



Installation, Operation and Maintenance Manual



Electric Backup	Gas Backup
OG 300-2004008A (SR 56/80 E PVDB)	OG 300-2004009A (SR 56/80 G PVDB)
OG 300-2004008B (SR 40/80 E PVDB)	OG 300-2004009B (SR 40/80 G PVDB)
OG 300-2007015A (SR 56/120 SE PVDB)	OG 300-2007026A (SR 80/80 G PVDB)
OG 300-2007025A (SR 80/80 E PVDB)	OG 300-2007026B (SR112/80 G PVDB)
OG 300-2007025B (SR112/80 E PVDB)	OG 300-2007026C (SR 112/120 G PVDB)
OG 300-2007025C (SR112/120 E PVDB)	

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



0326 SW Pendleton St.

Portland, OR 97239
(503) 866-6437

www.SolReliant.com

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 page 3, **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.

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Monitoring Your System – Please Read Carefully

Once your system is fully operational, you can monitor it using two devices: the flow meter and the temperature gauge. (See diagram on page 4 for location).

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 (see diagram on page 4). 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. (See **Operation and Maintenance, page 34** and **Troubleshooting, page 35.**)

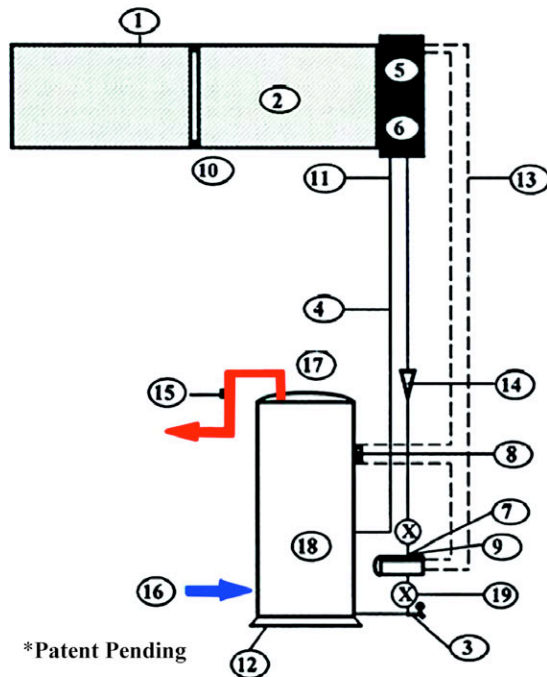
You should check your flow meter and temperature gauge at least once a month.

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. AE-56 High Efficiency Thermafin Collector (56 sq. ft.)
2. Low iron glass for maximum light transmission
3. Low point drain & fill valve.
4. Warm fluid from solar collector
5. 36 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

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.

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 fluid drains back into the reservoir tank by gravity. The propylene glycol in the system protects it from freezing.

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%). Although we warranty these collectors for six years, their real useful life can easily be 50 years or more.

Tank

Your solar storage tank is made by Rheem and has a capacity of either 80 gallons (Model # 81VR80HE-1) or 120 gallons (Model # 81VR120HE-1), depending on your system. It is guaranteed for 6 years by Rheem. 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.

The solar storage tank, like your auxiliary water heater, is equipped with a sacrificial anode rod. The purpose of this anode is to protect the tank from the minerals and aggressive chemical elements in water that could reduce the life of your glass-lined stainless steel tank. The life of both your storage tank and your auxiliary water heater can be extended considerably if anode

rods are changed every 10 years or whenever needed. Your local water bureau or well testing agent can advise you if the anode should be changed more often.

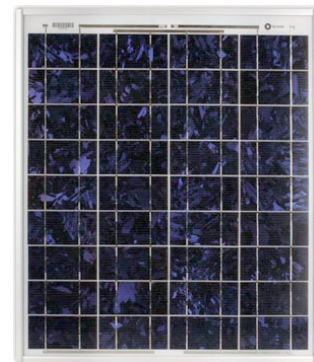
Pump and Control

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 just above the solar storage tank, mounted on the “hot” pipe between the solar tank outlet and the inlet on the auxiliary water tank, the temperature gauge will tell you to what temperature solar energy has pre-heated the water. In order to get an accurate reading, it is necessary to turn on a hot water faucet for a few moments to let hot water move from the solar tank past the temperature gauge. Other temperature gauge wells can be located on the solar return line and the mixed or tempered hot water “out” line. You can get multiple readings from one gauge by moving it from well to well.

Solar Storage Tank Isolation Valve (*Two tank systems only*)

The Sol-Reliant solar storage tank can be bypassed** (or “isolated”). In the event that your solar storage tank ever has a problem or a leak, the solar storage tank can be isolated while maintaining full hot water service to the house.

Solar Pre-heat Position



Bypass Solar Position



When in the solar pre-heat position, the main cold water supply to *the entire hot water system of your house* first enters the solar storage tank and flows out of the solar tank to the auxiliary heater. These two valves are normally open, and the crossover line or bypass valve is normally closed (see photo left). To bypass solar, change the position of all three valves (see photo right). The pre-heat line from the solar storage tank to the auxiliary water heater feeds through the **left** side (when facing the valve handle) on the same four-port isolation valve.

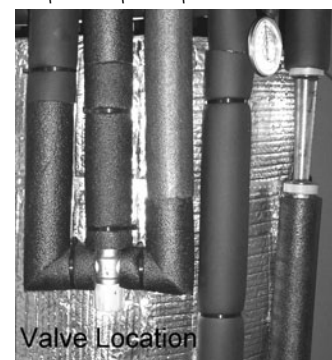
When in the bypass or isolated solar position, which involves turning the **isolation valve handle ¼ turn or 90 degrees**, the cold water supply to *the entire hot water system of your house* is redirected within the isolation valve itself from the solar storage tank to your auxiliary heater. In this position water neither enters nor leaves your storage tank; instead it passes into the valve through the top right port and directly out through the top left port.

****ONLY BYPASS YOUR SOLAR STORAGE TANK IN THE EVENT OF A LEAK OR FOR SERVICING.**

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

Cold Mixed Hot



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 produced by Dowfrost™ HD, a non-toxic propylene glycol antifreeze, in combination with distilled water, in the solar loop plumbing as a heat transfer fluid. The fluid is dyed bright yellow to aid in leak detection. A 50% glycol solution is adequate to protect from freezing down to -20 degrees F.

Dowfrost™ HD - Propylene Glycol Fluid - Freeze protection mixing chart

Freezing Temperature, °F	% Glycol by Volume	Freeze tolerance limits are based on an assumed set of environmental conditions
26	10	
19	20	
8	30	
-7	40	For more information, see MSDS Data Sheets
-28	50	
-60	60	
<-60	70	

Technical data for operating fluid

The service temperature range for Dowfrost™ HD is -50 to 325 degrees F. At full strength it has a freezing point of -100 degrees F. The boiling point is 325 degrees F. Mixed with water, Dowfrost™ HD has no flash point. In pure concentration the flashpoint is 214 degrees F. Specific Heat: In a 50% glycol/water solution, at -20 degrees F the specific heat is .756; at zero degrees, .764; at 30, .766; at 50, .80; at 70, .812; at 90, .824; at 110, .836; at 130, .845; at 150, .860; at 170, .872; at 190, .864. In 50% or greater glycol solutions, the vapor pressure below 100 degrees F is zero. It rises to 1.1 psia-English units at 110 degrees F, 1.5 @ 120; 1.9 @ 130; 2.5 @ 140; 3.2 @ 150; 14.6 @ 200; and 25.6 @ 250. Viscosity in a 50% solution @ -10 degrees F is 95.97; at zero degrees, 61.32; at 10 degrees, 40.62; at 30, 19.66; at 50, 10.65; at 70, 6.34; at 90, 4.05; at 110, 2.79; at 130, 2.02; at 150, 1.53; at 170, 1.20; at 190, .97; at 210, .81, and at 230, .69.

Instructions for inspection, treatment and disposal of fluid

An easy and reliable way to read your pH level is to use narrow range pH paper such as pHydration Control paper with a 7.2 to 8.18 pH range. It should be between 8 and 10. Any fluid below the pH of 7 should be replaced.

You can quickly determine the condition of your fluid by examining its appearance and odor. Any drastic variation from the initial fluid specifications, such as a black or dark-gray color, presence of an oily layer, burnt odor, or any heavy sludge indicates the need for replacement.

Dowfrost™ HD is non-toxic and biodegradable. It may be handled without special equipment. Small spills may be soaked up with common absorbent material. Clean up with water. More information can be found on the Dow website (www.dow.com) or by calling 1-800-447-4369.

Roof Flashing

The Sol-Reliant uses a single stainless steel flashing for both pipes penetrating the roof. With the accompanying rubber boot it allows water-tight penetrations in a single, well-protected location. 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 Rheem 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 glycol, 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 180 degrees F. In the event the temperature reaches 170 degrees in the top of the solar tank, the system shuts down in order to preserve the glycol. 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 over 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.

Solar Loop Pressure Relief Valve

A 125 p.s.i. 3/4” Watts 3 L pressure-only relief valve is located just below the bottom of the photovoltaic module above pipes going through the roof. This is an emergency relief valve protecting the pump and the solar loop components from excessive pressure. Since the solar loop is not pressurized, it is very unlikely this valve would ever be used.



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 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 giving the reservoir itself an R-10 insulation.

Pipe Insulation:

3/4" wall closed-cell Armaflex is used to insulate all heat carrying lines as well as the first 5 feet of the cold water line from the cold water inlet on the solar storage tank. 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). The PV module must also be grounded against lightning using a #6 bare copper wire, which terminates at a proper earth ground.

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.

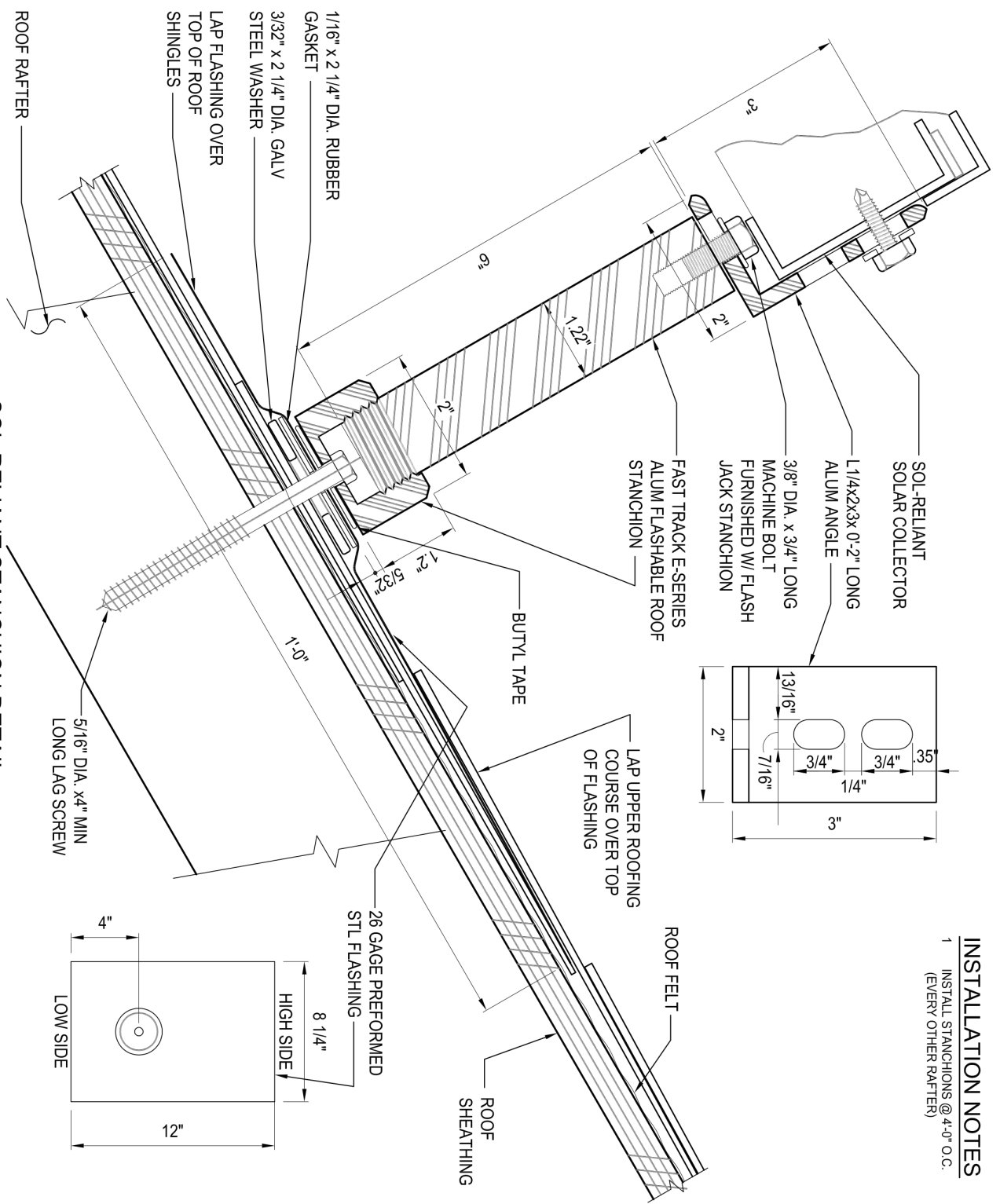
STEP 7 (ROOF): Once collector is centered, mark where pipes will go through the roof. Use a Dixon or other crayon to make this mark (yellow tends to be the most visible). Get your eye close to the roof and make a vertical line at the midpoint between the two unions. Move to the side of the collector 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 higher and to the inside of the other union. This is the outlet from the “Fat Tube” drainback reservoir. It is the HOT RETURN PIPE from the collector. 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, one on each side of the union. (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)

