential controller screen. The range of measurement shall be not less than 30°F to 200°F with an accuracy of +/- 2%.

APPENDIX A

Sensor Wire:

Sensor wire for temperature sensors or other electronic sensors must be no less than 18/2 AWG. Sensor wire must be insulated; in locations where the sensor wire is exposed to the elements it must be UV resistant and rated for outdoor use.

Piping and Hoses

Piping and Hoses shall be copper tube or corrugated stainless steel with a maximum operating temperature of not less than 220°F and maximum working pressure of not less than 125 psi.

Pipe Insulation

Pipe insulation shall have a maximum operating temperature of no less than 220°F. All pipes shall be insulated to R2.6 or greater, typically this will require a wall thickness of ¾" or greater. When located in exposed areas, pipe insulation shall be protected with a UV resistant coating or jacket.

Auxiliary Water Heaters

The auxiliary water heater shall be listed by an accredited listing organization.

The specific auxiliary water heater selected for a system should be adequately sized to meet the full hot water load at the residence taking into account the delivered hot water temperature; the mains cold water temperature and the expected hot water usage as per standard water heater sizing guidelines.

APPENDIX C

SUNSAVER OG-300 SYSTEM LABELS

Labels containing the text below shall be attached to the appropriate valves on all SRCC OG-300 certified systems.

FLUID IDENTIFICATION:

THE HEAT TRANSFER FLUID USED IN THIS SYSTEM IS WATER.

BE EXTREMELY CARFUL WHEN DRAINING THIS FLUID. IT MAY BE DISCHARGED AT A VERY HIGH TEMPERATURE AND PRESSURE.

THE HEAT TRANFER FLUID USED IN THIS SYSTEM SHALL BE FDA GENERALY RECOGNIZED AS SAFE (GRAS). NO OTHER FLUID SHALL BE USED THAT WOULD CHANGE THE ORIGINAL CLASSIFICATION OF THIS SYSTEM. UNAUTHORIZED ALTERATIONS TO THIS SYSTEM COULD RESULT IN A HAZARDOUS HEALTH CONDITION.

PLEASE CONSULT SECTION 8 OF YOUR INSTALLATION MANUAL FOR INSTRUCTION ON SHUTTING DOWN AND DRAINING THE SYSTEM.

FREEZE LABEL:

PLEASE CONSULT SECTION 4.13.4 OF YOUR INSTALLATION MANUAL FOR SPECIFIC FREEZE TOLERANCE INFORMATION.

VALVE NO. 23 - COLD WATER SUPPLY ISOLATION VALVE

THIS VALVE IS NORMALLY OPEN AND ALLOWS POTABLE WATER TO FILL THE SOLAR STORAGE TANK. WHEN CLOSED THE SOLAR STORAGE TANK IS ISOLATED FROM THE PRESSURIZED CITY COLD WATER SUPPLY LINE PIPING.

VALVE NO. 5 – TANK ISOLATION VALVE

VALVE 5 IS NORMALLY OPEN. WHEN CLOSED IN CONJUNCTION WITH VALVE 14 THE SOLAR COLLECTOR LOOP PIPING IS ISOLATED FROM THE SOLAR STORAGE TANK.

APPENDIX C

VALVE NO. 14 – TANK AND PUMP ISOLTATION VALVE

VALVE 14 IS NORMALLY OPEN. WHEN CLOSED IN CONJUNCTION WITH VALVE 5 THE SOLAR COLLECTOR LOOP PIPING IS ISOLATED FROM THE SOLAR STORAGE TANK. WHEN CLOSED IN CONJUNCTION WITH VALVE 12 THE CIRCULATOR PUMP IS ISOLATED FROM THE SOLAR STORAGE TANK. **NEVER** SHUT THESE VALVES WHILE THE CIRCULATING PUMP IS IN OPERATION.

VALVE NO. 12 – PUMP ISOLATION VALVE

VALVE 12 IS NORMALLY OPEN. WHEN CLOSED IN CONJUNTION WITH VALVE 14 THE CIRCULATING PUMP IS ISOLATED FROM THE SOLAR COLLECTOR LOOP PIPING. **NEVER** SHUT THESE VALVES WHILE THE CIRCULATING PUMP IS IN OPERATION.

VALVE NOS. 9 – SYSTEM FILL VALVE

VALVE 9 IS NORMALLY CLOSED. WHEN OPEN IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

BE EXTREMELY CARFUL WHEN DRAINING THIS FLUID. IT MAY BE DISCHARGED AT A VERY HIGH TEMPERATURE AND PRESSURE.

