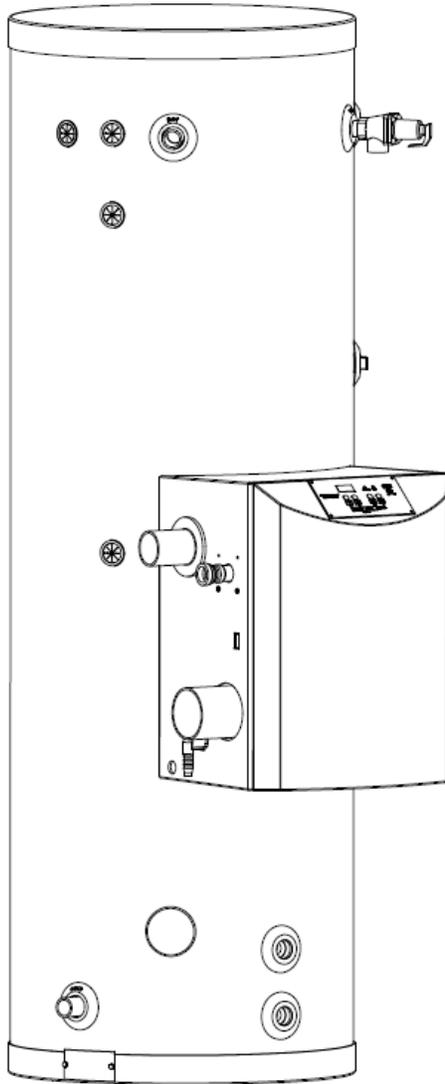




Phoenix Solar Water Heater



INSTALLATION

OPERATION

MAINTENANCE

**Phoenix Water Heater Models
PH130-80S / 130-119S
PH199-80S / 199-119S**



The solar energy system described in this manual, when properly installed and maintained, meets the minimum standards established by the SRCC. This certification does not imply endorsement or warranty of this product by the SRCC.

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

SPECIAL ATTENTION BOXES

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important product information.

DANGER

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

WARNING

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

CAUTION

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

CAUTION

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

FOREWORD

This manual is intended to be used in conjunction with other literature provided with the Solar Water Heater. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications including Solar Water Heating System Design and Installation Guidelines, be reviewed in their entirety before beginning any work.

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

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

FOR THE INSTALLER

WARNING

This manual must only be used by a qualified heating installer/service technician. Read all instructions in this manual before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

INSTALLATION OR SERVICE OF THIS SOLAR WATER TANK IS REQUIRED TO BE PERFORMED BY LICENSED PROFESSIONALS WHERE SOLAR, PLUMBING AND ELECTRICAL WORK IS REQUIRED.

The installer should be guided by the instructions furnished with the tank, local codes and utility company requirements. Preference should be given to codes and requirements where they differ from the furnished instructions.

INSTALLATIONS MUST COMPLY WITH:

Local, state, provincial, and national codes, laws, regulations and ordinances.

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

The latest version of the National Fuel Gas Code, ANSI Z223.1, from American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131.

In Canada – CGA No. B149 (latest version), from Canadian Gas Association Laboratories, 55 Scarsdale Road, Don Mills, Ontario, Canada M3B 2R3. Also, Canadian Electrical Code C 22.1, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

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

The latest version of the National Electrical Code, NFPA No. 70.

In Canada, refer to Canadian Electrical Code C 22.1, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

NOTE: The Phoenix gas manifold and controls met safe lighting and other performance criteria when undergoing tests specified in ANSI Z21.10.3 – latest edition.

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PART 1: GENERAL SAFETY INFORMATION

⚠ WARNING

INSTALLER – Read all instructions in this manual before installing. Perform steps in the order given.

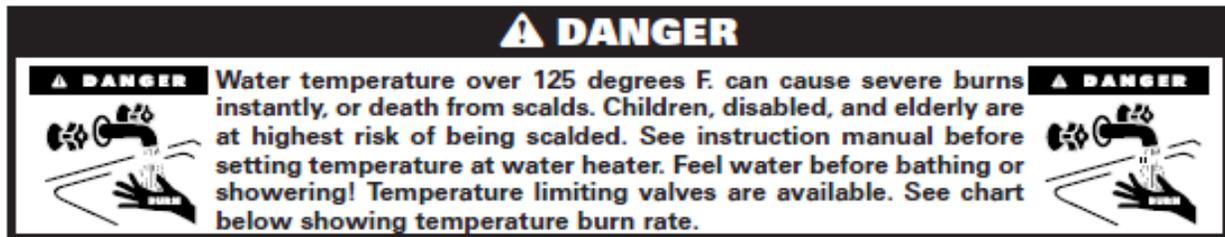
USER – This manual is for use only by a qualified installer/service technician. Refer to user's information manual for your reference. Have this heater serviced/inspected by a qualified service technician annually.

FAILURE TO ADHERE TO THE GUIDELINES ON THIS PAGE CAN RESULT IN SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

A. LOCAL INSTALLATION REGULATION

Installation of this solar water heater may be governed by individual local rules and regulations for this type of product, which must be observed. Always use the latest edition of codes. The installation, adjustment, service, and maintenance of the solar water heater must be done by a licensed professional who is qualified and experienced in the installation, service, and maintenance of solar hot water systems.

B. WATER TEMPERATURE ADJUSTMENT



If the solar water heater is going to have a set temperature above 120°F, you must use an ASSE 1017 rated mixing valve to avoid severe burns or death from scalding temperature.

⚠ WARNING

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

C. FREEZE PROTECTION/WINTERIZING

NOTE: Consider piping and installation when determining heater location.

To winterize the heater, drain the entire system. Pump one gallon of non-toxic, NSF food grade propylene glycol, FDA rated as GRAS (Generally Recognized As Safe), into the tank. Consult the glycol manufacturer for specific instructions on concentration percentage as well as freeze and burst protection methods. Check the concentration of antifreeze to assure protection is adequate to protect the bottom of the heater from freezing.

PART 2: GENERAL INFORMATION

A. PREFACE

By using the sun's energy to heat water, solar hot water heating systems help reduce the nation's dependence on polluting fossil fuels. This reliable, efficient solar water heater meets the certification requirements of SRCC-OG-300.

B. INTRODUCTION

Solar system performance and efficiency varies with factors such as: household hot water load, ambient air temperature, roof pitch, collector orientation, and seasonal intensity.

Your solar system uses a circulation pump to circulate heat transfer fluid throughout the system. Depending on system design, you may use distilled water (often used in drain back systems), or a propylene glycol/water solution (in closed loop systems) as heat transfer fluid. Drain back and propylene glycol systems provide freeze protection to the solar components.

This manual intends to familiarize you with the proper installation and maintenance of your solar water heating system. This system must be installed by a licensed solar or plumbing contractor in accordance with SRCC Standard OG-300 and all applicable national, state, and local codes.

NOTE: Failure to follow the procedures described in this manual voids the manufacturer warranty.

C. SYSTEM DESCRIPTION

Some of the components in the Phoenix Solar Water Heating System include: the solar collector(s), a Phoenix Solar Water Heater, a circulator pump, a differential solar control, and an expansion tank. Depending on the type of solar system, distilled water or non-toxic, FDA rated Generally Recognized As Safe (GRAS) propylene glycol will be used as heat transfer fluid.

D. PHOENIX SOLAR WATER HEATER

The Phoenix Solar Water Heater has an internal solar heat exchanger for use with solar collectors. And when there is not sufficient solar energy, the Phoenix Solar Water Heater utilizes a gas-fired backup to provide hot water. (Refer to solar piping details in this manual for suggested piping application.)

E. SOLAR WATER HEATER LOCATION

Choosing a location for your solar water heater is an extremely important part of the installation process. The heater location should be centralized to the piping system, in an area where it will not be exposed to freezing temperatures. All piping should be insulated to protect against freezing and heat loss.

In addition, the solar water heater should be installed with plenty of clearance for service. If minimum clearances are not met, it may not be possible to service the heater without removing it from its location.

Finally, the solar water heater should also be installed in a place where T&P discharge or a leak will not result in damage to the surrounding area. If such a location is not available, install an auxiliary catch pan.

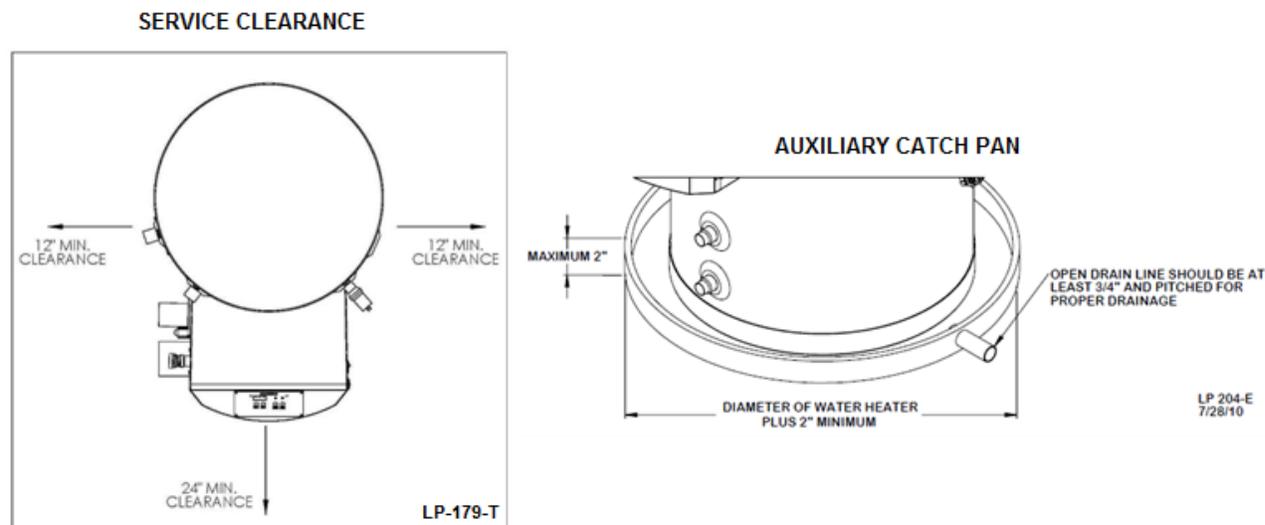


Figure 1 - Clearances

F. INSPECTION OF THE SOLAR WATER HEATER

When receiving your solar water heater, inspect it for possible damage. Check markings on the rating plate to be certain the power supply corresponds to that for which the water heater is equipped.

G. SOLAR PIPING CONNECTION

When making a connection to the heat exchangers, use Teflon tape and joint compound to prevent leaks. The heat exchanger connections are 1" NPT. Do not apply heat directly to heat exchanger thread connection when sweating fittings.