A1	APPR: egh	SOL-RELIANT MOUNTING	O H Architecture, PC Eric Hess, NCARB 3805 N Michigan Ave. Portland, OR 97227 ph: (503) 816-4858
	DATE: Jan 24, 2011		
	PROJ: -		
	FILE: a1 11x8 ps.dwg		
6125 NE, Portland, OR 97213			

1
7

MOUNTING BRACKET

NO SCALE

SHOWN
WITHOUT
NO-CAULK
FLASHINGS

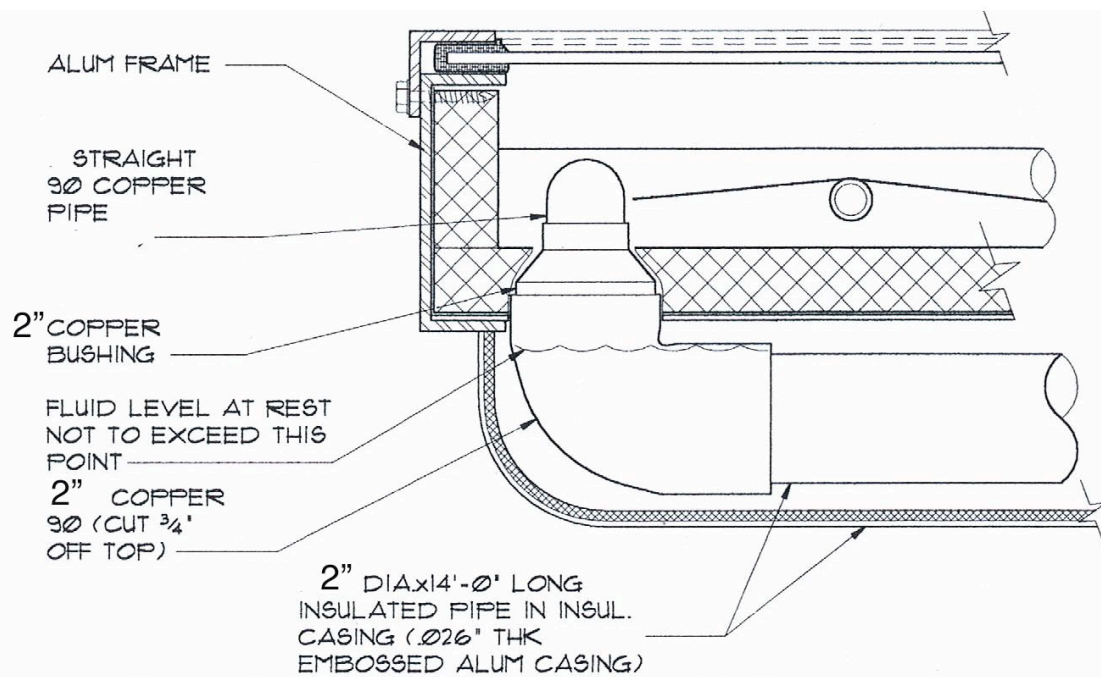
2
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SECTION THRU PANEL

SUPPLY HEADER

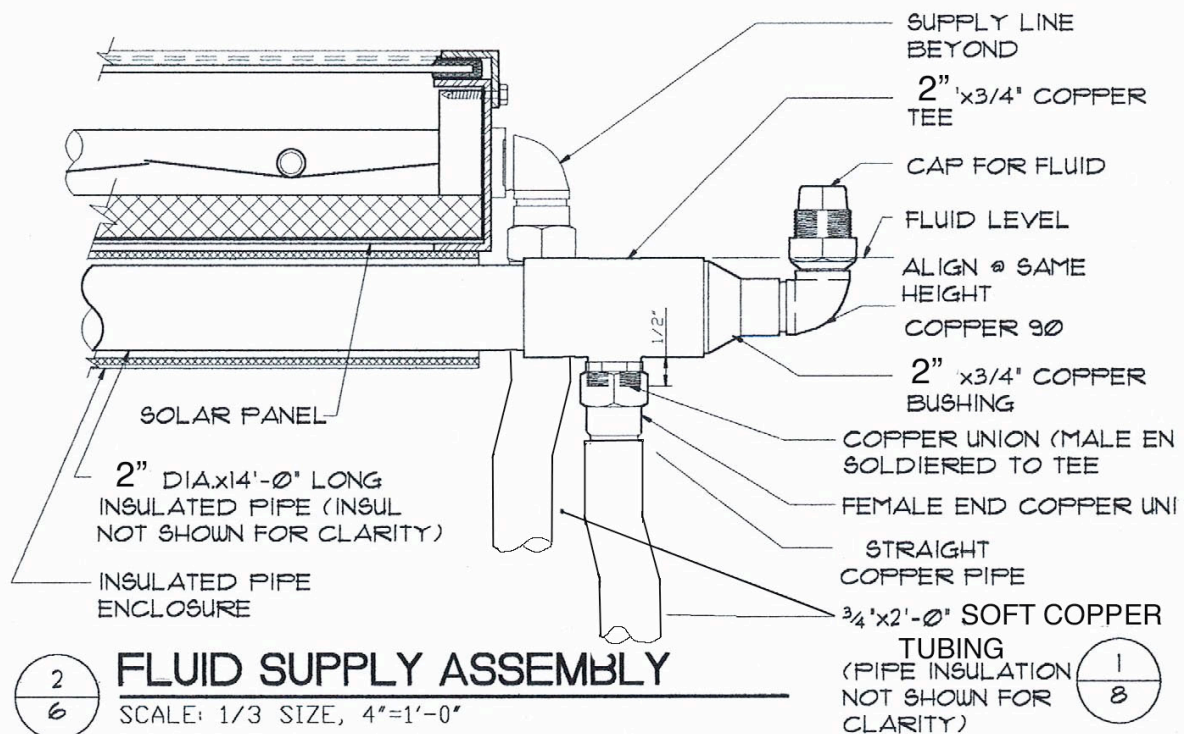
MAX FLUID LEVEL
@ DRAINED BACK
STATE

2"
COPPER RESERVOIR
PIPE



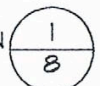
ANTI-SIPHONING ASSEMBLY

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

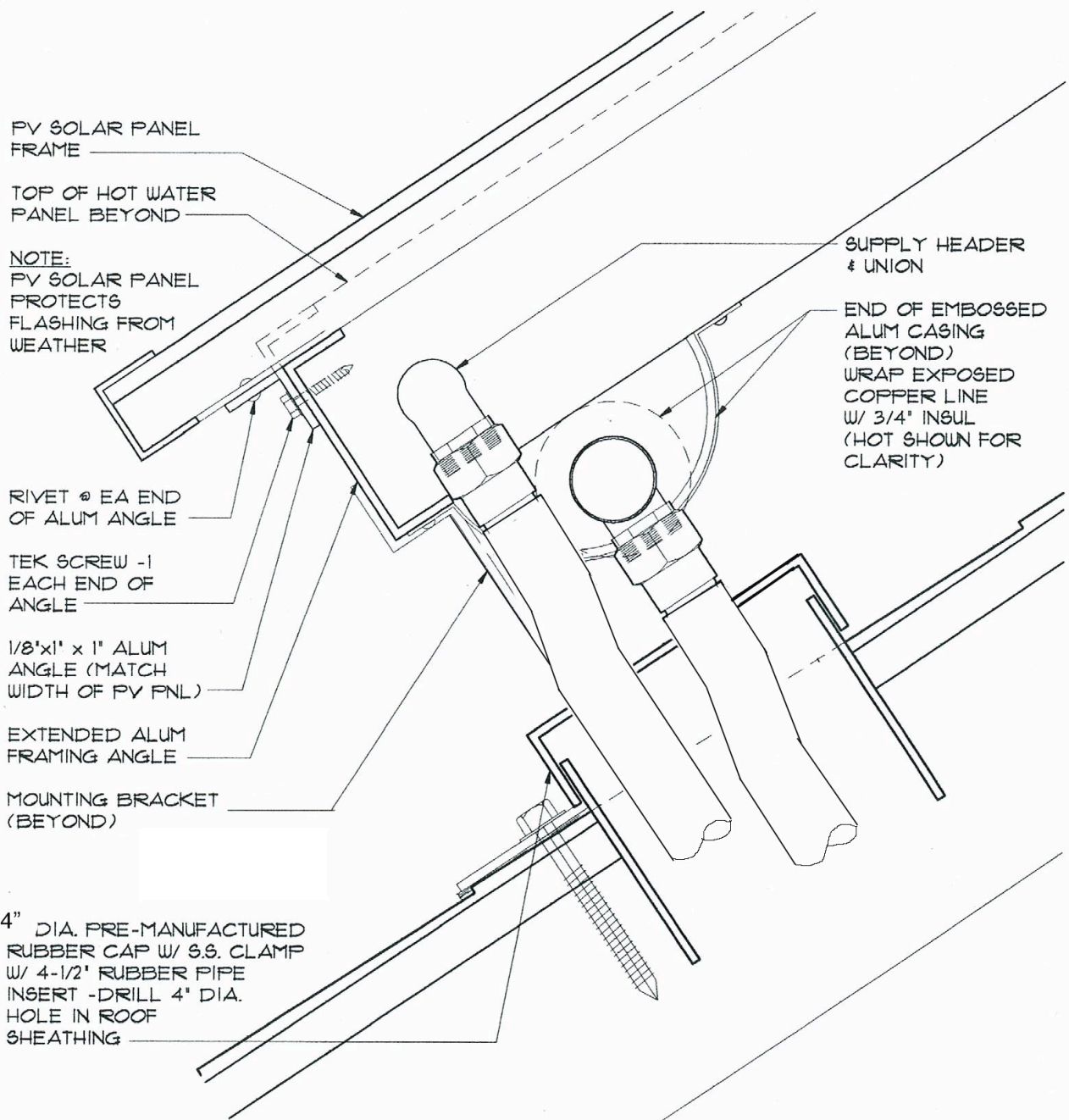


FLUID SUPPLY ASSEMBLY

SCALE: 1/3 SIZE, 4"=1'-0"



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.



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. Level the tank with shims, if necessary. Larger shims, cedar shingle size, work best. Secure the tank with the earthquake straps provided according to the directions provided.

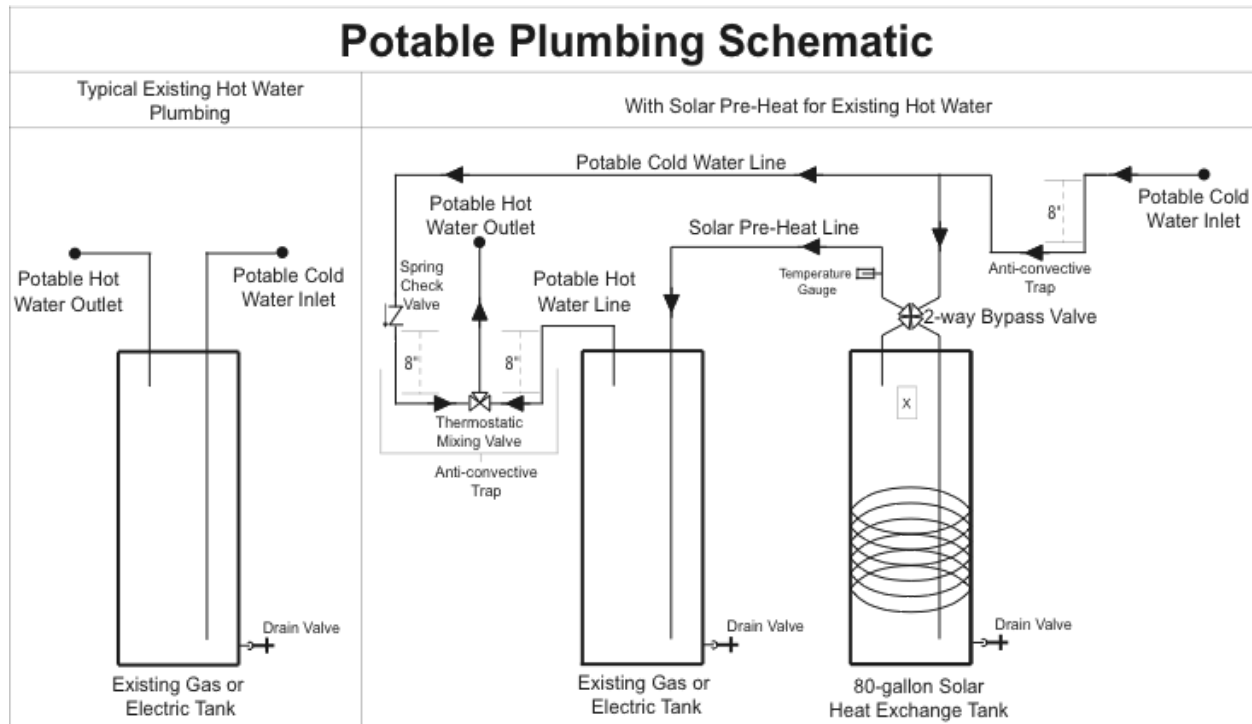
STEP 2: Plumb the solar loop, using rigid copper pipe (Type M or thicker), remember to maintain constant downhill fall between the solar collector and the tank. Strap vertical and horizontal pipes every 6'. Use two hole pipe clamps, plumbers tape, or other strapping that can be attached outside the pipe 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.