VALVES NOS. 11 – SYSTEM PURGE VALVE

VALVE 11 IS NORMALLY CLOSED. WHEN OPEN IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

BE EXTREMELY CARFUL WHEN DRAINING THIS FLUID. IT MAY BE DISCHARGED AT A VERY HIGH TEMPERATURE AND PRESSURE.

ADDITIONAL TWO TANK SYSTEM VALVES

VALVE NO. 24 – COLD FEED TO SOLAR TANK ISOLATION VALVE

THIS VALVE IS NORMALLY OPEN. WHEN CLOSED IN CONJUNCTION WITH VALVE NO. 25 IT WILL ISOLATE THE SOLAR STORAGE TANK FROM THE POTABLE WATER SYSTEM.

APPENDIX C

VALVE NO. 25 – HOT OUTLET FROM SOLAR TANK ISOLATION VALVE

THIS VALVE IS NORMALLY OPEN. WHEN CLOSED IN CONJUNCTION WITH VALVE NO. 24 IT WILL ISOLATE THE SOLAR STORAGE TANK FROM THE POTABLE WATER SYSTEM.

VALVE NO. 26 – SOLAR TANK BYPASS VALVE

THIS VALVE IS NORMALLY CLOSED. WHEN OPENED IN CONJUNCTION WITH CLOSING VALVES NO. 24 & 25 IT WILL ALLOW COLD WATER TO BYPASS THE SOLAR SYSTEM AND FEED DIRECTLY INTO THE AUXILLIARY WATER HEATER.

APPENDIX F

SUNEARTH INC.
Quality Solar Energy Products

TEN-YEAR LIMITED PRODUCT WARRANTY

This warranty only applies to the following SunEarth products (hereinafter SunEarth Products):

COLLECTORS: Empire, Imperial, SunBelt, SunWise, and Custom Collectors
ABSORBERS: SunBurst and Custom Absorber Plates used in any glazed application
ICS AND DRAINBACK: CopperHeart ICS, CopperHeart Tanks, and CopperStor DrainBack Tanks

Under conditions of normal use and service the above SunEarth Products are warranted to the original, or subsequent users, for a period of **10 years** from the date of sale to be free of defects in material and workmanship pursuant to the exclusions detailed in this written warranty statement. SunEarth's liability for these products shall be limited to repairing or replacing at SunEarth's option, without charge, F.O.B. SunEarth's factory or an authorized SunEarth distributor or service center. SunEarth will not be liable for any costs of transportation, inspection, removal, reinstallation, or any other labor or freight charges that may arise in connection with a warranty claim, except as expressly set forth in this warranty.

The use of **ANY** of the above SunEarth Products for pool or spa heating is **NOT** covered by this warranty, **UNLESS** the pool or spa water is isolated from the above SunEarth Products through the use of a heat exchanger.

FIELD LABOR

Field labor to repair or replace any defective SunEarth Product is reimbursable as follows:

Year 1	$100/collector
Year 2 ~ 5	$75/collector
Year 6 ~ 10	$50/collector

FREIGHT AND SHIPPING EXPENSES

In the event of a valid warranty claim approved by SunEarth, SunEarth will pay for freight and shipping expenses as follows:

Year 1 of Warranty: SunEarth will pay the freight and shipping costs for the new or repaired SunEarth Product between SunEarth and the nearest local distributor, dealer, authorized service center, city, or shipping terminal.

After Year 1 of Warranty: Freight and shipping costs are the responsibility of the owner.

THIS WARRANTY DOES NOT APPLY

This warranty **does not apply** to the following: **(1)** conditions resulting from a failed component or part that is not part of the above listed SunEarth Products; **(2)** to damage caused by freezing conditions; **(3)** to conditions resulting from misuse, abuse, neglect, accident, or alteration; **(4)** to cosmetic discoloration of the collector framewall, absorber plate, or glazing over time; **(5)** to glass breakage; **(6)** to conditions resulting from the introduction of harmful chemicals, caustic fluids, or liquids deleterious to copper tubing, including improperly applied or maintained heat transfer fluids or chlorinated pool or spa water; **(7)** to SunEarth Products in which heat transfer fluids other than potable water or propylene glycol (DowFrost HD

APPENDIX F

recommended) was used; **(8)** to propylene glycol pH levels above 10 or below 8; **(9)** to periods of stagnation in excess of 30 days; **(10)** to excessive pressure; **(11)** to erosion corrosion of the copper tubing resulting from excessive flow rates; **(12)** to improper plumbing configurations that do not conform to SunEarth's manifolding requirements; **(13)** to clouding or condensation naturally resulting from temporary intrusions of moisture into the collector; **(14)** to conditions resulting from floods, earthquakes, winds, fire, lightning, or circumstances beyond SunEarth's control; **(15)** to damage caused by installation methods, including mounting, that do not conform to relevant national, state or local codes and ordinances, good industry practices, or to current applicable SunEarth manuals, diagrams, technical bulletins, or written installation instructions; **(16)** or to applications other than medium temperature (110 - 160F) domestic water heating.