In closed loop glycol systems, freeze protection fluid must be non-toxic, propylene glycol, FDA rated as GRAS. To protect the heat exchanger and other system components, regular scheduled maintenance must be established to monitor and maintain proper heat transfer fluid pH levels.

⚠ WARNING

Many heat transfer fluids are classified as toxic. Do not introduce heat transfer fluids into any fittings on the heater except those clearly marked for that purpose.

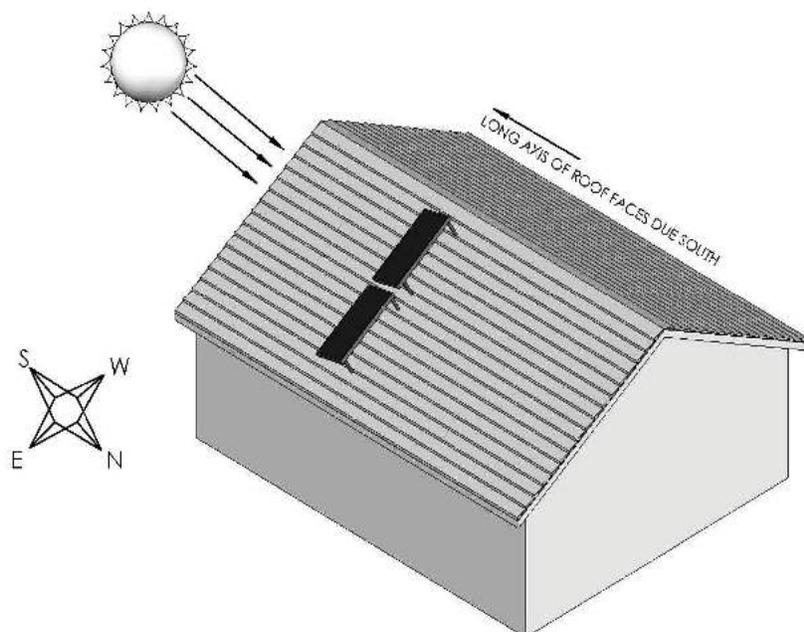
The system components should carry temperature and pressure ratings equivalent to the design of the solar collector. To ensure system is appropriate for installation climate, the solar collector ratings should be verified against the collector manufacturer specifications. Collector and storage tank temperatures can be read from the system controllers. Typical tank operating temperatures range from 40-80°F on the cold supply line to the 175°F tank high limit. The collector temperature sensor should be 5-20°F higher than the tank sensor during normal charging operation. During idle period, when there is no sun, the collector sensor will read the ambient temperature; in full sun, the sensor will read as high as 250°F. Temperatures vary depending on installation climate.

Using proper concentrations of glycol, solar systems can be operated at ambient temperatures as low as -60°F. Freeze tolerance limits are based upon an assumed set of environmental conditions. Refer to the DOWFROST specification sheet in the back of this manual for recommended concentrations.

Depending on the controller model, the differential controller uses 10k ohm thermistors or 1k RTDs to monitor the temperature difference between the collector and the solar water heater. The controller turns on when the collector is 12-20°F above tank temperature and turns off when the differential drops to 4°F.

H. GENERAL SOLAR PANEL ORIENTATION

Part of the performance of your solar water heater is based on the correct orientation of the solar panels. The collector should be mounted as close to the storage tank as possible to minimize heat loss in the



pipings runs. In North America, collectors should be oriented facing due south. However, if this is not possible, they may be installed within 40 – 60 degrees of due south. Optimal tilt is +/- 10° from the latitude of the site. The solar collector must be located in an area of the roof that will be unshaded for the majority of the day (from 9 AM – 3 P<) year round. Adjacent buildings and trees should be checked for possible winter shading.

You must consult your solar panel installation manual for recommended mounting and positioning of the panels.

Figure 2 – Example of Solar Panel Orientation – LP-199-O

I. GENERAL SOLAR PANEL INSTALLATION

The contractor shall obtain all required permits and approvals for installing the solar system. The installation shall conform to all federal, state and local regulations governing solar water heating system installations. The contractor shall adhere to sound building safety and trade practices. Special consideration must be given to building code requirements for the penetration of structural members and fire rated assemblies. Before the installation, the contractor shall inspect the condition of the roof and notify the homeowner of any existing roof damage or necessary repairs. The most important structural consideration is to securely anchor the solar collector and the solar strut mounting hardware to the structural members of the roof with stainless steel hanger or lag bolts as detailed in figures below. Consult with the panel manufacturer installation manual for proper guidelines in your application.

Preserving the integrity of the roof membrane is the most important roofing consideration. Ensure that all roof penetrations required to plumb and mount the solar collector are properly flashed and sealed in accordance with standard roofing practices. The recommended elastomer for sealing roof penetrations is Tremco "POLYroof".

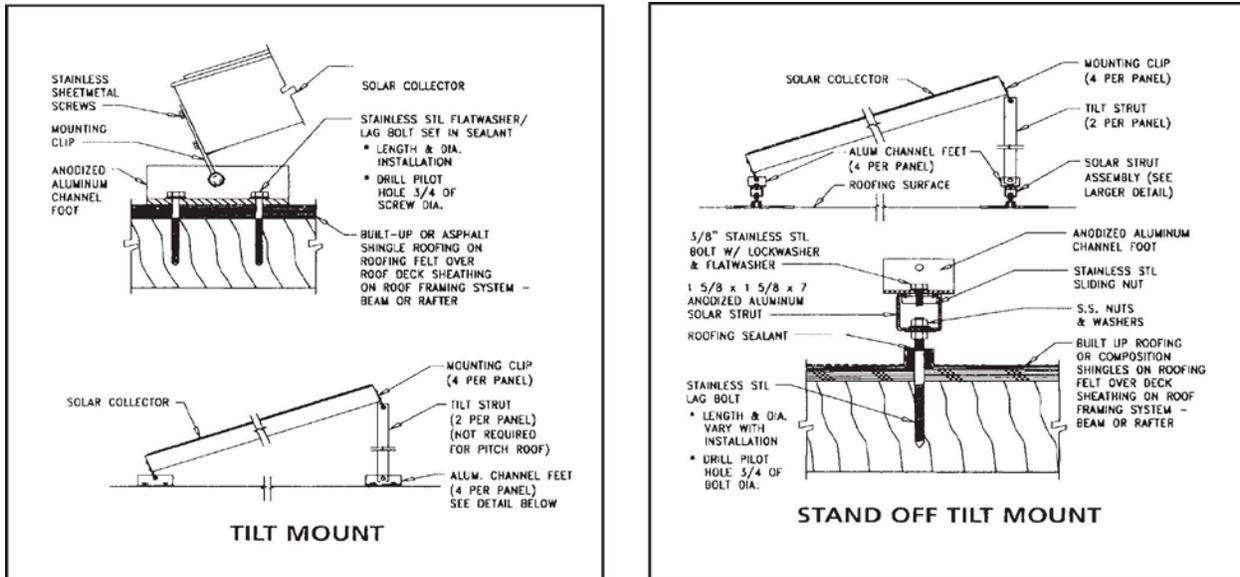


Figure 3 - This detail is an example of a typical solar roof mount application. All equipment should be installed in accordance with all local codes and best practices as identified with National Roofing Contractors Association (NRCA) or other qualified body.

J. COLLECTOR LOOP PIPE INSULATION

To minimize heat loss, the collector loop cold supply and hot return lines must be well insulated with high quality flexible closed cell insulation. The wall thickness of the pipe insulation should not be less than $\frac{3}{4}$ ". A 1" wall thickness is required in all areas prone to annual hard freeze conditions. When it comes to pipe insulation the rule is simple: thicker is better. The specified piping insulation material is Rubatex Insul-Tube 180 or equal.

To the extent possible, slide the insulation material over the pipe without cutting or taping. All butt joints must be sealed with contact adhesive. The use of rigid polyethylene pipe insulation is prohibited. The temperatures generated by your collector in the summer months or under stagnation conditions can melt this type of material.

Any above ground exterior pipe insulation is subject to UV degradation and must be wrapped with foil tape or painted with two coats of high quality water-based acrylic resin coating as supplied by the insulation manufacturer. The required coating material is Rubatex UV Protective Coating or equal.

K. COLLECTOR PIPING

Collector piping requires the use of all copper and brass fittings in the collector loop. In glycol loops, cast iron is also acceptable. Couplings rather than unions should be used to join the collectors to avoid leaks and fluid loss. Use only lead-free solder. Engelhard Silvacrete 100 or equal is required. Use of 50/50 lead solder is expressly prohibited. Use of galvanized steel, CPVC, PVC, or any other type of plastic pipe is prohibited.

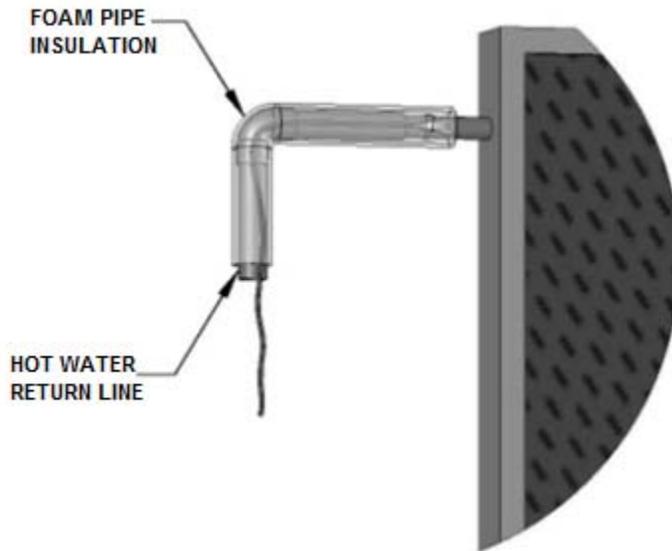
Piping in new solar installations may have dirt, grease, solder flux, or other impurities in the piping that over time affect the quality of the glycol HTF. A thorough cleaning is required before charging the system with glycol.

All vertical piping between the storage tank and the collector shall be supported at each story or at maximum intervals of ten feet (10'). Copper plumbers tape or tube strap is required. The pipe insulation may not be compressed or crimped by the strapping material.

The installation of all horizontal and vertical piping may not reduce the performance or rating of any structural member or fire rated assembly. Adhere to all applicable local codes and ordinances.

L. COLLECTOR SENSOR PLACEMENT

The collector sensor must be located on the hot water return line as close to the collector as possible. Some collectors have insertion areas to measure temperatures more accurately at the collector manifold.



Sensors are typically accurate to +/- 1/2°F if properly installed and weatherized. To maximize sensor accuracy, attach the flanged portion of the sensor to the collector header pipe with a stainless steel hose clamp. Wire nuts used to connect the sensor and low voltage wiring shall be all plastic, sealed with silicone, and thoroughly wrapped in electrician's tape.

