

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

EagleSun™ Solar Water Heating Systems “DXR” Drainback



This manual covers the installation, operation and maintenance of the system models below;
DX-50-26, DX-50-32

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INTRODUCTION

“Conservation for today... Energy for tomorrow...”

Alternate Energy Technologies, LLC., (AET) would like to extend our congratulations on your purchase of an EagleSun Solar Water Heating System. Years of research and development, backed by critical engineering, has brought the finest solar products you can buy. Please take time to read this booklet thoroughly. Each step is outlined completely and clarified by diagrams where necessary.

“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 SRCC.”

Your EagleSun system has been designed to be a complete solar appliance interface that incorporates ease of installation and maximum efficiency for years of trouble-free service. The system uses the sun’s energy to heat your water, reducing your electricity consumption. The EagleSun system will pay for itself many times over the life of the system. All installations require a connection to your existing home water system. Only a qualified installer, regulated by the local code compliance office or the “Authority Having Jurisdiction”, should do the installation. Your installation contractor should be familiar with the applicable building codes. The codes are intended to protect the health, safety, and welfare of the public.

THEORY OF OPERATION

Your EagleSun system collects heat by circulating water between the solar collectors, a drainback reservoir and simultaneously, between a heat exchanger inside the reservoir and your existing water heater. Since only thermally efficient tap water is used, maximum safety and performance is assured. The EagleSun drainback system is ideally suited to cold regions with many freezing days each year or areas with aggressive water conditions. EagleSun drainback systems provide a fail-safe method of ensuring that collectors and collector loop piping never freeze by removing all water from the collectors and collector piping loop when the system is not collecting heat. The simplicity of the drainback method provides reliable operation that makes this system an asset to any home located in extreme hot or colder climates.

As the sun comes up in the morning and starts to shine on the solar collectors, the collectors will begin to heat up. A differential temperature control senses temperature differences between water leaving the solar collector and the coldest water in the water heater. When the collector sensor temperature is about 12° F warmer than the tank sensor temperature, the controller turns on the pumps. When the temperature difference drops to about 5° F, the pump is turned off. In this way, the water always gains heat from the collector when the pump operates. The solar installer manually sets the differential temperature of the controller at the time of the system installation. The pumps are very quiet, but, you may hear a trickling noise as water returns into the drainback reservoir during operation.

When the pumps turn on, the water in the collector loop is circulated through the collector and gets heated. The return water from the solar collectors that accumulates in the drainback tank then heats the heat exchanger through which potable water from the water heater is circulated. The heated potable water is then circulated back to the water heater. When there is no longer a marked difference between the temperature at the solar collector and at the water heater (5° F) the controller automatically turns the pumps off – since there is no heat to be gained. This process is repeated continually throughout the day, so that by the end of the day, the water in the water heater is hot. This is all done automatically and requires no interaction on the part of the system owner.

Freeze protection is provided when the system is in the drainback mode. Water in the collectors and exposed piping drains into the insulated drainback reservoir tank each time the pump shuts off. A slight tilt of the collectors is required in order to allow complete drainage. A sight glass attached to the drain-back reservoir tank shows when the reservoir tank is full and the collectors have been drained. In this way the drainback system is protected from freeze damage and overheating at all temperatures including during prolonged periods of stagnation.

The collector and collector plumbing should be sloped back toward the drainback reservoir at 1/4" per foot minimum to allow the system to drain.

All solar systems will have a backup source of heating. The backup source for this system is your electric water heater. The backup source is used because on some days, when it is very cloudy, the solar contribution will be very small. On days when there is plenty of sun, and the sun is doing the work of heating the water automatically, the resulting high water temperature in the tank will keep the internal hot water heater thermostat from turning on the gas or electric heat, thus saving fuel and money.

DXR DRAINBACK SYSTEM COMPONENTS

This system is comprised of the following components:

- Solar collector(s)
- Drainback reservoir with heat exchanger and sight glass
- Water heater (*existing*)
- Circulation pumps (2x)
- Differential temperature controller
- Pressure relief valve

THE SOLAR COLLECTORS

The collector array consists of solar collectors of sufficient size to meet the design criteria for your household needs and geographic area, plus a set of 4 mounting brackets for each solar collector. All collectors specified in these systems are SRCC certified, manufactured by Alternate Energy Technologies, of the AE or MSC series, using Thermafin absorbers with Selective Crystal Clear Black coating. The Crystal Clear Black surface has been proven to withstand very high temperatures for long periods of time and will not flake or chip. It is a revolutionary coating, which is actually a crystalline structure that is "grown" on the surface of the copper plating material.

Crystal Clear Black coating is a leading edge technology that allows the maximum amount of solar energy to be absorbed at the lowest light level and virtually eliminates the amount of energy radiated to the sky.

The absorber plate within the collector is made of Thermafin risers. Manufactured using a high frequency forge welded molecular bond between copper tube and copper fin to form the risers that make up the absorber plate. Thermafin is designed to conduct the maximum amount of heat absorbed to the fluid that passes through the tube and returns to the water heater. Unlike other methods, that solder or braze the tube and fin, Thermafin has only copper to conduct the heat and is therefore the most efficient and durable product available.

The glass on the solar collector is a low iron tempered glass of exceptional clarity. This means that sunlight coming into the collector loses very little energy and transforms almost all of the light into heat. The tempered glass is very strong and resists damage that ordinary window glass could never withstand. A high-density foam material is used to provide insulation and minimize heat loss in cold weather. All copper piping is externally sealed with high temperature silicone grommets. All of this ensures that the maximum heat energy is transferred to the water, which is stored for use as needed.

The frame of the collector consists of a proprietary aluminum extrusion, with an integral quick lock-mounting rail for ease of installation with our patented "Quick lock" mounting hardware. The mounting brackets come in a set of 4 per solar panel, and all hardware is included except for the actual bolt used to attach to the roof or mounting surface. All fasteners and bolts are made of high quality and long lasting stainless steel.

DRAINBACK RESERVOIR

The drainback reservoir is a very high quality, well-insulated, hot water storage/transfer device. The drainback reservoir incorporates an internal, finned, coiled copper heat exchanger and the tank is typically mounted adjacent to the water heater.

Potable water, circulating from the water heater, never comes in contact with the fluid in the collectors. The heated water, from the solar collectors, is directed into the drainback reservoir surrounding heat exchanger. The heat exchanger collects heat from the surrounding fluid and transfers it to the potable water in the water heater.

THE WATER HEATER

The water heater used in this system is your existing standard water heater. This water heater is plumbed to accommodate the solar interface. The water heater stores the heat energy generated by the solar system. As the pumps circulate the fluids throughout the system, the fluids become hot and this heat energy is transferred to the water in the water heater. This large volume of heated water is used as the hot water source for the fixtures in the building/residence.

The backup water heating source is provided by a thermostatically controlled 4500 watt element in the water heater. Refer to the water heater's installation manual for specific installation/electrical requirements. It is recommended that a water heater time switch be installed to limit backup heating by the electrical element. The time switch can be automatically or manually activated and deactivated depending upon your additional water heating needs.

THE CIRCULATION PUMPS

The collector loop pump is selected for its head pumping characteristics. The potable loop pump circulates water through the heat exchanger in the drainback reservoir and into the water heater. These pumps are very quiet, efficient, and reliable. The collector loop pump is located below the drainback reservoir so that it has water pushing into the suction side of the pump from above, and therefore will never run dry. If this pump needs to be replaced all moving parts are contained inside a replaceable cartridge. The outer pump body may be removed by unbolting the pump motor from the volute, and the inner cartridge may be replaced without having to disturb any of the plumbing.

THE DIFFERENTIAL CONTROL

A differential controller (and its accompanying sensors) is used to activate the pumps. The controller will be set by the installation contractor to turn the pumps on and off at a specific temperature – usually on at 12°F difference between the sensor at the water heater and the sensor at the collector, and usually off at a 5°F difference.

SYSTEM PROTECTION VALVES

The EagleSun drainback system is equipped with several thermal protection valves. A temperature and pressure relief valve, on the water heater, insures that excessive temperatures and system pressure is adequately relieved as needed. A pressure relief valve, on the drainback reservoir, insures the tank does not exceed the design pressure of the system. Isolation valves are required to isolate the system when the system is need of maintenance or repair. A tempering valve is required to insure that the water delivered to the fixtures is prevented from reaching scalding temperatures.

FREEZE PROTECTION

The homeowner is not required to perform any actions to prevent freeze damage to the collectors. The system is only circulating when the collectors are hotter than the storage. In freezing conditions this is not the case, therefore there is no circulation and the water has drained from the collectors into the reservoir.

This system has a freeze tolerance limit of -60°F (60° below zero F), ambient air temperature. When conditions such as these are present, during prime daylight hours, power to the controller should be disconnected by unplugging the power cord to the controller.

“Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures above the specified limit, may cause freezing in exposed parts of the system. It is the owner’s responsibility to protect the system in accordance with the Supplier’s instructions if the air temperature is anticipated to approach the specified freeze tolerance limit.”

OPERATING INDICATORS

The drainback system uses a sight glass, on the drainback reservoir, as an indicator that the system is working. As the pumps are energized, the fluid level across the sight glass falls, thus indicating that the fluid is being removed from the drainback reservoir. As the pumps are de-energized, the fluid level across the sight glass rises, thus indicating the fluid in the solar loop is returning (draining) back into the reservoir. Additionally, the “Pump” lamp, on the control face, will be illuminated when power to the pumps is available.

INSTALLATION INSTRUCTIONS

PRE-INSTALLATION CHECKLIST

Unlike other types of solar collectors, the AET solar collectors do not add a significant amount of weight to the roof. However, if the collectors are placed at a steeper pitch than the roof itself, the additional exposed flat surfaces could present extreme wind loading forces during sustained high winds. Neither wind loading (including uplift) nor the additional weight of filled collectors shall exceed the live or dead load ratings of the building, roof, roof anchorage, foundation or soil. Collector supports shall not impose undue stresses on the collectors. The design load shall be as specified by the codes in force at the installation site and shall include an additional load due to snow accumulation for applicable locations. Check local codes for roof load requirements. The mounting hardware supplied with your solar system has been designed for specific wind loads, but only if adequate support structure is present with sufficiently strong structural members (such as engineered trusses). Most building permit offices may be able to help you with recommended roofing practices for your area. All exposed materials used in the installation of this system shall be protected from ultraviolet radiation. Components should be of a UV stable material or covered/coated to prevent premature degradation.

