Solar Drainback or Pressurized Water Heating System Kit

Installation
Start-Up
Maintenance
Parts
Warranty

For Residential and Commercial Use

**-32-KIT, -40-KIT, -64-KIT, -80-KIT, -96-KIT Models

**“DB” Denotes Drainback Kits

***“PR” Denotes Pressurized Kits

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

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

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.
The installer should be guided by the instructions furnished with the tank, as well as local codes and utility company requirements. Preference should be given to codes and requirements where they differ from the furnished instructions. Always use the latest edition of codes.

Additional publications which should guide the installer include:

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


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.

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NOTE: HTP, Inc. reserves the right to modify product technical specifications and components without prior notice.
Part 1 - General Safety Information

WARNING

Installer - Read all instructions in this manual before installing. Perform steps in the given order.

User - This manual is for use only by a qualified heating installer / service technician. Have the solar water heating system serviced / inspected annually by a qualified service technician.

Failure to adhere to these guidelines can result in substantial property damage, severe personal injury, or death.

NOTE: Obey all local codes. Obtain all applicable permits before installing the solar system.

NOTE: Install all solar system components and piping in such a manner that does not reduce the performance of any fire rated assembly.

NOTE: If the solar water heating system is exposed to the following, do not operate. Immediately call a qualified service technician.
1. Fire
2. Damage
3. Submersion in Water

Failure to adhere to these guidelines can result in substantial property damage, severe personal injury, or death.

Only use this solar hot water system as intended and described in this installation manual. Any use other than described will void warranty and may lead to fire, property damage, personal injury, or death.

CAUTION

High heat sources (sources generating heat 100°F / 37°C or greater, such as stove pipes, space heaters, etc.) may damage plastic components of the water heater as well as plastic vent pipe materials. Such damages are NOT covered by warranty. It is recommended to keep a minimum clearance of 8” from high heat sources. Observe heat source manufacturer instructions, as well as local, state, provincial, and national codes, laws, regulations and ordinances when installing this water heater and related components near high heat sources.

Improper installation or use may result in property damage. Such damages are NOT covered by warranty.

Pipe runs must be solidly attached with proper clamping methods. Soldered connections should be secured with 95/5 lead-free solder. Use only pipe rated for 250°F minimum on both the collector return and supply piping.

A. When Servicing the Solar Water Heating System

To avoid electric shock, disconnect electrical supply before performing maintenance.

To avoid severe burns, allow solar collector and associated equipment to cool before servicing.

B. Local Installation Regulations

Installation of this solar water heating system may be governed by individual local rules and regulations for this type of system, 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.

C. Chemical Vapor Corrosion

Table 1 - Products and Areas Likely to Have Contaminants

<table>
<thead>
<tr>
<th>Products to Avoid</th>
<th>Areas Likely to Have Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray cans containing fluorocarbons</td>
<td>Dry cleaning / laundry areas and establishments</td>
</tr>
<tr>
<td>Permanent wave solutions</td>
<td>Swimming pools</td>
</tr>
<tr>
<td>Chlorinated waxes / cleaners</td>
<td>Metal fabrication plants</td>
</tr>
<tr>
<td>Chlorine-based swimming pool chemicals</td>
<td></td>
</tr>
<tr>
<td>Calcium chloride used for thawing</td>
<td>Refrigeration repair shops</td>
</tr>
<tr>
<td>Sodium chloride used for water softening</td>
<td>Photo processing plants</td>
</tr>
<tr>
<td>Refrigerant leaks</td>
<td>Auto body shops</td>
</tr>
<tr>
<td>Paint or varnish removers</td>
<td>Plastic manufacturing plants</td>
</tr>
<tr>
<td>Hydrochloric or Muriatic acid</td>
<td>Furniture refinishing areas and establishments</td>
</tr>
<tr>
<td>Cements and glues</td>
<td>New building construction</td>
</tr>
<tr>
<td>Antistatic fabric softeners used in</td>
<td>Remodeling areas</td>
</tr>
<tr>
<td>clothes dryers</td>
<td></td>
</tr>
<tr>
<td>Chlorine-type bleaches, laundry detergents, and cleaning solvents</td>
<td>Garages and workshops</td>
</tr>
<tr>
<td>Adhesives used to fasten building products</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: DAMAGE TO THE WATER HEATER, COLLECTOR, OR RELATED COMPONENTS CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY. (Refer to the limited warranty for complete terms and conditions.)

D. Water Temperature Adjustment

An ASSE 1017 rated mixing valve to avoid severe burns or death from scalding temperatures is required per SRCC OG-300. An ASSE 1017 rated mixing valve is included in this kit. Install the mixing valve on the domestic water heating side of the system following the instructions included with the mixing valve and the solar water heater.

Table 2 - Approximate Time / Temperature Relationships in Scalds

<table>
<thead>
<tr>
<th>Approximate Temperature</th>
<th>Approximate Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>More than 5 minutes</td>
</tr>
<tr>
<td>125°F</td>
<td>1 1/2 to 2 minutes</td>
</tr>
<tr>
<td>130°F</td>
<td>About 30 seconds</td>
</tr>
<tr>
<td>135°F</td>
<td>About 10 seconds</td>
</tr>
<tr>
<td>140°F</td>
<td>Less than 5 seconds</td>
</tr>
<tr>
<td>145°F</td>
<td>Less than 3 seconds</td>
</tr>
<tr>
<td>150°F</td>
<td>About 1 1/2 seconds</td>
</tr>
<tr>
<td>155°F</td>
<td>About 1 second</td>
</tr>
</tbody>
</table>

