SunEarth

Cascade 2 Drainback

SRCC OG-300 Certified Solar Water Heating System

Installation, Operation and Maintenance Manual

CASCADE 2
DOMESTIC SOLAR WATER HEATING SYSTEM

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

The Cascade 2 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 Cascade 2 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.

The Cascade 2 Drainback solar water heating systems can be protected against freeze damage to temperatures as low as -50ºF (-46ºC). This system should not be installed in areas within the continental United States where the annual ambient temperature has ever fallen below minus 50° Fahrenheit (-46° Celsius). The Cascade 2 Drainback system must be installed as specified in this manual to have effective freeze protection at these low temperatures.

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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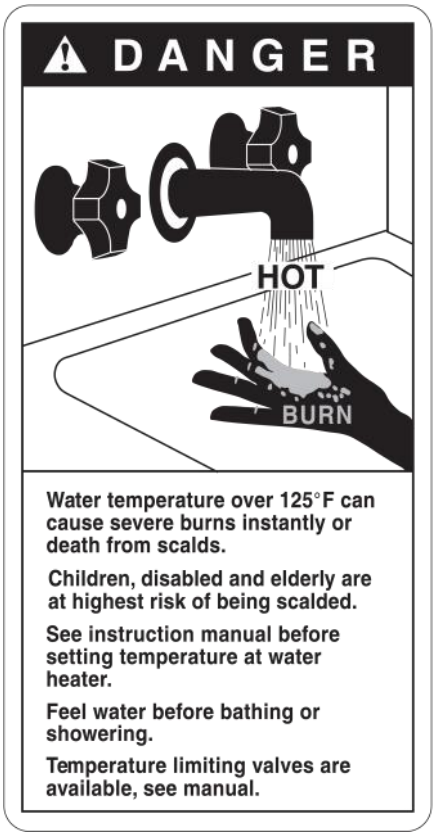
⚠ DANGER!

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

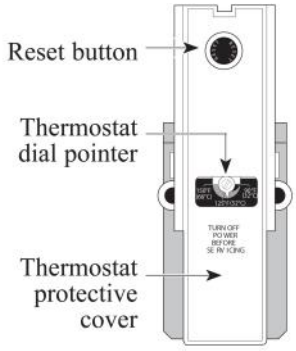
Table courtesy of Shriners Burn Institute

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 Cascade 2 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 Cascade 2 systems incorporate any appropriate technological advances. To ensure that products represent the current state of the art in solar water heating Cascade 2 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 Cascade 2 system will save on an annual basis.

Your Cascade 2 Drainback solar system is known as a "forced circulation closed loop drainback" system because it utilizes a mechanical pump to efficiently circulate water throughout the unpressurized closed loop solar piping. The "drainback" connotation refers to the freeze-protection mechanism used in the system. In drainback systems, the heat exchange fluid (water) in the collector array and solar loop piping drains back by gravity into the drainback storage reservoir when the pump stops circulating. Air replaces water in the collector array and solar loop piping to prevent it from freezing when the pump is off.

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 Cascade 2 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 and also two tank systems that include a solar storage tank and supplemental tank type or tankless water heater. Frequent reference is made throughout this manual to specific component parts. The placement of each component can be seen in the system schematic Figures 2 thru 4b. A description of each component and its function is found in Section 10.

2) SYSTEM DESCRIPTION AND OPERATIONAL PRINCIPLE

The key components in the Cascade 2 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 Cascade 2 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. Cascade 2 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 be 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.

The water in the SunEarth collector and the solar loop piping automatically drains back into the drainback reservoir each time the circulating pump turns off. Gravity drains the piping and provides the freeze protection for your Torrent Drainback system.

To ensure proper drainage the SunEarth solar collector must be installed in the vertical position so that the internal riser tubes are run parallel, not perpendicular, to the slope of the roof.

The system also can be manually drained in order to protect the integrity of the collector and solar loop piping if it is exposed to extended periods of disuse or

persistent hard freeze conditions below - 50° Fahrenheit. (See Section 7 for instructions).

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 Fluid Identity and Toxicity

The Cascade 2 Drainback system uses water as a heat transfer fluid, this is heated in the collector and indirectly heats the domestic hot water through the external heat exchanger. Use of toxic heat transfer fluids is prohibited.

3.11 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 15°.

COLLECTOR ORIENTATION

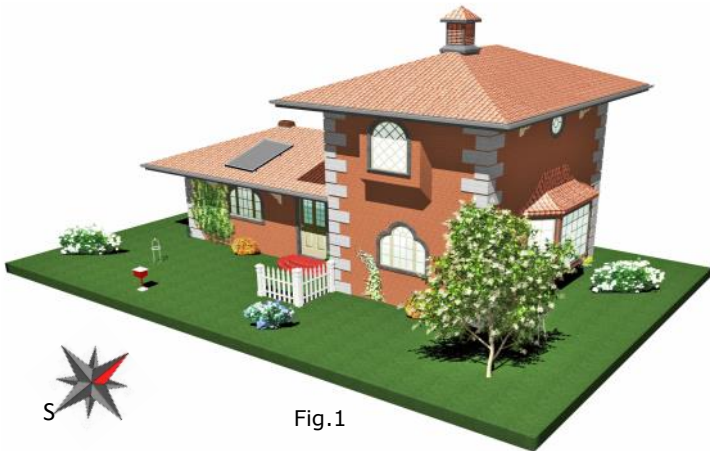
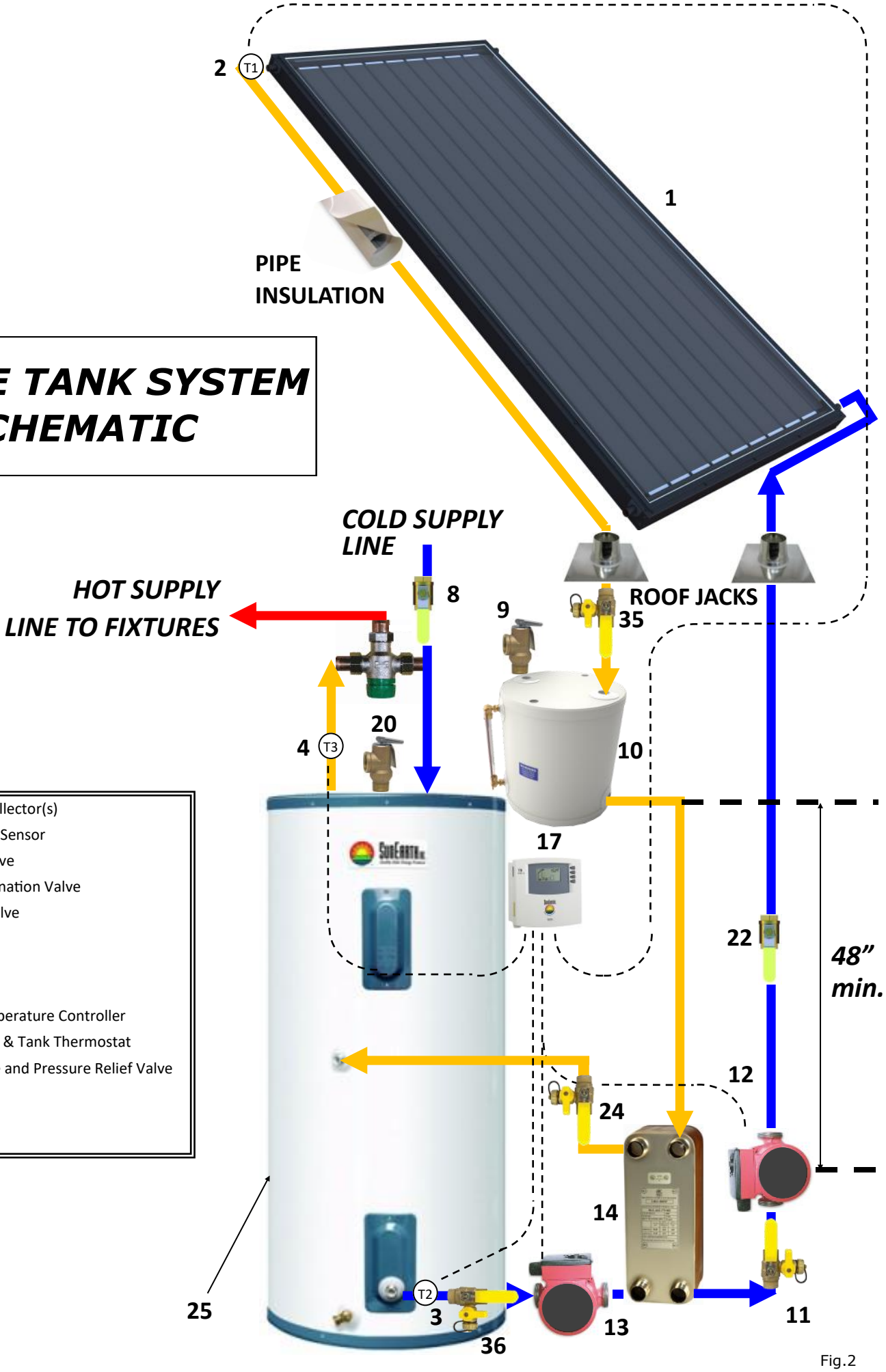


