



Adv Thermal Solar LLC



# Drain Back Tank for Solar Water Heating User's Manual

**READ AND UNDERSTAND ENTIRE MANUAL AND MANUALS OF THE RESPECTIVE COMPONENTS BEFORE OPERATING OR SERVICING OF THE DRAIN BACK TANK!**

**ONLY PERFORM SERVICE AND / OR OPERATIONS DESCRIBED BELOW IF YOU ARE LICENSED AND ARE PROPERLY TRAINED PROFESSIONAL INSTALLER OF SOLAR SYSTEMS!**

This manual describes our drain back type solar water heater with the following characteristics:

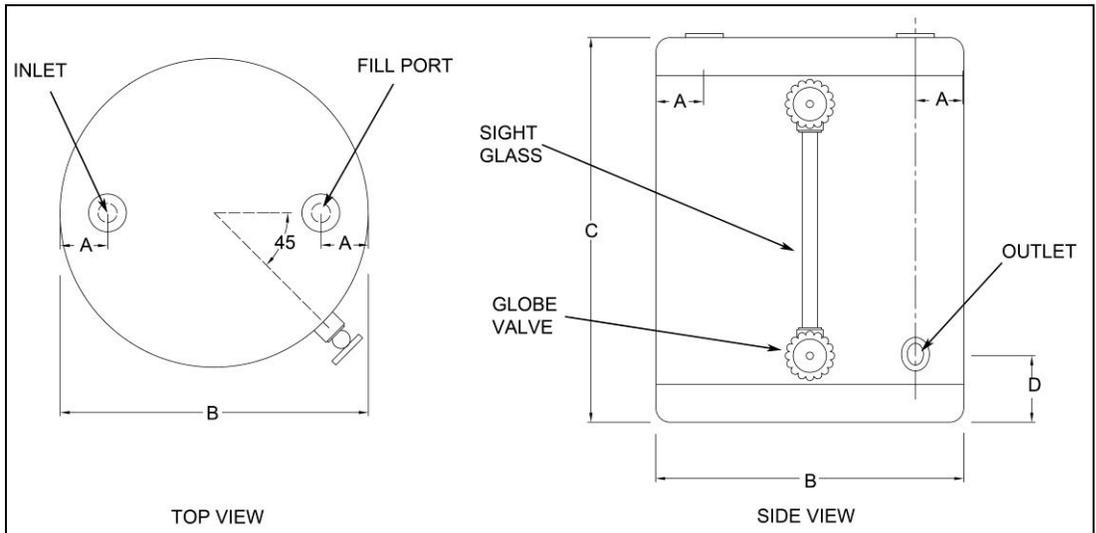
- Closed solar fluid loop. **Vent screw needs to be loose to prevent pressure buildup**
- Self-protected from freezing or overheating with or without electric power being on.
- Allows for extra ATS collectors for space heating (dual coil tank may be required.)
- Backup DHW can be an existing separate water heater or indirect tank.
- Uses industry-standard circulators (pumps) with a Bronze Impeller.

## 1. Components

The solar loop of the system consists of a small drain back reservoir to store solar fluid, a