Obtain all applicable permits. Structural members penetrated by the solar system components must meet local codes. The installer is to run the piping in such a way that the performance of any fire rated assembly is not reduced. This applies to the collector mounting as well as the installation of any other system components.

Inspect the roof. If it is in poor condition, it is advisable to replace all or part of the roof where the system will be attached. Locate a roof area facing as close to due south as possible for the placement of the solar collectors. The plumbing runs must be planned in advance using the shortest possible route between the water heater and collector. Make sure you have no low points in the sloped horizontal pipe runs. This could trap water and in freezing weather cause the pipe to rupture.

Make sure you have all the necessary plumbing materials, tools, and accessories before beginning work.

CAUTION!

Solar collectors become very hot when in direct sunlight with no fluid being circulated through them. Extreme caution should be taken when standing near, or handling solar collectors in this state. Where possible, cover the collectors with a tarpaulin or other opaque covering until you are ready to energize the system. The circulating pump becomes very hot when running. Do not touch before allowing sufficient time to cool down.

Wear gloves when handling the solar collectors! They get extremely hot when left exposed to the sun. The bright orange plastic caps should be removed prior to placing the collectors on the roof otherwise they may get so hot that they melt in place. Also, never try to lift the collectors by the pipe nipples. These bend when hot and would damage the collector. You should have a tarp handy to keep the collectors covered during the entire installation process. This will prevent the collectors becoming too hot to handle as you make your final adjustments and connections.

EagleSun Solar Water Heating Systems are pre-engineered systems. Plumbing materials specified in this system to be constructed of copper, brass, bronze or stainless steel and designed to meet or exceed the expected design temperature and pressure ratings of the system. Use of galvanized steel, CPVC, PVC, PEX or any other type of plastic pipe is prohibited. EagleSun drainback systems are designed to use 3/4" copper pipe (1/2" pipe is acceptable for single collector installations) for the collector loop and 1/2" copper for the tank interconnect piping. Type M may be used except where otherwise specified by the Authority Having Jurisdiction. Use only lead-free solder. Use of 50/50 lead solder is expressly prohibited. When installed properly, the solar system should not subject the existing system to excessive temperature or pressure or bypass existing safety devices. The installer should review the site specific conditions to insure proper operation can be achieved.

Dielectric, brass or bronze nipples should be used on all connections to the water heater. **Dielectric unions are not approved** for installation with these solar systems. Incompatible materials shall be isolated or treated to prevent degradation to the extent that their function could be significantly impaired under in-service conditions.

On existing tanks, the cold input from the pressurized supply line to the house (either city water or well water) must be fed into the tank inlet. This is marked "Cold Inlet" and is located on top of the tank. There is a long plastic tube attached internally to this connection so that incoming cold water is directed immediately to the bottom of the tank, and therefore does not mix and cool down the hot water. A cold-water shutoff valve must be installed above this connection so that water flow may be completely stopped in the event of a leak, repair, or maintenance.

The hot water output to the house from the tank should be connected to the port labeled "Hot Outlet" on the top of the tank. Again, a dielectric nipple must be used where a connection is made between galvanized and copper pipes. (Dielectric unions are not recommended.) A tempering valve must be installed at this point to limit the temperature of water delivered to the home and prevent a scald hazard.

All hot water lines should be insulated to R2.6 with at least 1/2" thick heat elastomeric resistant rubber tubing insulation such as Armstrong Armaflex. Insulation must be painted or covered with an all service jacket to prevent UV degradation. The final 5 feet of the cold water supply should be insulated to R2.6. All rooftop components are to be protected from ultraviolet radiation, either by design or as per the manufacturer's recommendations. Components requiring any maintenance should be installed free from of obstructions.

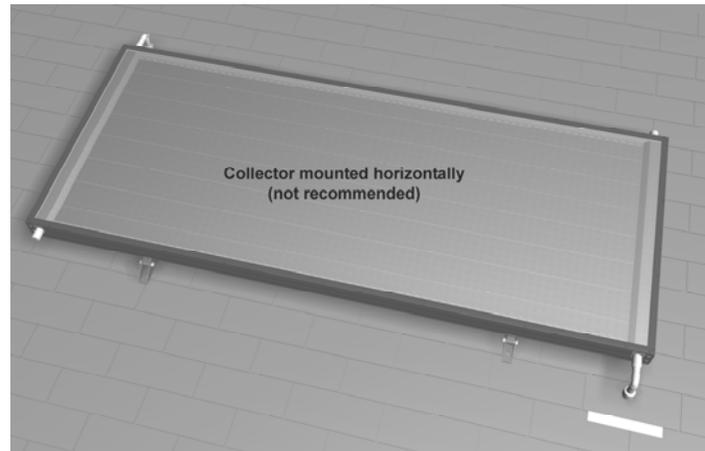
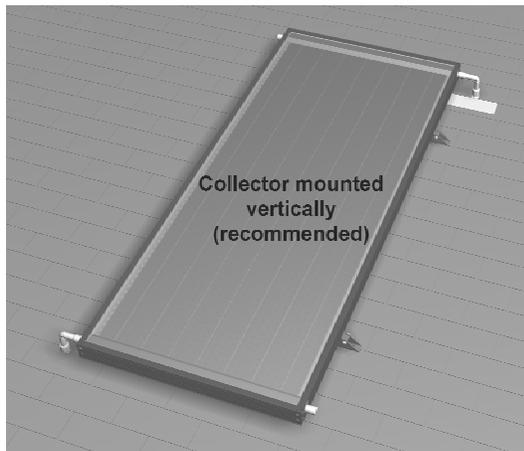
This system includes two isolation ball valves required for servicing the solar collector plumbing loop. These valves should remain in the open position under normal operating conditions and should only be closed when maintenance is being performed. The valves are located as to not disrupt the normal flow of water through the water heater.

In most instances, the solar collectors can be attached to the roof using the standard mounting hardware provided with the solar system. Certain types of roofing will require special attention for proper mounting. For example, a clay tile or cement tile roof. Complete roofing attachment methods of solar collectors for these various types of roofs are beyond the scope of this manual. The manual will describe and illustrate some of these approved mounting techniques. A competent contractor should be used to ensure that all roof penetrations and attachment points are not a source of rainwater leakage later on. Standard plumbing roof jacks or solar industry copper flashings may be used for plumbing penetrations in most cases.

The collectors should be canted slightly toward the inlet side to ensure they drain completely when maintenance is required on the system.

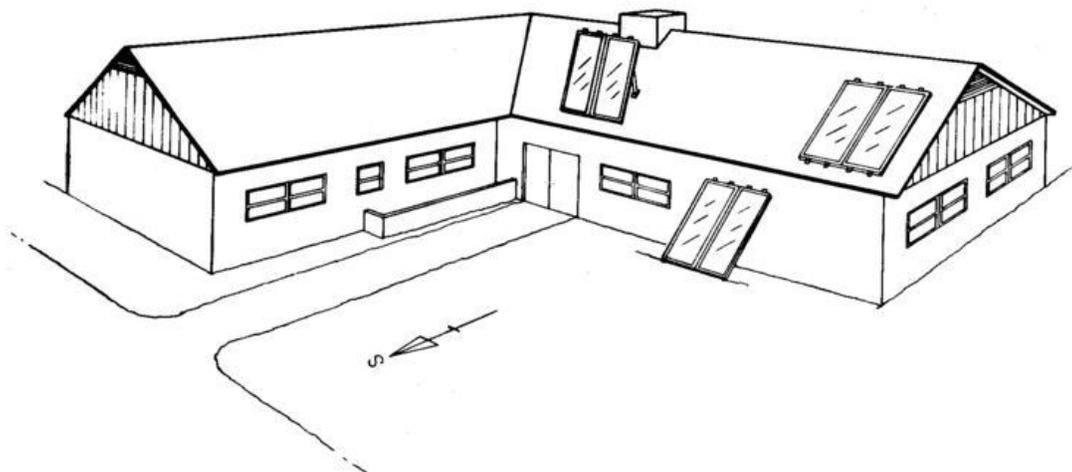
Electrical connections should only be made after the plumbing system is fully installed and ready to be charged. Insure that the controller is in the "OFF" position until you are ready to energize the pump. Remember to remove collector coverings prior to energizing the system.

NOTE: All collectors are to be mounted vertically (see below), sloped in order to be completely void of fluid when drained, and oriented in such manner as described below under COLLECTOR LOCATION.



COLLECTOR LOCATION

The solar collectors provided with your EagleSun system have been certified for performance by the Solar Rating and Certification Corporation. Proper location of the solar collector(s) is important for maximum system efficiency. The collector(s) should be located in a section of the roof which is unshaded for the middle six hours of the day in each month of the year. Roof mounted collectors should be placed in the central field of the roof area, and where permissible, a minimum of 3' from the eaves, valleys, hip and ridge lines to minimize wind loading conditions. Collectors should be placed as close to the water heater as possible to minimize heat loss in the plumbing runs. The illustration below shows several alternatives for collector mounting.



COLLECTOR ORIENTATION

For best year-round performance, collectors should be mounted facing due south and at an angle from horizontal, equal to the latitude of the install location. For reasons of aesthetics, it is most practical to mount the collectors “flush”, or in the same plane as the roof angle, to simulate skylights. A minor increase in collector area may be required to account for the loss in efficiency due to the off-angle mounting. For East or West roof orientations, increasing collector array area by 25% will in most locations, compensate.