The line on the left at the top of the tank is the hot outlet of the solar tank to your back up water heater. The line on the right is the cold inlet from the cold supply to the hose.

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. It is important to create a thermal trap in the cold water supply. This is accomplished by plumbing the line straight down 12-18" and then back up. The remaining open port of the cold water tee needs to be plumbed to the cold side of the tempering valve (marked "Cold"). The tempering valve should be located 12"-18" below the top of the tank.

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 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. A 6AWG bare copper conductor need to be run from an earth ground to the body of the PV module. This conductor is a lightning ground not an equipment ground.

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 with 1/2” flex conduit.

STEP 3 (INSIDE): Run a 6AWG bare, stranded copper wire from an earth ground to the junction box in the attic. Leave at least 6 feet of excess. This wire will need to reach the body of the PV module. Feed the 6AWG wire into the junction box, through the conduit and out to the roof.

STEP 4 (INSIDE): Run 12/2 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 5 (ROOF): Feed the 6AWG wire through the weatherhead. Attach the weatherhead to the EMT sticking through the roof flashing. Feed the MC cables into the weatherhead, through the conduit to the metallic junction box in the attic.

STEP 6: (ATTIC): Wire the MC Cables to the ends of the 12 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 glycol/water mixture 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. 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:** Propylene glycol is non- toxic (but not cheap). 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. 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.

The total volume of the fat tube is 2.3 gallons. The operational volume of the collector is the same as that of the collector at rest. The fill weight of fluid added is 8.9 pounds per gallon of glycol and 8.3 pounds per gallon of water. Therefore, fluid weight in the collector is 19.81 lbs. The total solar loop plumbing volume is usually between 4 and 5 gallons. The system operating pressure will be less than 20 psi. (even during stagnation) at the solar collector. The normal operating temperature of the system is less than 200 degrees F. All components, pump, and seals are rated to operate within the temperature and pressure ranges of the system.

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!

Residential Solar Water Heater

USE & CARE MANUAL

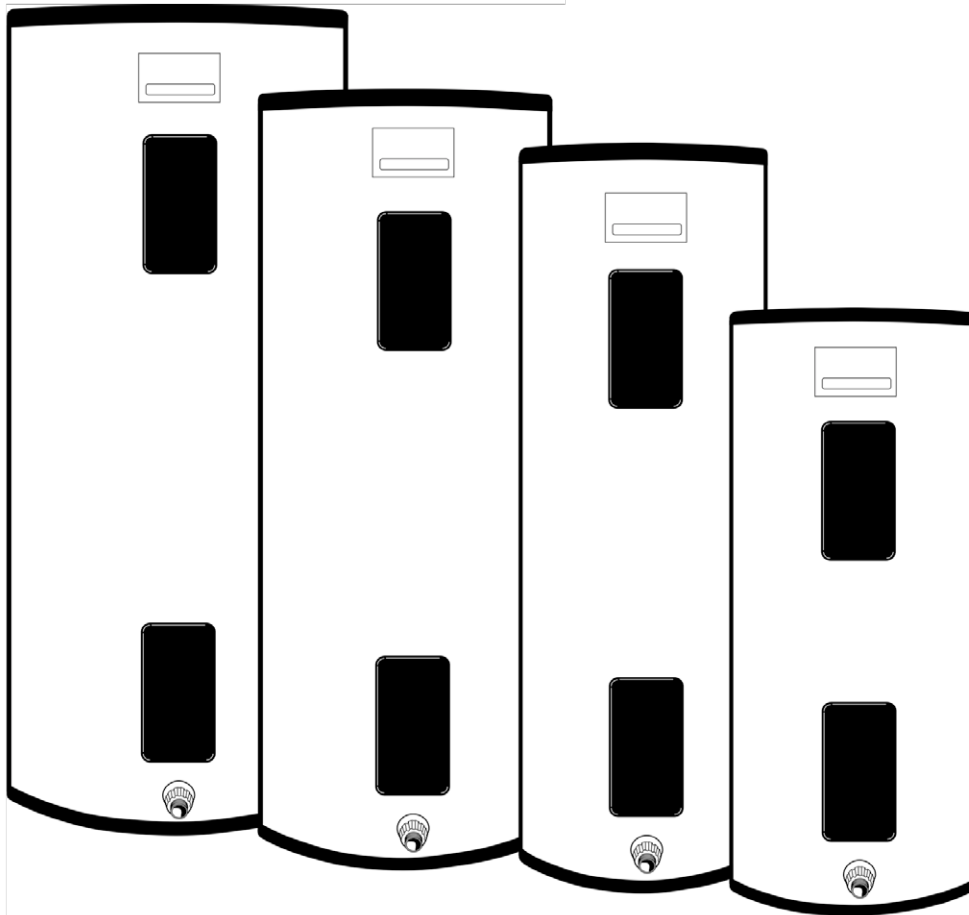
WITH INSTALLATION INSTRUCTIONS FOR THE CONTRACTOR



LISTED
Solar Water Heater
96G1

The purpose of this manual is twofold: one, for the installing contractor, to provide requirements and recommendations for the proper installation and adjustment of the water heater; and two, for the owner-operator, to explain the features, operation, safety precautions, maintenance and trouble shooting of the water heater. This manual also includes a parts list.

It is imperative that all persons who are expected to install, operate or adjust this water heater read the instructions carefully so that they may understand how to do so.



Do Not Destroy this Manual. Please read carefully and keep in a safe place for Future Reference.



Recognize this symbol as an Indication of Important Safety Information!



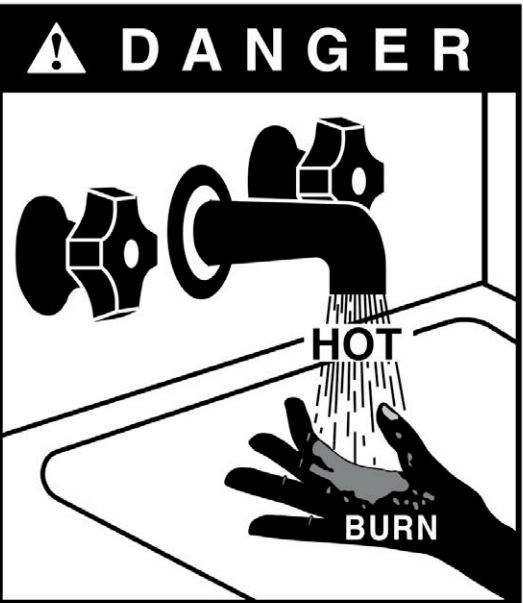
CALIFORNIA PROPOSITION 65 WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.



General Safety Precautions

Be sure to read and understand the entire Use & Care Manual before attempting to install or operate this water heater. It may save you time and cost. Pay particular attention to the General Safety Precautions. Failure to follow these warnings could result in serious bodily injury or death. Should you have problems understanding the instructions in this manual, or have any questions, STOP, and get help from a qualified installer, service technician, or the local electric utility.

WATER TEMPERATURE ADJUSTMENT - Safety and energy conservation are factors to be considered when selecting the water temperature setting of water heater's thermostat. Water temperatures above 125°F can cause severe burns or death from scalding. Be sure to read and follow the warnings outlined on the label pictured below. This label is also located on the water heater near the thermostat access panel.



Water temperature over 125°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, see manual.

TIME / TEMPERATURE RELATIONSHIPS IN SCALDS

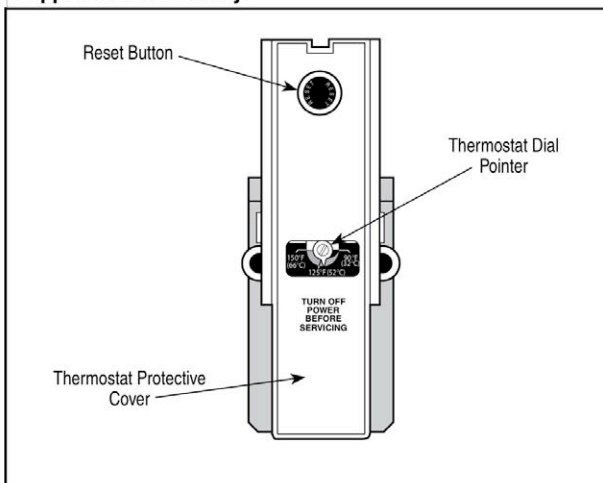
Temperature	Time to Produce Serious Burn
120° F	More than 5 minutes
125° F	1 1/2 to 2 minutes
130° F	About 30 seconds
135° F	About 10 seconds
140° F	Less than 5 seconds
145° F	Less than 3 seconds
150° F	About 1 1/2 seconds
155° F	About 1 second

Table courtesy of Shriners Burn Institute

The chart shown above may be used as a guide in determining the proper water temperature for your home.

NOTE: Households with small children, disabled, or elderly persons may require a 120°F or lower thermostat setting to prevent contact with "HOT" water.

The temperature of the water in the heater is regulated by the adjustable surface mounted thermostat located behind the upper Jacket Access Panel. To comply with safety regulations the thermostat was set at 120° F before the water heater was shipped from the factory.



The illustration above shows the temperature adjustment dial used for setting the water temperature. Refer to Operation section of this manual for detailed instructions in how to adjust the thermostat.

DANGER

There is a Hot Water SCALD Potential if the thermostat is set too high.

Mixing valves for reducing point of use water temperature by mixing hot and cold water in branch water lines are available. Contact a licensed plumber or the local plumbing authority for further information.

Introduction

The location chosen for the water heater must take into consideration the following:

LOCAL INSTALLATION REGULATIONS

Solar storage or solar electric storage water heaters must be installed in accordance with these instructions, local codes, utility company requirements or, in the absence of local codes, the latest edition of the National Electrical Code. It is available from some local libraries or can be purchased from the National Fire Prevention Association, 1 Batterymarch Park, Quincy, MA 02269 as booklet ANSI/NFPA 70.

LOCATION

Locate the water heater or storage tank as determined by the type of solar system that is being installed. The area should be clean, dry and as near as practical to the area of greatest heated water demand. The piping should be insulated. Long uninsulated hot water lines can waste energy and water. Place the water heater in such a manner that the thermostat and element access panels can be removed to permit inspection and servicing such as removal of elements or checking controls. The water heater and water lines should be protected from freezing temperatures. Do not install the water heater in outdoor, unprotected areas.

CAUTION

The water heater should not be located in an area where leakage of the tank or connections will result in damage to the area adjacent to it or to lower floors of the structure. Where such areas cannot be avoided, it is recommended that a suitable catch pan, adequately drained, be installed under the water heater.

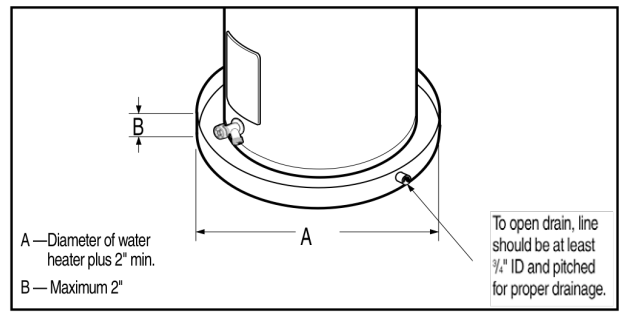


Figure 1. — Auxiliary Catch Pan

NOTE: Auxiliary catch pan installation MUST conform to local codes. Catch Pan Kits are available from the distributor or store where the water heater was purchased.

Installation

1. **INSPECT SHIPMENT** — Inspect water heater for possible damage. Check the markings on the rating plate of the water heater to be certain the power supply (Solar Electric Only) corresponds to that for which the water heater is equipped.
2. **THERMAL EXPANSION** — Determine if a check valve exists in the inlet water line. It may have been installed in the cold water line as a separate back flow preventer, or it may be part of a pressure reducing valve, water meter or water softener. A check valve located in the cold water inlet line can cause what is referred to as a "**closed water system**". A cold water inlet line with no check valve or back flow prevention device is referred to as an "**open**" water system.

As water is heated, it expands in volume and creates an increase in the pressure within the water system. This action is referred to as "**thermal expansion**". In an "**open**" water system, expanding water which exceeds the capacity of the water heater flows back into the city main where the pressure is easily dissipated.

A "**closed water system**", however, prevents the expanding water from flowing back into the main supply line, and the result of "**thermal expansion**" can create a rapid, and dangerous pressure increase in the water heater and system piping. This rapid pressure increase can quickly reach the safety setting of the relief valve, causing it to operate during each heating cycle. Thermal expansion, and the resulting rapid, and repeated expansion and contraction of components in the water heater and piping system can cause premature failure of the relief valve, and possibly the heater itself. Replacing the relief valve will not correct the problem!