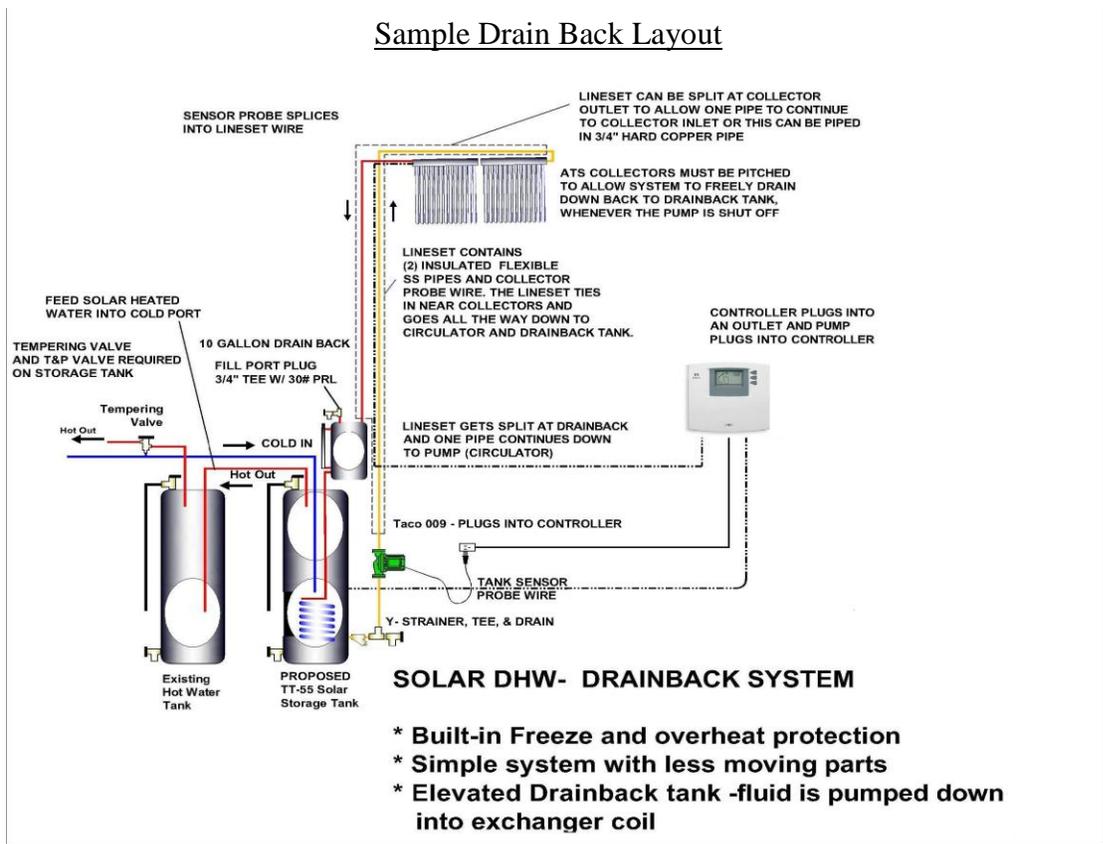
pressure relief vent, a pump to lift the fluid and move it through the ATS collectors, one or more ATS collectors, and the heat exchanger coil built into the Solar water heater. The solar fluid is a propylene glycol and water mixture. A boiler drain and fill plug are typically added separately, for maintenance.

The potable, or domestic hot water, is stored in the solar water heater and does not mix with the solar fluid. **The system should include a tempering valve to manage the outgoing water temperature.** The solar pump is controlled by a differential temperature control, mounted on the side of a tank or wall near the solar pump. The controller continually compares a temperature sensor at the solar collector array and one in the lower portion of the potable water storage tank to determine when to turn on the pump.



**ATS DRAIN BACK TANK SPECIFICATIONS TABLE**

MODEL	GAL	A	B	C	D	INLET	OUTLET	FILL	SHIP WT
ATS-DB10	10	2.5"	16.25"	20.25"	3.5"	3/4"	3/4"	3/4"	20 lbs
ATS-DB15	15	2.5"	16.25"	28.25"	3.5"	3/4"	3/4"	3/4"	26 lbs



## 2. Description of Operation

When sunlight hits the collectors and their temperature rises to differential set point (typically 16 degrees F) than that of the sensor in the potable water of the storage tank, the

differential temperature control turns on the power to the pump. The solar fluid is driven up to fill the collectors and, after a couple of minutes (depending on length of run), can be heard gurgling down the return pipe and flowing through the heat exchanger. Pumping

continues until the collectors and the stored water come within four degrees of each other, the pump turns off and all the solar fluid drains back to the holding tank. It is normal for the pump to stop and start several times throughout the day. This happens especially when the storage water has already been heated to near collector temperatures. Since the collectors and exposed pipes have no fluid in them when they are cold, no antifreeze is necessary, but **if there is danger of the solar fluid storage tank (Drain Back Tank) freezing or there are dips in the line preventing proper drainage**, antifreeze should be added. The control includes an adjustable high temperature limit. When the lower storage tank temperature reaches the limit -- usually set inside the control at around 140° -- the control shuts off the pump even if the collectors are still hot. This would typically occur near the end of a sunny day when little domestic hot water or space heat had been used.

The operation of the water heater is covered in its own manual provided by the manufacturer.

