OPEN LOOP DOMESTIC HOT WATER SOLAR SYSTEM
WITH DIFFERENTIAL CONTROL

MODELS SLCO32DC-66, SLCO40DC-80,
SLCO64DC-120, SLCO80DC-120

INSTALLATION MANUAL

Solene™
927 Fern St. Suite 1500
Altamonte Springs, FL 32701
(866) 902-0060

SRCC OG-300 Certified

The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Florida Solar energy center, in accordance with section 377.705, Florida Statutes. This certification does not imply endorsement or warranty of this product by the Florida Solar Energy Center or the State of Florida.

SOLAR RATING AND CERTIFICATION CORPORATION
Independent Certification of Solar Water and Swimming Pool Heating Collectors and Systems

The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Florida Solar Energy Center, in accordance with Section 377.705, Florida Statutes. This certification does not imply or endorse warranty of the product by the Florida Solar Energy Center of the State of Florida. Solar Water Heating System

SLCO-IMDC
5/1/07

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SAFETY PRECAUTIONS

There is no substitute for safety. Always exercise extreme caution, care and good judgment when working on or around a roof. Here are just a few installation precautions to keep in mind:

- When working on the roof, always take care to avoid hazards such as overhead electrical wires or loose shingles. Secure ladders so they will not slip or fall. Wear shoes with proper tread to prevent slipping on the ladder or sloped roof areas.
- Always check that power is turned off before attempting any wiring or electrical hook-ups, especially when water is present. It's always a good idea to shut power off to both the solar storage tank and to the automatic control when there is water leaking at the tank.

Do not hook up or turn on any electricity to the solar storage tank until it is full of water. If the heating element is not covered in water prior to being turned on, it will burn out.

Always consult the proper authorities or check with your local building department for the permit requirements and codes applicable before you start the job. Installation should always be in accordance with the National Fire Code and with all local codes.

INSTALLATION INSTRUCTIONS

SIZING & ORIENTATION

The vast majority of Solar Domestic Hot Water (SDHW) systems are comprised of "Medium Temperature" solar collectors manufactured using tempered glass and some type of metal absorber plate. They differ from "Low Temperature" systems predominantly utilized in swimming pool heating applications. These systems are typically manufactured using plastic resins. "High Temperature" systems are utilized to generate steam for industrial applications. Corona collectors belong to the "Medium Temperature" category.

Normally, only one or two Corona collectors are needed for a SDHW system. The number of collectors is determined not only by the amount of water that is needed, but also by the latitude of the installation and the collector's orientation. The following table details Corona's recommended minimum system sizing guide for a typical installation:

Tank Capacity	# of Collectors Needed	Collector Type	Control Type	System Model Number
66 gallon	1	SLCO-32 (4' x 8')	Differential Control	SLCO32DC-66
80 gallon	1	SLCO-40 (4' x 10')	Differential Control	SLCO40DC-80
120 gallon	2	SLCO-32 (4' x 8')	Differential Control	SLCO64DC-120
120 gallon	2	SLCO-40 (4' x 10')	Differential Control	SLCO80DC-120

Normally, collectors are installed on roofs, as close as possible to the tank, to minimize heat loss through the pipe. The pipes between the tank and the collectors MUST be insulated with at least ½" thick insulation, for the same reason.

The solar collectors must be located in a structurally sound area of the roof that will be exposed to the sun for the majority of the day, all year round.

The recommended angle of the collectors is the angle of the installation location's LATITUDE. This angle is designed to maximize solar absorption during winter months when the sun is low. A variation of +/- 15 degrees is acceptable. The orientation of the collectors must be due south ± 55 degrees. Flush mounts on available roof slopes are recommended to allow convenience and cost effectiveness, since these variations from the exact angle and orientation will affect the system's performance only by about 5%.

COLLECTOR MOUNTING

There are two basic roof-mounting methods:

FLUSH MOUNT INSTALLATION - Parallel to the roof line, as illustrated below.