The suggested method of controlling thermal expansion is to install an expansion tank in the cold water line between the water heater and the check valve. (refer to Figure 2.) The expansion tank is designed with an air cushion built in that compresses as the system pressure

increases, thereby relieving the over pressure condition and eliminating the repeated operation of the relief valve. Other methods of controlling thermal expansion are also available. Contact your installing contractor, water supplier, or plumbing inspector for additional information regarding this subject.

3. **WATER SUPPLY CONNECTIONS** — Refer to Fig. 2 for suggested typical installation. The installation of unions or flexible copper connectors is recommended on the hot and cold water connections so that the water heater may be easily disconnected for servicing if necessary. The HOT and COLD water connections are clearly marked and are 3/4" NPT on all models. Install a shut-off valve in the cold water line near the water heater.

IMPORTANT!! Do not apply heat to the hot or cold water connections. If sweat connections are used, sweat tubing to adapter before fitting adapter to hot or cold water connections on heater. Any heat applied to the hot or cold water supply fittings will permanently damage them.

4. **RELIEF VALVE** — A new combination temperature and pressure relief valve, complying with the Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems, ANSI Z21.22, must be installed in the opening provided and marked for the purpose on the water heater. (Refer to Fig. 2.) No valve of any type should be installed between the relief valve and the tank. Local codes shall govern the installation of relief valves.

The pressure rating of the relief valve must not exceed 150 PSI, the maximum working pressure of the water heater as marked on the rating plate. The BTUH Rating of the relief valve must not be less than the input rating of the water heater as indicated on the rating label located on front of the heater (1 watt = 3.412 BTUH).

Installation

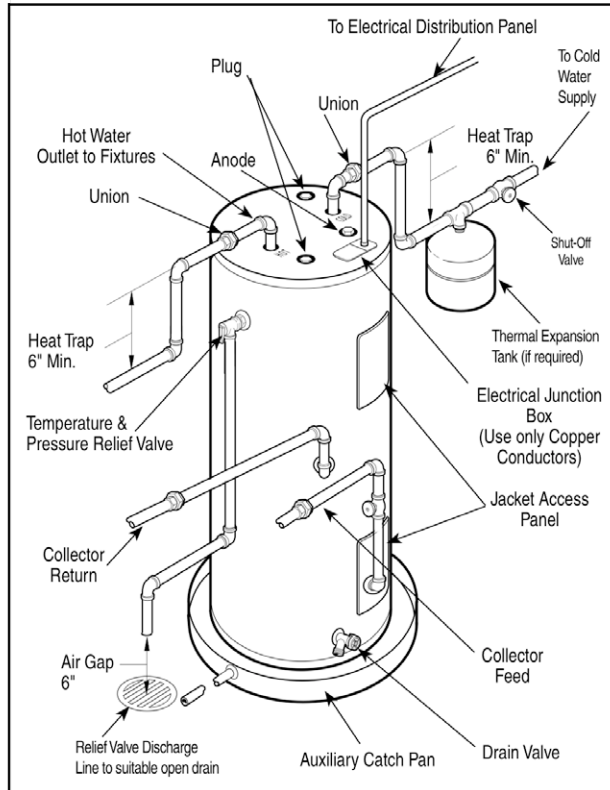


Figure 2.—Typical Installation for Side Connections Top collector feed openings must be plugged with 3/4" plugs.

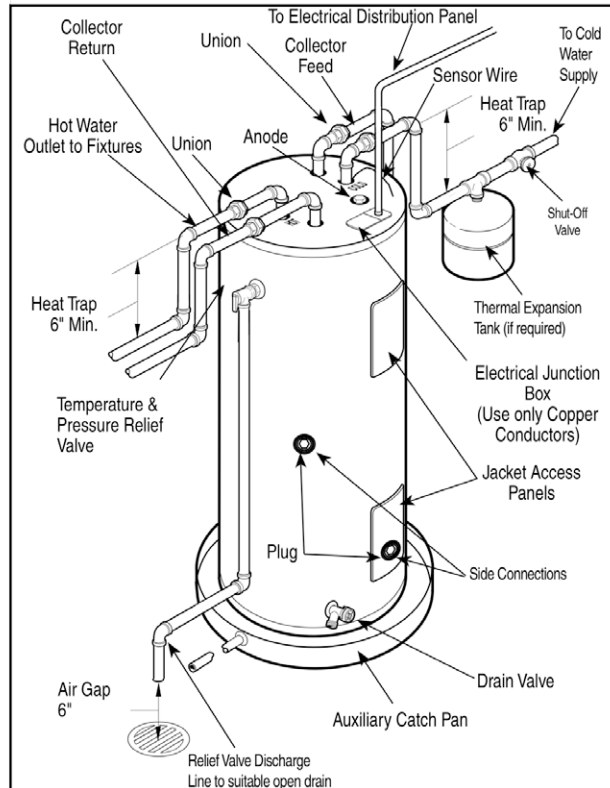


Figure 2.—Typical Installation for Top Connections - Side collector feed openings must be plugged with 3/4" Plugs.

Connect the outlet of the relief valve to a suitable open drain so that the discharge water cannot contact live electrical parts and to eliminate potential water damage. Piping used should be of a type approved for hot water distribution. The discharge line must be no smaller than the outlet of the valve and must pitch downward from the valve to allow complete drainage (by gravity) of the relief valve and discharge line. The end of the discharge line should not be threaded or concealed and should be protected from freezing. No valve of any type, restriction or reducer coupling should be installed in the discharge line.

5. TO FILL WATER HEATER — Make certain drain valve is completely closed and the collector feeds that are not in use are plugged tight. Open shut-off valve in cold water supply line. Open each hot water faucet slowly to allow air to vent from the water heater and piping. A steady flow of water from the hot water faucet(s) indicates a full water heater.

WARNING

Tank **MUST BE** full of water before power is turned on. Heating element **WILL BE DAMAGED** if energized for even a short time while tank is dry. The water heater's warranty does not cover damage or failure resulting from operation with an empty or partially empty tank. (Reference is made to the limited warranty for complete terms and conditions.)

6. ELECTRICAL CONNECTIONS for Electric Solar Only— A separate branch circuit with copper conductors, overcurrent protective device and suitable disconnecting means must be provided by a qualified electrician. All wiring must conform to local codes or latest edition of the National Electrical Code ANSI/NFPA 70.

The water heater is completely wired to the junction box inside jacket at top front of water heater. An opening for 1/2" or 3/4" electrical fitting is provided for field wiring connections. (Refer to Fig. 3)

The voltage requirements and wattage load for the water heater is specified on the rating plate on front of heater.

Table 1 recommends minimum branch circuit sizing based on National Electric Code. Refer to wiring diagram on back cover of this manual for field wiring connections.

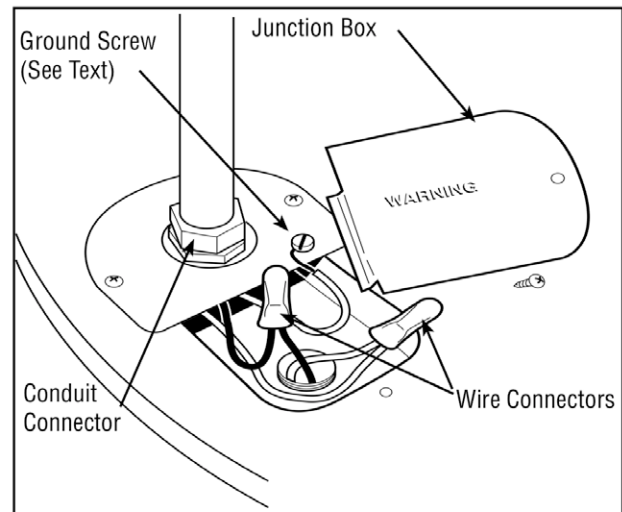


Figure 3. — Water Heater Junction Box.

Installation

Total Water Heater Wattage	Phase	Recommended Over Current Protection (Fuse or Circuit Breaker) Amperage Rating			Copper Wire Size - AWG Based on N.E.C. Table 310-16 (75°C.)		
		120V	208V	240V	120V	208V	240V
1,500	1	20	15	15	12	14	14
	
2,000	1	25	15	15	10	14	14
	
2,500	1	30	20	15	10	12	14
	
3,000	1	35	20	20	8	12	12
	
3,500	1	...	25	20	...	10	12
	
4,000	1	...	25	25	...	10	10
	
4,500	1	...	30	25	...	10	10
	
5,000	1	...	35	30	...	8	10
	
5,500	1	...	35	30	...	8	10
	
6,000	1	...	40	35	...	8	10
	

Table 1. — Branch Circuit Sizing and Wire Size Guide Based on N.E.C. ANSI / NFPA 70

CAUTION

The presence of water in the piping and water heater does not provide sufficient conduction for a ground. Non-metallic piping, dielectric unions, flexible connectors etc. can cause the water heater to be electrically isolated.

The branch circuit wiring should include either:

- A. Metallic conduit or metallic sheathed cable approved for use as a grounding conductor and installed with fittings approved for the purpose.

- B. Non-metallic sheathed cable or metallic conduit or metallic sheathed cable not approved for use as a ground conductor shall include a separate conductor for grounding. It should be attached to the ground terminals of the water heater and the electrical distribution box. (Refer to Fig. 3)

CAUTION

The manufacturer's warranty does not cover any damage or defect caused by installation, attachment or use of any type of energy saving or other unapproved devices (other than those authorized by the manufacturer) into, onto or in conjunction with the water heater. The use of unauthorized energy saving devices may shorten the life of the water heater and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices.

If local codes require external application of insulation blanket kits the manufacturer's instructions included with the kit must be carefully followed.

WARNING

Application of any external insulation to this water heater will require careful attention to the following:

- **Do Not** cover the temperature and pressure relief valve.
- **Do Not** cover jacket access panel to thermostat and heating element.
- **Do Not** cover electrical junction box of water heater.
- **Do Not** cover operating or warning labels attached to the water heater nor attempt to relocate them on exterior of insulation blanket.

Installation Check List

A. Water Heater Location

- ☐ Close to area of heated water demand.
- ☐ Indoors and protected from freezing temperatures.
- ☐ Area free of flammable vapors.
- ☐ Provisions made to protect area from water damage.
- ☐ Sufficient room to service water heater.

B. Water Supply

- ☐ Water heater completely filled with water.
- ☐ Water heater and piping air vented.
- ☐ Water collector openings not in use are plugged tight.
- ☐ Water connections tight and free of leaks.

C. Relief Valve

- ☐ Temperature and Pressure Relief Valve properly installed and discharge line run to open drain.
- ☐ Discharge line protected from freezing.

D. Wiring

- ☐ Power supply voltage agrees with water heater rating plate.
- ☐ Branch circuit wire and fusing or circuit breaker of proper size.
- ☐ Electrical connections tight and unit properly grounded.

Model No. _____ Serial No. _____ Date of Installation _____ Installed By: _____

Operation

SAFETY PRECAUTIONS

- A. **Do** turn off power to water heater if it has been subjected to over heating, fire, flood or physical damage.
- B. **Do Not** turn on water heater unless it is filled with water.
- C. **Do Not** turn on water heater if cold water supply shut-off valve is closed.
- D. If there is any difficulty in understanding or following the OPERATION or MAINTENANCE instructions, it is recommended that a qualified person or serviceman perform the work.

⚠ CAUTION

Hydrogen gas can be produced in a hot water system served by this water heater that has not been used for a long period of time (generally two weeks or more). HYDROGEN GAS IS EXTREMELY FLAMMABLE!! To dissipate such gas and to reduce risk of injury, it is recommended that the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance connected to the hot water system. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. Do not smoke or use an open flame near the faucet at the time it is open.

1. **WATER TEMPERATURE SETTING** — The temperature of the water in the water heater can be regulated by setting the temperature dial of the adjustable surface mounted thermostat located behind the upper jacket access panel. This thermostat controls the water heater's heating element only. (A separate thermostat should be utilized in monitoring the temperature from the collector). To comply with safety regulations the thermostat are factory set at 120° F or less where local codes require.

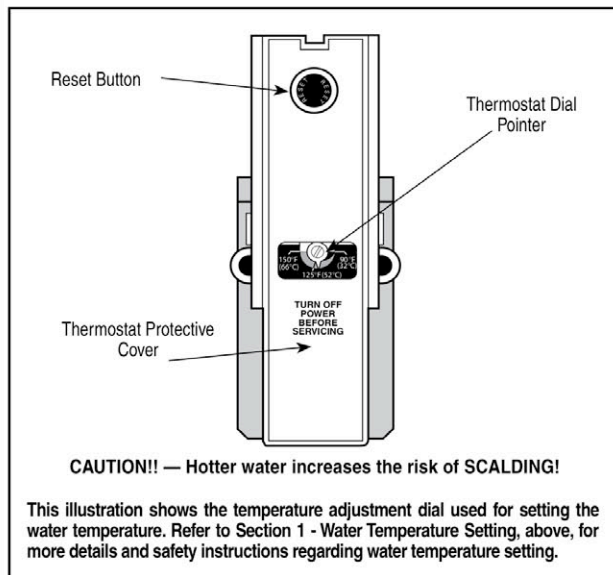


Figure 4. — Thermostat and Protective Cover.

Safety and energy conservation are factors to be considered when selecting the water temperature setting of the water heater's thermostat. The lower the temperature setting the greater the savings in energy and operating costs.

⚠ DANGER

There is a Hot Water SCALD Potential if the thermostat is set too high.