Table 3 - Approximate Time / Temperature Relationships in Scalds

<table>
<thead>
<tr>
<th>Approximate Temperature</th>
<th>Approximate Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>More than 5 minutes</td>
</tr>
<tr>
<td>125°F</td>
<td>1 1/2 to 2 minutes</td>
</tr>
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<td>130°F</td>
<td>About 30 seconds</td>
</tr>
<tr>
<td>135°F</td>
<td>About 10 seconds</td>
</tr>
<tr>
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<td>Less than 5 seconds</td>
</tr>
<tr>
<td>145°F</td>
<td>Less than 3 seconds</td>
</tr>
<tr>
<td>150°F</td>
<td>About 1 1/2 seconds</td>
</tr>
<tr>
<td>155°F</td>
<td>About 1 second</td>
</tr>
</tbody>
</table>

NOTE: Households with small children, disabled, or elderly persons may require a 120°F or lower temperature setting to prevent severe personal injury or death due to scalding.
In addition, to prevent scalding, the high temperature of the potable water must be limited using an ASSE 1016 tempering valve. This valve is usually located between the hot water storage tank and faucets in bathrooms, kitchens, etc. Tempering valves are mandatory under most codes and usually set to a maximum of 120°F. Tempering valves must be rated for high-temperature solar use.

**E. Freeze Protection**

**NOTE:** Consider piping and installation when determining water heater location. Place the water heater in a location not prone to freezing.

**CAUTION**

Failure of the water heater, solar system, or components due to freeze related damage IS NOT covered by product warranty.

In order to meet health and safety regulations, solar system antifreeze fluid should be food grade polypropylene glycol, FDA rated as “generally recognized as safe” (GRAS). The recommended glycol is DOWFROST or equivalent. 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 specification sheet included with the glycol for recommended concentrations. A glycol/water mix must not exceed 50%, unless the manufacture specifies that a different ratio is recommended for use with solar water heaters. Glycol may need to be changed periodically (every 3-5 years) to prevent it from becoming acidic; please refer to the guidelines provided by the glycol manufacturer regarding replacement.

**NOTE:** The use of glycol not recognized as GRAS is allowed in double wall heat exchanger models ONLY.

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**Part 2 - Prepare the Solar Water Heating System Kit**

Remove all sides of the shipping crate to inspect the Solar Water Heating System Kit and move components to the installation location.

**NOTICE**

**UNCRACTING THE SOLAR WATER HEATING SYSTEM KIT**
- Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

**CAUTION**

**COLD WEATHER HANDLING** - If the Solar Water Heating System Kit or associated components have been stored in a very cold location (BELOW 0°F) before installation, handle with care until the components come to room temperature. Failure to do so could result in damage to the components.

**A. What’s Included in the Kit**
See the Replacement Parts tables at the end of this manual for lists of the components included in the solar water heating system kit.

**B. Locating the Solar Water Heating System**

Carefully consider installation when determining solar water heating system location. Please read the entire manual before attempting installation. Failure to properly take factors such as piping and wiring into account before installation could result in wasted time, money, and possible property damage and personal injury.

To avoid long pipe runs, the collector(s) should be positioned as close as possible to the storage tank. Storage tank location should therefore be considered part of the location requirements of the solar collector(s). The storage tank should be located as close as possible to the most frequent draw off points in the building.

Solar water heaters are certified for indoor use only. **DO NOT INSTALL OUTDOORS.** Outdoor installations ARE NOT covered by warranty.

Choose a location for the solar water heating system as centralized to the domestic piping system as possible. Also, locate the solar water heating system and piping where it will not be exposed to freezing temperatures. All piping should be insulated. Additionally, place the solar water heating system Zone Manifold so that the components and connections are easily accessible.

Follow all the instructions included with the solar water heater and components when locating and installing this solar water heating system.
Part 3 - Installing the Drainback System Kit

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

A. Installing Solar Collector Components

It is mandatory that all plumbing be done in accordance with 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.

Provide clear access to the water heater, pump, drainback tank, mixing valve, and other key components.

NOTE: These instructions do not detail how to install the solar collectors. Refer to the solar collector instructions for detailed installation information.

WARNING

Ensure the solar collectors are moved to the installation location BEFORE installing the solar collector components. Solar collectors are very heavy. Installing the solar collector components BEFORE moving the collectors to the installation location will increase the risk of damage to the collectors, substantial property damage, severe personal injury, or death.

Solar collectors are very heavy. Use caution as to not drop the collectors when moving to the installation location. Dropping the collectors could result in damage to the collectors, substantial property damage, severe personal injury, or death.

CAUTION

Never use dielectric unions or galvanized steel fittings in the collector loop. Doing so will lead to corrosion, property damage, and possible early water heater failure. Such damage IS NOT covered by warranty. Use only copper and brass fittings.

Do not install check valves or vacuum breaks in a drainback system. Doing so will result in premature component or system failure.

Use two wrenches when tightening connections. Use one wrench to prevent the return or supply line adapters from turning. DO NOT OVERTIGHTEN. Failure to prevent piping adapters from turning could cause damage to heater components.

1. a. SINGLE COLLECTOR INSTALLATIONS - Continue to Step 2.
   b. MULTIPLE COLLECTOR INSTALLATIONS - Use two pipe wrenches to install the collector unions and manifold the collectors. See Figure 1. Ensure O-Rings are installed on the collector adapters before installing the unions.

2. Install caps on the unused collector adapters. Ensure O-Rings are installed on the collector adapters before installing the caps. See Figure 2.

B. Connecting the Return Solar Flex Lines

1. Install the male to male solar flex line adapter into the elbow installed on the solar collector return adapter. See Figure 3.
2. Install the solar flex line with sensor into the solar collector return adapter. Ensure the adapter and reinforcing ring are positioned as described in Figure 4. See Figure 5 for installed solar flex line.

