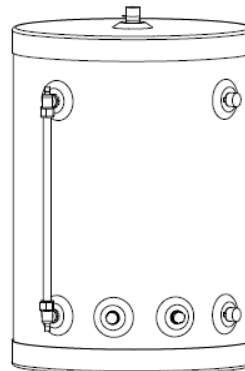
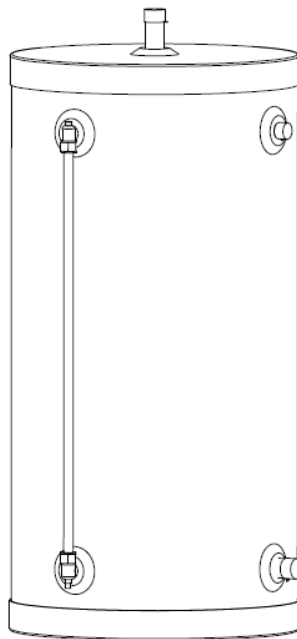
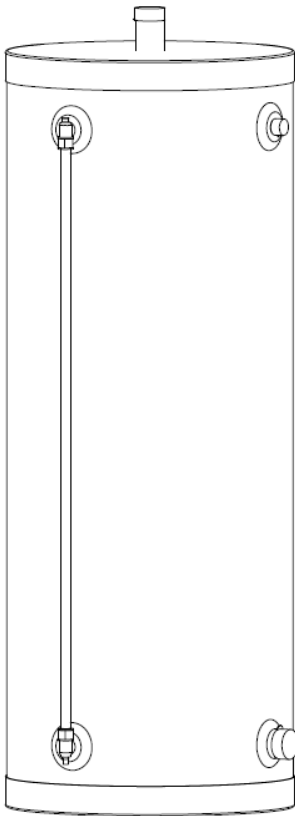




Drain Back Tank



INSTALLATION

MAINTENANCE

**Drain Back Tank
Models***

**10DB / 15DB
20DB / 30DB
40DB / 60DB**

SSU-10DBX / 15DBX / 20DBX

****X** following the model number denotes models with internal heat exchanger**

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

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.

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 information concerning the product.

DANGER

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

WARNING

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

CAUTION

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

CAUTION

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

FOREWORD

This manual is intended to be used in conjunction with other literature provided with the 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 including Solar Water Heating System Design and Installation Guidelines, be reviewed in their entirety before beginning any work.

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

FOR THE INSTALLER

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, local codes and utility company requirements. Preference should be given to codes and requirements where they differ from the furnished instructions.

Additional publications which should guide the installer include:

Solar Water Heating System Design and Installation Guidelines, SRCC OG-300, from Solar Rating and Certification Corporation, 1679 Clearlake Road, Cocoa, FL 32922-5703.

Code for the installation of Heat Producing Appliances (latest version), is available from American Insurance Association, 85 John Street, New York, NY 11038.

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.

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

PART 1: GENERAL SAFETY INFORMATION

A. PRECAUTIONS

NOTE: OBTAIN ALL APPLICABLE PERMITS AND OBEY ALL LOCAL CODES.

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

WARNING

If any system component(s) is/are exposed to the following, do not operate until the affected component(s) has/have been inspected by a qualified serviceman.

1. FIRE
2. DAMAGE
3. SUBMERSION IN WATER

CAUTION

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

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

NOTE: HTP DOES NOT WARRANT THE DRAIN BACK TANK AGAINST FREEZE RELATED DAMAGE.

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. Use only copper pipe rated for 250°F minimum on both the collector return and supply piping.

B. CHEMICAL VAPOR CORROSION

NOTE: DAMAGE TO THE SOLAR WATER TANK, COLLECTOR, OR RELATED COMPONENTS CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY. The limited warranty is voided when failure of water tank is due to a corrosive atmosphere. (Refer to the limited warranty for complete terms and conditions).

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 – Chemical Contaminants

C. INSULATION BLANKETS

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


D. DOMESTIC HOT WATER SCALD PREVENTION

WARNING

Households with small children, disabled, or elderly persons may require a 120°F or lower temperature setting to prevent scalding.