### 3. Installation

This section is intended to inform the Drain Back system owner of some of the considerations and logic that went into the installation of the solar equipment. It may be helpful if a re-roofing, renovation, or other change demands part of the system be moved. **THIS MANUAL IS INTENDED AS REFERENCE ONLY and any Service or Installation should be done by a properly licensed and knowledgeable Solar Installer.**

#### Collectors and Pipes

Your collectors may have been mounted using any of several methods, depending on whether the feet are attached directly to the collector frames or a separate frame was fabricated to hold the collectors; whether they are parallel with the roof surface or held up with legs, etc. On most roofs (other than standing seam metal) each foot has a stainless

steel lag bolt that penetrates the roof into solid wood.

The collector array faces close to south at approximately a 45° angle from horizontal and is also very slightly tilted from vertical in an easterly or westerly direction (i.e., “crooked” on the roof) so that the bottom pipe of the collectors will drain. The minimum drain slope is 1 inch in 8 feet.

There must also be a similar continuous slope in the solar pipe that runs from the lower end of the collector panels on the roof to the heat exchanger and solar fluid tank.

If the attic or other area where these pipes run is ever renovated, be certain the slope is not compromised. If the attic is used for storage make certain no heavy object is placed upon or hung from a pipe so as to bend it or cause a low spot.

If the collectors must be moved for roof repairs consult a solar installation professional beforehand.

#### Drain back Reservoir

The reservoir containing the solar fluid should be protected from rain and prolonged freezing temperatures in case of extended power failures. The preferred location is within the insulated area of a building or conditioned space. If it is installed in an attic, pipes to and from the backup water heater may be situated to provide some residual heat migration to prevent freezing, or antifreeze mixture used as the solar fluid.

ATS drain back reservoirs are Stainless Steel and when installed with a bronze pump, do not require any anti-corrosive buffer (“boiler treatment”). If there is **NO** danger of freezing, the solar fluid can be plain water. The drain back and the domestic water tanks must be installed on a floor or surface substantial enough to carry the full weight of the tank plus water. The table below shows approximate filled weights of three common tanks. Drain pans should be used where leaks could damage flooring or floors below. As long as the propylene glycol drain back fluid is maintained, there is little chance of the tank rusting out as will a tank containing domestic water. However, the tank should be accessible

for maintenance.

Sizing of Drain Back Tank should be with respect to the length and diameter of plumbing. See "Reference Chart 1" at end of manual.

#### Approximate Weight of Full Tanks

Tank Size	Approx Weight	Fluid
10 gal	115 lbs	Non-toxic Glycol
15 gal	155 lbs	Non-toxic Glycol

## 4. Maintenance

The top level of the fluid (with pumps off and fluid drained back) should be within 4" of the top of tank site glass. See "Checking Level and Topping Up the Solar Fluid", below. If the fluid in the tank is not plain water, the **anti-corrosive buffer compound or antifreeze** in the solar fluid should be tested at least **every three years**.

Since the pump is lubricated by the fluid it pumps, it requires no maintenance, but if it sits too long without running the fluid can leave deposits that will prevent the pump from being able to start without being either taken apart and freed up or replaced.

Indoor **pipe insulation** should be checked every few years. Patch any areas where shrinkage or damage has caused gaps to form, using insulation rated for high temperatures (rubber foam, or fiberglass; not plastic foam.)

Animals are attracted to the warmth of the system and proper precaution should be used.

### Checking Level and Topping Up the Solar Fluid

ATS drain back systems have a vent screw located on the top of the site glass so our solar fluid loop is vented but there should be almost no evaporation under normal use. A sight glass on the reservoir side shows fluid level. The following are instructions for

checking and topping up the fluid in case any is ever lost.

If possible this procedure should be done when the drain back tank and collectors are not hot.

a) Turn off or unplug the system's differential temperature control. Wait five minutes for all the fluid to drain back into the holding tank.

b) Observe the solar fluid drain back tank.

**CAUTION: THIS TANK, ITS FITTINGS, AND THE FLUID MAY BE VERY HOT!** Are there any signs of fluid leakage at the base or in the drain pan (if installed) under the tank? Any sign of drip or corrosion from leakage at the pressure relief valve, fill plug, on boiler drain, etc? If so, note that and clean it and correct as necessary.

c) Remove fill cover /valve during the draining or filling operation.

d) Check to make sure it is open ensuring it is pressure neutral. As a further precaution, place the rag over the port and never look at or stand over the fill port. If the level is more than 4" below the site glass top, fluid should be added. Put a funnel in the fill hole and slowly add water or antifreeze/water mixture (depending on your system design ) until the level is about 1" below the site glass top.

g) Make a note of how much fluid you added and the date.

h) Plug in and/or turn on the differential temperature control. Listen for the pump to start and, in a minute or two, the solar fluid to begin returning to the drain back tank. Make sure to leave the control in its "Auto" setting of the function switch.

