Evacuated Tube Solar Collectors

For Residential and Commercial Use

HP-30SC Models

The surfaces of these products contacted by potable (consumable) water contain less than 0.25% lead by weight as required by the Safe Drinking Water Act, Section 1417.

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.
Additional publications which should guide the installer include:

- Differ from the furnished instructions. Preference should be given to codes and requirements where they accompany the tank, as well as local codes and utility company requirements.

- The installer should be guided by the instructions furnished with the Evacuated Tube Solar Collector. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications, such as Solar Water Heating System Design and Installation Guidelines, SRCC OG-300, be reviewed in their entirety before beginning any work.

Installation should be made in accordance with the regulations of the Authority Having Jurisdiction, local code authorities, and utility companies which pertain to this type of water heating equipment.

- Authority Having Jurisdiction (AHJ) – The Authority Having Jurisdiction may be a federal, state, local government, or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department or health department, building official or electrical inspector, or others having statutory authority. In some circumstances, the property owner of his/her agent assumes the role, and at government installations, the commanding officer or departmental official may be the AHJ.

- NOTE: HTP reserves the right to modify product technical specifications and components without prior notice.

For the Installer

**WARNING**

For your safety, please read through this manual carefully before installation to minimize the risk of fire, property damage, personal injury, or death. Ensure the solar hot water system is properly installed in accordance with this manual before use.

**INSTALLATION OR SERVICE OF THESE SOLAR PANELS IS REQUIRED TO BE PERFORMED BY LICENSED PROFESSIONALS WHERE SOLAR, PLUMBING, AND ELECTRICAL WORK IS REQUIRED.**

The installer should be guided by the instructions furnished with the tank, as well as local codes and utility company requirements. Preference should be given to codes and requirements where they differ from the furnished instructions.

Additional publications which should guide the installer include:


The latest version of the National Electrical Code, NFPA No. 70.

In Canada refer to Canadian Electrical Code C 22.1, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

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Introduction - About Your Solar Collector
Your Evacuated Tube Solar Collector is designed to offer reliable hot water heating in hot, mild, or cold climates. Evacuated tubes provide insulation around heat pipes and operate in open loop, closed loop, and drain back solar systems, making these collectors ideal for a variety of installation designs, including in cold climates where flat panel collectors may not be an option.

Additionally, if an evacuated tube (or tubes) should break, there is no need to shut down the system. The collector will continue to function until the damaged tube(s) can be replaced. NOTE: Solar system performance and efficiency varies with factors such as: household hot water load, ambient air temperature, collector/roof pitch, collector orientation, and seasonal intensity. Job site conditions will require your installation contractor to supply some or all of the following:
- Plumbing connections
- Piping and insulation
- Valves between your backup water system and the solar system

NOTE: Failure to follow the procedures and instructions in this manual WILL VOID the warranty.

Part 1 - General Safety Information
This solar collector is not intended for open loop (direct heating) of swimming pool applications.

WARNING
Installer - Read all instructions in this manual before installing. Perform steps in the given order.
User - This manual is for use only by a qualified heating installer / service technician. Have this solar water heating system serviced / inspected annually by a qualified service technician.

NOTE: Obey all local codes. Obtain all applicable permits before installing the solar system.

NOTE: Install all solar system components and piping in such a manner that does not reduce the performance of any fire rated assembly.

NOTE: If the solar water heating system is exposed to the following, do not operate. Immediately call a qualified service technician.
1. Fire
2. Damage
3. Submersion in Water

Failure to adhere to these guidelines can result in substantial property damage, severe personal injury, or death.

Only use this solar hot water system as intended and described in this installation manual. Any use other than described will void warranty and may lead to fire, property damage, personal injury, or death.

NOTICE
UNCRATING THE SOLAR COLLECTOR - Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Before Installation - Store components in a safe, dry location. Do not store outside on the ground where water or snow can collect and cause damage. If components are going to be stored for extended periods of time before installation, store them indoors or outdoors high enough off the ground to avoid water damage. It is recommended to wrap components with a water resistant cover.

NOTE: Damages to panels due to improper storage ARE NOT covered by warranty.

ALL PIPING AND PLUMBING CONNECTIONS SHOULD BE MADE WITH COPPER PIPE ONLY. No less than ¾” I.D. copper tube of the type meeting local codes must be used for piping. Pipe runs must be solidly attached with proper clamping methods. soldered connections should be secured with 95/5 lead-free solder. Use only pipe rated for 250°F minimum on both the collector return and supply piping.

A. When Servicing the Solar Water Heating System
To avoid electric shock, disconnect electrical supply before performing maintenance.
To avoid severe burns,allow solar collector and associated equipment to cool before servicing.

B. Metallic Components
To avoid injury, always wear leather protective gloves when handling solar collector components. All efforts have been made to make the metal components safe to handle, but there may still be some sharp edges.

C. Local Installation Regulations
Installation of this solar water heating system may be governed by individual local rules and regulations for this type of system, which must be observed. Always use the latest edition of codes. The installation, adjustment, service, and maintenance of the solar water heater must be done by a licensed professional who is qualified and experienced in the installation, service, and maintenance of solar hot water systems.
D. Evacuated Tubes
Be careful when handling the evacuated tubes, as they will break if knocked heavily or dropped.

If exposed to sunlight, hot, and have internal pressure built up, the tubes may explode rather than implode if knocked and broken. This is a rare occurrence, but safety precautions should be taken. To avoid personal injury, wear safety glasses and leather gloves at all times when handling evacuated tubes.

When installed, evacuated tubes may break if struck by a hard object with enough force (e.g., a branch falling on the roof). During installation, consideration should be taken as to the possible path any broken glass may take. Where possible, protection should be provided to prevent broken glass from reaching ground level where somebody could walk on it.

THE INSTALLER SHOULD MAKE THE HOMEOWNER AWARE OF THE SOLAR COLLECTOR LOCATION AND THE POSSIBLE VICINITY OF BROKEN GLASS IN THE EVENT OF AN EXTREME STORM OR HEAVY OBJECT FALLING ON THE COLLECTOR.

E. High Temperatures

- In sunlight, the copper plumbing ports can reach temperatures in excess of 392°F. Thick leather gloves must be worn when handling hot components to prevent serious burns.
- Keep solar hot water system and components away from children and animals.
- In an installed, fully plumbed system, if the pump is stopped in sunny conditions, the copper pipes and piping can easily reach temperatures in excess of 320°F. Caution should be taken when handling such components.
- Do not store combustible materials (dry leaves, tree branches, gasoline, etc.) in the vicinity of the solar system.

Failure to follow these warnings could lead to property damage, serious personal injury, or death.

F. Safety Precautions

- Always wear safety glasses when handling evacuated tubes.
- Wear thick leather gloves when handling metal components and hot plumbing components, including hot heat pipes.
- Adhere to safety regulations when working on roofs (or at a height).
- Always obtain engineer approval for installations in high wind regions.
- Assembly of the solar hot water system requires two persons with the ability to lift 50 pounds each.
- It is best to install the solar hot water system on a cool, cloudy day.
- Store evacuated tubes in dark or shaded places until insertion into the manifold.
- Use of lead solder is expressly prohibited. Use of galvanized steel, CPVC, PVC, PEX, or any other type of plastic pipe is prohibited.

G. Water Temperature Adjustment
An ASSE 1017 rated mixing valve to avoid severe burns or death from scalding temperatures IS REQUIRED PER SRCC OG-300.

H. System Water

Do not use petroleum-based cleaning or sealing compounds in a solar water heating system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.

Do not use "homemade cures" or "patent medicines". Damage to the system, substantial property damage, and/or serious personal injury may result.

I. Freeze Protection

NOTE: Consider piping and installation when determining solar collector location. Place the solar collector as close to the water heater as possible.

Failure of the solar system or components due to freeze related damage IS NOT covered by product warranty.