⚠ DANGER

⚠ DANGER Water temperature over 125 degrees 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.



APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F	More than 5 minutes
125°F	1 ½ 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 ½ seconds
155°F	About 1 second

PART 2: GENERAL 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 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 non-rated plastic pipe is prohibited.

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 ¼" 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.

PART 3: SPECIFICATIONS

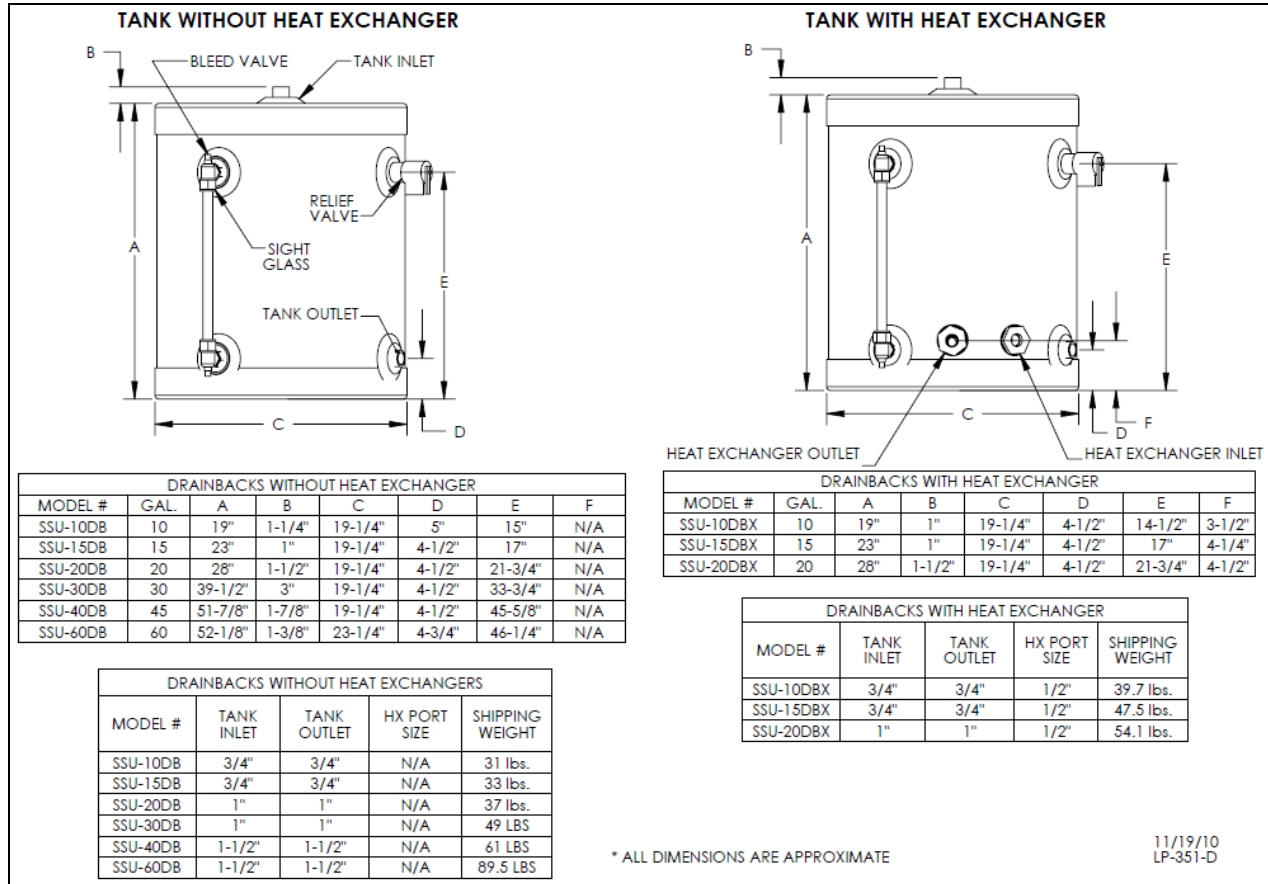


Figure 1 – Drain Back Tank Specifications and Dimensions

PART 4: INSTALLATION

A. DRAIN BACK TANK LOCATION

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 glass must have clearance for inspection and service.