Fig.1

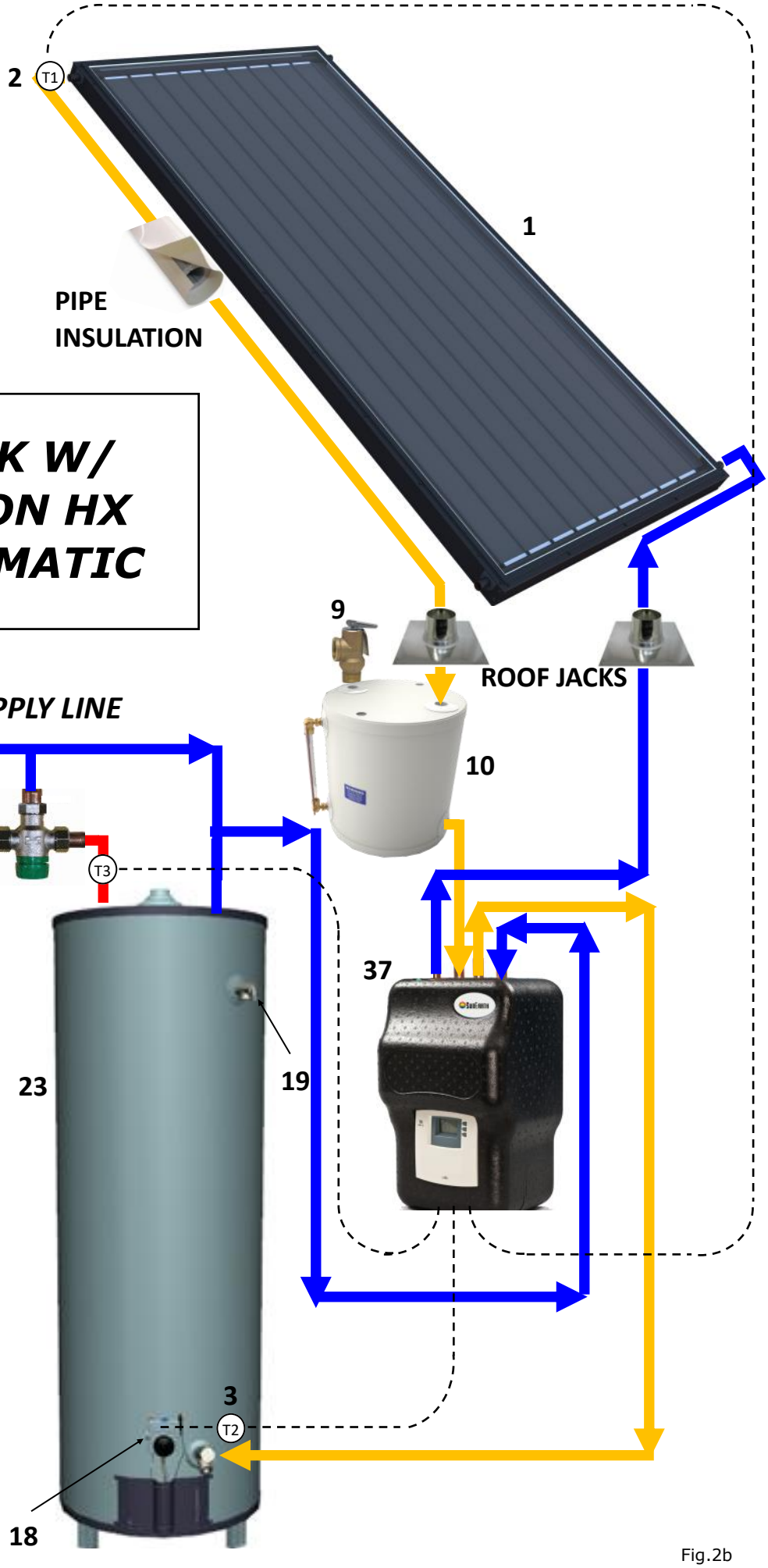
SINGLE TANK SYSTEM SCHEMATIC



- **(1)** SunEarth Solar Collector(s)
- **(2, 3, 4)** Temperature Sensor
- **(5, 6, 7, 8, 22)** Ball Valve
- **(11, 24, 35, 36)** Combination Valve
- **(9)** Pressure Relief Valve
- **(10)** Drain Back Tank
- **(12, 13)** Pump
- **(14)** Heat Exchanger
- **(17)** Differential Temperature Controller
- **(18)** Heating Element & Tank Thermostat
- **(19, 20)** Temperature and Pressure Relief Valve
- **(21)** Mixing Valve
- **(23)** Water Heater
- **(25)** Solar Tank

Fig.2

SINGLE TANK W/ SOLARSTATION HX SYSTEM SCHEMATIC



(1) SunEarth Solar Collector(s)
(2, 3, 4) Temperature Sensor
(5, 6, 7, 8, 22) Ball Valve
(11, 24, 35, 36) Combination Valve
(9) Pressure Relief Valve
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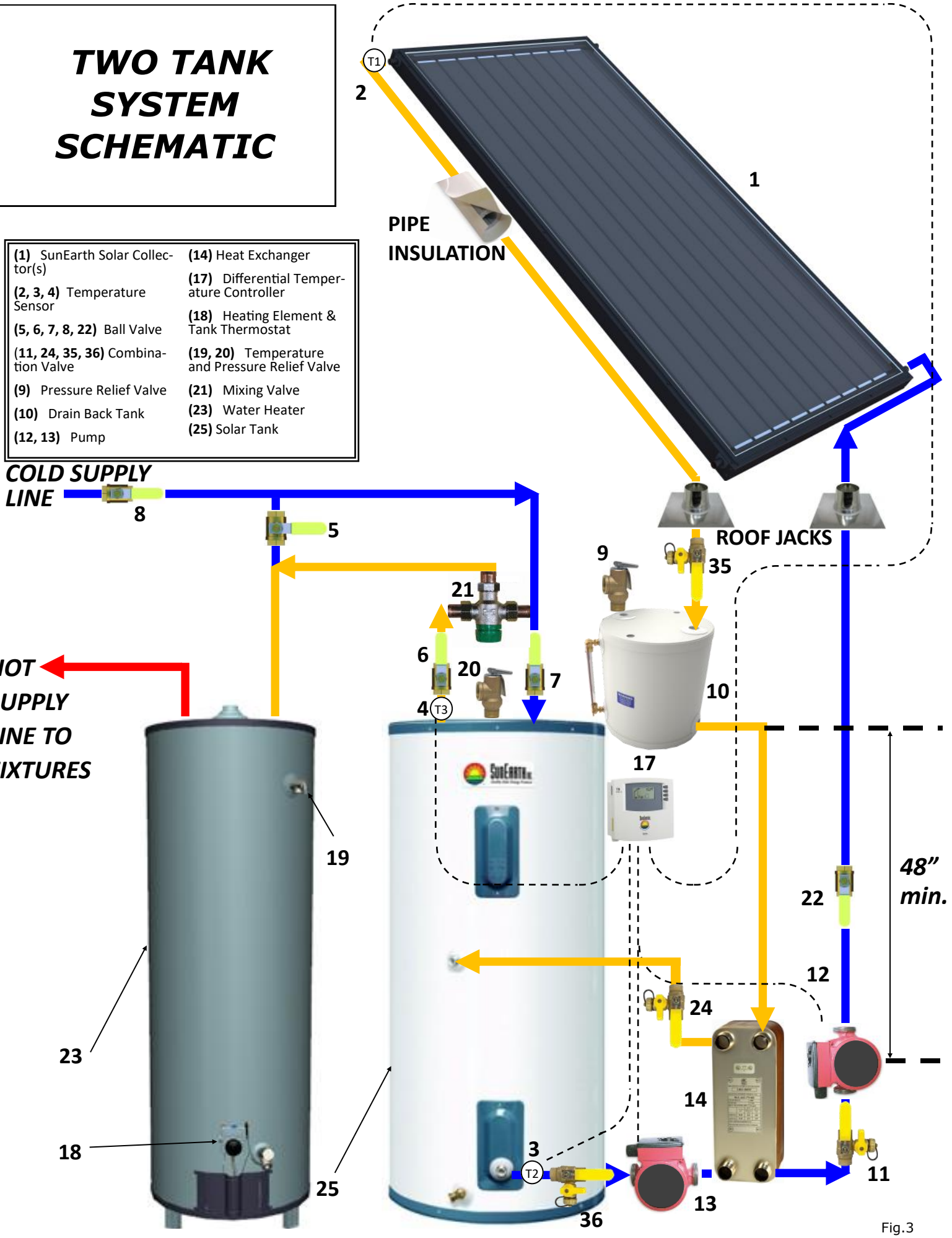
(14) Heat Exchanger
(17) Differential Temperature Controller
(18) Heating Element & Tank Thermostat
(19, 20) Temperature and Pressure Relief Valve
(21) Mixing Valve
(23) Water Heater
(25) Solar Tank
(37) SolarStation HX

Fig.2b

TWO TANK SYSTEM SCHEMATIC



(1) SunEarth Solar Collector(s)	**(14)** Heat Exchanger
(2, 3, 4) Temperature Sensor	**(17)** Differential Temperature Controller
(5, 6, 7, 8, 22) Ball Valve	**(18)** Heating Element & Tank Thermostat
(11, 24, 35, 36) Combination Valve	**(19, 20)** Temperature and Pressure Relief Valve
(9) Pressure Relief Valve	**(21)** Mixing Valve
(10) Drain Back Tank	**(23)** Water Heater
(12, 13) Pump	**(25)** Solar Tank

Fig.3

TWO TANK W/ SOLARSTATION HX SYSTEM SCHEMATIC

(1) SunEarth Solar Collector(s)
(2, 3, 4) Temperature Sensor
(5, 6, 7, 8, 22) Ball Valve
(11, 24, 35, 36) Combination Valve
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(19, 20) Temperature and Pressure Relief Valve
(21) Mixing Valve
(23) Water Heater
(25) Solar Tank
(37) SolarStation HX

