



Drain Back Solar Systems

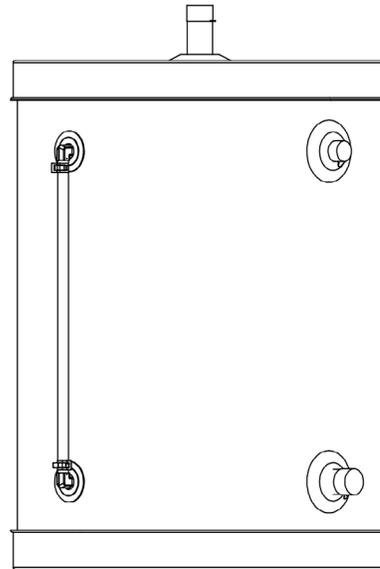
Installation

Start-Up

Maintenance

Parts

Warranty



For Residential and Commercial Use

DB Models



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

WARNING

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.

NOTICE

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

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.

SPECIAL ATTENTION BOXES

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important product information.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in serious personal injury or death.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in personal injury or death.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor personal injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

NOTICE is used to address practices not related to personal injury.

Foreword

This manual is intended to be used in conjunction with other literature provided with the Solar Water Heater. 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.

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

The design of this solar system is approved by the Solar Rating and Certification Corporation (SRCC). Any deviation from the approved specified SRCC components may affect your ability to certify this system.

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, Inc. reserves the right to modify product technical specifications and components without prior notice.

For Your Records

Write the Product Model and Serial Numbers:

Model # _____

Serial # _____

These numbers are listed on the product ratings label. Keep this manual and information for future reference.

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 THIS SOLAR SYSTEM 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. Always use the latest edition of codes.

Additional publications which should guide the installer include:

Local, state, provincial, and national codes, laws, regulations, and ordinances.

Solar Water Heating System Design and Installation Guidelines, SRCC OG-300, available from Solar Rating & Certification Corporation, 400 High Point Drive, Suite 400, Cocoa, FL 32926-6630, www.solar-rating.org.

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

Drain back tanks are designed to allow solar collectors and related piping to drain heat transfer fluid into the drain back reservoir when not in use.

Drain back systems are versatile: ideally suited for both cold and warm regions. The drain back process protects solar system components from both freezing and overheating, and saves power by shutting down the solar system when there is no longer a demand for hot water. Drain back systems have fewer components than pressurized systems, making drain back systems easier to use, service, and maintain. The drain back tank ships without a heat exchanger for use with a solar water heater with an internal heat exchanger.

This manual intends to familiarize you with the proper installation and maintenance of your solar water heating system. This system must be installed by a licensed solar or plumbing contractor in accordance with SRCC Standard OG-300 and all applicable national, state, and local codes.

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 the existing domestic water system and the drain back solar system

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

9 Part 1 - General Safety Information

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.

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

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.

DO NOT USE THE SOLAR SYSTEM IF ANY PART HAS BEEN SUBMERGED IN WATER. Immediately call a qualified service technician. Components may need to be replaced. Attempting to operate components that have been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged water heater could result in property damage, severe personal injury, or death.

NOTE: Damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.

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.

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.

CAUTION

High heat sources (sources generating heat 100°F / 37°C or greater, such as stove pipes, space heaters, etc.) may damage plastic components of the water heater as well as plastic vent pipe materials. Such damages ARE NOT covered by warranty. It is recommended to keep a minimum clearance of 8" from high heat sources. Observe heat source manufacturer instructions, as well as local, state, provincial, and national codes, laws, regulations and ordinances when installing this water heater and related components near high heat sources.

Ensure there are no low points or dips in sloped non-vertical supply and return pipe runs from the solar collectors to the drain back tank. Low points and improperly designed solar piping can trap water and possibly rupture in freezing weather. Pitch non-vertical piping ¼" per foot towards the drain back tank to facilitate proper drainage, and take care to properly layout piping to ensure there are no low points. In addition, the drain back tank and solar storage tank must be protected from freezing temperatures. Care must be taken when filling the system to avoid overfilling and exposing pipes to a freezing condition.

Improper installation or use may result in property damage. Such damages ARE NOT covered by warranty.

NOTICE

UNCRATING SYSTEM COMPONENTS - Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

ALL PIPING AND PLUMBING CONNECTIONS SHOULD BE MADE WITH COPPER PIPE ONLY. No less than 3/4" 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. PEX piping is approved for use in the solar loop of drain back systems ONLY.

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. 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.

C. Chemical Vapor Corrosion

Products to Avoid	Areas Likely to Have Contaminants
Spray cans containing fluorocarbons	Dry cleaning / laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes / cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric or Muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, laundry detergents, and cleaning solvents	Garages and workshops
Adhesives used to fasten building products	

Table 1 - Products and Areas Likely to Have Contaminants

NOTE: DAMAGE TO THE DRAIN BACK TANK, SOLAR SYSTEM, OR RELATED COMPONENTS CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY. (Refer to the limited warranty for complete terms and conditions.)

D. Insulation Blankets

For installation of insulation blankets, refer to *Solar Water Heating System Design and Installation Guidelines, SRCC OG-300*.

E. Water Temperature Adjustment

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

Approximate Time / Temperature Relationships in Scalds	
120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 seconds
155°F	About 1 second

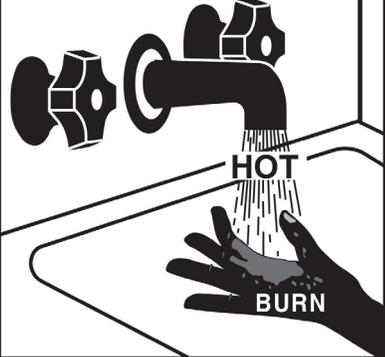
Table 2 - Approximate Time / Temperature Relationships in Scalds

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. Tempering valves are mandatory under most codes and usually set to a maximum of 120°F. Tempering valves must be rated for high-temperature solar use.

DANGER



Water temperature over 125°F can cause severe burns instantly or death from scalds.

Children, disabled and elderly are at highest risk of being scalded.

See instruction manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

F. Freeze Protection

NOTE: Consider piping and installation when determining drain back tank location. Place tank in a location not prone to freezing.

CAUTION

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

In order to meet health and safety regulations, solar system antifreeze fluid should be food grade polypropylene glycol, FDA rated as “generally recognized as safe” (GRAS). The recommended glycol is DOWFROST or equivalent. Using proper concentrations of glycol, solar systems can be operated at ambient temperatures as low as -60°F. Freeze tolerance limits are based upon an assumed set of environmental conditions. Refer to the specification sheet included with the glycol for recommended concentrations. A glycol / potable water mix must not exceed 50%, unless the manufacture specifies that a different ratio is recommended for use with solar water heaters. Glycol may need to be changed periodically (every 3-5 years) to prevent it from becoming acidic; please refer to the guidelines provided by the glycol manufacturer regarding replacement.

Part 2 - Important Information

A. Scope of this Manual

This manual pertains only to the installation and operation of the drain back tank. Details for the installation, operation, and maintenance of the complete solar water heating system, including, but not limited to: the solar collector(s), storage tank, gas 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 drain back tank 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 drain back tank 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 solar collector to the drain back tank and solar water heater.

Return – The plumbing line running from the solar water heater to the inlet of the collector. This line incorporates the circulation pump.

D. System Design

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. Drain back systems use potable water or a glycol / potable water mix as HTF.

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 must be mounted at ¼” pitch towards the supply port to facilitate the drain back process. In addition, collector plumbing should slope toward the drain back reservoir at ¼” 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)
Chloride	< 100 ppm
pH Levels	6.5 - 8.5

Table 3 - Water Quality Requirements

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 chlorides are present.

NOTE: Leakage of the drain back tank due to corrosion caused by improper water quality IS NOT covered by product warranty.

G. Freeze Protection

Though drain back systems provide freeze protection by allowing HTF from the solar collectors to drain into a reservoir in freezing conditions, it is important to locate the drain back tank in a location not prone to freezing conditions. 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.”

Part 3 - General Solar Information

A. System Description

By using the sun’s energy to heat water, solar hot water heating systems help reduce the nation’s dependence on polluting fossil fuels. This reliable, efficient drain back tank meets the certification requirements of SRCC-OG-300.

Basic components of a drain back solar water heating system include: the solar collector(s), a solar water heater, a circulator pump, and a differential solar control.

Drain back solar systems use potable water or a glycol / potable water mix as a heat transfer fluid (HTF) and operate in a closed loop. A drain back reservoir tank allows the solar collector(s) to drain HTF when not in use, protecting the system from both freezing and overheating. HTF

solar hot water heaters provide a backup when solar contribution is limited due to adverse weather conditions.

CAUTION

Do not introduce HTF into any fittings on the heater except those clearly marked for that purpose.

B. 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.

C. Solar Collector Installation

NOTE: These solar collector instructions are general in nature. Reference the solar collector manufacturer's instructions for more specific and detailed installation information.

The solar collector installation contractor shall obtain all required permits and approvals when installing the solar system. The installation shall conform to all federal, state and local regulations governing solar water heating system installations. The contractor shall adhere to sound building safety and trade practices. Special consideration must be given to building code requirements for the penetration of structural members and fire rated assemblies.

WARNING

All persons working on roofs should have completed a fall safety course and must be properly outfitted with appropriate safety equipment. Failure to follow this information could result in property damage, severe personal injury, or death.

Before installation, the contractor shall inspect the condition of the roof and notify the homeowner of any existing roof damage or necessary repairs. The most important structural consideration is to securely anchor the solar collector and solar strut mounting hardware to the structural members of the roof with stainless steel hanger or lag bolts. Consult with the collector manufacturer installation manual for proper guidelines in your application.

WARNING

Solar collectors should be covered at all times until installation is complete. Failure to follow this information could result in severe personal injury or death.

Preserving the integrity of the roof membrane is the most important roofing consideration. Ensure that all roof penetrations required to plumb and mount the solar collector are properly flashed and sealed in accordance with standard roofing practices. The recommended elastomer for sealing roof penetrations is Tremco "POLYroof".

D. 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.

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.

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 may be installed with 1/4" pitch towards the supply port to facilitate the drain back process.

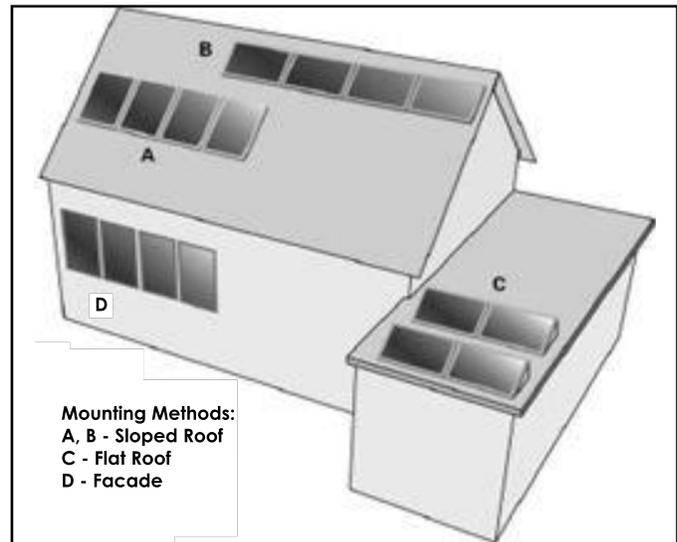


Figure 1 - Suggested Solar Collector Mounting Designs

E. Collector Piping

CAUTION

Never use dielectric unions or galvanized steel fittings in the collector loop. Doing so will lead to corrosion, property damage, and possible early water heater failure. Such damage IS NOT covered by warranty. Use only copper and brass fittings.