Figure #1, Flush mounted collector

Flush Mount Installations are recommended when the roof's slope conforms to the orientation requirements as stated previously. This is the easiest and most aesthetically pleasing installation method. After the collector(s) are installed, it should resemble skylight. The flush mount consists of four (4) U-channels (SL-UC) and four (4) Gripper Sets (SL-GS), two set each for the top and bottom.

1. Start from the bottom. The bottom side of the Corona collector is marked by two weep holes placed about 20" apart on the short anodized aluminum edge of the collector. When elevating the collector to the roof, make sure that the "weep holes" are facing down. It is recommended to install the collectors vertically (length up the roof's slope), but the collectors may be installed horizontally as well.

2. Once the collector's location is determined, anchor two (2) U channels to the roof using two (2) stainless steel 2" x 5/8" lag bolts for each U-channel. The U-channels should

be spaced approximately 30” apart. The collectors will rest on top of the U-channels. (Picture 1)

Picture #1

3. Verify a secure connection to the trusses. If lagging directly into the roof trusses is not possible, secure a 2’ x 4’ wood beam perpendicular to the trusses, inside the attic, and anchor the bolts to this member. Again, verify a secure connection into the new member.

4. Connect the Latch to the Gripper (Picture 2) utilizing the provided nut and bolt. Slide the Latch into the top of the U channel so that the Gripper remains on top of the opening. Place them at the middle of the U-channel’s top and tighten. (Picture 3)

Picture #2

Picture #3

5. Loosen the Gripper providing space to insert the slot at the collector’s edge between the Gripper’s hook and the U-channel’s top. Once both Grippers are grabbing the collector’s edge slot, tighten both Grippers. (Picture 4)

Picture #4

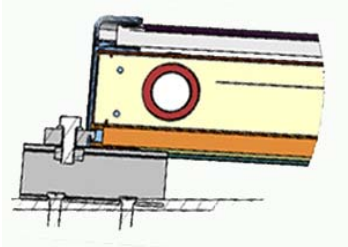


Figure #3

6. Repeat steps 2-5 for the top. That’s it. The collector is anchored.

ANGLE MOUNT INSTALLATION - Not parallel to the roofline, normally used on flat roofs and ground mounts, as illustrated below.

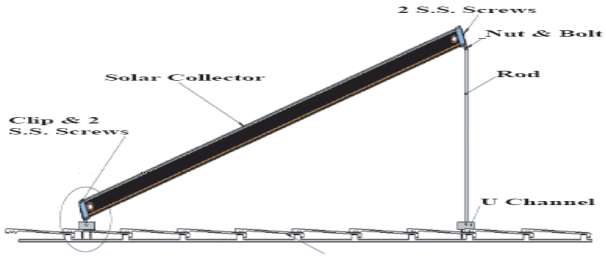


Figure #2, Angle mounted collector

Angle Mount Installations involve positioning the collector(s) at an angle so that the upper part of the collector is higher than the lower in reference to the mounting surface. The "angle mounting" is used on horizontal surfaces or on roofs that slope in directions other than south ±55 degrees.

1. Use the Angle Mounting kit (SL-MK), see picture 5. Connect the U-channels to the roof just like in the Flush Mounting method. Assemble the mounting clips to both U-channels utilizing the provided bolts (Picture 6).

Picture #5

Picture #6

2. Screw the mounting clips to the BOTTOM part of the collector (the weep hole side) using two (2) stainless steel or aluminum screws each. (Picture 7)

Picture #7

3. Assemble both rods and top mounting clips (picture 8). Connect the clips to the collector's top by stainless steel or aluminum screws. (Figure 4)

Picture #8

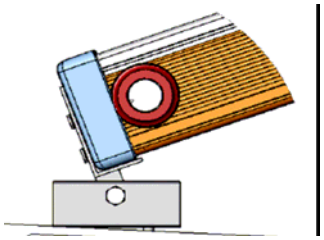


Figure #4

4. Connect to the U-channels to the opposite side of the rod, using the provided nuts and bolts. (Picture #10)

Picture #10

5. Lift the collector's top with the assembled rod kits and anchor the U-channels to the roof, ensuring the proper angle to the collectors. (Picture 11)

Picture #11

Install all components in accordance with local code so that the performance of any structural member or fire rated assembly is not reduced.