For best winter production, proper orientation is achieved when the collectors are facing due south and tilted at an angle from horizontal to latitude + 10°. This favors the winter sun because ambient temperatures are lower during the winter and collector efficiency can suffer. When collectors are mounted one behind the other, they shall be spaced apart so the morning and afternoon sun, on December 21 - when the sun is at its lowest altitude, will not cast shadows from one collector onto the other and cause a loss in efficiency.

If the collectors are to be tilted off the plane of the roof, they should be tilted upward using the pre-drilled strut provided by the manufacturer. Use the nominal dimensions listed in the hardware spacing chart, the trigonometric formulas on the following page and the angle values (sine, cosine & tangent) from Appendix A to calculate the length of the support strut and spacing between collectors if required.

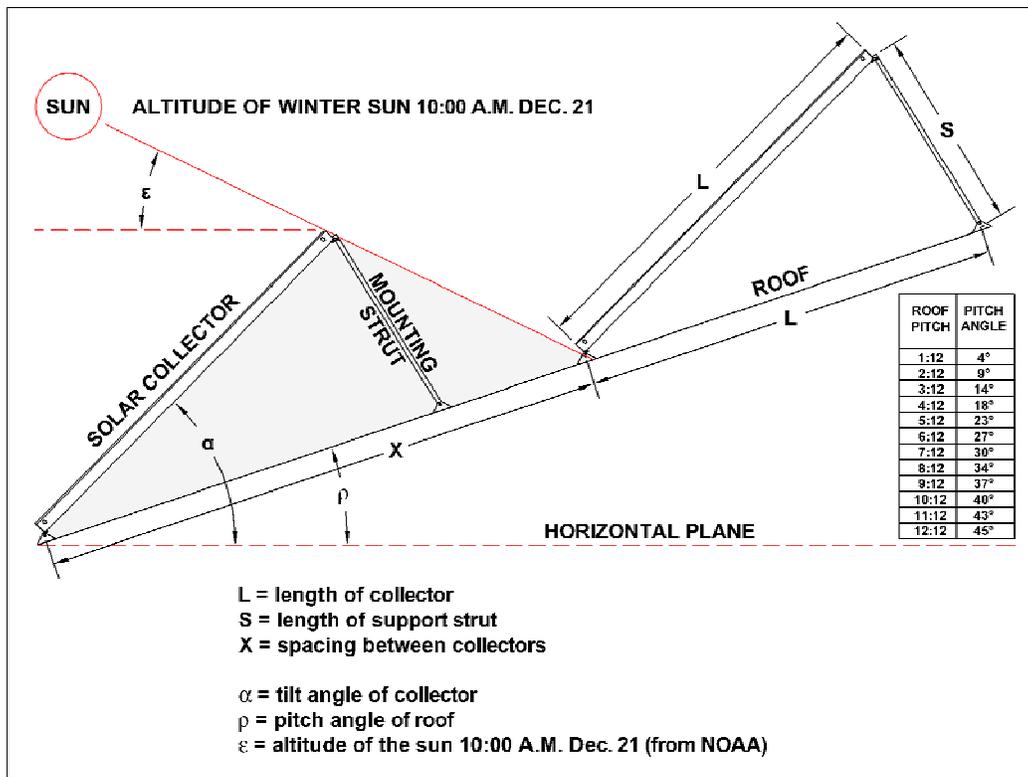
Building materials adjacent to solar equipment shall not be exposed to elevated temperatures which could accelerate their deterioration. Many non-metal roofing materials will soften in the temperature range of 60 – 80°C (140-180°F) and begin to degrade above this temperature.

The location, orientation, and position of the collector relative to nearby objects and surfaces shall be such that water run-off from the collector surface is not impeded nor is excessive build-up of snow on lower portions of the collector glazing permitted to occur.

MOUNTING HARDWARE SPACING

Solar Collector Dimensions												
Model No.	AE-21	AE-24	AE-26	AE-28	AE-32	AE-40	MSC-21	MSC-24	MSC-26	MSC-28	MSC-32	MSC-40
Length (l)	85.187	97.187	77.187	85.187	97.187	121.187	86.125	98.125	78.125	86.125	98.125	122.125
Width (w)	35.187	35.187	47.187	47.187	47.187	47.187	35.875	35.875	47.875	47.875	47.875	47.875
Height (h)	3.137	3.137	3.137	3.137	3.137	3.137	3.082	3.082	3.082	3.082	3.082	3.082
Area	20.82	23.75	25.29	27.91	31.85	39.71	21.46	24.45	25.97	28.63	32.62	40.60
Weight	74	84	90	99	113	153	76	87	91	102	116	151
MOUNTING HARDWARE SPACING – Centerline to Centerline (in)												
AE-MH MSC-MH	86.187	98.187	78.187	86.187	98.187	122.187	88.233	100.233	80.233	88.233	100.233	124.233
AE-FM MSC-RRM	88.663	100.663	80.663	88.663	100.663	122.663	87.375	99.375	79.375	87.375	99.375	12.375
AE-RM MSC-RM	86.835	98.835	78.835	86.835	98.835	122.835	87.333	99.333	79.333	87.333	99.333	123.333

Dimensions shown (length, width and height) are nominal and listed in inches, area in ft² and weight in lbs. Use the formulas below for tilted applications.



To calculate the length of the support strut use the formula as follows:

$$S = 2 \times L \times \sin((\alpha - \rho) \div 2)$$

Add two (2) inches to the calculated length to allow for the pre-drilled holes, positioned ± 1.0 in from each end of the support strut.

To calculate the recommended spacing between collectors use the formula as follows:

$$X = L \times \cos(\alpha - \rho) + L \times \sin(\alpha - \rho) \times \tan(90 - \rho - \epsilon)$$

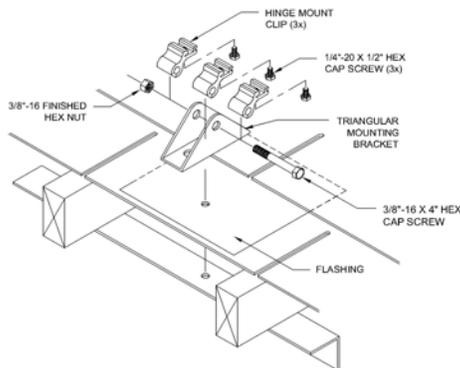
This would be spacing distance required to insure collectors do not shade one another in stacked arrays or saw-tooth type mounting configurations.

MOUNTING HARDWARE

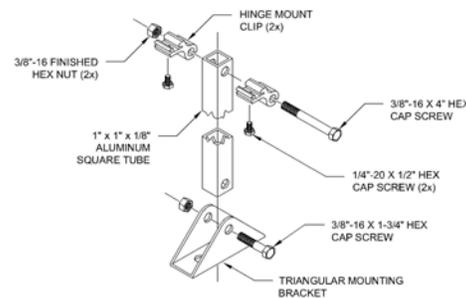
Provided in the EagleSun system, is a specially designed mounting hardware to speed collector installation. This hardware consists of ten LOCK-TIGHT hinge sets, four roof brackets, two rear struts, and bolts (see details below).

- After locating the mounting points, the mounting bracket holes should be drilled.
- A heavy coating of sealant should be applied to the bottom of the flashing plate, which should fit flat against the roof. It is necessary for the plate to slide under the above shingles to insure proper drainage of water.
- The bottom of the roof bracket and the area around the threaded rod should also be thoroughly coated with tar sealant. When the bracket is set in place, alignment with the collector hinges is necessary before final tightening of the nuts. This should be completed before the sealant has time to set.
- The threaded rod is fastened through a 2' x 6" wood or 2" x 2" x 1/4" steel angle bracket under the roof as shown.
- The rear struts should be cut to length and drilled according to the formulas detailed on the previous page. All bolts should be tightened securely. A stainless steel washer should be placed where the threaded rod passes through the aluminum bracket.

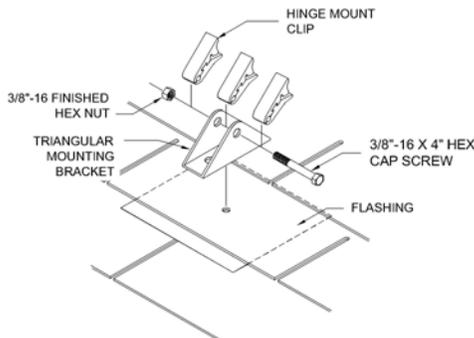
It is very important that the penetrations through the roof be well sealed. It should be carefully checked that all bolts are coated with tar and that no leaks are possible. Roof flashings must be used for collector mounts and pipe penetrations. Consult your local code office or roofing contractor for minimum required flashing thickness.



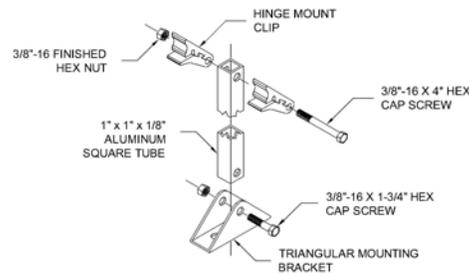
AE Series – High-Wind Mount Detail



AE Series – Tilt Support Detail



MSC Series – High-Wind Mount Detail



MSC-Series – Tilt Support Detail

The “High-Wind” Mount Details above are intended for installations where the anticipated local wind velocities exceed 90 MPH. For installations where wind velocities are less than 90 MPH, a Standard Mount Set will suffice. The standard mount set only requires one Hinge Mount Clip (set) per non-tilted attachment and two when a tilt support is employed.

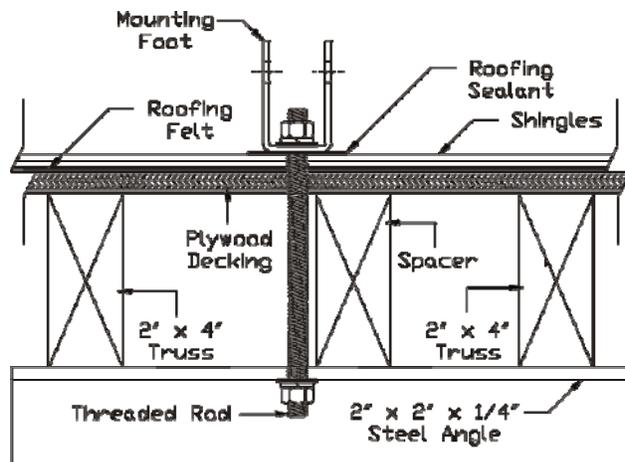
ATTACHMENT OPTIONS

The collector shall be installed on a mount capable of maintaining tilt and azimuth to design conditions. There are three acceptable ways to secure the collector mounting brackets to the roof. Of these three methods, lag bolting is preferred since the wood swells around the lag so the hardware does not loosen over time.