Install a 2" high catch pan with a minimum of 3/4" drain line to prevent water damage if leakage should occur (See Figure 2).

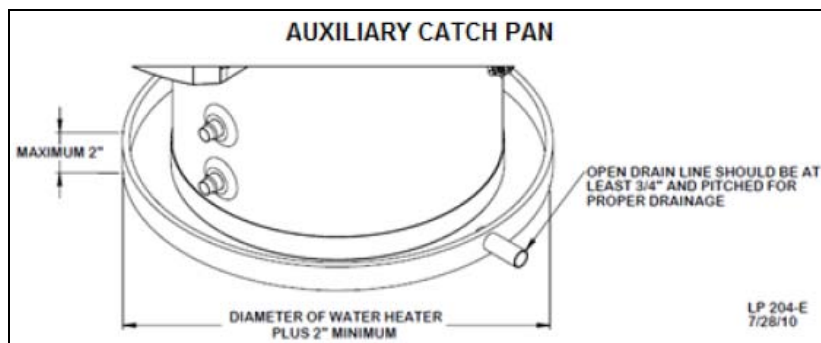


Figure 2 – Catch Pan Illustration

B. SYSTEM PIPING AND PLUMBING

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

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.

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.

C. 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

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

- a. Pipe solar collector return to the inlet fitting located on the top of the drain back tank.
 - b. Pipe drain back tank outlet to the solar collector supply fitting.
 - c. Pipe cold supply water from the solar storage tank to the heat exchanger inlet fitting located on the drain back tank.
 - d. 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 ¾" thick heat resistant rubber tubing insulation.

Before commissioning the system, install the sight glass 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.

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.

D. SOLAR SYSTEM PUMP

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.

