ALTERNATE ENERGY TECHNOLOGIES, LLC.

AET TECHNICAL BULLETIN, TB-INST20150519

System Flushing Instructions:

Drainback Systems

DX Drainback Tank shown

INTRODUCTION

After installing the AET Drainback system, the Solar Collector Loop should be flushed in order to remove excess flux and debris. This process should be repeated for existing systems to eliminate contaminants from the transfer fluid if needed, or after a repair has been made to the solar collector loop.

Buffers and inhibitors should be added to extend the life of the drainback system. When added to the solar loop, they help to keep the heat transfer fluid clean and free of rust and contaminants.

OPTIMUM TIME FOR FLUSHING AND/OR FILLING

Filling and flushing should be done when the system is cold: i.e., the collectors are cool or barely warm to the touch. The **collectors should be no more than 120° F.**

Optimum times to flush or fill any solar system include: 9:00am in the morning; in the evening hours after 8:00pm; or an overcast, cloudy day.

If flushing the system during these times is not possible, make sure that the **temperature of the collectors is no greater than 120° F.** A heavy covering, such as a moving blanket or quilt, can be placed over the collectors to make sure they do not gain heat while performing these procedures.

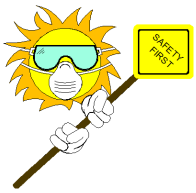
SAFETY

Safety Gear: Remember to wear the appropriate safety gear (such as goggles, gloves, and mask) when working with chemicals.

PR Valve Safety: Never open or close the pressure relief valve when the system is hot, or when the system is running. This can cause system malfunction and damage, and will void the drainback tank warranty. Let the system cool down first.

PR Valve Rating: AET provides a PR 45 Pressure Relief Valve. It is designed to release air when the pressure in the system reaches 45 psi. Do not replace the pressure relief valve with one having a higher pressure rating. Pressurizing the solar loop above 45 psi can cause damage, and will void the drainback tank warranty.

Disposing of Flushing Fluid: The flushing fluid removed should be disposed of in accordance with the manufacturer's recommendations.



ADDITIVES, BUFFERS, CLEANERS, AND KITS

Sentinel Inhibitors and Buffers

Sentinel products are available to flush and treat the heat transfer fluid.

One quart is adequate to treat a residential system. The manufacturer recommends adding 1% of the total volume of the solar loop.

Sentinel X100: Inhibitors and Buffers

Sentinel X100 is a combination of inhibitors and buffers designed to keep the system clean and protect the collector, solar loop piping, pump, and drainback reservoir. AET Part #: DB-X100

Sentinel X200: Descaler

Sentinel X200 is a combination of inhibitors and buffers designed to prevent scale formation in a new or existing system. AET Part #: DB-X200

Sentinel X400: Cleaner

Sentinel X400 is a cleaning agent used to remove flux and debris from a new or existing system. AET Part #: DB-X400

Adding Sentinel Products to the System

For your convenience, AET has developed a Kit to help add the Sentinel products into the solar loop.

Solutions are placed in the removable container, and are pushed into the system using pressurized water.
AET Part #: DB-FLUSHKIT

Pressure Checking the System

Air infiltration can cause system damage and void the warranty. Protect the system by performing a pressure test to find leaks.

For your convenience, AET has developed a pressure testing apparatus.
AET Part #: DB-PCK

FLUSHING THE SYSTEM AND ADDING INHIBITORS
STEP BY STEP PROCESS

STEP #1: DRAIN THE SYSTEM (see Page 4).

STEP #2: PRESSURE TEST THE SYSTEM (see Page 5).

STEP #3: FLUSH THE SYSTEM

1. Fill the Solar Loop with Sentinel X400 (see Page 6).
2. See "Using Sight Glass while Filling" (Page 7).
3. Turn on the pump by setting the controller to "ON."
4. See "Using Sight Glass while Running" (Page 8).
5. Circulate the fluid for at least 2 hours.