Collector piping in drain back systems may be constructed of copper and brass fittings, or PEX.

Systems Piped in Copper

To avoid leaks and fluid loss, copper and brass ground joint unions should be used to join the collectors. Use only lead-free solder. Engelhard Silvacrite 100 or equivalent is the required soldering material. Use of 50/50 lead solder is expressly prohibited. Use of galvanized steel, CPVC, PVC or any other nonrated plastic pipe is prohibited.

Systems Piped in PEX

- The PEX shall not be exposed to sunlight.
- Drain back systems employing PEX shall be non-pressurized (capped at atmospheric on the day of installation) or the system shall be vented to the atmosphere.
- At the inlet and outlet of the collector(s), a length of uninsulated copper tube of no less than 3/4" nominal diameter shall be used for a distance of no less than three feet before the conversion to PEX for the return line is made.
- Connections in the PEX piping runs to and from the collectors shall use only those fittings supplied and/or approved by the PEX manufacturer for potable water piping.
- The systems shall have a pressure-only relief valve installed at the drain back tank location or the tank shall be vented to the atmosphere. The pressure rating for this valve shall be no less than 25 psi and no more than 50 psi.

- If the collector stagnation temperature is below 210°F, PEX can be used without a length of copper pipe between the collector and the PEX.

Penetrations through walls or other surfaces shall not allow intrusion by insects and/or other vermin. Ensure that all structural penetrations are properly sealed with an elastomer, such as Tremco "POLYroof".

Piping in new solar installations may have dirt, grease, solder flux, or other impurities that will affect the quality of HTF over time. Thorough cleaning is required before charging new solar installations with glycol.

All vertical piping between the drain back tank and collector shall be supported at each story or at maximum intervals of ten (10) feet. In addition, all non-vertical solar collector piping should pitch 1/4" per foot down to the drain back tank to facilitate proper drainage. Ensure that there are no dips or low points in solar piping that could trap fluid and possibly rupture in freezing conditions. Copper plumbers tape or tube strap is the required strapping material. The pipe insulation may not be compressed or crimped by the strapping material.

The installation of all piping may not reduce the performance or rating of structural members or fire rated assemblies and must adhere to all applicable local codes and ordinances.

F. Collector Loop Pipe Insulation

The collector loop supply and return lines must be well insulated with high quality, flexible, closed cell insulation to minimize heat loss. Wall thickness of pipe insulation should not be less than 3/4". 1" wall thickness is required in all areas prone to annual hard freeze conditions. When it comes to pipe insulation the rule is simple: thicker is better. The specified insulation material is HT/Armaflex or equivalent.

Whenever possible, slide the insulation material over the pipe without cutting or taping. All butt joints must be sealed with contact adhesive. HT/Armaflex should be sealed with Armaflex HT 625 adhesive. Use of rigid polyethylene pipe insulation is prohibited. Temperatures generated by your collector in the summer months or under stagnation conditions can melt this type of material.

Any above ground exterior pipe insulation is subject to UV degradation and must be wrapped with PVC pipe wrap or painted with two coats of high quality water-based acrylic resin coating as supplied by the insulation manufacturer. Foil tape should not be used as it will fail. The required coating material is Armaflex WB Finish or equivalent. Prior to applying finish, wipe insulation clean with denatured alcohol. Paint insulation with two coats of finish. Do not tint the finish.

G. Collector Sensor Placement

The collector sensor must be located on the hot water return line as close to the collector as possible. Some collectors have insertion wells to measure temperatures more accurately at the manifold.

Sensors are typically accurate to +/- 1/2 °F if properly installed and weatherized. To maximize sensor accuracy, attach the flanged portion of the sensor to the collector header pipe with a stainless steel hose clamp. Wire nuts used to connect the sensor and low voltage wiring shall be all plastic, sealed with silicone and thoroughly wrapped in electrician's tape.

The low voltage wiring used to connect the sensors to the controller should be a minimum 18 AWG. The wiring should be bare or tinned copper, two conductor, PVC insulated, with a PVC UV rated gray jacket suitable for exterior use. Use Eastman Wire & Cable no. 5704, Beldon Wire and Cable no. 8461 or equivalent.

The sensor must be placed on the solar collector hot out line as close to the collector header as possible, or inserted into a sensor well near the hot out line. Place the sensor wire over the rubber pipe insulation, under the insulation tape or PVC pipe wrap. Thoroughly

wrap and weatherize the insulation with electrician's tape or insulation tape as provided by the manufacturer.

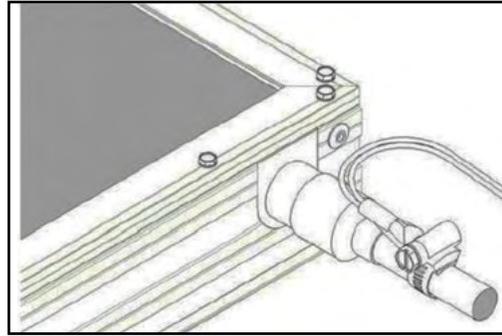


Figure 2 - Sensor Cable Detail

H. 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.

I. 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.

J. 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.

K. Galvanic Reaction

 WARNING
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. This reaction could lead to structural failure, property damage, severe personal injury, or death.

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.

L. Wind Stress

When installing the solar collector(s), 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.

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.

M. Snow Load

In areas prone to heavy snowfall, the solar collector(s) 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.

N. 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.

O. 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 that a hot water tap be turned on 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.

P. Sizing the Drain Back Tank

To ensure proper operation of the drain back solar system, the drain back tank volume should be sized with double the volume capacity of the total volume of the solar collectors and all solar piping above the drain back tank.

For example:

An HP-30SC Evacuated tube solar collector has a .3 gallon capacity.

100 feet of 1" copper pipe has a 4.6 gallon capacity.

The capacity of the collector and piping equals 4.9 gallons.

The system requires a 10 gallon drain back tank.

Part 4 - Installation

A. Checklist

Location

- Sufficient room to service drain back tank, piping, and related controls
- Provisions made to protect area from water damage
- Centrally located to fixtures
- Protected from freezing temperatures
- Area free of flammable and/or corrosive vapors

Potable Water Supply

- All related piping free from leaks
- Thermal expansion tank installed
- Water heater and fixtures have been properly purged of air
- ASSE 1017 rated thermostatic mixing valve IS REQUIRED PER SRCC OG-300

- Have water supply tested and ensure it meets the requirements outlined in this manual

Relief Valve

- Temperature and Pressure relief valve properly installed and discharge line runs to open drain
- Discharge line not exposed to freezing temperatures
- Discharge line constructed of copper

Anti-Freeze Fluid (If Used in System)

- Make sure freeze protection fluids are certified non-toxic, FDA rated GRAS
- Glycol percentage must be calculated per local area freeze level
- Provide glycol MSDS sheet to end user

NOTE: Make sure you have all necessary tools, materials and accessories before beginning work on the solar system.

CAUTION

COLD WEATHER HANDLING - If the water heater has 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 water heater.

B. Tools and Materials

The following is a minimum list of basic required tools. Other plumbing components will be field supplied according to installation needs.

Electric Drill	Drill Index (w/ 1/2", 3/4", 1", and 1 1/4" Wood Bits)	Torch and Striker
Putty Knife	Hack Saw	High Temperature Joint Compound
Tubing Cutter	Tin Snips	Solder Flux
Tape Measure	Emory Paper	24" Level
Extension Cord	Slip Joint Pliers	Needle Nose Pliers
Silicon Caulk and Roof Tar	Pipe Wrenches, 10" and 14"	Angle Iron
Open End Wrenches 9/16 & 7/16	Screw Driver 6" Flat Blade	Screw Driver 6" Phillips
Wire Stripper or Knife	Wire Cutters	Black Latex Outdoor Paint
Adjustable Wrenches 8" & 10"	Aluminum Flashing Sheet	Flashlight
Extension Cord	Wire Nuts or Connectors	Threaded Rod, Nuts, and Washers
Miscellaneous Copper Pipe and Fittings (3/4")	1" x 3/4" Copper Sweat Couplings	1" Copper Sweat Caps
Minimum 3/4" ID Type M Copper Tubing	Stainless Screw Clamps	Thermal Adhesive
7/8" x 3/4" and 1 1/8" x 3/4" Pipe Insulation		

Table 4 - Basic Required Tools

C. Locating the Drain Back Tank

This drain back tank is certified for indoor use only. DO NOT INSTALL OUTDOORS. Outdoor installations ARE NOT covered by warranty.

To minimize expense, choose a location for the drain back tank as

centralized to the solar tank and domestic piping system and near the solar collectors as possible. Also, locate the tank in as warm a location as possible, away from areas which would subject the drain back tank reservoir to freezing temperatures. All piping should be insulated to protect against freezing and minimize heat loss.

Additionally, the drain back tank, solar water heater, and all related solar system components should be installed with plenty of clearance for inspection and service. If minimum clearances are not met, it may not be possible to service the solar system without removing components from installation locations.

The drain back tank should also be installed in a place where T&P discharge or a leak will not result in damage to the surrounding area. Install a 2" high drain pan with a minimum of 3/4" drain line to prevent water damage if leakage should occur. See Figure 3.

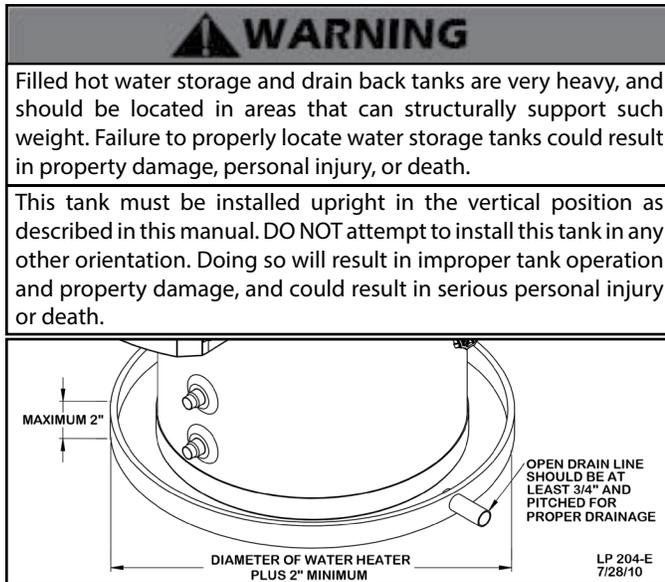


Figure 3 - Recommended Service Clearances

CAUTION

All drain back tanks eventually leak. Locate the tank where any leakage from the relief valve, related piping, tank, or connections will not result in damage to surrounding areas or lower floors of the building. Any drain back tank should be installed in such a manner that if it should leak the resulting flow of water will not cause damage to the area in which it is installed. National Plumbing codes require a drain pan for any water heater installation. This drain pan should be sized with a maximum depth of 2", and a minimum diameter 2" greater than the diameter of the water heater. The drain pan should empty into an open drain line. This drain line should be 3/4" ID minimum, piped to an open drain. Leakage damages ARE NOT covered by warranty. Failure to install a drain pan is the sole responsibility of the owner and/or installer. Reference UPC 2000 (Uniform Plumbing Code) Section 510 - Protection from Damage or IPC 200 (International Plumbing code) Section 504 - Safety Devices. Leakage damages ARE NOT covered by warranty.