E. 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.

G. DRAIN BACK TANK WITH BOILER AND INDIRECT WATER HEATER DETAIL

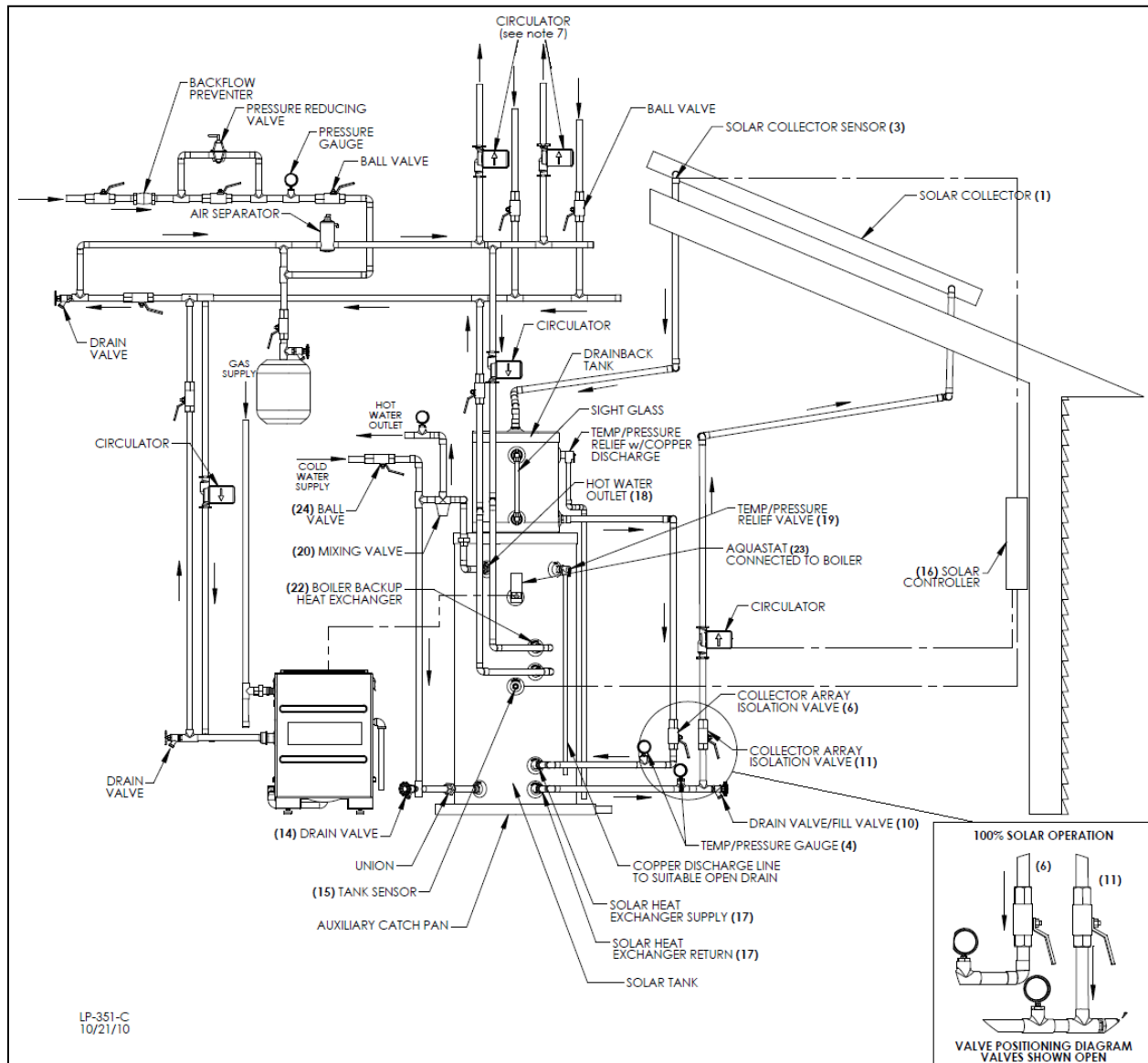


Figure 4 – Drain Back System with Boiler Back Up

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. Circulators shown in the above hydronic piping should have an integral flow check or alternately use a stock pump with an external spring type check valve. **(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.