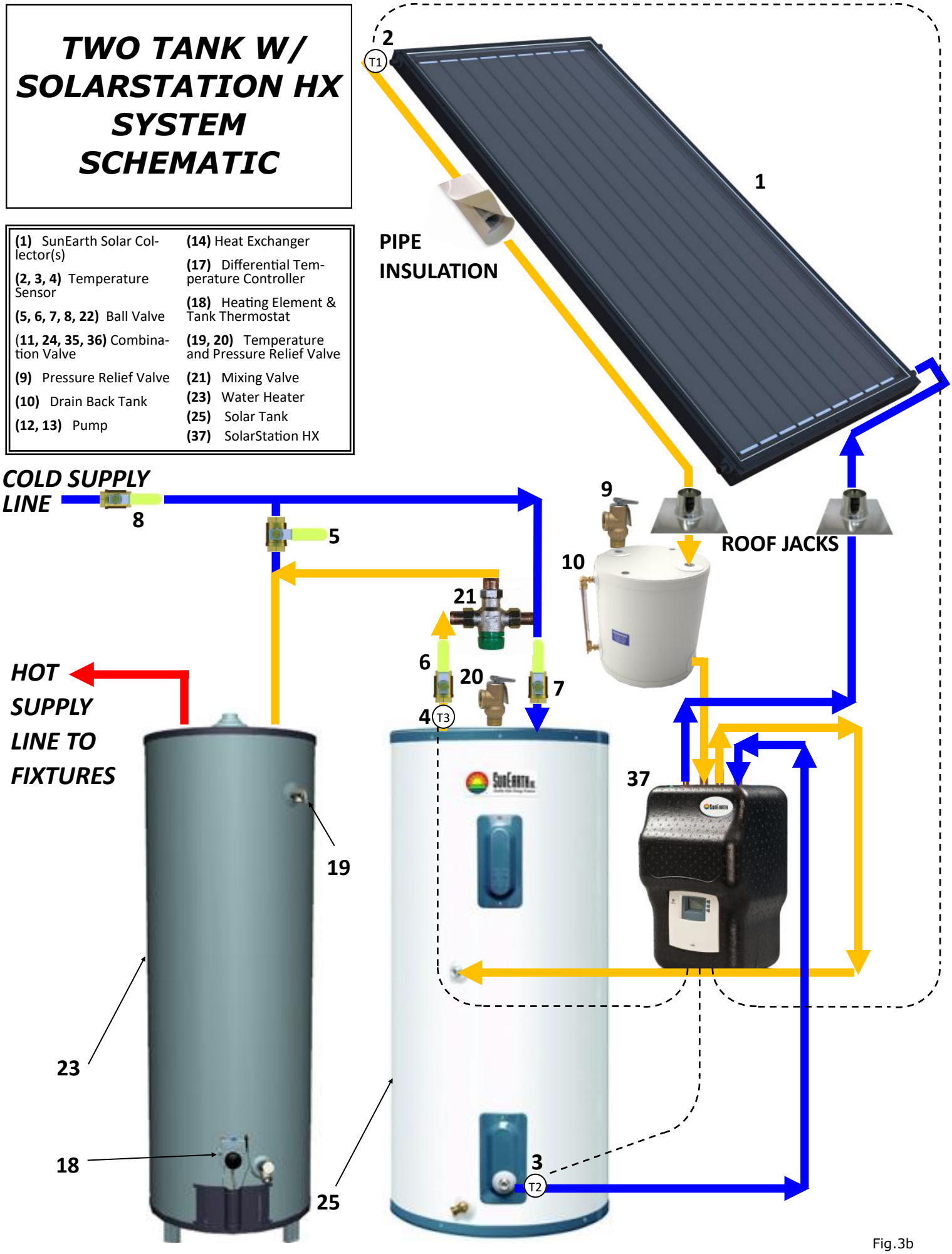

Fig.3b

TANKLESS SYSTEM SCHEMATIC

(1) SunEarth Solar Collector(s)
(2, 3, 4) Temperature Sensor
(5, 6, 7, 8, 22) Ball Valve
(11, 24, 35, 36) Combination Valve
(9) Pressure Relief Valve
(10) Drain Back Tank
(12, 13) Pump
(14) Heat Exchanger
(17) Differential Temperature Controller
(18) Heating Element & Tank Thermostat
(19, 20) Temperature and Pressure Relief Valve
(21) Mixing Valve
(23) Water Heater
(25) Solar Tank

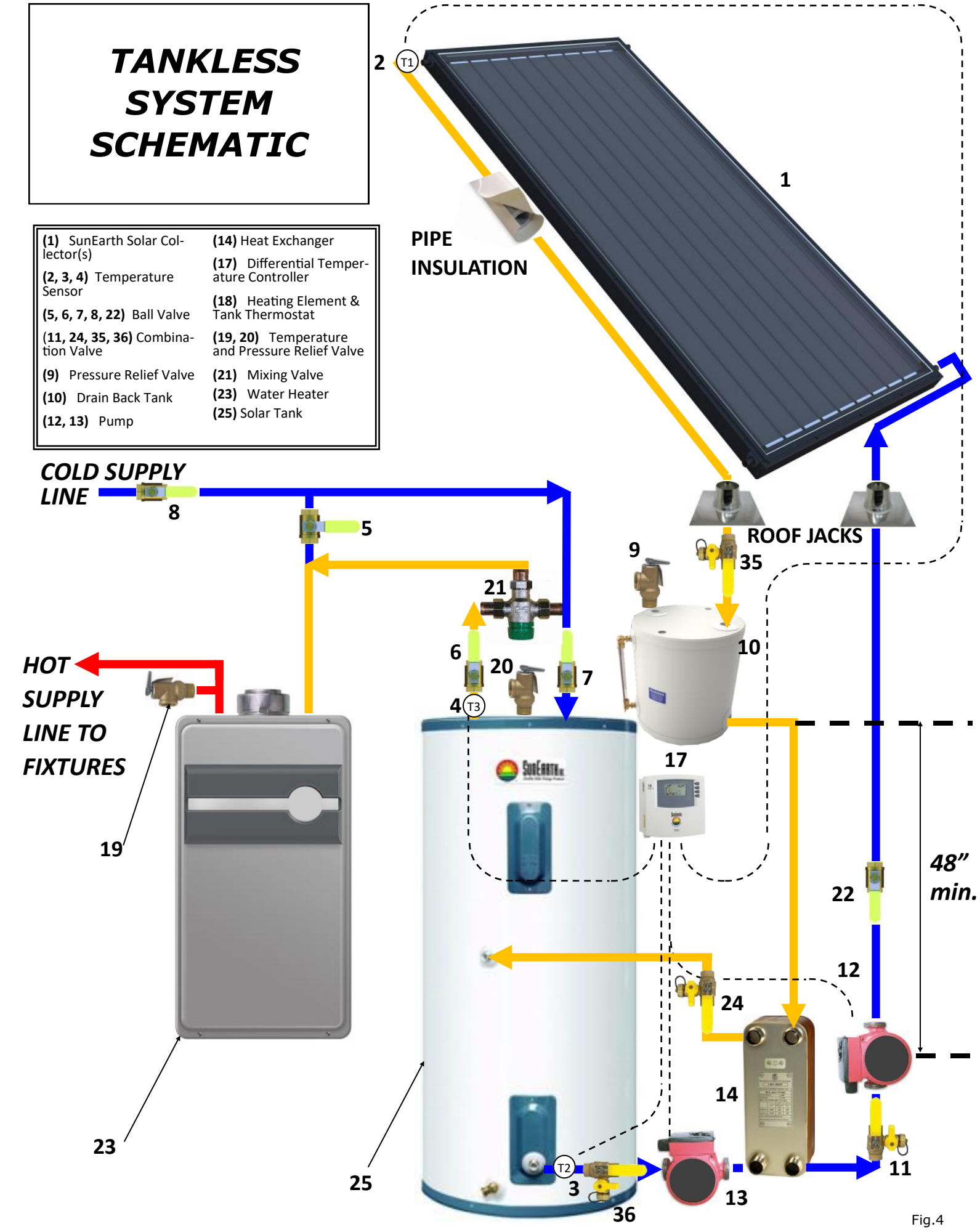

Fig.4

TANKLESS W/ SOLARSTATION HX SYSTEM SCHEMATIC

(1) SunEarth Solar Collector(s)