The low voltage wiring used to connect the sensors to the controller should be a minimum 18 AWG. The wiring should be bare or tinned copper, two conductor, PVC insulated, with a PVC UV rated gray jacket suitable for exterior use. Use Eastman Wire & Cable no. 5704, Beldon Wire and Cable no. 8461 or equal.

Figure 4 – Sensor Placement – LP-199-O

The sensor "bundle" must be placed under the rubber pipe insulation covering the collector header. Thoroughly wrap and weatherize the insulation with electrician's tape or insulation tape as provided by the manufacturer (Rubatex Insul-Tape or equal).

PART 3: WATER HEATER INSTALLATION

A. INSTALLATION CHECKLIST

Location

- Sufficient room to service water heater
- Provisions made to protect area from water damage
- Centrally located to fixtures
- Protected from freezing temperatures
- Area free of flammable vapors

Potable Water Supply

- All related piping free from leaks
- Thermal expansion tank installed
- Water heater and fixtures have been properly purged of air
- ASSE 1017 rated thermostatic mixing valve (if water temperature is set above 120°F)

Relief Valve

- Temperature and Pressure relief valve properly installed and discharge line runs to open drain
- Discharge line not exposed to freezing temperatures
- Discharge line constructed of copper

Solar Heat Exchanger to Solar Panel

- Anti-freeze (if required) is added and rated as non-toxic with copy of MSDS sheet for homeowner
- Solar heat exchanger completely purged of air
- Expansion tank and pressure temperature gauge operating properly
- Solar control shows circulators operating properly on the solar panels

Anti-Freeze Fluid

- Make sure freeze protection fluids are certified non-toxic
- Glycol percentage must be calculated per local area freeze level
- Provide glycol MSDS sheet to end user

B. POTABLE WATER PIPING

The design and installation of the solar water heating system should be done by qualified individuals. It is important that good design and installation practice be followed to assure that your system will operate properly. Failure to follow installation guidelines for your solar water heater system could cause component failure and possible safety issues.

 WARNING
--

<p>Many heat transfer fluids are classified as toxic. Do not introduce heat transfer fluids into any fittings on the heater except those clearly marked for that purpose.</p>

It is mandatory that all plumbing be done in accordance with all local and state codes or warranty will be void. It is also necessary to use both thread tape and pipe dope on all mechanical connections. The potable water piping is located on the side of your solar water heater and marked Hot and Cold. It is recommended that unions or flexible copper connectors be used so heater can be easily serviced. Install a shut-off valve on the cold feed near the solar water heater to isolate the tank for future service.

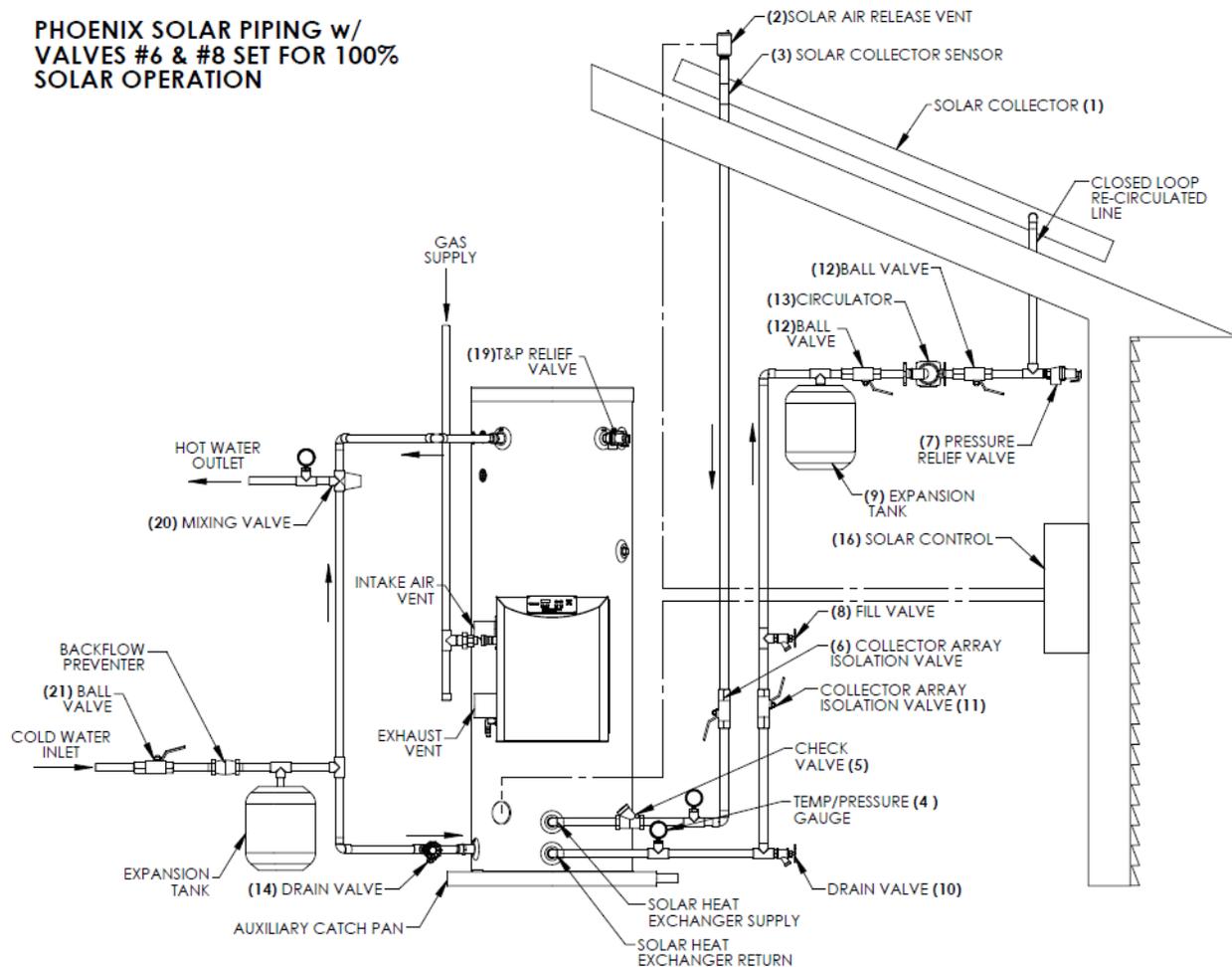
Provide clear access to the storage tank, pump, expansion tank, mixing valve, time clock and other key components. The components on the potable side of the system may require future service or maintenance, so it is recommended that the connections be made with brass unions. You must use copper and brass fittings in plumbing the solar storage tank and expansion tank. The use of galvanized fittings, nipples, dielectric unions, CPVC, PVC, or other plastic pipe is prohibited.

Hard copper connections to the city cold water supply line and home hot water feed lines are recommended.

The gaskets in standard water heater flex hose connectors can become brittle and compressed over time and begin leaking on the water heater. If not detected in a timely manner, a drip or leak may cause serious damage to the tank's electrical components, or, in extreme cases, cause the tank to leak from the outside in.

C. SOLAR HEAT EXCHANGER PIPING

**PHOENIX SOLAR PIPING w/
VALVES #6 & #8 SET FOR 100%
SOLAR OPERATION**



NOTES:

1. THIS DRAWING IS MEANT TO SHOW SYSTEM PIPING CONCEPT ONLY. THE INSTALLER IS RESPONSIBLE FOR ALL EQUIPMENT AND DETAILING BY LOCAL CODES.
2. ANTI-FREEZE, NON-POTABLE HEAT TRANSFER FLUID SHALL BE USED FOR THE SOLAR HEAT EXCHANGER CIRCUIT ONLY. NEVER INTRODUCE ANTI-FREEZE SOLUTION TO ANY OTHER CONNECTION OTHER THAN THE SOLAR HEAT EXCHANGER.
3. IF THERE IS A CHECK VALVE ON THE COLD WATER FEED LINE, A THERMAL EXPANSION TANK SUITABLE FOR POTABLE WATER MUST BE SIZED AND INSTALLED WITHIN THIS PIPING SYSTEM BETWEEN THE CHECK VALVE AND THE COLD WATER INLET OF THE SOLAR WATER HEATER.
4. A THERMOSTATIC MIXING VALVE IS RECOMMENDED IF THE DOMESTIC HOT WATER SETTING IS ABOVE 120 DEGREES F.
5. A MINIMUM OF 12 DIAMETERS OF STRAIGHT PIPE MUST BE INSTALLED UPSTREAM OF ALL CIRCULATORS.
6. MAKE SURE TANK IS FULLY PURGED OF AIR BEFORE POWER IS TURNED ON TO THE BACKUP HEAT SOURCE.
7. CIRCULATORS SHOWN IN THE HYDRONIC PIPING ABOVE SHOULD HAVE AN INTEGRAL FLOW CHECK OR ALTERNATELY USE A STOCK PUMP WITH AN EXTERNAL SPRING TYPE CHECK VALVE. (DUE TO EXTREME TEMPERATURES, CIRCULATORS WITH INTEGRAL FLOW CHECKS ARE NOT TO BE USED IN SOLAR SYSTEMS.)

LP-204-D
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Figure 5 - This drawing is meant to demonstrate system piping concept only.

Set up the primary balance of the system components following the piping detail in Figure 5.

Run ½" type M or larger copper pipes, or flex line sets, to and from the collector following the direction of supports, penetrations, and other relative items.

Only copper, cast iron, or brass are to be allowed in the collector piping loop due to transient operating temperatures that may reach as high as 300°F. PEX, PVC, CPVC, and other polymers are expressly prohibited in the piping network.

When making a connection to the heat exchanger, use Teflon Tape and joint compound to prevent leaks. The connections to the heat exchanger are 1" NPT. Do not apply heat directly to the heat exchanger thread connection when sweating fittings.

Line pressure and temperature gauge shall be installed in the collector supply and return lines to allow for a simple diagnostic check of proper system operation. On a sunny day, the hot water return line should be approximately 5 – 12°F warmer than the water in the collector supply line. Compare the temperature readings in the two line thermometers. The ¾" cold water supply line to the storage tank must be insulated with a minimum 7/8" x ½" pipe insulation to a minimum distance of 5' behind the storage tank, or to the wall if closer than 5'.

D. TANK SENSOR PLACEMENT

Make sure the sensor is secured on the stud located in the lower section of the water heater. Secure the sensor by packing Rubatex insulation behind it. This will also help the sensor react to temperature change.

Non-toxic freeze protection fluid must be used to protect the system from freezing. Use a mixture appropriate for your climate. Do not use a higher glycol to water concentration than necessary, as this will adversely impact heat transfer efficiency. See the **DowFrost Data Sheet** in the back of this manual for recommended concentrations. A copy of the MSDS sheet must be left with the end user of the solar system. See "**EMERGENCY OVERVIEW**" as part of the DowFrost Data Sheet in the back of this manual.