## 5. Warnings

It is acceptable, but not necessary, to turn off the system over vacation or time when no hot water is being used. If the pump is not run for months at a time, however, it may become stuck, requiring a service call to dismantle the pump body.

If the solar fluid pump is ever replaced, specify a new pump that has sufficient static head to push the fluid to the top of the collectors, plus a few feet extra to allow for pump aging.

## 6. Troubleshooting (Typical Drain Back Systems)

If you are ever uncertain of whether the sun is heating your water or not, contact your installer. You should continue to have hot water as long as there is a reasonable amount of sunshine and you are not using more hot water than the system was designed to supply.

The best basis for troubleshooting is to become familiar with the sounds the system makes in normal operation. Also, by measuring the temperature of the pipes on a sunny midday you should be able to tell a difference in the temperature of the fluid going to the collectors and that of the returning.

The voltage to the temperature sensors on most controllers is low. **If a controller is suspected consult the controller manual for trouble shooting.**

Pump bodies normally run warm; however they should never become hot enough to discolor. If this is noticed unplug immediately and consult pump manual for service information.

The solar system is independent of the backup system. If on a cloudy day or at night the water temperature is low, the backup system or possibly the tempering valve may be suspect.

Symptom:	Possible Cause:
1) Pump Never Runs	1a) If diff. temp. control LCD screen is not lit check the outlet or circuit breaker. 1b) Check Controller display for error messages and check manual for interpretation. If none are displayed, use switch on side of Controller; move switch upward from AUTO to ON. This should force the pump on. If the pump comes on and runs normally the problem is in a sensor, sensor wiring, or internal to the control. Temperature sensor/wire at collector is open or sensor/wire at tank is shorted, or a sensor is defective. Disconnect sensor wires from control and test with ohmmeter. Control literature

	includes temperature/ resistance charts, or call tech support.
2) Pump hums and gets hot but does not circulate fluid.	2) Pump's running capacitor or one winding is bad; rotor may be stuck or impeller or shaft broken. Call for service.
3) Pump runs all the time, 24Hrs a day.	3a) Test as 1b) above, but turn switch from AUTO to OFF. If pump(s) do not stop then relay in control is stuck on. call service 3b) Temperature sensor/wire at collector is shorted or sensor/wire at tank is open, or sensor is defective. Test with ohmmeter. Control literature includes temperature/ resistance charts, or call Manufacturer to find out if reading is normal.
4) Pump runs long after sun is down, but not all night. (In very hot weather pump could run all night.)	4) System is not effectively getting heat from the collectors into the water. If the solar fluid tank is not hot, the solar fluid volume may be too low to fill collectors.
5) System turns pump off even though the sun is still on the collectors.	5) High temperature limit of storage water (usually 110 to 130° at bottom of tank) may have been reached.
6) Steam hisses from the Drain Back Tanks.	6) The solar loop is getting overly hot. There may not be enough fluid to complete the loop (listen for sound described in 7b).
7) Noises	7a) The pumps are lubricated by the water they pump. The noise should be a steady hum. "Bacon frying" or a soft "popcorn popping" indicates air in the lines. Solar fluid contacting hot collectors can flash into steam with a loud thump if the pump comes on after the collectors have been in full sun for a while. 7b) After the pumps have been running for two minutes or so, solar fluid may be heard coming down the return pipe. The sound is like a gurgling fountain and is <b>normal</b> . 7c) Screeching or clattering indicates pump bearings are worn; unplug the control immediately and call Installer for service.
8) Water not hot enough	8) Determine the events that cause this. Is it true all the time (in which case the tempering (mixing) valve, if installed, is suspect), only when there has not been much sunshine (in which case the backup heating is not sufficient), or only when you turn off the backup (in which case the solar may not be fully functioning)? It is also possible you have begun using more hot water than your system was designed to provide.