1. Spanner Mounting
2. J-Bolt Mounting
3. Lag Bolt Mounting (preferred)

SPANNER MOUNTING

In spanner mounting, after the brackets are positioned on the chalk line, a 3/8" hole is drilled between the rafters. An aluminum flashing is positioned over the hole where the top of the flashing is extended up under the shingle above the 3/8" hole and extends down over it. Caulk is applied between the flashing and the roof. The bracket is then positioned over the 3/8" hole using sealant between the bracket and the flashing. A piece of 3/8" all-thread is then inserted through the hole. A washer and nut secures the all-thread to the bracket (be sure the seal underneath the washer and on top of the nut). The all-thread rod should extend about 4" below the roof. Drill a 3/8" hole in a 2 x 2 angle and insert the all-thread rod through it. The 2 x 2 angle should span 2 rafters. With a washer and double bolt secure the all-thread to the 2 x 2 angle. Tighten down until the bracket is tightly secured to the roof. Be careful not to over-tighten and bell out the roof underneath the bracket.

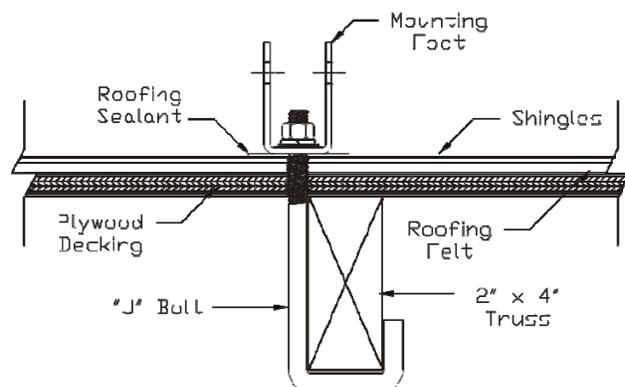


NOTES: Spacer Blocks

- Spacer blocks shall be installed within 1" of the thru-bolt. When thru-bolt is within 2" of a rafter, only one spacer block will be required on the opposite side of the bolt, away from the rafter. Two spacer blocks are required when the bolt is more than 2" from the rafter.
- When the mounting provisions of adjacent collectors are installed side by side and the thru-bolts are 1 1/2" or more apart, it will be necessary to have at least one spacer block (or rafter) between bolts.
- Sealant is required between mounting block and shingles/sheathing. Bolt holes shall be sealed to prevent moisture penetration.

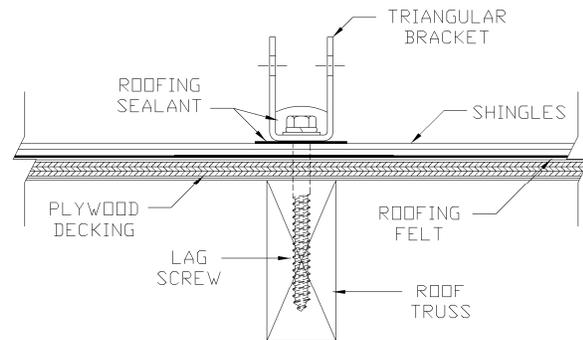
J-BOLT MOUNTING

J-bolt mounting is done very similar to lag screw mounting except instead of drilling into the center of a rafter a hole must be drilled directly beside a rafter. The size of the hole must be slightly larger than the bolt diameter. This is more easily accomplished if the attic person would drill a pilot hole through the roof along side the chosen rafter. Fit the bolt through the mounting brackets and insert the bolt (J side first) through the hole in the roof. Work the J underneath the rafter. Pull the J-bolt snug against the rafter before tightening the nut. Use double nuts or lock-washers to securely fasten the mounting bracket to the J-bolt.



LAG BOLT MOUNTING

In lag bolt mounting you must locate the center of the rafters along the top and bottom chalk lines. One method is to have one person on the roof and another in the attic. Using a hammer the person on the roof can tap the roof and determine where it is denser sounding. The roof person can drill a pilot hole while the attic person helps with distance corrections. Then the attic person can call off the distance to the next rafter while the roof person drills corresponding pilot holes. Flashing the brackets is done as previously described. Secure the brackets to the roof using a 3/8" x 3-1/2" stainless lag screw, a flat washer, and a lock washer.



NOTES:

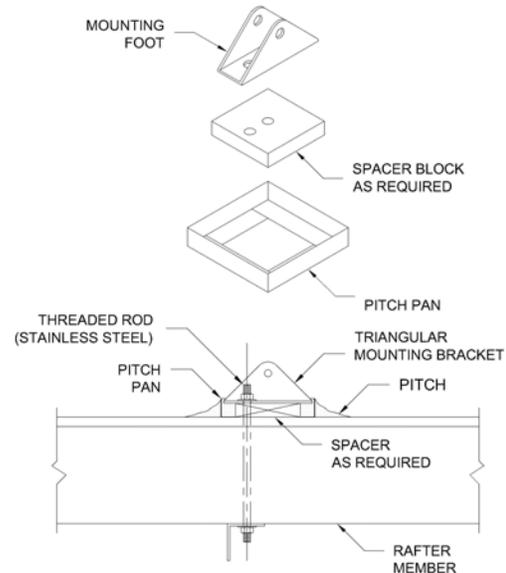
- Lag bolts are to be 3/8" diameter and must penetrate the rafter member a minimum of 3".
- Pilot holes should be drilled into the centerline of the rafter and should be between 60-75% of the bolt diameter.
- Apply a liberal amount of roof sealant or a sealant pad around the opening prior to securing the mounting bracket.
- All connection hardware (bolts & washers) to be stainless steel.

PITCH PAN

The pitch pan is necessary any time standing water is encountered. The purpose is to provide an adequate seal around any penetration in the roof. The pitch pan is placed in the proper position and flat on the roof. Its flange is sealed with roofing felt and hot tar. The holes are sealed on the inside with roofing tar to a sufficient level to insure a permanent seal.

NOTE: All penetrations in structural members or fire rated assemblies are to be made in accordance with local codes using acceptable roofing practices.

In the mounting details shown on this and the preceding pages, the term Triangular Mounting Bracket, Triangular Bracket and Mounting Foot is used interchangeably and references the same part.



PITCH PAN DETAIL
SPANNER MOUNTING SHOWN

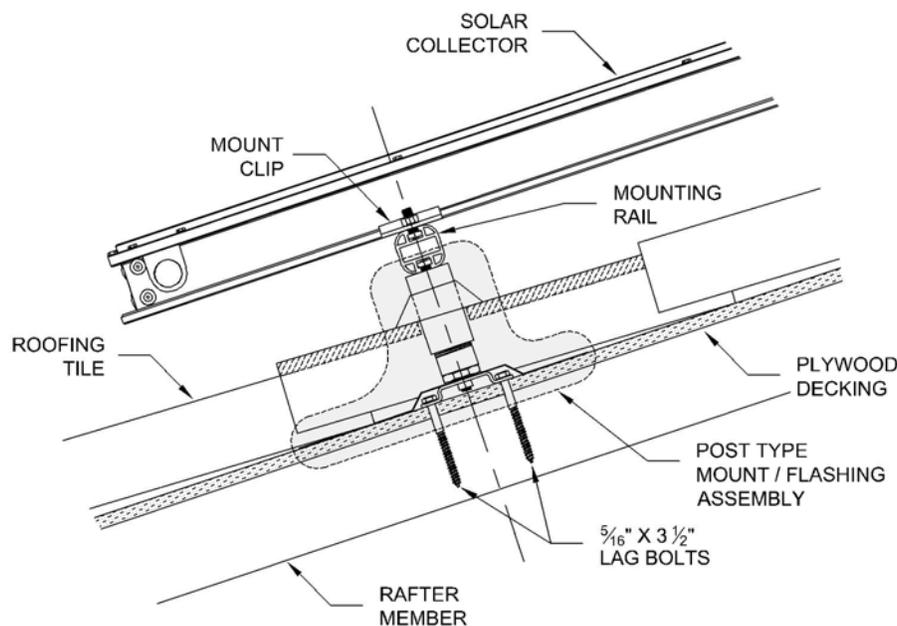
ARRAY MOUNTING ON TILE / METAL ROOFS

Tile and metal roofs are a little more difficult to mount solar collectors on but following this procedure will render a leak free installation. The solar panels are mounted on two rails located about a foot and half from the top and bottom of the solar collectors. The collectors are secured to the rails using rack mount hardware. The 1 3/4" aluminum mounting rails are anchored to the roof by using post-type, mount / flashing assemblies (preferred) or stainless steel 3/8" hanger bolts. Mounting rails are to be anchored having a sufficient number of mount points to transfer the projected loads.

Procedure:

1. Locate the roof rafters beneath the tile where the mount assembly will be attached. Mark the tiles at the points where the mount assemblies are to be installed.
2. Using a 1/4" x 6" drill bit, drill a pilot hole through the tile and at a sufficient depth to intersect the roof decking, marking it.
3. Using a 2" hole saw, drill a hole through the tile, then remove tile and place aside.
4. Using the 1/4" hole/mark as a center point for alignment, fasten the mount base plate through the decking and into the rafter members with (2) 5/16" x 3 1/2" lag bolts.
5. Apply a liberal amount of roofing caulk or mastic to the bottom of the roof flashing and position it over the mount base plate. Secure its position with several roofing nails and screw in the double stud bolt with the silicone washer against the flashing.
6. Attach the male section of the threaded standoff to the open thread of the double stud bolt.
7. Replace the tile and thread the female section onto the male section through the hole in the tile.
8. Place the rubber sealing boot onto the threaded standoff.
9. Thread a 3/8" x 1" stainless steel bolt into the top end of the threaded standoff allowing for sufficient space to slide the mounting rail onto the head of the bolt.
10. Install additional mount assemblies using the methods described in steps 1-9.
11. Slide a section of mounting rail across the bolt heads spanning the threaded standoffs and secure into position by turning the standoffs in the counter-clockwise direction. Repeat for each mounting rail section.