PIPE INSTALLATION

Careful consideration of the proper piping of the system should be done prior to a final decision being made on the collector mounting. The collectors and piping should slope slightly downward, toward the tank, in order to allow for draining in freezing conditions.

Piping should consist of copper tube (Type M), insulated with at least ½" Armaflex pipe insulation or similar and be wrapped with aluminum tape in all areas exposed to UV radiation. All soldered connections require 95/5 solder.

The cold-water inlet (supply) pipe connection should be made at the lowest corner of the collector. The hot-water outlet (return) pipe connection should be made at the opposite corner of the cold-water inlet. The hot-water return should have the shortest possible run back to the storage tank to avoid heat loss.

The Vacuum Relief Valve (Part #6), Automatic Air Vent (Part #7), Pressure Relief Valve (Part #8), and Freeze Protection Valve (Part #5), should be plumbed into the return line as illustrated in the System Schematic on page 12 of this manual.

It is extremely important to take special care in weather proofing the piping installation through the roof.

1. Drill a hole the same diameter as the copper piping being utilized in the system installation being careful not to place the opening above the collector supply point. The system will not drain properly if the opening is above the above the supply point.

2. Cement a copper roof flashing around the pre-drilled hole. The upper edge of the flashing should slide underneath the adjoining shingle.

3. Push the copper tube up through the roof flashing. Slide the flashing cap over the copper tubing so it rests on the flashing opening. The wiring for the Photovoltaic Module should also be run through this the return line flashing.

4. After all of the piping is completed, solder the flashing cap into place.

5. Utilizing a polybutalyne adhesive, finish weather proofing the roof flashing.

PLUMBING

The storage tank should be placed in a location to best minimize heat loss. It should be placed as close to the system return line as possible. Adequate ventilation and access for possible future service work are important considerations. In order to prevent possible water damage in case of tank leakage, a pan with a ¾" drain line should be installed.

As illustrated in the System Schematic on page 12 of this manual there are very specific requirements as to valve, thermostat, and pump placement.

The following component equipment should solder in place according to their specific relative locations as outlined in the System Schematic.

1. Circulation Pump (Part #4) - Taco 006BC4 Circulation Pump
2. Thermometers (Part #11) - Letro SL-2D In-Line Thermometer w/ temperature range of 50° to 220 F°.
3. Boiler Drains (Part # 12) - BD-050 (½"), or BD-075 (¾") Boiler Drains on both Supply and Return lines.
4. Ball Valves (Part #14) - BV-050 (½"), or BV-075 (¾") Ball Valves on both Supply and Return lines.
5. Cold Water Inlet Valve - GV-075 (¾") Gate Valve.
6. Mixing Valve - Watts 70A-075 (¾") Mixing Valve.

AUTOMATIC DIFFERENTIAL CONTROL

Power to the circulation pumps is controlled by an automatic differential control that has two temperature sensors. One sensor is located on the outlet of the solar collector and the other sensor is located on the storage tank behind the lower access panel. When the storage tank sensor detects water temperatures cooler than the desired temperature set on the control, and if the collector sensor is 8° F warmer than the storage tank sensor, the automatic control turns on the circulation pump to harvest the energy available from the sun. When the desired temperature is met, or when the solar collector sensor drops to within 4 degrees of the storage tank sensor, the control turns off the circulation pump. (This on/off differential can be set to 24°/4° rather than the 8°/4°.)

The automatic control has a three-position switch - ON, AUTO or OFF. (Sometimes this switch is located on the inside of the cover.) During normal operation, the control is switched to AUTO where the control will turn the circulation pump on and off at the appropriate times. When switched to ON, the control sends power to the circulation pump. When switched to OFF, the control turns the circulation pump off.

