Flat Plate Solar Collectors

Installation
Start-Up
Maintenance
Parts
Warranty

For Residential and Commercial Use

SS-26-FP / SS-32-FP / SS-40-FP Models*

*“FP” Denotes Smooth Copper Tube w/ Aluminum Plate Models
“U” Denotes Model with Unions
“W” Denotes Model with Sensor Wells

This manual must only be used by a qualified installer / service technician. Read all instructions in this manual before installing. Perform steps in the given order. Failure to do so could result in substantial property damage, severe personal injury, or death.

HTP reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.
FOREWORD
This manual is intended to be used in conjunction with other literature provided with the Flat Plate 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
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.

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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FOR THE INSTALLER

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Introduction - About Your Solar Collector  
Your Solar Collector is designed to offer reliable hot water heating in hot, mild, or cold climates. Flat plate solar collectors operate in open loop, closed loop, and drain back solar systems, making these collectors ideal for a variety of installation designs. 
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.

CAUTION  
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. Flat Plate Collectors  
Be careful when handling the collectors, as they will break if dropped. When installed, collectors may break if struck by a hard object (e.g. a branch falling on the roof).
E. High Temperatures

**WARNING**
- In sunlight, the copper plumbing ports can reach temperatures in excess of 300°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 ports and piping can easily reach temperatures in excess of 300°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
- Wear leather gloves when handling metal components and hot plumbing components.
- 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 75 pounds each.
- If the water storage tank is empty, the solar collector can reach temperatures of 300°F. Always check the water temperature before working on the solar collector.
- 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.

**WARNING**
Households with small children, disabled, or elderly persons may require a 120°F or lower temperature setting to prevent severe personal injury or death due to scalding.

In addition, to prevent scalding, the high temperature of the potable water must be limited using an ASSE 1016 tempering valve. This valve is usually located between the hot water storage tank and faucets in bathrooms, kitchens, etc. Temperer valves are mandatory under most codes and usually set to a maximum of 120°F. Temperer valves must be rated for high-temperature solar use.

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.

**CAUTION**
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 water 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.

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 90 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 installed 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 inch 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dissolved Solids</td>
<td>&lt; 500 ppm</td>
</tr>
<tr>
<td>Total Hardness</td>
<td>&lt; 7 grains (120 ppm)</td>
</tr>
<tr>
<td>Chlorides</td>
<td>&lt; 100 ppm</td>
</tr>
<tr>
<td>pH Levels</td>
<td>6.5 - 8.5</td>
</tr>
</tbody>
</table>

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 four attachment points must be made (2 on the upper and 2 on the lower track), each with a minimum pull strength of 220 lb. If this cannot be achieved, additional attachment points must be made to achieve minimum strength levels.

If installing at a raised angle (tilt-up mounts, as seen in Part 5), a minimum of four attachment points must be made (2 on the upper and 2 on the lower track), 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 collectors. 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.
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.

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.

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

Part 3 - Installation Information
A. Transport, Unpacking, and Inspection
Solar collectors are normally transported in a protective crate. Boxes containing the mounting assemblies will generally accompany the collectors.

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.
B. Collector Dimensions and Weights

![Diagram of collector dimensions](image)

*Figure 1 - Collector Dimensions - Right to Left Flow Shown. Specify Right to Left or Left to Right Flow. NOTE: No more than eight (8) collectors may be installed in an array.*

<table>
<thead>
<tr>
<th>Specifications</th>
<th>SS-26-FP</th>
<th>SS-32-FP</th>
<th>SS-40-FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dim. A (in.)</td>
<td>2.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dim. B (in.)</td>
<td></td>
<td>47.18</td>
<td></td>
</tr>
<tr>
<td>Dim. C (in.)</td>
<td>77.18</td>
<td>97.18</td>
<td>121.18</td>
</tr>
<tr>
<td>Dim. D (in.)</td>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dim. E (in.)</td>
<td></td>
<td>49.5</td>
<td></td>
</tr>
<tr>
<td>Weight (lbs.)</td>
<td>90</td>
<td>113</td>
<td>153</td>
</tr>
<tr>
<td>Gross Frontal Area (ft²)</td>
<td>25.6</td>
<td>31.8</td>
<td>39.7</td>
</tr>
<tr>
<td>Transparent Frontal Area (ft²)</td>
<td>23.6</td>
<td>29.9</td>
<td>37.4</td>
</tr>
<tr>
<td>Absorber Plate Area (ft²)</td>
<td>23.2</td>
<td>25.7</td>
<td>36.9</td>
</tr>
<tr>
<td>Fluid Capacity (Gallons)</td>
<td>.7</td>
<td>1.9</td>
<td>1.22</td>
</tr>
<tr>
<td>Nominal Flow Rate (Gal/Min)</td>
<td></td>
<td>0.8 - 1.5 gallons per collector</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 - Collector Specifications and Dimensions