(2, 3, 4) Temperature Sensor

(5, 6, 7, 8, 22) Ball Valve

(11, 24, 35, 36) Combination Valve

(9) Pressure Relief Valve

(10) Drain Back Tank

(12, 13) Pump

(14) Heat Exchanger

(17) Differential Temperature Controller

(18) Heating Element & Tank Thermostat

(19, 20) Temperature and Pressure Relief Valve

(21) Mixing Valve

(23) Water Heater

(25) Solar Tank

(37) SolarStation HX

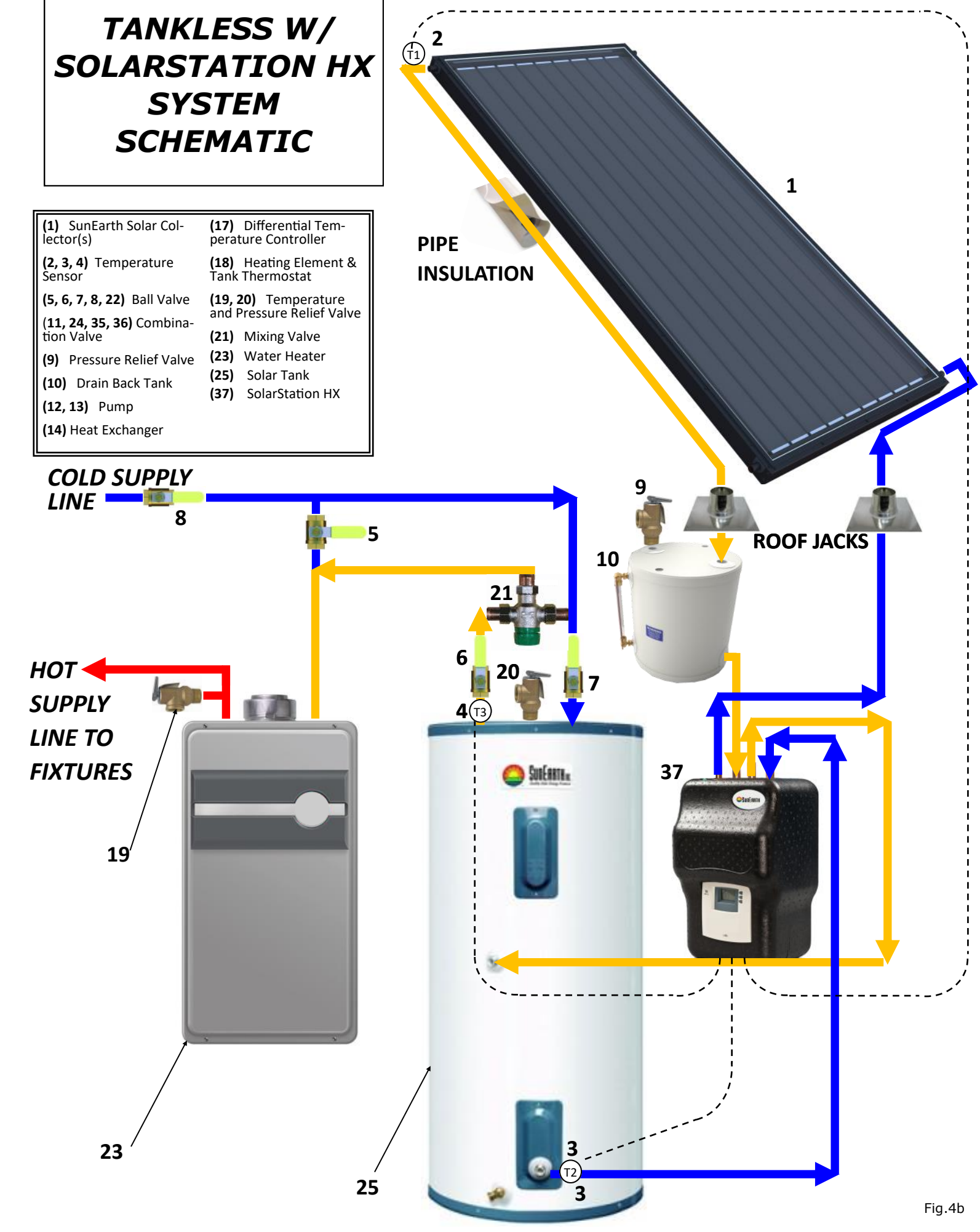

Fig.4b

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 solar collector in your Cascade 2 Drainback solar system must be mounted in a vertical orientation parallel to the slope of the roof. See Figure 1. This orientation allows the internal riser tubes to rapidly drain when the circulation pump shuts off.

CRITICAL: Both the collectors and the solar loop piping must be sloped to drain away from the highest point in the system back to the drainback reservoir.

The minimum required slope is 1/4" vertical drop per foot of horizontal piping run (2% minimum slope). Use the steepest slope possible on the return line piping to the drainback reservoir. Water will drain down both the return tubes directly to the drainback reservoir and the supply tubes by spinning the pump impeller in the reverse direction.

The collector should be mounted as close to the storage tank as possible to minimize heat loss in the piping runs. If the home has attic access, mounting the collectors near the roof peak provides for additional attic workspace.

The solar collector should be mounted on the roof in accordance with these general principles:

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.)

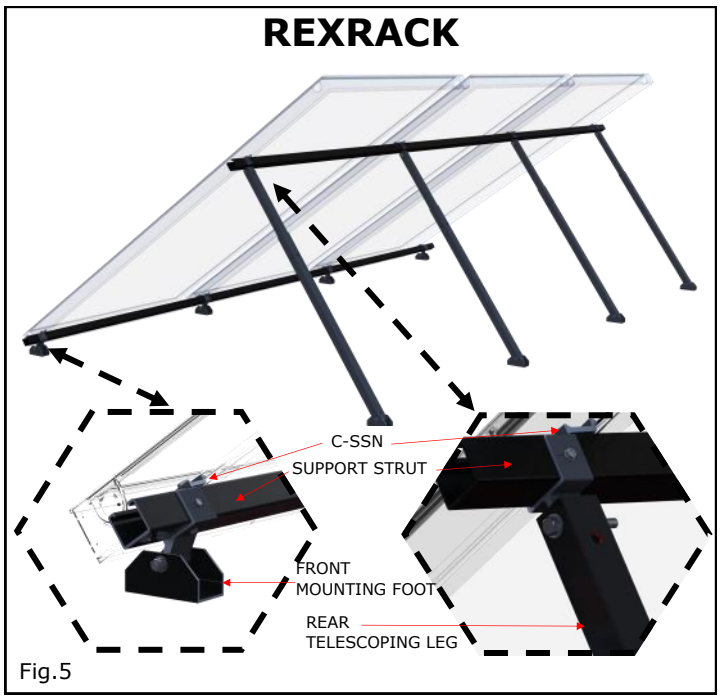

Fig.5

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.

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

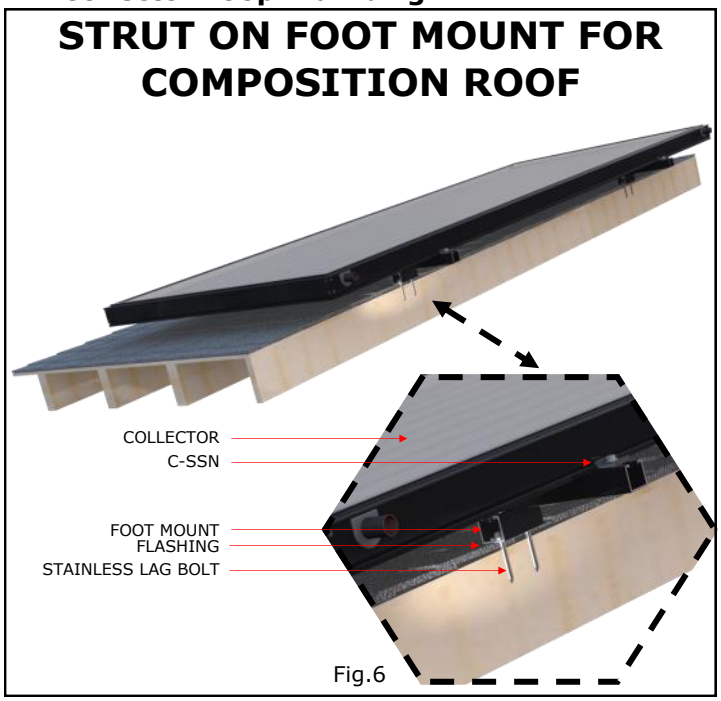

Fig.6

The collector loop must be plumbed using copper or stainless steel piping and copper, brass, bronze or stainless steel fittings. Lead-free solder shall be used. Use of galvanized steel, CPVC or PVC is prohibited. PEX may be used only in systems that meet the following conditions:

- The PEX tubing shall not be exposed to sunlight.
- Water must be used as the heat transfer fluid.
- The system shall be non-pressurized (capped at atmospheric on the day of installation) or shall be vented to atmosphere.

STRUT ON STANDOFF FOR FLAT TILE ROOF

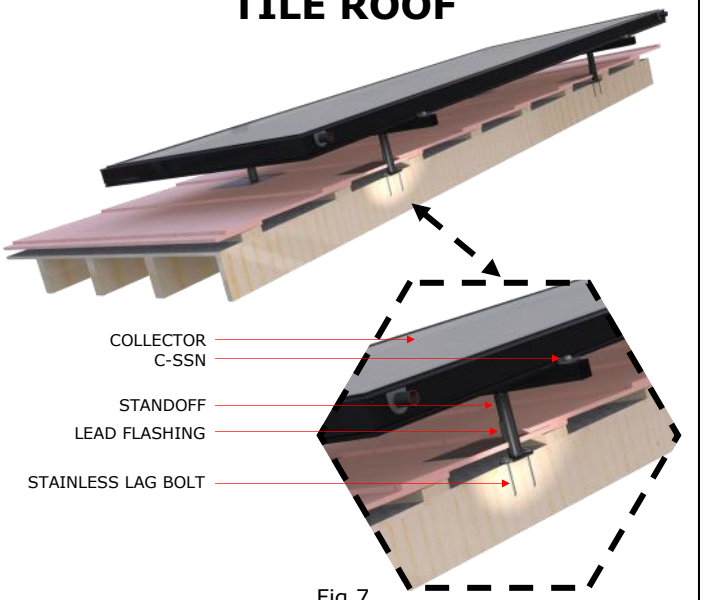

Fig.7

STRUT ON STANDOFF FOR CURVED TILE ROOF

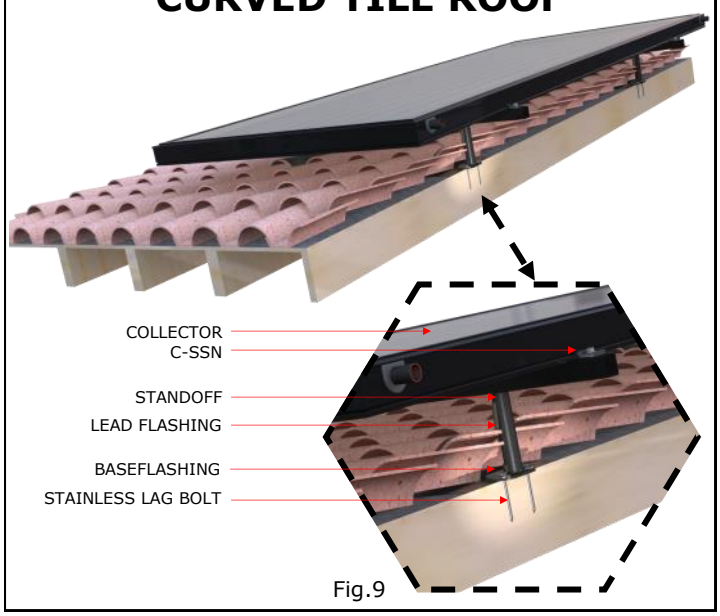

Fig.9

STRUT ON STANDOFF FOR COMPOSITION ROOF

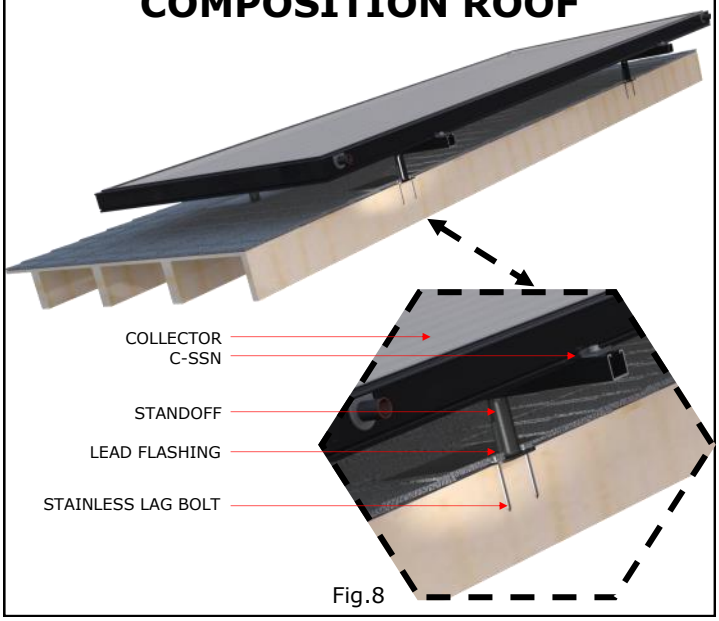

Fig.8

- A length of uninsulated copper tube no less than ¾" nominal diameter shall be used at the hot outlet and cold inlet of the solar collector(s) for a distance of no less than three feet (3') before the transition is made to PEX tubing.
- All connections in the PEX piping runs shall be approved by the PEX manufacturer for potable water piping.
- The system shall have a pressure-only relief valve installed at the drainback tank location or shall be vented to the atmosphere. The pressure rating for the relief valve shall be no less than 25 psi and no more than 50 psi.
- Only Solder Fluxes meeting the criteria of ASTM B 813 should be utilized for joining by soldering any copper and copper alloy tube and fittings in the entire solar system.