## **Reference Chart 1**

Description	Pipe Diameter	Nominal Size	3/8"	1/2"	5/8"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Standard Steel Pipe	US Gallons of Fluid per 100 ft. pipe		1.0	1.6	-	2.8	4.5	7.8	10.6	17.5	24.9	38.5
Type "L" Copper Tubing	US Gallons of Fluid per 100 ft. pipe		0.76	1.22	1.81	2.52	4.30	6.55	9.27	16.12	24.86	35.48

# Drain Back Tank 10-Year Limited Warranty

## **1.) SCOPE OF COVERAGE**

This warranty applies to a new Drain Back purchased by the end user. The warranty covers the stainless steel drain back vessel. It extends to the first buyer and to any subsequent owners of the system for a total of Ten (10) years. All of the supplied components that include but are not limited to the fittings, glass, valves and other parts that are not the stainless steel drain back vessel, carry a Three (3) year warranty.

## **2.) WARRANTY ON THE DRAIN BACK TANK**

Adv Thermal Solar (“Seller”) warrants fully its solar drain back to be free from defects in both material and workmanship for a total period of 10 years from date of installation acceptance by the original owner. If a failure does occur during the warranty period, Seller will provide a new part, or at Seller’s option, have repaired any part of the drain back tank. A new warranty shall apply to any replacement part, but shall be limited in time to the remainder of the original warranty period. This warranty applies to a drain back tanks installed for use as a drain back tank to provide a reservoir in a solar system for use in Non Pressurized medium temperature range applications (110 to 200 degrees Fahrenheit) only.

## **3.) SERVICE LABOR RESPONSIBILITY**

This warranty does not cover any labor costs for repair or replacement

## **4.) Stainless Steel**

SELLER warrants fully for a period of 10 years against and degradation of the Stainless Steel tank, which would significantly affect the drain back tank performance.

## **5.) WARRANTY EXCLUSIONS:**

A. This Warranty Will Not Apply To The Following Exclusions

- 1.) To defects or malfunctions resulting from failure to properly install, operate or maintain the drain back.
- 2.) To damage from abuse, modification, accident, fire, flood, hail, wind or other acts of God.
- 3.) To intentional or unintentional breakage.
- 4.) To drain back failure which occurs due to damage caused by heat transfer fluids or lack of heat transfer fluids.
- 5.) If the drain back is moved from the original installation location.
- 6.) To damage caused by freeze or excessive pressure.

B. Limitation on Exclusion from Coverage: Conditions that may occur in the normal operation of the drain back tank shall not be invoked by Seller to reduce the coverage of this warranty.

## **6.) OTHER RIGHTS AND REMEDIES**

A. Consequential and Incidental Damages Seller shall not be liable for: (1) Consequential damages to the system in which the improperly functioning drain back tank is installed, and (2) Incidental expenses incurred to repair or replace, as necessary, any other obligations or liability in connection with the drain back tank.

B. No Other Expressed Warranties Unless otherwise explicitly agreed in writing, it is understood that these are the only written warranties given by Seller, and Seller neither assumes nor authorizes anyone to assume for it any other obligations or liability in connection with the drain back tank.

C. **Implied Warranties:** This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

D. **Right to Arbitration:** Any dispute between the buyer and Seller pertaining to this warranty may, at the option of the buyer, be resolved by arbitration in the state installed according to the rules of the American Arbitration Association, except for installation issues where installation was conducted by a non-Seller approved installer.

## **7.) FILING A CLAIM**

All claims should be filed with the contractor or the Dealer from whom the drain back tank was purchased. If unable to do so, please contact Adv Thermal Solar LLC at: PO Box 535 Bohemia, NY 11716

## **8.) EXTENDED WARRANTIES**

Warranty Extensions are available directly through Adv Thermal Solar LLC. These warranties will protect your Adv Thermal Solar LLC drain back tank beyond the standard warranty.

A. 2 Year Limited Warranty Extension on the Stainless Vessel (12 Year Total Warranty)

Extended Warranties provide the same coverage, and are bound by the same constrictions and policies as the standard 10-year warranty.

## **9) ADDITIONAL OWNER RESPONSIBILITIES:**

- a) Maintain Drain Back tank to prevent any scale deposits.
- b) Keep Drain Back Tank from Freezing
- c) Make provisions so that if the Drain Back tank or any component part or connections should leak, the resulting flow of fluid will not cause damage to the area in which it is installed.
- d) Periodic Maintenance of the PH of the solar fluid. The pH should not exceed 9 or drop below 7. Failure to do so will cause damage.
- e) Operate tank as a neutral pressure vessel.

Note: use of cast iron pump will void warranty.

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