SOL-RELIANT™

The Solar Water Heater Built to Last

Installation and Operation Manual

MODELS:
SR 40/120 SE PVDB
SR 56/120 SE PVDB

IMPORTANT: Please keep this manual on site with the Sol-Reliant™ System

SOL-RELIANT™
The Solar Water Heater Built to Last

0326 SW Pendleton St. Portland, OR 97239 www.SolReliant.com
(503) 866-6437

Thank you for choosing a Sol-Reliant™ solar hot water heating system. You have invested in one of the most reliable and dependable solar water heating systems on the market. It will serve you for decades and pay for itself over and over.

Beyond the economics, thousands of pounds of CO2 will NOT go into the Earth's atmosphere each year because you decided to go solar.

More than twice the hot water, less than half the cost, and environmentally friendly– that's the value of your Sol-Reliant™ solar water heating system.

Your system consists of the highest quality components to give you many years of trouble-free performance.

This manual provides all the information related to the system and is intended to be for the benefit and use of the original owner, future owners, and as a reference for anyone who may be working on or around the system.

Please take a moment now to read **Monitoring Your System**, which explains how easy it is to make sure your system is always functioning properly. It is very easy to tell if the system is working.

Again, thank you for choosing Sol-Reliant. We appreciate your business. If you have any questions, or if we can be of assistance in any way, please do not hesitate to contact us.

Monitoring Your System

Once your system is fully operational, you can monitor it using two devices: the flow meter and the temperature gauge.

The flow meter is a visual site glass located near the top of the solar tank, and shows the current flow rate of your system. With maximum sun, the circulation rate will be about 2.5 gallons per minute. If there is no flow on a sunny day, or if there are excessive bubbles in the flow meter, this could indicate a problem. However, if the system has reached high limit, indicated by the temperature gauge being above 150 degrees F, it may have turned off automatically. For an accurate reading, hot water should be turned "on" for a few seconds somewhere in the house to move water from the solar tank past the temperature gauge.

The temperature gauge is located just above the solar storage tank, mounted on the "hot" pipe returning to the solar tank from the solar collector. The temperature gauge shows the temperature of the heat transfer fluid as it is being heated by the sun. In order to get an accurate reading, the pump must be in operation. *NOTE: This gauge does not tell you the internal temperature of the potable water within the solar storage tank. The temperature within the storage tank will be 20-40 degrees cooler than the temperature gauge reading.*

When leaving for extended periods in the summer or winter, there is no need to switch your system off.

You should check your flow meter and temperature gauge at least once a month.

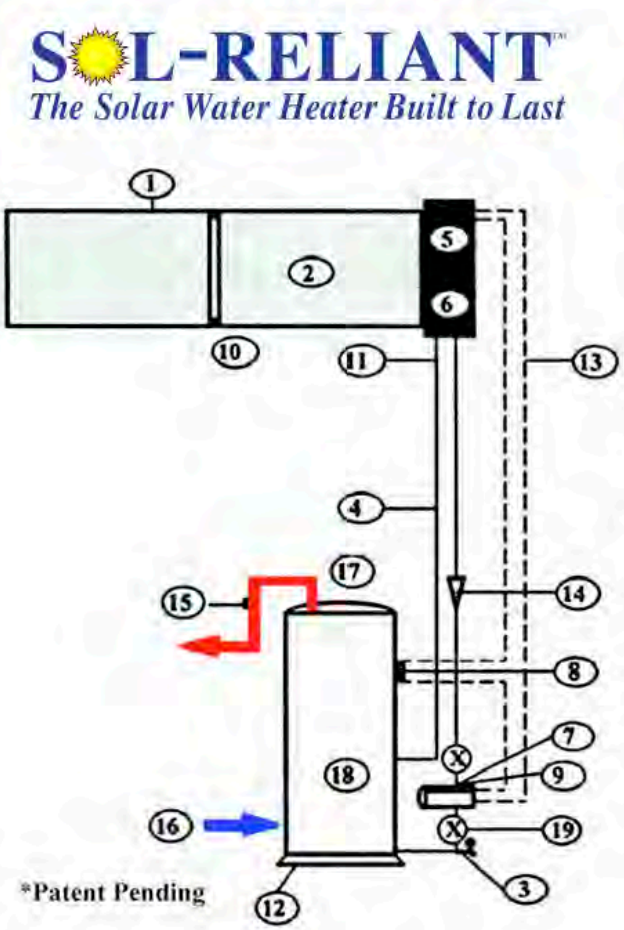
In case of emergency call your installer:

_____

or Sol-Reliant™ at (503) 866-6437

System Diagram

All the components of your system are listed in the diagram below:



1. AET High Efficiency Thermafin Collector
2. Low iron glass for maximum light transmission
3. Low point drain & fill valve
4. Warm fluid from solar collector
5. 30 watt photovoltaic (PV) module
6. PV module mounted to hide pipes (no visible plumbing!)
7. 12 volt DC pump powered by PV module
8. High limit switch to prevent excessive temperatures
9. Manual on/off switch
10. Drain back reservoir just below bottom of collector
11. Heat transfer fluid - food grade propylene glycol
12. Insulation pad and wrap according to OSEIA standards
13. 12 volt DC electrical conductors
14. Flow meter, measures gallons per minute
15. Temperature gauge, downstream mixing valve, and solar bypass valve to Brightway standards
16. Potable cold water in
17. Potable hot water out.
18. Stainless steel solar tank with double wall heat exchanger
19. Two isolating ball valves, above and below pump

How It Works

Your system is closed loop, which means the solar heating components including the collector, pump, heat exchange coil, and drain back reservoir are part of a closed circuit -– a closed circuit separate from the potable water system. When the sun comes out, a photovoltaic (PV) powered pump circulates the heat transfer fluid through the solar collector. The fluid gains heat and travels from the roof to the heat exchanger coils located in the bottom third of your solar storage tank. The solar-heated fluid warms the potable water in the tank before it continues back to the solar collector, where it gains more heat and repeats the process. The solar-heated fluid warms the potable water in the tank without contamination, safely isolated by an efficient, double-wall heat exchanger. The heat transfer fluid is freeze-proof because it is a combination of food-grade propylene glycol and water, or a mixture of distilled water and ethanol designed to prevent freezing 20 degrees below record temperatures for your area.

Before you had a solar system, the cold water from your water source went directly to your existing electric or gas water heater (hereafter referred to as auxiliary water heater). Now it goes to the bottom of the solar storage tank. The solar pre-heated water rises to the top of the tank due to stratification (hot water rises; cold water moves to the bottom). The solar pre-heated water then moves from the top of the solar storage tank to your auxiliary water heater whenever you turn on the hot water. The more the sun pre-heats the water, the less energy is required by your auxiliary water heater to bring the water in the tank up to the desired temperature. For instance, if the water heater element is set at 120 degrees F, and the sun has already pre-heated the water to 120 degrees or above, the element will not come on at all. If the solar pre-heated water is less than 120 degrees, the water heater element will turn on long enough to "boost" the temperature up to the thermostat setting.

Your solar system is fully automatic. The 12-volt DC pump is powered directly by the 30-watt photovoltaic (PV) module. The pump is self-regulating: the brighter the sun, the faster it pumps. Even on cloudy days there will be some solar gain. If there is no sun, the pump has no power to operate, and the system will be in a state of rest, or "drained-back." The solar loop is not pressurized. In the drained-back state, the thermal collector is empty. A length of 2" diameter copper pipe located just below the collector acts as a reservoir tank and holds enough fluid to keep the pump primed during circulation. With the pump off, the heat transfer fluid drains back into the reservoir tank by gravity.

System Components

Collector

The Sol-Reliant solar thermal collector uses AET Thermafin absorber plates. These are all-copper absorbers with a selective surfacing called Black Majic, which allows for optimum absorption in sunny or cloudy weather. This special surfacing gives you 96% absorption when light strikes the solar absorber plate with less than 10% loss through emissivity. The absorbers are housed in an anodized aluminum box, insulated with high-temperature rigid insulation around the perimeter of the box and on the underside of the absorber assembly. Low-iron, tempered glass allows the maximum amount of sunlight to enter the collector (over 90%). Flat plate collectors can easily last 50 to 100 years.

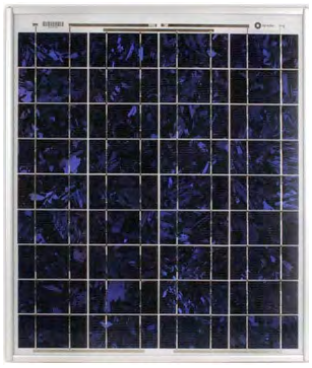
Tank

Your stainless steel storage tank has a capacity of either 80 gallons (Model # TMSS-80) or 120 gallons (Model # TMSS-120), depending on your system. A DWP (double wall with leak protection) type heat exchanger is coiled around the bottom one-third of the solar storage tank. The heat transfer fluid circulates through the solar collector and heat exchanger, warming the potable water in the tank.