The collector loop pipe sizing must be adequately sized to handle the design flow rates for the collector(s). SunEarth recommends ¾" nominal diameter pipe sizes for two collector systems and ½" nominal diameter pipe sizes for one collector systems, except for the return piping from the collector to the drainback tank, this should always be ¾" or larger.

CAUTION: The solar loop piping from the collector(s) to the drainback tank must be no less than 3/4" T-M copper tube to allow air to migrate up the tube ensuring full draining of the collector(s) and tubes.

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 in the pipe 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 flows through all collectors in the array during normal operation.

To ensure proper drainage of the collector array and solar loop piping the lines must be adequately sloped to drain back to the drainback reservoir.

CRITICAL: The required slope is 1/4" vertical drop per foot of horizontal run (2% slope). Failure to properly orient the collector and solar loop piping to allow adequate drainage may result in freeze damage. SunEarth solar collectors are not warranted against freeze damage.

Figure 11 illustrates correct and incorrect methods of plumbing the solar collector array. Note that water will trap in the "U" section of piping as illustrated in the drawing marked incorrect thus making it susceptible to freeze damage.

Piping in new solar installations can be covered with dirt, grease, solder flux or other impurities that may affect the system performance. A thorough cleaning is required before charging. A Water soluble flux should be used when soldering pipe joints in the collector loop

in order to facilitate system flushing. Carefully review the cleaning procedures in "Charging the System" outlined below.

All vertical piping between the storage tank and the collector shall be supported at each story or at maximum intervals of ten feet (10'). Horizontal runs shall be sloped to drain (minimum 2% slope) and supported every five feet (5') to prevent sagging. Roof runs shall be secured and supported providing at least 1-1/2 inches clearance from roof. Pipe supports shall be constructed from a material that will not rot, compress or degrade over time as this may lead to pipe sagging and failure to drain. Standard best piping practices shall be followed as described in the Uniform Plumbing Code, International Plumbing Code or other recognized code or standard. Copper 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. Include bends and elbows to allow for expansion such as swing joints at the collector inlet & outlet.

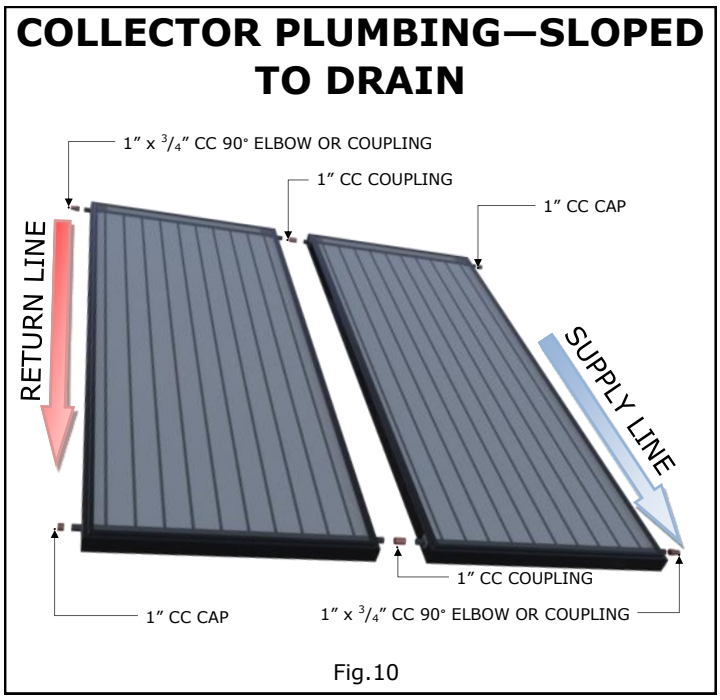

Fig.10

The installation of all horizontal and vertical piping may 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.

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 $^1/_2$". A 1" wall thickness is required for exposed piping in all areas prone to annual hard freeze conditions. When it comes to pipe insulation the rule is simple: thicker is better.

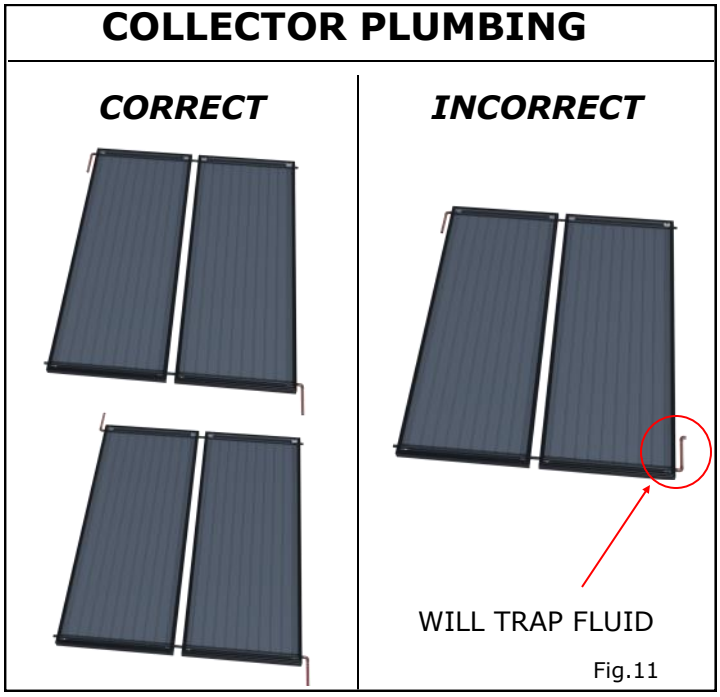

Fig.11

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.

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 the 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 low-

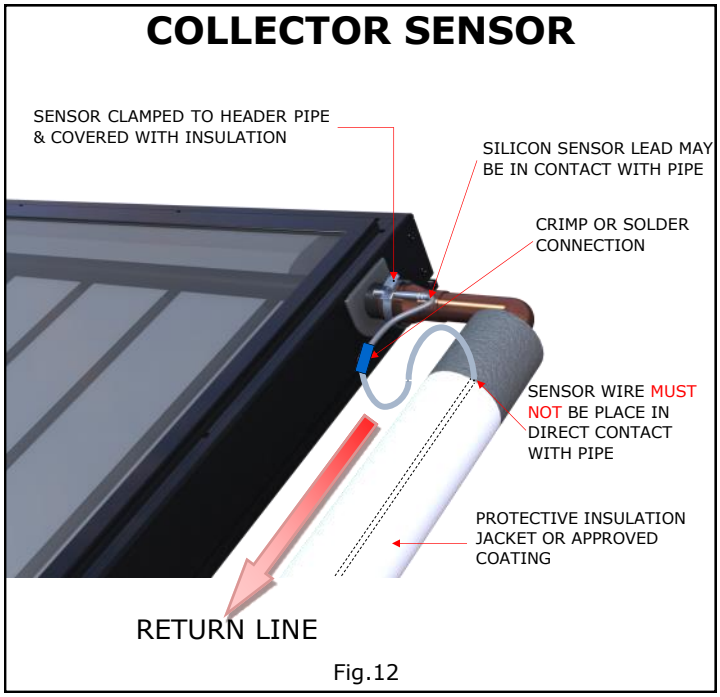

Fig.12

er 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

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

The solar tank is heated indirectly through the external heat exchanger by separate pumps on the collector loop and the potable side of the heat exchanger.

When plumbing the SunEarth solar storage tank and drainback reservoir make sure that all the components are accessible and easy to reach. Ensure that there is clear access to the storage tank, circulating pump, drainback reservoir, mixing valve, flow meter and other key components. If a component in the potable water side of the system may require future service or maintenance make the connections with brass unions. Use only brass nipples and unions and copper and brass fittings in plumbing the solar storage tank and drainback reservoir. The use of galvanized fittings or nipples, CPVC or PVC piping is prohibited.

Check valves are NOT ALLOWED anywhere in the collector loop. A check valve in the collector loop will prevent proper draining of the collectors and may result in freeze damage. If the pump used has an integral check valve, the check valve must be removed before installing the pump in the system.

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.

The differential temperature 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 – 15°F warmer than the water in the collector supply line.

The specified SunEarth controller continuously displays the temperature of the SunEarth collectors (T1) and the temperature at the bottom of the solar tank (T2). In addition, you may choose to install a third temperature sensor (T3); this is normally installed at the hot water outlet on both single and double tank systems.