In addition, water leak detection devices and automatic water shutoff valves are readily available at plumbing supply houses. IT IS HIGHLY RECOMMENDED BY THE MANUFACTURER TO INSTALL WATER LEAK DETECTION DEVICES AND AUTOMATIC SHUTOFF VALVES IN ANY DRAIN BACK TANK INSTALLATION WHERE A LEAKAGE OF WATER COULD RESULT IN PROPERTY DAMAGES.

D. Specifications and Dimensions

MODEL #	GAL.	A	B	C	D	E
SSU-10DB	10	20"	1-1/4"	19-1/4"	4-1/2"	15"

MODEL #	TANK INLET	TANK OUTLET	SHIPPING WEIGHT
SSU-10DB	3/4"	3/4"	31 lbs.

LP-351-D
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* ALL DIMENSIONS ARE APPROXIMATE

Figure 4 - Drain Back Tank without Heat Exchanger Specifications and Dimensions

Part 5 - Piping

The design and installation of the solar water heating system should be done by qualified individuals. It is important that good design and installation practices be followed to assure that your system will operate properly. Failure to follow installation guidelines for you solar water heating system could cause component failure and possible safety issues.

A. Potable Water Piping

CAUTION

It is very important that you do the potable piping before you pipe into your solar system. Failure to do so may damage your water heater.

Do not introduce HTF into any fittings on the heater except those clearly marked for that purpose.

It is mandatory that all plumbing be done in accordance with local and state codes or warranty will be void. It is also necessary to use both thread tape and pipe dope on all mechanical connections. The potable water piping is located on the side of your solar water heater and marked Hot and Cold. It is recommended that unions or flexible copper connectors be used so heater can be easily serviced. Install a shut-off valve on the cold feed near the solar water heater to isolate the tank for future service.

Provide clear access to the storage tank, pump, expansion tank, mixing valve, time clock and other key components. The components on the potable side of the system may require future service or maintenance,

so it is recommended that the connections be made with brass unions. You must use copper and brass fittings in plumbing the solar storage tank and expansion tank. The use of galvanized fittings, nipples, dielectric unions, CPVC, PVC, or other plastic pipe is prohibited.

Hard copper connections to the city cold water supply line and home hot water feed lines are recommended.

The gaskets in standard water heater flex hose connectors can become brittle and compressed over time and begin leaking on the water heater. If not detected in a timely manner, a drip or leak may cause serious damage to the tank's electrical components, or, in extreme cases, cause the tank to leak from the outside in.

B. Water Chemistry Requirements

CAUTION

Chemical imbalance of the water supply may affect efficiency and cause severe damage to the appliance and associated equipment. Water quality must be professionally analyzed to determine whether it is necessary to treat the water. Various solutions are available to adjust water quality. Adverse water quality will affect the reliability of the system. In addition, operating temperatures above 135°F will accelerate the build-up of lime scale and possibly shorten appliance service life. Failure of an appliance due to lime scale build-up, low pH, or other chemical imbalance IS NOT covered by the warranty.

The water must be potable, free of corrosive chemicals, sand, dirt, and other contaminants. It is up to the installer to ensure the water does not contain corrosive chemicals or elements that can damage the heat exchanger. Potable water is defined as drinkable water supplied from utility or well water in compliance with EPA secondary maximum contaminant levels (40 CFR Part 143.3). If the water contains contaminants higher than outlined by the EPA, water treatment is recommended and additional, more frequent maintenance may be required.

If you suspect that your water is contaminated in any way, discontinue use of the appliance and contact an authorized technician or licensed professional.

- **Water pH between 6.5 and 8.5**
 - pH levels below 6.5 can cause an increase in the rate of corrosion. pH of 8.5 or higher can potentially cause lime scale build-up
 - Maintain water pH between 6.5 and 8.5. Check with litmus paper or have it chemically analyzed by a local water treatment company.
 - If the pH is not between 6.5 and 8.5, consult a local water treatment company for solutions.
- **Hardness less than 7 grains (120 mg/L) (Commercial Use - water temperatures of 140°F and greater)**
 - Hardness levels above the required amounts can lead to lime scale build-up throughout the system. Water below 5 grains/gallon (85 mg/L) may be over softened.
 - Consult local water treatment companies for unusually hard water areas (above the required amounts) or for other treatment solutions if water is being over softened (below 5 grains/gallon [85 mg/L]).
- **Chloride concentration less than 100 ppm (mg/L)**
 - Do not fill appliance or operate with water containing chlorides in excess of 100 ppm (mg/L).
 - Using chlorinated fresh water should be acceptable as levels are typically less than 5 ppm (mg/L).
 - Do not connect the appliance to directly heat swimming pool or spa water.
- **Total Dissolved Solids (TDS) less than 500 ppm (mg/L)**
 - Total dissolved solids are minerals, salts, metals, and charged particles that are dissolved in water.

- The greater the amounts of TDS present, the higher the corrosion potential due to increased conductivity in the water.
- If using softened water to fill the appliance, it is still possible to have high TDS. This water can be corrosive. Consult local water treatment companies for other treatment solutions to reduce this affect.

***NOTE:** To promote appliance service life, it is strongly recommended to follow the maintenance procedures in this manual.

C. Solar Heat Exchanger Piping

Set up the primary balance of the system components following the piping detail in Figures 7 and 8.

Run ½" type M or larger copper pipes, or flex line sets, to and from the collector following the direction of supports, penetrations, and other relative items.

Copper or PEX may be used in the solar loop piping of drain back systems.

When making a connection to the heat exchanger, use Teflon Tape and joint compound to prevent leaks. Do not apply heat directly to the heat exchanger thread connection when sweating fittings.

Line pressure and temperature gauge shall be installed in the collector supply and return lines to allow for a simple diagnostic check of proper system operation. On a sunny day, the hot water return line should be approximately 5 – 12°F warmer than the water in the collector supply line. Compare the temperature readings in the two line thermometers. The ¾" cold water supply line to the storage tank must be insulated with a minimum 7/8" x ½" pipe insulation to a minimum distance of 5' behind the storage tank, or to the wall if closer than 5'.

D. Necessary Components for Water Heater Installation

Listed below are components needed for installation of the solar water heater.

Solar Collector

Absorbs and transfers the sun's energy into the solar heat exchanger located on the bottom of the solar water heater.

Solar Air Release Vent*

This air vent allows air contained in the solar system to release.

*Remove and cap the solar air release vent after commissioning the system.

Solar Collector Sensor

This sensor is wired to the solar controller and automatically turns on the circulator pump when the differential set point is reached between the solar water heater and collector.

Solar Temperature and Pressure Gauge

The solar temperature and pressure gauge displays the actual temperature and pressure supplied and returned to the solar collector.

Check Valve

Helps minimize convective heat loss at night when the system is not operating. If a check valve is not installed, most of the heater energy stored during the day would be transferred into the collector and lost.

Collector Isolation Valve (Valves #6 and 11)

Valves #6 and 11 isolate the collector loop from the solar water heater.

Pressure Relief Valve (for Solar System)

Releases pressure in the solar loop when it exceeds 150psi. Contact your installation contractor immediately if this valve opens and releases fluids.

System Fill Valve (Valve #8)

Fills the system with HTF. Also eliminates air from the system.

Expansion Tank

Precharged with air to allow for the expansion and contraction of HTF.

Drain Valve (Valve #10)

Used to charge the collector loop with glycol, purge air from the loop and drain the solar water heater heat exchanger of fluid.

Collector Isolation Valve (for system fill) (Valve #11)

Used to direct the flow of HTF and to pressurize and eliminate air from the solar system.

Ball Valve (for circulator) Valve #12

Used to isolate the circulator pump for service. Close both ball valves to isolate pump.

Circulator (#13)

Circulates the HTF from the solar collector into the solar heat exchanger.

Drain Valve (Tank) (Valve #14)

Flushes sediment which may accumulate on the bottom of the solar water heater and also provides a means of draining the tank.

Tank Sensor

Is wired to the solar controller to measure the temperature on the bottom of the solar water heater in conjunction with the solar collector sensor. Turns the circulating pump on and off at the solar control preset temperature differentials.

Solar Controller

The solar controller turns the circulator on or off depending on heat gained from solar operation. The controller also limits overheating in the solar water heater. Some controllers have various options. The controller should always be set in the "auto" position so that it operates the array automatically when there is solar energy to be collected.

Solar Heat Exchanger

The solar heat exchanger has an integral finned tube designed to transfer heated energy rapidly from the solar collector into potable water. The heat exchanger is constructed for superior corrosion resistance and long-term reliability.

Hot Water Outlet

Each solar water heater has a hot water dip tube outlet which draws water from the top of the heater. This helps to keep heat trapped inside the highly insulated storage tank.

Solar Tank Temperature and Pressure Relief Valve

The relief valve must comply with standards for relief valves (ANSI Z21.22) by a nationally recognized lab that maintains periodic inspections of production listed equipment. No valve of any type should be installed between the relief valve and tank. Local codes govern installation of relief valves.

The relief valve outlet must be piped to a suitable open drain so that the discharge water cannot contact live electric parts to eliminate potential damage. Piping used should be approved for hot water distribution. The discharge line must be no smaller than the outlet of the relief valve and must pitch downward to allow complete drainage. The end of the discharge piping should not be threaded or concealed and must be protected from freezing. No valve of any type, restriction or reducer coupling should be installed in the discharge line.

Mixing Valve (Rated ASSE 1017) REQUIRED PER SRCC OG-300

Automatically blends hot and cold water feed lines to control discharge to an acceptable and safe temperature. This also increases the amount of hot water drawn from the solar water heater by

not allowing incoming cold water to fully temper the hot water stored inside the tank. To help prevent injury due to scalding, it is recommended that the mixing valve be set at 120°F.

Ball Valve (for cold water shut-off) (Valve #24)

The cold water shut off valve should be used in the event of an emergency shutdown.

CAUTION
It is very important that you do the potable piping before you pipe into the solar system. Failure to do so may damage your water heater. Improper installation IS NOT covered by warranty.

E. Installation of the Drain Back Tank

CAUTION
Never use dielectric unions or galvanized steel fittings on any domestic water connections or auxiliary connections. ONLY use copper or brass fittings. Teflon thread sealant must be used on all connections.

1. Pipe solar collector return to the inlet fitting located on the top of the drain back tank.
2. Pipe drain back tank outlet (located near the bottom of the tank) to the solar heat exchanger inlet.
3. Pipe solar heat exchanger outlet to the solar collector supply fitting.

(See installation diagrams in Part 5 for piping details.)

Insulate all hot water lines, as well as the final 5' of cold water supply pipe leading to the system, with at least ¾" thick heat resistant rubber tubing insulation.

Before commissioning the system, install the sight tube and an ASME/ANSI rated 30 PSI pressure relief valve into the appropriate fittings on the drain back tank using pipe dope. Follow further pressure relief valve installation information listed below.

