



Drain Back Tank

Installation

Start-Up

Maintenance

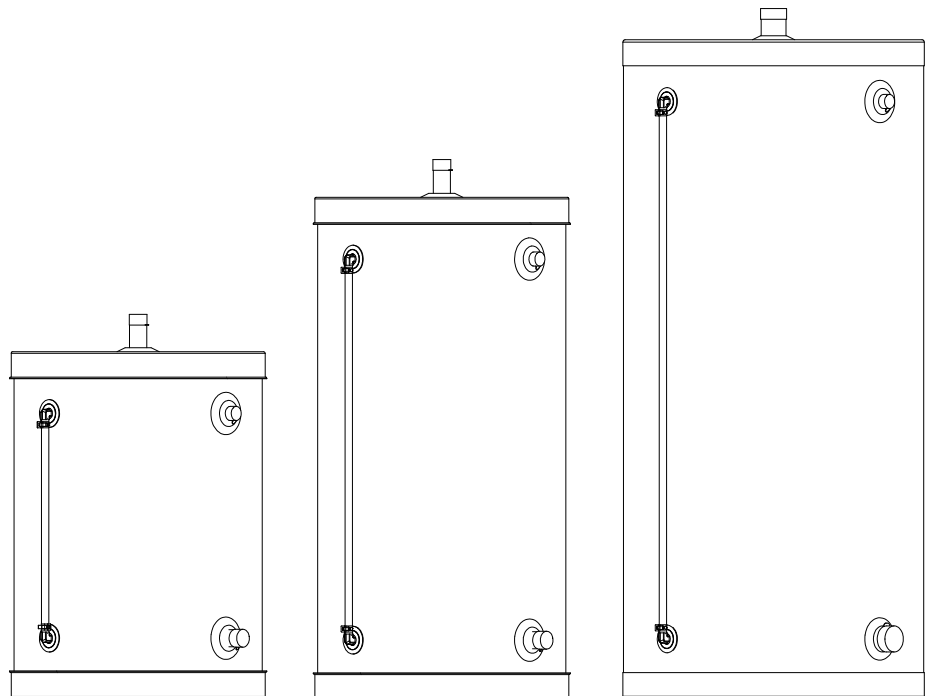
Parts

Warranty

*For Residential and
Commercial Use*

DB Series and DBX Models*

*A suffix of "X" denotes models with
internal heat exchanger



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 your solar water heating system. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications, such as *Solar Water Heating System Design and Installation Guidelines, SRCC OG-300*, be reviewed in their entirety before beginning any work.

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

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

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

For the Installer



WARNING

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

INSTALLATION OR SERVICE OF THIS SOLAR PRODUCT 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.

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.

Table of Contents

Introduction	2
Part 1 - General Safety Information	3
A. When Servicing the Solar Water Heating System	3
B. Local Installation Regulations	3
C. Chemical Vapor Corrosion	4
D. Insulation Blankets	4
E. Water Temperature Adjustment	4
F. Freeze Protection	4
Part 2 - Important Information	5
A. Piping	5
B. Sizing the Drain Back Tank	5
C. Locating the Solar Water Heater	5
D. Specifications and Dimensions	6
Part 3 - Piping	8
A. System Piping and Plumbing	8
B. Installation of the Drain Back Tank	8
1. Drain Back Tanks without Heat Exchangers	8
2. Drain Back Tanks with Heat Exchangers	8
C. Solar System Pump	8
D. Electrical Installation	9
E. Fluid Quality Requirements	9
F. Installing the Drain Back Tank Sight Tube	9
G. Applications	10
Part 4 - Start-Up Preparation	11
A. Fill the Drain Back Reservoir	11
B. Start-Up Procedure	12
Part 5 - Service / Maintenance Procedures	12
A. Shutdown Procedures	12
B. Draining the Drain Back Reservoir	12
C. Routine Maintenance	12
D. Vacation Shutdown Procedure	12
Part 6 - Troubleshooting	12
A. Leaks	12
B. Other Problems	12
Limited Warranty	13
Customer Installation Record Form	15

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. Your drain back tank may come with an internal heat exchanger (for use with a storage tank), or without a heat exchanger (for use with either a solar water heater with an

internal heat exchanger or a storage tank with an external plate and frame heat exchanger).