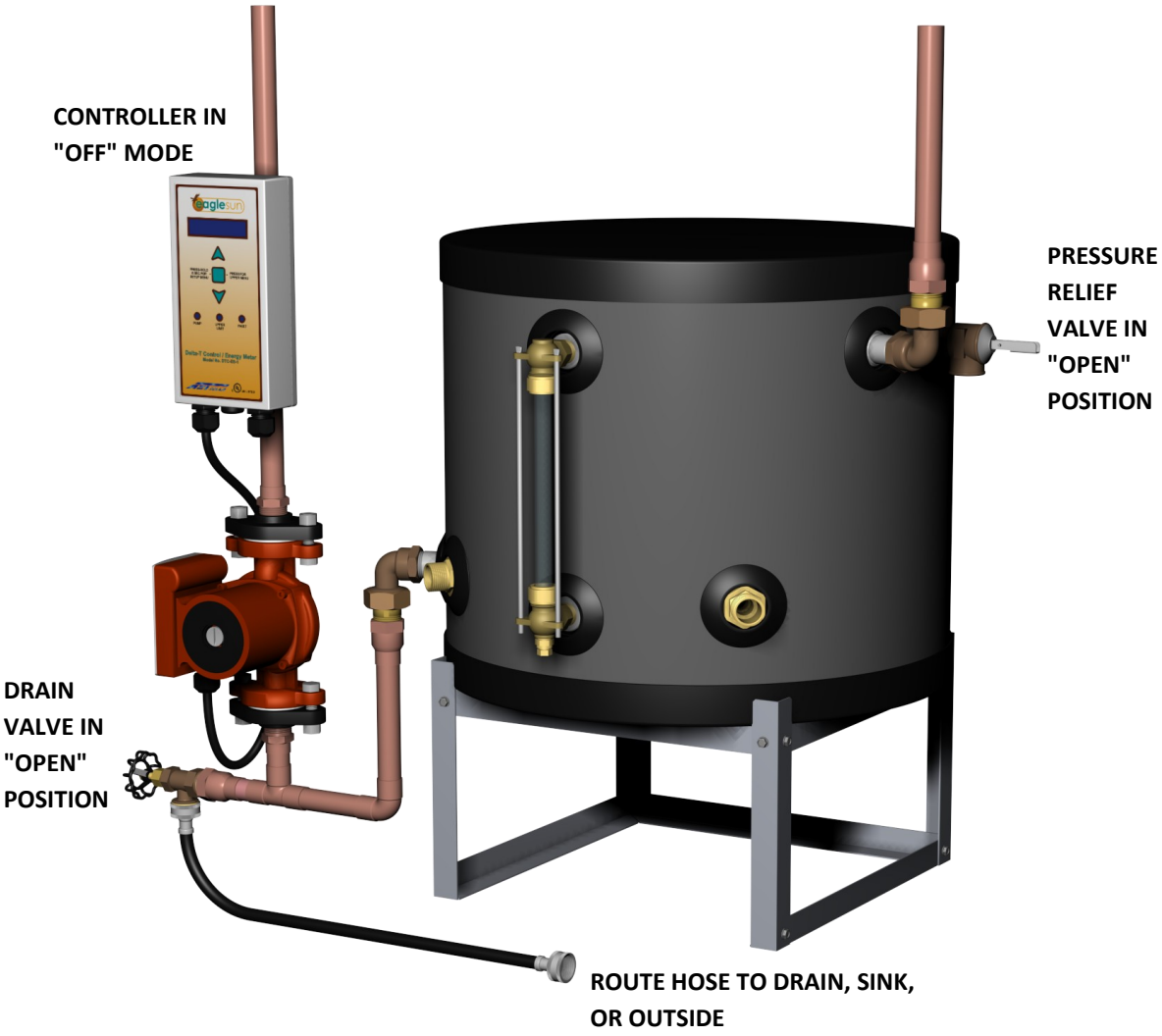
STEP #4: DRAIN THE SYSTEM (see Page 4).