THE AUTOMATIC CONTROL HAS A HIGH LIMIT STORAGE SETTING THAT CAN BE ADJUSTED FROM 110°F TO 200°F AND IS TYPICALLY PRESET TO 140°F.

ELECTRICAL AND WIRING REQUIREMENTS

A properly licensed contractor must make the 230-volt electrical connection to the water heater or solar storage tank and the electronic time switch (Optional). If your solar contractor is not allowed by law to make these connections consult a licensed electrician.

NEVER ACTIVATE THE CIRCUIT BREAKER CONTROLLING THE ELECTRICAL HEATING ELEMENT UNTIL THE SOLAR STORAGE TANK IS COMPLETELY FILLED WITH WATER. This will prevent "dry firing" of the heating element. The electrical heating element will be destroyed almost instantaneously if not completely submerged in water when activated. Make sure the water heater circuit breaker is off until the solar storage tank is completely filled.

We recommend the use of a 115-volt differential control with a factory installed six-foot line cord. The installation requires one 115-volt outlet to be installed near the solar storage tank. Plug the control into the outlet. The circulation pump line cord is plugged into the receptacle on the side of the controller. A 230-volt control and circulation pump may be substituted, but troubleshooting the components in the future becomes more difficult. The specified differential thermostat is the Goldline model GL-30-LCO.

THERMOMETERS

Locate two thermometers; one at the supply line and one on the return line of the solar loop so that the temperature rise across the collector can be determined.

LABELS

Label installation is mandatory at several locations of the system. Please insure compliance by affixing labels at the designated locations.

SYSTEM START-UP

The Start-up Procedures are detailed in the Solene Open Loop (SL/CO-HMDC) Homeowner's Manual.

SYSTEM OPERATION

Solene systems are designed to accommodate three separate modes of operation. Your solar water heating system can (1) provide 100% solar operation during good weather, or (2) serve as a pre-heater to your electric water heater adding solar energy when and as available, or (3) 100 % on utility power during inclement weather.

TOTAL SOLAR OPERATION

Turn off the circuit breaker to your solar storage tank. If a water heater time switch has been installed, set the switch to the "off" position. If you have a mechanical timer remove the trippers from the face of the switch.

TOTAL PREHEAT

Leave the circuit breaker to your solar storage tank on and set the tank thermostat to the lowest acceptable temperature setting. The electric resistance heating elements will come on only when the tank temperature falls below the thermostatic set point. If the solar heated water entering the tank is warmer than the thermostatic set point, the electric heating elements will not come on. If you have a water heater timer, you may preset the timer to turn the heating element on and off at specified times throughout the day if desired.

TOTAL UTILITY POWER

Leave the circuit breaker to your solar storage tank on and close the isolation ball valves in the collector loop. In this mode of operation you must turn off the circulation pump. To turn the pump off, open the controller and change the operational setting from automatic to off. Failure to turn off the pump can quickly damage the pump motor, shaft, bearings or impeller.