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

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.

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

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.

NOTE: If the solar water heating system is exposed to the following, do not operate. Immediately call a qualified service technician.

1. Fire
2. Damage
3. Submersion in Water

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

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

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.

CAUTION

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 THE WATER HEATER - 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 ¾" I.D. copper tube of the type meeting local codes must be used for piping. Pipe runs must be solidly attached with proper clamping methods. Soldered connections should be secured with 95/5 lead-free solder. Use only pipe rated for 250°F minimum on both the collector return and supply piping.

A. When Servicing the Solar Water Heating System

To avoid electric shock, disconnect electrical supply before performing maintenance.

To avoid severe burns, allow solar collector and associated equipment to cool before servicing.

B. 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

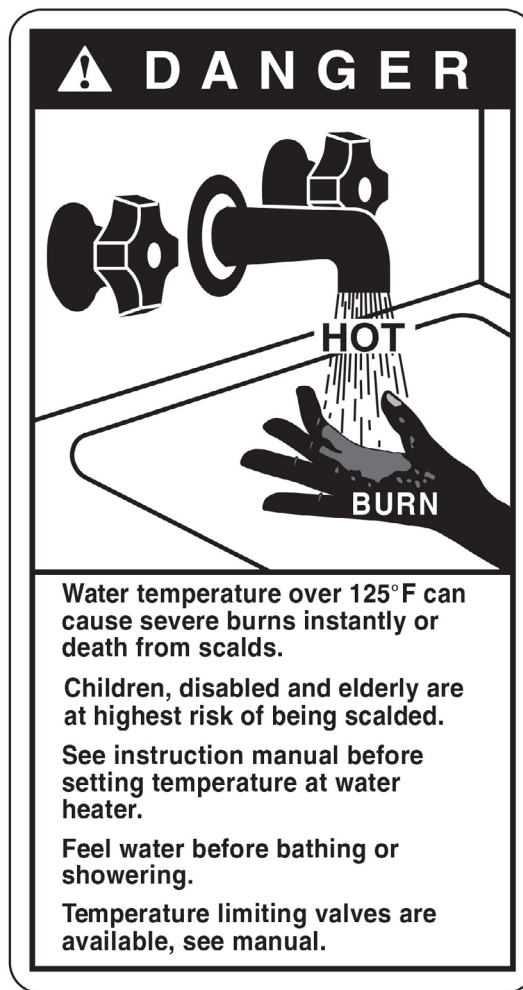
An ASSE 1017 rated mixing valve to avoid severe burns or death from scalding temperatures IS REQUIRED PER SRCC OG-300.

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.



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. Piping

Collector piping requires the use of copper and brass fittings in the collector loop. 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 Silvacore 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 non-rated plastic pipe is prohibited.

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

All vertical piping between the drain back tank and collector(s) shall be supported at each story or at maximum intervals of ten feet (10'). 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.

B. 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.

NOTE (Drain Back Tanks with Heat Exchangers ONLY): Drain back tanks with heat exchangers have pressure drop which must be considered in system design. Refer to Figure 1 for pressure drop through the heat exchanger of the various gallon sizes. The chart represents flow and friction loss through the heat exchanger, and will aid circulator selection.