Pump and Control

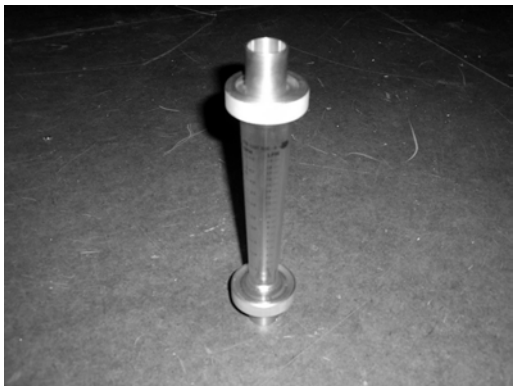
The Sol-Reliant uses a 12-volt DC pump to circulate the heat transfer fluid through the solar collector and heat exchanger. You should expect to see a flow rate of 1-3 gallons per minute at the flow meter, located on the plumbing of the solar storage tank (see below). Your system is self-regulating because the pump is powered by a photovoltaic module (pictured below). On bright, sunny days, the pump will run at the maximum speed for your system. On overcast days, the pump will run at a lower speed.

Photovoltaic (PV) Module



The 30-watt photovoltaic module collects energy from the sun to power the pump (pictured above).

Flow Meter



The visual site glass located near the top of the solar tank shows current flow rate of your system. The Pentair LDF 360B shows flow from 0.5 gallon to 5 gallons per minute. With maximum sun, the meter will show about 2.5 to 3 gallons per minute.

Temperature Gauge

Located on the return line from the solar collector, shows the temperature coming off the roof. The heat in the fluid is transferred to the water in the tank. Therefore, the temperature of the water lags behind the temperature on the gauge until late in the day when the tank “catches up.”

Tempering Valve

To protect from scalding when the solar pre-heat temperature is higher than 120 degrees, a tempering valve is installed just before hot water enters the building to automatically allow cold water to mix with hot so a consistent temperature is passed to all the hot water faucets. This valve is adjustable from 110 to 160 degrees. It is possible to have 160-degree solar heated water stored in your tanks, yet the temperature entering the building is never above that of the tempering valve setting.

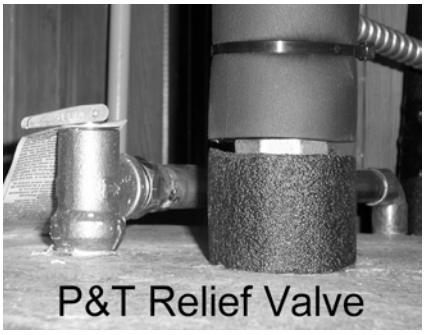
Heat Transfer Fluid

The Sol-Reliant system uses a Class II heat exchange fluid consisting of either food-grade propylene glycol or a mixture of ethanol and distilled water in the solar loop plumbing as a heat transfer fluid. A 50% glycol solution or 50% ethanol solution is adequate to protect from freezing down to -28 degrees F.

Roof Flashing

All plumbing penetrations through the roof are flashed. The Sol-Reliant uses no-caulk flashings for all other flashings, one for each of the standoff brackets that support the collector and another for the electrical weatherhead.

Pressure and Temperature Relief



The Solar Pre-Heat Storage Tank includes a temperature and pressure relief valve (P & T valve) located on top of the tank. This is an emergency over-temperature and over-pressure valve to protect the tank. If the valve opens for any reason, water under pressure will discharge for a several seconds.

Toggle Switch and High Limit Switch

The pump circuit contains two switches: One is a manual "On/Off" switch located on top of the grey electrical box that is attached to the tank next to the flow meter. The other is a high limit switch installed against the internal wall of the solar storage tank behind the grey box. In order to preserve the heat transfer fluid, this White-Rogers #3 LOI-181 switch will open the circuit to the pump (which shuts the pump off) when the internal tank temperature of the potable water is at 160 degrees F. In the event the temperature reaches 160 degrees in the top of the solar tank, the system shuts down. The switch will close at 140 degrees enabling the pump to operate again if there's sun.

NOTE: When the pump shuts off, the fluid in the collector drains back into the reservoir mounted behind the solar thermal collector. This results in the collector being empty or

"stagnant." Even though the collector can achieve temperatures approaching 400 degrees F, it is harmless for it to be empty. Since the heat transfer fluid drains out of the collector into the reservoir, it is protected from the excessive temperatures that can cause it to degrade.

Piping materials

Due to the high temperatures that can occur in a solar water heating system, only copper pipe is used. Type "M" copper is used on the closed solar loop piping. Any threaded piping or threaded fittings in the system are of brass. Unions are also of brass and have no gaskets. Both solar loop and potable piping are insulated with minimum R-6 high temperature closed-cell pipe insulation.

Reservoir

The Sol-Reliant system features a uniquely integrated, hidden drain back reservoir. A copper pipe holds enough heat transfer fluid to keep the pump primed, a custom 2" diameter pipe running the full length of the collector. When the pump comes on, fluid from the reservoir feeds the suction side of the pump. As fluid fills the copper tubing in the solar collector, the reservoir level drops. Once the copper tubing in the collector is filled, fluid returns through the reservoir back to the suction side of the pump. The reservoir, therefore, never becomes empty, and the pump always has prime. When the pump shuts off, the fluid drains back into the reservoir, and air rises into the solar collector. When the system is inactive, the reservoir holds slightly more fluid than the volume contained in the solar collector. The reservoir is enclosed in a metal shroud, which is lined with Tekfoil, an insulation and radiant barrier.

Pipe Insulation:

3/4" wall closed-cell Armaflex is used to insulate all heat carrying lines. Any exterior insulation is protected from UV deterioration with PVC jacketing.

Installation Instructions

Pre-installation planning

Tank location: The solar tank is 29" in diameter (not including the pipe tree with pump assembly and 62" inches tall (not including any piping). If a tank drain pan is needed, you will need a 32" pan.

Collector Location:

Shading- The top priority is to always locate the collector where it will get the best exposure to the sun, especially the PV module. Stay away from trees and other shading as much as possible. Locate the solar collector high on the roof near the peak to minimize present and future shading. There should be no shading between the hours of 10 a.m. to 4 p.m.

Tilt and Orientation- The optimum tilt and orientation for your location can be obtained from your state energy office or www.nrel.gov. As a rule, tilt and orientation are critical, but concessions can be made in most cases to "flush mount" the solar collector to an existing roof pitch with only nominal losses in efficiency.. Usually, orientation can be 20 degrees east or west of optimum with negligible energy loss. The collector can be mounted flat if necessary but some degree of tilt is recommended.

Types of roofs - Instructions are included in this manual for composition, cedar shingle and cedar shake roofing. For tile, metal, built up or other, contact Sol-Reliant or your dealer for supplemental pages dealing with specific mounting instructions for your type of roof

Mounting hardware included with the Sol-Reliant system consists of a minimum of 4 UniRac 7" two piece standoffs placed about 8 feet apart in two rows. Additional brackets are available if desired or needed (steep pitch, high winds or heavy snow loads). Your local building department will be helpful in determining to what extent the new roof load from the solar collector needs support.

Ground Mounting. If installing a ground mounted Sol-Reliant collector, the bottom of collector must be higher than the top of the heat exchanger (about the middle of the solar storage tank) to facilitate a full gravity drain of the collector fluid.

Solar Loop Plumbing: The maximum one-way length using 3/4" copper pipe is 100 feet. Using 1" pipe the maximum one-way distance is 150'. All plumbing lines in the solar loop must have continuous fall (downhill slope of at least 1/8" per horizontal foot) from the bottom of the solar collector to the top of the heat exchanger. The distance between the solar tank and the collector should be kept to a minimum.

Potable water. An expansion tank is necessary if a check valve or back-flow prevention device is present in the incoming water supply. To maximize the operational life of the solar storage tank the potable water supplied to the system shall have: a) less than 1000 parts per million (ppm) total dissolved solids, b) less than 500 ppm total hardness, and c) less than 400 ppm total alkalinity. If necessary, an adequate filter or other water treatment equipment should be installed upstream of the solar tank to insure water quality at the levels listed.

Wire runs. To ensure less than a 2% voltage drop # 10 wire for runs of 100' to 150', # 12 for runs under 100'. **NOTE:** NEC Code requires all photovoltaic circuits that enter a building or structure to have their wiring contained within metallic conduit or raceways between the point of penetration and the first readily available disconnecting means (the toggle switch located on the Sol-Reliant storage tank).

Installing the Collector - Rooftop Installation

STEP 1 (ROOF): Determine where on the roof you want the collector to be placed. Including the width of the PV module, the collector will occupy a footprint of 15'9" from side to side by 46-1/2" from top to bottom. **NOTE**: the Sol-Reliant collector must slope no less than 1'4" and no more than 1/2" from the high side of the collector to the low side where the pipes

come out of the collector. In other words, there should be a very slight slope. In no case should the collector slope away from the piping. It is recommended that the collector be mounted so that the top is at least a foot lower than the peak of the roof. Before leaving the roof and heading for the attic, take a measurement from the peak to where you have determined to place your top-most brackets. Remember this dimension.