1. Clean the Sight Glass as required (see Page 9).

STEP #5: ADD BUFFERS AND INHIBITORS

1. Add buffers and inhibitors (see Page 6).
2. For more information on buffers and inhibitors, see page 2.
3. These buffers and inhibitors are engineered to last the life of the solar system.

HOW TO DRAIN THE SYSTEM



SYSTEM DRAINING STEPS

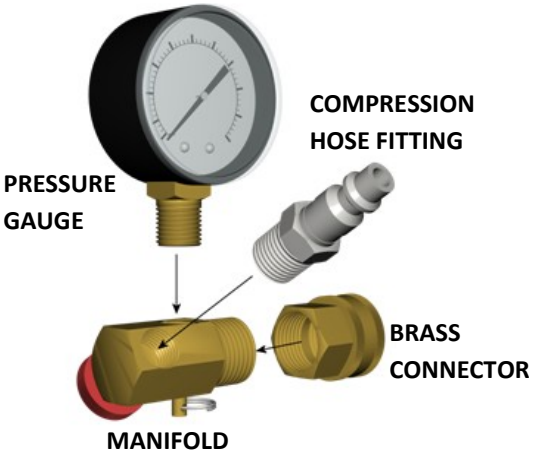
1. Turn the controller "OFF."
2. Let the system cool down.
3. Make sure the boiler drain valve is closed.
4. Open the pressure relief valve on the drainback tank.
5. Connect a washing machine or garden hose to the boiler drain valve.
6. The other end of the hose should be able to reach a drain, sink, or outside area.
7. If the hose Is not long enough, attach sections of hose together with fittings.
8. Open the boiler drain, removing the fluid from the system.
9. Dispose of the fluid in accordance with the manufacturer's directions.

PRESSURE TESTING THE SYSTEM

Systems must be pressure tested to make sure there are no leaks. Leaks in the system can allow air to enter. Air can react with the fluid and metals in the solar loop to form rust and aggressive water. This can lead to system corrosion and early failure, and will void the collector and drainback warranties.

PRESSURE TESTING APPARATUS

For your convenience, AET has developed a pressure testing apparatus: Part #: DB-PCK.