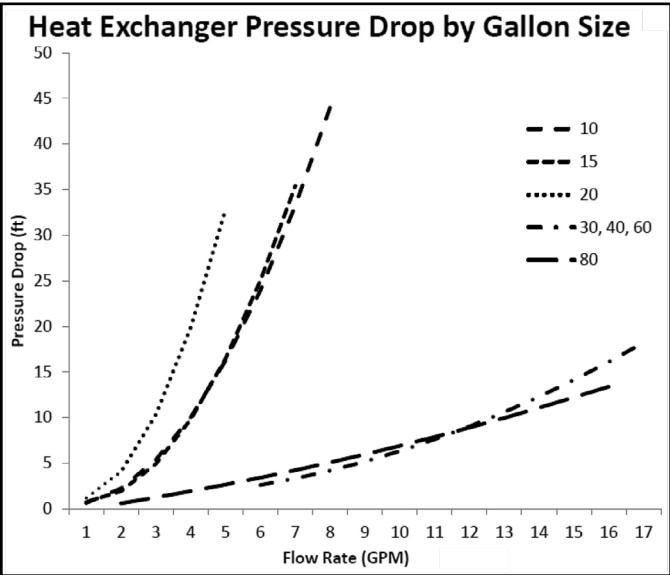


Figure 1 - Pressure Drop through the Heat Exchanger

C. Locating the Solar Water Heater

To minimize expense and heat loss, locate the drain back tank as centrally to the solar tank and near the solar collectors as possible. The tank must also be located in as warm a location as possible, away from areas which would subject the drain back reservoir to freezing temperatures. The drain back tank has no controls, but the sight tube must have clearance for inspection and service.

In addition, the solar water heater should be installed with plenty of clearance for service. If minimum clearances are not met, it may not be possible to service the heater without removing it from its location. 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 1).