The collector loop must be charged with a mixture of heat transfer fluid and distilled or deionized water. The use of regular tap water as a mixing agent is prohibited. Regular scheduled maintenance must be established to monitor and maintain the proper pH level of the heat transfer fluid in the system to protect the heat exchanger and other components in the system.

E. NECESSARY COMPONENTS FOR SOLAR WATER HEATER INSTALLATION

Listed below are components needed for installation of the solar water heater.

Solar Collector

Absorbs and transfers the sun's energy into the solar heat exchanger located on the bottom of the solar water heater.

Solar Air Release Vent

This air vent allows air contained in the solar system to release. The air vent valve must be designed to work in high temperatures (as high as 350°F) with a glycol medium. (This is typical of solar systems.)

Solar Collector Sensor

This sensor is wired to the solar controller and automatically turns on the circulator pump when the differential set point is reached between the solar water heater and collector.

Tank and Heat Exchanger Temperature and Pressure Gauge

The temperature and pressure gauge on the solar piping will show the user the actual temperature and pressure supplied and returned to the solar collector.

Check Valve

Helps minimize convective heat loss at night when the system is not operating. If a check valve is not installed, most of the heater energy stored during the day would be transferred into the panel and lost.

Collector Isolation Valve (Valve #6)

Valve #6 and 11 (for solar collector isolation) isolates the collector loop from the solar water heater.

Pressure Relief Valve (for Solar System)

Releases pressure in the solar loop when it exceeds 75psi. If the valve opens and releases fluids, *contact your installation contractor immediately.*

System Fill Valve (Valve #8)

Fills the system with heat transfer fluid. Also eliminates air from the system.

Expansion Tank

Pre-charged with air to allow for the expansion and contraction of heat transfer fluid.

Drain Valve (Valve #10)

Used to charge the collector loop with glycol, purge air from the loop and drain the solar water heater heat exchanger of fluid.

Collector Isolation Valve (for system fill) (Valve #11)

Used to direct the flow of heat transfer fluid and to pressurize and eliminate air from the solar system.

Ball Valve (for circulator) Valve #12

Used to isolate the circulator pump for service. Close both ball valves to isolate pump.

Circulator (#13)

Circulates the heat transfer fluid from the solar collector into the solar heat exchanger.

Drain Valve (Tank) (Valve #14)

Flushes sediment which may accumulate on the bottom of the solar water heater and also provides a means of draining the tank.

Tank Sensor

Is wired to the solar controller to measure the temperature on the bottom of the solar water heater in conjunction with the solar collector sensor. Turns the circulating pump on and off at the solar control preset temperature differentials.

Solar Controller

The solar controller turns on or off the circulator depending on heat gained from solar operation. The controller also limits overheating in the solar water heater. Some controllers have various options. The controller should always be set in the "auto" position so that it operates the array automatically when there is solar energy to be collected.

Solar Heat Exchanger

The solar heat exchanger has an integral finned tube designed to transfer heated energy rapidly from the solar collector into potable water. The heat exchanger is constructed in 90/10 copper nickel for superior corrosion resistance and long-term reliability.

Hot Water Outlet

Each solar water heater has a hot water dip tube outlet which draws water from the top of the heater. This helps to keep heat trapped inside the highly insulated storage tank.

Solar Tank Temperature and Pressure Relief Valve

The relief valve must comply with standards for relief valves (ANSI Z21.22) by a nationally recognized lab that maintains periodic inspections of production listed equipment. No valve of any type should be installed between the relief valve and tank. Local codes govern installation of relief valves.

The relief valve outlet must be piped to a suitable open drain so that the discharge water cannot contact live electric parts to eliminate potential damage. Piping used should be approved for hot water distribution. The discharge line must be no smaller than the outlet of the relief valve and must pitch

downward to allow complete drainage. The end of the discharge piping should not be threaded or concealed and must be protected from freezing. No valve of any type, restriction or reducer coupling should be installed in the discharge line.

Mixing Valve (Rated ASSE 1017)

Automatically blends the hot and cold water feed lines to control discharge to an acceptable and safe temperature. This also increases the amount of hot water that is drawn from the solar water heater by not allowing the incoming water to fully temper the hot water stored inside the tank.

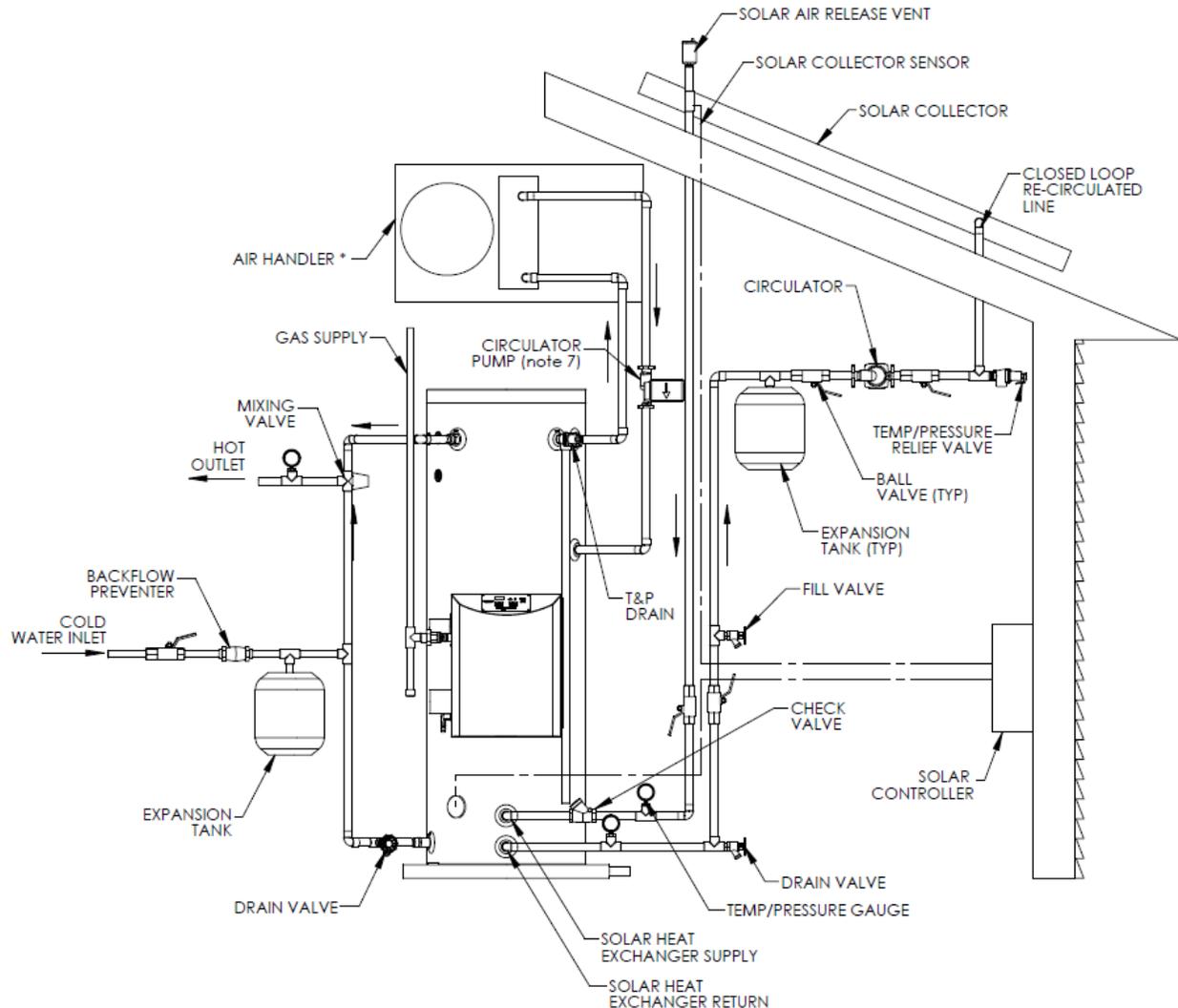
Ball Valve (for cold water shut-off) (Valve #24)

The cold water shut off valve should be used in the event of an emergency shutdown.

 CAUTION

It is very important that you do the potable piping before you pipe into the solar system. Failure to do so may damage your water heater.

F. PHOENIX SOLAR PIPING WITH AIR HANDLER



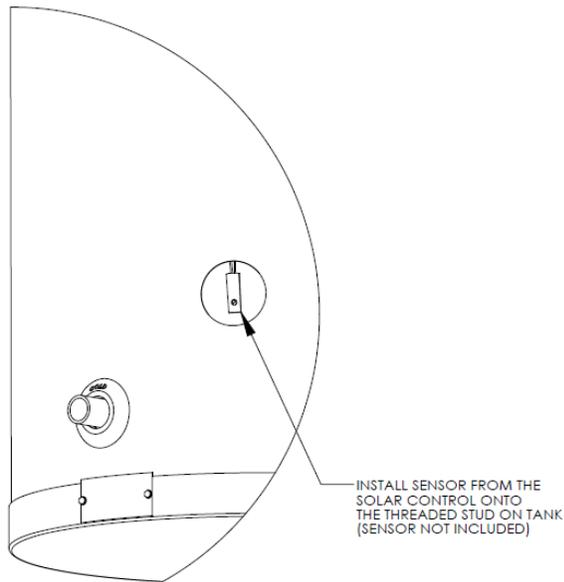
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2. ANTI-FREEZE, NON-POTABLE HEAT TRANSFER FLUID SHALL BE USED FOR THE SOLAR HEAT EXCHANGER CIRCUIT ONLY. NEVER INTRODUCE ANTI-FREEZE SOLUTION TO ANY OTHER CONNECTION OTHER THAN THE SOLAR HEAT EXCHANGER.
3. IF THERE IS A CHECK VALVE ON THE COLD WATER FEED LINE, A THERMAL EXPANSION TANK SUITABLE FOR POTABLE WATER MUST BE SIZED AND INSTALLED WITHIN THIS PIPING SYSTEM BETWEEN THE CHECK VALVE AND THE COLD WATER INLET OF THE SOLAR WATER HEATER.
4. A THERMOSTATIC MIXING VALVE IS RECOMMENDED IF THE DOMESTIC HOT WATER SETTING IS ABOVE 120 DEGREES F.
5. A MINIMUM OF 12 DIAMETERS OF STRAIGHT PIPE MUST BE INSTALLED UPSTREAM OF ALL CIRCULATORS.
6. MAKE SURE TANK IS FULLY PURGED OF AIR BEFORE POWER IS TURNED ON TO THE BACKUP HEAT SOURCE.
7. CIRCULATORS SHOWN IN THE HYDRONIC PIPING ABOVE SHOULD HAVE AN INTEGRAL FLOW CHECK OR ALTERNATELY USE A STOCK PUMP WITH AN EXTERNAL SPRING TYPE CHECK VALVE. (DUE TO EXTREME TEMPERATURES, CIRCULATORS WITH INTEGRAL FLOW CHECKS ARE NOT TO BE USED IN SOLAR SYSTEMS.)