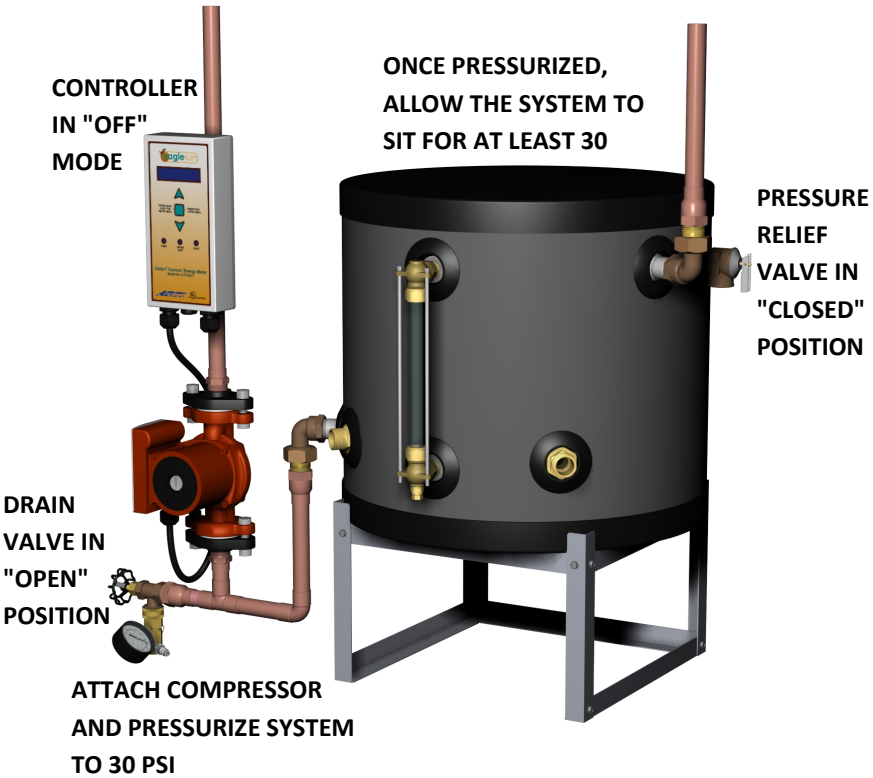


ASSEMBLY

a. Connect the pressure gauge to the manifold.
b. Connect the compression hose fitting to the manifold.
c. Connect the manifold to the brass connector.
d. Connect the brass connector to the boiler drain.
e. Connect the compression hose fitting to a source of compressed air.

PRESSURE TESTING STEPS

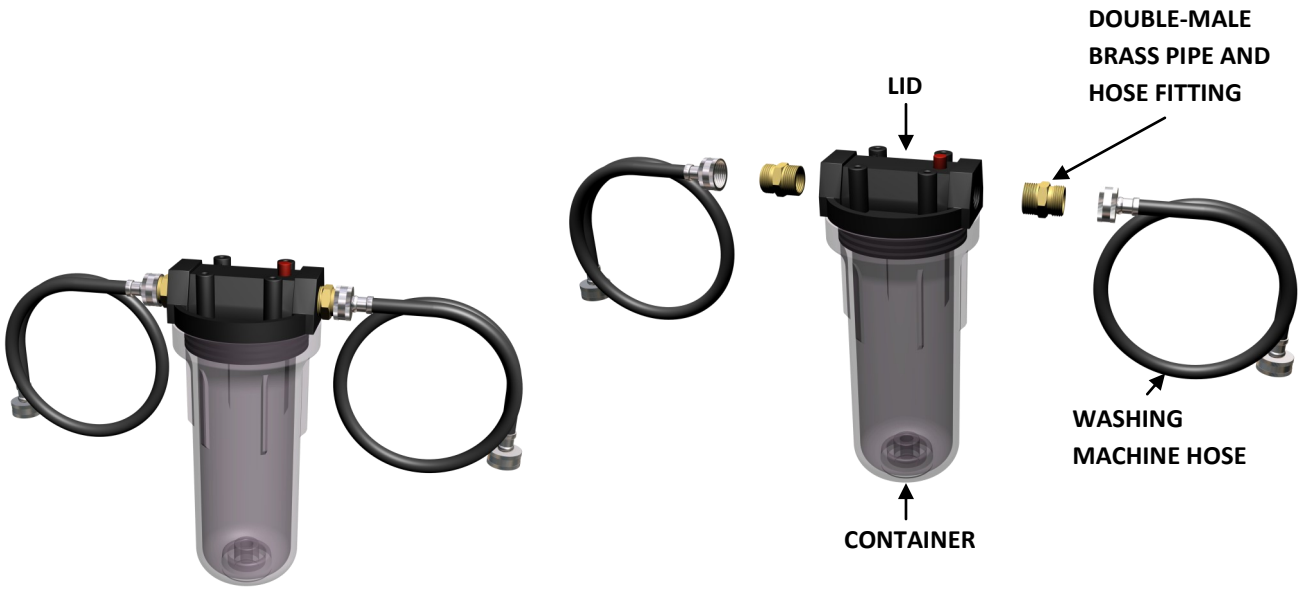
1. Turn the controller "OFF."
2. Close the pressure relief valve. Make sure the valve stem seats properly.
3. Open the boiler drain valve.
4. Pressurize the system with air.
5. Apply a soapy water solution on all the joints and fittings: including the sight glass fittings and pressure relief valve.
6. Maintain the pressure for 30 minutes.
7. Note leaks and fix before proceeding.
8. Turn the controller "OFF."
9. Open the pressure relief valve.
10. Remove the pressure gauge assembly.