C. Tools and Materials

<table>
<thead>
<tr>
<th>Tool</th>
<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></td>
<td>Hack Saw</td>
<td>High Temperature Joint Compound</td>
</tr>
<tr>
<td>Tubing Cutter</td>
<td></td>
<td>Tin Snips</td>
<td>Solder Flux</td>
</tr>
<tr>
<td>Tape Measure</td>
<td></td>
<td>Emory Paper</td>
<td>24&quot; Level</td>
</tr>
<tr>
<td>Extension Cord</td>
<td></td>
<td>Slip Joint Pliers</td>
<td>Needle Nose Pliers</td>
</tr>
<tr>
<td>Silicon Caulk and Roof Tar</td>
<td></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></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></td>
<td>Wire Cutters</td>
<td>Black Latex Outdoor Paint</td>
</tr>
<tr>
<td>Adjustable Wrenches 8&quot; &amp; 10&quot;</td>
<td></td>
<td>Aluminum Flashing Sheet</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 - Basic Required Tools

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 395°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 crackling 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 2, 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.

NOTE: 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 – 8 collectors, use 1” pipe. For drain back systems, use 3/4” pipe for 1 – 4 collectors and 1” pipe for 5 – 8 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 8. If the entire installation requires more than 8 collectors, use parallel strings of an even number. If even numbers cannot be achieved on parallel strings, flow balancing valves must be installed to ensure each collector has the same flow.

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.

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
Four mounting choices are available for HTP solar collectors: Tilt mounts or 2/3 mounts, flush mounts, or rack mounts (see Part 4). 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>CAUTION</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 - Mounting Installation

A. Mount Types
HTP offers three types of mounting assemblies.

1. Tilt Mount (Part # 8600P-002) or 2/3 Mount (8600P-691)
Tilt or 2/3 mounts are most commonly used on flat roofs. These mounts can be adjusted to an angle to maximize collector efficiency. HTP's tilt or 2/3 mounts consist of four hinged triangle feet that, when combined with a rear strut (Part # FP-ST), can create a panel tilt or inclination of up to 60°. The rear strut determines the degree of tilt, and can be cut to the appropriate size.

2. Flush Mount (Part # 8600P-012)
Often called direct mounts, flush mounts are often used on a sloped roof that is within 15° of latitude. Flush mount feet raise the collector 3” from the mounting surface. If roof pitch is insufficient, a tilt mount may be necessary.

3. Rack Mount (Part # 8600P-014)
Rack mounts are used to attach collectors to a metal frame (such as Uni-Strut). These mounts can also be used to attach collectors directly to the roof. However, this is unadvisable, as rack mounts install close to the roof surface and allow collectors to collect leaves, snow, and other debris.

B. General Mounting Information
Mounts should be attached to collectors as close to symmetrically as possible. Mounting clamps should be attached to the collector between 4° and 10° from corners if installed vertically, and 4° and 16° if installed horizontally. See below for detail.

Figure 3 - Solar Collector with Acceptable Mounting Locations

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure the roof surface is solid and able to withstand in excess of 330 lbs 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, severe personal injury, or death.</td>
</tr>
</tbody>
</table>

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Tilt Mounts (Part # 8600P-002)

The tilt mount package contains enough hardware to secure one collector.
Each set contains:
- Six (6) Tilt hinges, each with ¼” #20 stainless steel set screws, pre-installed
- Four (4) Triangle mounting feet
- Four (4) 1 ¾” x 3/8” – #16 stainless steel bolts
- Two (2) 4” x 3/8” – #16 stainless steel bolts
- Six (6 each) 3/8” stainless steel nuts and washers

Triangle Mounting Feet

Mount triangle feet to structure or Uni-Strut at proper spacing according to collector size (see Figure 3 for spacing). The triangle mounting feet can be fastened to Uni-Strut or directly to the roof using appropriate fasteners and sealant.

Front Mounts

Fully loosen the tilt hinge set screws. Once loosened, the tilt hinge will engage into the Quick Lock frame rail. Slide the flush mount to the desired location along the bottom side of the collector that will meet the roof. Tighten the screw to keep hinge from sliding. See Figure 3 for mounting locations.
Next, attach the triangle foot to the tilt hinge with the 1 ¾” x 3/8” bolt, 4” x 3/8” bolt, and 3/8” nut and washer.