NOTE: Where it is not possible to locate the rafters, use the spanner mount method. Be sure to follow the instruction for the proper use and placement of spacer blocks.

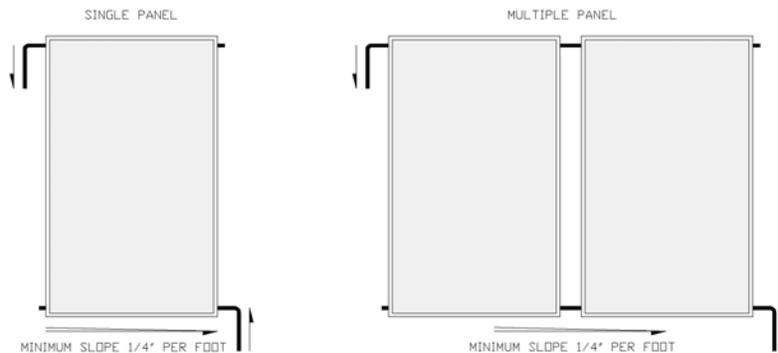


COLLECTOR PIPING

The piping of the system should be considered before a final decision is made on how the collectors are mounted. Piping should be made of copper tube of the type meeting local codes, insulated with a flexible elastomeric pipe insulation or equivalent, and painted or wrapped where exposed to ultraviolet radiation (pipe insulation should be rated for 230°F). The collector inlet/outlet piping is 1" nominal copper pipe. Use reducing couplings to reduce down to the proper system piping size. Multi-panel arrays should be plumbed in reverse-return (see multiple panel layout below) or should include a balancing valve to insure even flow across the array(s).

All plumbing runs between the tank and the solar collectors should be completely vertical when going up and down vertical wall surfaces. **All horizontal runs should be sloped at a pitch of 1/4" inch per foot back down towards the direction of the tank.** Care should be taken in the spacing of collectors as attachment of piping is easiest with properly aligned collectors. For example, a flat roof with a parapet wall should be penetrated rather than running pipes parallel to the roof surface then go up over the parapet wall before going down again. This would create a rather long horizontal low point in the pipe run where water gets trapped, and it would be unable to properly drain back into the drainback tank when the pumps shut off.

All plumbing connections to the solar panels should be made with copper pipe only. CVPC may not be attached to the solar collectors, as very high temperatures may be reached on hot summer days. Piping should be adequately supported for correct pitch and supports shall be designed to avoid compressing or damaging the insulation material. Soldered connections should be made with 95/5 solder. Multiple collectors must always be connected in parallel as shown in the plumbing schematic.



This system includes a fill/drain valve required for servicing the solar collector plumbing loop. This valve should remain closed under normal operating conditions and should only be opened when maintenance is being performed. The valve is located as to not disrupt the normal flow of water through the water heater.

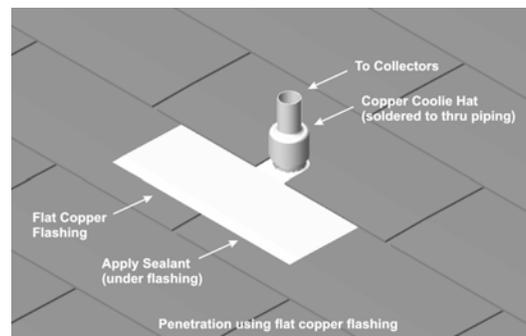
A pressure and temperature relief valve must be installed on the water heater and a pressure relief valve must be installed on the drainback reservoir. No air vent or vacuum breaker is necessary on the solar collector plumbing runs. The air gap at the top of the water in the drainback tank serves to break the siphoning action. This action is responsible for proper draining of the solar collectors when the solar circulation pump is shut off.

Installation of a tempering valve is required. This is an automatic cold water mixer on the hot water side of the tank, which supplies hot water to the house. Refer to the system drawing on page 31, of this document, for the installation location of this valve. Only ASSE 1016 and 1017 certified valves are to be used with this system. See the system parts list, on page 25 of this document, for the valve recommended for this system.

PIPING THROUGH THE ROOF

Penetrations of the building through which piping or wiring is passed shall not reduce or impair the function of the enclosure. Penetrations through walls or other surfaces shall not allow intrusion by insects and/or vermin. Required roof penetrations shall be made in accordance with applicable codes and also by practices recommended by the National Roofing Contractors Association. When penetrations are required in structural members to accompany passage of solar components, those modified structural members shall comply with local building codes. Penetrations through fire-rated assemblies etc. shall not reduce the building's fire resistance required by local codes, ordinances and applicable standards.

One inch holes are drilled through the roof on the same plane as the supply and return header nipples. Do not drill the hole above the supply header of the collector. This will prevent the collector from draining. Placing the hole below the supply header is acceptable, but it is more aesthetic if it is located on the same plane. A copper flashing is placed around the hole with its base cemented to the roof and its upper edges slid under the adjoining shingle. The copper tube supply and return line is then pushed up through the hole in the flashing. A “coolie cap” is then slid over the copper tube till it meets the flashing. After piping to the collectors is completed, the “coolie cap” is soldered to the copper tube. This allows for expansion and contraction of the copper pipe, while maintaining a rain/snow barrier. Polybutylene adhesive is then placed on the top and bottom of the flashing, providing a weatherproof seal. The sensor wire should also be run through the return flashing.



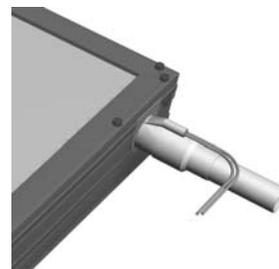
In-roof piping hangers shall provide adequate support and correct pitch (1/4" per foot minimum) of pipes. Supports for insulated pipes should avoid compressing or damaging the insulation material.

SENSOR MOUNTING AT COLLECTOR

The controller heat sensor is mounted to the nipple outlet of the collector. A stainless steel, screw-type pipe clamp secures the sensor to the pipe or the sensor can be wedged in the header grommet. When clamped, insure the sensor is clamped across the flat / compressed portion of the sensor. Clamping across the barrel of the sensor can cause permanent damage to the sensor. The entire nipple should be wrapped thoroughly with insulating tape so that the sensor is isolated from the outside air. Sensor interconnect wiring should be 18-22 gauge and rated for outdoor use. Sensor wire should not be in direct contact with the piping. The sensor wire is to be wrapped to the outside of the pipe insulation. Do not run the wires parallel to telephone or power cables. If the sensor wires are located in an area with strong sources of electromagnetic interference (EMI), shielded cable or twisted pair should be used or the wires can be run in a grounded metal conduit. All connections exposed to the weather must be made with waterproof “outdoor” rated connectors.



Sensor with stainless clamp



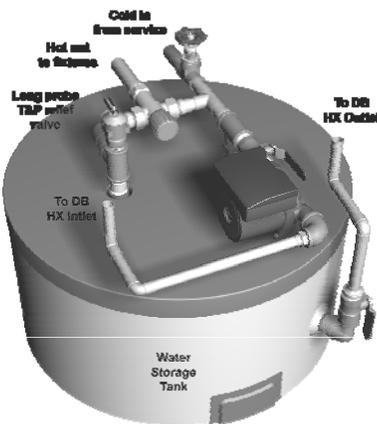
Sensor wedged in grommet

WATER HEATER PLUMBING

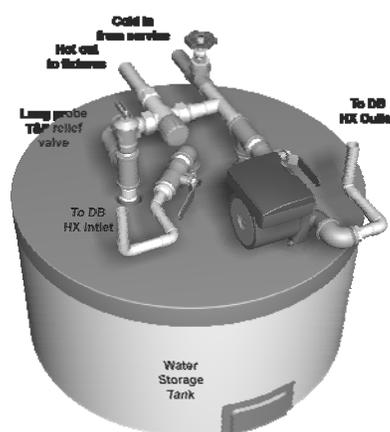
NOTE: Prior to connecting the solar system to an existing water heater, be sure to turn-off the power to the water heater at the circuit breaker and drain the water tank to a suitable drain location. The installer should also check the quantity and condition of the anode rod(s) and recommend replacement if necessary.

To minimize expense and heat loss, the tank should be near the collectors and central to points of greatest water demand. It should be located indoors, in as warm of a spot as possible. It should be located with adequate ventilation, with a minimum of 6-8 inches of clearance and with ready access to controls and serviceable parts.

The solar system feed and return lines will be plumbed into the water heater at the cold water feed and at the T&P connection ports. The existing T&P relief valve will be removed and replaced with a long probe T&P at the hot water feed to the fixtures as shown in the illustrations below (additional illustrations on pages 30-32).



Side connect plumbing



Top connect plumbing

Provision should be made to prevent water damage in case of leakage. A catch pan with a minimum of 3/4" drain line at least 2" in height may be installed and pitched for proper drainage where the tank is installed in or above the living space. Electrical service of 240V should be available for the element and 110V for the pump and controller. System subassemblies which are exposed to public traffic and are maintained at elevated temperatures shall either be insulated sufficiently to keep exposed surface temperatures below 60°C (140°F) during operation, or they shall be suitably isolated. Any other exposed areas that are maintained at hazardous temperatures shall be identified with appropriate warnings.

SENSOR MOUNTING AT WATER HEATER

The sensor mounted at the water heater should be located in the lower portion of the tank. The sensor should be of the strap/bolt-on type. The strap/bolt-on sensor should be wedged securely between the tank wall and the thermostat bracket or surrounding insulation.