 WARNING
To avoid water damage or scalding due to relief valve operation:
<ul style="list-style-type: none"> • Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge. • Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length. • Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible. • The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F or greater. • Do not pipe discharge to any location where freezing could occur. • No valve may be installed between the relief valve and heater or in the discharge line. Do not plug or place any obstruction in the discharge line. • Test the operation of the relief valve after filling and pressurizing the system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, immediately replace with a new, properly rated relief valve. • Test relief valve at least once annually to ensure the waterway is clear. If valve does not operate, turn the heater "off" and call a plumber immediately. • Take care whenever operating relief valve to avoid scalding injury or property damage.
FAILURE TO COMPLY WITH THE ABOVE GUIDELINES COULD RESULT IN FAILURE OF RELIEF VALVE OPERATION, RESULTING IN POSSIBILITY OF SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

F. Solar System Pump

CAUTION

The circulating pump becomes very hot when running. Allow sufficient time to cool before touching. Failure to do so can lead to personal injury.

Solar pumps must be installed at least 3' below drain back tank level. Remove integral check if so equipped. The solar system pump must be sized to lift water to the top of the collector array. The solar pump must be sized for proper flow and head loss. Friction losses must also be considered when sizing a pump and solar system piping.

When sizing the pump, determine the head losses (also called psi, head feet, and foot lift). Determine head loss through piping and the heat exchanger using the solar collector manufacturer's recommended flow rates. Consider the vertical lift from the drain back tank to the top of the solar panels. Size the pump for whichever is greater: Head loss pumping through the system, or vertical lift, not both. A solar modulating pump control is highly recommended on a drain back system.

CAUTION

If the pump continues pumping at full speed rate after the system is primed, the solar loop will often be over-pumped and the recommended velocity will be exceeded. This condition will lead to premature failure and reduced performance of the solar system.

G. Electrical Installation

ALL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH LOCAL ELECTRICAL CODES. A qualified electrician or contractor is required to install a 115-120VAC duplex receptacle adjacent to the solar storage tank. This receptacle is used to supply power to the pump/control combo.

H. Installing the Drain Back Tank Sight Tube

IMPORTANT NOTE: A sight tube has been included with the solar drain back tank. The sight tube allows service technicians, installers, and users to quickly determine proper drain back system drainage and solar system heat transfer fluid level.

CAUTION

It is extremely important that this sight tube be installed BEFORE filling the solar water heating system. Failure to install the sight tube will result in a spillage of heat transfer fluid, which, depending on your system, may or may not contain antifreeze. Property damages due to failure to install the sight tube ARE NOT covered by product warranty.

1. Fit one (1) clamp on the solar drain back tank sight tube. Move the clamp about two inches down the sight tube.
2. Fit the drain back tube onto the top sight tube fitting. See Figure 5.

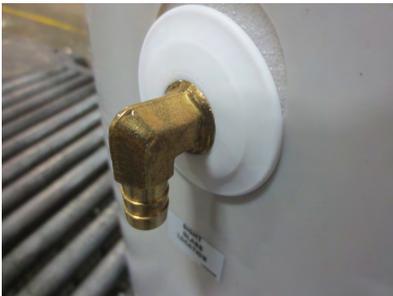


Figure 5 - Brass Drain Back Sight Tube Fitting

3. Move the clamp over the tube and onto the sight tube fitting. This will secure the tube to the fitting. See Figure 6.
4. Fit one (1) clamp on the other end of the solar drain back tank sight tube. Move the clamp about two inches down the sight tube.

5. Fit the drain back sight tube onto the bottom sight tube fitting. It may be necessary to use an adjustable wrench to offset the fitting. This will ease securing the drain back tank sight tube to the fitting.
6. Move the clamp over the tube and onto the sight tube fitting. This will secure the tube to the fitting. See Figure 6.



Figure 6 - Sight Tube Secured to Brass Fitting

NOTE: If the fitting was offset, use an adjustable wrench to straighten it back up.

7. After the solar water heating system has been piped, check the drain back sight tube and fittings and repair any leaks.

I. Applications

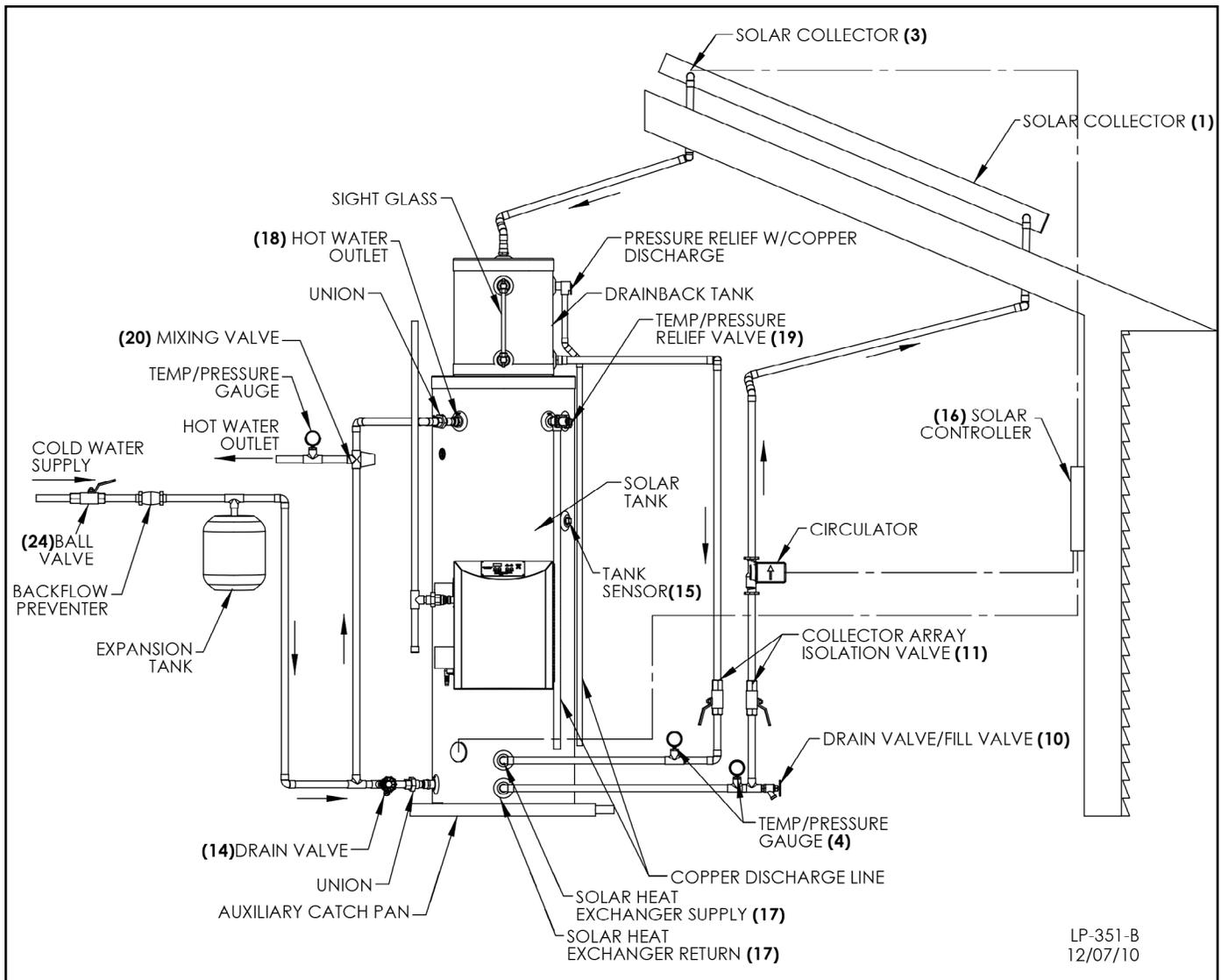


Figure 7 - Drain Back Tank without Heat Exchanger and Gas Fired Back Up

FIGURE NOTES:

1. This drawing is meant to demonstrate system piping concept only. The installer is responsible for all equipment and detailing by local codes.
2. Non-potable HTF shall only be used for the solar heat exchanger circuit. Never introduce non-potable HTF to any connection other than the solar loop.
3. If there is a check valve on the cold water feed line, a thermal expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and cold water inlet of the solar water heater. The expansion tank should be properly sized for the volume of stored hot water and maximum tank temperature. Normal solar control settings may be between 120° and 160°. Do not exceed 160° on the solar control setting.
4. A solar rated mixing valve is recommended if the domestic hot water setting is above 120°F. A standard mixing valve generally cannot deliver the temperature protection range at which a solar system operates.
5. A minimum of 12 diameters of straight pipe must be installed upstream of all circulators.
6. Make sure solar storage tank is fully purged of air before power is turned on to the backup heat source.
7. **Due to extreme temperatures, circulators with integral flow checks are not to be used in solar systems. If circulator comes equipped with an integral flow check, remove it.**
8. Non-vertical drain back solar system piping should pitch ¼" per foot back to the tank to facilitate draining.
9. No check valves are allowed in the solar loop.
10. Solar pumps must be installed 3' below the drain back tank.

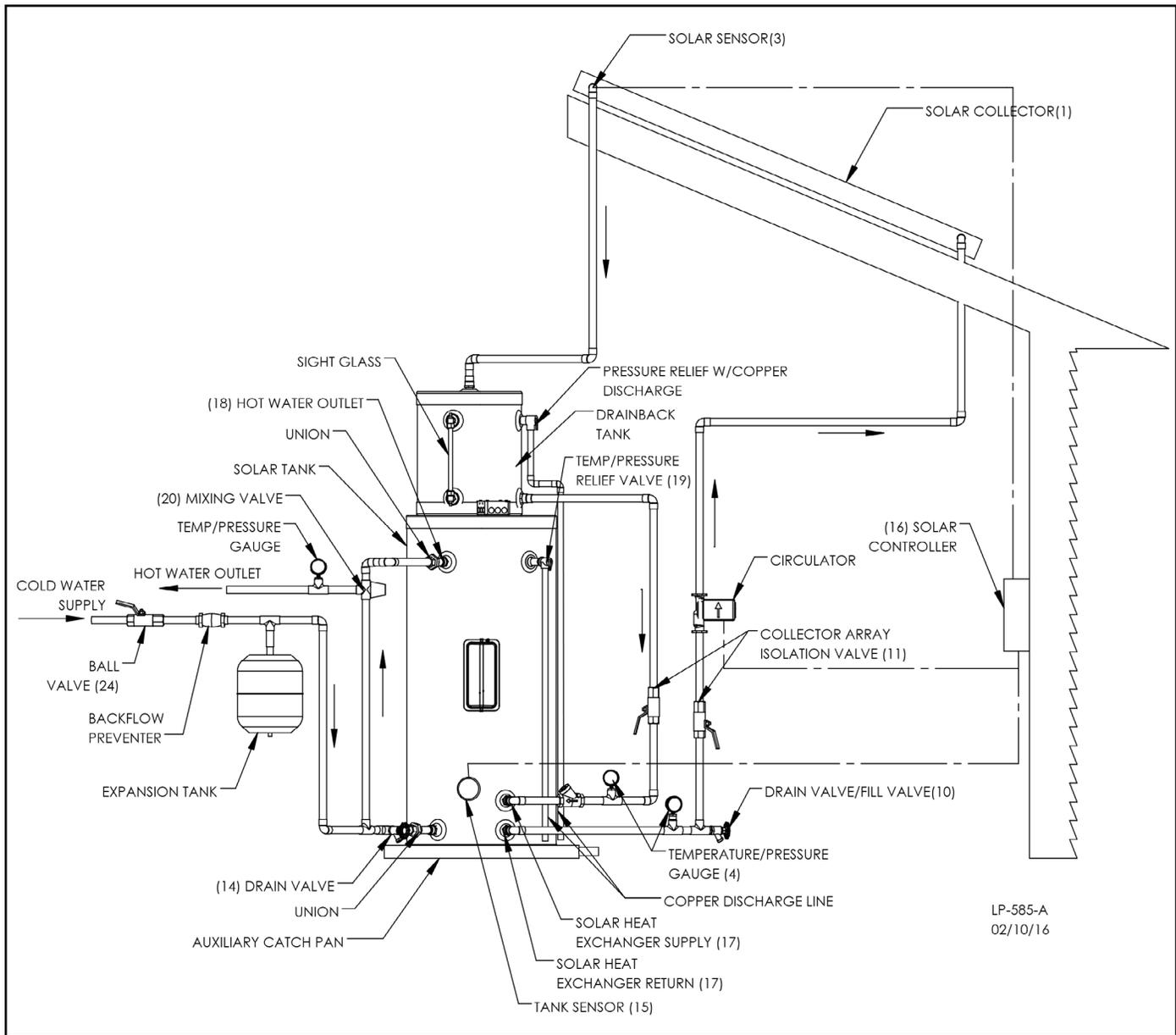


Figure 8 - Drain Back Tank without Heat Exchanger and Electric Back Up

FIGURE NOTES:

1. This drawing is meant to demonstrate system piping concept only. The installer is responsible for all equipment and detailing by local codes.
2. Non-potable HTF shall only be used for the solar heat exchanger circuit. Never introduce non-potable HTF to any connection other than the solar loop.
3. If there is a check valve on the cold water feed line, a thermal expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and cold water inlet of the solar water heater. The expansion tank should be properly sized for the volume of stored hot water and maximum tank temperature. Normal solar control settings may be between 120° and 160°. Do not exceed 160° on the solar control setting.
4. A solar rated mixing valve is recommended if the domestic hot water setting is above 120°F. A standard mixing valve generally cannot deliver the temperature protection range at which a solar system operates.
5. A minimum of 12 diameters of straight pipe must be installed upstream of all circulators.
6. Make sure solar storage tank is fully purged of air before power is turned on to the backup heat source.
- 7. Due to extreme temperatures, circulators with integral flow checks are not to be used in solar systems. If circulator comes equipped with an integral flow check, remove it.**
8. Non-vertical drain back solar system piping should pitch 1/4" per foot back to the tank to facilitate draining.
9. No check valves are allowed in the solar loop.
10. Solar pumps must be installed 3' below the drain back tank.

Part 6 - Fluid Quality

A. Solar Loop Fluid Quality

HTP, Inc. recommends the use of potable water as HTF in its drain back solar systems.

Fluid 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 listed below.

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

In order to meet health and safety regulations, solar system antifreeze fluid should be food grade polypropylene glycol, FDA rated as "generally recognized as safe" (GRAS). Using proper concentrations of glycol, solar systems can be operated at ambient temperatures as low as -60°F. Freeze tolerance limits are based upon an assumed set of environmental conditions. Refer to the DOWFROST specification sheet in the back of this manual for recommended concentrations. If using a glycol / potable water mix, the water must meet the above requirements, and the glycol content of the liquid must not exceed 50%, unless the manufacture specifies that a different ratio is recommended for use with solar water heaters. Glycol may need to be changed periodically (every 3-5 years) to prevent it from becoming acidic; please refer to the guidelines provided by the glycol manufacturer regarding replacement.

B. Fluid Safety Labeling

Included with your solar system is a set of labels which describe component function. These labels alert the owner to potential hazards. Affix these labels by string/wire/tie on valves, and/or "peel and stick" on pipe insulation. Labels on the solar loop system must contain the following warning:

"No other fluid shall be used that would change the original classification of the system. Unauthorized alterations to this system could result in a hazardous health condition." All labeling MUST be in place at final inspection.

C. Freeze Protection

Though drain back systems provide freeze protection for the solar collectors, additional care must be taken in regions that 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 above the specified limit, may cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with the Supplier's instructions if the air temperature is expected to approach the specified freeze tolerance limit."

For areas with temperatures not falling below -5°C/23°F, a simple low temperature controller may be used to guard against freezing. If necessary, backup freeze protection in the form of an uninterrupted power supply (UPS), or freeze valves (which open to allow water to dribble out) should also be installed.

For areas with temperatures that fall below -5°C /23°F, a closed loop filled with a polypropylene glycol-water mix should be used to provide hard freeze protection. Please refer to glycol manufacturer's specifications about the temperature ranges the liquid can withstand. Only food grade polypropylene-glycol, FDA rated as GRAS, should be used.

NOTE: HTP DOES NOT WARRANT THE SOLAR WATER HEATER, SOLAR COLLECTOR, OR ANY COMPONENTS AGAINST FREEZE RELATED DAMAGE.

Part 7 - Start-Up Preparation

CAUTION

DO NOT MOVE ON TO THESE STEPS UNTIL THE ENTIRE SOLAR SYSTEM, INCLUDING ALL PIPING, SOLAR COLLECTORS, SENSORS, PUMP, CONTROLS, AND ELECTRICAL CONNECTIONS, ARE PROPERLY SECURED, INSULATED, LABELED AND INSTALLED.

A. Check for Leaks in the Solar Loop

To check for leaks in the solar loop, utilize the same procedure used by plumbers checking for leaks in new construction.

1. Isolate the solar loop.
2. Use a compressor to pressurize the solar loop to 25 PSI.
3. After 1 hour, check to see if there has been a drop in pressure.
 - a. If pressure has not dropped, slowly release the remaining air pressure in the loop and move on to Section B.
 - b. If pressure has dropped, use a spray bottle with soapy water to locate the leak. Once all leaks have been found and repaired, pressurize the solar loop again.

NOTE: Do not introduce heat transfer fluid into the solar system until you have successfully completed the pressure test.

B. Fill the Drain Back Reservoir

1. Attach hose to solar loop fill valve.
2. Open fill valve and the bleed valve on the drain back tank sight tube (see Specification drawings for locations).
3. Slowly fill the drain back reservoir to the top of the sight tube.
4. When nearly full, close bleed valve and add between 2 and 5 PSI head pressure to the system. When system is full and at desired head pressure, shut off fill valve.
5. Remove fill hose.

CAUTION

Take care not to overfill the drain back solar system. Overfilling will cause a potentially dangerous condition that could lead to freezing and failure of the solar system.

C. Start-Up Procedure

Once the system is filled as prescribed above:

1. Apply power to the solar controller.
2. Set controller to operate pump manually. Let pump run for 5 minutes.
3. Check for leaks at collectors and in attic, if applicable.
4. If no leaks are found, program controller for your drain back system (see solar controller programming instructions).

If the sun is shining and the tank is cool, the pump should turn on and begin circulating water. Check control settings to maximize your system performance.

Part 8 - Service / Maintenance Procedures

A properly maintained solar water heating system can provide years of dependable, trouble-free service. It is suggested that a routine preventive maintenance program be established and followed by the end user with the solar contractor. Listed below is the maintenance check list that outlines the primary components of the solar system that need to be inspected annually.

1. HTF Glycol (if used) – It is very important that the quality of the glycol is maintained to avoid damage to the collector loop and related components. See the manufacturer's data sheet for further details.
2. Water quality can affect the operation of the solar heat exchanger over time. In very hard water areas, it is recommended to drain (#14) a few gallons of water from the bottom of the storage tank to keep the water heater free of sediment.

3. Clean and inspect the solar collector (#1). Dirt or film may settle on the surface and affect performance. Check collector supplier for cleaning procedures.
4. Check piping and component insulation for deterioration.
5. Inspect the T&P valve (#19) on the water heater. Lift the release handle lever. Make sure discharge is directed to an open drain.

WARNING

Never open the pressure relief valve while the system is in operation or hot water is present. Allow to cool prior to opening. Failure to do so could result in serious personal injury or death.

6. The area near the water heater must be kept free of flammable liquids such as gasoline, paint thinners, adhesives, or other combustible materials.

A. Shutdown Procedures

Simply unplug the solar controller to shut down the drain back system. The pump will stop and water will drain out of the collectors into the reservoir.

B. Draining the Drain Back Reservoir

1. Unplug the controller and wait until all water returns to the reservoir.
2. Attach hose to fill valve.
3. Open the pressure relief valve.
4. Open fill valve.
5. Allow the system to completely drain.
6. Close fill valve and the pressure relief valve.
7. Remove drain hose.

CAUTION

Never open the pressure relief valve while the system is in operation or hot water is present. Allow to cool prior to opening.

C. Routine Maintenance

The heat transfer fluid level in the drain back reservoir should be checked twice a year. With the system turned off, make sure that the water level in the reservoir reaches the top of the sight tube. If not, follow the instructions in "Fill the Drain Back Reservoir"; this manual. Periodically check the temperature difference between the collector supply (from the tank to the collector) and collector return lines (from the collector to the tank). As a rule, an 8 – 12° temperature gain should be expected across a collector, in bright sun, at the proper flow rate. Larger systems may have a greater temperature difference. The storage tank should be flushed to prevent scale build up on an annual or bi-annual basis following the manufacturer's recommendations.

D. Vacation Shutdown Procedure

If hot water is not to be used for an extended period of time, unplug the controller and allow the solar collectors and piping to drain into the drain back reservoir. To re-energize, simply plug in the controller.

E. Estimated Life of Components

Proper care and maintenance will determine the life expectancy of the individual components of the solar system. Refer to manufacturer's warranty information to determine coverage of individual components. To obtain warranty service, call your local service or installing contractor.

F. Temperature and Pressure Relief Valve

A temperature and pressure relief (T&P) valve is designed for emergency safety relief and shall not be used as an operating control. A T&P valve functions by discharging water in an emergency. Therefore, it is essential that a discharge line be piped from the valve in order to carry the overflow to a safe place of disposal. The discharge line must be the same size as the valve outlet, must pitch downward from the valve, and terminate at least 6" above a drain where any discharge will

be clearly visible.

WARNING

Following installation of the T&P Relief Valve, the valve lever MUST be operated AT LEAST ONCE A YEAR by the water heater owner to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, blocking waterways and rendering the valve inoperative. When the lever is operated, hot water will discharge if the waterways are clear. PRECAUTIONS MUST BE TAKEN TO AVOID PERSONAL INJURY FROM CONTACT WITH HOT WATER AND TO AVOID PROPERTY DAMAGE. BEFORE operating lever, check to see that a discharge line is connected to the valve, directing the flow of hot water from the valve to a proper place of disposal. If no water flows when the lever is operated, replacement of the valve is required. **TURN THE WATER HEATER "OFF" AND CALL A PLUMBER IMMEDIATELY.**

Part 9 - Troubleshooting

Owners are advised to contact the installer whenever in-depth interaction with the solar system is required.

A. Leaks

For leaks in the potable water system or solar storage tank, close the cold water inlet and unplug the solar controller. This will isolate the solar system until repairs can be made.

B. Other Problems

A noisy pump could be an indication of worn bearings, obstructions, or a leak in your system. Call your installer for diagnosis of the problem, repair of the system, and/or replacement of components.

WARNING

For your safety, DO NOT attempt repair of electrical wiring or other operating controls. Refer repairs to qualified service personnel. Failure to do so could result in serious personal injury or death.