STEP 2 (ATTIC): From inside the attic near the peak, locate the rafter or truss, which will be in the center (side to side) of the collector. Measure 4' to either side of this member and mark those rafters. Having determined approximately how far down the roof you want your top-most bracket, measure precisely from the peak and mark. Start with the rafter that will be further away from the plumbing penetration. The measurements on the rafter closer to the plumbing penetration will be made exactly 1 (one) inch lower down the roof. (Since the rafters you are mounting to are 8' apart, placing the brackets that will be closer to the plumbing penetration exactly 1" lower than the other set will automatically give you the optimal 1/8" per foot of slope throughout the entire collector.) Using a long, small diameter drill bit (1/8" or smaller) drill a hole up through the roof at the marked location tangent to one face of the proper rafter. Measure 44-1/2" down from the first hole and drill a second along side of the same rafter. From the attic, you will have drilled 4 holes, 8' apart marking the location of all four mounting brackets that will support the Sol-Reliant collector.

STEP 3 (ROOF): Going back onto the roof, measure over 3/4" from the guide holes and make vertical mark over the centers of the two rafters designated for mounting. Make a horizontal mark across the vertical at exactly the same distance down the roof as the hole you drilled up from the attic. Place the top hole of the power post base over your mark and drill a pilot hole through both holes in the base. Cut out the composition so that the top edge of the no-caulk will be under at least two courses of roofing and the center hole will be in the proper position to accept the standoff post. Then, cut a hole through the lower layers of composition down to the sheeting, to ensure that the base is mounted flush and solid to the roof. This hole should be just larger than the power post base. Position the rest of the standoffs in the same manner, making sure that the set closer to where the pipes will go through the roof is lower so that the collector slopes the correct direction (i.e.: falling to the right for a right hand collector, or left for the left hand collector).

STEP 4 (ROOF): Install all four standoff bases using the stainless steel lag bolts provided (5/16" by 4"). Put the lag bolts through the holes in the bases and bolt them into the pilot holes you drilled in Step 3. Stick the standoff posts through the gasket hole of the no-caulk flashings, then slip the no-caulk flashing into the position you cut out in the roofing in Step 3. Screw the standoff post onto the base. **Make sure that it is not cross-threading** and that it screws all the way down. Using the 3/8 bolts provided, attach the four UniRac 2x3" L-feet to the top of the standoff posts so that the 3" leg is upright and the 2" leg points directly at the other stand off on the same rafter.

STEP 5 (ROOF): Re-check your measurements. The collector is 46-1/2". The space, top to bottom between the inside face of L-foot bracket should be approximately 1/8" wider than the SR collector dimension. The L-feet have slotted holes to allow for corrections. Make sure that these bolts are tight, before moving to Step 6, since the collector will then be covering them.

STEP 6 (ROOF): With the help of at least one assistant, set the Sol-Reliant collector on the mounting brackets. Measure from the outside edge of the L-bracket to the outside edge of the collector on each side, slide the collector side to side until centered (centered without regard for the PV module. Factoring the PV module into the dimensions always makes the collector looking "funny"), that is, the two dimensions between L-foot and collector edge are the same distance.

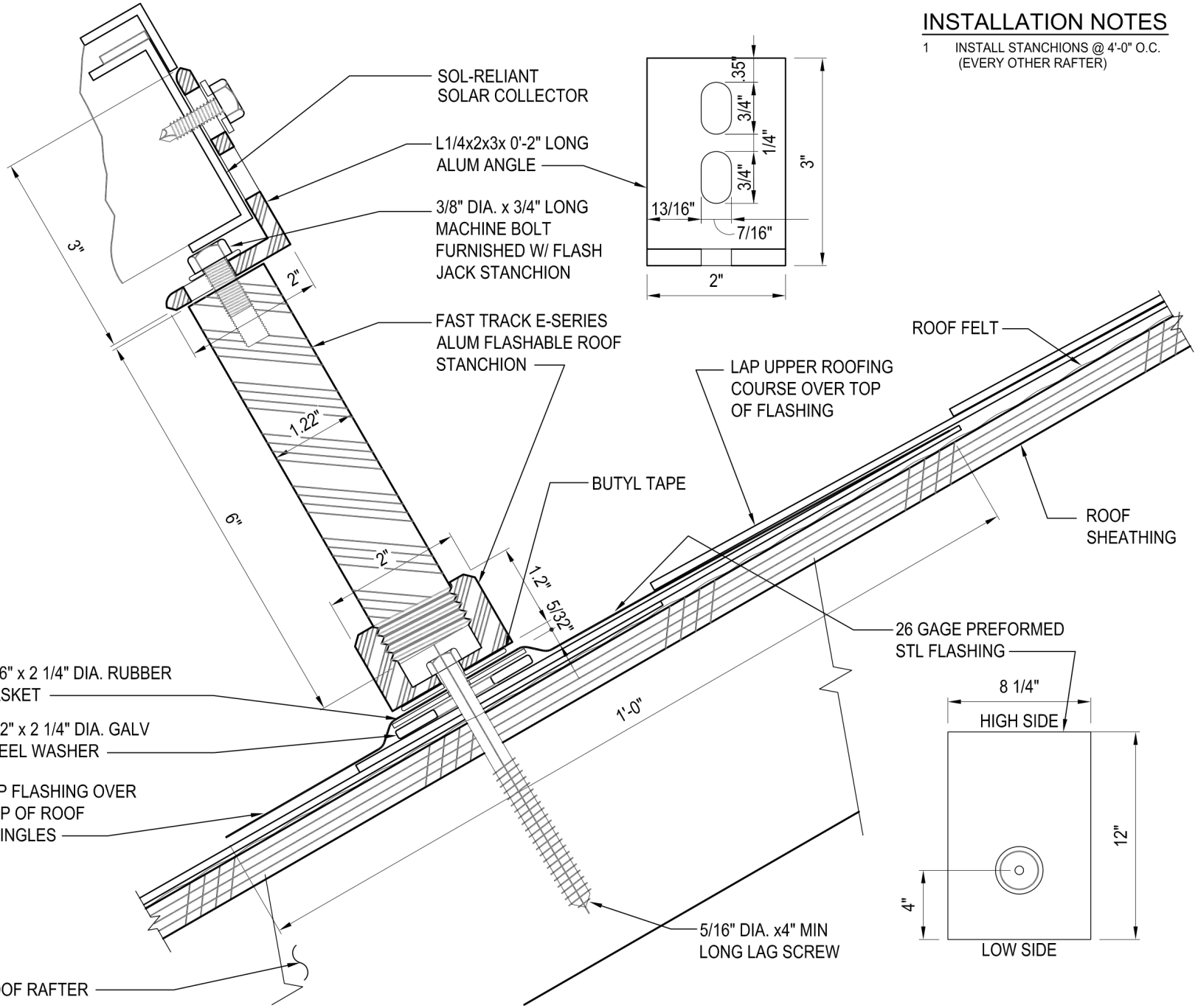
STEP 7 (ROOF): Once collector is centered, mark where pipes will go through the roof. Use a Dixon or other crayon to make this mark (yellow tends to be the most visible). Get your eye close to the roof and make a vertical line at the midpoint between the two unions. Move to the side of the collector and repeat the process, this time making a horizontal line. When you're done, you will have made a crosshair that precisely marks the center point between the two unions, both left and right and up and down. Now, slide the solar collector away from the mark. Using your mark as the center hole, drill a 4" hole in the roof. (**NOTE:** There should not be a rafter below, but in the case of irregular or uncommon rafter spacing, you will want to drill a test hole first to make sure you are clear of all structural members in the attic. Adjust the final positioning of the solar collector as necessary.)

STEP 8 (ROOF): Install stainless steel flashing centered over the 4" hole. Make sure the top edge of the flashing is under more than one course of roofing. No caulk should be necessary. Take the 4" rubber cap-all and place it underneath the unions on the collector. Make sure that it is no farther up or down the roof than the 4" collar on the flashing. Press the cap-all up against the unions on the collector. This will leave impressions in the rubber on top of the cap-all. Using these impressions as marks, drill through the cap-all with a 5/8" hole saw.

STEP 9 (ROOF): Solder the removable union halves from the collector onto the ends of the two lengths of soft copper tubing provided. Slip these through the 5/8" holes in the cap-all with the union halves up. Place the cap-all on the 4" collar of the stainless steel flashing, sliding the soft copper tubing through and into the attic. Make sure the cap-all seats all the way down on the collar and that the 4" hose clamp is in place (but not tightened) around it. **Take note of the union that is <u>higher</u> and to the <u>inside</u> of the other union. This is the <u>outlet</u> from the "Fat Tube" drainback reservoir. <u>It is the HOT RETURN PIPE from the collector.</u> You'll have to remember which is the supply and which is the return line for the final hook up.**

STEP 10 (ROOF): Positioning one installer at each end, slide the collector into place, making sure that the union halves line up with their respective mates. Make sure the collector is resting in place in all 4 brackets. Tighten the unions. **Use two wrenches, <u>one on each side</u> of the union, applying equal and opposite pressure. (Your warranty doesn't cover damage you inflict yourself.)**

STEP 11 (ROOF): Double check that the collector has slight downward slope (1/8 inch / ft.) toward the roof flashing. You are now finished on the roof for the time being. Run one 1" TEK screw **(NO LONGER THAN 1 inch)** through the top of both vertical slots of each of the 4 L-feet and into the side of the solar collector. Do not over tighten. Tighten the rubber boot onto the flashing via the stainless steel clamp on the boot.