LP-204-F
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Figure 6 - This drawing is meant to demonstrate system piping concept only.

G. TANK CONTROL



Install the solar sensor onto the threaded stud provided in the front of the water heater (sensor not included). Additional equipment may be needed in order to wire the control to the existing system. Controls also have the ability to monitor and display solar collector temperature and upper and lower tank temperatures.

Figure 7

H. CIRCULATOR SIZING

The circulator pump must be sized for the related piping and pressure drop of the heat exchanger. The graph in Figure 8 represents the pressure drop of the solar heat exchanger. You must consult the solar panel manufacturer for flow requirements to assist in pump selection

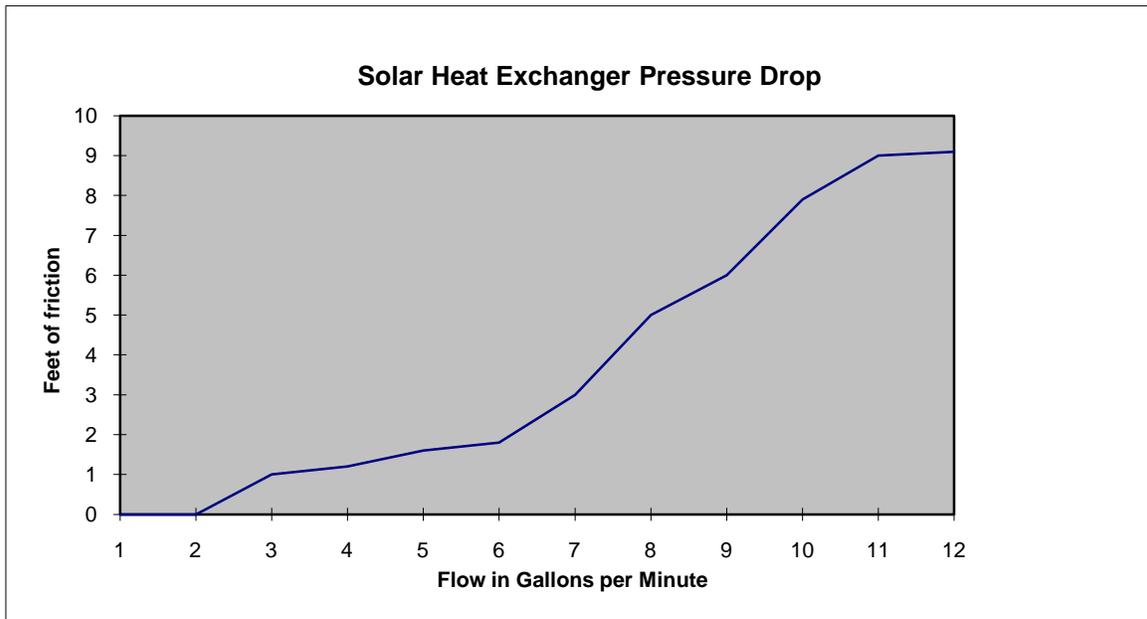


Figure 8 – Flow Chart – LP-200-L

I. CHARGING THE SYSTEM

Closed Loop Glycol

Solar Tank

Fill the solar tank with water. Do this by opening the cold water isolation ball valve to the solar tank. Inspect all fittings for leaks. The solar collector loop should be pressure tested with air (25 lbs.) before you pressurize the solar collector loop with glycol. Mix the DowFrost propylene glycol and distilled water in accordance with the data sheet in the back of the manual. The charging process will require a low flow diaphragm pump to fill and pressurize the collector loop.

Solar Collector

Connect the discharge side of the pressure pump to the fill valve. Place the pump suction side hose in the glycol solution. Close the ball valve (#11). Connect a second hose to the drain valve (#10) and place the other end of the hose in the empty bucket.

TOTAL COLLECTOR LOOP FLUID CAPACITY IN GALLONS*

1. One Collector System	3.5 gallons
2. Two Collector System	4.5 gallons

***Assumes a total 100' pipe run using ¾" Type M hard copper tubing.
The solar heat exchanger has a 1.5 gallon fluid capacity.**

Open the upper fill valve (#18) and allow the pressure from the expansion tank to push the water in the glycol loop back to prime the pressure pump. When the hose in the bucket containing the glycol mixture stops bubbling, you may begin charging the collector loop with glycol. With both fill and drain valves open, run the low flow diaphragm pump until the glycol mixture begins flowing into the empty bucket. Quickly switch the hose from the empty/return bucket to the bucket containing the glycol mixture. Continue to circulate the fluid using the pressure pump until the bubbling has stopped and the air has been purged.

After charging the collector loop, shut the lower drain valve (#10) and let the pressure pump drive up the loop pressure to the appropriate level (generally in the range of 25 psi). To more accurately calculate the proper pressure, measure the height of the solar collector above the tank and divide this number by 2.31, then add 20 psi to this number.

CAUTION

The pressure in the glycol loop should not exceed 45 psi when the system is in operation on a sunny day. Contact your solar contractor if the collector loop exceeds the threshold.

After pressurizing the solar system, run the circulator and allow the air to purge out of the vent. Once purged, monitor pressures and check for leaks before insulating pipes. Pressure should then be about 25 psi.

Above ground piping must be insulated with a wall thickness of at least ¾". A 1" thickness is required in areas prone to hard freeze conditions. Above ground insulation must be protected from ultraviolet degradation. All piping must be supported at a maximum interval of 10' and the piping supports must not crimp or compress the insulation.

J. COMMISSIONING THE SYSTEM

Closed Loop Glycol

After the glycol loop has been charged and pressure is around 25 psi (check gauge on solar heat exchanger) set the solar control to the desired settings. Solar controls come with default settings that will work in most installations. If it is a cloudy day, you may have to activate the circulator pump. Once the



pump is running and the system is fully purged, set the control to the desired settings. It is recommended that the storage tank high limit set point is not set any lower than 160°F. A lower set point could lower the performance of the solar water heater and cause overheating of the collector system. You must install an anti-scald valve on the hot water outlet as temperature within the storage tank can cause injury – please see warning label for outlet temperature restriction.

PART 4: MAINTENANCE

A properly maintained solar water heating system can provide years of dependable, trouble free service. It is suggested that a routine preventive maintenance program be established and followed by the end user with the contractor. Below is the maintenance check list that outlines the primary components of the solar system that need to be inspected annually.

1. Glycol – It is very important that the quality of the glycol heat transfer fluid is maintained to avoid damage to the collector loop and related components which come in contact with the fluid. See the DowFrost data sheet located in the back of the manual for further details.
2. Over time, water quality can affect the operation of the solar heat exchanger. In very hard water areas, it is recommended you drain (#14) a few gallons from the tank to keep the bottom of the water heater free of sediment.
3. Clean and inspect the solar collector (#1). Dirt or film which may have settled on the surface may affect performance. Check collector supplier information for cleaning procedures.
4. Check insulation for deterioration.
5. Check solar tank sensors to assure they are secure and have not moved or loosened.
6. Inspect the T&P valve (#19) on the water heater. Lift the release handle lever and make sure discharge is directed to an open drain.
7. The area near the water heater must be kept free of flammable liquids such as gasoline, paint thinners, adhesive, or other combustible materials.

A. SHUTDOWN PROCEDURES

The solar system is designed to be easily isolated for emergency repairs or routine maintenance. To isolate the water heater, simply shut down supply water shut off valve (#21) which isolates the water heater from the pressurized cold water supply.

The collector loop can be isolated from the solar storage tank by closing (#6 and #11). If the pressure in this loop drops, or you find a glycol leak, shut these valves and contact your installation contractor. Turn the circulating pump off on your solar control.

B. VACATION SHUTDOWN

Solar water heaters can build up very high temperatures when there is no daily draw on the system. The best way to dissipate heat in the system is set the control to run the circulator pump 24 hours a day to cool off the storage tank at night. The collector will radiate heat back to the atmosphere at night, preventing the system from stagnating at very high temperatures.

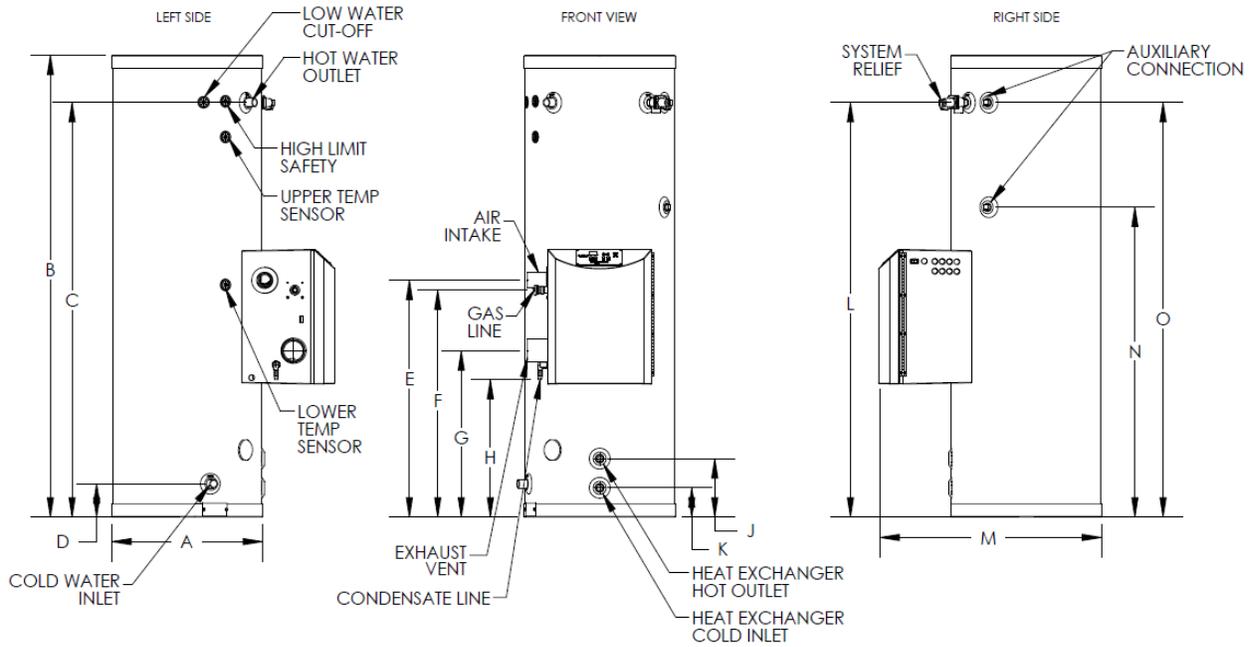
C. ESTIMATED LIFE OF COMPONENTS

Proper care and maintenance will determine the life expectancy of the individual components of the solar system. Refer to manufacturer's warranty information to determine coverage of individual components. To obtain warranty service, call your local service or installing contractor.