C. Operating Suggestions for the User

A properly designed solar hot water system provides solar energy for approximately 70 – 90% of annual hot water needs. Listed below are some suggestions that will maximize the benefits of your solar hot water system.

1. Showers - If possible, take showers during the day, or in the early evening. Use low flow showerheads to reduce water consumption.
2. Dishwashing – Run your dishwasher during the day, after showers, to ensure as much hot water as possible is available for showers.
3. Laundry – Spread clothes washing over the week instead of washing all at the same time.
4. Single Lever Faucets – When using cold water, make sure the lever is all the way over in the cold position. This prevents hot water from inadvertently flowing from the solar storage tank.

Problem	Reason	Remedy
No Hot Water	1. Improper Wiring	Rewire per Wiring Diagram
	2. No Power - Blown Fuse or Tripped Circuit Breaker a. Shorted Wiring b. Circuit Overloaded c. Improper Wiring	a. **Replace or repair b. **Provide adequate circuit or reduce load c. ** Rewire per diagram
	3. Solar System Incorrectly Installed	**Check installation
	4. Leaking Plumbing or Open Hot Water Faucet(s)	**Ensure all faucet(s) are closed. Check water meter
Not Enough Hot Water	1. Heater Undersized	Reduce rate of hot water use
	2. Wired Incorrectly	**Check wiring or replace
	3. Solar System Incorrectly Installed	**Check installation
Water Too Hot or Not Hot Enough	1. Thermostat Setting Too High or Low	Change setting as required
	2. Thermostat Out of Calibration	**Replace
	3. Solar System Incorrectly Installed	**Check installation

Table 5 - Troubleshooting - See Solar Water Heater Installation Manual for More Detailed Maintenance Information - ** USER - For your safety, DO NOT attempt repair of electrical wiring, thermostat, or operating controls. Refer repairs to qualified service personnel.

WARNING

The risk of scald injury increases as you increase water temperature. Use a water tempering or mixing valve and extreme caution when using hot water to avoid scald injury. Consult codes for conformance. Failure to follow the instructions in this warning statement could result in serious personal injury or death from scalds.

Be sure to disconnect electrical power before performing service. Failure to do so could result in electrical shock, property damage, serious personal injury, or death.

CAUTION

If draining of the water heater is necessary, open the T&P valve or a hot water tap to prevent vacuum buildup in the tank and piping.

Part 10 - System Parts Listing

A. Estimated Component Life

These water storage tanks are designed for 12 – 20 years of use. When installed and maintained as directed by this manual, one can expect many years of trouble-free service from this solar system. However, all components in this system are subject to installation conditions. For example: Where hard water is present, mineral deposits can shorten the life of components. Periodic maintenance as prescribed by this manual ensures that these components are well protected from such damage.

B. Warranties and Disclaimers

NOTE: WE EXCLUDE ANY WARRANTY FOR, OR LIABILITY FROM ACTS OF NATURE, INCLUDING FREEZE DAMAGE.

Warranty periods for tank components are listed in the table below:

Manufacturer	Item	Model #	Tank Coverage	Component Coverage
HTP, Inc.	Drain Back Tank	SSU-10DB	5 (Five) Years	1 (One) Year

Table 6 - Warranty Periods

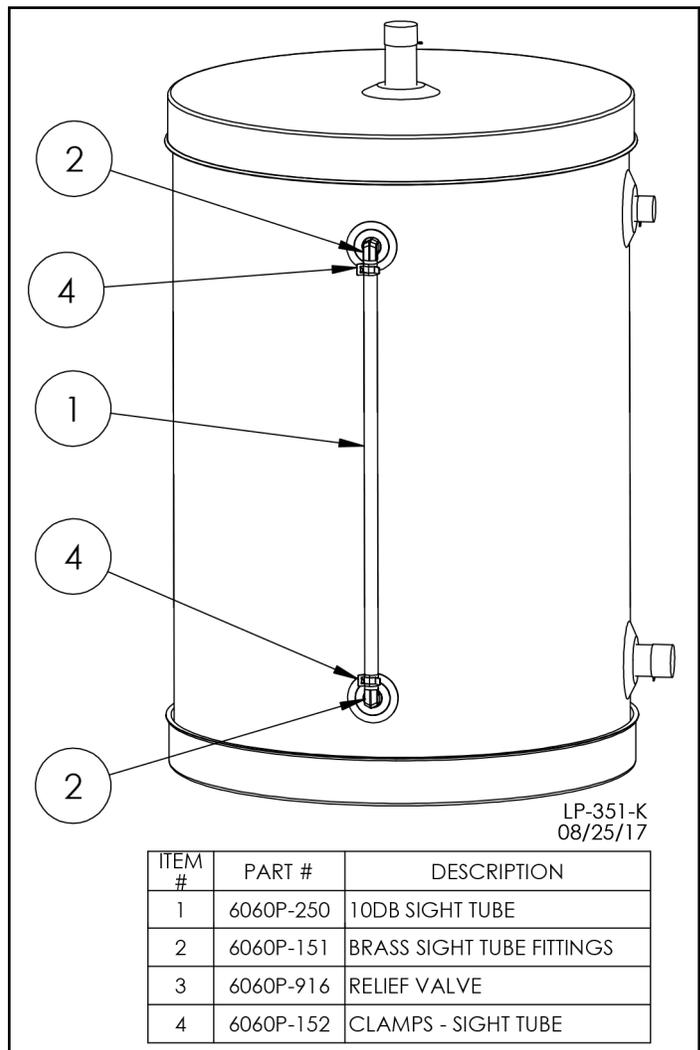


Figure 9 - Drain Back Tank Replacement Parts

Product Information



DOWFROST

Inhibited Propylene Glycol-based Heat Transfer Fluid

DOWFROST* heat transfer fluid contains specially formulated packages of industrial inhibitors that help prevent corrosion. Because propylene glycol fluids have low acute oral toxicity, DOWFROST propylene glycol-based fluids are often used in applications where contact with food or beverage products could occur.

Recommended use temperature range: -45°C (-50°F) to 120°C (250°F)

Suitable applications: secondary cooling and heating, freeze and burst protection of pipes, various deicing, defrosting, and dehumidifying.

For health and safety information for this product, contact your Dow sales representative or call the number for your area on the second page of this sheet for a Material Safety Data Sheet (MSDS).

Typical Concentrations of DOWFROST Fluid Required to Provide Freeze and Burst Protection at Various Temperatures

Temperature °C (F°)	Percent DOWFROST Fluid Concentration Required	
	For Freeze Protection Volume %	For Burst Protection Volume %
-7 (20)	18	12
-12 (10)	29	20
-18 (0)	36	24
-23 (-10)	42	28
-29 (-20)	46	30
-34 (-30)	50	33
-40 (-40)	54	35
-46 (-50)	57	35
-51 (-60)	60	35

NOTE: These figures are examples only and may not be appropriate to your situation. Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions of less than 30% glycol. Contact Dow for information on specific cases or further assistance.

ATTENTION: These are typical numbers only and are not to be regarded as specifications. As use conditions are not within its control, Dow does not guarantee results from use of the information or products herein; and gives no warranty, express or implied.

Typical Freezing and Boiling Points of DOWFROST Fluid†

Wt. % Propylene Glycol	Vol. % Propylene Glycol	Wt. % DOWFROST	Vol. % DOWFROST	Freezing Point °C (°F)	Boiling Point °C @ 101 kPa (°F @ 760 mmHg)	Degree Brix ^{††}	Refractive Index 22°C (72°F)
0.0	0.0	0.0	0.0	0 (32.0)	100.0 (212)	0.0	1.3328
5.0	4.8	5.2	5.2	-1.6 (29.1)	100.0 (212)	4.8	1.3383
10.0	9.6	10.5	10.0	-3.3 (26.1)	100.0 (212)	8.4	1.3438
15.0	14.5	15.7	15.1	-5.1 (22.9)	100.0 (212)	12.9	1.3495
20.0	19.4	20.9	20.3	-7.1 (19.2)	100.6 (213)	15.4	1.3555
25.0	24.4	26.1	25.5	-9.6 (14.7)	101.1 (214)	19.0	1.3615
30.0	29.4	31.4	30.7	-12.7 (9.2)	102.2 (216)	22.0	1.3675
35.0	34.4	36.6	36.0	-16.4 (2.4)	102.8 (217)	26.1	1.3733
40.0	39.6	41.8	41.4	-21.1 (-6.0)	103.9 (219)	29.1	1.3790
45.0	44.7	47.0	46.7	-26.7 (-16.1)	104.4 (220)	31.8	1.3847
50.0	49.9	52.3	52.2	-33.5 (-28.3)	105.6 (222)	34.7	1.3903
55.0	55.0	57.5	57.5	-41.6 (-42.8)	106.1 (223)	38.0	1.3956
60.0	60.0	62.7	62.7	-51.1 (-59.9)	107.2 (225)	40.6	1.4008
65.0	65.0	68.0	68.0	a	108.3 (227)	42.1	1.4058
70.0	70.0	73.2	73.2	a	110.0 (230)	44.1	1.4104
75.0	75.0	78.4	78.4	a	113.9 (237)	46.1	1.4150
80.0	80.0	83.6	83.6	a	118.3 (245)	48.0	1.4193
85.0	85.0	88.9	88.9	a	125.0 (257)	50.0	1.4235
90.0	90.0	94.1	94.1	a	132.2 (270)	51.4	1.4275
95.0	95.0	99.3	99.3	a	154.4 (310)	52.8	1.4315

† Typical properties, not to be construed as specifications

†† Degree Brix is a measure of the sugar concentration in a fluid and is important in fermentation and syrups applications. Although there is no sugar present in DOWFROST heat transfer fluids, the glycol affects the refractive index of the fluid in a similar fashion.

^a Freezing points are below -50°C (-60°F).

NOTE: Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions of less than 30% glycol. Contact Dow for information on specific cases or further assistance.

*Trademark of The Dow Chemical Company

DOWFROST

Inhibited Propylene Glycol-based Heat Transfer Fluid

Typical Properties of DOWFROST Fluid†

DOWFROST Heat Transfer Fluid	
Composition (% by weight)	
Propylene Glycol	96
Performance Additives	4
Color	Colorless
Specific Gravity	
15/15°C (60/60°F)	1.050–1.060
pH of Solution	
(50% glycol)	9.0–10.0
Reserve Alkalinity (min.)	10.0 ml

†Typical properties, not to be construed as specifications. Complete sales specifications are available on request.