INSTALLATION NOTES

1 INSTALL STANCHIONS @ 4'-0" O.C.
(EVERY OTHER RAFTER)

SOL-RELIANT STANCHION DETAIL

SCALE: HALF SCALE JAN 24, 2011

THIS DETAIL ONLY REFERS TO INSTALLATION
OTHERS TO PROVIDE STRUCTURAL STAMPED
CALCULATIONS VERIFING THIS DESIGN

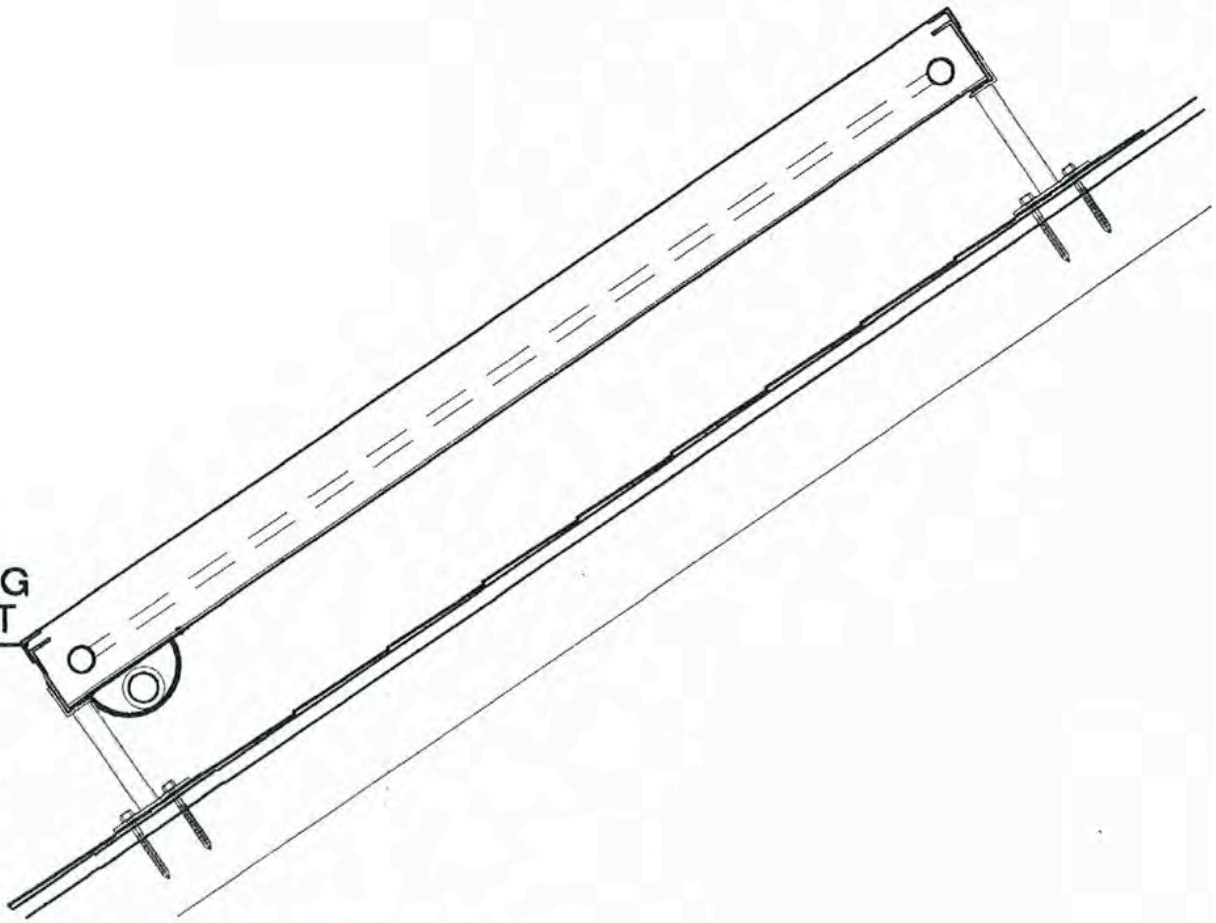
O H Architecture, PC
Eric Hess, NCARB
3805 N Michigan Ave.
Portland, OR 97227
ph: (503) 816-4858