3. Run the solar collector return flex line to the inlet on the top of the drainback tank. Use thread tape to connect the male to female adapter to the drainback tank inlet. Use two pipe wrenches to install the solar flex line to the drainback tank inlet adapter. Ensure the adapter and reinforcing
ring are positioned as described in Figure 4. See Figure 6 for installed solar flex line.

4. Install the tee onto the adapter provided on the solar drainback tank.
Install the male to male threaded adapter into the tee.
Install the pressure relief valve provided with the drainback tank onto the threaded adapter.
Install the pressure gauge into the tee. See Figure 7.

5. Connect the male to female adapter to the drainback tank outlet. Then use two pipe wrenches to install the solar flex line to the adapter. Ensure the adapter and reinforcing ring are positioned as described in Figure 4. See Figure 8 for installed solar flex line.

6. Run the return solar flex line to the inlet on the solar water heater heat exchanger. See Figure 9. Install the solar flex line to the inlet on the solar heat exchanger on the water heater. See Figure 10. Ensure the adapter and reinforcing ring are positioned as described in Figure 4.

C. Completing Solar Water Heating System Piping

1. Install the tee onto the outlet of the solar water heater heat exchanger.
Install the male to male threaded adapter into the top of tee.
Install the drain valve into the bottom of the tee.
Install the pump into the tee.
Install the female to male adapter on the pump.
Install the solar flex line to the pump adapter. Ensure the adapter and reinforcing ring are positioned as described in Figure 4. See Figures 11 and 12.

2. Run the solar flex line to the collector supply connection. Connect the male to female adapter into the elbow installed on the collector supply connection.
Install the solar flex line to the adapter. Ensure the adapter and reinforcing ring are positioned as described in Figure 4.
**D. Applications**

Figure 13 - Drainback Kit Installation

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Elbow</td>
<td>K</td>
<td>Collector Sensor Wire (Included with Solar Control)</td>
</tr>
<tr>
<td>B</td>
<td>Coupling</td>
<td>L</td>
<td>Three Speed Solar Pump</td>
</tr>
<tr>
<td>C</td>
<td>Cap</td>
<td>M</td>
<td>1” X 2” Brass Nipple</td>
</tr>
<tr>
<td>D</td>
<td>3/4” X 1” Male Reducer</td>
<td>N</td>
<td>3/4” X 3/4” X 1” Brass Tee</td>
</tr>
<tr>
<td>E</td>
<td>3/4” Mixing Valve</td>
<td>O</td>
<td>3/4” Drain Valve</td>
</tr>
<tr>
<td>F</td>
<td>Solar Control</td>
<td>P</td>
<td>60 PSI Pressure Gauge</td>
</tr>
<tr>
<td>G</td>
<td>Solar Flex Line with Sensor</td>
<td>Q</td>
<td>3/4” X 3/4” X 1/4” Brass Tee</td>
</tr>
<tr>
<td>H</td>
<td>3/4” SST Adapter Straight Female</td>
<td>R</td>
<td>3/4” Nipple</td>
</tr>
<tr>
<td>I</td>
<td>3/4” NPT Union Set</td>
<td>S</td>
<td>Temperature and Pressure Relief Valve (Comes with Drainback Tank)</td>
</tr>
<tr>
<td>J</td>
<td>Solar Flex Line without Sensor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 - Drainback Kit Parts
Part 4 - Installing the Pressurized System Kit
The design and installation of the solar water heating system should be done by qualified individuals. It is important that good design and installation practices be followed to ensure the system will operate properly. Failure to follow installation guidelines for your solar water heating system could cause component failure and possible safety issues.

A. Installing Solar Collector Components
It is mandatory that all plumbing be done in accordance with 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.

Provide clear access to the water heater, pump, expansion tank, mixing valve, and other key components.

NOTE: These instructions do not detail how to install the solar collectors. Refer to the solar collector instructions for detailed installation information.

WARNING
Ensure the solar collectors are moved to the installation location BEFORE installing the solar collector components. Solar collectors are very heavy. Installing the solar collector components BEFORE moving the collectors to the installation location will increase the risk of damage to the collectors, substantial property damage, severe personal injury, or death.

Solar collectors are very heavy. Use caution as to not drop the collectors when moving to the installation location. Dropping the collectors could result in damage to the collectors, substantial property damage, severe personal injury, or death.

CAUTION
Never use dielectric unions or galvanized steel fittings in the collector loop. Doing so will lead to corrosion, property damage, and possible early water heater failure. Such damage IS NOT covered by warranty. Use only copper and brass fittings.

Use two wrenches when tightening connections. Use one wrench to prevent the return or supply line adapters from turning. DO NOT OVERTIGHTEN. Failure to prevent piping adapters from turning could cause damage to heater components.

1. a. SINGLE COLLECTOR INSTALLATIONS - Continue to Step 2.
   b. MULTIPLE COLLECTOR INSTALLATIONS - Use pipe wrenches to install the collector unions and manifold the collectors. See Figure 14. Ensure O-Rings are installed on the collector adapters before installing the unions.

2. Install caps on the unused collector adapters. Ensure O-Rings are installed on the collector adapters before installing the caps. See Figure 15.

3. a. SINGLE COLLECTOR INSTALLATIONS - Continue to Step 2.
   b. MULTIPLE COLLECTOR INSTALLATIONS - Use pipe wrenches to install the collector unions and manifold the collectors. See Figure 14. Ensure O-Rings are installed on the collector supply adapter before installing the 90° elbow. See Figures 16 and 24.