The Torrent Drainback system typically requires a high head, low flow circulating pump. The maximum head on the pump curve must be greater than the static lift head required to fill the system. The static lift head is the vertical height from the bottom of the drainback tank to the highest point in the system (usually the collector outlet header). When the pump is filling the system it will be pumping against the static lift head and should provide no less than 0.5 GPM flow. Once the system has been filled to the top of the collector, water will start to cascade down the return line filling the return line as far as the drainback reservoir. Once this pipe is fully flooded the return line will start to siphon, resulting in an increase in flow as the system transitions from the filling condition to the running condition. In the running condition the flow rate should not exceed 5 GPM. Good pump selection requires that the pump provide enough lift for the filling condition without excessive flow in the running condition. This is usually achieved using a pump with a "steep" pump curve. For multistory buildings, this can be especially challenging unless the drainback tank is located on the upper floor.

When there is a risk of pump cavitation due to high flow rates, a pump throttling valve (COMPONENT #22) may be located on the discharge, or upstream, side of the pump to adjust the solar loop flow rate and to prevent cavitation of the circulating pump. Cavitation is a fluid condition that can lead to pitting or other damage to the pump impeller. A throttling valve on the return piping from the collector to the drainback tank can also be beneficial in situations where excessive noise is experienced due to high flow rates into the drainback tank.

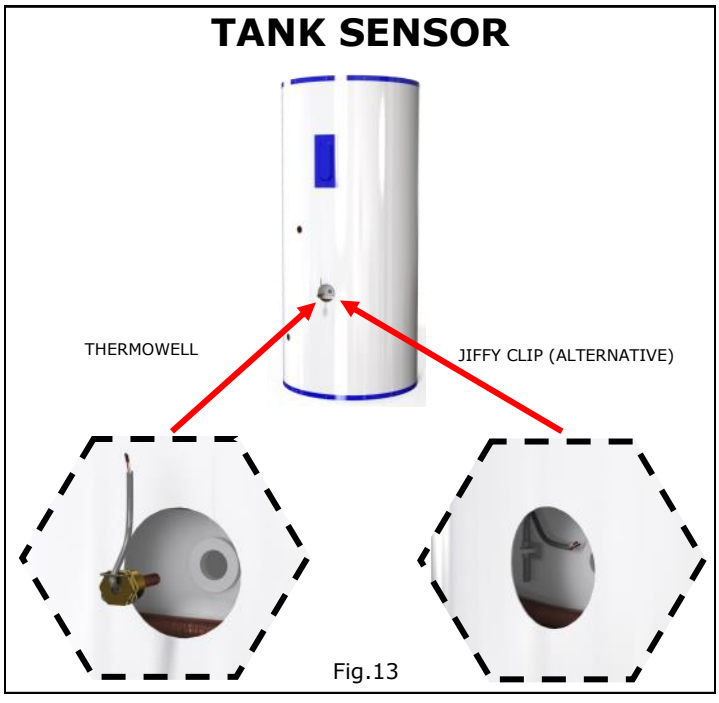

Fig.13

A brass boiler drain (COMPONENT #11) must be installed at the lowest point in the system to allow for charging the solar loop piping and to serve as a drain valve for manual draining and maintenance.

A high quality thermostatic mixing valve is a required component in all OG-300 certified systems and should be plumbed in line with brass union connections for ease of future repair or replacement. The mixing valve shall be standard ASSE 1017 approved. The specified mixing valve should have an operating range between 95°F and 120°F. The mixing valve shall include a set point of 120°F delivered water temperature.

WARNING: SCALDING CAN OCCUR WITHIN FIVE SECONDS WHEN WATER TEMPERATURES APPROACH 140° F. DESPITE THE INSTALLATION OF A MIXING VALVE IN YOUR TORRENT DRAINBACK SYSTEM, ALWAYS EXERCISE CAUTION WHEN OPENING A HOT WATER FIXTURE OR FAUCET IN YOUR HOME.

The 3/4" cold water supply line to the solar storage tank shall be insulated with R-2.6 or greater pipe insulation to a minimum distance of 5' behind the storage tank, or to the wall if closer than 5'.

Figures 11, 12 and 13 show the plumbing schematics for single and two tank Torrent Drainback systems. A brief explanation of the main components and their function is found in Section 10 below.

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.

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.

4.10 Choosing and Installing the Drainback Reservoir

SunEarth CopperStorTM copper drainback tanks are available in 2.5; 5; 7.5 and 10 gallon capacities. Stainless steel drainback tanks are available in 10; 15 and 20 gallons. Small glass lined steel electric water heaters available in various sizes from 6 to 20 gallons can also be used as drainback tanks; do not connect the heating element when using these tanks as a drainback reservoir. The minimum drainback tank volume must be DOUBLE the volume of the piping and collector loop above the initial fill level of the system. This volume is calculated from the fluid capacity of all the collectors in the system plus all piping above the drainback tank fill level.

Select the appropriate tank based on the collector(s) chosen and the total length of solar supply and return loop piping in the system. Table 1 and Table 2 indicate the proper drainback tank for the two most common piping scenarios. Our preference is to use Table 1: 1/2" piping for the supply line and 3/4" piping for the return line. This provides some flow related benefits, extends the allowable pipe run and is slightly less expensive.

The drainback reservoir shall be mounted in a location that is NEVER subjected to freezing conditions. The drainback tank may be mounted to a wall using brackets or on a stand over the solar tank. The outlet of the drainback tank should be at least 48" above the suction side of the circulating pump to give sufficient net positive suction head available to the pump (See Figures 11, 12 and 13).

The drainback reservoir should be installed at the highest location practicable. The benefits of this include: reduced risk of pump cavitation; reduced pumping head required to fill the system allowing smaller pumps to be used; and reduced piping above the drainback reservoir allowing smaller drainback tanks. In buildings with two or more floors, it is beneficial to install the drainback on the uppermost floor, preferably near the ceiling.

Drainback tanks are factory insulated to provide both heat retention and a noise buffer against the sound of falling water.

If your Torrent Drainback system includes the optional flow meter it should be plumbed so that the top of the flow meter is level with the top of the drainback tank so that the flow meter also provides a visual check of the fluid level in the system. The top and bottom of the flow meter should be supported to relieve stresses on the connecting unions.

DO NOT install the pressure relief valve (COMPONENT #9) on the drainback tank at this time. The COMPONENT #9 is threaded in place after the solar loop piping has been filled with water. See Section 4.13 for instructions on charging the system.

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 Heat Transfer Fluid (HTF)

The HTF must be a non-toxic fluid that meets FDA Generally Recognized as safe (GRAS) Classification. The Torrent Drainback System uses water to meet this requirement.

Water used to fill the collector loop must meet certain minimum standards for purity. Impurities in the dilution water can increase metal corrosion, and cause the formation of scale and other deposits on the heat exchanger's internal heat transfer surfaces. Distilled or deionized water is recommended.

4.14 Flushing and Filling the System

TABLE 1			
ARRAY	DB-5	DB-7.5	DB-10
1 EP/EC-40	82	138	194
2 EP/EC-21	76	132	188
2 EP/EC-24	73	129	185
2-EP/EC-32	62	118	174
PIPE RUN LENGTHS FOR 1/2" TYPE M AND 3/4" TYPE M RETURN LINES.			

TABLE 2			
ARRAY	DB-5	DB-7.5	DB-10
1 EP/EC-40	61	103	144
2 EP/EC-21	57	98	140
2 EP/EC-24	54	96	138
2-EP/EC-32	46	88	130
PIPE RUN LENGTHS FOR 3/4" TYPE M AND 3/4" TYPE M RETURN LINES.			

Once the components have been plumbed it is time to fill the solar storage and collector loop with water as follows:

4.14.1 STEP 1 – Flush and Fill the potable loop with water.

Close potable flushing combination valves (COMPONENTS #24 & 36). Fill the solar tank with water and check that there are no leaks on the potable side of the system.

Do this by opening the cold water isolation ball valve to the solar tank (COMPONENT #8) and opening a hot water outlet, such as a faucet, until the water runs freely. When the tank is filled, inspect all threaded fittings and solder joints for leaks.

Connect a washing machine hose to the drain ports of the potable flushing combination valves (COMPONENT #24 & 36). Open domestic flushing combination valves drain ports (COMPONENT #24 & 36).

Open potable flushing valve (COMPONENT #36) and close valves drain port when water flows out of the hose. Close domestic flushing valve (COMPONENT #24) drain valve when water flows clear from the hose.

Open potable flushing valve (COMPONENT #24). Check for leaks. The entire potable piping is now pressurized with potable water.

4.14.2 STEP 2 - Flush and Fill the solar loop piping with water.

Close solar flushing combination valves (COMPONENTS #11 & 35).

Connect a washing machine hose to the solar flushing combination valve drain port (COMPONENT #11), open the solar flushing valve drain port (COMPONENT #11). Connect the other end of the hose to a water pressurized water source or a utility pressure pump.

TABLE 3—Specifications for SunEarth CopperStor Drainback Reservoirs

SUNEARTH MODEL NUMBER	WIDTH (IN)	LENGTH (IN)	DEPTH (IN)	DRY WEIGHT (LBS)	FLUID CAPACITY (GAL)
DB-5	12	50	5	42	5.0
DB-7.5	18	50	5	56	7.5
DB-10	24	50	5	84	10.0
MAXIMUM PRESSURE 160 PSIG, CONNECTIONS 3/4"					

Connect a washing machine hose to the solar flushing combination valve drain port (COMPONENT #35), open the solar flushing combination valve drain port (COMPONENT #35). Open the water pressurized water source. Run until clear water runs from the washing machine hose connected to the solar flushing combination valve drain port (COMPONENT #35).

Open the solar flushing combination valves (COMPONENTS #11 & 35). Close the solar flushing combination valves drain ports (COMPONENTS #11 & 35), turn off the water source. Verify water level in drainback tank is within 1 inch from the top of the sight glass or flow mater; fill or drain as necessary.

4.14.3 STEP 3 – Run the pump to check operation and flush impurities from the collector loop.

At this point it is recommended to run water through the system to remove any solder flux residue or other impurities that were introduced into the system during plumbing. Water soluble flux should have been used when soldering pipe joints in the collector loop to facilitate system flushing. Set the switch on the side of the SunEarth control to the "ON" position see (fig 16). Allow the pump to circulate water through the system for 15-20 minutes. While the pump is running check the entire collector loop for leaks and ensure that there is adequate flow.