COMPONENT PARTS LIST AND FUNCTION

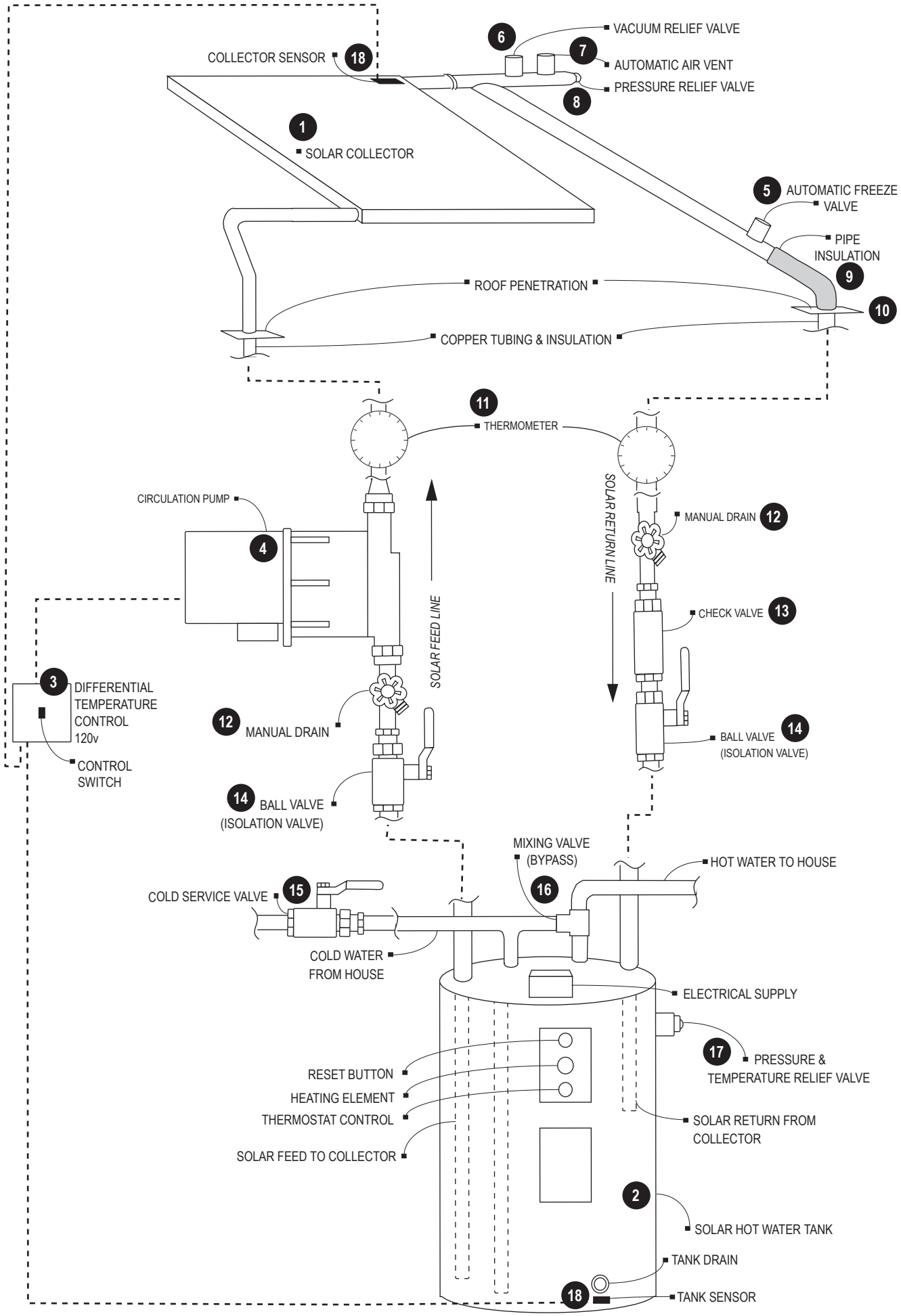
While specific products are mentioned below, there are many components that can be substituted with like or equal products. For instance there are several different mixing valves or isolation valves that can be utilized, not just the one specifically listed. Sometimes sweat or threaded connections or varying fitting sizes are dealer preference. All of the components listed below are available from Solene at 927 Fern St. Suite 1500, Altamonte Springs, FL 32701 (866) 902-0060.

See the schematics on page #12 & #13 for the location of the following list of components.