4. Install the 1" x 1" x 1/2" tee onto the collector supply adapter. Ensure O-Rings are installed on the collector supply adapter before installing the tee.

   Use thread tape to install the shut-off air vent valve into the 1/2" adapter on the tee.

   Use thread tape to install the automatic air vent into the shut off valve.

B. Connecting the Supply and Return Solar Flex Lines
1. Install the male to male solar flex line adapters into the open end of the tees on the solar collector return and supply adapters.

2. Install the solar flex line with sensor into the solar collector return adapter, and the solar flex line without sensor into the solar collector supply adapter. Ensure the adapters and reinforcing rings are positioned as described in Figure 17. See Figure 18 for installed solar flex line.

Figure 14 - Collector Unions
2. Install caps on the unused collector adapters. Ensure O-Rings are installed on the collector adapters before installing the caps. See Figure 15.

Figure 15 - Installed Cap
3. Install the 90° elbow into the collector supply adapter. Ensure O-Rings are installed on the collector supply adapter before installing the 90° elbow. See Figures 16 and 24.

Figure 16 - Installed 90° Elbow
4. Install the 1" x 1" x 1/2" tee onto the collector supply adapter. Ensure O-Rings are installed on the collector supply adapter before installing the tee.

   Use thread tape to install the shut-off air vent valve into the 1/2" adapter on the tee.

   Use thread tape to install the automatic air vent into the shut off valve.

Figure 17 - Adapter and Reinforcing Ring on Solar Flex Line
3. Run the solar collector return and supply flex lines to the pump control station.

Figure 18 - Installed Solar Flex Line
C. Pump Control Station
1. Use thread tape and pipe dope to install the four (4) male to 3/4” female adapters in the pump control inlets and outlets. See Figure 19.
2. Use thread tape and pipe dope to install the four (4) male to male adapters in the pump control inlets and outlets. Ensure the O-Ring is installed on the adapter as described in Figure 20.

Figure 19 - Installed Male to 3/4” Female Adapter

Figure 20 - Installed Male to Male Adapter

3. Use thread tape and pipe dope to install the four (4) female to male adapters in the pump control inlets and outlets.
4. Use pipe wrenches to remove the black pipe from the pump control station. See Figure 21. Then use the pipe wrenches and thread tape and pipe dope to install the three speed solar pump into the pump control station.

NOTE: To ease installation, it may be necessary to entirely remove the pump control station solar supply pipe. If this is necessary, take note of how best to reinstall the solar supply pipe, and the components necessary.

Figure 21 - Remove the Black Pipe and Install the Pump

D. Completing Solar Water Heating System Piping
1. Install the solar system supply and return flex lines to the pump control station top inlet and outlet. Ensure the adapters and reinforcing rings are positioned as described in Figure 17.
2. Install the solar system supply and return flex lines to the pump control station bottom inlet and outlet. Ensure the adapters and reinforcing rings are positioned as described in Figure 17.
3. Run the solar system return and supply flex lines from the pump control station to the inlet and outlet on the solar water heater heat exchanger.
4. Use thread tape and pipe dope to connect the female to male adapters on water heater heat exchanger inlet and outlet.
5. Install the solar system supply and return flex lines to the water heater heat exchanger inlet and outlet. Ensure the adapters and reinforcing rings are positioned as described in Figure 17. See Figure 23.

Figure 23 - Installed Solar Flex Line on the Heat Exchanger Inlet

6. See Figure 24 for a completed typical installation.

Figure 22 - Installed the Solar Flex Line on the Pump Control Outlet

7. Use thread tape and pipe dope to install the solar expansion tank and flex line to the pump control station. Ensure the expansion tank is properly supported and mounted. See Figure 24 for a typical installation.
E. Applications

Figure 24 - Pressurized Kit Installation

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Elbow</td>
<td>K</td>
<td>Collector Sensor Wire (Included with Solar Control)</td>
</tr>
<tr>
<td>B</td>
<td>Coupling</td>
<td>L</td>
<td>3/4” Solar Flex Fitting Kit</td>
</tr>
<tr>
<td>C</td>
<td>Cap</td>
<td>M</td>
<td>Dual Line Solar Station</td>
</tr>
<tr>
<td>D</td>
<td>3/4” X 1” Male Reducer</td>
<td>N</td>
<td>Three Speed Solar Pump</td>
</tr>
<tr>
<td>E</td>
<td>3/4” Mixing Valve</td>
<td>O</td>
<td>Solar Expansion Tank</td>
</tr>
<tr>
<td>F</td>
<td>Solar Control</td>
<td>P</td>
<td>Expansion Tank Flex Line Kit</td>
</tr>
<tr>
<td>G</td>
<td>Solar Flex Line with Sensor</td>
<td>Q</td>
<td>1” FPT X 1/2” Tee Fitting</td>
</tr>
<tr>
<td>H</td>
<td>3/4” SST Adapter Straight Female</td>
<td>R</td>
<td>Shut Off Valve</td>
</tr>
<tr>
<td>I</td>
<td>3/4” NPT Union Set</td>
<td>S</td>
<td>Air Vent</td>
</tr>
<tr>
<td>J</td>
<td>Solar Flex Line without Sensor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 - Pressurized Kit Parts
Part 5 - Wiring

**WARNING**

Wiring errors can cause improper and dangerous operation, and possibly result in electrical shock. To avoid electrical shock, turn off all power to the heating appliance and controls when wiring. Ensure the power remains off while any wiring connections are being made. Failure to follow these instructions could result in component or product failures, serious injury, or death. Such product failures ARE NOT covered by warranty.

Jumping out control circuits or components WILL VOID product warranty and can result in property damage, personal injury, or death.