Procedure:

1. Insure the electrical power to the water heater has been turned off at the circuit breaker panel.
2. Remove the upper element access panel, set the thermostat to 120°F and disconnect the wires from the thermostat to the lower element (if present). Tape and coil aside.
3. Remove the lower element access plate (cover) and insulation to expose the tank wall.
4. Wedge the sensor securely under the bottom thermostat bracket, insuring the sensor makes good contact with the tank wall.
5. If a bottom thermostat bracket is not available, using a large flat-head screwdriver, scrape back the insulation from the tank wall enough to wedge the sensor securely against the tank.
6. Attach 18/2 sensor wire to the wires of the sensor and run the wire up the outside of the tank to the controller attaching it to the terminals marked tank and common.
7. Replace the insulation and cover.

CLOSED LOOP FLUID HANDLING SYSTEM

In locations where there are more than 15 freezing nights per year, or where corrosion or mineral build-up is a problem and pipes can be drained, an EagleSun drainback system is recommended. The drainback system provides protection from freezing conditions, inhibiting corrosion and mineral buildup. The design of the system will aid in controlling excessive temperatures which may occur due to a loss in power. Manual intervention is required as a secondary precaution to protect components from freeze damage, when air temperatures fall below -60° F (-51.1°C).

The drainback tank is equipped with an immersed, single-wall, finned coil heat exchanger for the potable water loop. The coil is designed to meet the requirements of the ASME pressure vessel code. The solar loop/drainback tank is on the low pressure side of the heat exchanger which provides protection against fluid leaks into the potable water system. This EagleSun drainback system is a two-pump system, incorporating a high head pump to provide flow to the collectors while a secondary pump circulated potable water through the heat exchanger, transferring heat to the water heater. When the collectors are at a higher temperature than the tank, the pumps are switched on. This function is controlled by a differential temperature controller.

The solar loop plumbing requires no check valve to limit “reverse-thermosiphoning” of the solar loop. This prevents the loss of thermal energy from the water heater when the system is not in operation and/or during the evening hours when the tank temperature exceeds the outdoor ambient air temperature. Typical plumbing configurations are shown in the diagrams at the end of this manual.

The drainback system is filled at atmospheric pressure and should not exceed the normal operating pressure of the potable water system. The drainback tank is equipped with a 30 psi pressure relief, included to prevent excessive pressure build-up in the system. **DO NOT PRESSURIZE THE DRAINBACK TANK!** Pressurizing the solar loop/drainback tank can cause damage to the system and void warranty coverage.

The water heater is to be UL listed for water heating applications. A 240 VAC, 4.5 kW backup element is provided in the top of the tank to supply hot water during inclement weather and when the solar system is being serviced or where solar contribution is low. A thermostat with reset is included to limit over-temperature conditions.

The water heater is equipped with a temperature and pressure relief valve to handle over-temperature and/or over-pressure conditions. The R-Factor of the water heater is provided by the tank manufacturer. Refer to the manufacturer’s documentation for specific instruction on the tank installation.

The following chart is used to approximate the performance of your solar water heating system, as-well-as, collector fluid volumes and the recommended flow rate, design pressure and design temperature.

System Model No	Collector Model No	Collector Qty	BTU's* per Day	Collector Fluid Volume (gal)	System Flow Rate (gpm)	System Design Pressure (psig)	System Design Temp (°F)
DX-50-26	AE-26	1	26,000	0.90	1.25	< 30	< 250
	MSC-26	1	26,000	0.90	1.25	< 30	< 250
DX-50-32	AE-32	1	32,000	1.05	1.25	< 30	< 250
	MSC-32	1	32,000	1.05	1.25	< 30	< 250

*Btu’s are based on testing through SRCC for Category C, Clear Day (36°F) application.
Go to: <http://www.aetsolar.com/certifications.shtml> for more information.

ELECTRICAL INSTALLATION

A qualified electrician or contractor is required to install all electrical components and wiring. Connections should be made in accordance with local electrical codes. A 115-120VAC duplex receptacle is required, adjacent to the water heater, to supply power to the differential controller which provides electrical service to the pumps. The installer should consult the manufacturer's documentation for specific installation instructions when a water heater time switch is to be installed.

EAGLESUN DIFFERENTIAL TEMPERATURE CONTROLLER

The EagleSun Delta-T Control / Energy Meter, is designed for use on a solar thermal water heating system. It will monitor collector and storage water temperature sensors and operate their respective water pump(s) in order to maintain desired differential temperature between them; integral variable speed drive on the collector pump and turn on/off on the storage pump; read from the flow sensor and auxiliary (2) temperature sensors to calculate the BTU's; transmit data to the PC via RS-232 for the purpose of data logging and long term diagnostics; power and transmit data to the remote display panel.

See instructions provided with controller in box for proper installation.

It is recommended that the controller high temperature limit be set to 140°F and the tank backup element adjusted to 120°F.

Inputs

Line voltage; Power cord	115Vac (L, N, G), 15Amps
Collector sensor, COL	10k Thermistor, 5Vdc circuit
Storage sensor, STO	10k Thermistor, 5Vdc circuit
Auxiliary sensor 1, AUX1	10k Thermistor, 5Vdc circuit
Auxiliary sensor 2, AUX2	10k Thermistor, 5Vdc circuit
Flow sensor; FLO, FS, GND, 5V	5Vdc circuits

Outputs

Variable speed pump, VAR SPEED	Phase controlled line voltage, Triac: 4Amps max
Fixed speed pump, FIXED SPEED	Line voltage, Relay contacts: 20A (or 2HP motor)@240VAC, NO
Communication: COM	5Vdc power, TX (RS-232) at 10Vdc, RJ45 jack



OPERATION INSTRUCTIONS

Refer to the diagrams on pages 30-32 for part identifications

FILLING THE WATER HEATER

1. In the building / residence, locate and open the hot water valve at the service fixture furthest from the water heater
2. Returning to the water heater, open the cold water shut-off valve "D"
3. Returning to the service fixture, close the valve once the water runs clear and without air
4. Open / close all hot water service fixtures to purge remaining air from the hot water plumbing system

FILLING THE DRAINBACK RESERVOIR

1. Attach one end of a double female washing machine hose to the drain valve on the water heater and the opposing end in a 5 gallon bucket or water drain
2. Open the water heater drain valve to allow any sediment to purge from the tank bottom (close once complete)
3. Open the pressure relief valve "C" on the drainback reservoir to allow air to purge during the charging process
4. Attach the washing machine hose (unconnected end) to the fill valve "A" and open the valve
5. Open the drain valve slowly to fill the drainback reservoir to ¼" below the top of the reservoir sight glass
6. Close the drain valve and allow the fluid level to stabilize. Add additional fluid if required
7. With valve "A" closed completely, close valve "C"
8. Ensure that valve "A" and the drain valve are closed completely before you drain and remove the washing machine hose

(Note: If replenishing water during periodic maintenance, make sure the controller is unplugged.)

START-UP PROCEDURE

Once the system is completely plumbed and filled according to the instructions above, the final act required to commission the system is simply to plug the controller line cord into a standard 115 VAC wall outlet.

1. With the controller in the off mode, mark the water level on the sight glass with a Sharpie marker.
2. Switch controller to on mode and let run for 5 minutes. Mark the running water level on the sight glass.
3. Check for leaks at collectors and in attic. Shut-down and repair if necessary.
4. Switch controller to off mode and let rest for 5 minutes. Insure the water level returns to high level mark.
5. Once all checks well, switch controller to automatic mode. If the sun is shining and the tank is cool, the pumps should turn on and the fluids begin to circulate.

EMERGENCY / SHUT DOWN PROCEDURE

To shut down the EagleSun drainback system, simply switch the controller to the off mode or unplug the differential controller. Both pumps will stop and the water will drain out of the collectors and into the drainback reservoir. The system can be totally isolated by closing the isolation valves (valves "F") should the drainback tank require offsite repair / replacement.

CAUTION!

Never open Valve "C" while the system is in operation or hot water is present.
Allow to cool prior to opening.

DRAINING THE DRAINBACK RESERVOIR

1. Unplug the controller and wait until all water returns into the reservoir
2. Attach a washing machine hose to valve "A" and place the opposing end into a suitable pan, bucket or drain
3. Open the pressure relief valve "C" (see the caution statement above)
4. Open fill valve "A" (valve "C" MUST be open first)
5. Allow the system to drain completely
6. Close valve "A" and the relief valve "C"
7. Remove the water supply hose

SERVICE / MAINTENANCE PROCEDURES

TROUBLESHOOTING GUIDE

The homeowner will know that the solar system is operating if both pumps are running and the water level in the sight glass is at the marked running level. This indicates that the pump has pumped the water from the reservoir through the collectors.

Problems with systems usually fall under two categories: system leaks or lack of sufficient solar heated water.

LEAKS

If leaks exist, the system should be shut down for repair. Make sure the electrical circuit to the controller is unplugged. Close off the cold water inlet to isolate the solar system, until a suitable repair can be made.

There is a possibility that what may appear to be leaks may be condensation on the pipes. Also, water escaping from the T&P relief valve, on the water heater, may be an indication of proper function as they are designed to vent off excess temperature and pressure. Discharge from the T&P relief valve can happen, but it should be checked if it happens frequently.

INSUFFICIENT HOT WATER

If insufficient hot water is available, a system malfunction may not be indicated. A low amount of solar radiation or heavy water demand can be the cause. If no excessive demands are put on the system and ample solar radiation is available, the system should operate properly. The pump should run each sunny day until a full supply of hot water is stored. If the pump does not run, there is a problem on the electrical end of the system. Either, the pump, controller, or sensors may be malfunctioning. The controller can be bypassed by running a power cable directly to the pump and checking its function separate from the control system. Make sure that the problem is not a blown fuse or a tripped breaker or GFI outlet. If the pump runs normally when powered externally, the control circuit is the problem area.

Differential controllers use thermistor sensors to determine modes of operation. To verify proper sensor operation, refer to the Temperature vs Resistance Conversion Chart for 10k Thermistors included in the controller installation manual. Check sensor wiring. If no faulty wiring can be discovered, replace the sensors.