WARNING

Following installation of the T&P Relief Valve, the valve lever MUST be operated AT LEAST ONCE A YEAR by the water heater owner to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, blocking waterways and rendering the valve inoperative. When the lever is operated, hot water will discharge if the waterways are clear. **PRECAUTIONS MUST BE TAKEN TO AVOID PERSONAL INJURY FROM CONTACT WITH HOT WATER AND TO AVOID PROPERTY DAMAGE.** BEFORE operating lever, check to see that a discharge line is connected to the valve, directing the flow of hot water from the valve to a proper place of disposal. If no water flows when the lever is operated, replacement of the valve is required. **TURN THE WATER HEATER "OFF" AND CALL A PLUMBER IMMEDIATELY.**

This device is designed for emergency safety relief and shall not be used as an operating control. A relief valve functions by discharging water in an emergency. Therefore, it is essential that a discharge line be piped from the valve in order to carry the overflow to a safe place of disposal. The discharge line must be the same size as the valve outlet, must pitch downward from the valve, and terminate at least 6" above a drain where any discharge will be clearly visible.



SOLAR WATER HEATER DIMENSIONS																
SRCC RATED SYSTEM	MODELS*	GAL.	A	B	C	D	E	F	G	H	J	K	L	M	N	O
PH-80S	PH-130-80S	80	23"	72"	65"	5-3/4"	37-1/2"	36"	27"	22-1/2"	9-3/4"	5-1/4"	64-3/4"	34"	48-3/4"	64-3/4"
PH-119S	PH-130-119S	119	27"	74"	66"	7-1/4"	38-1/4"	36-3/4"	27-1/4"	23-1/4"	11-1/2"	7"	66-1/4"	38-1/4"	49-1/4"	66-1/4"
PH-80S	PH-199-80S	80	23"	72"	65"	5-3/4"	37-1/2"	36"	27"	22-1/2"	9-3/4"	5-1/4"	64-3/4"	34"	48-3/4"	64-3/4"
PH-119S	PH-199-119S	119	27"	74"	66"	7-1/4"	38-1/4"	36-3/4"	27-1/4"	23-1/4"	11-1/2"	7"	66-1/4"	38-1/4"	49-1/4"	66-1/4"

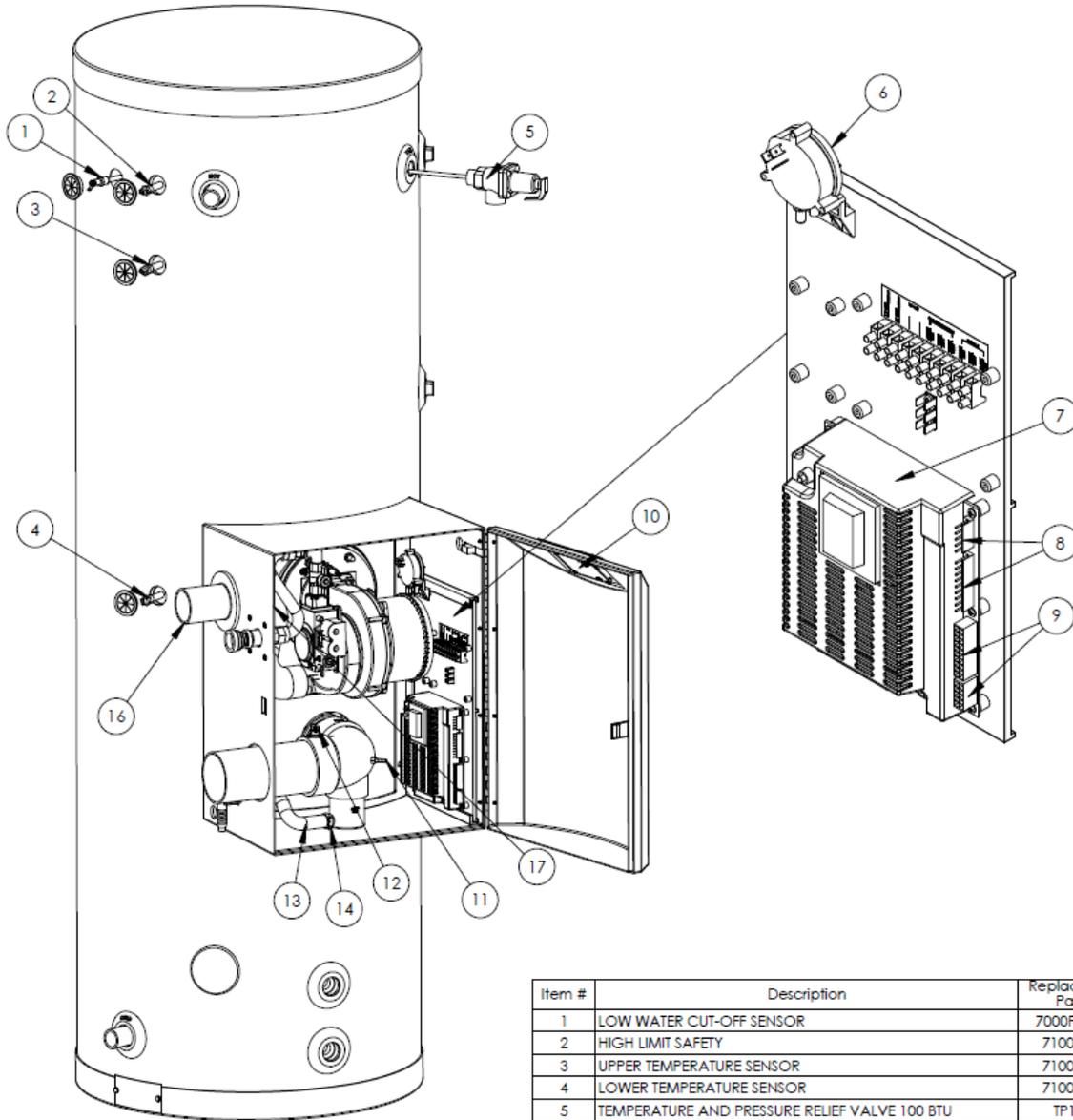
* MODEL NUMBER MAY HAVE A SUFFIX DESIGNATION OF "LP" FOR PROPANE GAS

ALL DIMENSIONS ARE APPROXIMATE

SOLAR WATER HEATER SPECIFICATIONS											
SRCC RATED SYSTEM	MODELS	GAL.	BTU'S	AIR INTAKE/ EXHAUST VENT SIZE	WATER INLET/ OUTLET SIZE	HEAT EXCHANGER SIZE	AUXILIARY CONN.	GAS LINE CONN.	SYSTEM RELIEF PIPE SIZE	SHIPPING WEIGHT	
PH-80S	PH-130-80S	80	130,000	2"	1" NPT	1"	1"	3/4"	3/4"	245 LBS.	
PH-119S	PH-130-119S	119	130,000	2"	1" NPT	1"	1"	3/4"	3/4"	415 LBS.	
PH-80S	PH-199-80S	80	199,000	3"	1" NPT	1"	1"	3/4"	3/4"	245LBS	
PH-199S	PH-199-119S	119	199,000	3"	1" NPT	1"	1"	3/4"	3/4"	415 LBS	