It is of extreme importance that all system components be properly grounded. It is very important that the building system ground is inspected by a qualified electrician prior to making this connection. Electrical power must only be turned on when the system is completely filled with cold water. Failure to follow these instructions could result in component or product failure, serious injury, or death.

**Electrical Shock Hazard** - Turn off electrical power supply at service entrance panel before making any electrical connections. Failure to do so could result in serious injury, or death.

**CAUTION**

Label all wires prior to disconnecting them when servicing the solar system. Wiring errors can cause improper and dangerous operation. Failure to follow these instructions may result in property damage or personal injury.

**CAUTION**

Wiring must be NEC Class 1. If original wiring supplied with the manifold must be replaced, use only TEW 105 °C wire or equivalent. The solar system must be electrically grounded as required by the National Electrical Code, ANSI/NFPA 70 - Latest Edition.

A. Installation Must Comply With

1. National Electrical Code and any other national, state, provincial, or local codes or regulations.
2. In Canada, CSA C22.1, Canadian Electrical Code Part 1, and any local codes.

B. Wiring the Solar Water Heating System Components

1. Install the solar sensor wire gasket on the return side of the solar collector. See Figure 25.
2. Locate the solar collector sensor bulb. See Figure 26.
3. Run the solar collector sensor (the sensor with the black, UV protected wire) through the solar sensor wire gasket. See Figure 27.

![Figure 27 - Installing the Solar Sensor in the Solar Wire Gasket](image)

**NOTE:** The sensor may run up or down through the solar wire gasket, as required by installation conditions.

4. Install the solar sensor into the solar collector sensor bulb. See Figure 28.

![Figure 28 - Installing the Solar Sensor into the Sensor Bulb](image)

5. To complete solar system wiring, please refer to the instructions included with the components when wiring the solar pump, water heater, and any controls that may be used in the system.

**NOTE:** The included sensor with gray wire runs to the solar water heater. See solar water heater manual for installation instructions, and instructions included with the controls for wiring instructions.

Part 6 - Start-Up and Operation

Each solar water heater ships with operating instructions. Please refer to the instructions included with the water heater and any other components that may be used in the solar water heating system (drain back tank, solar control, pump station, etc.) when starting up, programming, and operating the solar water heating system.

Part 7 - Maintenance and Troubleshooting

**WARNING**

DO NOT carry out any maintenance or cleaning of the solar system before turning off the power supply. Failure to adhere to these guidelines can result in substantial property damage, electric shock, severe personal injury, or death.

1. To promote solar system reliability and safety it is recommended to maintain and clean it a minimum of every six months. Some installation conditions may require more frequent cleaning.
2. Check the solar system for evidence of leakage. Repair any leaks.
3. Ensure all wires are intact and properly connected.
4. In addition, please refer to the instructions included with the water heater and any other components that may be used in the solar water heating system (drain back tank, solar control, pump station, etc.) when maintaining the solar water heating system.
Set-Up Instructions for Drainback Systems

Set-up and filling instructions for pressure closed-loop drainback systems

Install the drainback (DB) tank in a conditioned space or add glycol to reduce freeze potential. Slope all plumbing and collectors ¼” per foot to the DB tank. Adding glycol does not supersede this slope for draining. Mount DB tank as high as possible to reduce pump size and power demands.

**CAUTION**

DO NOT wire the pump to the controller until the controller program pump function has been switched from “Auto” to “OFF”. Only then should the pump be wired to the unpowered controller. After the pump is connected control power can be restored.

Filling instructions:

1. Ensure pump is located 4’ below DB tank.
2. Use 18/2 thermostat wire to connect sensors to the controller. The black sensor wire runs outside to the collectors. Using shielded wire is advisable when the wire is located near other electrical sources.
3. Install and secure the collector sensor in the collector’s hot-out side sensor well to ensure an accurate temperature reading.
4. Install the tank sensor into the provided control well or onto the sensor stud. If these are not available, place the sensor on the cold DHW feed port against the tank, under the insulation and with direct contact to the steel.
5. Locate the fill valve below the pump. Connect a filler hose to the valve.
6. Fill the system until fluid is 2” from the top of the DB tank sight glass.
7. Check pressure gauge. Ensure there is at least 10 to 20 psi in the cold system. (It is just water and easy to drain and repair should a leak be detected. A high pressure air test is generally not needed.)
8. Ensure the system holds pressure over time. (If pressure does not hold, repair leaks and refill the system.)
9. Power the controller. Enter programming and set pump function to “OFF”.
10. Unplug controller and wire in the pump on R1.
11. Restore power the controller.
12. Locate the ¾” silver slotted air purge in the middle of the pump. Open to purge air from pump cavity.
13. On the solar controller, set the pump function to “ON”.
14. Determine that the water is returning to the DB tank and verify the pump can complete the circuit. The water level on the sight glass will drop substantially.
15. Mark and document the water level’s lowest point on the sight glass with tape or a mark.
16. Use the solar controller to disengage the pump by setting pump function to “OFF”.
17. With the pump off, verify that the fluid level returns to the original high full mark. If it falls short, repair plumbing for any leaks and ensure it pitches back to the DB tank for complete drainage. Restart filling test.
18. Run the system and let it heat in the sun. Flush, drain, and refill if necessary.
19. When the system is ready to operate, set the pump function to “auto” in the solar controller.
20. Observe the system and verify heat transfer from solar collectors to the tank. Ensure sensor readings are responding appropriately.
21. Observe and monitor solar performance over several days.

**CAUTION:** Included kit components are shown in this drawing. DO NOT add check valves, a vacuum break, expansion tanks, or air eliminators. Check the pump and remove any internal check valve. This is a closed-loop sealed system.