1. **Corona Solar Collector** –Corona SLCO40 4 x 10, or SLCO32 4 x 8 with all copper chrome plated absorber plate.
2. **Solar Storage Tank –** Lochinvar FTA066K 66 Gallon, or FTA082K 80 Gallon, or FTA120K 120 Gallon Solar Storage Tank with Single 4500W Backup Element.
3. **Differential Control –** Goldline Differential Control with Adjustable High Limit determines when system is on or off.
4. **Circulation Pump –** Taco 006BC, Grunfos, or March 80AC, circulate water through system.
5. **Freeze Valve –** Dole FP-45 Freeze Valve protects system from freezing.
6. **Vacuum Relief Valve –** Watts N-36 Vacuum Relief Valve allows air into the system when draining collector.
7. **Air Vent –** Sparco FV-147 Air Vent allows air trapped in collector to purge.
8. **Pressure Relief Valve –** Watts 530C Pressure Relief Valve protects system from excessive pressure.
9. **Pipe Insulation –** ACT05834 Armaflex Copper Pipe Insulation to prevent heat loss through pipes. Any Pipe Insulation that is exposed to sunlight must be wrapped with foil tape or coated with a water-based acrylic resin coating as specified by the Insulation Manufacturer.
10. **Roof Penetration Flashing –** All Copper Roof Flashing. Gooseneck type flashing is recommended for feed line to accommodate sensor wire.
11. **Thermometer –** Letro SL-2D In-Line Thermometer w/ temperature range of 50°F to 220°F.
12. **Boiler Drains –** BD-050 ½', or BD 075 ¾' Boiler Drains on both Feed and Return lines used in conjunction with #13 Ball Valves, allow for manually draining the solar system.
13. **Check Valve –** Heliodyne SCV 75/50 Check Valve for PV Systems prevents thermo-siphoning from storage tank through solar collectors.
14. **Ball Valves –** BV-050 ½", or BV-075 ¾" Ball Valves used as Isolation Valves in conjunction with #11 Boiler Drains to manually drain the solar system.
15. **Cold Water Inlet Valve –** GV-075 ¾" Gate Valve gives ability to turn off the cold feed to the Solar Storage Tank.
16. **Mixing Valve –** Watts 70A-075 ¾" Mixing Valve tempers temperature of hot feed line to home.
17. **Pressure & Temperature Relief –** Watts 100XL-4 P&T Relief Valve located on the solar storage tank opens at 150psi or 210°F.

MODEL SLCO40DC-80
MODEL SLCO32DC-66

SOLENE DHW SYSTEM SCHEMATIC



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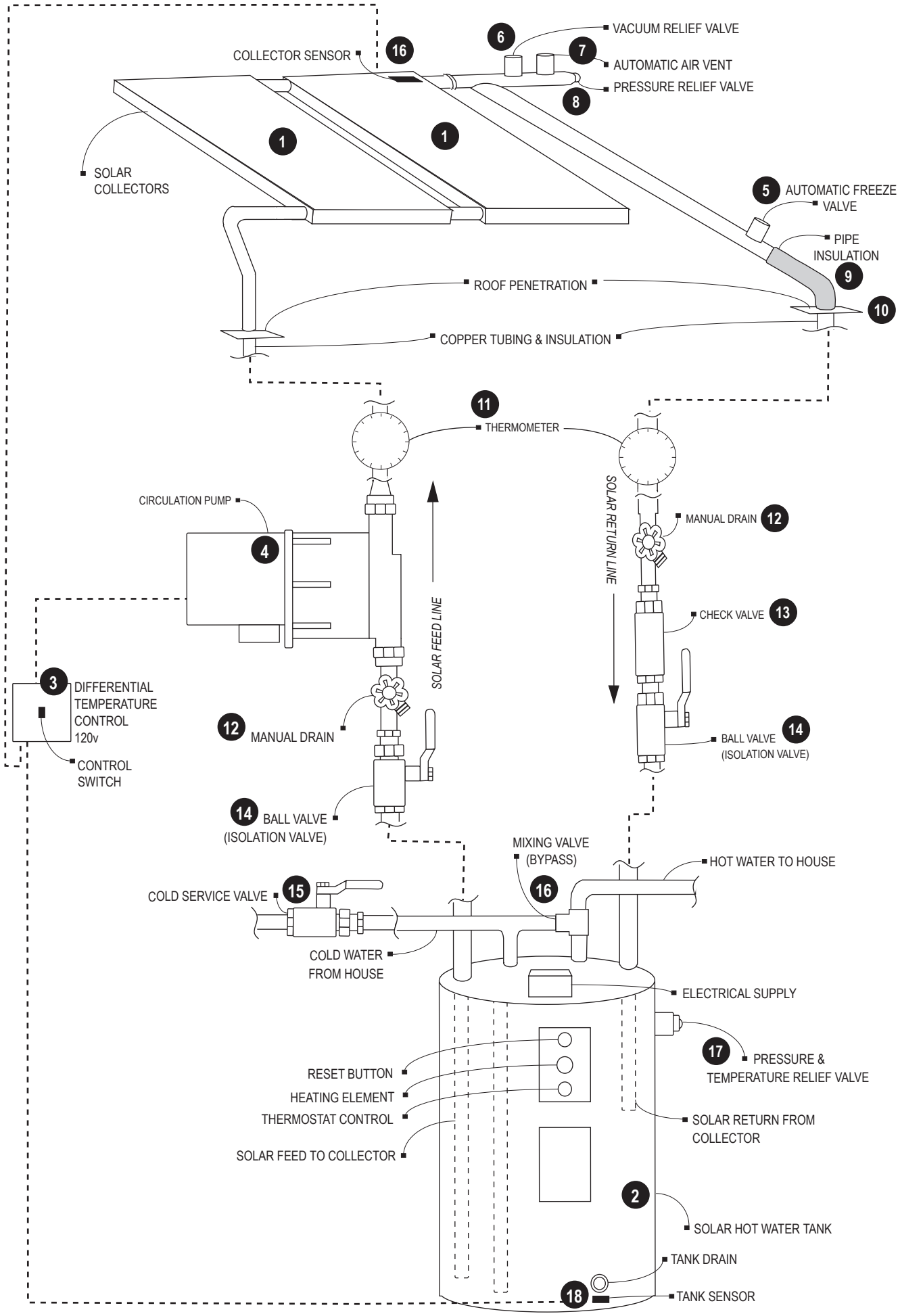
MODEL SLCO80DC-120
MODEL SLCO64DC-120
MODEL SLCO60DC-80