SOL-RELIANT MOUNTING

6125 NE, Portland, OR 97213

APPR: egh
DATE: Jan 24, 2011
PROJ: -
FILE: a1 11x8 ps.dwg

A1

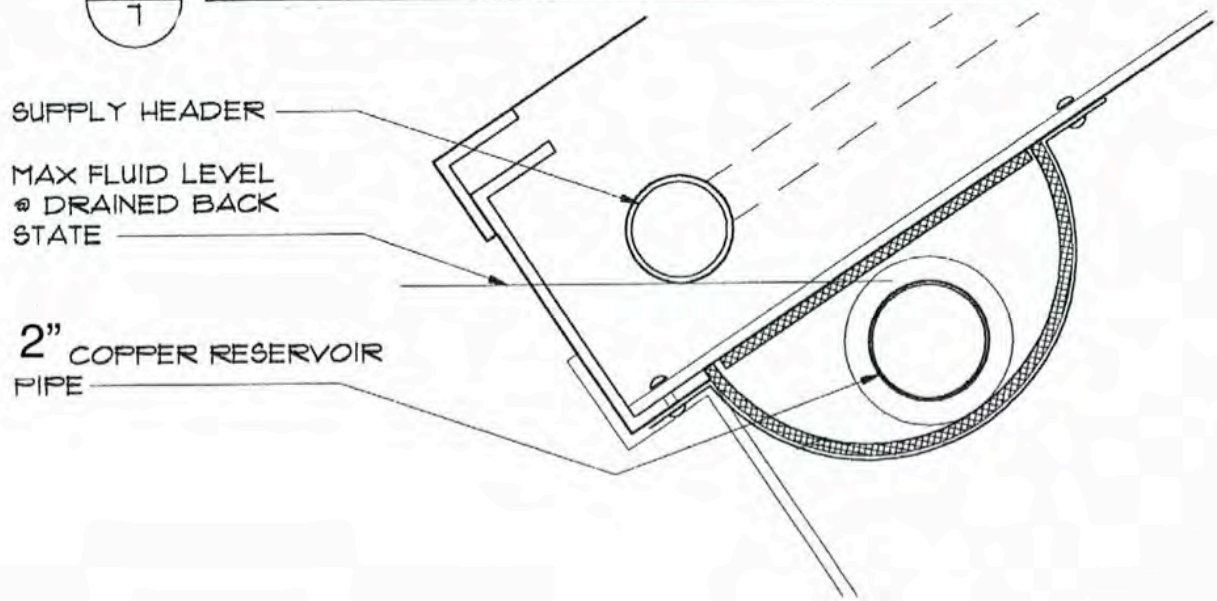


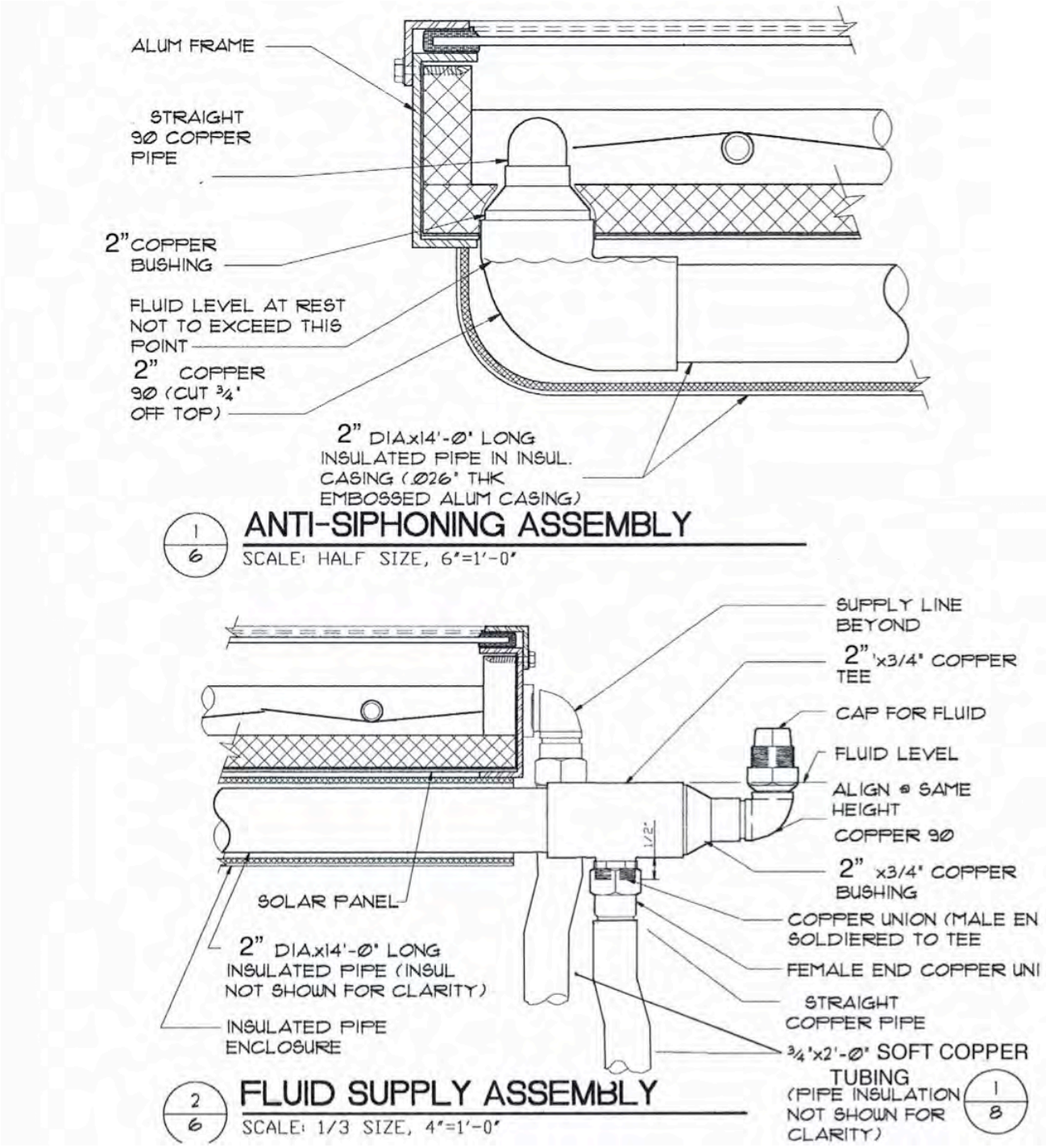
1/7 **MOUNTING BRACKET**

NO SCALE

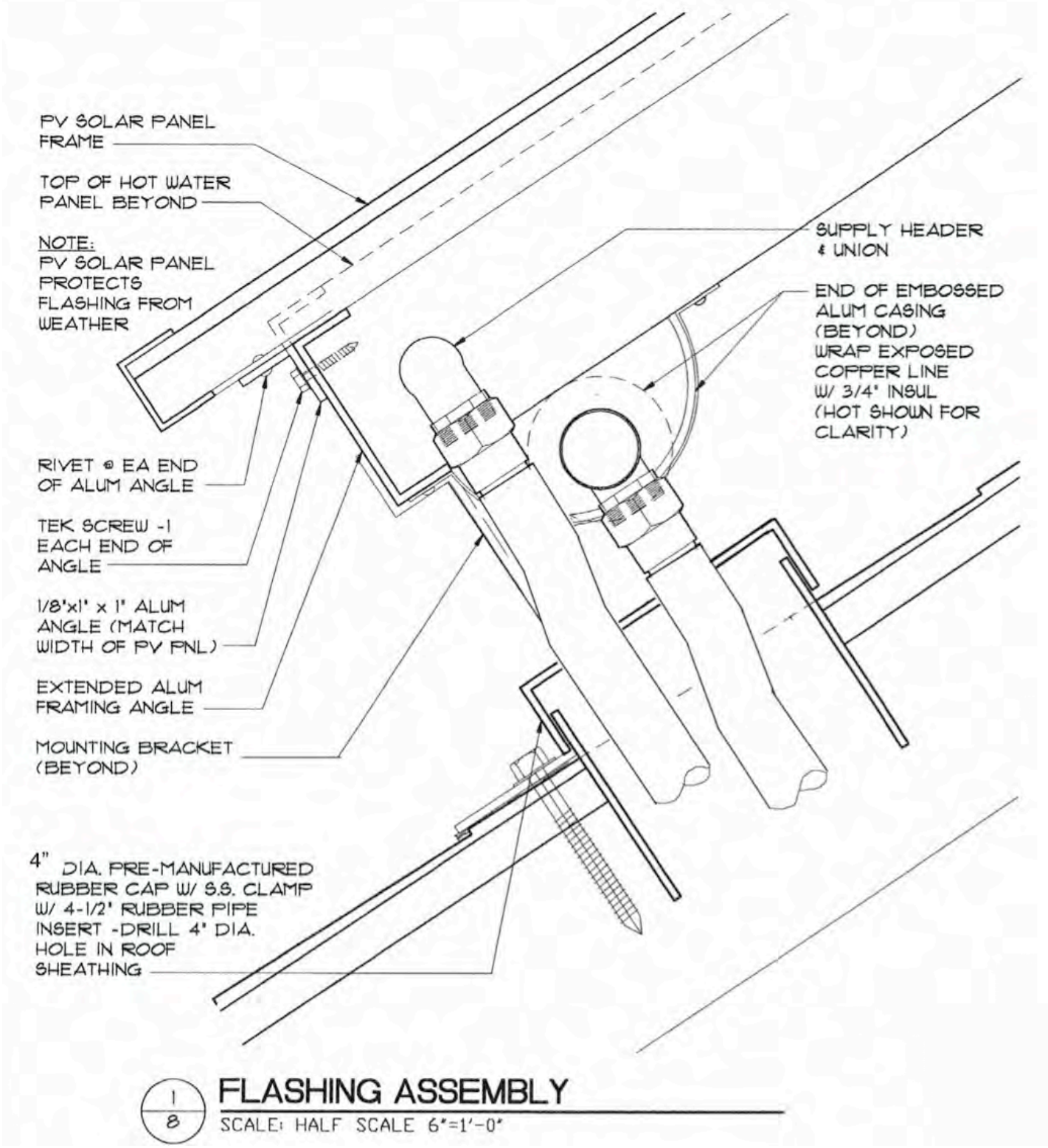
SHOWN WITHOUT NO-CAULK FLASHINGS

2/7 **SECTION THRU PANEL**





The "Anti-Siphoning Assembly" consists of brazed fittings configured so that the reduction in pipe size is done in the vertical rather than horizontal plain. This prevents any possibility for thermal siphoning.



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FLASHING ASSEMBLY

SCALE: HALF SCALE 6"=1'-0"

Installing the solar tank & completing the solar loop

Your Sol-Reliant system comes with the lower portion of the solar loop pre-plumbed and pressure tested. The pump (with both its manual and high-limit switches) is installed on the tank. The pump is attached to the "supply line" (the pipe in which fluid goes up to the collector). The Flow meter is installed in the line above the pump. Isolation valves are located on each side of the pump, and a Drain/Fill Valve is at the low point in the solar loop on the pipe below the pump. The other pipe attaches to the "return line" from the collector. Fluid travels downward inside this pipe from the outlet port on the fat tube at the collector.

STEP 1: Set the tank. Place the solar storage tank on the insulation pad provided. It must be level, and strapped to the wall for earthquake protection in areas where code requires. Level the tank with shims, if necessary. Larger shims, cedar shingle size, work best.

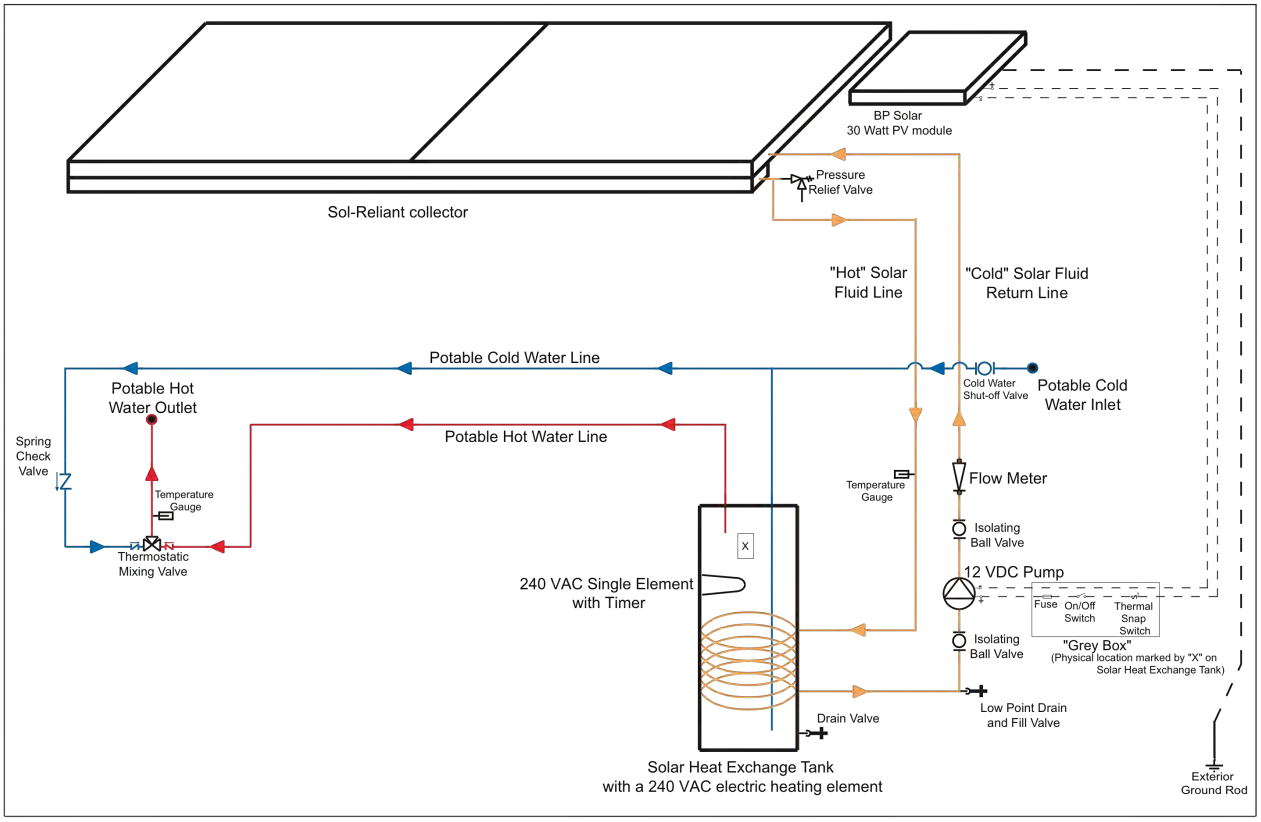
STEP 2: Plumb the solar loop, using Type M copper pipe. Remember to maintain constant downhill fall between the solar collector and the tank. Strap vertical and horizontal pipes every 6'. Use two hole pipe clamps, plumbers tape, or other strapping that can be attached outside the pipe insulation. Attach in such a way that the insulation is not compressed. Check horizontal runs for fall. Piping must be installed in such a way that the performance of any structural member or fire rated assembly is not compromised. Local building codes will dictate what is allowable.