This drawing is meant for reference only. The installer is responsible for all equipment and detailing required by local codes. Installation must comply with state and local building codes. All piping must be sized correctly to specific length and size, according to accepted engineering methods or codes. HTP Inc. accepts no liability in the design, interpretation, or installation of this reference.

2/14/17
**Pressure closed-loop drainback**

**Programming collector to tank solar differential control**

**Simple description:** Most basic, >7 differential control. Solar transfer based on S1 and S2. Place tank sensor in well or stud, or under insulation against steel of the cold inlet port. Programming below slows pump down after collectors have been primed.

**Sequence Description:**

The controller monitors the collector temperature (S1) and tank temperature (S2). If the collector temp is higher than 12° [programmable (DTO)] the pump (R1) will engage. Pump disengages if collector temp comes within 8° [programmable (DTF)] of tank temp.

**Required Sensors:**

- S1: Collector (black wire)
- S2: Bottom tank

**Optional Sensors:**

- S3: For display purposes only
- S4: Near solar pump, used to measure BTU’s output.

**Components:**

- C1: Collectors, T1: primary tank or heat load, B1: wiring bus located under control cover

**Outputs:**

- R1 = solar pump located 4' below DB tank with some horizontal piping if possible (bronze or stainless pump sized for lift and collector[s] gpm)

**Variable Default Range Description**

- ARR 1 NA Drainback Solar System in accord with this drawing
- DTO 12° 8.5 – 40 △T required to start solar pump
- DTF 8° 1 - 11.5 △T required to stop solar pump
- RS 4 2 – 40 △T rise required for pump to increase by 10%
- DT S 3 – 65 △T where min pump speed (nMN) begins following startup at 100% for 10 seconds
- RIS 4 2 – 40 △T rise required for pump to increase by 10%
- DT F 100 30 – 100 Lowest pump speed during modulation
- S MX 170° 40 – 205 Tank temp set point, middle or bottom sensor (S2)
- Glass lined tank maximum 140° Stainless steel 180°
- EM 230 170-390 Maximum collector temperature before shut down
- OCN on/off on Minimum collector temperature mode
- CMN 90/110° 50 – 195 Minimum collector temp to start solar pump (prevents pump cycling at night)
- OFC off/ on/off Freeze protection. Engages pump in freezing conditions with no or low antifreeze
- CFR n/a 15 – 50 Temp of collector when pump will run to prevent freezing if OFC is set to on
- OHQM off/ on/off Energy monitoring mode (Get this to lend an approximation to the owner of BTU’s productive)
- FMX 0 – 20 Maximum flow in liters per min (set to .75 gallon per number of collectors used)
- MEDT _ _ 0 – 3 Type of anti-freeze (0=water, 1=prop glycol, 2=ethyl glycol, 3=Tyford)
- MED% _ _ 20 – 70 Glycol percentage in system
- ODB on/off off/on Drainback function
- IDTO 1 - 100s Time to operate pump at 100% (DTO)
- IFL 1 min 1 – 30m Time to operate until shut down.
- ISTB 1 min 1 – 15m Time the pump must continue to operate after DTO
- OBST off/ on/off Second booster pump
- Man1 auto/off/auto/on Relay #1 mode
- Man2 n/a/off/auto/on Relay #2 mode
- LANG Eng F° or C°
- RESE off Reset to default program
- PROG n/a Program number
- VERS Version number

*Suggested start-up settings for this drawing. Refer to the solar controller manual for more details.*
Set-Up Instructions for Pressurized Closed-Loop with Glycol Systems

Field Tools Needed:
- Pressurized filling station or a high-head pressure pump that can generate at least 50 psi
- Hoses for filling to connect to the field-supplied filling pump
- Air compressor for pressure testing the system and setting the pressure on the expansion tank
- Components and tools for roof flashing when a roof penetration is used
- Standard spanner wrenches for tightening supplied fitting

General Instruction:
Locate and mount collectors according to instructions
- Use 18/2 thermostat wire to connect sensors to the controller. The black sensor wire runs outside to the collectors. Using shielded wire is advisable when the wire is located near other electrical sources.
- Install and secure the collector sensor in the collector’s hot-out side sensor well to ensure an accurate temperature reading.
- Install the tank sensor into the provided control well or onto the sensor stud. If these are not available, place the sensor on the cold DHW feed port against the tank, under the insulation and with direct contact to the steel.
- After system components are assembled and connected, dry pressure test the solar loop to 100 psi for an extended period of time with the expansion tank and top collector air vent isolated from the system. This test is important because the system will deal with stagnation, high temperatures with pressure spikes, and extreme temperature variations.
- If the lift distance from the tank to the collectors is >20' the approximate target pressure of the solar loop will be 30 psi.
- If the lift distance from the tank to the collectors is <20' the approximate target pressure of the solar loop will be 40 psi.
- Pre-charge the expansion tank to 2 to 3 psi above the target pressure (as determined by lift distance)

Additional Notes:
- The pump station is shipped in its own box with or without the pump inserted. All fittings in this pump station must be checked for tightness and seal. Do not assume that shipping has not interfered with any of the fitting seals.
- Most of the solar loop fittings are sealed with O-rings and/or gaskets. Over-tightening is not necessary.

This drawing is meant for reference only. The installer is responsible for all equipment and detailing required by local codes. Installation must comply with state and local building codes. All piping must be sized correctly to specific length and size, according to accepted engineering methods or codes. HTP Inc. accepts no liability in the design, interpretation, or installation of this reference.
Set-Up and Filling Instructions for Pressurized Closed-Loop with Glycol Systems

**CAUTION**
- It is recommended to not begin this procedure with the collectors uncovered. Cover the collectors when you work on the collectors even if it is overcast and there is little sun.