Part 2 - Important Information

A. Scope of this Manual
This manual pertains only to the installation and operation of the solar collector. Details for the installation, operation, and maintenance of the complete solar gas/electric heating system, including, but not limited to: the storage tank, gas/electric booster, pump, system controller, valves, and other plumbing components, should be provided separately by their respective manufacturers.

NOTE: This manual is primarily a reference document for authorized installation individuals, as the solar collector is not permitted to be installed by non-authorized persons.

B. Local Standards and Authorized Persons
Installation must be completed in accordance with local standards and regulations.

Installation must also be completed by a qualified tradesperson who holds relevant industry licenses or certificates. The term "authorized person(s)" used throughout this document refers to a suitably qualified professional. Unless otherwise specified, no part of the solar collector may be inspected, repaired, or maintained by anybody other than an authorized person.
C. Terminology
Solar terminology differs from region to region. To avoid confusion, please note the following:

Supply – The plumbing line running from the outlet of the collector to the tank.
Return – The plumbing line running from the tank (or heat exchanger) to the inlet of the collector. This line incorporates the circulation pump.
Insulation – Solar radiation level, expressed in kWh/m²/day or Btu/ft²/day.

D. Possible System Designs

1. Open Loop Systems
An open loop system has potable water circulating through the solar collectors. Open loop systems are recommended for hot or warm climates that rarely freeze. For rare incidents when ambient temperature drops below freezing, the controller can be programmed to provide freeze protection by circulating warm water from the tank through the solar collectors.

For open loop systems, the normal operating pressure should be less than 72.5 psi. This operating pressure is provided via use of a pressure limiting/reduction valve on the main supply line. An expansion tank is required in open loop systems.

An open loop system may allow the solar collectors to stagnate to prevent overheating of the storage tank. In the event of component failure, the pressure relief valve must be able to release the increased pressure, and should be rated to meet the maximum possible pressure output of the solar collector(s). Please see Part 3 for sections regarding overheating.

2. Closed Loop Systems
A closed loop system uses non-potable heat transfer fluid (HTF) and must be pressurized to less than 72.5 psi. Closed loop systems require an expansion tank to accommodate HTF expansion. The system should be designed to minimize stagnation after tank temperature has been met; extensive stagnation may increase pH levels and glycol deterioration.

The expansion tank and plumbing must be properly sized so that the safety pressure relief valve will not activate except in the event of component failure or extreme conditions. The pressure release must be set at no more than 113 psi. (There may be exceptions in engineered designs for tall buildings.)

3. Drain Back Systems
The drain back method provides effective overheating and freeze protection, making these systems well-suited for all climates. When storage tank water temperature settings are reached or the collector temperature falls below a set temperature, the pump shuts off, allowing the HTF to drain back into the tank. Some drain back systems use potable water as HTF. Others use a propylene glycol / potable water mix.

Drain back systems require larger pumps to move HTF up and into the solar collectors. Mounting the drain back tank as high as possible within conditioned space will reduce pump size.

For drain back systems, the solar loop often operates at less than 25 psi, far lower than open or closed loop systems. These low operating pressures do not require an expansion tank. A pressure relief valve, installed on the drain back tank and piped in copper to an appropriate drainage location, will provide sufficient expansion protection. This pressure relief valve and drain outlet pipe must never be sealed or blocked. The pressure relief valve is intended to be operated for safety purposes only.

NOTE: Supply and return connections to the collector must use eccentric fittings or a fitting arrangement that allows full draining of header pipes. The collector or array should be mounted with a 1/4” pitch towards the supply port to facilitate the drain back process.

In addition, collector plumbing should slope toward the drain back reservoir at 1/4” per foot minimum to facilitate the drain back process. If continual slope is not achievable, consider a pressurized closed loop system.

E. Fluid Quality
Water quality is very important. Water in direct flow through the solar collectors must first meet potable water requirements; any fluid circulated through the collectors should be non-corrosive to copper. In addition, water quality must meet the following requirements.

| Total Dissolved Solids | < 500 ppm |
| Total Hardness | < 7 grains (120 ppm) |
| Chlorides | < 100 ppm |
| pH Levels | 6.5 - 8.5 |

Table 1 - Water Quality Requirements

In areas with “hard” water (water hardness greater than 120 ppm) where open loop format is used, lime scale may form inside the solar collector. Scale deposits will reduce collector efficiency and eventually plug the collectors. In such regions, it is advisable to install a water softening device to ensure the long term efficient operation of the collector, or consider a closed loop system.

In order to meet health and safety regulations, glycol used should be food grade propylene glycol, FDA rated as “generally recognized as safe” (GRAS). If using a glycol / potable water mix, the water must meet the above requirements. The glycol content of the liquid must not exceed 50%, unless the manufacturer specifies that a different ratio is recommended for use with solar water heaters. Glycol should be checked periodically to prevent it from becoming acidic. Please refer to guidelines provided by the glycol manufacturer regarding glycol maintenance.

F. Corrosion
Both copper and stainless steel are susceptible to corrosion when, amongst other factors, high concentrations of chlorine are present. The solar collector may be used for heating of spa or pool water, but levels of free chlorine must not exceed 5 ppm. Otherwise, the copper header could corrode.

NOTE: HTP DOES NOT WARRANT THE SOLAR COLLECTOR AGAINST CORROSION-RELATED DAMAGE.

G. Freeze Protection
Freeze protection must be implemented in any regions that may experience freezing conditions at any time throughout the year.

“Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures below the specified limit, may cause freezing in exposed parts of the system. It is the owner’s responsibility to keep the system’s freeze protection levels maintained in accordance with the supplier’s instructions if the air temperature is expected to approach the specified freeze tolerance limit.”

Open or closed loop systems: In areas with temperatures not falling below 23°F, a differential solar controller with freeze protection may be used (e.g. requiring pump to circulate if the manifold temperature approaches freezing). In an open loop system, a freeze valve (which opens to allow water to dribble out) could also be considered.

Closed loop systems: In areas with temperatures falling below 23°F, a propylene glycol / potable water mix should be used to provide freeze protection. Please refer to glycol manufacturer’s specifications about the temperature ranges the liquid can withstand. Only food grade propylene glycol, FDA rated as GRAS, should be used.

NOTE: HTP DOES NOT WARRANT THE SOLAR COLLECTOR AGAINST FREEZE-RELATED DAMAGE.

H. Wind Stress
When installing the collector, please consider the issue of wind...
resistance and the resultant stress on attachment points. Adhere to relevant building codes/regulations regarding installation of such objects.

For flush mounting on a pitched roof, a minimum of two attachment points per front track must be made, each with minimum pull strength of 220 lbs. If this cannot be achieved, additional attachment points must be made to achieve minimum strength levels.

If installing the low, mid, high or fixed angle roof frames, a minimum of two attachment points per front track must be made, each with a minimum pull strength of 330 lbs. If this cannot be achieved, additional attachment points must be made to achieve minimum strength levels.

It is the responsibility of the installation contractor to ensure that the frame mounting is of suitable strength. Where applicable, inspection by building department officer or equivalent should be completed to ensure the installation is in accordance with relevant regulations.

I. Snow Load

In areas prone to heavy snowfall, the solar collectors should ideally be installed at an angle of 50° or greater to help promote snow sliding off the tubes. In addition, it is advisable to raise the lower collector frame off the roof surface 6 – 8 inches or higher. Doing this places the collector above moderate snowfall accumulation and allows drifting snow to more easily slide out from under the collector, which helps ensure that snow does not cover the collector array. A front track extension can be used for this purpose.

Please refer to local regulations regarding snow loading precautions.

J. Storage Tanks

It is recommended that the lever on the pressure and temperature relief valves (PTRV) on main pressure hot water storage tanks be operated once every 6 months to ensure reliable operation. It is important to raise and lower the lever gently, and be careful as the water released will be HOT. Failure to operate the PTRV on a regular basis could lead to failure of the component and the possibility of the storage tank exploding.

It is recommended, and may also be a local regulation, that, in order to expel water safely, the PTRV have a copper pipe connected and run to an appropriate drainage location. The PTRV and drain outlet pipe must not be sealed or blocked.