NOTE: Households with small children or invalids may require a 120° F or lower thermostat setting to prevent contact with "HOT" water.

TIME / TEMPERATURE RELATIONSHIPS IN SCALDS

Temperature	Time to Produce Serious Burn
120° F	More than 5 minutes
125° F	1 1/2 to 2 minutes
130° F	About 30 seconds
135° F	About 10 seconds
140° F	Less than 5 seconds
145° F	Less than 3 seconds
150° F	About 1 1/2 seconds
155° F	About 1 second

Table courtesy of Shriners Burn Institute

⚠ DANGER

Make certain power to water heater is OFF before removing jacket access panel FOR ANY REASON.

If adjustment is necessary, turn off power to water heater, remove the upper jacket access panel and insulation exposing the thermostat. The thermostat protective cover should not be removed. Set thermostat dial pointer, with a small screwdriver, to desired temperature. (Refer to Fig. 4.) Replace insulation and jacket access panel. Turn on power to water heater.

2. **SAFETY CONTROLS** — The water heater is equipped with a combination Thermostat and Temperature Limiting Control (ECO) that is located above the heating element in contact with the tank surface. If for any reason the water temperature becomes excessively high, the Temperature Limiting Control (ECO) breaks the power circuit to the heating element. Once the control opens, it must be reset manually.

⚠ CAUTION

The cause of the High Temperature Condition must be investigated by qualified service personnel and corrective action taken before placing the water heater in service again.

To reset Temperature Limiting Control, turn off power to water heater, remove the upper jacket access panel and insulation. The thermostat protective cover **SHOULD NOT** be removed. (Refer to Fig. 4.) Press red "RESET" button. Replace insulation and jacket access panel before turning on power to water heater.

Operation--

3. EMERGENCY INSTRUCTIONS —

WARNING

If water heater has been subjected to flood, fire, or physical damage, turn off power and water to water heater. Do not operate the water heater again until it has been thoroughly checked by qualified service personnel. In cases of flood or fire, the manufacture recommends replacement.

4. **VACATION AND LONG TIME SHUT-DOWN** — If the water heater is to remain idle for an extended period of time, the power and water to the water heater should be turned off to conserve energy. The water heater and piping should be drained if they might be subjected to freezing temperatures.

NOTE: Refer to "Hydrogen Gas Caution" in Safety Precautions Section on page 6.

After a very long shut-down period, the water heater's operation and controls should be checked by qualified service personnel. Make certain the water heater is completely filled before again placing it in operation .

5. DRAINING HEATER —

CAUTION

Shut off power to water heater before draining water.

In order to drain water heater, turn off cold water supply, then it is necessary to open a hot water faucet or lift the handle on the relief valve to admit air to the tank. Attach a garden hose to the drain valve on the water heater and direct the stream of water to a drain where it will do no damage.

DANGER

The water drained from the tank may be hot enough to present a SCALD HAZARD and should be directed to a suitable drain to prevent injury or damage.

6. **ANODE** — This water heater is equipped with an anode rod designed to prolong the life of the glass lined tank. The anode is slowly consumed cathodically, thereby eliminating or minimizing corrosion of the glass lined tank.

Water sometimes contains a high sulfate and/or mineral content and together with the cathodic protection process can produce a hydrogen sulfide or rotten egg odor in the heated water. Chlorination of the water supply should minimize the problem.

NOTE: Do not remove the anode rod from the water heater's tank, except for inspection and/or replacement, as operation with the anode rod removed will greatly shorten the life of the glass lined tank and will exclude warranty coverage.

Maintenance

Properly maintained, your water heater will provide years of dependable trouble-free service. It is suggested that a routine preventive maintenance program be established and followed by the user. It is further recommended that a periodic inspection of the operating controls, heating element and wiring should be made by service personnel qualified in electric appliance repair.

1. ROUTINE PREVENTATIVE MAINTENANCE

- A. Most electrical appliances make some sound when in operation, even when new. If the hissing or singing sound level increases excessively, the electric heating element may require cleaning. Contact your installer or plumbing contractor to inspect.
- B. The area near the water heater must be kept free of flammable liquids such as gasoline or paint thinners, adhesives or other combustible materials.
- C. At least once a year, lift and release the lever handle on the temperature pressure relief valve, located near the top of the water heater, to make certain the valve operates freely and allow several gallons to flush through discharge line. Make certain the discharged water is directed to an open drain.

DANGER

Before manually operating the relief valve, make certain no one will be exposed to the danger of coming in contact with the hot water released by this valve. The water may be hot enough to create a SCALD hazard. The water released should be directed to a suitable drain to prevent injury or damage.

NOTE: If the temperature and pressure relief valve on the water heater discharges periodically, this may be due to thermal expansion in a "Closed" water system. Contact the water supplier or your plumbing contractor on how to correct this. **DO NOT** plug the relief valve outlet.

- D. A water heater's tank can act as a settling basin for solids suspended in the water. It is, therefore, not uncommon for hard water deposits to accumulate in the bottom of the tank. It is suggested that a few quarts of water be drained from the water heater's tank every month to clean the tank of these deposits.
- E. Rapid closing of faucets or solenoid valves in automatic water using appliances can cause a pounding "water hammer" sound. "Water hammer" can be described as a banging noise heard in a water pipe following an abrupt alteration of the flow with resulting pressure surges. Strategically located risers in the water pipe system can be used to minimize the problem. Also water hammer arresting devices are usually available from your plumber or local plumbing supply store.
2. **ANODE ROD INSPECTION** — The anode rod should be removed from the water heater's tank annually for inspection and replaced when more than 6" of core wire is exposed at either end of the rod. Refer to Fig. 2 for anode rod location. Make certain cold water supply is turned off before removing anode rod.

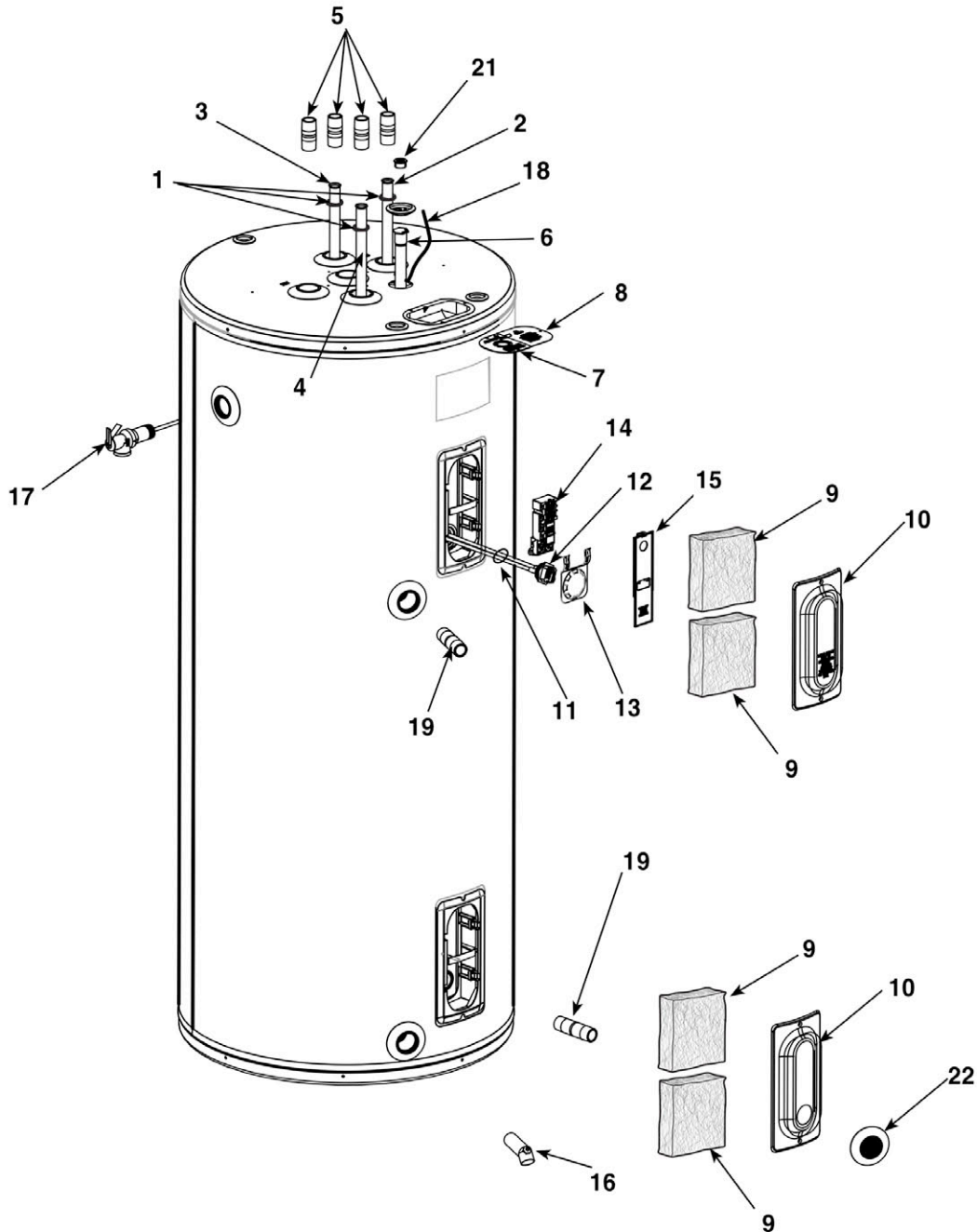
Replacement Parts List

80 - 120 Gallon Models Universal Connect Models

Instructions for placing a Parts Order:

Address parts orders to the distributor or store from where the heater was purchased. All parts orders should include:

1. Model number and Serial number of heater (from rating plate).
2. Specify voltage and wattage as marked on rating plate.
3. Part Description (as noted at right) and number of parts desired.



Replacement Parts List

Ref. No.	Part Description	Qty. Req'd
1.	Dip Tube Gasket	3
2.	Dip Tube (Cold Inlet)	1
3.	Dip Tube (Collector Feed)	1
4.	Dip Tube (Collector Return)	1
5.	Nipple Top Connection	4
6.	Anode Rod	1
7.	Plate Cover	1
8.	Junction Box Cover	1
9.	Cavity Insulation	4
10.	Jacket Access Panel	2
11.	Heating Element Gasket	1
12.	Heating Element	1
13.	Thermostat Bracket	1
14.	Thermostat	1
15.	Thermostat Protective Cover	1
16.	Drain Valve	1
17.	Relief Valve	1
18.	Sensor wire and Sensor Stud (Not Replaceable)	1
19.	Nipple Side Connections	2
20.	3/4" Plugs (Not pictured)	2
21.	Sensor Wire Gasket	1
22.	Shroud	1
23.	Owners Manual (Not Pictured)	1

CAUTION

For your safety, **DO NOT** attempt repair of electrical wiring, thermostat, heating element or other operating controls. Refer repairs to qualified service personnel.

Notes

Trouble Shooting Guide

NATURE OF TROUBLE	POSSIBLE CAUSE	SERVICE
No Hot Water	<ol style="list-style-type: none"> 1. Improper Wiring 2. No Power — blown fuse or circuit breaker tripped <ol style="list-style-type: none"> a. Shorted wiring b. Circuit overloaded c. Improper wiring d. Grounded element or thermostat 3. Manual Reset Limit (ECO) open <ol style="list-style-type: none"> a. Thermostat defective b. Thermostat out of calibration c. Heat build-up due to loose wires d. Defective Limit (ECO) 4. Solar System Incorrectly Installed 5. Defective Element 6. Leaking plumbing or open hot water faucet(s) 	<p>Rewire per Wiring Diagram</p> <p>** Replace or repair</p> <p>** Provide adequate circuit or reduce load</p> <p>** Rewire per diagram</p> <p>** Replace</p> <p>Refer to "Operation Section"</p> <p>** Replace</p> <p>** Lower setting or replace</p> <p>** Tighten wire connections</p> <p>** Replace</p> <p>** Check Installation</p> <p>** Replace Element</p> <p>Make sure all faucets are closed and check water meter.</p>
Not enough Hot Water	<ol style="list-style-type: none"> 1. Heater undersized 2. Defective Element 3. Miswired or defective thermostat 4. Solar System Incorrectly Installed 5. See #6 above (In No Hot Water) 	<p>Reduce rate of hot water use</p> <p>** Check amperage, replace element if low</p> <p>** Check wiring or replace</p> <p>** Check Installation</p>
Water too hot or not hot enough	<ol style="list-style-type: none"> 1. Thermostat setting too high or low 2. Thermostat out of calibration 3. Solar System Incorrectly Installed 4. Grounded Element 	<p>Change setting as required</p> <p>** Replace</p> <p>** Check Installation</p> <p>** Replace</p>
Noisy heating element	<ol style="list-style-type: none"> 1. Scale build-up on element 	<p>** Remove and clean</p>
Rattling noise during periods of water usage	<ol style="list-style-type: none"> 1. Internal Heat Trap fittings in operation 2. Loose Pipes 3. Water Pressure too high 4. Scale Build-up inside tank 	<p>None. The rattling noise is normal for Heat Trap fittings when in operation and does not indicate a need for service.</p> <p>Check and call local utility if necessary</p> <p>Drain and flush tank.</p>

CAUTION

** For your safety, DO NOT attempt repair of Electrical Wiring, Thermostat, Heating Element or other Operating Controls. Refer repairs to qualified service personnel.