HOW TO FILL SYSTEM

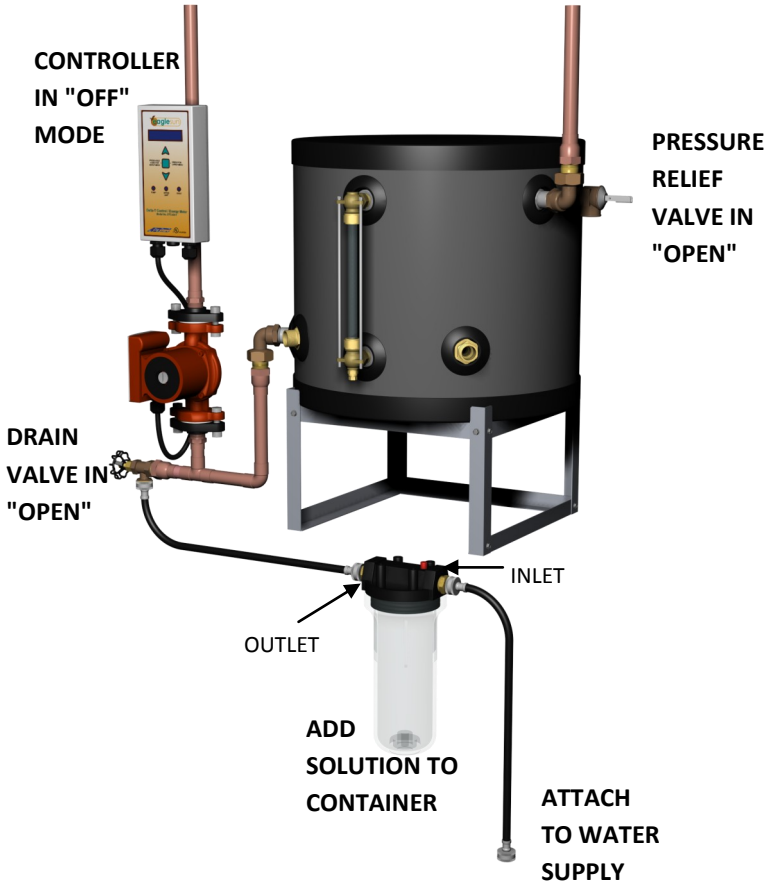
SYSTEM FILLING APPARATUS

For your convenience, AET has developed a system filling apparatus: Part #: DB-FLUSHKIT .



ATTACHING THE SYSTEM FILLING APPARATUS

1. Turn the controller "OFF."
2. The boiler drain valve should be closed.
3. Open the pressure relief valve.
4. Connect the **¾" NPT side** of the double-male brass pipe and hose fittings to the lid.
5. Connect the washing machine hoses to the other end of the fittings.
6. Look at the top of the lid. One side is marked "outlet."
7. Attach the "outlet" side to the boiler drain valve on the drainback tank.
8. Use the other hose to attach the side marked "inlet" to a water source.
9. Unscrew the clear container from the lid.
10. Fill the container with the proper solution.
11. Replace the lid.
12. Turn on the water supply.
13. Open the boiler drain valve, and start filling the system **slowly.**
14. Watch the sight glass. The fluid level should go to the "STOP LEVEL" line (see Page 7).
15. Close the pressure relief valve.



USING THE SIGHT GLASS
while Filling

The sight glass is an important part of the drainback system. When properly set up, the sight glass is a visual aid to show if the system is working properly.

IF THIS IS AN EXISTING SYSTEM, There may be a mark (either a zip-tie or a permanent marker) indicating a "STOP LEVEL" or STOP" line.

If this mark is present:

The system will be filled up to this line.
When the system is off (i.e. the pump is not running), the water level should rise to this mark.

IF THIS IS A NEW SYSTEM, OR if the mark is not present:

1. Place a zip-tie on the sight glass 1" below the top. As you begin filling the system, the water level should not go above this point.

2. NOTE: The zip tie can be moved up or down slightly to correspond to the actual, final waterline after filling. This line should be approximately 1 inch from the top of the sight glass to ensure that the system is properly filled.