4.14.4 STEP 4 – Check that Collectors are Draining Back.

Turn the controller back to the 'OFF' position see (fig 16). Allow time for the collectors and piping to drain into the drainback reservoir. Observe the water level in the drainback reservoir by means of the site glass, visual flow meter or by checking with a dowel rod. The water level in the drainback reservoir should return to the original fill level after a few minutes. If the water level does not return to the original fill level, the system is not draining properly and may freeze. If water level does not return to original level, check that the collectors are tilted with riser tubes at 15° or more and that all piping is sloped to drain at 2% or more.

4.14.5 STEP 5 - Drain the system to remove impurities.

Drain the cycled water out of the array by placing the hose attached to the solar flushing combination valve drain port (COMPONENT #11) into a service drain or bucket. Open the solar flushing combination valve drain port (COMPONENT #11) and completely drain the water from the system.

CAUTION: THIS WATER MAY BE EXTREMELY HOT!

4.14.6 STEP 6 - Refill the system with water.

Connect a washing machine hose to the solar flushing combination valve drain port (COMPONENT #11) and to a utility pump. Open solar flushing combination valves (COMPONENT #11 & 35) and then slowly pump deionized water into the system until the water level is within 1 inch from the top of the sight glass or flow meter. Run the system pump and verify proper operation and that the water level returns to "set point" on the sight glass or flow meter when the system drains (circulating pump off).

5) SYSTEM START-UP PROCEDURES

Throughout the installation procedures outlined in Section 4, emphasis has been placed on the proper plumbing and wiring of the primary system components. The solder and threaded connections also have been visually inspected for leaks and the solar loop piping has been cleaned and charged. Having successfully completed these tasks it is time to set your system to run automatically.

Set the SunEarth control to the 'ON' position. Listen until you can hear water flowing through the solar loop return piping from the collector.

Place your ear next to the pump and listen for signs of cavitation. Cavitation sounds like sand running through the pump and is caused by the implosion of small air bubbles hitting the pump impeller. Cavitation can dramatically reduce the life of the pump and the flow setting valve (COMPONENT #22) should be used to eliminate this condition. If you hear cavitation when the valve is wide open, slowly close the valve until the sound is gone.

5.1 Start Automatic System Operation

Set the SunEarth control to the 'AUTO' position see (fig 16). Your system is now set to run automatically whenever solar energy is available to be collected.

6) TWO MODES OF SYSTEM OPERATION

Both single and double tank Torrent Drainback systems are designed to accommodate two separate modes of operation. Your system can either (1) serve as a preheater to your conventional electric or gas water heater or (2) be bypassed entirely and run 100% on utility power during inclement weather or when maintenance is required.

Single Tank Operating Instructions:

6.1 Solar Preheat:

Leave the circuit breaker on to your solar storage tank and set the tank thermostat to the lowest acceptable temperature setting. The electric resistance heating element will come on only when the tank temperature falls below the thermostatic set point. If the solar heated water entering the tank is warmer than the thermostatic set point, the electric heating element will

not come on. If you have a water heater timer, you may preset the timer to turn the heating element on and off at specified times throughout the day if desired.

6.2 100% Utility Power:

Leave the circuit breaker to your solar storage tank on. In this mode of operation you must turn off the circulation pump. To turn the pump off, change the operational setting from automatic to "off". Failure to turn off the pump can quickly damage the pump motor, shaft, bearings or impeller.

Two Tank System Instructions:

6.3 Solar Preheat:

Follow the instructions for the single tank system for setting the thermostat, heating element or gas fired water heater or tankless gas water heater for automatic operation. Solar preheat mode operates with the collectors heating the solar storage tank and supplying this heated water into the auxiliary tank whenever there is hot water draw. The ball valves going to and from the solar storage tank (VALVE # 6 & 7) must be open while the bypass ball valve (VALVE # 5) must be closed. See Figure xxx, Solar Preheat.

6.4 100% Utility Power:

Set the thermostat for the auxiliary electric water heater, gas fired water heater or tankless gas water heater to the desired hot water temperature. 100% Utility power mode operates by supplying mains water directly to the auxiliary heater whenever there is hot water draw, bypassing the solar storage tank. Follow the instructions for the single tank system for setting the thermostat, gas or electric heater for automatic operation. The ball valves going to and from the solar storage tank (VALVES # 6 & 7) must be closed while the bypass ball valve (VALVE # 5) must be open. See Figures xxx, 100% Utility Power.

7) SYSTEM SHUT DOWN AND ISOLATION PROCEDURES

Your Cascade 2 Drainback 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 line (COMPONENT #8). In the case of a storage tank or fitting leak immediately shut this valve and call your installation contractor for service.

TABLE 4—Design Flow Rates

ARRAY	Flow Rate
1 EP/EC-40	1.2
2 EP/EC-21	1.2
2 EP/EC-24	1.6
2-EP/EC-32	1.9

The collector loop can be quickly drained if a leak is detected or for routine maintenance. Set the SunEarth control to the 'OFF' position. Next, attach a hose to the lower boiler drain (COMPONENT #11) and open the valve to drain the system.

CAUTION: THIS WATER MAY BE EXTREMELY HOT!

In two tank systems the solar storage tank can be isolated from the back-up water heater. Set the valve handles to the 100% utility power configuration as outlined above. By closing these valves the tank can be serviced or replaced. The operation of the back-up water heater will not be affected.

8) VACATION RECOMMENDATIONS AND PROCEDURES

Solar water heating systems can build up very high temperatures during summer months if there is no daily draw on the system. If a short summer vacation is planned the best way to avoid overheating in a drainback system is to set the SunEarth control to the 'OFF' position. The pump will not circulate during the day and the system will not "gain" any additional heat.

For extended vacations of a month or more SunEarth recommends that you cover the panels with a suitable opaque material. Stagnation conditions can have an adverse effect on the internal collector piping if the panel is left unprotected. SunEarth's collector warranty specifically excludes stagnation conditions in excess of sixty days.

Remember to reset the SunEarth control to the 'AUTO' position upon your return and check the system for proper operation and draining by monitoring the water levels with the pump on and off.

9) MAINTENANCE AND TROUBLESHOOTING

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

9.1 Checking the Water Level

It is important that the drainback reservoir remains full for proper system operation. To check the fluid level, set the SunEarth control to the 'OFF' position and allow the fluid in the array to drain into the drainback reservoir. For systems installed with an optional flow meter or sight glass, check to see that the fluid is not less than 1" from the top of the meter. If your system does not have a flow meter, unscrew the pressure relief valve (COMPONENT #9) and dip a wooden dowel into the threaded copper fitting to check that the fluid level is not more than 6-8" below the valve fitting. If a small amount of fluid is needed to bring the reservoir up to the proper level, pour it directly into the COMPONENT #9 fitting port. Rewrap the thread with Teflon tape and reinstall the COMPONENT #9. You may also follow the instructions in section 4.13 for charging the system if more water is required.

Please remember that over time you **WILL** lose some fluid in the solar loop piping. **If the water level is not properly maintained you may do irreparable damage to your circulating pump.** Check your fluid levels at least once a year.

9.2 Replacing the Anode Rod

The second 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 (ST1). 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 at the tank's glass lining. In time the solar storage tank, like any other gas or electric water heater, will begin 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. Periodic replacement of the anode rod in your solar storage tank can significantly extend the tank life.

9.3 Flushing the Storage Tank

The solar storage tank also should be flushed annually to minimize sediment buildup 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 at the circuit breaker or time switch (if present) before flushing. Set the SunEarth control to the 'OFF' position. In a two tank system it is not necessary to disconnect the power to the electric water heater in order to flush the solar tank.

Open the flush valve on the bottom of the storage tank and drain a sufficient volume of water to eliminate the sediment. After the procedure is complete make sure the tank is completely full of water before restoring power to the thermostat and heating element. Set the SunEarth control to the **'AUTO'** position.

9.4 Cleaning the Collector Glass

If you live in a dusty climate it is beneficial to wash off the dirt that settles on the collector glass once a month. Clean glass allows the collector to maintain a high level of thermal performance.

9.5 Maintaining Pipe Insulation

Check the exterior pipe insulation annually and patch or repair any exposed surfaces or degraded areas. Repair as necessary with manufacturer's recommended jacket or coating or a high quality exterior latex paint.

9.6 Glass Replacement

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 your installation contractor to change the glass.

9.7 Leaks

If you detect a water leak in the solar loop piping or tank plumbing, contact your installation contractor to service and refill the system.

9.8 Pump Not Circulating

If it's been a sunny day and you don't have hot water, first 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 volt outlet. If the pump does not run it may need to be replaced. If the pump does run when plugged directly into the wall outlet, the problem may be located in the controller or one of the temperature sensors. Contact your installation contractor for service.

9.9 Night Time Heat Loss

If you have a full tank of hot water before bed and the solar storage tank is cold in the morning 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. 180ºF tank and 45ºF collector), check both sensors using a resistance meter to see if they are correctly calibrated. If you find a defective sensor replace it immediately.

9.10 Auxiliary Electric Element not Operating

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 and thermostat. Double tank systems with conventional electric water heaters have two heating elements and thermostats.

DANGER: NEVER REMOVE THE PROTECTIVE ACCESS PLATE ON THE EXTERIOR OF THE SOLAR STORAGE TANK OR CONVENTIONAL WATER HEATER WITHOUT DISCONNECTING THE 230 VOLT POWER SUPPLY AT THE CIRCUIT BREAKER.

After the circuit breaker has been turned off, remove the access plate on the storage tank or water heater 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. It 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 your installation contractor for service.

In two tank systems the conventional electric water heater will be wired for electrical back-up. The solar tank will serve solely as a storage tank and will not be wired. 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 Figures 11, 12 and 13 for the location of the specific component numbered below.

1. SunEarth Solar Collector(s): Absorbs the sun's heat energy and transfers this heat to the heat exchange fluid (water) circulating through the collector.

2. Collector Sensor (T1): Wired to the control. Works in conjunction with the tank sensor to automatically turn your circulating pump on and off at preset temperature differentials.