How to Obtain Service Assistance

1. Should you have any questions about your new water heater, or if it requires adjustment, repair, or routine maintenance, it is suggested that you first contact your installer, plumbing contractor or previously agreed upon service agency. In the event that the firm has moved, or is unavailable, refer to the telephone directory commercial listings or local utility for qualified service assistance.

2. Should your problem not be solved to your complete satisfaction, you should then contact the Manufacturer's National Service Department at the following address:

2600 Gunter Park Drive
Montgomery, Alabama 36109-1413
Phone: 1-800-432-8373.

When contacting the manufacturer, the following information should be made available:

- a. Model and serial numbers of the water heater as shown on the rating plate attached to the jacket of the heater.
- b. Address where water heater is located and can be seen.
- c. Name and address of installer and any service agency who performed service on the water heater.
- d. Date of original installation and dates any service work was performed.
- e. Details of the problem as you can best describe them.
- f. List of people, with dates, who have been contacted regarding your problem.



NOTICE



FOR INSTALLATIONS IN THE STATE OF CALIFORNIA

California Law requires that residential water heaters must be braced, anchored or strapped to resist falling or horizontal displacement due to earthquake motions. For residential water heaters up to 52 gallon capacity, a brochure with generic earthquake bracing instructions can be obtained from:

OFFICE OF THE STATE ARCHITECT
1102 Q St., Suite 5100
Sacramento, CA 95811 - 6550
Telephone: (916)445-8100

or, ask a water heater dealer. However, applicable Local Codes shall govern installations. (For residential water heaters of capacity greater than 52 gallons, consult the local building jurisdiction for acceptable bracing installations)

Supplemental Instructions

The installation instructions in the Use & Care Manual supplied with the water heater should be followed in addition to the following Supplemental Instructions.

For increased energy efficiency, certain water heater models covered by this Use & Care Manual have been supplied with two (2) 24" sections of pipe insulation. Should the model being employed in your particular installation include the pipe insulation, please install the insulation as shown below for the type of installation configuration that best matches yours.

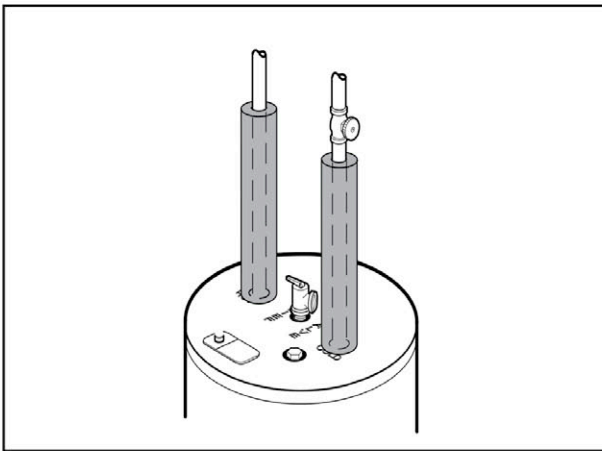


Figure 1. Typical Vertical piping arrangement.
(Your installation may vary slightly.)

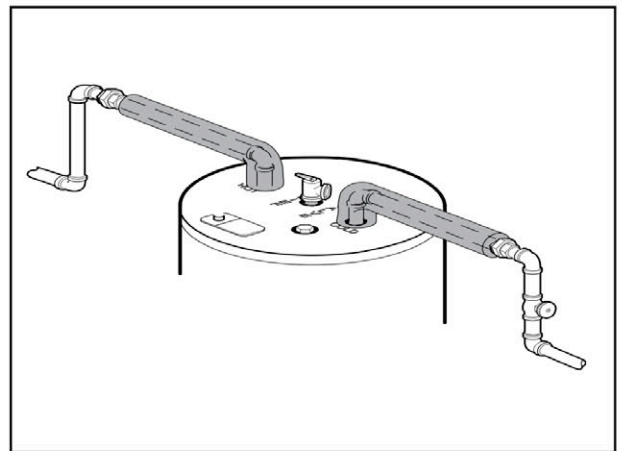
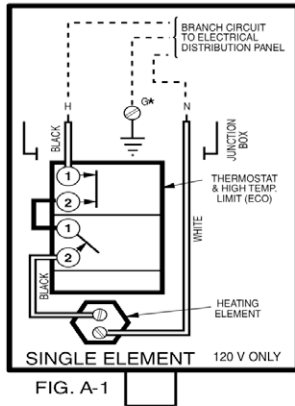
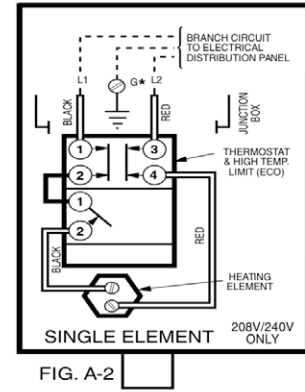


Figure 2. Typical Horizontal piping arrangement.
(Your installation may vary slightly.)

Wiring Diagrams



* Grounding conductor may be required.
Refer to Wiring Section of Manual



THIS WATER HEATER IS WIRED AS INDICATED ABOVE.

Operation and Maintenance

The Sol-Reliant system is designed to operate for 10 years with no required maintenance.

After 10 years it is advisable to check, and possibly change, the anode rod in the solar tank. Also the glycol should be checked for degradation. It is not necessary to change the glycol after 10 years. Dowfrost™ can last 20 years or more in a Sol-Reliant system as long as the pH remains above 7.

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 of the solar pre-heat tank. To get an accurate reading at the temperature gauge, you must first run some hot water in the house. You will know the system is working properly if, at the end of a sunny day when no significant amount of hot water has been used, the temperature is in the range of **100 to 160** degrees F.

NOTE: There will be no flow through the flow meter on a sunny day if the system has reach a its high limit temperature.

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.

Please see pages 22-33 for detailed instructions on the solar water heating storage tank from the tank manufacturer.

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 loss of operating fluid indicating either a leak somewhere in the solar loop or possibly fluid lost from pressure relief valve at the collector. 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 page 9, “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)

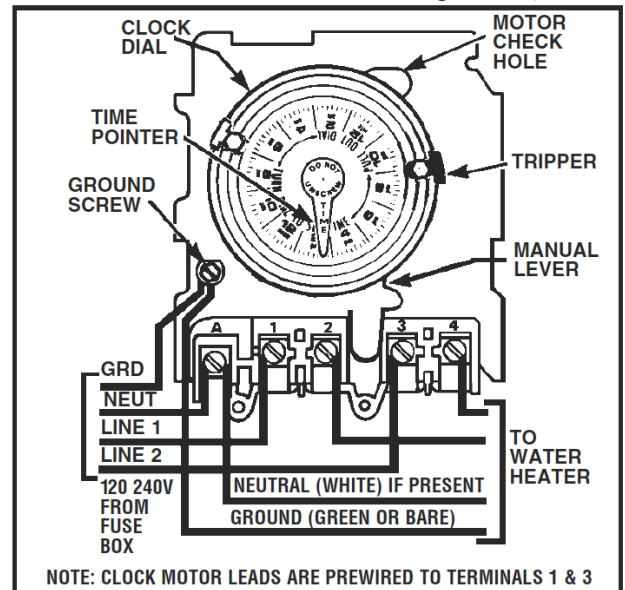
WH40 ELECTRIC WATER HEATER TIME SWITCH DOUBLE POLE, 10,000 WATTS (40 AMP) MAX., 250 VOLT - 60 HZ.



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



Manufacturer's Warranty

Sol-Reliant™ offers a full 5 year warranty on the complete system and on all components. In addition, the Solar Storage Tank is warranted by Rheem Manufacturing for 6 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:

SOL-RELIANT™
0326 SW Pendleton St.
Portland, OR 97239
www.solreliant.com
(503) 866-6437



BP SOLAR LIMITED WARRANTY CERTIFICATE

This warranty is valid for all products manufactured 1st of January 2010 and later.

BP Solar provides the following limited warranties to purchasers of BP Solar products according to the warranty level specified on the label on the back of your BP Solar product (hereinafter referred to as Your BP Solar Product), and subject to the exclusions contained in Section 2, and in Section 3 hereof. The Warranty applicable to Your BP Solar Product's warranty level is located in the corresponding columns to the right of Your BP Solar Product's applicable warranty level in the Warranty Information Chart below. If your product's warranty level is not listed contact your customer service center or sales representative. The warranty starts with delivery date to the final customer. Customers need to demonstrate delivery date by handing in their original invoice or appropriate verification. Nothing in this document affects any terms or rights which cannot be lawfully excluded

WARRANTY INFORMATION CHART		
WARRANTY LEVEL	MATERIALS & WORKMANSHIP	PERCENTAGE OF SPECIFIED MINIMUM POWER OUTPUT
25-12-5	5-Year Limited Warranty of Materials and Workmanship	25 – Year Limited Warranty of 85% Minimum Power Output 12 – Year Limited Warranty of 93% Minimum Power Output
0-12-2	2 -Year Limited Warranty of Materials and Workmanship	12 –Year Limited Warranty of 90% Minimum Power Output

SECTION 1. Warranty Descriptions.

Your BP Solar Product may have one or more of the following warranties. See the Warranty Information Chart above to determine which warranty or warranties applies to Your BP Solar Product.

- A. Limited Warranties of Materials and Workmanship:
5 -Year Limited Warranty of Materials and Workmanship
2 -Year Limited Warranty of Materials and Workmanship

If Your BP Solar Product comes with a Limited Warranty of Materials and Workmanship, BP Solar warrants that for the term of your warranty (see Warranty Information Chart) Your BP Solar Product sold hereunder shall be free from defects in materials and workmanship. If, during the term of your warranty, there is such a defect, then BP Solar will, at its sole option, repair or replace Your BP Solar Product with an equivalent product, or refund the purchase price, annually reduced by a linear depreciation, taking into account an anticipated life time of 30 years, to you.

This Limited Warranty of Materials and Workmanship does not warrant a specified level of power output. The Limited Warranties of Percentage of Specified Power Output described below may warrant power output.

- B. Limited warranties of Percentage of Specified Minimum Power Output:
12 – Year Limited Warranty of 93% of Minimum Power Output
25 – Year Limited Warranty of 85% of Minimum Power Output

If your BP Solar Product comes with a Limited Warranty of a Specified Power Output, BP Solar warrants Your BP Solar Product against defects in materials and workmanship that result in Your BP Solar Product's failure to produce your warranted percentage (see Warranty Information Chart) of the minimum power output specified in BP Solar's applicable written specifications, for the term of your warranty (see Warranty Information Chart). If BP Solar determines, using standard test conditions as defined in IEC 60904 at the date of manufacturing, that your BP Solar product is not providing your warranted percentage of its specified minimum power output during the term of your warranty, then BP Solar will, at its sole option, repair or replace Your BP Solar Product, or provide you with additional component(s) to bring the aggregate power output to at least your warranted percentage of the specified minimum power output.

SECTION 2. GENERAL INFORMATION.

The following applies to all warranted BP Solar products:

- A. BP Solar may, at its discretion, use new, remanufactured or refurbished parts or products when repairing or replacing Your BP SOLAR Product under this warranty. Replaced parts or products will become the property of BP Solar.
- B. BP Solar is not responsible for, and purchaser hereby agrees to bear, the costs of any on-site labor and any costs associated with the installation, removal, reinstallation or transportation of Your BP Solar Product or any components thereof for service under this limited warranty.
- C. Notwithstanding anything to the contrary in this warranty certificate, the warranties provided herein shall apply only to the owner at the time of the occurrence of a warranty case. The defective module has to be part of the solar plant, in which it was initially integrated.

SECTION 3. WARRANTY EXCLUSIONS AND LIMITATIONS

The following applies to all warranted BP Solar products:

- A. The warranties provided herein do not cover damage, malfunctions or service failures caused by:
- 1) Failure to follow BP Solar's installation, operation or maintenance instructions;
 - 2) Repair, modifications, or movement of Your BP Solar Product by someone other than a service technician approved by BP Solar, or attachment to Your BP Solar Product of non-BP Solar equipment;
 - 3) Abuse, misuse, or negligent acts;



BP SOLAR LIMITED WARRANTY CERTIFICATE

- 4) Power failure surges, lighting, fire, flood, pest damage, accidental breakage, actions of third parties, vandalism and other events or accidents outside BP Solar's reasonable control and not arising under normal operating conditions
- B. BP Solar makes no warranties, express or implied other than the warranties made herein, and specifically disclaims all other warranties, merchantability or fitness for a particular purpose.
- C. BP Solar excludes its liability for any special incidental, consequential or punitive damages arising from the use or loss of use of or failure of your BP Solar product to perform as warranted, including but not limited to damages for lost services, lost profit or savings, and expenses arising out of third-party claims. To the full extent permitted by law BP Solar's maximum liability under any warranty, expressed, implied, or statutory, or for any manufacturing or design defects, is limited to the purchase price of the product. The purchaser's exclusive remedy for breach of warranty or for manufacturing or design defects shall be only as stated herein.
- D. Where the purchaser is a natural person and if and to the extent required by applicable law, nothing in this limited warranty shall operate or shall be construed to operate so as to exclude or restrict the liability of BP Solar for death or personal injury caused to the purchaser by reason of the negligence of BP Solar or its servants, employees or agents.
- E. The rights granted by this Warranty are in addition to any statutory or other legal rights granted or existing under laws of the country or State in which the BP Solar Product was purchased and those legal rights are not affected by this Warranty.
- F. Some States do not allow limitations of certain so the above limitation may not apply to you.
- G. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Any claim or dispute arising under or in connection with this warranty certificate must be brought in the courts of the State of Maryland, U.S.A., unless the original product was purchased in a member state of the European Union or in the country of Australia. In the event the original product was purchased in a member state of the European Union, any claim or dispute arising from or in connection to this warranty certificate must be brought in the courts of Spain. In the event the original product was purchased in the country of Australia, any claim or dispute arising from or in connection to this warranty certificate must be brought in the courts of the State of New South Wales.