**NOTE:** If the water heater is left in an operating condition and not used for two weeks or more, a quantity of highly flammable hydrogen may accumulate in the top of the water cylinder.

To dissipate hydrogen safely, it is recommended to turn on a hot water tap for several minutes at a sink, basin, or bath, but not a dishwasher, clothes washer, or other electrical or heat producing appliance. During this process, there must be no smoking, open flame, or electrical appliance operating nearby. Hydrogen discharged through the tap will sound like air escaping. Failure to dissipate hydrogen properly could result in explosion and fire, serious property damage, severe personal injury, or death.

K. Hail Resistance

Glass evacuated tubes are surprisingly strong and able to handle significant impact stresses once installed. Testing and impact stress modelling proves that evacuated tubes, when installed at an angle of 40° or greater, are able to withstand impact from hail larger than 1” in diameter. The ability of evacuated tubes to withstand hail impact is greatly influenced by the angle of impact, so installing the collectors at low angles does reduce their impact resistance.

It is recommended that in areas prone to large hail (> 3/4”) the solar collector should be installed at an angle of 40° or greater to provide optimum protection. This is generally a common installation angle, as many populated areas in the world fall within 30-70° latitude.

If a tube should break, it can easily be replaced. Though a reduction in heat output will result, the solar collector can still function properly with one or more broken tubes (heat reduction depends upon how many tubes are broken). A broken tube should be replaced by authorized persons only.

**WARNING**

To dissipate hydrogen safely, it is recommended to turn on a hot water tap for several minutes at a sink, basin, or bath, but not a dishwasher, clothes washer, or other electrical or heat producing appliance. During this process, there must be no smoking, open flame, or electrical appliance operating nearby. Hydrogen discharged through the tap will sound like air escaping. Failure to dissipate hydrogen properly could result in explosion and fire, serious property damage, severe personal injury, or death.

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**Part 3 - Installation Information**

A. Transport, Unpacking, and Inspection

When possible, transport the boxes of evacuated tubes standing upright, taking notice of the THIS WAY UP arrows. If the boxes can only be laid down, always place on a flat, firm surface such as compressed wooden board. If stacking the boxes, do not exceed 3 layers and strap in place to avoid movement. Straps should be padded with thick cardboard or similar padding at corners to avoid cutting into the boxes.

**Component List**

Please familiarize yourself with the components listed on the packing list. If any components are missing, and/or additional part(s) are required, please contact your supplier.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A: Manifold Legs</td>
<td>(3) Three Pieces</td>
</tr>
<tr>
<td>Part B: Back Brace</td>
<td>(4) Four Pieces</td>
</tr>
<tr>
<td>Part C: Horizontal Support Brace</td>
<td>(3) Three Pieces</td>
</tr>
<tr>
<td>Part D: Manifold Arm</td>
<td>(3) Three Pieces</td>
</tr>
<tr>
<td>Part E: Clamp</td>
<td>(6) Six Pieces</td>
</tr>
<tr>
<td>Part F: Triangle Plate</td>
<td>(3) Three Pieces</td>
</tr>
<tr>
<td>Part G: Feet</td>
<td>(6) Six Pieces</td>
</tr>
</tbody>
</table>
Part H: Nut - (50) Fifty Pieces

Part I-1: Small Bolt - (40) Forty Pieces

Part I-2: Large Bolt - (10) Ten Pieces

Part J: Base Tube Frame - (1) One Piece

Part K-1: Plastic End Cap (Female) - (20) Twenty Pieces

Part K-2: Plastic End Cap (Male) - (20) Twenty Pieces

Part L: Evacuated Tube - (20) Twenty Pieces

Part M: Manifold - (1) One Piece

Part N: Fit Ring - (20) Twenty Pieces

Do not remove and/or expose the tubes to sunlight until ready to install, otherwise the heat pipe tip will become hot enough to cause serious burns.

**NOTE:** HTP DOES NOT WARRANT THE COLLECTOR, EVACUATED TUBES, OR HEAT PIPES AGAINST FAILURE AS A RESULT OF DAMAGE INCURRED DURING TRANSPORT OR INSTALLATION.

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**WARNING**

**COLD WEATHER HANDLING** - If the solar collector or components have been stored in a very cold location (BELOW 0°F) before installation, handle with care. Failure to do so could result in damage to the collector or evacuated tubes. Such damages are not covered by warranty, and could result in property damage or severe personal injury.

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**B. Collector Dimensions and Weights**

<table>
<thead>
<tr>
<th>Model</th>
<th>HP-30SC</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Tubes</td>
<td>30</td>
</tr>
<tr>
<td>Weight (lbs.)</td>
<td>252</td>
</tr>
<tr>
<td>Dimensions (Inches)</td>
<td>101 X 79 X 58</td>
</tr>
<tr>
<td>Net Aperture Area (ft²)</td>
<td>30.04</td>
</tr>
<tr>
<td>Storage Tank Size (Gallons)</td>
<td>70+</td>
</tr>
<tr>
<td>Nominal Flow Rate (Gal/Min)</td>
<td>0.84 gallons per collector</td>
</tr>
</tbody>
</table>

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**C. Tools and Materials**

Make sure you have all necessary tools, materials and accessories before beginning work on the solar system. The following is a minimum list of basic required tools. Other plumbing components will be field supplied according to installation needs.

<table>
<thead>
<tr>
<th>Electric Drill</th>
<th>Drill Index (w/ 1/2&quot; and 3/4&quot; Wood Bits)</th>
<th>Torch and Striker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Putty Knife</td>
<td>Hack Saw</td>
<td>High Temperature Joint Compound</td>
</tr>
<tr>
<td>Tubing Cutter</td>
<td>Tin Snips</td>
<td>Solder Flux</td>
</tr>
<tr>
<td>Tape Measure</td>
<td>Emory Paper</td>
<td>24&quot; Level</td>
</tr>
<tr>
<td>Extension Cord</td>
<td>Slip Joint Pliers</td>
<td>Needle Nose Pliers</td>
</tr>
<tr>
<td>Silicon Caulk and Roof Tar</td>
<td>Pipe Wrenches, 10&quot; and 14&quot;</td>
<td>Angle Iron</td>
</tr>
<tr>
<td>Open End Wrenches 9/16 &amp; 7/16</td>
<td>Screw Driver 6&quot; Flat Blade</td>
<td>Screw Driver 6&quot; Phillips</td>
</tr>
<tr>
<td>Wire Stripper or Knife</td>
<td>Wire Cutters</td>
<td>Black Latex Outdoor Paint</td>
</tr>
<tr>
<td>Adjustable Wrenches 8&quot; &amp; 10&quot;</td>
<td>Aluminum Flashing Sheet</td>
<td>Flashlight</td>
</tr>
<tr>
<td>Wire Nuts or Connectors</td>
<td>Miscellaneous Copper Pipe and Fittings (3/4&quot;)</td>
<td>1&quot; Copper Tee</td>
</tr>
<tr>
<td>1&quot; by 1/2&quot; Bush</td>
<td>1&quot;Reducer - 1/2&quot; or 3/4&quot;</td>
<td>5/8&quot;X 1/2&quot;wall &amp; 7/8&quot;X 1/2&quot; wall insulation</td>
</tr>
<tr>
<td>1/2&quot;ID and 3/4&quot; ID Type M Copper Tubing</td>
<td>Threaded Rod, Nuts, and Washers</td>
<td>Stainless Screw Clamps</td>
</tr>
<tr>
<td>Thermal Adhesive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**D. System Design**

System design should be completed prior to installation. Solar collectors need to be installed correctly to ensure high efficiency and,
most importantly, safe and reliable operation. Please seek professional advice for the design and installation of your solar heating system.

**NOTE:** Only authorized licensed contractors are permitted to install the solar collector.

**E. Delta-T Controller Settings**

Usually a Delta-T ON value of 8 – 20°F and Delta-T OFF value of 4 – 10°F is appropriate. These settings may need to be altered slightly according to location and system design. Refer to the instruction manual provided with the chosen solar controller for appropriate settings.