3. Tank Sensor (T2): Wired to your controller. Works in conjunction with the collector sensor to turn your circulating pump on and off at preset temperature differentials.

4. Tank Outlet Sensor (T3) - Optional: Wired to your controller, this sensor shows the temperature of the hot water leaving the solar storage tank. This sensor is for information purposes only, it does not affect the control of the system.

5, 6, 7. Solar Tank Bypass Valve Assembly: For two tank systems only. Assembly of three ball valves allows the solar tank to be completely isolated and by-

passed in the case of tank failure. When the solar tank is bypassed, water will be heated by the auxiliary heater only. Solar bypass valve assembly may also be a combination of two 3-way valves or a single 4-port single action bypass valve.

8. Mains Supply Line Isolation Valve: When open allows potable water to fill the solar storage tank or back-up water heater. When closed isolates the solar storage tank and back-up water heater from the pressurized city cold water supply line.

9. Pressure Relief Valve (PRV): Will discharge heat transfer fluid (water) from the collector closed loop at the PR valve pressure setting, (typically 75 – 150 PSI). Under normal operating conditions, the pressure relief valve will not discharge fluid. If this valve opens and water is expelled contact your contractor immediately. This valve also can be manually opened to assist filling or draining the collector loop.

The PRV protects the collector and all components in the collector loop from pressures in excess of the PRV pressure setting.

WARNING: THE PRESSURE RELIEF VALVE SETTING MUST NOT BE HIGHER THAN THE MAXIMUM WORKING PRESSURE OF THE COMPONENTS IN THE COLLECTOR LOOP.

10. Drainback Reservoir: An insulated storage reservoir that holds the collector and solar loop piping heat exchange fluid (water) when the circulating pump is off.

11. Solar Flush Combination Valve: Used to charge and drain the solar loop piping.

12. Circulating Pump: Circulates water through the collector and solar loop piping to the hot side of the external heat exchanger.

13. Potable Circulating Pump: Circulates water from the storage tank through the cold side of the external heat exchanger.

14. External Heat Exchanger: Transfers heat from the hot water circulating through the solar collector to the potable water circulated through the solar storage tank.

17. Differential Temperature Controller: Automatically turns the circulating pump on and off when there is sufficient heat to be gained in the solar collector.

18. Heating Element & Tank Thermostat: The auxiliary water heater thermostat controls the temperature setting of the auxiliary heating element.

19, 20. Temperature and Pressure Relief Valve: Universally required by the plumbing code on water heaters. Will automatically release and dump water at either 150 PSI of pressure or 210° F in temperature.

21. 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 Torrent Drainback solar water heating system. The mixing valve may include and integral check valve to prevent backflow of mixed or hot water into the cold water feed line. When the mixing valve does not include an integral check valve, an external check valve should be placed on the cold feed to the mixing valve. In two tank systems the mixing valve may be located; either at the outlet to the solar storage tank; or at the outlet to the auxiliary heater.

22. Pump Throttling Valve: May be partially closed to reduce the flow rate and prevent pump cavitation.

24. Potable Flush Combination Valve: Used to flush the potable loop and isolate the heat exchanger.

35. Solar Flush Combination Valve: Used to flush the solar loop.

36. Potable Flush Combination Valve: Used to flush the potable loop and isolate the heat exchanger.

37. SolarStation HX: Self contained unit consisting of pumps, controls, heat exchanger and service valves.

11) ESTIMATED COMPONENT LIFE

You can expect a long and useful like from the primary components in your Cascade 2 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 Collector Loop Pressure

The pressure in the solar collector loop should be within 0 – 20 PSIG.

12.2 Circulation Flow Rate

The flow rate in the collector loop should be 0.5 – 4 GPM when the pump first comes on (filling the collector loop). Once the collector loop is full and water starts to siphon down the return piping the flow rate will normally increase and should be 0.8 – 5 GPM with the system circulating.

12.3 Temperature Differential

The temperature difference between the collector outlet sensor (T1) and the solar tank sensor (T2) should be 4 ºF – 30ºF when the system is circulating.

12.4 Fluid Level

The water level when the system is not circulating (pump stopped) should such that the drainback tank not less than 75% full. When the system is circulating (pump running); the water level in the drainback tank should be not less than 25% full. The drainback tank should never be pumped dry in normal operation as this may result in damage to the circulator pump.

APPENDIX A

CASCADE 2 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	SunBelt	SB-24-0.75 SB-32-0.75 SB-40-0.75
SunEarth	ThermoRay	TRB-26 TRB-32 TRB-40

Collector Mounting Hardware

Make	Series
SunEarth	SolarStrut; RexRack; Flush Mount Kit; Universal Tilt Kit; Landscape 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*; SE-80-6*; SE120-6*
Any Equivalent UL, AGA 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

CASCADE 2 APPROVED COMPONENTS

Heat Exchanger

Make	Series	Model Numbers
AIC	L-Line	LA14-10

Drainback Reservoir

Make	Series	Model Numbers
SunEarth	CopperStor	DB-2.5;DB-5;DB-7.5;DB-10;DP-6.0;SP-7.2
SunEarth	DBT	DBT 10 SS; DBT 15 SS; DBT 20 SS
Rheem	Professional Classic	PROE10 ; PROE15 ; PROE20
A.O. Smith	ProMax®	EJC-6; EJC-10; EJC-20
Zilmet	VSG*	VSG 8; VSG 12; VSG 18
Or Approved Equal *Requires Installation of R3.8 Insulative Cover		

Pump Station

Make	Series	Model Numbers
SunEarth	SolarStation HX	100005-6DB

APPENDIX A

Solar Storage Tank

The Solar Storage Tank shall be glass lined steel, stainless steel or polymer construction. Tank insulation shall be R-12 or higher. The maximum working temperature shall be no less than 180oF and the maximum working pressure shall be no less than 75 psi.

Circulator Pumps

The circulator pump shall be a wet rotor small circulator with a cast iron, 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 200oF 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)

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 between 30psi and 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.

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 30oF to 200oF 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%.

Sensor Wire:

APPENDIX A

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

CASCADE 2 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.

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

HEAT EXCHANGER:

THE HEAT EXCHANGER USED IN THIS SYSTEM IS A SINGLE WALL BRAZED PLATE HEAT EXCHANGER

FREEZE LABEL:

THE TORRENT DRAINBACK SYSTEM IS PROTECTED FROM FREEZING BY AUTOMATICALLY DRAINING THE SOLAR COLLECTORS AND EXPOSED PIPING WHENEVER THE CIRCULATION PUMP SHUTS OFF. WHEN PROPERLY INSTALLED AND OPERATED THE SYSTEM IS PROTECTED TO TEMPERATURES AS LOW AS -50° F.

VALVE NO. 8 - 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.

BOILER DRAIN NO. 11 – SYSTEM FILL & DRAIN VALVE

VALVE 11 IS NORMALLY CLOSED. WHEN OPENED IN CONJUNTION WITH PRV (COMPONENT # 9) IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

THE HEAT TRANSFER FLUID USED IN THIS SYSTEM IS WATER. 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.

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

APPENDIX C

PRESSURE RELIEF VALVE (COMPONENT #9)

THE PRV WILL AUTOMATICALLY OPEN AND DISCHARGE FLUID OR AIR IN THE EVENT OF THE COLLECTOR LOOP PRESSURE EXCEEDING THE MAXIMUM WORKING PRESSURE OF THE SYSTEM.

WHEN FILLING OR DRAINING THE SYSTEM THROUGH BD, THE PRV IS MANUALLY OPENED OR REMOVED FROM THE COLLECTOR LOOP IN ORDER TO ALLOW AIR TO FLOW IN OR OUT OF THE COLLECTOR LOOP.

VALVE NO. 7 – COLD FEED TO SOLAR TANK ISOLATION VALVE

THIS VALVE IS NORMALLY OPEN. WHEN CLOSED IN CONJUNCTION WITH VALVE NO. 6 IT WILL ISOLATE THE SOLAR STORAGE TANK FROM THE POTABLE WATER SYSTEM.

VALVE NO. 6 – HOT OUTLET FROM SOLAR TANK ISOLATION VALVE

THIS VALVE IS NORMALLY OPEN. WHEN CLOSED IN CONJUNCTION WITH VALVE NO. 7 IT WILL ISOLATE THE SOLAR STORAGE TANK FROM THE POTABLE WATER SYSTEM.

VALVE NO. 5 – SOLAR TANK BYPASS VALVE

THIS VALVE IS NORMALLY CLOSED. WHEN OPENED IN CONJUNCTION WITH CLOSING VALVES NO. 6 & 7 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

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:
0.70	30004281	C2-32T-40G
0.80	30004283	C2-52T-50G
0.80	30004282	C2-40T-50G
1.20	30004280	C2-52T-80-2G
0.90	30004279	C2-32T-80-2G
1	30004278	C2-40T-80-2G
2	30003995	C2-40-80
1.90	30004023	C2-48-80-TLG
1.80	30004007	C2-48-80-2
4.10	30004026	C2-80-120-TLG
1.60	30004006	C2-42-80-2
2.60	30004025	C2-64-120-TLG
5.20	30004002	C2-80-120
1.60	30004003	C2-40-80-2
2.40	30004004	C2-64-80-2
3.20	30004001	C2-64-120
2.30	30004009	C2-64-120-2
1.50	30004005	C2-32-80-2
3.40	30003996	C2-64-80
1.70	30003997	C2-32-80
2.30	30003999	C2-48-80
2	30003998	C2-42-80

The installed system is marked above.

APPENDIX G

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:
0.90	30004013	C2-32-80-2G
1	30004014	C2-42-80-2G
1.10	30004015	C2-48-80-2G
1.30	30004017	C2-64-120-2G
1.60	30004018	C2-80-120-2G
1.30	30004012	C2-64-80-2G
2.80	30004020	C2-64-80-TLG
2.60	30004021	C2-32-80-TLG
1.60	30004022	C2-42-80-TLG
3	30004010	C2-80-120-2
1	30004011	C2-40-80-2G
1.60	30004019	C2-40-80-TLG

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: sales@sunearthinc.com • www.sunearthinc.com

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