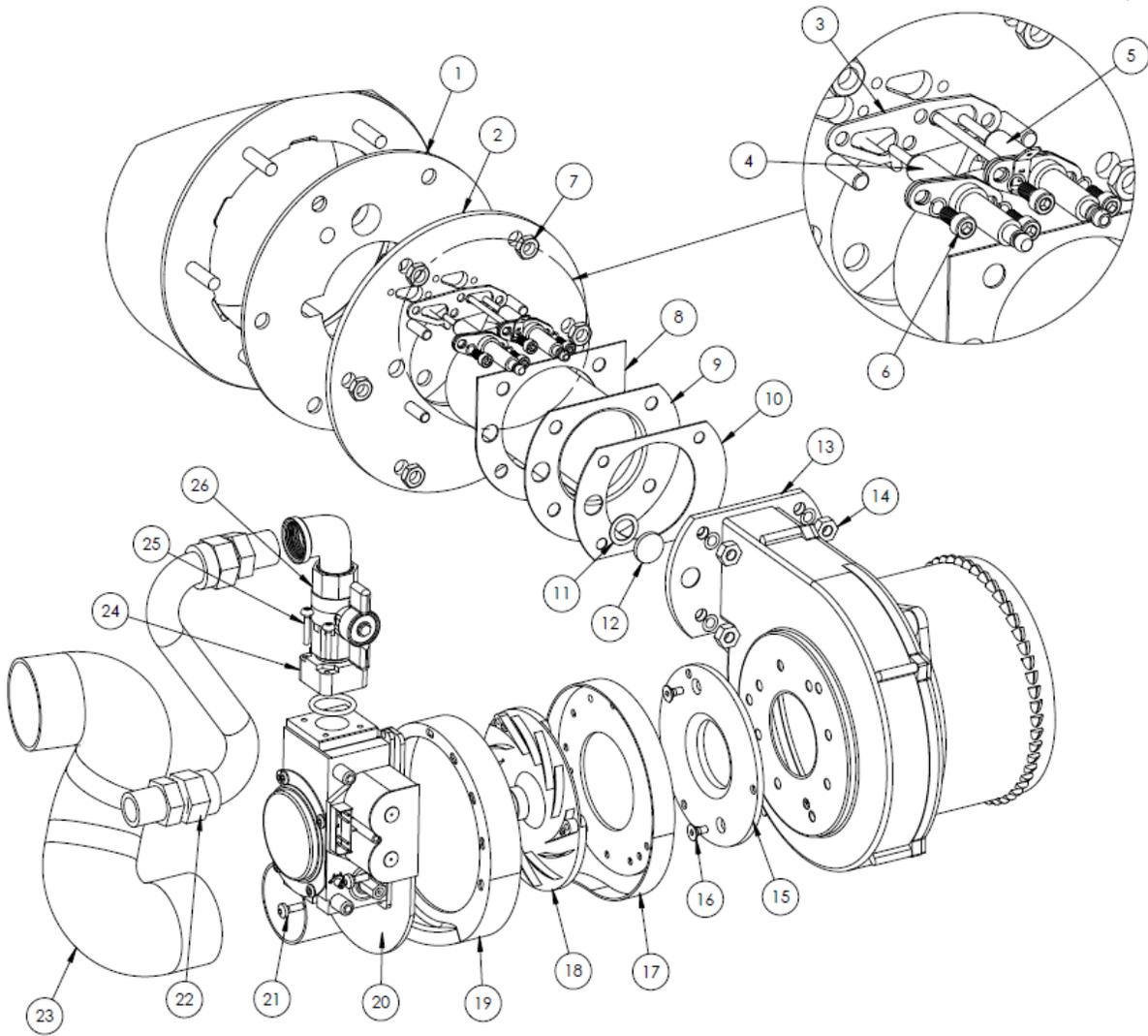
LP-204-L
09/15/10

Figure 9 – LP-204-L



Item #	Description	Replacement Part #
1	LOW WATER CUT-OFF SENSOR	7000P-852-1
2	HIGH LIMIT SAFETY	7100P-006
3	UPPER TEMPERATURE SENSOR	7100P-004
4	LOWER TEMPERATURE SENSOR	7100P-005
5	TEMPERATURE AND PRESSURE RELIEF VALVE 100 BTU	TP1400
	TEMPERATURE AND PRESSURE RELIEF VALVE 130/160/199 BTU	TP1700
6	BLOCKED VENT PRESSURE SWITCH	7250P-150
7	CONTROL BOARD	7450P-122
8	120 VOLT WIRE HARNESS (LOCATION SHOWN)	7100P-272
9	LOW VOLTAGE WIRE HARNESS (LOCATION SHOWN)	7100P-273
10	CONTROL DISPLAY	7350P-009
11	S.S. HOSE BARB	7250P-154
12	FLUE ECO	VS210
13	CONDENSATE HOSE	7100P-121
14	HOSE CLAMP - CONDENSATE HOSE	7250P-215
15	SENSOR WIRE HARNESS (NOT SHOWN)	7100P-274
16	2" COUPLING - AIR INLET (100/130 BTU)	7100P-114
	3" COUPLING - AIR INLET (160/199 BTU)	7100P-103
17	NUT - AIR INLET COUPLING	7100P-104
18	OUTDOOR SENSOR (NOT SHOWN)	7250P-319

Figure 10



Item #	Description	Replacement Part #	Item #	Description	Replacement Part #
1	GASKET - MOUNTING PLATE	7100P-139	15	ADAPTER PLATE	7250P-644
2	MOUNTING PLATE	7100P-007	16	FLAT HEAD SCREW - ADAPTER PLATE	7100P-045
3	GASKET - PROBES	7100P-155	17	AIR INTAKE ADAPTER - BLOWER SIDE	7500P-185
4	FLAME RECTIFICATION PROBE (w/GASKET)	7100P-082	18	SWIRL PLATE - BLACK (100/130 BTU)	7100P-042
5	IGNITOR ELECTRODE (w/GASKET)	7100P-093		SWIRL PLATE - WHITE (160/199 BTU)	7500P-092
	IGNITOR ELECTRODE (LP MODEL) (w/GASKET)	7100P-094	19	AIR INTAKE ADAPTER - VALVE SIDE	7500P-184
6	10-32 X 3/8 SCREWS/#10 LOCK WASHERS	N/A	20	GAS VALVE (100/130 BTU)	7000P-862
7	NUTS - 5/16-18	N/A		GAS VALVE (160/199 BTU)	7000P-863
8	GASKET - BURNER MOUNTING FLANGE	7100P-152	21	SCREWS - GAS VALVE	7100P-046
9	BURNER - 100-130K BTU	7100P-096	22	1/2" FLARE X 1/2" NPT FLEX HOSE	7100P-140
	BURNER - 160-199K BTU	7100P-095	23	TUBE - AIR INLET	7500P-189
10	GASKET - BURNER OUTLET	7000P-361	24	GAS VALVE ADAPTER (w/O-RING)	7250P-454
11	GASKET - SIGHT GLASS	7100P-105	25	SCREWS - M4 X 20MM GAS VALVE ADAPTER	7250P-717
12	SIGHT GLASS	G2000	26	GAS SHUT-OFF VALVE	7250P-140
13	COMBUSTION BLOWER (w/GASKET, SIGHT GLASS)	7100P-015			
14	1/4-20 BRASS NUTS/1/4 LOCK WASHERS	7100P-268			

Figure 11

PART 5: TROUBLESHOOTING

NATURE OF TROUBLE	POSSIBLE CAUSE	SERVICE
No hot water	1. No power – blown fuse or circuit breaker tripped a. Shorted wiring b. Circuit overloaded c. Improper wiring d. Grounded element or thermostat	a. **Replace or repair b. **Provide adequate circuit or reduce load c. **Rewire per diagram d. **Replace
	2. Manual reset limit (ECO) open a. Thermostat defective b. Thermostat out of calibration c. Heat build-up due to loose wires d. Defective limit (ECO)	Refer to “Operation” Section a. **Replace b. **Lower setting or replace c. **Tighten wire connections d. **Replace
	3. Solar system incorrectly installed	**Check installation
	4. Leaking plumbing or open hot water faucet(s)	Make sure all faucet(s) are closed and check water meter
Not enough hot water	1. Heater undersized	Reduce rate of hot water use
	2. Defective thermostat or wired incorrectly	**Check wiring or replace
	3. Solar system incorrectly installed	**Check installation
	4. See #4 above (in No hot water)	See above
Water too hot or not hot enough	1. Thermostat setting too high or low	Change setting as required
	2. Thermostat out of calibration	**Replace
	3. Solar system incorrectly installed	**Check installation
	4. Grounded element	**Replace

Table 1

CAUTION

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

Product Information



DOWFROST

Inhibited Propylene Glycol-based Heat Transfer Fluid

DOWFROST* heat transfer fluid contains specially formulated packages of industrial inhibitors that help prevent corrosion. Because propylene glycol fluids have low acute oral toxicity, DOWFROST propylene glycol-based fluids are often used in applications where contact with food or beverage products could occur.

Recommended use temperature range: -45°C (-50°F) to 120°C (250°F)

Suitable applications: secondary cooling and heating, freeze and burst protection of pipes, various deicing, defrosting, and dehumidifying.

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 Fluid Required to Provide Freeze and Burst Protection at Various Temperatures

Temperature °C (F°)	Percent DOWFROST 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 30% 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 Fluid†

Wt. % Propylene Glycol	Vol. % Propylene Glycol	Wt. % DOWFROST	Vol. % DOWFROST	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	5.2	5.2	-1.6 (29.1)	100.0 (212)	4.8	1.3383
10.0	9.6	10.5	10.0	-3.3 (26.1)	100.0 (212)	8.4	1.3438
15.0	14.5	15.7	15.1	-5.1 (22.9)	100.0 (212)	12.9	1.3495
20.0	19.4	20.9	20.3	-7.1 (19.2)	100.6 (213)	15.4	1.3555
25.0	24.4	26.1	25.5	-9.6 (14.7)	101.1 (214)	19.0	1.3615
30.0	29.4	31.4	30.7	-12.7 (9.2)	102.2 (216)	22.0	1.3675
35.0	34.4	36.6	36.0	-16.4 (2.4)	102.8 (217)	26.1	1.3733
40.0	39.6	41.8	41.4	-21.1 (-6.0)	103.9 (219)	29.1	1.3790
45.0	44.7	47.0	46.7	-26.7 (-16.1)	104.4 (220)	31.8	1.3847
50.0	49.9	52.3	52.2	-33.5 (-28.3)	105.6 (222)	34.7	1.3903
55.0	55.0	57.5	57.5	-41.6 (-42.8)	106.1 (223)	38.0	1.3956
60.0	60.0	62.7	62.7	-51.1 (-59.9)	107.2 (225)	40.6	1.4008
65.0	65.0	68.0	68.0	a	108.3 (227)	42.1	1.4058
70.0	70.0	73.2	73.2	a	110.0 (230)	44.1	1.4104
75.0	75.0	78.4	78.4	a	113.9 (237)	46.1	1.4150
80.0	80.0	83.6	83.6	a	118.3 (245)	48.0	1.4193
85.0	85.0	88.9	88.9	a	125.0 (257)	50.0	1.4235
90.0	90.0	94.1	94.1	a	132.2 (270)	51.4	1.4275
95.0	95.0	99.3	99.3	a	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.

° 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 30% glycol. Contact Dow for information on specific cases or further assistance.

DOWFROST Inhibited Propylene Glycol-based Heat Transfer Fluid

Typical Properties of DOWFROST Fluid†

DOWFROST Heat Transfer Fluid	
Composition (% by weight)	
Propylene Glycol	96
Performance Additives	4
Color	Colorless
Specific Gravity 15/15°C (60/60°F)	1.050–1.060
pH of Solution (50% glycol)	9.0–10.0
Reserve Alkalinity (min.)	10.0 ml

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

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

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb·°F)	Density kg/m ³ (lb/ft ³)	Therm. Cond. W/mK [Btu/hr ft ² (°F/ft)]	Viscosity mPa·s (cps)
10 (50)	3.821 (0.913)	1033.71 (64.53)	0.4344 (0.2510)	4.5068 (4.51)
40 (104)	3.903 (0.933)	1019.56 (63.66)	0.4622 (0.2670)	1.6295 (1.63)
65 (149)	3.972 (0.949)	1004.26 (62.69)	0.4771 (0.2757)	0.9144 (0.91)
90 (194)	4.041 (0.966)	985.77 (61.54)	0.4846 (0.2800)	0.6040 (0.60)
120 (248)	4.123 (0.985)	959.35 (59.89)	0.4838 (0.2795)	0.4246 (0.42)

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

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb·°F)	Density kg/m ³ (lb/ft ³)	Therm. Cond. W/mK [Btu/hr ft ² (°F/ft)]	Viscosity mPa·s (cps)
-20 (-4)	3.569 (0.853)	1053.16 (65.75)	0.3635 (0.2100)	48.9043 (48.90)
10 (50)	3.668 (0.877)	1042.14 (65.06)	0.3936 (0.2274)	7.2173 (7.22)
40 (104)	3.768 (0.900)	1026.49 (64.08)	0.4150 (0.2398)	2.2389 (2.24)
65 (149)	3.850 (0.920)	1009.90 (63.05)	0.4262 (0.2463)	1.1762 (1.18)
90 (194)	3.933 (0.940)	990.10 (61.81)	0.4313 (0.2492)	0.7462 (0.75)
120 (248)	4.032 (0.964)	962.08 (60.06)	0.4294 (0.2481)	0.5084 (0.51)

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

Temp. °C (°F)	Specific Heat kJ/(kg)(K) (Btu/lb·°F)	Density kg/m ³ (lb/ft ³)	Therm. Cond. W/mK [Btu/hr ft ² (°F/ft)]	Viscosity mPa·s (cps)
-30 (-22)	3.339 (0.798)	1064.83 (66.48)	0.3246 (0.1875)	172.8273 (172.83)
-20 (-4)	3.378 (0.807)	1061.71 (66.28)	0.3336 (0.1927)	73.0193 (73.02)
10 (50)	3.493 (0.835)	1049.25 (65.50)	0.3560 (0.2057)	10.6481 (10.65)
40 (104)	3.809 (0.863)	1032.17 (64.44)	0.3716 (0.2147)	3.1103 (3.11)
65 (149)	3.708 (0.886)	1014.40 (63.33)	0.3792 (0.2191)	1.5483 (1.55)
90 (194)	3.802 (0.909)	993.42 (62.02)	0.3821 (0.2208)	0.9339 (0.93)
120 (248)	3.918 (0.936)	964.00 (60.18)	0.3792 (0.2191)	0.6029 (0.60)

For further information, call...