**F. Stagnation and Overheating**

Stagnation refers to the condition that occurs when the pump stops running. This can be due to pump failure, power blackout, or as a result of a high tank temperature protection feature built into the controller which turns the pump off.

If the system is designed to allow stagnation as a means of preventing tank overheating, the collector and plumbing in close proximity may reach temperatures greater than 395°F; components that may be exposed to these high temperatures, such as valves, plumbing, or insulation, should be suitably rated.

If the system is designed to allow stagnation of the collector when the tank reaches a set maximum level, steam may form in the collector(s). In such a system, temperature relief valves or auto air vents should be isolated (using an isolation valve) on the collector outlet, as these options may not be able to withstand the high temperatures and allow stable stagnation of the collector (may dump hot water).

In the event of component failure or extreme conditions, the PTRV on the hot water storage tank may open as a safety measure. Under such conditions, the collector will normally reach a maximum temperature of around 320°F. Any heat returning from the collector is generally not enough to cause a continued increase in tank temperatures (e.g. heat input is less than tank heat losses), and therefore is able to meet requirements in some regions limiting hot water dumping. A cracking noise may be heard coming from the supply line when hot water is used as the pressure in the system drops and steam forms. This is normal.

**G. Sizing System to Avoid Overheating**

The system should be sized so that overheating of the tank is difficult to achieve in a single day, even during hot, sunny periods. If the system is oversized, such that excessive heat is often produced during summer months, consider installing a drain back system, a heat dissipater unit, and carefully review the points in Part 3, Section H, Preventing Overheating.

**H. Collector Angle, Plane, and Direction**

1. **Collector Direction**

The collector should face the equator. In the northern hemisphere, this is due south, and in the southern hemisphere, due north. Facing the collector in the correct direction and angle is important to ensure optimal heat output. A deviation of up to 15° from due south is acceptable, and will have minimal effect on heat output.

**NOTE:** In Figure 1, D orientation (landscape) is not recommended for drain back systems.

2. **Collector Angle (Tilt)**

It is common for collectors to be installed at an angle that corresponds to the installation latitude. While adhering to this guideline, an angle of latitude +/- 10° is acceptable, and will not greatly reduce solar output. The solar collector should be installed at an angle between 20 – 80° to ensure optimal operation.

For year-round domestic hot water, the collector should be tilted to an angle of equal to the latitude of the installation site. Add 15° to the latitude to optimize for winter performance (space heating). Subtract 15° from the latitude to optimize for summer performance (indirect pool heating).

Given the formula above, a solar collector installed at 30°N latitude should face due south at an angle of 45° for wintertime advantage, and 15° for summertime heating.

**Preventing Overheating**

To reduce summer heat output, angle the collector for optimal winter absorption. This is achieved by installing the collector at an angle of around 15° above the latitude angle (e.g. 45° at 30°N latitude). This angle corresponds closely to the angle of the sun in the sky during the winter months, thus maximizing winter output. Conversely, during the summer when the sun is high in the sky, the relative collector surface area exposed to sunlight is reduced, cutting overall heat production considerably (by about 15%). This option is ideal for installations where solar thermal is being used for space heating.

**3. Collector Plane (Horizontal or Vertical)**

The collector could be installed vertically, but may be installed at an angle, such as sideways on a pitched roof. It is not recommended to install a drain back system in the horizontal or landscape style. In vertical installations, collectors should be installed with a 1/4” pitch towards the supply port to facilitate the drain back process. See more detail in Part 2, Section D, Number 3. The collector must not be installed upside down (tubes pointing upwards) or with tubes lying horizontally. The heat pipes will not function.

**I. Avoid Shade**

Collectors should be located so that shading does not occur between 9 AM and 3 PM local time. Partial shading due to small objects such as antennas and flues is not of great concern.

**J. Location**

To avoid long pipe runs, the collector should be positioned as close as possible to the storage tank. Storage tank location should therefore be considered part of the location requirements of the solar collector. The storage tank should be located as close as possible to the most frequent draw off points in the building.

**K. Expansion Tank**

**WARNING**

Expansion of HTF occurs as it heats. When HTF expands, it has to be controlled, as fluid cannot be compressed like air. A properly sized and installed expansion tank can accommodate expansion of HTF. If the expansion tank fails, a properly sized and installed PTRV will activate and protect the system. Failure to properly control HTF expansion may result in property damage, personal injury, or death.
See the following requirements for expansion requirements specific to application.

1. **Open Loop Systems**
Open loop systems have a check valve/non-return valve on the cold main. Expanded water is released via the PTRV, which is mounted on the tank or solar collector loop. To prevent wasteful dumping of water, it is required to install a potable water expansion tank on open loop systems.

2. **Closed Loop Systems**
Closed loop systems should always be installed with a solar expansion tank. Refer to the solar expansion tank manufacturer’s guidelines regarding correct sizing.

3. **Drain Back Systems**
Expansion tanks are not required in drain back system design.

**L. Lightning Protection**
To avoid lightning related damage or electrical safety issues, it is advisable to earth/ground the frame and copper circulation loop of the collector.

**M. Pipe Sizing and Connections**
HTP solar collectors are provided as standard with 1” copper pipe ports. For domestic heating applications with 1 or 2 collectors, nominal 1/2” piping is suitable. For applications using 2 - 4 solar collectors in series, it is advised to use nominal 3/4” piping. For 5 collectors, use 1” pipe. For drain back systems, use 5/8” pipe for 1 – 4 collectors and 1” pipe for 5 collectors. In connections of banks of collectors, larger pipe sizes should be used as required for the given application, with consideration given to flow rates, pressure drops, and pump sizing.

The material used for the solar loop must be able to withstand the operating temperatures and pressures to which the system may be exposed due to normal or extraordinary conditions (e.g. pump failure or power outage). Copper or stainless steel pipe is the most widely used piping material for solar applications.

**N. Connection of Multiple Collectors**
The maximum number of collectors that can be connected in series is 5. If the entire installation requires more than 5 collectors, use parallel strings of an even number. Even numbers cannot be achieved on parallel strings, flow balancing valves must be installed to ensure each collector has the same flow.

When connecting collectors in series (5 maximum), flexible connections should be used between each collector in order to allow for expansion and contraction of the copper header with temperature changes. Failure to use flexible connections between consecutive END port collectors may result in damage to the header if the system stagnates.

In drain back systems, supply and return connections to the collector must use eccentric fittings or a fitting arrangement that allows full draining of header pipes. The collector or array should be mounted with a 1/4” pitch towards the supply port to facilitate the drain back process. In addition, collector plumbing should slope toward the drain back reservoir at 1/4” per foot minimum to allow the system to drain. If continual slope is not achievable, consider a pressurized closed loop system.

**NOTE:** HTP does not warrant the collector against damages resulting from poorly managed header expansion and contraction.

**O. Potable Water**
If the system is open loop direct flow, meaning that potable water is flowing through the collector, any components used in the system must meet potable water requirements.

**P. Mounting Frame**
HTP solar collectors are supplied with an adjustable, extruded aluminum frame, which allows installers to change the angle of the collector to maximize efficiency and suit a range of different installation formats. Feet are supplied to fasten the panel securely to the roof. It is important that frame attachment points and externally supplied fasteners are of suitable structural strength and corrosion resistance. Be sure to tighten all hardware securely.

**Q. Galvanic Reaction**

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc galvanized components should NOT be installed in direct contact with stainless steel or aluminum, as galvanic reaction between metals can cause premature oxidation of the zinc coating, as well as the steel and aluminum underneath, leading to premature solar system failure and property damage. Such damages ARE NOT covered by product warranty.</td>
</tr>
</tbody>
</table>

Avoid using galvanized steel bolts. Use stainless steel components instead. If galvanized components ARE used, avoid direct contact between two metals by using rubber/plastic separators.

If roof surface is galvanized steel, refer to manufacturer’s corrugated roof installation guidelines.