H. DRAIN BACK TANK WITH HEAT EXCHANGER

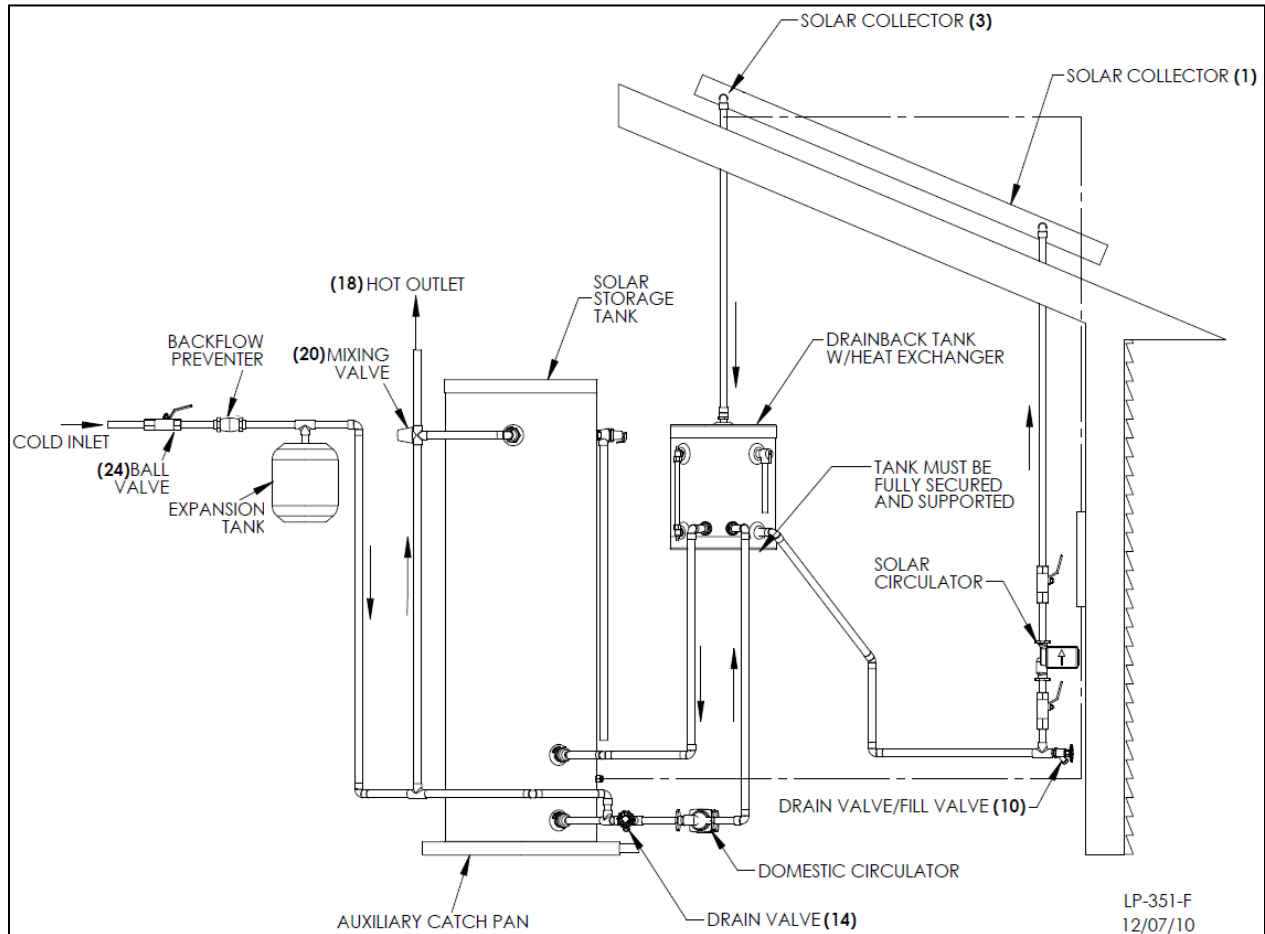


Figure 5 – Drain Back System with Heat Exchanger

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 5: HEAT TRANSFER FLUID QUALITY

Two heat transfer fluids may be used in drain back systems: Distilled water or glycol/water mix.

In order to meet health and safety regulations, drain back 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 glycol manufacturer’s specification sheet for recommended concentrations.

If using a glycol/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. HTP recommends using a pre-blended solution. Glycol/water mix should be tested for pH and freeze protection annually, and 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 and balancing additives.

NOTE: HTP DOES NOT WARRANT THE DRAIN BACK TANK AGAINST FREEZE RELATED DAMAGE.

PART 6: STARTING YOUR DRAIN BACK SYSTEM

NOTE: DO NOT MOVE ON TO THESE STEPS UNTIL THE ENTIRE SOLAR SYSTEM, INCLUDING ALL PIPING, SOLAR COLLECTORS, SENSORS, PUMPS, 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 glass (see Specification diagram for location, Figure 1).
3. Slowly fill the drain back reservoir to the top of the sight glass.
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 7: SERVICE/MAINTENANCE PROCEDURES

A. SHUT DOWN PROCEDURE

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.

CAUTION

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

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 (see the caution statement above).
4. Open fill valve.
5. Allow the system to completely drain.
6. Close fill valve and the pressure relief valve.
7. Remove drain hose.

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 glass. If not, follow the instructions in Part 6, Section A: "FILL THE DRAIN BACK RESERVOIR".

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 PROCEDURES

If hot water isn't to be used for some 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 8: 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 piping, shut down the system by pulling the plug on the solar controller and call a plumber.

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

IMPORTANT NOTES:

Customer: Please only sign after the installer has reviewed the installation, safety, proper operation and maintenance of the system. In the case that the system has any problems, please call the installer. If you are unable to make contact, please contact your HTP Sales Representative.

Distributor/Dealer: Please insert contact details.