In the United States and Canada: 1-800-447-4369 • FAX: 1-989-832-1465

In Europe: +32 3 450 2240 • FAX: +32 3 450 2815

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



VISCOSITY: The HTF viscosity over the service temperature range is based on a specific gravity 15/15°C (60/60°F) 1.053-1.063. DOWFROST inhibited glycol-based fluid has an effective operating temperature range of -50°F to 250°F. At temperatures below -50°F, increased viscosity (>1,000 centipoise) can make use of DOWFROST impractical unless larger pumps are installed. At the upper end of the operating range for DOWFROST fluid, a maximum bulk temperature of 250°F is recommended. Film temperature should not exceed 300°F. DOWFROST fluid can tolerate brief temperature excursions up to 100°F above the maximum recommended temperatures. However, extended exposure of the fluid to temperatures in excess of 50°F above the maximum recommended temperatures will result in accelerated degradation of the glycol and inhibitor systems. In addition, the film temperature should remain within 50°F of the bulk fluid temperature and the pressure at all points in the system should be at least 5 psi greater than the vapor pressure exerted by the fluid to avoid localized boiling and resulting precipitation. At temperatures above 150°F, the system must be closed to avoid rapid oxidation of the propylene glycol, inhibitor depletion, and subsequent increased corrosion. Automatic make-up water systems should be avoided in order to prevent undetected dilution or loss of glycol and consequent loss of freeze and corrosion protection.

FLAMMABILITY: When mixed with water, DOWFROST is not flammable, as the fluid has no measurable flash point (Pensky-Martens Closed Cup) in concentrations up to 80% glycol. Undiluted DOWFROST has a flash point of 214°F (Pensky-Martens Closed Cup). It is possible to ignite solutions of propylene if enough water has been vaporized and the concentration of propylene glycol increases to greater than 80 percent.

INSPECTION AND TREATMENT OF HEAT TRANSFER FLUID: 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-grey color, presence of an oily layer, burnt odor, or any heavy sludge in the fluid may indicate the need for replacement.

TESTING THE FLUID pH LEVEL: Control of pH between 8 and 10 is important to minimize corrosion and glycol degradation. Using narrow range pH paper, such as pHDrion Control paper with a 7.2 to 8.8 pH range, is an easy and reliable way to read your pH level. A pH tester can also measure alkalinity or acidity and give you an indication of the reserve alkalinity or inhibitor level of the fluid. The desirable pH range should fall between 8.0 and 10.0. Adjustments can be made using a 50% solution of sodium hydroxide or potassium hydroxide if the pH is approaching the acidic range (below 8.0). An inexpensive pH tester is available from Misco Products. The accuracy of this product is +/- 0.5 pH. Contact Misco Products at 1-800-358-1100 and ask for the Dow discount.

SPILL, LEAK, AND DISPOSAL PROCEDURES: Using appropriate safety equipment, small spills may be soaked up with common absorbent material. For large spills, the fluid should be pumped into suitable containers located in diked areas. Residual material should be cleaned up with water. Concentrate can be handled according to local, state, and federal regulations.

EMERGENCY OVERVIEW

POTENTIAL HEALTH EFFECTS

EYE: May cause slight transient (temporary) eye irritation.
Corneal injury is unlikely. Mists may cause eye irritation.

FIRST AID: FLUSH EYES WITH PLENTY OF WATER

SKIN CONTACT: Prolonged contact is essentially non-irritating to skin. A single prolonged exposure is not likely to result in the material being absorbed through the skin in harmful amounts. Repeated exposure may cause flaking and softening of skin.

FIRST AID: WASH OFF IN FLOWING WATER OR SHOWER

INGESTION: Single dose oral toxicity is considered to be extremely low. No hazards anticipated from swallowing small amounts incidental to normal handling operations.

FIRST AID: NONE REQUIRED

INHALATION: At room temperature, vapors are minimal due to physical properties. Mists may cause irritation of upper respiratory tract (nose and throat).

**FIRST AID: REMOVE TO FRESH AIR.
IF EFFECTS OCCUR, CONSULT A PHYSICIAN.**

**NOTE TO PHYSICIAN: NO SPECIFIC ANTIDOTE.
SUPPORTIVE CARE. TREATMENT BASED ON
JUDGEMENT OF THE PHYSICIAN IN RESPONSE TO
THE REACTION OF THE PATIENT. CONSULT DOW CHEMICAL
24 HOUR EMERGENCY 1-989-636-4400.**

SYSTEM MODELS	SOLAR COLLECTOR COMPANY	MODEL	# OF COLLECTORS
PH-80	HTP	HP-30-SC	1
	AET	AE32E	1
	SUN EARTH	EP-32	1
	APRICUS	AP-22	1
PH-119	HTP	HP-30-SC	2
	AET	AE32E	2
	SUN EARTH	EP-32	2
	APRICUS	AP-22	2

Table 2

SOLAR SYSTEM REPLACEMENT PARTS		
Part	Company	Model
CONTROLLER	STECA	TRO301
	GOLDLINE	GL-30
	HELIOTROPE	Thermal Delta T
PUMP	TACO	007
	GRUNDFOS	15-58F
EXPANSION TANK	AMTROL	Extrol #30
CHECK VALVE	WATTS	SERIES 600*
		*(ALTERNATE APPROVED EQUIVALENT)
PRESSURE RELIEF VALVE	WATTS	3L (75 psig)
AIR VENT	TACO	417*
		*(ALTERNATE APPROVED EQUIVALENT)
MIXING VALVE	TACO	500 SERIES
	WATTS	1170 SERIES
	HONEYWELL	AM101 SERIES
	CACHE ACAC	HEATGUARD 110 SERIES

Table 3

SUPERSTOR SOLAR SRCC OG-300 LABEL SET

The following labels must be attached to the relevant valves in the system in order for it to be considered OG-300 compliant. This page should be laminated, each label cut from it, punched in the margin at the left hand side and affixed to the appropriate valve with a wire tie, plastic ties are inappropriate due to high operating temperatures. Failure to affix these labels will void the SRCC OG-300 system certification.

VALVE 6 COLLECTOR ARRAY ISOLATION VALVE

VALVE 6 IS NORMALLY OPEN DURING OPERATION. IT IS CLOSED TO ISOLATE THE STORAGE TANK FROM THE COLLECTOR ARRAY SHOULD THE STORAGE TANK NEED SERVICING OR REPLACING.

VALVE 11 COLLECTOR ARRAY ISOLATION VALVE

VALVE 11 IS NORMALLY OPEN DURING OPERATION. IT IS CLOSED TO ISOLATE THE STORAGE TANK FROM THE COLLECTOR ARRAY SHOULD THE STORAGE TANK NEED SERVICING OR REPLACING.

VALVE 8 COLLECTOR ARRAY FILL/DRAIN VALVE

PLEASE CONSULT YOUR INSTALLATION MANUAL FOR SPECIFIC FREEZE TOLERANCE INFORMATION.

A 60% CONCENTRATION OF DOWFROST PROPYLENE GLYCOL AND DISTILLED WATER CAN PROTECT YOUR SUPERSTOR SOLAR SYSTEM TO TEMPERATURES AS LOW AS -65° F. LOWER CONCENTRATIONS OF DOWFROST AND DISTILLED WATER WILL PROVIDE A LOWER LEVEL OF FREEZE PROTECTION.

VALVE 24 COLD WATER SUPPLY BALL VALVE

THIS VALVE IS NORMALLY OPEN AND ALLOWS POTABLE WATER TO FILL THE SOLAR STORAGE TANK. WHEN CLOSED, THE SOLAR STORAGE TANK IS ISOLATED FROM THE PRESSURIZED CITY COLD WATER SUPPLY LINE PIPING.

VALVE 8 COLLECTOR ARRAY FILL/DRAIN VALVE (WARNING HOT)

VALVE 8 IS NORMALLY CLOSED. WHEN OPEN, IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

THE HEAT TRANSFER FLUID USED IN THIS SYSTEM IS DOWFROST PROPYLENE GLYCOL. IT MUST BE HANDLED AND DISPOSED OF IN ACCORDANCE WITH THE DOW CHEMICAL COMPANY MATERIAL SAFETY DATA SHEET. A COPY OF THE MSDS HAS BEEN PROVIDED WITH YOUR INSTALLATION MANUAL. NO OTHER FLUID SHALL BE USED THAT WOULD CHANGE THE ORIGINAL CLASSIFICATION OF THIS SYSTEM. UNAUTHORIZED ALTERATIONS TO THIS SYSTEM COULD RESULT IN A HAZARDOUS HEALTH CONDITION.

BE EXTREMELY CAREFUL WHEN DRAINING THIS FLUID. IT MAY BE DISCHARGED AT A VERY HIGH TEMPERATURE AND/OR PRESSURE.

VALVE 10 COLLECTOR ARRAY FILL/DRAIN VALVE (WARNING HOT)

VALVE 10 IS NORMALLY CLOSED. WHEN OPEN, IT IS USED TO CHARGE AND DRAIN THE SOLAR COLLECTOR LOOP PIPING.

THE HEAT TRANSFER FLUID USED IN THIS SYSTEM IS DOWFROST PROPYLENE GLYCOL. IT MUST BE HANDLED AND DISPOSED OF IN ACCORDANCE WITH THE DOW CHEMICAL COMPANY MATERIAL SAFETY DATA SHEET. A COPY OF THE MSDS HAS BEEN PROVIDED WITH YOUR INSTALLATION MANUAL. NO OTHER FLUID SHALL BE USED THAT WOULD CHANGE THE ORIGINAL CLASSIFICATION OF THIS SYSTEM. UNAUTHORIZED ALTERATIONS TO THIS SYSTEM COULD RESULT IN A HAZARDOUS HEALTH CONDITION.

BE EXTREMELY CAREFUL WHEN DRAINING THIS FLUID. IT MAY BE DISCHARGED AT A VERY HIGH TEMPERATURE AND/OR PRESSURE.

HTP CUSTOMER INSTALLATION RECORD FORM

The following form should be completed by the installer for you to keep as a record of the installation in case of a warranty claim. After reading the important notes at the bottom of the page, please also sign this document.

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

IMPORTANT NOTES:

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

Distributor/Dealer: Please insert contact details.