SOLENE DHW SYSTEM SCHEMATIC



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COMPONENT LIFE EXPECTANCY

Installed and maintained properly, your Solene Solar Hot Water Heating System should provide many years of trouble free, uninterrupted service. The main component of the system, the Corona Solar Collector, is designed to last 25 to 30 years. Solar Storage Tanks have a life expectancy anywhere from 10 to 20 years depending greatly upon regional water quality. (Tank life can be extended by replacing the internal sacrificial anode rod from time to time.) Differential Control and Circulation Pump life expectancies run from 5 to 10 years. As electrical components, they are susceptible to lightning strikes or electrical surges. Valve life expectancy varies greatly depending water quality and usage.

FOR MORE INFORMATION

Detailed information regarding System Operation, Routine Maintenance, Freeze Protection, and Start-up and Shutdown procedures can be found in the Solene Open Loop (DC) Domestic Hot Water Solar System Homeowner's Manual (SL/CO-HMDC).

CONTACT INFORMATION

If you have any questions regarding the operation of your system, please contact your Installing Solene Dealer.

Solene Dealer Contact Information

Solene™
927 Fern St. Suite 1500
Altamonte Springs, FL 32701
(866) 902-0060

SOLENE OPEN LOOP OG-300 SYSTEM LABELS

(Whole page will be embossed foil)

The following labels provide the system owner with important safety and operating information. Be sure to cut out the labels below and apply them to the proper system components as described below. Refer to the Solene DHW System Schematic in this manual for reference numbers.

Solene System Isolation Valve
Normally Open

Solene System Isolation Valve
Normally Open

Place these labels on Isolation Valves (#13)

WARNING HOT

WARNING HOT

WARNING HOT

WARNING HOT

Place these labels on Circulation Pump (#4), Manual Drains (#11) and Mixing Valve (#15)

FREEZE PROTECTION

Collector loop filled with water is protected by Freeze Valve under normal conditions. When air temperatures are expected to be below 32ºF for extended periods of time, drain solar loop as instructed in manual.