---

**Part 4 - Collector Installation**

### Installing Clamp to Manifold
1. Place the manifold flat so the bolts are facing up.
2. Remove nuts attached to bolts on manifold.
3. Secure clamps to the bottom of the manifold using a ½” ratchet.

### Installing Clamp to Base Tube Frame
1. Secure clamps to the base tube frame using short bolts.
2. Tighten the bolts with ½” ratchet.

**WARNING**
Ensure the mounting surface is solid and able to withstand in excess of 330lbs of pull force that may be encountered during high winds. Consult a structural engineer if in doubt. Failure to follow this information could result in property damage, severe personal injury, or death.
## Installing Manifold and Base Tube Frame to Manifold Arms

1. Space out manifold arms so the rails line up with the clamps on the manifold and the base tube frame.
2. Slide in the short bolts in the arms first.
3. Slide small bolts into the rail before securing any nuts. Align so the ends of the clamps are flush along the end of the rails.
4. Secure manifold to manifold arms.

## Installing Triangle Plate Assembly

1. Slide two short bolts in the manifold arm.
2. Align the edge of the triangle plate to the edge of the manifold arm.
3. Secure the triangle plate to the manifold arm with nut, tighten with ratchet.
4. Repeat for the next two arms.

## Installing Legs to Assembly

1. Slide manifold legs onto the top bolt of the triangle plates.
2. Align the edge of the manifold leg with the corner of the top edge of the triangle base plate. The legs should be able to pivot about the bolt without interference.

## Installing Feet to Assembly

1. Place feet on the side of the manifold leg facing outward. The foot on the middle leg can be placed on either side.
2. Align so bottom of the foot is flush along the bottom of the manifold leg.

---
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| 3.   | Attach feet to manifold arms.  
5.   | Attach horizontal supports at the midpoints of manifold legs and arms. |
| 4.   | Align so foot is flush to the bottom of the manifold arms in the same direction as the feet on manifold legs.  
6.   | These supports can be adjusted along either support in order to create the desired angle. |
| 3.   | Attach the remaining back brace supports across the previous ones, creating an X.  
5.   | Attach horizontal supports at the midpoints of manifold legs and arms.  
6.   | These supports can be adjusted along either support in order to create the desired angle. |
| 4.   | Face feet outwards and attach to the manifold arms. Feet on the middle support can face either side.  
5.   | Screw plastic end cap back into place.  
6.   | When evacuated tubes are fully installed, wipe clean with liquid glass cleaner and cloth/paper towels. |

**Installing Evacuated Tubes**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1.   | Unscrew plastic end caps.  
2.   | Insert fit ring into hole in manifold.  
3.   | Apply a small amount of liquid soap or other non-flammable lubricant around the marked area to ensure smooth insertion. |
| 4.   | Place evacuated tube through end cap and screw into manifold.  
5.   | Screw plastic end cap back into place.  
6.   | When evacuated tubes are fully installed, wipe clean with liquid glass cleaner and cloth/paper towels. |
CAUTION

Do not spray water into the evacuated tube(s). Doing so may damage the tube(s).

Completed Collector Detail

<table>
<thead>
<tr>
<th>Angled Collector</th>
<th>Flat Mounted Collector</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="Isometric View" /></td>
<td><img src="#" alt="Isometric View" /></td>
</tr>
<tr>
<td><img src="#" alt="Back View" /></td>
<td><img src="#" alt="Top View" /></td>
</tr>
<tr>
<td><img src="#" alt="Right View" /></td>
<td><img src="#" alt="Front View" /></td>
</tr>
</tbody>
</table>

**Part 5 - Roof / Wall Mounting Suggestions**

**WARNING**

Working on the roof is extremely dangerous. Plan the installation carefully such that a safe distance from the edge can be maintained. Sure footing is also required. Be sure to wear sturdy, rubber soled shoes. NO SANDALS OR FLIP FLOPS. Harnessing equipment for fall prevention is mandatory.

Be sure that the roof is dry before beginning installation. Be sure that any ladders are set firmly against the side of the building and mounted properly. Have someone hold the ladder for you while you climb.

Be aware of any electric or water lines before drilling into the roof. Plan the installation accordingly.

Failure to follow this information could result in property damage, serious personal injury, or death.

The following details suggested roof attachment methods:

**J Bolt Penetration**

**Lag Bolt Penetration**

**Threaded Bolt Penetration**

**A. Roof Mounting**

In order to meet strength requirements in areas with winds up to 130 mph and category “D” exposure, collectors should be mounted into roof studs using lag threaded bolts or J bolts. Any other installation format should be approved by a structural engineer. When attaching to the roof surface, it is important to ensure proper sealing to prevent water penetration. It is also important to consider the building structure and roof construction type to ensure the structure is adequate for the collector’s weight and can withstand wind loads as determined by local codes. For commercial buildings, it is especially recommended to consult a structural engineer.
When installing a collector that will be raised and not flush to the roof, the increase in wind stress at the mounting points must be considered. Consult local wind load requirements.

Use larger stainless steel lag bolts to fasten the collector feet to a flat roof. If standing water may gather on the roof around the collector, ensure that all mounting and plumbing holes are thoroughly sealed and waterproofed.

### B. Flush Pitched Roof Installation

#### 1. Tiled Roof Attachment
For tiled roofs, carefully plan the location of the manifold, frame tracks and plumbing in order to minimize the number of tiles that need to be removed and returned into place. Tiles may have holes cut to allow the roof straps or bolts to pass through. Any holes must be covered and/or sealed with standard roofing materials to avoid leaks.

For tiled roofs, 2’ or 3’ long roof attachment straps can be used (2 per front track). One end of each strap should be secured to the underside of the frame front tracks using bolts and nut lock assemblies; the other end secured to structurally secure roof framing using 0.3” / 8mm diameter or thicker stainless steel bolts or screws. Please ensure that roof-analyzing points are of suitable structural integrity. Once the upper straps are attached and tightened, adjust the bottom straps to ensure that they too are providing support to the frame.

#### 2. Corrugated Iron Roof Attachment
For installation on a corrugated iron roof, a thick rubber pad can be used to separate the frame from the roof and also seal the drill hole. Use a standard corrugated iron roofing screw to secure the collector front feet directly to the roof’s wooden frame (additional holes may need to be drilled in the frame front track to properly secure the collector).

If the roofing screw is zinc galvanized steel, it should have a rubber/nylon washer to prevent direct contact with the stainless steel frame. The rubber pad will form a tight seal against the roof, preventing any water ingress. Addition of some silicone sealant beneath the pad and inside the hole is advisable to help waterproof the installation. This mounting method is also suitable when attaching a low or mid angle solar collector.

### 3. Asphalt Shingle Roof
For installation on an asphalt shingle roof, the same corrugated roof method outlined above can be used, the lone difference being that an extra thick rubber pad should be used to compensate for collector feet sinking into the asphalt.

### C. Low Pitched Roof Installation
When installing a tilt/angled collector on a low pitched roof, follow the attachment instructions above. The solar collector’s horizontal supports easily slide along the manifold arms and legs into the proper installation angle. Minimum pitch must be no lower than 25° for panels to perform properly.

### D. Flat Roof Installation
Use .4” / 10mm diameter or larger stainless steel lag bolts to fasten the collector feet to a flat roof. If standing water may gather on the roof around the collector, ensure that all mounting and plumbing holes are thoroughly sealed and waterproofed.

#### WARNING
Ensure the surface is solid and able to withstand in excess of 150kg / 330lbs of pull force that may be encountered during high winds. Consult a structural engineer if in doubt. Failure to do so could result in property damage, serious personal injury, or death.

### E. Wall Mounting
Wall attachment methods depend largely on wall material. For brick or concrete walls, secure collector feet with stainless steel expansion bolts. For wood or synthetic boarding, stainless steel screws that can penetrate into the wall framework may be suitable for mounting. If the strength of these screws is a concern, use bolts that run directly through the wood with a large washer or metal plate positioned before the nut.