If the pump is running all the time, even when the collectors are cool, then the storage sensor or collector sensor may be open. It is also possible that the sensor wire itself is at fault. To check this, service personnel should test the continuity with an ohm meter. Be sure to disconnect the sensor when performing this test. Test the wire with both ends open, then retest after twisting the 2 sensor wires together at one end. The system can be set on a timer or switched on manually until the controller is properly functioning.

SYSTEM TROUBLESHOOTING AND OPERATIONAL CHECK

The system can be checked to determine that it is operating by noting the temperature difference between the collector feed and collector return lines. The return line should be hotter than the feed line. In addition, the owner should periodically check the drainback reservoir sight glass to make sure that there is sufficient water in the drainback reservoir.

The table below lists some of the possible problems, their cause, and their remedy. System owners are advised to contact the installer whenever a remedy requires some type of in-depth interaction with the solar system.

PROBLEM	POSSIBLE CAUSE	REMEDY
Insufficient Hot Water	Insufficient Solar Energy Back up source malfunction Excessive hot water consumption	Check system size, location & orientation Check / Replace Reduce consumption
Pump does not start	Controller switch in "Off" position Controller unplugged or blown fuse Defective sensor	Turn to "Auto" Return power to controller or replace fuse Replace sensor
Pump runs continuously	Controller in "On" position Defective sensor	Turn to "Auto" Replace sensor
Pump operates but no fluid Flows through the collectors	Flow tubes clogged Loss of fluid in drainback system	Flush collector tubing Cool system, locate air leak, refill properly
No water	Isolation Valve closed	Open valve
System leaks	Pipe burst due to freezing or defective joint Defective seals or piping	Repair or replace Check pipe insulation Repair or replace
System does not drain	Collector installed at incorrect angle Piping insufficiently sloped for draining Supply and return lines reversed	Change so draining can occur Check and ensure that piping slopes 1/4"/ft Switch lines

OTHER PROBLEMS

A noisy pump is an indication of worn bearings, obstruction, loss of prime or cavitation. As a rule of thumb, an 8-20° temperature gain should be expected across a collector, in bright sun, at the proper flow rate. Collectors should warm (not hot) to the touch.

MAINTENANCE

DRAINBACK MAINTENANCE

Maintenance of a drainback system is minimal. The water heater should be partially purged every 6 months to allow minerals to be removed preventing scale build up (this is recommended for all water heaters).

The collector glass should be kept clean for best system performance. Rain water will usually suffice, but a garden hose can be used during dry, dusty weather.

ROUTINE MAINTENANCE

In areas of infrequent rain the collector glazing should be visually inspected on a periodic basis (once a quarter) and cleaned with a hose if necessary.

The water level in the drainback reservoir should be checked bi-annually. The solar loop includes a fill / drain valve at the lowest elevation of the pipe work to insure the complete draining of the solar loop if required. With the system off, make sure that the water level in the sight glass at the drainback reservoir is filled to within 1/4" of the top of the sight glass. If not, follow the instructions in "Filling the Drainback Reservoir".

The water heater should be flushed on an annual or bi-annual basis following the manufacturer's recommendations.

Exterior pipe insulation should be treated as required with an exterior UV inhibitor paint or an all service jacket. Contact your authorized AET Dealer if you feel insulation needs re-coating or replacement.

NON-ROUTINE MAINTENANCE / TROUBLESHOOTING

In case of a leak in the collector system, first attempt to identify the source of the leak, then unplug the controller. Since the solar loop is isolated from the water heater via the heat exchanger, no valves need to be operated. If the leak is in the collector contact your installation contractor listed below or AET direct for instructions on how to repair or replace the absorber plate.

For leaks in the potable water system or the water heater, unplug the solar controller and close off the cold water inlet to isolate the solar system, until a suitable repair can be made.

VACATION PROCEDURES

If no hot water is to be used for some time, unplug the controller. To re-energize the system, simply plug the controller back into the power receptacle.

SYSTEM PARTS LIST

AET P/N	Description
<i>varies</i>	AE-26, AE-32 or MSC-26, MSC-32
<i>varies</i>	<i>uses customer's existing water heater</i>
<i>varies</i>	"Thermomiser" Drainback models: DB-10-10XC
<i>varies</i>	Grundfos UP 15-100F w/flange kit and UP 15-10 SU7P or Taco 009F5 w/flange kit and Taco 003B
<i>varies</i>	EagleSun DTC-ES-1 or Goldline GL-30 w/2 -10k sensors
BD-75	Watts BD Series or equivalent
PR-30	Watts 3L-Z9 (30 psi) or equivalent– included with the drainback tank
TPRV-8	Watts 100XL-8 or equivalent
* BV-75	Watts B6001 Series or equivalent
* 1170-M2	Watts 1170 tempering valve or equivalent
* CT-12M	½" Type M copper tube
* CT-34M	¾" Type M copper tube (½" for single collector installations)
* PI-5812	½" Pipe insulation (5/8" O.D.), ½" wall thickness or equivalent
* PI-7812	¾" Pipe insulation (7/8" O.D.), ½" wall thickness or equivalent
* WH40	Intermatic "Little Gray Box" Water Heater Time Switch or equivalent

** parts provided by others*

ESTIMATED COMPONENT LIFE

When installed and maintained as directed in this manual, one can expect many years of trouble-free service from this system. All components in this system are subject to the conditions of the installation. In locations where hard water is present, mineral deposits can prematurely foul-out the design life of these components. Periodic maintenance is required to insure that these components are well protected from such damage.

The solar collectors used in this system have a design life of 30+ years. Water heaters are designed for 12-20 years of use. The lesser components, such as pumps and valves are designed for 5+ years, however, are more likely to foul, as described above, if not maintained properly.

WARRANTIES AND DISCLAIMERS

Please note that we specifically exclude any warranty for, or liability from, acts of nature, including freeze damage and shading of the collectors by future growth.

FLUID QUALITY

This system uses water as a heat transfer fluid media in the solar loop.

“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.”

HAZARDS

Solar collectors become very hot when in direct sun with no fluid being circulated through them. Extreme caution should be taken when standing near, or handling solar collectors in this state.

The circulating pumps become very hot when running. Always allow at least 30 minutes for the pump to cool down before touching the pump.

Relief valves may discharge fluids at high temperature and/or pressure.

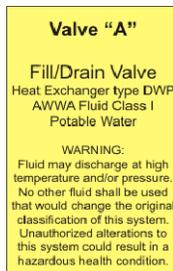
FLUID SAFETY LABELING

Included with your EagleSun drainback system is a set of labels which describe the component function. These labels are necessary to alert the owner of potential hazards. These labels are affixed by string/wire tie (on valves) and/or “peel-and-stick” (on pipe insulation). All labeling must be in place at final inspection. Label examples are as shown on the following page.

FLUID SAFETY LABELING:

Valve “A” – this label is affixed to the system fill/drain valve at the lowest point in the solar plumbing loop.

The heat transfer fluid is introduced here. When properly charged, the fluid level should be approximately ¼” from the top of the sight glass, on the drainback reservoir.



Valve “B” – this label is affixed to the temperature and pressure relief valve on top of the water heater.

The valve is preset to open and discharge if either a high pressure or high temperature situation occur in the water heater.



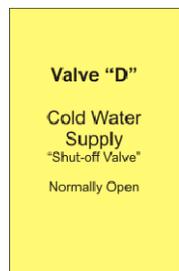
Valve “C” – this label is affixed to the pressure relief valve on the drainback reservoir.

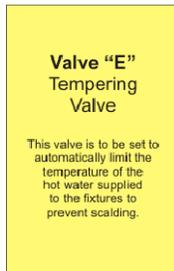
This valve is normally closed and may open and discharge if high pressure occurs in the collector plumbing loop.



Valve “D” - this label is affixed to the cold water supply, “shut-off” valve.

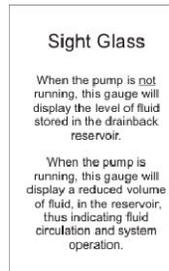
This valve is normally open and should **only** be closed when maintenance is performed on the system. Power should be disconnected, at the circuit breaker, prior to service.



FLUID SAFETY LABELING (cont):

Valve "E" – the label is affixed to the tempering valve.

This valve is used to limit the temperature of the water to the fixtures in the dwelling to prevent scalding.

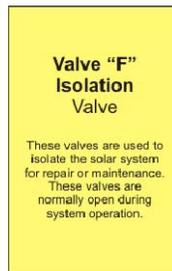


Sight Glass – this label is affixed to the base of the sight glass on the drainback tank.

The sight glass is used as a means by which an observer can easily identify that the system is operating properly.

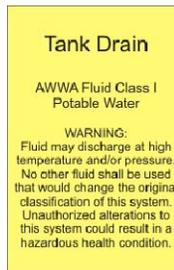
Valve "F" – the label is affixed to the isolation valves.

These valves are used to isolate the solar system for repair and/or maintenance. These valves are normally open during system operation.



Freeze Protection – this label is affixed to the collector return line at the base of the drainback tank.

Manual intervention is required as a secondary precaution to protect components from freeze damage, when air temperatures fall below -60° F (-51.1°C).



Tank Drain – this label is affixed to the tank drain valve at the base of the water heater.

This valve is to be used only as directed in the water heater owner's manual or as directed in this manual. Power should be disconnected, at the circuit breaker, prior to service.



WARNING / HOT – labels are affixed to the collector return line at the drainback tank, the hot water supply line from the water heater and on all system components that could present a safety hazard due to high temperatures.

NOTE: The fluid safety labeling, as described above, is intended as a means of identification for the homeowner and/or service personnel. Removal of these labels could result in personal injury.

SYSTEM WARRANTY

For standard warranty service, contact AET at 800-874-2190 or email: info@aetsolar.com

EXTENDED SERVICE AGREEMENT (ESA) PROGRAM

AET has partnered with Service Net to provide a 5 Year Parts and Labor OEM warranty with every bundled AET EagleSun Solar Water Heating System. The installing dealer will have the ability to upgrade the end-user's coverage from the base 5 year parts and labor warranty to a 12 year parts and labor warranty giving the end-user an additional 7 years of coverage.