Maximum Operating:

Temperature: 200ºF Pressure: 130psi

Place this label in visible location on Solar Tank

WARNING

Ungrounded Piping

Stay clear during any thunderstorm activity.

WARNING

Ungrounded Piping

Stay clear during any thunderstorm activity.

Place these labels on Solar Feed and Return Line above Solar Tank

(5 X 7 Freeze Protection Label)

SOLENE FREEZE PROTECTION INSTRUCTIONS

(Models SL140PV-80 & SL130PV-66)

Your Solene Solar System has a Freeze Valve on the roof that protects your system from freezing. During near freezing conditions this valve will allow water to flow through the collector from the storage tank and trickle onto the roof. This Freeze Valve needs water pressure to operate properly. DO NOT CLOSE THE ISOLATION VALVES unless you are going to completely drain your solar system as described below.

MANUAL DRAIN DOWN FREEZE PROTECTION – Follow these steps:

Disconnect the wires from the PV Panel to the Circulation Pump.

Close both Isolation Valves.

Connect drain hose to the Drain Valve on the return line of the solar system, or use a water vessel to catch the water. Open the Drain Valve on the return line. (CAUTION - WATER MAY BE EXTREMELY HOT - POSSIBLE STEAM) Allow all water to drain out of the solar system.

Move drain hose or water vessel to the Drain Valve on the feed line below the circulation pump and open the Drain Valve on the feed line.

Leave these Drain Valves open while your system is turned off.

Ten (10) Year Warranty
Plus Lifetime Limited Warranty

Warranty

This warranty is issued by SOLENE LLC, 927 Fern Street, Suite1500, Altamonte Springs, Florida 32701, and applies to all new CORONA collectors when purchased for use on residential or commercial water heating applications. SOLENE LLC, warrants to the original purchaser only that the CORONA collector will be free from defect in materials and workmanship in the manufacturing process under normal use and service for a period of **ten (10)** years from the date of initial installation when purchased from and properly installed by an **AUTHORIZED DEALER** within that dealer's authorized territory. During that time, should CORONA collector or component exhibit a manufacturing defect, the defective collector or component will be repaired or replaced, without charge for the equipment by SOLENE LLC, or its authorized dealer or distributor. Labor expenses to repair or replace a defective CORONA collector is reimbursable, to an authorized dealer, up to $100 in years one (1) and two (2), $75 in years three (3) through five (5), and $50 in years six (6) through ten (10).

Your dealer is _____, _____
Authorized Dealer Phone

Bonus Lifetime Limited Warranty

CORONA collectors carry a Lifetime Limited Warranty. Any CORONA Collector found to be defective in material or workmanship subsequent to the initial **Ten Year (10)** Warranty will be replaced, so long as the purchaser pays fifty percent (50%) of the published collector list price at the time the replacement is required.

Exceptions

SOLENE, LLC will not be liable for inspection, freight, removal, or any other charges arising from this warranty unless specifically stated in this warranty statement. Neither SOLENE LLC, its dealers, nor its distributors shall be liable for incidental or consequential damages, damage of any sort or nature resulting from abuse, misuse, neglect, abnormal weather conditions, freezing, scaling due to hard water, acts of God, or damage caused by improper installation. This warranty does not apply to installation components or to solar collectors which have not been installed and maintained in strict compliance with SOLENE's installation and operation manuals and instructions and/or applicable ordinances or codes or to systems not installed by an authorized dealer within its authorized territory. In no event shall the liability exceed the purchase price of the product. There are no implied warranties of merchantability or implied warranty of fitness, which extends beyond the description of the face hereof.

Proof of Purchase

It is the responsibility of the consumer to establish the original purchase date for warranty purposes. We recommend that a bill of sale, canceled check, or some other appropriate payment record be kept for that purpose. If the system is registered within 10 days of installation at www.solene-usa.com, the electronic registration confirmation is the only future proof of purchase necessary. The completion of the Online System Registration Form is a condition precedent to coverage under this warranty.

Note

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

Solene LLC
927 Fern Street, Suite 1500 • Altamonte Springs, FL 32701