Rear Mounts

Fully loosen the tilt hinge set screws. Slide the tilt hinges to desired location along the top side of the collector.
Leave a 1” space between the tilt hinges. Tighten set screw with a 7/16” wrench to a maximum of 10 foot pounds to lock the flush mount into position.
Position the E1022 struts between the two tilt hinges on each side and align the hole in the strut with holes in the tilt hinge. Insert the 4” x 3/8” bolt through all three pieces and secure with a 3/8” nut and washer.
Position the E1022 strut into the triangle foot and align the hole in the strut with the holes in the triangle foot. Insert the 1 3/4” x 3/8” bolt and secure with a 3/8” nut and washer.
Check for collector alignment and tighten all fasteners.
Use Table 4 to determine the length of the rear strut.

<table>
<thead>
<tr>
<th>Collector Tilt</th>
<th>SS-32 Base Dim. 98.18”</th>
<th>SS-40 Base Dim. 122.18”</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>53” Strut Length E-E</td>
<td>65” Strut Length E-E</td>
</tr>
<tr>
<td>35°</td>
<td>61” Strut Length E-E</td>
<td>75” Strut Length E-E</td>
</tr>
<tr>
<td>40°</td>
<td>69” Strut Length E-E</td>
<td>86” Strut Length E-E</td>
</tr>
<tr>
<td>45°</td>
<td>77” Strut Length E-E</td>
<td>96” Strut Length E-E</td>
</tr>
<tr>
<td>50°</td>
<td>85” Strut Length E-E</td>
<td>105” Strut Length E-E</td>
</tr>
<tr>
<td>55°</td>
<td>93” Strut Length E-E</td>
<td>115” Strut Length E-E</td>
</tr>
<tr>
<td>60°</td>
<td>100” Strut Length E-E</td>
<td>124” Strut Length E-E</td>
</tr>
</tbody>
</table>

C-C of holes, subtract 1”

E-E = end to end. C-C = center to center.

Table 4 - Rear Strut Length Chart
2/3 Mounts (Part # 8600P-691)

The 2/3 mount package contains enough hardware to secure one collector.
Each set contains:
- Four (4) triangle mounting feet
- Two (2) tilt hinges
- Two (2) 2/3 side brackets
- 1/4” – Four (4) stainless steel set screws, pre-installed per flush mount
- Six (6) 3/8-16 X 1 3/4 Screws
- Six (6) 3/8 flat washers and nuts

Triangle Mounting Feet

Begin by mounting the front triangle feet to structure at proper spacing according to collector size (see Figure 3 for spacing). The triangle mounting feet can be fastened directly to the roof using appropriate fasteners and sealant. Set the collector onto the triangle mounting feet and tighten the set screws.

2/3 Side Mounts

Loosen the set screws fully on the side mounts. Once loosened, the side mounts will engage into the Quick Lock frame rail. Slide the side mounts to desired location. See Table 5 for proper 2/3 side mount location. Tighten set screw with a 7/16” wrench to a maximum of 10 foot pounds to lock the flush mount into position.

Position the E1022 strut into the side mount and align the hole in the strut with the holes in the mount. Insert the 1 3/4” x 3/8” bolt and secure with a 3/8” nut and washer. Mount strut into triangle mounting feet. Repeat for other strut.
Mount the triangle feet to the structure using appropriate fasteners and sealant. Check for collector alignment and tighten all fasteners.

Flush Mounts (Part # 8600P-012)

The flush mount package contains enough hardware to secure one collector.
Each set contains:
- Four (4) Flush mounts
- 1/4” – 20 stainless steel set screws, pre-installed per flush mount

Mounting the Flush Mounts

Loosen the set screw fully. Once loosened, flush mount will engage into the Quick Lock frame rail. Slide the flush mount to desired location. Tighten set screw with a 7/16” wrench to a maximum of 10 foot pounds to lock the flush mount into position.
The flush mounts can be fastened to Uni-Strut or directly to an asphalt roof using the appropriate fasteners and sealant. See Figure 3 for proper placement of flush mounts.

Rack Mounts (Part # 8600P-014)

Each rack mount package contains enough hardware to secure one collector.
The set contains:
- Four (4) Rack mounts
- 1/4” – 20 stainless steel set screws, pre-installed per flush mount

Fully loosen the set screw. Once loosened, the rack mount will engage into the Quick Lock frame rail. Slide the rack mount to the desired location.
Tighten set screw with a 7/16” wrench to a maximum of 10 foot pounds to lock the rack mount into position.