SECTION 4. HOW TO GET WARRANTY SERVICE and/or INFORMATION REGARDING DISPOSAL AND RECYCLING OPTIONS

For warranty service, disposal and/or recycling options, please contact the distributor you purchased Your BP Solar Product from or the customer service representative at regional customer service center at BP Solar. BP Solar regional customer service center contact numbers can be found at (<http://www.bpsolar.com/>).

This warranty is offered by the applicable BP Solar selling entity.

**Main Offices – Hauptgeschäftsstelle – Oficinas Principales
Principaux Bureaux – Uffici Principali
Australia – Australien – Australia – Australie – Australia –
BP Solar Australia Pty Ltd.**
71 Epping Road
North Ryde
NSW 2113, Australia
☎ +61 2 8762 5777

**Germany – Deutschland – Alemania – Allemagne – Germania
BP Solar Germany GmbH**
Max-Born-Strasse. 2
D-22761 Hamburg
Germany
☎ +49 (0) 40 6395 3800

**India – Indien – India – Inde
Tata BP Solar India Ltd.**
Plot 78 Electronic City,
Hosur Road
Bangalore 561 229, India
☎ +91 80 40702000

**Spain – Spanien – España-Espagne – Espagna -
BP Solar España S.A.U.**
Avenida de Bruselas, 36
P.E. Arroyo de la Vega
28108 Alcobendas
Madrid, Spain
☎ +34 91 414 70 00

**United States – Vereinigte Staaten Estados Unidos – Etats-Unis
BP Solar International LLC.**
East Coast:
630 Solarex Court
Frederick, Maryland 21703
U.S.A.
☎ +1-301-698-4200

West Coast:
90 New Montgomery Street
San Francisco, California 94105
U.S.A.
☎ +1-415-284-1900

**France – Frankreich – Francia
Apex BP Solar**
1, rue du Grand Chêne
34270 Saint Mathieu de Tréviers
France
382 499 499 RCS Montpellier
☎ +33 499 622 622



SX 330

30 Watt Photovoltaic Module

High-efficiency photovoltaic module using silicon nitride multicrystalline silicon cells.

Performance

Rated power (P_{max})	30W
Power tolerance	$\pm 10\%$
Nominal voltage	12V
Limited Warranty ¹	12 years

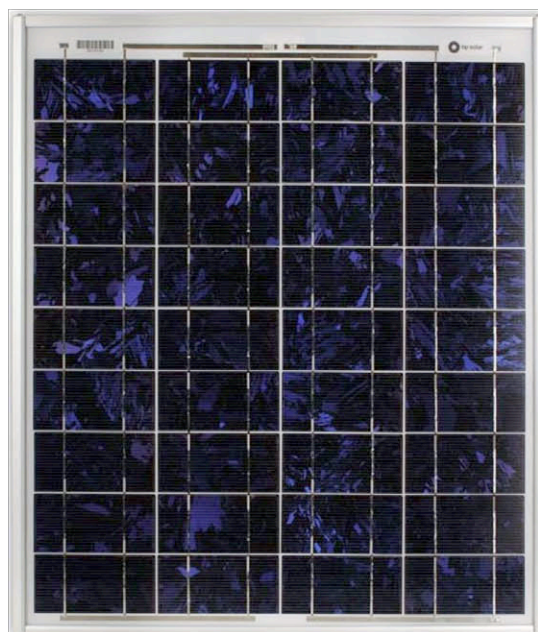
Configuration

J	Clear universal frame and standard J-Box
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Electrical Characteristics²

SX330

Maximum power (P_{max}) ³	30W
Voltage at Pmax (V_{mp})	16.8V
Current at Pmax (I_{mp})	1.78A
Warranted minimum P_{max}	27W
Short-circuit current (I_{sc})	1.94A
Open-circuit voltage (V_{oc})	21.0V
Temperature coefficient of I_{sc}	$(0.065 \pm 0.015)\% / ^\circ C$
Temperature coefficient of V_{oc}	$-(80 \pm 10)mV / ^\circ C$
Temperature coefficient of power	$-(0.5 \pm 0.05)\% / ^\circ C$
NOCT (Air 20°C; Sun 0.8kW/m ² ; wind 1m/s)	47 \pm 2°C
Maximum series fuse rating	5A
Maximum system voltage	50V (US NEC rating)



Mechanical Characteristics

Dimensions	Length: 595mm (23.4")	Width: 502mm (19.7")	Depth: 50mm (1.97")
Weight	3.9 kg (8.6 pounds)		
Solar Cells	36 cells (57mm x 114mm) in a 4x9 matrix connected in series		
Junction Box	J-Version junction box with 4-terminal connection block; IP 65, accepts PG 13.5, M20, ½ inch conduit, or cable fittings accepting 6-12mm diameter cable. Terminals accept 2.5 to 10mm ² (8 to 14 AWG) wire.		
Construction	Front: High-transmission 3mm (1/8 th inch) tempered glass; Back: Polyester; Encapsulant: EVA		
Frame	Clear anodized aluminum alloy type 6063T6 Universal frame; Color: silver		

1. Module Warranty: 12-year limited warranty of 90% power output; 2-year limited warranty of materials and workmanship. See your local representative for full terms of these warranties.
2. These data represent the performance of typical BP modules, and are based on measurements made in accordance with ASTM E1036 corrected to SRC (STC.)
3. During the stabilization process that occurs during the first few months of deployment, module power may decrease by approx. 1% from typical P_{max} .

Quality and Safety



Listed by Underwriter's Laboratories for electrical and fire safety
(Class C fire rating)



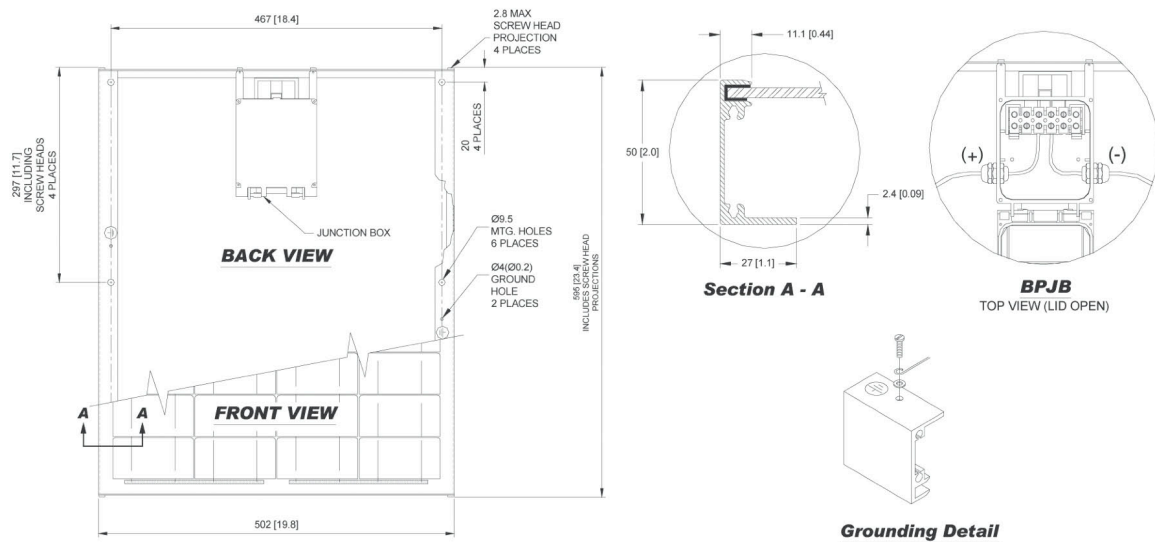
Approved by Factory Mutual Research in NEC Class 1, Division 2,
Groups C & D hazardous locations.

Qualification Test Parameters

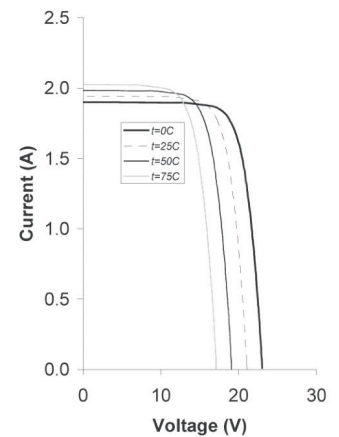
Temperature cycling range	-40°C to +85°C (-40°F to 185°F)
Humidity freeze, damp heat	85% RH
Static load front and back (e.g. wind)	2,400 pa (50psf)
Front loading (e.g. snow)	5,400 pa (113psf)
Hailstone impact	25mm Ø (1 inch) at 23 m/s (52mph)

Module Diagram

Dimensions in brackets are in inches. Un-bracketed dimensions are in millimeters. Overall tolerances $\pm 3\text{mm}$ (1/8")



SX330 I-V Curves



Included with each module: self-tapping grounding screw, instruction sheet, and warranty document.

Note: This publication summarizes product warranty and specifications, which are subject to change without notice.
Additional information may be found on our web site: www.bpsolar.com





The new degree of comfort.™



Residential Solar Electric
**Solaraide Water Heaters
& Storage Tanks**

Solaraide™ tanks with multi-port connections are available as electric backup water heaters and as storage tanks for solar water heating systems

Features & Benefits

- Connection ports on the top, right and left side fit more installations and reduce SKUs
- Two well insulated models to choose from...a storage tank or a high efficiency 4500 Watt backup electric water heater
- Electric backup model provides at least 40-gallons of stored hot water

Easy Installation and Maintenance

- Collector feed and return fittings conveniently located on front of tank for easy installation
- A special 1/2" NPT opening is provided for installation of a "probe type" thermostat
- Durable brass drain valve for easy maintenance

Tank Design & Construction

- Cold water inlet brings cold water to tank bottom to prevent mixing with heated water
- Rheemglas® tank lining resists corrosion and prolongs tank life
- Anode rod equalizes aggressive action for prolonged tank life
- Temperature and pressure relief valve included
- Electric backup model has automatic temperature control and over heat protection

Warranty

- 6-Year limited tank and parts warranty*

*See Residential Warranty Certificate for complete information

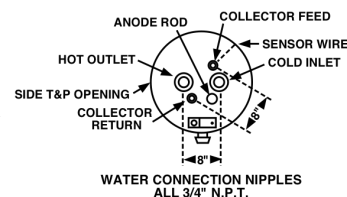
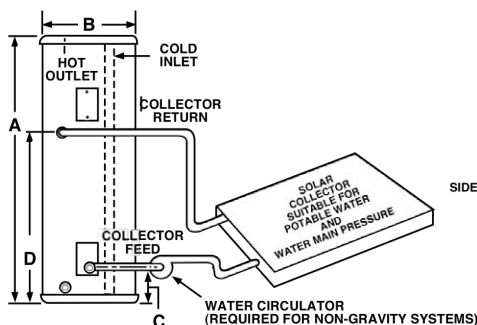
Units meet or exceed ANSI requirements and have been tested according to D.O.E. procedures. Units meet or exceed the energy efficiency requirements of NAECA, ASHRAE standard 90, ICC Code and all state energy efficiency performance criteria.

This unit uses the potable water within the tank for circulation through the solar system.



Solaraide Tanks

80 and 120-Gallon Capacities
Electric WHs and Storage Tanks
Connection Ports: Top & Sides



TYPE	DESCRIPTION			ROUGHING IN DIMENSIONS (SHOWN IN INCHES)				ENERGY INFO.	
	GAL. CAP.	MODEL NUMBER	ELEMENT WATTAGE UPPER	HEIGHT A	DIAMETER B	HEIGHT TO COLLECTOR FEED C	HEIGHT TO COLLECTOR RETURN D	APPROX. SHIP WT. (LBS.)	APPROX. R-FACTOR
TALL	80	81VR80U-1	4500 W*	58-3/4	24-1/2	3	38-1/4	192	R-17.3
	80	81VR80U-T	Storage Only	58-3/4	24-1/2	3	38-1/4	192	R-17.3
	120	81VR120U-1	4500 W*	62	28-1/4	3-3/4	38-1/2	336	R-16.7
	120	81VR120U-T	Storage Only	62	28-1/4	3-3/4	38-1/2	336	R-16.7

*Heaters furnished with standard 240 volt AC, single phase non-simultaneous wiring and 4500 watt heating element.

If heating elements of different wattages than those shown are demanded by zone requirements, they must be specifically requested.

Solaraide models meet all current requirements for solar storage tanks.

The tanks are Rheemglas lined and are designed to operate up to 150 PSI.

In keeping with its policy of continuous progress and product improvement, Rheem reserves the right to make changes without notice.