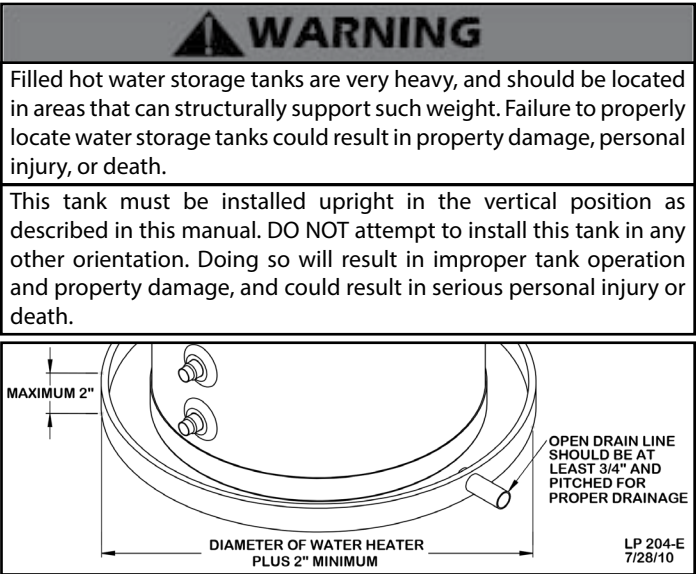


Figure 2 - Drain Pan Dimensions

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

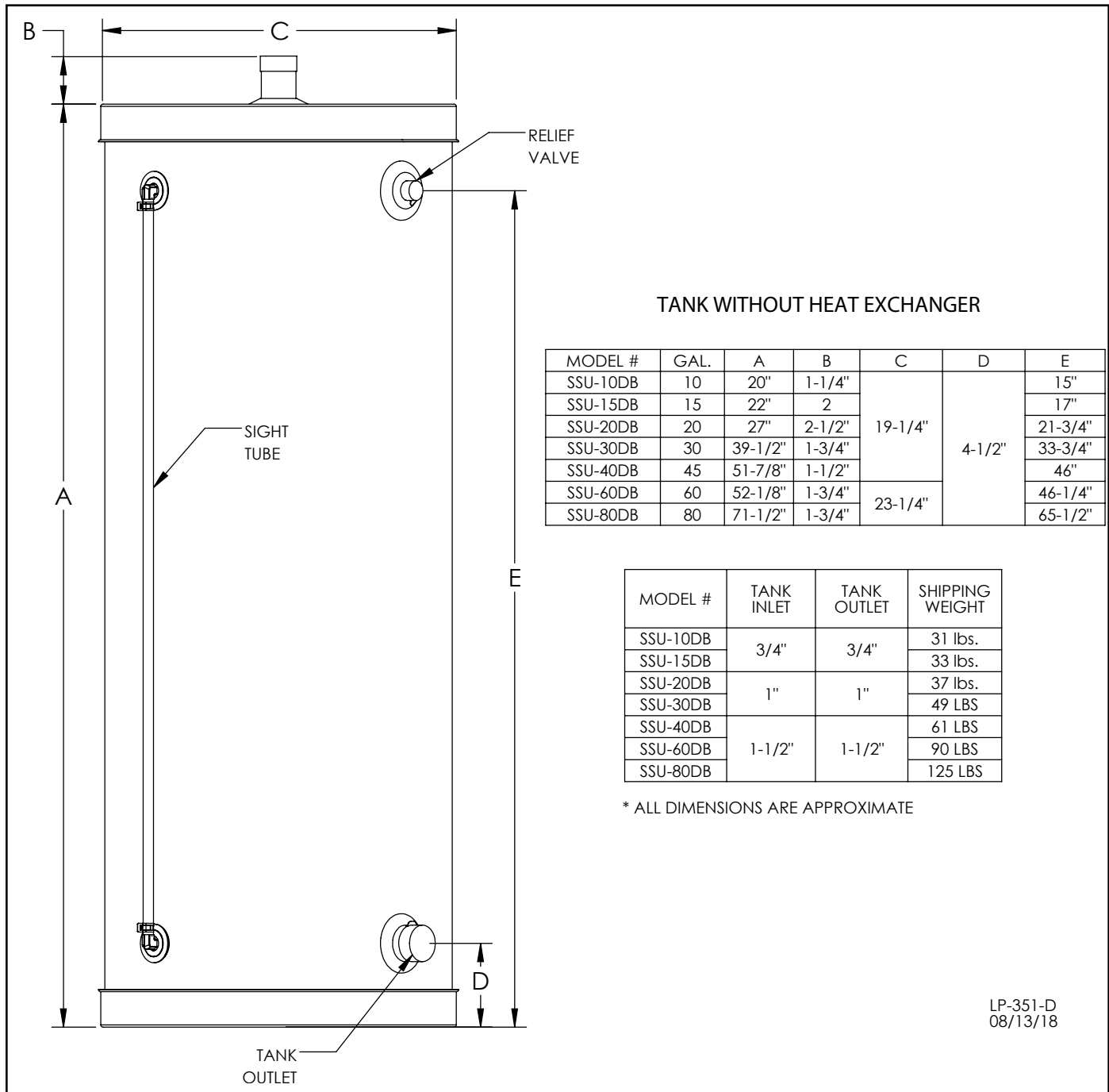


Figure 3 - Drain Back Tank without Heat Exchanger Specifications and Dimensions

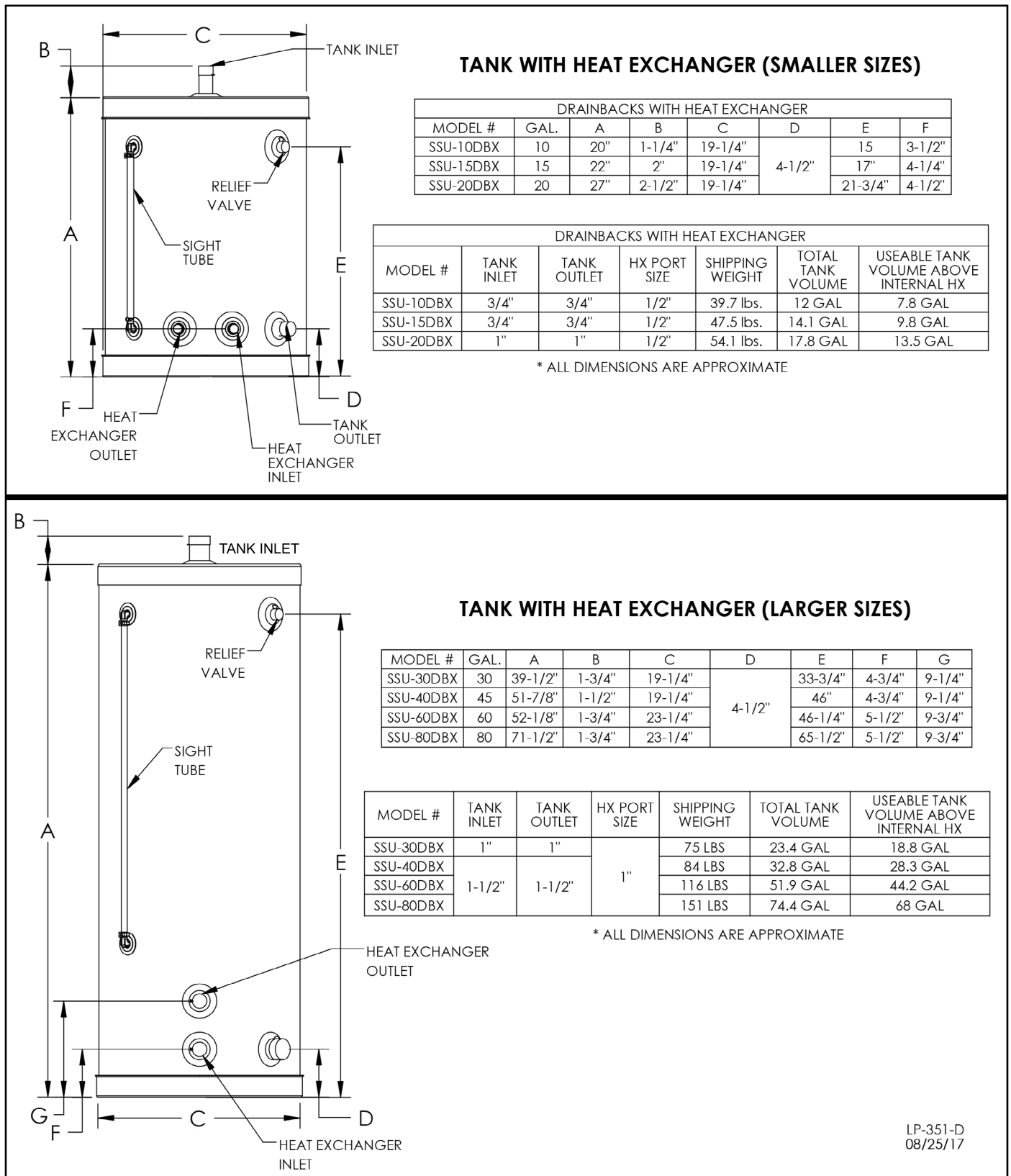


Figure 4 - Drain Back Tank with Heat Exchanger Specifications and Dimensions

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Part 3 - 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 your solar water heating system could cause component failure and possible safety issues.

NOTE: To ensure proper drainage, consider system piping **BEFORE** making a final decision on collector mounting.

A. System Piping and Plumbing

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 plumbing be done in accordance with all local and state plumbing codes. **FAILURE TO DO SO WILL VOID THE WARRANTY.** All solar collectors must be installed level. All non-vertical supply and return solar piping must be pitched at a minimum of $\frac{1}{4}$ " per foot for drainage and must drain without any fluid traps to prevent freezing. Ensure there are no dips, low points, or piping configurations that may trap fluid and rupture in freezing conditions.

ALL PIPING AND PLUMBING CONNECTIONS SHOULD BE MADE WITH COPPER PIPE ONLY. No less than $\frac{3}{4}$ " 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. No check valves are allowed within the solar piping loop. Remove integral check from pump if so equipped.

Insulate pipe with $\frac{3}{4}$ " pipe insulation rated for 250°F minimum. Insulate all hot water piping and all exposed cold water piping at the entrance to the solar tank. Paint pipe insulation exposed to ultraviolet radiation with insulation manufacturer approved UV resistant latex based paint, or wrap with PVC pipe wrap. Support piping with plumbers straps or pipe hangers and install in such a manner as to not crush the insulation.

B. 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. Drain Back Tanks without Heat Exchangers

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

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

2. Drain Back Tanks with Heat Exchangers

- Pipe solar collector return to the inlet fitting located on the top of the drain back tank.
- Pipe drain back tank outlet to the solar collector supply fitting.
- Pipe cold supply water from the solar storage tank to the heat exchanger inlet fitting located on the drain back tank.
- Pipe heat exchanger outlet to hot return fitting on solar storage tank.

(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 $\frac{3}{4}$ " 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:

- 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.

C. 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.

D. 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.

E. Fluid Quality Requirements

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. 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

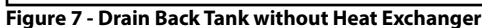
3. Move the clamp over the tube and onto the sight tube fitting. This will secure the tube to the fitting. See Figure 6.
4. Fit one (1) clamp on the other end of the solar drain back tank sight tube. Move the clamp about two inches down the sight tube.
5. Fit the drain back sight tube onto the bottom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



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 $\frac{1}{4}$ " 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.