If one of the above SunEarth Products is purchased outside the United States certain conditions of this warranty may **NOT** apply. Please contact your local SunEarth distributor or dealer for details.

LIMITED WARRANTY

EXCEPT AS EXPRESSLY PROVIDED IN THIS WARRANTY, THE ABOVE SUNEARTH PRODUCTS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY OR NON-INFRINGEMENT. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU.

LIMITATIONS OF REMEDIES

IN NO EVENT SHALL SUNEARTH BE LIABLE FOR ANY DAMAGES FOR LOST PROFITS, LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, ARISING OUT OF THE USE OR INABILITY TO USE THE ABOVE SUNEARTH PRODUCTS, OR FOR ANY CLAIM BY A THIRD PARTY. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

EXCLUSIVE AGREEMENT

THIS WARRANTY CONSTITUTES THE ENTIRE, COMPLETE, FINAL, AND EXCLUSIVE AGREEMENT FOR THE SUNEARTH PRODUCTS LISTED ABOVE. THIS WARRANTY SUPERSEDES ANY PROPOSAL, AGREEMENT, OR REPSRESENTATION, OR ANY OTHER COMMUNICATION, EITHER WRITTEN OR ORAL, MADE BETWEEN SUNEARTH AND SUNEARTH'S DISTRIBUTORS OR DEALERS, OR BETWEEN SUNEARTH AND THE END CONSUMER.

TO MAKE A CLAIM

To obtain service under this warranty, the product in question must be returned to the distributor or dealer of SunEarth products nearest you, or an authorized SunEarth service center. Each claim must be accompanied by documentation providing the following:

1) Owner's name, address, email address, and phone number
2) Installation contractor's name, email address, and phone number
3) Original sales receipt
4) Product model and serial number(s)
5) Date of installation
6) Date of failure
7) Reason for failure
8) Pictures of the suspected manufacturing defect – digital pictures of the suspected manufacturing defect also need to be submitted

If you have any warranty questions, contact your installation contractor or SunEarth at (909) 434-3100.

Effective 01/17/11 Protecting Our Environment – Since 1978
www.sunearthinc.com

APPENDIX G

Solar Rating & Certification Corporation™
The Industry Standard Since 1980.

OG-300 Certification Page Artwork

The Supplier is responsible for having a page in the installation and operation manual(s) with only the following table on it. It can be anywhere in the manual. SRCC will provide the artwork and no changes are allowed.

The solar system installer is to indicate (circle, check, etc.) the system that was actually installed.

	This product certified by: Solar Rating & Certification Corporation™ www.Solar-Rating.org	SunEarth, Inc. 8425 Almeria Avenue Fontana, CA 92335 USA
Solar Energy Factor (SEF_D)	SRCC Cert. No.	System Model:
2.30	2010008A	NF40P-80S
18.70	2010009H	NF96C-120S
5	2010008C	NF64P-80S
2.10	2010008D	NF40P-120S
2.50	2010008E	NF48P-120S
4.30	2010008F	NF64P-120S
10.60	2010008G	NF80P-120S
18.70	2010008H	NF96P-120S
2.50	2010009A	NF40C-80S
3	2010009B	NF48C-80S
6.50	2010009C	NF64C-80S
2.20	2010009D	NF40C-120S
2.70	2010009E	NF48C-120S
5.40	2010009F	NF64C-120S
16.50	2010009G	NF80C-120S
2.80	2010008B	NF48P-80S
The installed system is marked above.		

APPENDIX H

SUNEARTH

Service & Warranty Information

Contactor/Installer Information

Name:_____

Company:_____

Address:_____

Phone:_____

Email:_____

System Information

Model Number:_____

Date Purchased:_____

Collector Serial Number:_____

For Service and Repair Contact:_____

Comments:_____

_____

_____

_____

_____

SUNEARTH

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Email: info@sunearthinc.com • www.sunearthinc.com

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