Rheem Water Heating • 101 Bell Road
Montgomery, Alabama 36117-4305 • www.rheem.com

Rheem Canada Ltd./Ltée • 125 Edgeware Road, Unit 1
Brampton, Ontario L6Y 0P5 • www.rheem.com



INTEGRATED HOME COMFORT

PRINTED IN U.S.A. 11/12 WP FORM NO. 101-1 Rev. 18

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.

BR-20A

Laing Thermotech
a **xylem** brand

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.



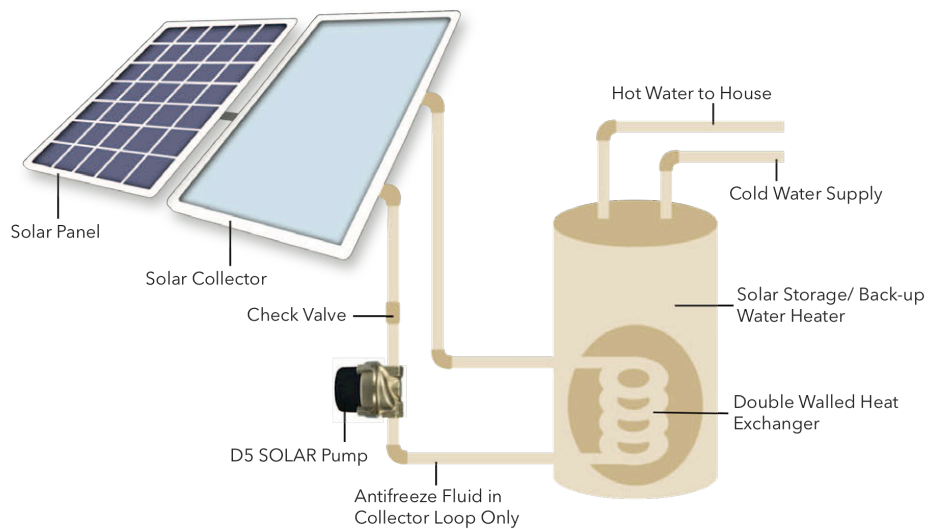


Technical Data

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



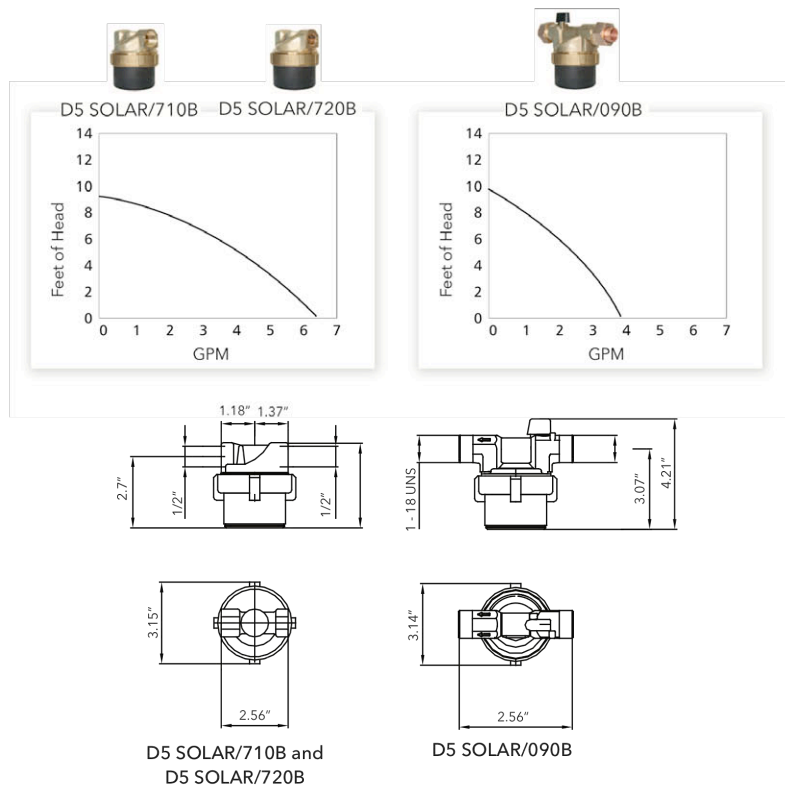
Available Models

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



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 Fax: (559) 265-4740 (800) 453-7523
www.xyleminc.com/brands/laingthermotech

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Laing Thermotech Limited Warranty for Commercial, Plumbing and Solar Products

(For Spa Warranty Contact the Spa Manufacturer)

Standard Warranty

Seller warrants that the goods purchased hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the purchase order) will (i) be built in accordance with the specifications referred to in the quotation or confirmation of sale, as the case may be, and (ii) will be free from defects in material and workmanship for a period of one (1) year from the date of installation or twenty-four (24) months from the date of manufacture (which date of manufacture shall not be greater than thirty (30) days after receipt of notice that the goods are ready to return) whichever shall occur first.



Xylem Inc.
3878 S. Willow, Suite 104
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www.xyleminc.com/brands/laingthermotech

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DOWFROST HD

Inhibited Propylene Glycol-based Heat Transfer Fluid

DOWFROST[®] HD heat transfer fluid is a formulation of 94.0 percent propylene glycol and a specially designed package of industrial corrosion inhibitors. The fluid is dyed bright yellow to aid in leak detection. Solutions in water provide freeze protection to below -50°C (-60°F) and burst protection to below -73°C (-100°F).

Recommended use temperature range:
-45°C (-50°F) to 160°C (325°F)

Suitable applications: single fluid process heating and cooling, closed-loop, water-based HVAC applications where propylene glycol solutions are preferred or required.

For health and safety information for this product, contact your Dow sales representative or call the number for your area on the second page of this sheet for a Material Safety Data Sheet (MSDS).

Typical Concentrations of DOWFROST HD Fluid Required to Provide Freeze and Burst Protection at Various Temperatures

Temperature °C (°F)	Percent DOWFROST HD Fluid Concentration Required	
	For Freeze Protection Volume %	For Burst Protection Volume %
-7 (20)	18	12
-12 (10)	29	20
-18 (0)	36	24
-23 (-10)	42	28
-29 (-20)	46	30
-34 (-30)	50	33
-40 (-40)	54	35
-46 (-50)	57	35
-51 (-60)	60	35

NOTE: These figures are examples only and may not be appropriate to your situation. Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions of less than 20% glycol. Contact Dow for information on specific cases or further assistance.
ATTENTION: These are typical numbers only and are not to be regarded as specifications. As use conditions are not within its control, Dow does not guarantee results from use of the information or products herein; and gives no warranty, express or implied.

Typical Freezing and Boiling Points of DOWFROST HD Fluid[†]

Wt. % Propylene Glycol	Vol. % Propylene Glycol	Wt. % DOWFROST HD	Vol. % DOWFROST HD	Freezing Point °C (°F)	Boiling Point °C @ 101 kPa (°F @ 760 mmHg)	Degree Brix ^{††}	Refractive Index 22°C (72°F)
0.0	0.0	0.0	0.0	0 (32.0)	100.0 (212)	0.0	1.3328
5.0	4.8	5.3	5.1	-1.6 (29.1)	100.0 (212)	4.8	1.3383
10.0	9.6	10.7	10.2	-3.3 (26.1)	100.0 (212)	8.4	1.3438
15.0	14.5	16.0	15.4	-5.1 (22.9)	100.0 (212)	12.9	1.3495
20.0	19.4	21.3	20.6	-7.1 (19.2)	100.6 (213)	15.4	1.3555
25.0	24.4	26.6	26.0	-9.6 (14.7)	101.1 (214)	19.0	1.3615
30.0	29.4	31.9	31.3	-12.7 (9.2)	102.2 (216)	22.0	1.3675
35.0	34.4	37.2	36.6	-16.4 (2.4)	102.8 (217)	26.1	1.3733
40.0	39.6	42.6	42.1	-21.1 (-6.0)	103.9 (219)	29.1	1.3790
45.0	44.7	47.9	47.6	-26.7 (-16.1)	104.4 (220)	31.8	1.3847
50.0	49.9	53.2	53.1	-33.5 (-28.3)	105.6 (222)	34.7	1.3903
55.0	55.0	58.5	58.5	-41.6 (-42.8)	106.1 (223)	38.0	1.3956
60.0	60.0	63.8	63.8	-51.1 (-59.9)	107.2 (225)	40.6	1.4008
65.0	65.0	69.1	69.1	b	108.3 (227)	42.1	1.4058
70.0	70.0	74.5	74.5	b	110.0 (230)	44.1	1.4104
75.0	75.0	79.8	79.8	b	113.9 (237)	46.1	1.4150
80.0	80.0	85.1	85.1	b	118.3 (245)	48.0	1.4193
85.0	85.0	90.4	90.4	b	125.0 (257)	50.0	1.4235
90.0	90.0	95.7	95.7	b	132.2 (270)	51.4	1.4275
95.0	95.0	a	a	b	154.4 (310)	52.8	1.4315

[†] Typical properties, not to be construed as specifications.

^{††} Degree Brix is a measure of the sugar concentration in a fluid and is important in fermentation and syrups applications. Although there is no sugar present in DOWFROST heat transfer fluids, the glycol affects the refractive index of the fluid in a similar fashion.

^{*} Propylene glycol concentrations greater than 94% are not attainable with DOWFROST HD fluid.

^b Freezing points are below -50°C (-60°F).

NOTE: Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions of less than 20% glycol. Contact Dow for information on specific cases or further assistance.

^{*}Trademark of The Dow Chemical Company

DOWFROST HD Inhibited Propylene Glycol-based Heat Transfer Fluid

Typical Properties of DOWFROST HD Fluid†

DOWFROST HD Heat Transfer Fluid	
Composition (% by weight)	
Propylene Glycol	94
Performance Additives	6
Color	Fluorescent Yellow
Specific Gravity 15/15°C (60/60°F)	1.053–1.063
pH of Solution (50% glycol)	9.5–10.5
Reserve Alkalinity (min.)	15.0 ml

†Typical properties, not to be construed as specifications. Complete sales specifications are available on request.

Saturation Properties of DOWFROST HD Fluid at 30% Propylene Glycol Concentration by Volume

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb°F)	Density kg/m³ (lb/ft³)	Therm. Cond. W/mK [Btu/hr ft² (°F/ft)]	Viscosity mPa·s (cps)
10 (50)	3.756 (0.898)	1043.85 (65.17)	0.4344 (0.2510)	4.5068 (4.51)
40 (104)	3.841 (0.918)	1029.85 (64.29)	0.4622 (0.2670)	1.6295 (1.63)
65 (149)	3.913 (0.935)	1014.87 (63.36)	0.4771 (0.2757)	0.9144 (0.91)
90 (194)	3.984 (0.952)	996.86 (62.23)	0.4846 (0.2800)	0.6040 (0.60)
120 (248)	4.070 (0.973)	971.26 (60.63)	0.4838 (0.2795)	0.4246 (0.42)

Saturation Properties of DOWFROST HD Fluid at 40% Propylene Glycol Concentration by Volume

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb°F)	Density kg/m³ (lb/ft³)	Therm. Cond. W/mK [Btu/hr ft² (°F/ft)]	Viscosity mPa·s (cps)
-20 (-4)	3.453 (0.825)	1066.76 (66.60)	0.3635 (0.2100)	48.9043 (48.90)
10 (50)	3.564 (0.852)	1055.38 (65.89)	0.3936 (0.2274)	7.2173 (7.22)
40 (104)	3.675 (0.878)	1039.77 (64.91)	0.4150 (0.2398)	2.2389 (2.24)
65 (149)	3.767 (0.900)	1023.55 (63.90)	0.4262 (0.2463)	1.1762 (1.18)
90 (194)	3.859 (0.922)	1004.39 (62.70)	0.4313 (0.2492)	0.7462 (0.75)
120 (248)	3.970 (0.949)	977.53 (61.03)	0.4294 (0.2481)	0.5084 (0.51)

Saturation Properties of DOWFROST HD Fluid at 50% Propylene Glycol Concentration by Volume

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb°F)	Density kg/m³ (lb/ft³)	Therm. Cond. W/mK [Btu/hr ft² (°F/ft)]	Viscosity mPa·s (cps)
-30 (-22)	3.165 (0.756)	1081.98 (67.55)	0.3246 (0.1875)	172.8273 (172.83)
-20 (-4)	3.210 (0.767)	1078.51 (67.33)	0.3336 (0.1927)	73.0193 (73.02)
10 (50)	3.346 (0.800)	1065.40 (66.51)	0.3560 (0.2057)	10.6481 (10.65)
40 (104)	3.481 (0.832)	1048.23 (65.44)	0.3716 (0.2147)	3.1103 (3.11)
65 (149)	3.594 (0.850)	1030.83 (64.35)	0.3792 (0.2191)	1.5483 (1.55)
90 (194)	3.707 (0.886)	1010.61 (63.09)	0.3821 (0.2208)	0.9339 (0.93)
120 (248)	3.843 (0.919)	982.63 (61.34)	0.3792 (0.2191)	0.6029 (0.60)

For further information, call...

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In the Pacific: +886 22 547 8731 • FAX: +886 22 713 0092

In other Global Areas: 1-989-832-1560 • FAX: 1-989-832-1465

www.dowfrost.com

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Published November 2001



Printed In U.S.A.

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NA/LA/Pacific: Form No. 180-01315-1101 AMS