Saturation Properties of DOWFROST Fluid at 30% Propylene Glycol Concentration by Volume

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb°F)	Density kg/m³ (lb/ft³)	Therm. Cond. W/mK [Btu/hr ft² (°F/ft)]	Viscosity mPa·s (cps)
10 (50)	3.821 (0.913)	1033.71 (64.53)	0.4344 (0.2510)	4.5068 (4.51)
40 (104)	3.903 (0.933)	1019.56 (63.65)	0.4622 (0.2670)	1.6295 (1.63)
65 (149)	3.972 (0.949)	1004.26 (62.69)	0.4771 (0.2757)	0.9144 (0.91)
90 (194)	4.041 (0.966)	985.77 (61.54)	0.4846 (0.2800)	0.6040 (0.60)
120 (248)	4.123 (0.985)	959.35 (59.89)	0.4838 (0.2795)	0.4246 (0.42)

Saturation Properties of DOWFROST Fluid at 40% Propylene Glycol Concentration by Volume

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb°F)	Density kg/m³ (lb/ft³)	Therm. Cond. W/mK [Btu/hr ft² (°F/ft)]	Viscosity mPa·s (cps)
-20 (-4)	3.569 (0.853)	1053.16 (65.75)	0.3635 (0.2100)	48.9043 (48.90)
10 (50)	3.668 (0.877)	1042.14 (65.06)	0.3936 (0.2274)	7.2173 (7.22)
40 (104)	3.768 (0.900)	1026.49 (64.08)	0.4150 (0.2398)	2.2389 (2.24)
65 (149)	3.850 (0.920)	1009.90 (63.05)	0.4262 (0.2463)	1.1762 (1.18)
90 (194)	3.933 (0.940)	990.10 (61.81)	0.4313 (0.2492)	0.7462 (0.75)
120 (248)	4.032 (0.964)	962.08 (60.06)	0.4294 (0.2481)	0.5084 (0.51)

Saturation Properties of DOWFROST Fluid at 50% Propylene Glycol Concentration by Volume

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb°F)	Density kg/m³ (lb/ft³)	Therm. Cond. W/mK [Btu/hr ft² (°F/ft)]	Viscosity mPa·s (cps)
-30 (-22)	3.339 (0.798)	1064.83 (66.48)	0.3246 (0.1875)	172.8273 (172.83)
-20 (-4)	3.378 (0.807)	1061.71 (66.28)	0.3336 (0.1927)	73.0193 (73.02)
10 (50)	3.493 (0.835)	1049.25 (65.50)	0.3560 (0.2057)	10.6481 (10.65)
40 (104)	3.609 (0.863)	1032.17 (64.44)	0.3716 (0.2147)	3.1103 (3.11)
65 (149)	3.706 (0.886)	1014.40 (63.33)	0.3792 (0.2191)	1.5483 (1.55)
90 (194)	3.802 (0.909)	993.42 (62.02)	0.3821 (0.2208)	0.9339 (0.93)
120 (248)	3.918 (0.936)	964.00 (60.18)	0.3792 (0.2191)	0.6029 (0.60)

For further information, call...

In the United States and Canada: 1-800-447-4369 • FAX: 1-989-832-1465

In Europe: +32 3 450 2240 • FAX: +32 3 450 2815

In the Pacific: +886 22 547 8731 • FAX: +886 22 713 0092

In other Global Areas: 1-989-832-1560 • FAX: 1-989-832-1465

www.dowfrost.com

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Published November 2001



VISCOSITY: The HTF viscosity over the service temperature range is based on a specific gravity 15/15°C (60/60°F) 1.053-1.063. DOWFROST inhibited glycol-based fluid has an effective operating temperature range of -50°F to 250°F. At temperatures below -50°F, increased viscosity (>1,000 centipoise) can make use of DOWFROST impractical unless larger pumps are installed. At the upper end of the operating range for DOWFROST fluid, a maximum bulk temperature of 250°F is recommended. Film temperature should not exceed 300°F. DOWFROST fluid can tolerate brief temperature excursions up to 100°F above the maximum recommended temperatures. However, extended exposure of the fluid to temperatures in excess of 50°F above the maximum recommended temperatures will result in accelerated degradation of the glycol and inhibitor systems. In addition, the film temperature should remain within 50°F of the bulk fluid temperature and the pressure at all points in the system should be at least 5 psi greater than the vapor pressure exerted by the fluid to avoid localized boiling and resulting precipitation. At temperatures above 150°F, the system must be closed to avoid rapid oxidation of the propylene glycol, inhibitor depletion, and subsequent increased corrosion. Automatic make-up water systems should be avoided in order to prevent undetected dilution or loss of glycol and consequent loss of freeze and corrosion protection.

FLAMMABILITY: When mixed with water, DOWFROST is not flammable, as the fluid has no measurable flash point (Pensky-Martens Closed Cup) in concentrations up to 80% glycol. Undiluted DOWFROST has a flash point of 214°F (Pensky-Martens Closed Cup). It is possible to ignite solutions of propylene if enough water has been vaporized and the concentration of propylene glycol increases to greater than 80 percent.

INSPECTION AND TREATMENT OF HEAT TRANSFER FLUID: You can quickly determine the condition of your fluid by examining its appearance and odor. Any drastic variation from the initial fluid specifications, such as a black or dark-grey color, presence of an oily layer, burnt odor, or any heavy sludge in the fluid may indicate the need for replacement.

TESTING THE FLUID pH LEVEL: Control of pH between 8 and 10 is important to minimize corrosion and glycol degradation. Using narrow range pH paper, such as pHDrion Control paper with a 7.2 to 8.8 pH range, is an easy and reliable way to read your pH level. A pH tester can also measure alkalinity or acidity and give you an indication of the reserve alkalinity or inhibitor level of the fluid. The desirable pH range should fall between 8.0 and 10.0. Adjustments can be made using a 50% solution of sodium hydroxide or potassium hydroxide if the pH is approaching the acidic range (below 8.0). An inexpensive pH tester is available from Misco Products. The accuracy of this product is +/- 0.5 pH. Contact Misco Products at 1-800-358-1100 and ask for the Dow discount.

SPILL, LEAK, AND DISPOSAL PROCEDURES: Using appropriate safety equipment, small spills may be soaked up with common absorbent material. For large spills, the fluid should be pumped into suitable containers located in diked areas. Residual material should be cleaned up with water. Concentrate can be handled according to local, state, and federal regulations.

EMERGENCY OVERVIEW

POTENTIAL HEALTH EFFECTS

EYE: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Mists may cause eye irritation.

FIRST AID: FLUSH EYES WITH PLENTY OF WATER

SKIN CONTACT: Prolonged contact is essentially non-irritating to skin. A single prolonged exposure is not likely to result in the material being absorbed through the skin in harmful amounts. Repeated exposure

may cause flaking and softening of skin.

FIRST AID: WASH OFF IN FLOWING WATER OR SHOWER

INGESTION: Single dose oral toxicity is considered to be extremely low. No hazards anticipated from swallowing small amounts incidental to normal handling operations.

FIRST AID: NONE REQUIRED

INHALATION: At room temperature, vapors are minimal due to physical properties. Mists may cause irritation of upper respiratory tract (nose and throat).

FIRST AID: REMOVE TO FRESH AIR.

IF EFFECTS OCCUR, CONSULT A PHYSICIAN.

NOTE TO PHYSICIAN: NO SPECIFIC ANTIDOTE.

SUPPORTIVE CARE. TREATMENT BASED ON JUDGEMENT OF THE PHYSICIAN IN RESPONSE TO THE REACTION OF THE PATIENT. CONSULT DOW CHEMICAL 24 HOUR EMERGENCY 1-989-636-4400

Solar System Replacement Parts		
Part	Company	Model
Controller	Caleffi	257260A
		257220A
		257270A
Pump	Grundfos	UPS-15-88U
		UPS-15-100U
		PM2
Expansion Tank	Flexcon	FSW18
	Caleffi	259018
Check Valve	Watts	Series 600*
		*(Alternate Approved Equivalent)
Pressure Relief Valve	Watts	3L (75 psig)
Air Vent	Taco	417*
		*(Alternate Approved Equivalent)
Mixing Valve	Taco	500 Series
	Watts	1170 Series
	Honeywell	AM101 Series
	Cache Acme	Heatguard 110 Series
	Caleffi	
Piping		Copper
Heat Transfer Fluid	Dow Chemical	DOWFROST (DOWFROST HD Approved for Use with DW Models)
		Potable Water

Figure 10 - Replacement Parts for Solar System

Approved Systems				
SRCC System Number	Model Number	Solar Collector Company	Model	# of Collectors
30004176 30004189	DB-80-40-GB DB-80-40-EB	AET	AE-40 MSC-40	1
		HTP	SS-40 SS-40-FP	
30004175 30004188 30004173 30004186	DB-80-64-GB DB-80-64-EB DB-119-64-GB DB-119-64-EB	AET	AE-32 MSC-32	2
		HTP	SS-32 SS-32-FP	
		AET	AE-40 MSC-40	
30004174 30004187 30004172 30004185	DB-80-80-GB DB-80-80-EB DB-119-80-GB DB-119-80-EB	HTP	SS-40 SS-40-FP	
		AET	AE-32 MSC-32	3
30004171 30004184	DB-119-96-GB DB-119-96-EB	HTP	SS-32 SS-32-FP	

Figure 11 - Approved Systems

	This product certified by: Solar Rating & Certification Corporation™ www.Solar-Rating.org 	HTP, Inc. 272 DUCHAINE BLVD NEW BEDFORD, MA 02745 USA
	Solar Energy Factor (SEF _b)	SRCC Cert. No.
1.7	30004176	DB-80-40-GB
2.6	30004175	DB-80-64-GB
3.6	30004174	DB-80-80-GB
2.8	30004173	DB-119-64-GB
4.4	30004172	DB-119-80-GB
6.9	30004171	DB-119-96-GB
1.9	30004189	DB-80-40-EB
2.9	30004188	DB-80-64-EB
4.2	30004187	DB-80-80-EB
2.4	30004186	DB-119-64-EB
3.2	30004185	DB-119-80-EB
4.5	30004184	DB-119-96-EB

The installed system is marked above.

Table 7 - Approved Systems: **INSTALLER: Make a note of the installed system in the table above.**

Model Number Key: The first two letters refer to the type of system, followed by solar storage tank gallons, square footage of collectors, and back-up type. For example: DB-80-40-GB refers to a Drain Back System with 80 gallons of storage, a 40 square foot solar collector, and Gas-Fired Back-up.

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SRCC OG-300 LABEL SET

The following labels must be attached to the relevant valves in the system in order for it to be considered OG-300 compliant. This page should be laminated, each label cut from it, punched in the margin at the left hand side and affixed to the appropriate valve with a wire tie, plastic ties are inappropriate due to high operating temperatures. Failure to affix these labels will void the SRCC OG-300 system certification.

VALVE 6 COLLECTOR ARRAY ISOLATION VALVE

VALVE 6 IS NORMALLY OPEN DURING OPERATION. IT IS CLOSED TO ISOLATE THE STORAGE TANK FROM THE COLLECTOR ARRAY SHOULD THE STORAGE TANK NEED SERVICING OR REPLACING.

VALVE 11 COLLECTOR ARRAY ISOLATION VALVE

VALVE 11 IS NORMALLY OPEN DURING OPERATION. IT IS CLOSED TO ISOLATE THE STORAGE TANK FROM THE COLLECTOR ARRAY SHOULD THE STORAGE TANK NEED SERVICING OR REPLACING.

VALVE 8 COLLECTOR ARRAY FILL/DRAIN VALVE

PLEASE CONSULT YOUR INSTALLATION MANUAL FOR SPECIFIC FREEZE TOLERANCE INFORMATION.

A 60% CONCENTRATION OF DOWFROST PROPYLENE GLYCOL AND DISTILLED WATER CAN PROTECT YOUR SUPERSTOR SOLAR SYSTEM TO TEMPERATURES AS LOW AS -65° F. LOWER CONCENTRATIONS OF DOWFROST AND DISTILLED WATER WILL PROVIDE A LOWER LEVEL OF FREEZE PROTECTION.