#### WARNING
Always consider the weight of the collector and the structural integrity of the wall. HTP requires that installations be inspected and approved by authorized building inspectors and comply with state and local codes. Failure to take this information into consideration could result in property damage, serious personal injury, or death.

Take note to adhere to the maximum collector angle of 80°, otherwise heat pipe performance may be reduced.

Also, consider possible shading from eaves, particularly in the summer. This may be included in system design to minimize summer heat output. Another advantage of installing under an eave overhang is to minimize snow buildup on the collector in areas with regular snowfall. Even with snow sitting on the bottom of tube, the heat pipes will work effectively to conduct heat, as inner tube temperature becomes fairly even for the full length of the tube due to heat transfer by the aluminum fins.

If installing on a wall such that the collector is above a walkway, please consider the danger associated with broken glass that could fall if the tubes were ever damaged (e.g. during an extreme storm, a tree branch falls on the collector). It may be necessary for a barrier to be installed below the collector to catch any such falling materials.

### Part 6 - Plumbing Connections
Once the frame has been mounted and the manifold attached, the manifold header may be connected to the system plumbing. If the collector (including evacuated tubes) is to be installed prior to plumbing connection (e.g. on a new house), high temperature resistant covers should be placed over the header inlet and outlet to prevent any contaminants entering the header (e.g. aluminum foil).
The solar collector will not be damaged by a short period of stagnation (greater than 14 days).

A. Temperature Sensor Insertion
The temperature sensor port is located beside the inlet and outlet ports. Generally the temperature should be sensed at the outlet of the manifold. Ensure that sensors and cable used on the collector are high temperature rated (up to 395°F).

The solar controller temperature sensor should be coated with a thin layer of thermal paste and inserted into the sensor port to the full depth. If the fit is too loose, slide a piece of copper or stainless steel plate/wire in beside the sensor. Ensure that pipe insulation is watertight. Use silicone sealant to ensure a watertight seal against the manifold.

B. Header Connection

CAUTION

Never use dielectric unions or galvanized steel fittings when connecting to a stainless steel storage tank or heater. Use only copper or brass fittings. Teflon thread sealant must be used on all connections. Failure to follow this information could result in premature product failure and property damage. Such damages ARE NOT covered by product warranty.

Non-Galvanized Connections / Pipe Fitting
To ensure a sound seal, use plumbing thread glue or Teflon tape approved for use in glycol based systems. Tighten using two wrenches, taking care not to stress the copper pipe. Do not over tighten.

Brazing/Sweating/Soldering to the collector is acceptable, but not recommended, as doing so can damage the manifold casing. Ideally, place a wet cotton cloth against the rubber seal to prevent heat damage.

C. Air Purge
Once the inlet and outlet are connected to the plumbing system, the collector loop should be purged of air.

1. Open Loop
For a system without an auto-air vent, a drain valve on the supply line should be installed along with a ball valve or a metal coin vent on the tank side. With the ball valve closed, the drain valve can be opened to allow air to escape as water pressure forces through the line.

WARNING

When opening the drain valve, released water may be hot. Steam may release as well. Failure to take caution when opening drain valve could result in serious personal injury or death.

Once the drain valve no longer releases air, close it. Then open the ball valve so normal operation may begin.

If an auto-air vent is installed on the outlet of the collector, air will automatically eliminate from the solar line. If using a manual air vent, open it until all air is eliminated.

2. Pressure Open Loop
Run the pump at the highest speed setting, forcing air out of the manifold and back into the tank. If an auto-air vent is installed on the outlet of the collector, air will automatically eliminate from the solar line. If using a manual air vent, open it until all air is eliminated.

3. Closed Loop
The solar loop may be filled with potable water (drain back system) or a glycol / potable water mix, unpressurized (drain back system), or vented and pressurized. The exact process will depend on the design of the loop and components used.

NOTE: A drain back system does not need to be purged.

D. Plumbing Check
Once plumbing is confirmed leak free and all air has been purged the heat pipes and evacuated tubes may be installed.

E. Glycol Freeze Protection
Only use food grade propylene glycol, FDA rated as GRAS (Generally Recognized As Safe), with additives that provide resistance to breakdown during high temperatures. Glycol pH should be checked periodically and replaced as specified by the manufacturer.

F. Insulation
Heavily insulate all piping running to and from the manifold with high quality insulation of at least 0.6” thickness (thicker in cold climates). Heat loss from the piping can be significant. Particular attention should be taken to insulate any possible points of heat loss. Insulations should have a temperature rating of 250°F. Ensure the insulation is tight against the collector casing, thus minimizing heat loss from the inlet and outlet. High quality silicone sealant should be used to prevent water from entering the temperature probe port and/or in between the piping and insulation foam.

Insulation foam exposed to direct sunlight should be protected against UV related degradation by wrapping/covering with UV protective material, such as adhesive back aluminum foil, PVC wrap, or similar.

For systems designed to allow stagnation, high temperature rated insulation such as glass wool or mineral wool should be used on piping close to the collector (6’). Glass wool insulation may come with an external foil wrap, but any cuts made during installation should be sealed with watertight, UV stabilized material, such as adhesive backed aluminum foil or PVC wrap.

Circulating pump volutes can be a source of significant heat loss and should be insulated. Some pumps come standard with a molded foam casing which has good insulation properties. If the pump does not have any insulation, the same foam insulation used on the pipe can be used to cover the pump. This insulation should be secured in place with good quality nylon cable ties or adhesive tape.

NOTE: Certain pumps are not designed to be insulated. Please contact the pump manufacturer if in doubt.

All internal and external piping should be insulated. This includes at least the 3” closest to the hot water outlet of the tank, as this copper pipe is a significant point of passive heat loss.

G. Pump Selection
When selecting a pump, there are two basic solar designs to consider: pressure glycol and closed loop drain back.

In pressure glycol systems, two factors determine pump size. These are:

- Flow rate in gpm (gallons per minute)
- Head loss

In drain back systems, an additional factor must be considered along with the previous two:

- Lift
- Each collector has a nominal flow rate of about .54 gpm.
- When determining head loss, consider the following:
  - Head loss pumping through the collector(s)
  - Head loss pumping through piping and fittings
  - Head loss pumping through a heat exchanger

*Drain back only: Determine the vertical lift from the water level in the drain back tank to the top of the solar panels (vertical lift is the same as head loss).

Refer to the chart below for pressure drop figures with a 40% glycol solution. When using potable water as HTF, there is a further 20% reduction in pressure drop.

NOTE: To convert psi to head feet, multiply psi by 2.31 and divide total by specific gravity (1 for water, 1.02 for 30% propylene glycol, 1.04 for 50% propylene glycol).

After determining gpm flow rate and total system head loss, a properly sized pump can be chosen. See recommendation from pump supplier to determine the proper pump for your job. Incorrect pump size will reduce or fail to deliver solar contribution.
To further increase solar production, use a variable speed solar pump controller (part # 8600-047).

Figure 3 - System Piping Applications

1. Drain back tank with solar water heater. (This drawing is meant to show system piping concept only. The installer is responsible for all equipment and detailing per local codes.)

2. Closed loop pressurized. (This drawing is meant to show system piping concept only. The installer is responsible for all equipment and detailing per local codes.)
Part 8 - Maintenance
Under normal conditions the solar collector is maintenance free. Other system components, such as the pump and glycol (if used) may require periodic inspection and changing/maintenance. Please refer to the documentation provided by the manufacturers of these components.

NOTE: Apart from those maintenance items outlined below, any system inspection, maintenance, or repair should only be completed by authorized persons. The solar collector warranty coverage MAY BE VOIDED if non-authorized persons attempt to maintain or repair the solar collector or associated components.

THE FOLLOWING BASIC MAINTENANCE MAY BE COMPLETED BY THE HOME OWNER:

A. Cleaning
Regular rain should keep the evacuated tubes clean. However, if the tubes are particularly dirty, wash with a soft cloth and warm, soapy water or glass cleaning solution, ONLY if the collector is located in a position which DOES NOT require climbing onto the roof or use of a step ladder. If the tubes are not easily and safely accessible, high pressure water spray is also effective.