### Side Mount Location for Selected Models

<table>
<thead>
<tr>
<th>Collector Model</th>
<th>Side Mount Location (From Bottom of Collector)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-26-FP</td>
<td>51.5”</td>
</tr>
<tr>
<td>SS-32-FP</td>
<td>64.8”</td>
</tr>
<tr>
<td>SS-40-FP</td>
<td>80.8”</td>
</tr>
</tbody>
</table>

Table 5 - Side Mount Location
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**

![J Bolt Penetration Diagram]

**Lag Bolt Penetration**

![Lag Bolt Penetration Diagram]

**Threaded Bolt Penetration**

![Threaded Bolt Penetration Diagram]

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. 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.

Consider possible shading from eaves, particularly in the summer. Strategic shading 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.

If installing on a wall such that the collector is above a walkway, please consider snow and where it will collect when it slides off the collector.

Ensure the roof surface is solid and able to withstand in excess of 330 lbs 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, severe personal injury, or death.
Part 6 - Plumbing Connections

A. Temperature Sensor Insertion
Temperature sensor wells are located on either side of the collector. Insert the sensor into the well below the hot out port. Ensure that the sensor and cable used on the collector are high temperature rated (up to 395°F). The sensor cable should not come in direct contact with the piping.
Ensure that any pipe insulation is watertight. Use silicone sealant to ensure a watertight seal against the collector.

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 header grommet. Care must be taken to avoid exposing the silicone rubber seal to the torch flame. 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.

2. Pressure Open Loop
Run the pump at the highest speed setting, forcing air out of the collector 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 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
Water vapor may appear on the inside of the collector glass when initially installed. This is not a problem and will disappear after a few days of operation. Consult your dealer or factory representative if water vapor does not clear up after a week of sunny weather.

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 collector 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 volumes 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.

WARNING
Always consider the weight of the collector and the structural integrity of the wall before installation. HTP requires that installations be inspected and approved by authorized building inspectors and comply with local and state codes BEFORE commissioning the system. Failure to do so could result in property damage, severe personal injury, or death.

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.

NOTE:

Figure 4 - Sensor Cable Detail

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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 pipe 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 between .8 and 1.5 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).

**NOTE ON CHART (Table 6):** To determine feet of head, multiply pressure drop by 2.31.

For example:

1. SS-40-FP at 3 gpm = 1.5 per panel and .071 psi = .071 for 2 panels at 3 gpm.
2. SS-40-FP at 12 gpm = 1.5 per panel and .071 psi = .071 for 8 panels at 12 gpm.

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).
Part 7 - System Piping Applications

A. Reverse Return
In Figure 6 you will find suggested collector piping diagrams utilizing reverse return for balanced flow:
NOTE: Landscape or horizontal examples not recommended for drain back systems.

B. Balance Flow Valves with Meters
Below you will find suggested collector piping diagrams using balance flow valves and meters for balanced flow. The following configurations may not work in drain back systems. These drawings can be applied to various system configurations, but may not meet certain requirements.

C. Pressure System Plumbing Panel Attachment
See the following diagram for examples of panel plumbing attachments for pressure systems. This diagram can be used for either vacuum tube or flat plate collectors. The collector can be plumbed from left to right or right to left. Note the air purge is on the hot out pipe. For collectors with 1" male threaded fitting (NPT), use high-temperature thread sealant that can be used with glycol. For collectors with 1" copper pipe, sweat a 1" sweat-to-male pipe thread.
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 collectors clean. However, if the collectors 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 collectors 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.

THE FOLLOWING MAINTENANCE MAY ONLY BE COMPLETED BY AUTHORIZED PERSONS:

B. 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.

C. Draining the Collector

If maintaining the system, or in preparation for extremely cold conditions (extended snow cover), draining of the collector 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.

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!
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
(H) 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>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector is installed at an angle of 40° or greater in areas prone to large hail (&gt;3/4&quot;).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame is secured to structurally sound roof/wall.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plumbing is leak free.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plumbing pipe runs are well insulated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation above roof level is protected against sunlight with foil wrap or equivalent.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controller is configured correctly with freeze setting (if required).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System is fitted with pressure relief valve on the collector outlet and/or storage tank.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure relief valve will dump only onto high temperature resistant material and will not pose a danger of scalding people.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump, controller, and all electrical connections are protected from water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collectors have been cleaned.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation record form has been given to customer and basic operation explained.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional checks for controller and pump have been completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water quality has been checked.</td>
<td></td>
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<tr>
<td>Collector loop piping has been flushed and cleaned.</td>
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Table 7 - Installation Checklist - All Items Should be Checked “Yes” for Installation to be Considered Completed Satisfactorily
HTP warrants each flat plate 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 flat plate 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. Failure of the solar collector due to the accumulation of solid materials and lime deposits.
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 fluid.
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 transitioned. 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.

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

**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.