VALVE 24 COLD WATER SUPPLY BALL VALVE

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

VALVE 8 COLLECTOR ARRAY FILL/DRAIN VALVE **(WARNING HOT)**

VALVE 8 IS NORMALLY CLOSED. WHEN OPEN, IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

THE HEAT TRANSFER FLUID USED IN THIS SYSTEM IS DOWFROST PROPYLENE GLYCOL. IT MUST BE HANDLED AND DISPOSED OF IN ACCORDANCE WITH THE DOW CHEMICAL COMPANY MATERIAL SAFETY DATA SHEET. A COPY OF THE MSDS HAS BEEN PROVIDED WITH YOUR INSTALLATION MANUAL. NO OTHER FLUID SHALL BE USED THAT WOULD CHANGE THE ORIGINAL CLASSIFICATION OF THIS SYSTEM. UNAUTHORIZED ALTERATIONS TO THIS SYSTEM COULD RESULT IN A HAZARDOUS HEALTH CONDITION.

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

VALVE 10 COLLECTOR ARRAY FILL/DRAIN VALVE **(WARNING HOT)**

VALVE 10 IS NORMALLY CLOSED. WHEN OPEN, IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

THE HEAT TRANSFER FLUID USED IN THIS SYSTEM IS DOWFROST PROPYLENE GLYCOL. IT MUST BE HANDLED AND DISPOSED OF IN ACCORDANCE WITH THE DOW CHEMICAL COMPANY MATERIAL SAFETY DATA SHEET. A COPY OF THE MSDS HAS BEEN PROVIDED WITH YOUR INSTALLATION MANUAL. NO OTHER FLUID SHALL BE USED THAT WOULD CHANGE THE ORIGINAL CLASSIFICATION OF THIS SYSTEM. UNAUTHORIZED ALTERATIONS TO THIS SYSTEM COULD RESULT IN A HAZARDOUS HEALTH CONDITION.

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

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Drain Back Tank Limited Warranty

Five year warranty to assure your complete satisfaction.
For Residential and Commercial Use

HTP warrants each drain back tank and its components 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 only available to the **original consumer purchaser** (hereinafter "Owner") of the drain back tank, and is non-transferable.

WARRANTY

1. Drain Back Tank assembly – consists of a stainless steel storage tank and heat exchanger (when applicable). Warranted for five (5) years.
2. Components are warranted for a period of one (1) year. These can consist of fittings, sight tube, pressure relief valve, and other components included with but not part of the tank assembly.

COVERAGE

- A. During the first year after the original date of installation, HTP warrants that it will repair or replace, at its option, any defective or malfunctioning component of the drain back tank that is found to have failed due to manufacturer's defect. Replacement components will be warranted for ninety (90) days.
- B. Should a defect or malfunction result in a leakage of water from the drain back tank 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, at its option, the defective or malfunctioning drain back tank. Replacements will be of the nearest comparable model available at the time of replacement. The replacement drain back tank will be warranted for the unexpired portion of the applicable warranty period of the original drain back tank.
- C. In the event of a leakage of water of a replacement drain back tank 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 drain back tank.
- D. If government regulations, industry certification, or similar standards require the replacement drain back tank or component(s) to have features not found in the defective drain back tank 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 and/or to upgrade the size and/or other features available on a new replacement drain back tank or component(s), the Owner will also receive a complete new limited warranty for that replacement drain back tank or component(s).
- E. If at the time of a request for service the Owner cannot provide a copy of the original sales receipt or the warranty registration, the warranty period for the drain back tank shall then be deemed to have commenced on the date of manufacture of the drain back tank and NOT the date of installation of the drain back tank, and be covered by the unexpired portion of the warranty detailed above.
- F. This warranty extends only to drain back tanks utilized in heating applications that have been properly installed by qualified professionals based upon the manufacturer's installation instructions.
- G. It is expressly agreed between HTP and the Owner that repair, replacement, or refund are the exclusive remedies of the Owner.

OWNER RESPONSIBILITIES

The Owner or Installer must:

1. Have a relief valve bearing the listing marks of the American Society of Mechanical Engineers (ASME) installed with the drain back tank assembly in accordance with federal, state, and local codes.

2. Maintain the drain back tank in accordance with the maintenance procedure listed in the manufacturer's provided instructions. Preventive maintenance can help avoid any unnecessary breakdown of the drain back tank and keep the system running at optimum efficiency.
3. Maintain all related system components in good operating condition.
4. Use the drain back tank at water pressures not exceeding the working pressure shown on the rating plate of the pressure relief valve.
5. Keep the drain back tank free of damaging scale deposits.
6. Make provisions so if the drain back tank or any component or connection thereto should leak, the resulting flow of water will not cause damage to the area in which it is installed.
7. Keep the drain back tank in an area not prone to freezing.
8. Periodic maintenance of glycol must be performed to assure pH levels do not exceed 10 or drop below 8. Failure to do so will cause damage to tank or components of the solar system.

WARRANTY EXCLUSIONS

This limited warranty will not cover:

1. Any drain back tank purchased from an unauthorized dealer or on-line retailer.
2. Any drain back tank 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 the Owner how to install, use, maintain, or to bring the drain back tank installation into compliance with local building codes and regulations.
4. The workmanship of any installer. The manufacturer disclaims and does not assume any liability of any nature caused by improper installation, repair, or maintenance.
5. Electricity or fuel costs, or increased or unrealized savings for same, for any reason whatsoever.
6. Any water damage arising, directly or indirectly, from any defect in the drain back tank or component part(s) or from its use.
7. Any incidental, consequential, special, or contingent damages or expenses arising, directly or indirectly, from any defect in the drain back tank or the use of the drain back tank.
8. Failure to locate the drain back tank 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 drain back tank or lower floors of the structure, as well as failure to install the drain back tank in or with a properly sized drain pan routed to an approved drainage location.
9. Any failed components of the system not manufactured by HTP as part of the drain back tank.
10. Drain back tanks repaired or altered without the prior written approval of HTP.
11. Damages, malfunctions, or failures resulting from improper installation, or failure to install the drain back tank in accordance with applicable building codes/ordinances or good plumbing and electrical trade practices; or failure to operate and maintain the drain back tank in accordance with the manufacturer's provided instructions.
12. Damages, malfunctions, or failures resulting from failure to operate the drain back tank at pressures not exceeding the working pressure shown on the relief valve.
13. Failure or performance problems caused by improper sizing of the drain back tank, piping, or wiring.
14. Damages, malfunctions, or failures caused by operating the drain back tank with modified, altered, or unapproved components, or any component / attachment not supplied by HTP.
15. Damages, malfunctions, or failures caused by abuse, accident, fire, flood, freeze, lightning, electrochemical reaction, acts of God and the like.
16. Tank failures (leaks) caused by operating the drain back tank in a corrosive or contaminated atmosphere.
17. Failure of the drain back tank due to the accumulation of solid materials or lime deposits.

18. Any damage or failure resulting from improper water chemistry. WATER CHEMISTRY REQUIREMENTS - Water pH between 6.5 and 8.5. Hardness less than 7 grains (120 mg/L). Chloride concentration less than 100 ppm (mg/L). TDS less than 500 ppm (mg/L);
19. Any damages, malfunctions, or failures resulting from the use of dielectric unions.
20. Production of noise, taste, odors, discoloration, or rusty water.
21. Drain back tanks replaced for cosmetic reasons.
22. Components of the drain back tank that are not defective, but must be replaced during the warranty period as a result of reasonable wear and tear.
23. Components of the drain back tank that are subject to warranties, if any, given by their manufacturers; HTP does not adopt these warranties.
24. Damages, malfunctions, or failures resulting from the use of any attachment(s) not supplied by HTP.
25. Drain back tanks installed outside the fifty states (and the District of Columbia) of the United States of America and Canada.
26. Drain back tanks moved from the original installation location.
27. Drain back tanks that have had their rating labels removed.

PROCEDURES FOR WARRANTY SERVICE REQUESTS

Any claim for warranty assistance must be made promptly. Determine if the drain back tank is "in-warranty" (that is, within the applicable warranty period) by reviewing a copy of the original sales receipt or warranty registration. The Owner must present a copy of the original sales receipt or warranty registration for a warranty service request.

If the drain back tank is "in-warranty", contact the retailer from whom the drain back tank was purchased (or the installer) for assistance. Be prepared to provide the retailer or installer with a copy of the original receipt, complete model and serial numbers, and the date of installation of the drain back tank, in addition to explanation of the drain back tank problem.

Warranty coverage is subject to validation of "in-warranty" coverage by HTP claims department personnel. All alleged defective or malfunctioning components must be returned to HTP via the local distribution channels where original purchase was made. **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 all warranty conditions are satisfied, HTP will provide replacement components to the retailer.

For 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

Except when specifically prohibited by the applicable state law, the Owner, and not the Manufacturer, shall be liable for and shall pay for all charges for labor or other expenses incurred in the removal, repair, or replacement of the drain back tank or any component part(s) claimed to be defective or any expense incurred to remedy any defect in the product. Such charges include, but are not necessarily limited to:

1. All freight, shipping, handling, and delivery costs of forwarding a new drain back tank or replacement part(s) to the owner.
2. All costs necessary or incidental in removing the defective drain back tank or component part(s) and installing a new drain back tank or replacement part(s).
3. All administrative fees incurred by the Owner, as well as material required to complete, and/or permits required for, installation of a new drain back tank or replacement part(s), and
4. All costs necessary or incidental in returning the defective water heater or component part(s) to a location designated by the manufacturer.

LIMITATIONS OF YOUR HTP WARRANTY AND REMEDIES

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED TO THE FURTHEST EXTENT UNDER APPLICABLE LAW IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY OBLIGATION, LIABILITY, RIGHT, CLAIM OR REMEDY IN CONTRACT OR TORT, WHETHER OR NOT ARISING FROM HTP'S NEGLIGENCE, ACTUAL OR IMPUTED. THE REMEDIES OF THE OWNER SHALL BE LIMITED TO THOSE PROVIDED HEREIN TO THE EXCLUSION OF ANY OTHER REMEDIES INCLUDING WITHOUT LIMITATION, INCIDENTAL OR CONSEQUENTIAL DAMAGES, SAID INCIDENTAL AND CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, PROPERTY DAMAGE, LOST PROFIT OR DAMAGES ALLEGED TO HAVE BEEN CAUSED BY ANY FAILURE OF HTP TO MEET ANY OBLIGATION UNDER THIS AGREEMENT INCLUDING THE OBLIGATION TO REPAIR AND REPLACE SET FORTH ABOVE. NO AGREEMENT VARYING OR EXTENDING THE FOREGOING WARRANTIES, REMEDIES OR THIS LIMITATION WILL BE BINDING UPON HTP. UNLESS IN WRITING AND SIGNED BY A DULY AUTHORIZED OFFICER OF HTP. THE WARRANTIES STATED HEREIN ARE NOT TRANSFERABLE AND SHALL BE FOR THE BENEFIT OF THE OWNER ONLY.

NO OTHER WARRANTIES

This warranty gives the Owner specific legal rights. The Owner may also have other rights that vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages so this limitation or exclusion may not apply to the Owner.

These are the only written warranties applicable to the drain back tank manufactured and sold by HTP. HTP neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said drain back tanks.

HTP reserves the right to change specifications or discontinue models without notice.

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.	
Customer's Name	
Date of Installation	
Installation Address	
Product Name / Serial Number(s)	
Comments	
Installer's Code / Name	
Installers Phone Number	
Signed by Installer	
Signed by Customer	
Installation Notes	

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.