STEP 3: Pressure test the solar loop. Temporarily install a brass plug in the threaded female fitting located on the collector near the pipes. Although this fitting is temporary you should wrap the threads to minimize the possibility of leaking. Using a Female Hose Bib Thread by Male NPT Adapter screwed into a Pressure Gauge with a Schraeder (or "Tire Type") Valve and an air compressor, fill the system with air from the Drain/Fill Valve at the bottom of the piping below the pump. These are simple off the shelf gauges available at hardware stores and plumbing supply stores. Make sure that the hose bib is open. You test the system to at least 60 psi. In the event of a leak, a soapy water solution will cause bubbling to result at the leaky joint(s). The pre-assembled system components from Sol-Reliant have been pressure tested, so check your work before examining fabricated components. Once the system holds pressure, you may move on to flushing and charging the system.

Potable water plumbing

STEP 1: Turn off the 220VAC breaker that supplies electricity to the water heater element. Then shut off the cold water supply to existing water heater. Drain the entire tank. Your existing tank holds 40 to 80 gallons of water. Once the tank is empty and all wiring and plumbing has been disconnected, remove it.

STEP 2: Lay the insulation pad provided on the footprint where the solar tank will go. Set the solar tank on the pad. You are now ready to route the cold water supply to the solar tank.



STEP 3: Place a Tee in the line downstream of the shut off valve. From one of the two open ports of the Tee, plumb to the cold inlet port on the top of the solar tank. The remaining open port of the cold water tee needs to be plumbed to the cold side of the tempering valve (marked "Cold").

STEP 4: Complete the plumbing of the tempering valve. From the "Hot" outlet port water heater, plumb to the "Hot" side of the tempering valve (marked "Hot"). From the "Mixed" port (in the middle) of the tempering valve, plumb to the hot water service to the house.

STEP 5: If a pressure reducing valve, check valve, or back flow preventer is installed on the incoming water supply, a properly sized expansion tank, usually 12 gallons, must be installed on the potable supply to the solar system.

STEP 6: You can now turn the water back on from the main hot water shut off. It will take the solar tank a while to fill. Turn on a hot water valve somewhere in the building to let air escape. Allow water to run for several minutes after air is purged in order for flux and impurities in the lines to clear.

Wiring the pump: Part I

The 12-volt DC Laing pump has a manual "on/off" switch located on top of the grey junction box mounted to the solar tank. Keep the pump switched "off" until wiring is complete.

The Sol-Reliant system comes with two MC (MultiContact™) Cables on the roof for quick connecting and disconnecting of the solar module. Two more MC cables are wired onto the module before shipping. The two MC cables are inserted through a weather head into a metallic junction box in the attic.

STEP 1 (ATTIC): Install a 4 Square metallic junction box near the plumbing penetration. Attach it to a convenient rafter or truss in the attic.

STEP 2 (ROOF/ATTIC): Install the short length of EMT and the roof flashing. Connect the EMT to the metallic junction box using the EMT connector provided.

STEP 3 (INSIDE): Run 10/2 with ground Metal Clad pre-wired flex conduit from the tank-mounted junction box to the metallic junction box in the attic. EMT or unwired flex can be run if desired.

STEP 4: (ATTIC): Wire the MC Cables to the ends of the 10 AWG conductors inside the junction box. Close the junction box.

Flushing and charging the solar loop

Flush the system to clear flux and other debris from the solar loop. First, remove the brass plug on the collector that you installed to pressure test the system. Prepare to flush the solar loop by attaching a washing machine hose from the hose bib at the bottom of the solar tank to the Drain/Fill Valve on the solar loop (the two hose bibs are just a few inches apart. Open the valve on the solar loop, then, **slowly** open the valve on the tank and **slowly** fill the system. Continue to fill until water overflows on the roof. Allow the flow for 10 minutes or more. Shut water pressure off and drain into a 5-gallon bucket and note how much fluid the system takes. If the pipe run is longer than 70 ‘ (one way) or pipe size greater than 3/4” is used, it would be advisable to have a second bucket on hand. This will help you determine the amount of heat transfer fluid necessary to charge the system. Fill and drain several times until water in solar loop is clear. Drain the final flushing charge and prepare for the operational charge.

Having determined the amount of fluid needed to fill the system, place that amount in a clean bucket in ratio to the heat transfer fluid needed. Example, 4 gallons needed to operate the system, 50% glycol mixture for the subject climate, use 2 gallons of glycol and 2 gallons of distilled water OR if ethanol is used, 2 gallons of ethanol and 2 gallons of distilled water. With solar circulating pump **turned “off”** use an auxiliary pump to fill the system. Pump fluid into the solar loop using a high-head pump. Fill slowly, until fluid gently overflows from the roof. **NOTE:** Both propylene glycol and ethanol are non- toxic. If you do not have access to such a pump for filling the system, it is possible (with the aid of a funnel) to pour fluid into the system from above This is very time consuming, however, because air has to escape from the same port as you **slowly** fill the system.

Once the solar loop is full, make sure that fluid level remains at the top of the port, adding fluid to top off if necessary, and allowing time for air bubbles to rise and escape to the atmosphere. When at rest and full, proceed to the next step

Insert the pressure relief valve in the female threaded fitting attached to the collector. Use Teflon tape AND pipe dope on the threads. Use **two** wrenches to tighten, **applying equal and opposite pressure**. NOTE: When you head to the roof to do this, bring the PV module and be ready to finish the rooftop portion of the PV circuit as outlined in the Wiring the Pump Section.

Wiring the Pump: Part II

STEP 1: Mount PV module to the collector. Place the bottom of the module on the extrusion and secure it with Tek Screws. Attach the top of the module to the side of the collector through the back of the triangle bracket. Make sure to use the shim taped to the backing of the PV module or the module will sag.

STEP 2: Connect the MC Cables. You're done on the roof.

STEP 3: Back at the tank, inside the grey junction box there are two wires that come in through the bottom from the pump. The red wire from the pump must connect to the fuse block then to the PV positive. The black wire is the negative. With the PV module wired into the circuit, check with a DC voltmeter to determine positive from negative. Even without sun the voltmeter will still give you a polarity reading.

IMPORTANT: Polarity is critical. The PV positive must go to the red wire of the pump. If reversed, the pump will fail immediately. Turn the PV pump switch on (up) when wiring is complete & checked (as above) for automatic operation!

Operation and Maintenance

The Sol-Reliant system is designed to operate for 20+ years with no required maintenance. After 10 years it is advisable to check, and possibly change, the anode rod in the solar tank.

The beauty of the PV-powered drain back system is that it requires almost no servicing. The system can operate on the hottest day of the year and the coldest day of the year. You can tell your system is working when the sun is out because the pump makes a discernable sound, and flow will be indicated in the glass flow meter located to the side and near the top of the solar storage tank. The temperature gauge tells you the temperature. To get an accurate reading at the temperature gauge, you must first run some hot water in the house.

When leaving home for extended periods it is not necessary to turn off your Sol-Reliant system. The system will shut itself off automatically once high temperature limits are reached.

The pump isolation valves just above and below the pump should always be fully open. They are there only to facilitate pump replacement without draining the solar loop.

The low point drain at the bottom of the solar loop has a threaded cap covering it. This is to protect against accidental draining of the heat transfer fluid. Three inches to the right, a corresponding hose bib on the potable water side of the solar storage tank is not capped. It can

be opened for periodic flushing of the bottom of the tank until rust and sediment clears. Usually a few seconds once a year is all that is needed. However, the heat transfer fluid should never be drained except for re-roofing, or for testing or changing fluid. The cap should be securely fastened and left in place once the system is charged and fully operational.

Troubleshooting

The following are the only failure possibilities of the Sol-Reliant drain back system:

System not turning on when sun comes out: This is most likely a bad connection between the solar PV module and pump. Modules almost never fail. The pump has more than a 20-year lifetime.

Pump is running but the flow meter indicates there is no flow. This is usually caused by a lack of sufficient operating fluid, possibly indicating a leak somewhere in the solar loop. Alternatively, the *pump itself may have failed*.