If cleaning is required and the above outlined methods are not suitable, the company that supplied and installed the solar collector should be contacted.

B. Leaves
Leaves may accumulate between or beneath the tubes. Please remove these leaves regularly to ensure optimal performance and prevent a fire hazard. (The solar collector will not cause the ignition of flammable materials). Such cleaning may only be completed by the homeowner if the tubes are easily and safely accessible.

THE FOLLOWING MAINTENANCE MAY ONLY BE COMPLETED BY AUTHORIZED PERSONS:

C. Broken Tube
If a tube is broken it should be replaced as soon as possible to maintain maximum collector performance. The system will still operate normally and safely with a broken tube. Any broken glass should be cleared away to prevent injury. Protective gloves must be worn when handling broken glass.

Handling broken glass must be done with extreme caution. Failure to do so may result in serious injury.

D. Insulation
The pipes running to and from the collector should be heavily insulated. This insulation should be checked periodically (at least once every 3 years) for damage. For any insulation exposed to sunlight, ensure protective cover/wrap/foil is in good condition. Replace as required.

E. Draining the Collector
If maintaining the system, or in preparation for extremely cold conditions (extended snow cover), draining of the manifold may be required. To drain the collector of fresh water (open loop, direct flow system):
1. Turn off the water supply to the solar storage tank.
2. If the storage tank or other system components are being concurrently drained, refer to their instruction manuals for details. If storage tank is not being drained, isolate piping to and from the solar collector (isolation valves should already be installed). Immediately open drain valves on both lines (or undo fittings). Never leave the isolation valves in the off position while the collector is full of water and exposed to sunlight. The water will heat and cause a pressure increase which may rupture fittings/connections.

NOTE: In good weather the water may be hot or have built up pressure, so take care when opening the drain valve.

3. Allow the manifold to sit in a vented state for 5 – 10 min to boil dry (may take longer in poor weather).
4. Always leave one drain valve or fitting open. Otherwise the system may build up pressure when it heats. For draining of other types of systems, please refer to specific instructions for the system.

F. Other Components
Other parts of the system, such as the pump and storage tank, should be serviced/inspected according to the manufacturer’s maintenance guidelines.

G. Stagnation
Drain back systems - These systems may be stagnated.
Pressure glycol systems - If left unattended for a significant length of time (greater than 14 days) such as during a vacation, the system will need a heat dump, a cover for the collector array, or to be drained to prevent stagnation damage. Many solar controllers have a vacation mode that allows for dumping the daily collected heat each night. See controller instructions.

Part 9 - Troubleshooting
Inspection items marked with an (H) may be completed by the homeowner, but only if investigation is clearly SAFE and EASY. Any information obtained during an investigation can then be relayed to the company that supplied and installed the system. Any other system troubleshooting, adjustments, or repairs may be completed ONLY by authorized persons.

A. No Hot Water
If there is no hot water, the problem will generally be related to the gas or electric heating system, not the solar collector. The collector simply pre-heats water, with final boosting completed by the electric element or gas booster system. For a retrofitted solar system, please contact the manufacturer/installer of your gas/electric water heater. For a new solar water heating system, please contact the company that supplied and installed the system.

B. Reduced Solar Contribution
Solar contribution is directly related to the amount of solar radiation and the volume of hot water used. During the winter and periods of rainy or particularly overcast weather, the amount of energy produced by the solar collector will be greatly reduced.

As a general rule, the solar collector is sized to provide close to 100% of your summer hot water needs, which, depending on your location and hot water usage patterns, may result in between 40% - 70% of your annual hot water energy needs. During the winter, increased cloud cover and reduced solar radiation levels may result in solar contribution as low as 20%. This is normal.

If, given similar environmental conditions, you feel the solar contribution (as indicated by energy savings) has considerably reduced, there may be a problem with your solar heating system. This may be due to an incorrectly configured controller, pump malfunction, or problem with the boosting system. In such cases, please contact the company who supplied and installed the system.

INVESTIGATION
(H) 1. Does the circulation pump appear to be operating? In sunny weather, the circulation pump should come on for 1 – 2 minutes every 3 – 5 minutes. The pump may run very quietly. You may need to touch the pump, or piping running to and from the pump, with a solid object to feel for motor operation (slight vibration). NOTE: DO NOT USE FINGERS! THE PUMP MAY BE HOT!
2. Are all the evacuated tubes intact? If a tube has been damaged or discolored it will reduce system performance and should be replaced. If a tube is damaged, do not attempt to remove it. Contact the company who supplied and installed the system.

3. Are there any apparent leaks in the plumbing to and from the collector? Any water trails down the roof, or around the storage tank?

C. Regular Water Dumping
During normal daily hot water use, if the temperature relief valve on the tank or collector is regularly dumping hot water (more than just a dribble), there may be a problem with the system.

POSSIBLE CAUSES
1. The system has been sized incorrectly (oversized). This will be most apparent in the summer months, when solar radiation levels are high.
2. A problem exists with the electric heating thermostat (electric boosting only).
3. Check expansion tank size. If undersized, water expansion may cause the relief valve to activate.

INVESTIGATION
To test the system, run the hot water tap in the bathroom or kitchen for 5 minutes to release some heat from the system (CAUTION: THE WATER WILL BE HOT. BE CAREFUL.) After this period, if the tank or collector still regularly dumps hot water, there is a problem. Please contact the company who supplied and installed the system to organize a service call.

Part 10 - Installation Checklist
The following list is a guide only. Specific items will depend on the nature of the installation.

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector faces due North/South as closely as possible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector is not significantly shaded throughout the day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector is not likely to be struck by falling objects such as branches or falling fruit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector is installed at an angle of 20-80°, preferably at a latitude angle.</td>
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<td></td>
</tr>
<tr>
<td>Collector is installed at an angle of 40° or greater in areas prone to large hail (&gt;3/4”).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame is secured to structurally sound roof/wall.</td>
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<td></td>
</tr>
<tr>
<td>Plumbing is leak free.</td>
<td></td>
<td></td>
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<tr>
<td>Plumbing pipe runs are well insulated.</td>
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<tr>
<td>Insulation above roof level is protected against sunlight with foil wrap or equivalent.</td>
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<tr>
<td>Controller is configured correctly with freeze setting (if required).</td>
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<tr>
<td>System is fitted with pressure relief valve on the collector outlet and/or storage tank.</td>
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<tr>
<td>Pressure relief valve will dump only onto high temperature resistant material and will not pose a danger of scalding people.</td>
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<tr>
<td>Pump, controller, and all electrical connections are protected from water.</td>
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<tr>
<td>Evacuated tubes have been cleaned.</td>
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<td></td>
</tr>
<tr>
<td>Installation record form has been given to customer and basic operation explained.</td>
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<td></td>
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<tr>
<td>Functional checks for controller and pump have been completed.</td>
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<tr>
<td>Water quality has been checked.</td>
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<tr>
<td>Collector loop piping has been flushed and cleaned.</td>
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</table>

Table 6 - Installation Checklist - All Items Should be Checked “Yes” for Installation to be Considered Completed Satisfactorily
HTP warrants each evacuated tube solar collector to be free from defects in materials and workmanship according to the following terms, conditions, and time periods. UNLESS OTHERWISE NOTED THESE WARRANTIES COMMENCE ON THE DATE OF INSTALLATION. This limited warranty is available to the original consumer purchaser (hereinafter “Owner”) of the solar collector, and is transferable to any subsequent owners of the solar collector for a total of ten (10) years. This limited warranty extends to solar collectors installed for use in medium temperature range applications (110 to 210°F ONLY). This warranty covers the evacuated tube solar collector and its components ONLY.

**Coverage**

A. Should a defect or malfunction result in a leakage of water or degradation of the collector absorber surface in such a way as to significantly affect collector performance within the above-stated warranty periods due to defective material or workmanship, malfunction, or failure to comply with the above warranty, with such defect or malfunction having been verified by an authorized HTP representative, HTP will repair or replace the defective or malfunctioning solar collector with a replacement solar collector of the nearest compatible model available at the time of replacement. Replacement parts or collectors shall be warranted for the remainder of the original warranty.