**Filling the Solar System:**
- Locate the feed and return charging ports on the pump station and connect the field-supplied hose to the filling pump. Close the isolation valve between the filling ports. Make sure that it is pumping in the same direction as the solar pump is pumping to the inlet of the collectors.
- Fill and charge the system. Circulate the fluid for 5 to 10 minutes to remove as much air as possible. While the filler pump is still circulating, ensure all isolation valves are open and on the collector air vent and expansion tank. Now open the valve between the filler ports. With the filler pump still operating, manually turn on the solar pump (in the solar controller, change pump function from ‘ON’, ‘OFF’, and ‘Auto’). Allow the system to purge as the fluid circulates through the system. If the sun is out, the fluid will begin to warm even though the collectors are covered.
- Start throttling down the return to the bucket valve and watch the pressure start to build. It is OK if the filling pump begins to labor more. There are two locations from which air bubbles will escape: 1) The automatic air vent on the collector, and 2) the manual air trap on the left side of the pump station. Try to maintain a higher circulation pressure for several minutes as the micro bubbles are purged out of the system. Leave the system at about 5 psi higher than the targeted pressure. The system needs to operate and heat for a full day, under full sun, to purge the remainder of the micro bubbles out of the system. Additional air purging should be considered again after several days of solar heating operation to eliminate the final gathering of the micro bubbles in the air vents.
- Ensure that the roof air vent isolation valve is not left open when you leave. In the event of a power failure, a closed valve will allow the system to stagnate normally as the collectors flash to steam; if the valve is open, the automatic air vent will discharge and not be able to differentiate between air and steam. If air is left in the system during stagnation, flashing and air migration may create flow and pop-off the pressure relief valve (PRV). Now steam expansion has extended outside of the collectors into the plumbing and no PRV is able to contain it.
- Leave the air vent open as long as you are there to naturally collect any micro bubbles while under hot operating conditions. It is extremely important that all of the air is removed from the system. This is a task that will require time and patience. You will have to return later to purge the air vent and pump station air traps. Not completing the full air purge to initiate the system will lead to potential system failure.
- After all air is purged, the system will operate under a full hot noon day environment at 10 to 15 psi above target set cold pressure. Ensure the supplied PRV has a rating of 20 psi above cold setup pressure.
- Ensure the controller is programmed correctly and that you can see appropriate readings from the sensors. In the solar controller, change the pump function to Auto. Observe controller functions to ensure it is operating automatically and initiating at appropriate times.

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**Figure 32 - Pressurized Closed Loop Set-Up**

*This drawing is meant for reference only. The installer is responsible for all equipment and detailing required by local codes. Installation must comply with state and local building codes. All piping must be sized correctly to specific length and size, according to accepted engineering methods or codes. HTP Inc. accepts no liability in the design, interpretation, or installation of this reference.*
Programming Instructions for Pressurized Closed-Loop with Glycol Systems

Pressurized closed loop glycol

Simple description: Most basic $\Delta T$ differential control settings. Solar transfer based on S1 and S2. Place tank sensor in sensor well or under insulation against steel of the cold inlet port.

Sequence Description:
Controller looks at the collector temperature (S1) and tank temperature (S2). If the collector temp is higher than 12° [programmable (DFO)] the pump (R1) will engage. Pump disengages if collector temp comes within 8° [programmable (DTF)] of tank temp. Pump modulated to $\Delta T$

Required Sensors:
- S1: Collector (black wire)
- S2: Bottom tank

Optional Sensors:
- S3, for display purposes only
- S4, Before solar pump, used to approximate BTU’s output.

Components:
- C1: collectors
- T1: primary tank or heat load (gas or electric back-up)
- B1: wiring bus located under control cover

Outputs:
- R1 = solar pump (can be modulated for variable speed or set to 100%)

Variable Default  Range  Description
ARR  1  NA  Solar System Valve logic for pool heating or other storage vessel
DFO  12°  8.5 – 40  $\Delta T$ required to start solar pump
DTF  8°  1 - 11.5  $\Delta T$ required to stop solar pump
DT S  20°  3 – 60  $\Delta T$ where min pump speed (nMN) begins following startup at 100% for 10 seconds
RIS  4°  2 – 40  $\Delta T$ rise required for pump to increase by 10%
RMN  40%  30 – 100  Lowest pump speed during modulation
S Mx  170°  40 – 205  Tank temp set point, middle or bottom sensor (S2) Stainless tanks can go to 180°. Glass only good to 140°
EM  270  170-390  Maximum collector temperature before shut down

OCC, CMX, OSYC, DTCO, DTCF, OSTC, OHOL, THOL,

OCN  off  on  Minimum collector temperature mode
CMN  50/110°  50 – 195  Minimum collector temp to start solar pump (Prevents from short pumping on hot nights)
OCF  off  on  Freeze protection. Engages pump in freezing conditions with no or low anti-freeze
CFR  n/a  15 – 50  Temp of collector when pump will run to prevent freezing if OCF is set to on

OTC, TCST, TCEN, TRCU, TCIN

QHGM  off  on  Energy monitoring mode
FMAX  6.0  0 – 20  Maximum flow in liters per min (set to .75 gallon per number of collectors used)
MEDT  1  0 – 3  Type of anti-freeze (1=water, 2=prop glycol, 3=ethyl glycol, 3=Tyfocon)
MED%  45%  20 – 70  Glycol percentage in system