System is not shutting off at high limit, System is overheating: The high limit switch may have failed. Turn the system off (see "Toggle Switch and High Limit Switch," for the location of the On/Off switch) and run hot water out of any faucet in the building for a few minutes. Call your solar contractor. NOTE: Water coming from the tap will not be hotter than the setting on the tempering valve.

Hot water coming into the house is too hot: This may be a problem with your thermostat setting on the auxiliary heating element or the setting on the tempering valve. Try adjusting the tempering valve to desired temperature.

Hot water coming into the house is lukewarm: This may be a problem with your thermostat setting on your auxiliary heating element or the setting on the tempering valve. Try adjusting the tempering valve to desired temperature.

Re-roofing

The Sol-Reliant was designed to require the minimum possible time to disconnect and remove for re-roofing.

STEP 1: Turn the pump switch to "OFF".

STEP 2: Drain 2-3 gallons of solar heat exchange fluid into a container that can be stored. Drain from the low point solar loop hose bib below the pump near the solar tank.

STEP 3: Loosen the copper unions on the solar pipes at the collector. Be sure to use two wrenches and apply equal and opposite pressure so as not to torque and twist the pipe.

STEP 4: Disconnect the electrical connections to the photovoltaic module.

STEP 5: Remove the hex head screws that hold the solar thermal collector to the mounting brackets.

The solar thermal and photovoltaic collector should now be free to lift off and place to the side so that the area under the collector can be re-roofed. Once the new roof is in, the Sol-Reliant collector is ready to reinstall. Take the removal steps in reverse order to reinstall the Sol-Reliant.

STEP 1: Place collector onto the mounting brackets. Screw in tech screws in the exact location from which they came.

STEP 2: Make electrical connections.

STEP 3: Re-plumb pipes together at the unions. Remember to use two wrenches, tighten with equal and opposite pressure until tight.

STEP 4: Re-install operating fluid. This may be poured in at the reservoir pressure relief port or pumped in from the bottom drain port if an auxiliary charging pump is available. Use Teflon tape when reinstalling the pressure relief valve. Use two wrenches.

STEP 5: Turn pump switch to “ON".

For any questions you might have about your system contact your installing contractor:

Contractor Name: _____

Phone: _____

For any questions you have about your system contact your solar contractor or call Sol-Reliant (503) 866-6437

(***Single Tank Systems Only)***

WH40 ELECTRIC WATER HEATER TIME SWITCH

DOUBLE POLE, 10,000 WATTS (40 AMP) MAX., 250 VOLT - 60 HZ.

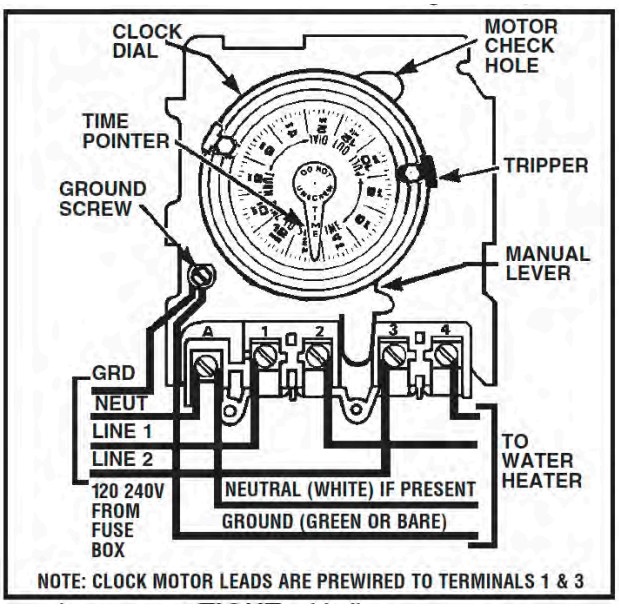
® LR3730

C US

This **Time Switch** will repeat a preset schedule daily, except when the **EXTERNAL MANUAL LEVER** is used. This manual lever permits the user to turn the water heater **ON** and **OFF** ***ahead*** of the schedule. The Time Switch will resume the preset program by the next scheduled **ON** or **OFF** operation.

NOTE: The manual lever is inoperative for 15 minutes immediately after the automatic operation.

The diagram on the right shows the mechanism and wiring of this Time Switch. The **TIME POINTER** is used to line up the correct time-of-day on the **CLOCK-DIAL**. The **ON** and **OFF TRIPPERS** turn water heater **ON** and **OFF** at the times indicated by their respective position on the **CLOCK-DIAL**.



TO SET PROGRAM

First, mount silver finished (ON) trippers at times you wish water heater to start operating. Place black (OFF) trippers at times you want to turn water heater **OFF**. Fasten trippers to dial by pushing them against the edge of the clock dial, then turning screws **TIGHT** with fingers.

Second, **PULL** clock dial out (toward you) and turn in either direction until correct time-of-day (the time now, when switch is being put into operation) is directly under the time pointer. *Do not move pointer.*

Third, close Time Switch cover. **Make sure it is latched and locked, if needed.**

AFTER POWER FAILURE (or if water heater was disconnected at the main panel), you must reset clock dial to the proper time-of-day.

TO SUSPEND AUTOMATIC OPERATION - Remove trippers from dial. Set manual lever as desired.

CAUTION: ***Always disconnect power at main panel before servicing this Switch or the water heater.***

INTERMATIC INCORPORATED
SPRING GROVE, ILLINOIS 60081-9698

158WH11272

DBS Thermomiser™ Storage Tank

Available in 80 and 120 Gallon Models
▶ 10-Year Limited Tank and Parts Warranty*

- Tank Construction of type 316L Stainless Steel with tolerance for high temperatures. Superior resistance to corrosion.
- High output 304 stainless steel submerged heat exchanger provides maximum efficiency to transfer the energy from the solar panels into hot water.
- High output electric back up element, constructed of high grade stainless steel incoloy making it more resistant for longer life.
- Environmentally safe CFC free water blown, extra thick foam insulation allows less than 1/2 degree F per hour heat loss, the best in the industry.
- Outer shell constructed of silver finished durable plastic for rust and impact resistance which prolongs tank life.
- Easy to install and maintain
- Factory supplied Temperature and Pressure Relief Valve
- SRCC OG300 Certified-applies to Federal Tax Credit when connected to an AET Solar Collector.
- Choice of 80 and120 gallons; storage tank with single element water heater.
- Heaters furnished with standard 240 volt AC, single phase non-simultaneous wiring and 4500 watt heating element

* See Residential Warranty Information Brochure for complete warranty information.

Description			Roughing in Dimensions (Shown in inches)		
Gal. Cap.	Model Number	Element Wattage Upper	Height	Diameter	Approx. ship weight (lbs)
60	TMSS-60	4500W	51.68	23.23	115
80	TMSS-80	4500W	70.00	23.23	146
120	TMSS-120	4500W	74.00	27.23	215

Stainless Steel Coil Data

Maximum Pressure 150 PSI
Maximum Temperature 210^0 F

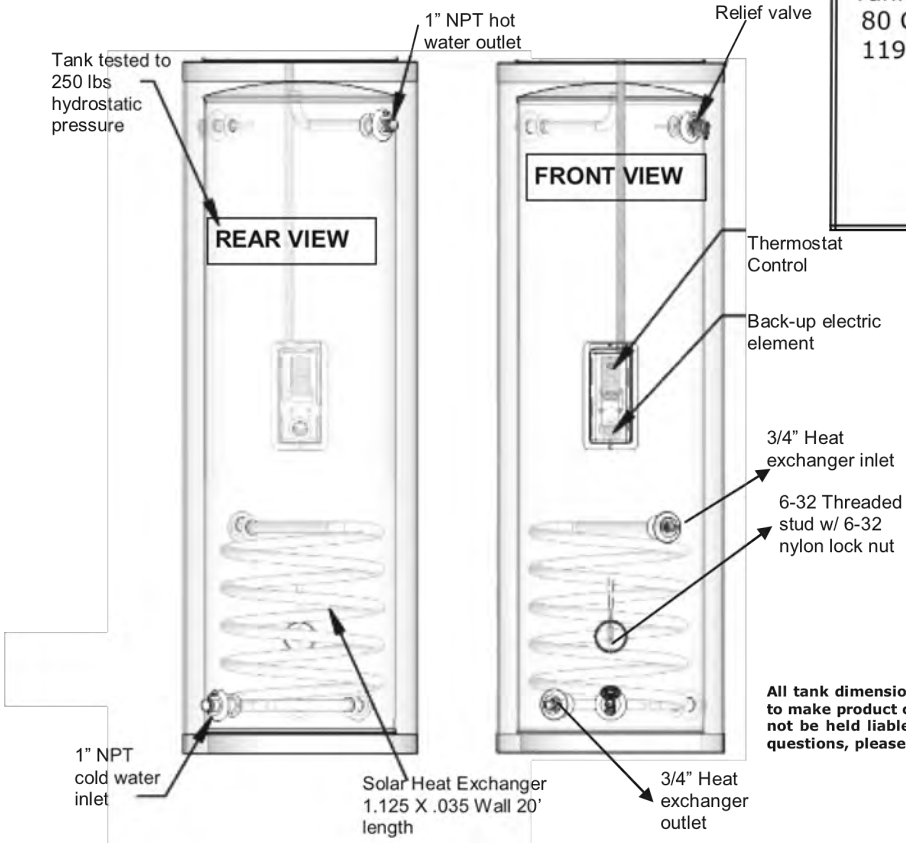
All tanks use the same heat exchanger, 1" ID:

Pressure drop at 1 GPM = 0.5′
Pressure drop at 2 GPM = 0.8′
Pressure drop at 3 GPM = 1.5′
Pressure drop at 4 GPM = 2.8′

Tank Size	Coil Capacity	Coil Length
80 Gallon	1.2 gallons	20′
119 Gallon	1.2 gallons	20′

Heat Exchanger inlet and outlet 3/4" MPT

Tank inlet and outlet 1" MPT



All tank dimensions are approximate. AET reserves the right to make product changes or updates without notice. AET will not be held liable for typographical errors in literature. For questions, please consult the factory.