3. Attach the zip-tie permanently to the sight glass with a piece of tape, or use a permanent marker to mark the top of the water line in the sight glass.

4. Label this line: "STOP LEVEL" (or "STOP")…see the Figure at the right.

5. Later this mark can be used as a reference. When the system is off (i.e. the pump is not running), the water level should rise to this mark.

USING THE SIGHT GLASS
while Running

The "RUN LEVEL" line should be marked when the pump is turned on for the first time.

IF THIS IS AN EXISTING SYSTEM, There may already be a mark (either a zip-tie or a permanent marker) indicating a “RUN LEVEL” or “RUN” line.

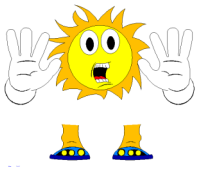
IF THIS IS A NEW SYSTEM, OR if the mark is not present, the water level should fall below the "STOP LEVEL" line when the pump is turned on.

When the water level in the sight glass stabilizes, mark the top of the ***new*** water line with a zip-tie or a permanent marker. If using a zip tie, attach the zip-tie to the sight glass with a piece of tape.

Label this line: “RUN LEVEL” (or “RUN”)… see the Figure at the right.

This new mark can be used as a reference. When the system is running, the water level should come to this mark.

DANGER ! **If the water in the sight glass *disappears*, TURN OFF THE SYSTEM IMMEDIATELY.** Go to the “TROUBLE SHOOTING” Section at the end of this bulletin for help.



IMPORTANT: **If the water level in the sight glass *rises*,** turn off the system. Check to see if the pump is installed backwards.

IMPORTANT: **If the water level in the sight glass *remains* relatively the *same***, turn off the system. Fluid is not circulating in the system. Check the pump. If the pump is working properly, check to see if any of the valves along the flow line (i.e. ball valves located at either ends of the pump) are closed. If these valves are closed, they are blocking the flow. Open the valves. If the problem is not resolved at this point, there is probably a blockage in the system. This must be located and fixed before flushing can continue.

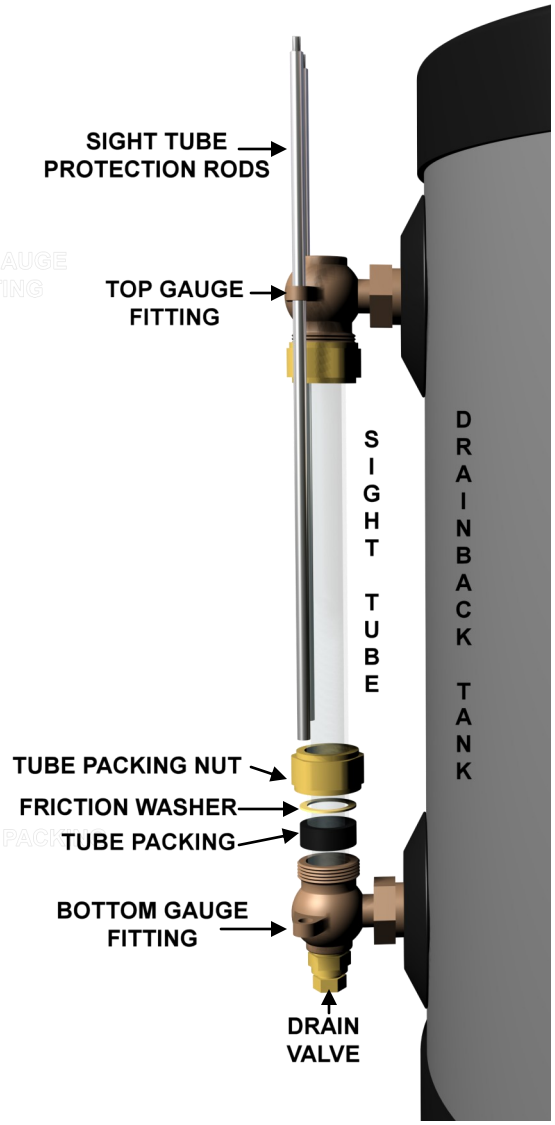
CLEANING THE SIGHT GLASS

This procedure can be used to clean a dirty Sight Glass

1. Have a small bucket or large cup ready.
2. Hold the bucket beneath the lower fitting on the sight glass.
3. Open the drainage valve on the bottom sight glass fitting, by turning it clockwise.
4. Allow the water to drain from the sight glass.
5. Once the water has drained from the sight glass, remove the sight glass for cleaning:

   NOTE: Do not remove the sight glass **fittings.** They have been factory installed and leveled. If the fittings have been accidentally removed, refer to the AET Technical Bulletin on Sight Glass Installation to make sure they are re-installed properly.

6. Loosen the top sight glass fitting by turning the tube packing nut counter-clockwise.
7. Loosen the bottom sight glass fitting by turning the tube packing nut clockwise.
8. Gently push the sight glass upward into the upper fitting.
9. This will expose the bottom of the sight glass.
10. Tilt the sight glass slightly and remove it from the top fitting.
11. Clean the sight glass with water. Use a small pipette brush to clean the inside.
12. Replace the sight glass carefully.
13. Orient the sight glass with the friction washer and tube packing at the bottom (see Figure to the right).

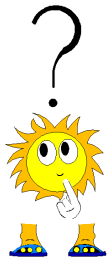


14. Gently push the upper end of the sight glass into the top fitting.
15. Allow the lower end of the sight glass to drop into the bottom fitting.
16. Allow it to seat properly in the bottom fitting.
17. Tighten the top sight glass fitting by turning the tube packing nut clockwise.
18. Tighten the bottom sight glass fitting by turning the tube packing nut counter-clockwise.

TROUBLE SHOOTING

BROWN STAINS IN THE SIGHT GLASS:

Brown stains can develop in the sight glass, depending on the water quality in your local area. Adding rust inhibitor to the system (as described in this bulletin) helps to prevent this condition. If the pressure relief valve is not closed and seated properly, air can enter the system, causing oxidation and rust: which will lead to brown stains in the sight glass. Make sure that the pressure relief valve is closed and properly seated. Pressure check the system carefully to locate any air infiltration that can cause continual oxidation of the heat transfer fluid.



NEVER PRESSURIZE A DRAINBACK SYSTEM:

The drainback system is designed to work with non-pressurized water at atmospheric conditions. Pressurizing the system could cause damage.

BANGING NOISES:

Banging Noises are usually due to pressure in the system. With the system cold, lift the pressure relief valve to relieve the pressure and eliminate air in the system. Close the valve. Banging noises should have stopped.

"STOP LEVEL" LINE USE:

When the system is not running, fluid should return to the "STOP LEVEL" line. If fluid does not return to this level, check the system for leaks. If the problem continues, there could be fluid trapped in the system. A sag or dip in the piping run can trap the fluid, preventing circulation. This must be corrected before operating the system.

"RUN LEVEL" LINE USE:

If the water level in the sight glass rises above the "STOP LEVEL" line, turn off the system. Check to see if the pump is installed backwards.

If the water level in the sight glass remains relatively close to the "STOP LEVEL" line, turn off the system. Fluid is not circulating in the system. Check the pump. If the pump is working properly, check to see if any of the valves along the flow line (i.e. ball valves located at either ends of the pump) are closed. If these valves are closed, they are blocking the flow. If the problem is not resolved at this point, there is probably a blockage in the system. This must be fixed before flushing can continue.

If the water in the sight glass disappears when the pump is turned on, turn off the system immediately.

Follow the procedures below:

1. Open the pressure relief valve. Add additional water to the system. Continue until the water begins coming out of the pressure relief valve.

2. Close the pressure relief valve and turn on the pump.

3. If the water in the sight glass *disappears*, TURN OFF THE SYSTEM IMMEDIATELY.

4. This indicates that the drainback reservoir size is insufficient for the system capacity. Replace the drainback reservoir with a larger size unit before resuming flushing procedure.