ODB  off  on  Drainback function

Man1  auto  off  Automation Relay #1 mode
Man2  n/a  off  Automation Relay #2 mode
LANG  Eng  Version number
UNIT  F*  F° or C°  Reset to default program
PROG  Program number
VERS  Version number

Suggested start-up settings for this drawing. Refer to the solar controller manual for more details.
### Table 5 - Pressurized Kit Parts - Collectors are available in 32 and 40 Sq. Ft. Models

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-**-FP-UW</td>
<td>Solar Collector</td>
<td>Depends on Kit</td>
<td>8600-679</td>
<td>3/4” X 1” NIP Male Reducer</td>
<td>3</td>
</tr>
<tr>
<td>8600-625</td>
<td>Pre-Mixed Glycol</td>
<td>5 Gallons</td>
<td>8600-588</td>
<td>3/4” SST Adapter Straight</td>
<td>3</td>
</tr>
<tr>
<td>8600-586</td>
<td>3/4” Solar Flex Pipe w/ Sensor (50’ Coil)</td>
<td>1</td>
<td>8600-505</td>
<td>1” Cast 3 Speed Solar Pump</td>
<td>1</td>
</tr>
<tr>
<td>8600-587</td>
<td>3/4” Solar Flex Pipe w/o Sensor (50’ Coil)</td>
<td>1</td>
<td>S8600-092</td>
<td>Female 90° Flex Line Connector</td>
<td>1</td>
</tr>
<tr>
<td>8600-517</td>
<td>3/4” Sweat Mixing Valve</td>
<td>1</td>
<td>8600-030</td>
<td>Shut-Off Valve for Air Vent</td>
<td>1</td>
</tr>
<tr>
<td>8600-632</td>
<td>Isolar Delta T Control</td>
<td>1</td>
<td>8600-029</td>
<td>Auto Air Vent</td>
<td>1</td>
</tr>
<tr>
<td>8600-525</td>
<td>3/4” NPT Union Set</td>
<td>2</td>
<td>8600-522</td>
<td>Mounting Kit</td>
<td>1</td>
</tr>
<tr>
<td>S8600-090</td>
<td>Male 90° Flexline Connector</td>
<td>1</td>
<td>8600-699</td>
<td>Dual Line Solar Station</td>
<td>1</td>
</tr>
<tr>
<td>8600-296</td>
<td>1” Cap with O-Ring</td>
<td>2</td>
<td>8600-532</td>
<td>Expansion Tank Flex Line Kit</td>
<td>1</td>
</tr>
<tr>
<td>8600-329</td>
<td>1” Female Brass Union with O-Rings</td>
<td>Depends on Kit</td>
<td>8600-671</td>
<td>Solar Expansion Tank</td>
<td>1</td>
</tr>
<tr>
<td>8600-080</td>
<td>Solar Sensor Wire Gasket</td>
<td>1</td>
<td>9500-0052</td>
<td>3/4” Brass Nipple</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 6 - Drainback Kit Parts - Collectors are available in 32 and 40 Sq. Ft. Models

** - Denotes Total Surface Area of Collector(s) in Square Feet - Ex: SS-80-FP-UW will include two (2) SS-40-FP Collectors

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-**-FP-UW</td>
<td>Solar Collector</td>
<td>Depends on Kit</td>
<td>8600-679</td>
<td>3/4” X 1” NIP Male Reducer</td>
<td>3</td>
</tr>
<tr>
<td>SSU-10DB</td>
<td>10 Gallon Solar Drainback Tank</td>
<td>1</td>
<td>8600-588</td>
<td>3/4” SST Adapter Straight</td>
<td>3</td>
</tr>
<tr>
<td>8600-586</td>
<td>3/4” Solar Flex Pipe w/ Sensor (50’ Coil)</td>
<td>1</td>
<td>8600-506</td>
<td>1” Cast 3 Speed Solar Pump</td>
<td>1</td>
</tr>
<tr>
<td>8600-587</td>
<td>3/4” Solar Flex Pipe w/o Sensor (50’ Coil)</td>
<td>1</td>
<td>8600-272</td>
<td>1/4” 60 PSI Pressure Gauge</td>
<td>1</td>
</tr>
<tr>
<td>8600-517</td>
<td>3/4” Sweat Mixing Valve</td>
<td>1</td>
<td>8600-273</td>
<td>3/4” X 3/4” X 1/4” Brass Tee</td>
<td>1</td>
</tr>
<tr>
<td>8600-632</td>
<td>Isolar Delta T Control</td>
<td>1</td>
<td>8600-276</td>
<td>1” X 2” Brass Nipple</td>
<td>1</td>
</tr>
<tr>
<td>8600-525</td>
<td>3/4” NPT Union Set</td>
<td>1</td>
<td>8600-275</td>
<td>3/4” X 3/4” X 1” FNPT Brass Tee</td>
<td>1</td>
</tr>
<tr>
<td>S8600-090</td>
<td>Male 90° Flexline Connector</td>
<td>2</td>
<td>8600-274</td>
<td>3/4” Drain Valve</td>
<td>1</td>
</tr>
<tr>
<td>8600-296</td>
<td>1” Cap with O-Ring</td>
<td>2</td>
<td>9500-0052</td>
<td>3/4” Brass Nipple</td>
<td>1</td>
</tr>
<tr>
<td>8600-329</td>
<td>1” Female Brass Union with O-Rings</td>
<td>Depends on Kit</td>
<td>8600-671</td>
<td>Solar Expansion Tank</td>
<td>1</td>
</tr>
<tr>
<td>8600-080</td>
<td>Solar Sensor Wire Gasket</td>
<td>1</td>
<td>9500-0052</td>
<td>3/4” Brass Nipple</td>
<td>1</td>
</tr>
</tbody>
</table>