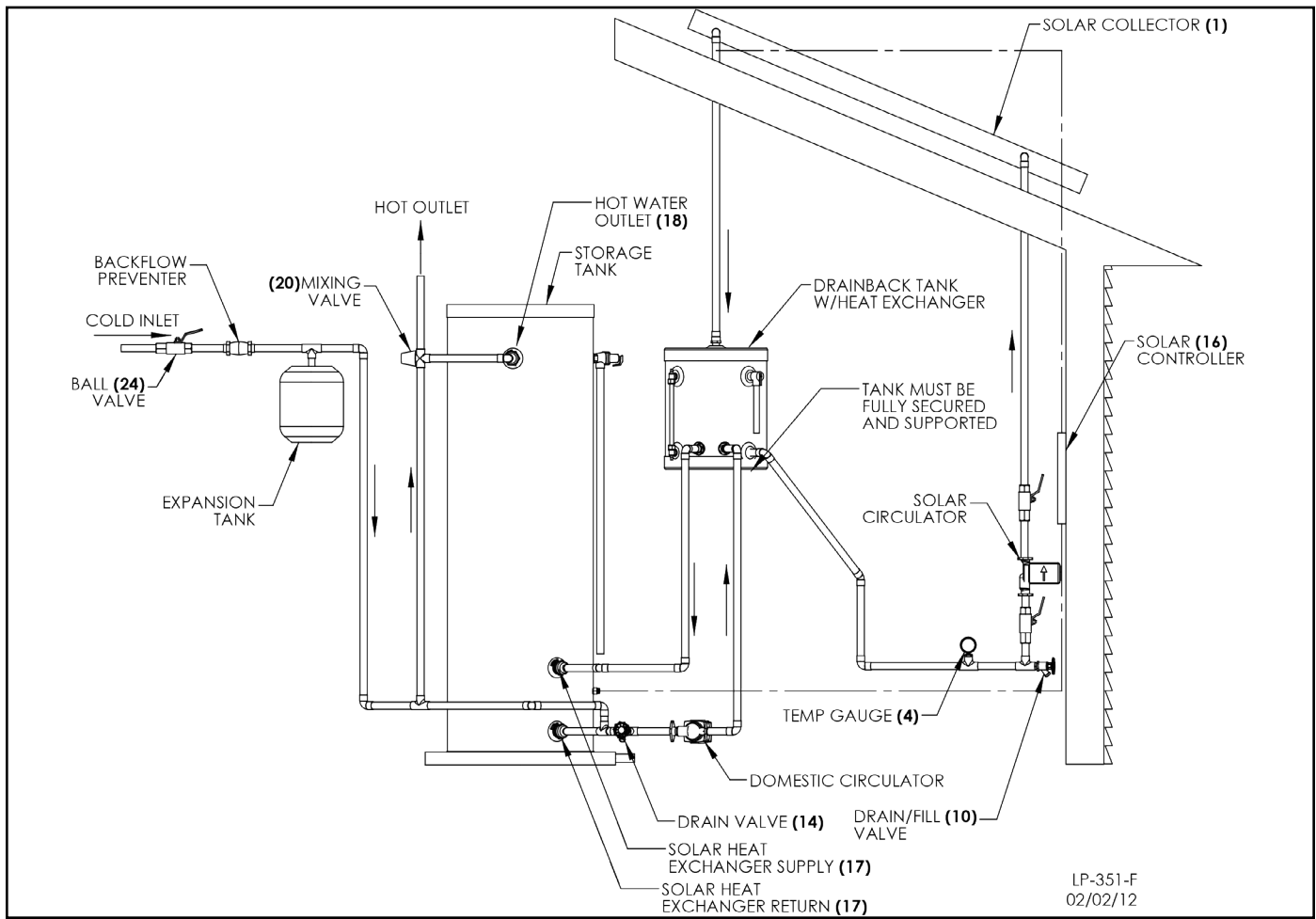


Figure 8 - Drain Back Tank with Heat Exchanger

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.
11. The drain back tank must be properly supported to account for the weight of the tank when filled with HTF.