The first DC spherical motor pump for direct connection to photovoltaic panels with automatic performance optimization using Maximum PowerPoint (MPP) tracking.

- Start-up Power Requires Less Than 1 Watt
- Directly Connects to P.V. Panel
- Economic and Powerful
- Wide Variability
- ECM Technology
- Shaft-less Spherical Motor

D5 Solar

HOT WATER. HOT SAVINGS.

Laing Thermotech

a xylem brand

BR-20A

D5 Solar Pump

Hot Water. Hot Savings.

Application

- The D5 solar pump can be used for most circulation pump applications without connection to the power grid but with direct connection a photovoltaic panel.
- This pump is perfect for single family home thermal solar systems or any circulation pump application where conventional power is not available.

Design

- The only moving part is a hemispherical rotor/impeller unit which sits on an ultra-hard, wear-resistant ceramic ball.
- There are no conventional shaft bearings or seals eliminating bearing noise and seal leaks.
- This pump is robust and has an estimated service life in excess of 50,000 hours.
- The self-realigning bearing is lubricated and cooled by the media.
- Even after prolonged shutdown, the pump will start reliably.
- All parts exposed to the fluid are completely corrosion resistant.

Soft Start-up

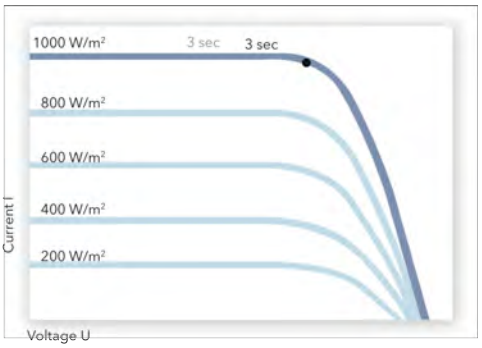
- When the photovoltaic panel provides sufficient power, the pump goes through the alignment phase by turning the rotor into the position required for start-up.
- The processor then waits until the capacitor is sufficiently charged.
- This enables a start-up with minimal power (less than one watt).

Over-temperature Safety Device

- The D5 Solar pump comes with an integrated over-temperature safety device which shuts off the pump electronics when reaching temperatures over 230°F.
- When the temperature of the pumped fluid is below 203°F the pump will function normally.
- The temperature of the electronic components is influenced by the temperature of the pumped media.
- After reaching a critical temperature 203°F the pump will lower its speed automatically in order to avoid a total shutdown.
- However, if the temperature continues to rise the pump will eventually shut down completely and automatically restart after cooling down.

Maximum Power Point (MPP) tracking

Every three seconds the processor will modify its operating point on the voltage-current curve of the PV panel to find the point of maximum performance. At this point, the pump achieves the maximum rpm and therefore the maximum performance. There is no need for a separate performance device. The ecocirc Solar pump will always find its best operating point under any given light and temperature conditions.

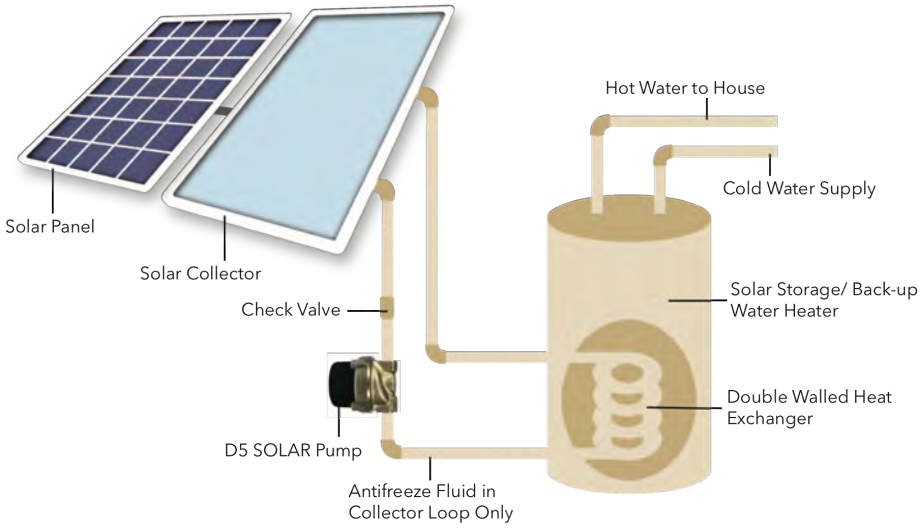


Typical Current-Voltage-curve of a photovoltaic panel. By employing MPP tracking every three seconds, the D5 pumps always automatically achieve maximum performance at any given insolation.

Technical Data

Motor Design:	Electronically commutated spherical motor with permanent magnet rotor/impeller
Voltage:	12 - 24 Volt
Power Consumption*:	Min. start-up power consumption less than 1 Watt, max. power consumption 22 Watts
Current Draw:	0.25 - 1.46 A
Acceptable Media:	Domestic hot water, heating water, water/glycol mixtures, other media on request**.
Environment:	IP 42
Insulation Class:	Class F

* Power consumption and start-up may vary in different installations
** Please check pump performance with more than 20 % glycol



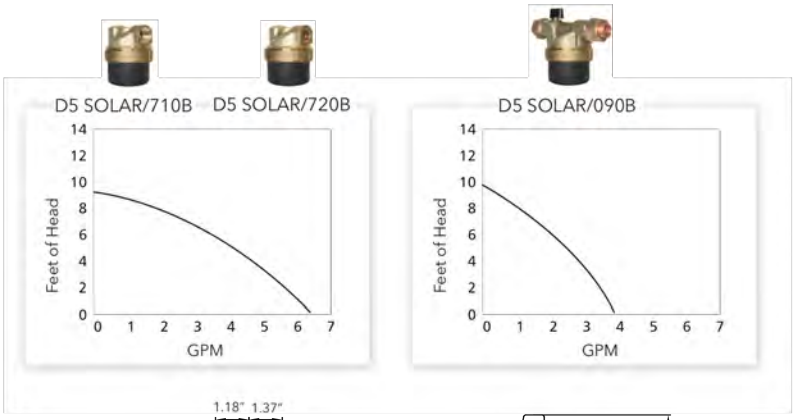
Available Models

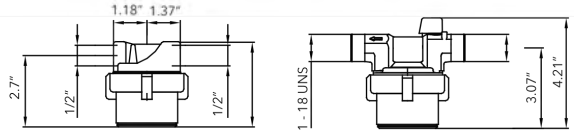
Part Number	Description	Model	Weight
LMB15107992	Lead Free Brass* Solar Circulator 1/2" Sweat	D5-SOLAR/720B	2 lbs.
LMB15107993	Lead Free Brass* Solar Circulator 1/2" NPT	D5 SOLAR/710B	2 lbs.
LMB15107995	Lead Free Brass* Solar Circulator 1/2" Union Sweat	D5 SOLAR/090B	2 lbs.

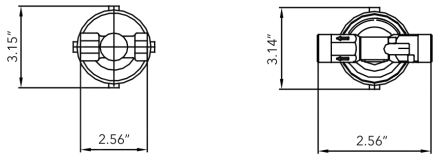
*Less than 0.25% Pb by weight on wetted parts surface areas.

Model	Pump Housing Material	Max. System Temperature	Housing Design	Connection	Max. Pressure
D5 SOLAR/720B	Brass	203°F	Inline	1/2" Sweat connection	150 PSI
D5 SOLAR/710B	Brass	203°F	Inline	1/2" Female pipe thread	150 PSI
D5 SOLAR/090B	Brass	203°F	Inline / BV+CV+PV*	1/2" Union Sweat	150 PSI

* built-in ball valve, check valve and purge valve







D5 SOLAR/710B and D5 SOLAR/720B

D5 SOLAR/090B

xylem
Let's Solve Water

Xylem Inc.
3878 S. Willow, Suite 104
Fresno, CA 93725
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Fax: (559) 265-4740 (800) 453-7523
www.xyleminc.com/brands/laingthermotech

SOL-RELIANT™

The Solar Water Heater Built to Last

Manufacturer's Warranty

Sol-Reliant™ offers a full 5 year warranty on the complete system and on all components. In addition, the Solar Collector and Solar Storage Tank are warranted by AET Manufacturing for 10 years.

The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Solar Rating and Certification Corporation (SRCC).

This certification does not imply endorsement or warranty of this product by SRCC.

For any questions about your system contact SOL-RELIANT™ at:

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www.solreliant.com
(503) 866-6437