B. In the event of a failure of a replacement solar collector due to defective material or workmanship, malfunction, or failure to comply with the above warranty, HTP reserves the right to refund to the Owner the published wholesale price available at the date of manufacture of the original solar collector.

C. If government regulations, industry certification, or similar standards require the replacement solar collector or component(s) to have features not found in the defective solar collector or component(s), the Owner will be charged the difference in price represented by those required features. If the Owner pays the price difference for those required features or other features available on a new replacement solar collector or component(s), the Owner will also receive a complete new limited warranty for that replacement solar collector or component(s).

D. If at the time of a request for service the Owner cannot provide a copy of the original sales receipt or the warranty card registration, the warranty period for the solar collector shall then be ten (10) years from the date of manufacture of the solar collector and NOT the date of installation of the solar collector.

E. This warranty extends only to solar collectors utilized in heating applications that have been properly installed by qualified professionals based upon the manufacturer’s installation instructions. F. It is expressly agreed between HTP and the Owner that repair, replacement, or refund are the exclusive remedies of the Owner.

G. HTP will not accept claims from the Owner for labor costs incurred by any person as a result of the repair, replacement, removal, or reinstallation of a solar collector or any component thereof.

**Owner Responsibilities**

The Owner or Installer must:

1. Operate the solar collector in a solar water heating system installed in accordance with federal, state, and local codes.
2. Operate the solar water heating system at pressures below that shown on the solar collector rating label.
3. Keep the solar collector free of damaging scale deposits.
4. Make provisions so if the solar collector or any component part or connection thereto should leak, the resulting flow of water will not cause damage to the area in which it is installed.
5. Maintain the solar collector in accordance with the maintenance procedure listed in the manufacturer’s provided instructions.
6. Maintain all related system components in good operating condition.
7. Use the solar collector in an open system, or in a closed system with a properly sized and installed thermal expansion tank.

**Warranty Exclusions**

This limited warranty will not cover:

1. Any solar collector purchased from an unauthorized dealer or online retailer.
2. Any solar collector not installed by a qualified heating installer/service technician, or installations that do not conform to ANSI, CSA, and/or UL standards, as well as any applicable national or local building codes.
3. Service trips to teach you how to install, use, maintain, or to bring the solar collector installation into compliance with local building codes and regulations.
4. Failure to locate the solar collector in an area where leakage of the tank or water line connections and the relief valve will not result in damage to the area adjacent to the solar collector or lower floors of the structure.
5. Any failed components of the solar water heating system not manufactured by HTP as part of the solar collector.
6. Solar collectors repaired or altered without the prior written approval of HTP.
7. Damages, malfunctions, or failures resulting from improper installation, or failure to install the solar collector in accordance with applicable building codes/ordinances or good plumbing and electrical trade practices; or failure to operate and maintain the solar collector in accordance with the manufacturer’s provided instructions.
8. Damages, malfunctions, or failures resulting from failure to operate the solar collector at pressures not exceeding the working pressure shown on the rating label.
9. Failure to operate the solar collector in an open system, or in a closed system with a properly sized and installed thermal expansion tank.
10. Failure or performance problems caused by improper sizing of the solar collector, expansion device, or piping.
11. Damages, malfunctions, or failures caused by operating the solar collector with modified, altered, or unapproved parts.
12. Damages, malfunctions, or failures caused by abuse, accident, fire, flood, freeze, lightning, acts of God and the like.
13. Failures (leaks) caused by operating the solar collector in a corrosive or contaminated atmosphere.
14. Failure of the solar collector due to the accumulation of solid materials and lime deposits.
15. Any damage or failure resulting from improper water chemistry.
16. Any damages, malfunctions, or failures resulting from the use of dielectric unions.
17. Production of noise, odors, discoloration, or rusty water.
19. Components of the solar collector that are not defective, but must be replaced during the warranty period as a result of reasonable wear and tear.
20. Damages, malfunctions, or failures resulting from the use of any attachment(s) not supplied by HTP.
22. Solar collectors moved from the original installation location.
23. Solar collectors that have had their rating labels removed.
25. Solar collectors installed as a roof membrane or integral part of an existing roof membrane.
26. When installed in a system using a glycol based heat transfer liquid and the solar collector is left exposed to daily sunlight without hot water usage or effective heat dissipation, such that the collector dry stagnates, with the exception of stagnation due to system component failure or power outage, where the system failure is remedied within forty eight (48) hours of occurring, and;
27. Solar collector(s) left dry (no liquid circulation) and exposed to daily sunlight (not covered) for a period of time exceeding fourteen (14) consecutive days.
28. Any labor charges incurred by any person in connection with the examination or replacement of a solar collector or parts claimed by the Owner to be defective.

PROCEDURES FOR WARRANTY SERVICE REQUESTS
Any claim for warranty assistance must be made immediately upon finding the issue. First, please consult the HTP Warranty Wizard (http://www.htproducts.com/Warranty-Wizard.html) to check warranty eligibility. You may also contact HTP Technical Support at 1-800-323-9651 for questions or assistance. Warranty coverage requires review and approval of the issue with HTP Technical Support or through the Warranty Wizard prior to a full unit replacement. Any claim for warranty reimbursement will be rejected if prior approval from HTP is not obtained in advance of a full unit replacement. Final determination will be made as part of the warranty claim process.

When submitting a warranty claim the following items are required:
1. Proof of purchase or installation of the product – Typically a copy of the invoice from the installing contractor, the receipt of the purchase of the product, or an original certificate of occupancy for a new home.
2. Clear pictures (or video) of the following:
   a. Serial number tag (sticker)
   b. The product
   c. The product issue / failure whenever possible
   d. A picture of the piping near the product
   e. For gas fired products, a picture of the venting, including how it exits the building
All claims will be reviewed by HTP within three (3) business days. If additional information is required and requested by the HTP Claims Department you will have thirty (30) days to provide it. When all requested information is provided HTP will respond within three (3) business days. The claim will be automatically closed if requested information is not provided within thirty (30) days. Claims will not be reopened without HTP Warranty Supervisor approval.
During the claims process a product that must be replaced will be given a designation of either a) field scrap, or b) return to HTP. If the product must be returned to HTP, the returned product must arrive at HTP within thirty (30) days of the date of our request to return the product. After receipt of the returned product HTP may require as many as thirty (30) additional days for product testing. **Note: Any components or heaters returned to HTP for warranty analysis will become the property of HTP and will not be returned, even if credit is denied.**

If you have questions about the coverage of this warranty, please contact HTP at the following address or phone number: HTP, 272 Duchaine Blvd., New Bedford, MA, 02745, Attention: Warranty Service Department, 1(800) 323-9651.

SERVICE, LABOR AND SHIPPING COSTS
This limited warranty does not extend to any shipping charges, delivery expenses, or administrative fees incurred by the Owner in repairing or replacing the solar collector or component(s). This warranty does not extend to any labor costs incurred by any person as a result of the repair, replacement, removal, or reinstallation of a solar collector or any component thereof. All such expenses are the Owner’s responsibility.
### Customer Installation Record Form

The following form should be completed by the installer for you to keep as a record of the installation in case of a warranty claim. After reading the important notes at the bottom of the page, please also sign this document.

<table>
<thead>
<tr>
<th><strong>Customer’s Name</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Date of Installation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Installation Address</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Product Name / Serial Number(s)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Comments</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Installer’s Code / Name</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Installers Phone Number</strong></td>
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</tr>
<tr>
<td><strong>Signed by Installer</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Signed by Customer</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Installation Notes</strong></td>
<td></td>
</tr>
</tbody>
</table>

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**IMPORTANT**

Customer: Please only sign after the installer has fully reviewed the installation, safety, proper operation, and maintenance of the system. If the system has any problems please call the installer. If you are unable to make contact, please call your sales representative.

Distributor / Dealer: Please insert contact details.