Part 4 - 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. Fill the Drain Back Reservoir

1. Attach hose to solar loop fill valve. The location of the fill valve varies depending on numerous factors, including whether the drain back tank has a heat exchanger.
2. Open fill valve and the bleed valve on the drain back tank

sight tube (see Specification drawing for location, this manual).

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.

B. 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 5 - Service / Maintenance Procedures

A. Shutdown Procedures

To shut down the drain back system, simply unplug the differential controller. 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.

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.

Part 6 - Troubleshooting

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

A. Leaks

For leaks in the solar system, shut down the system by pulling the plug on the solar controller and call a plumber.

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.

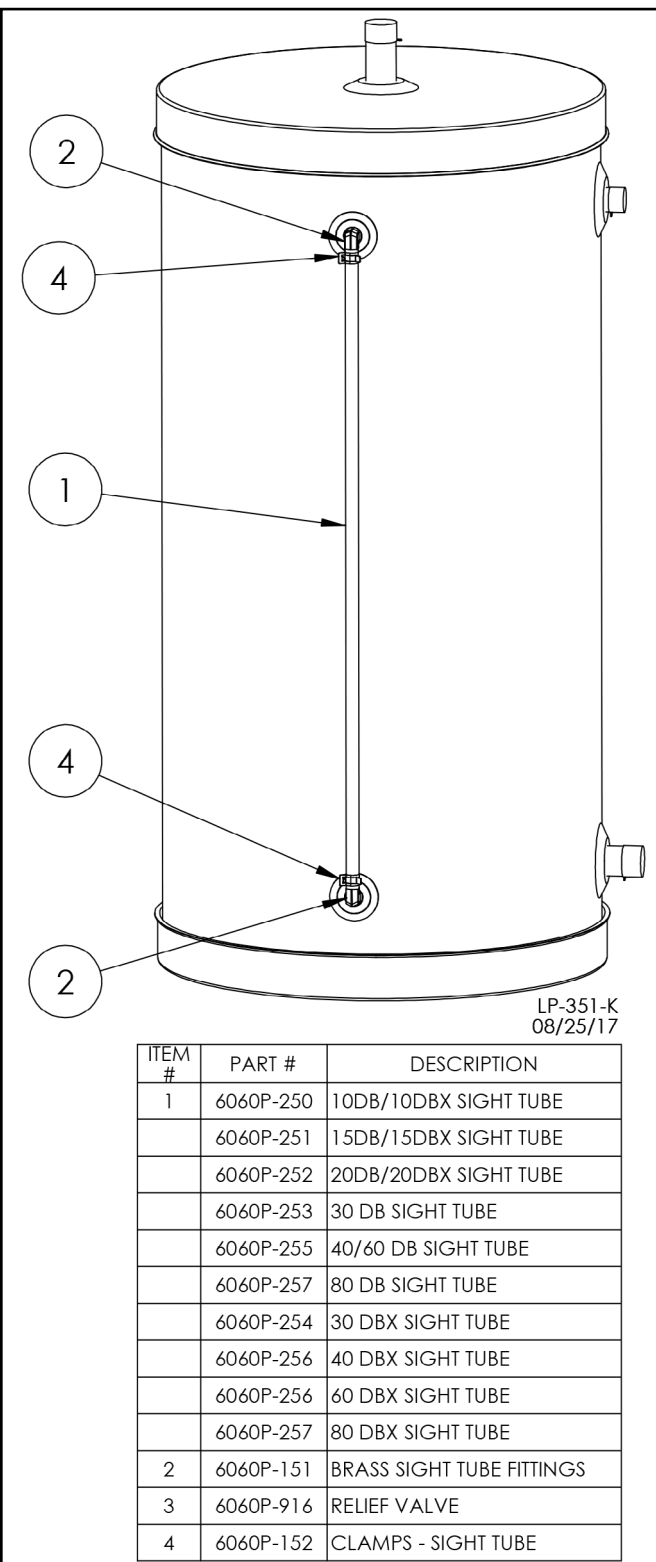


Figure 9 - Drain Back Tank Replacement Parts

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 online 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.