Service Agreement Contact Information

Contact information is listed below. Only Calls directly referencing the Service Net – AET warranty or ESA coverage should be fielded by Service Net Customer Service! All other calls should be directed to AET.

AET
 PO Box 928
 Jeffersonville, IN. USA 47130
 Fax: (866) 235-3441
 Phone: (888) 257-0913

Claims can be submitted three ways:

- Fax to: (866) 244-0156
- E-Mail to: hvacclaims@servicenet.com
- Mail to:
 - HRAI
 - Attn: Claims Processing
 - 650 Missouri Avenue
 - Jeffersonville, IN USA 47130
- Please be sure to include all required documents to expedite your claim. This will include the following:
 - Copy of the service ticket with the following:
 - End User information listed
 - Model number and serial number of the equipment
 - Detail on what was wrong with the equipment and what was done to fix it
 - End User's signature on the service ticket
 - If a part was purchased, a copy of the distributor's invoice
 - Completed Claim Form

All parts are available from your authorized agent or from AET direct.

RETURNS POLICY

All returns are subject to return authorization. No returned merchandise will be accepted without prior authorization from AET. If the return is authorized, the buyer will be issued a return authorization ("RA") number, which must be clearly marked on the package. AET will credit the purchase price of all normally stocked merchandise returned in good condition, in original packaging, within 30 days of purchase. There will be a 15% restocking charge on merchandise returned after 30 days. Items not in saleable condition, not normally stocked, and special-order items, may not be returned for credit. All items must be returned freight-prepaid. Replacements will be invoiced to the customer at normal price, and credit issued upon receipt of the failed item.

No credit will be given for any returned component without proper Return Authorization.

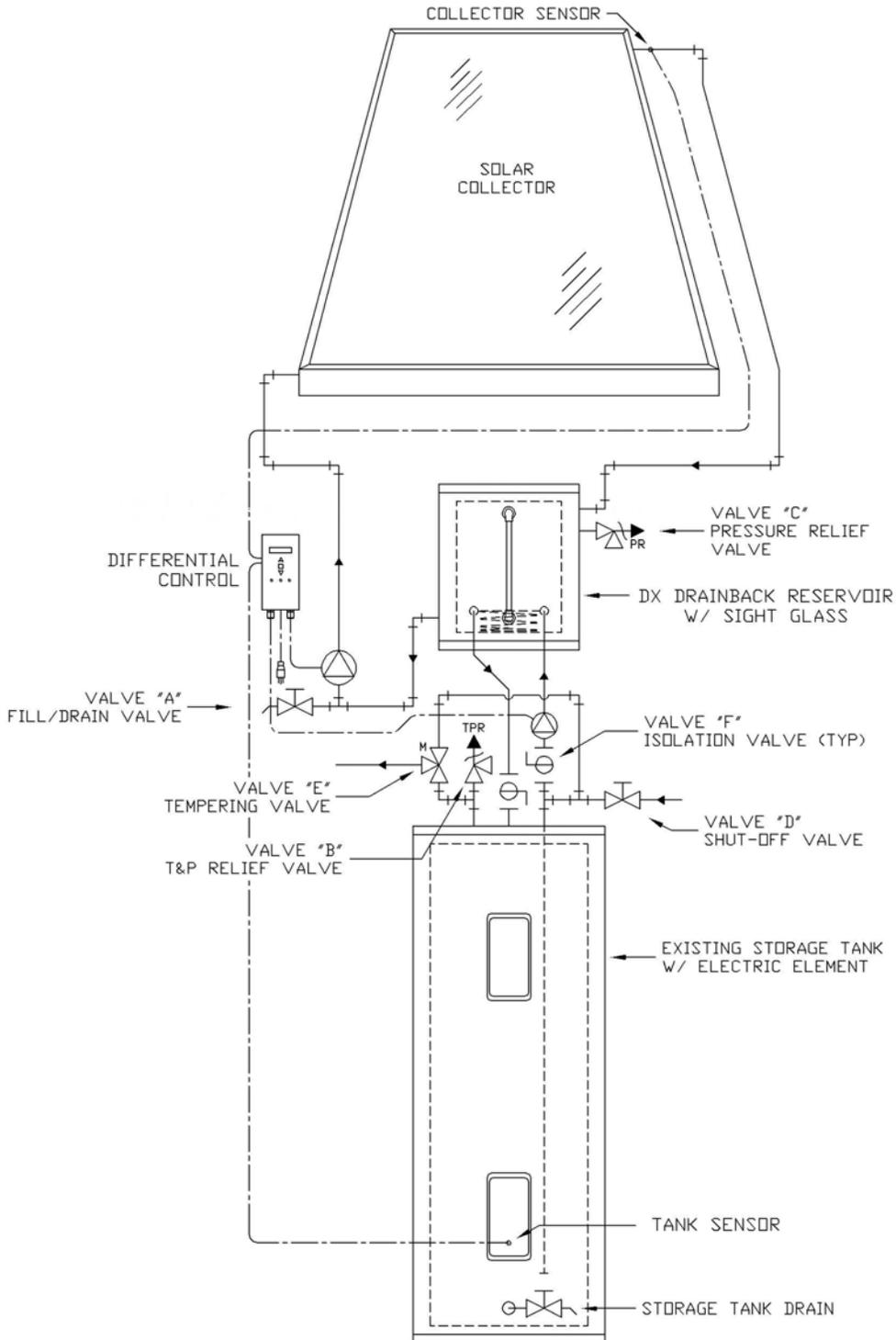
APPENDIX A

Trigonometric Functions of Angles

ANGLE	SIN	COS	TAN	ANGLE	SIN	COS	TAN
0.0	0.0000	1.0000	0.0000	46.0	0.7193	0.6947	1.0355
1.0	0.0174	0.9998	0.0175	47.0	0.7314	0.6820	1.0724
2.0	0.0349	0.9994	0.0349	48.0	0.7431	0.6691	1.1106
3.0	0.0523	0.9986	0.0524	49.0	0.7547	0.6561	1.1504
4.0	0.0698	0.9976	0.0699	50.0	0.7660	0.6428	1.1918
5.0	0.0872	0.9962	0.0875	51.0	0.7772	0.6293	1.2349
6.0	0.1045	0.9945	0.1051	52.0	0.7880	0.6157	1.2799
7.0	0.1219	0.9926	0.1228	53.0	0.7986	0.6018	1.3270
8.0	0.1392	0.9903	0.1405	54.0	0.8090	0.5878	1.3764
9.0	0.1564	0.9877	0.1584	55.0	0.8191	0.5736	1.4281
10.0	0.1736	0.9848	0.1763	56.0	0.8290	0.5592	1.4826
11.0	0.1908	0.9816	0.1944	57.0	0.8387	0.5446	1.5399
12.0	0.2079	0.9781	0.2126	58.0	0.8480	0.5229	1.6003
13.0	0.2249	0.9744	0.2309	59.0	0.8571	0.5150	1.6643
14.0	0.2419	0.9703	0.2493	60.0	0.8660	0.5000	1.7321
15.0	0.2588	0.9659	0.2679	61.0	0.8746	0.4848	1.8040
16.0	0.2756	0.9613	0.2867	62.0	0.8829	0.4695	1.8907
17.0	0.2924	0.9563	0.3057	63.0	0.8910	0.4540	1.9626
18.0	0.3090	0.9511	0.3249	64.0	0.8988	0.4384	2.0503
19.0	0.3256	0.9455	0.3443	65.0	0.9063	0.4226	2.1445
20.0	0.3420	0.9397	0.3640	66.0	0.9135	0.4067	2.2460
21.0	0.3584	0.9336	0.3839	67.0	0.9205	0.3907	2.3559
22.0	0.3746	0.9272	0.4040	68.0	0.9272	0.3746	2.4751
23.0	0.3907	0.9205	0.4245	69.0	0.9336	0.3584	2.6051
24.0	0.4067	0.9135	0.4452	70.0	0.9397	0.3420	2.7475
25.0	0.4226	0.9063	0.4663	71.0	0.9455	0.3256	2.9042
26.0	0.4384	0.8988	0.4877	72.0	0.9511	0.3090	3.0777
27.0	0.4540	0.8910	0.5095	73.0	0.9563	0.2924	3.2709
28.0	0.4695	0.8829	0.5317	74.0	0.9613	0.2756	3.4874
29.0	0.4848	0.8746	0.5543	75.0	0.9659	0.2588	3.7321
30.0	0.5000	0.8660	0.5773	76.0	0.9703	0.2419	4.0108
31.0	0.5150	0.8571	0.6009	77.0	0.9744	0.2249	4.3315
32.0	0.5299	0.8480	0.6249	78.0	0.9781	0.2079	4.7046
33.0	0.5446	0.8387	0.6494	79.0	0.9816	0.1908	5.1446
34.0	0.5592	0.8290	0.6745	80.0	0.9848	0.1736	5.6713
35.0	0.5736	0.8191	0.7002	81.0	0.9877	0.1564	6.3138
36.0	0.5878	0.8090	0.7265	82.0	0.9903	0.1392	7.1154
37.0	0.6018	0.7986	0.7535	83.0	0.9926	0.1219	8.1443
38.0	0.6157	0.7880	0.7813	84.0	0.9945	0.1045	9.5144
39.0	0.6293	0.7772	0.8098	85.0	0.9962	0.0872	11.4300
40.0	0.6428	0.7660	0.8391	86.0	0.9976	0.0698	14.3010
41.0	0.6561	0.7547	0.8693	87.0	0.9986	0.0523	19.0810
42.0	0.6691	0.7431	0.9004	88.0	0.9994	0.0349	28.6360
43.0	0.6820	0.7314	0.9325	89.0	0.9998	0.0174	57.2900
44.0	0.6947	0.7193	0.9657	90.0	1.0000	0.0000	infinite
45.0	0.7071	0.7071	1.0000				

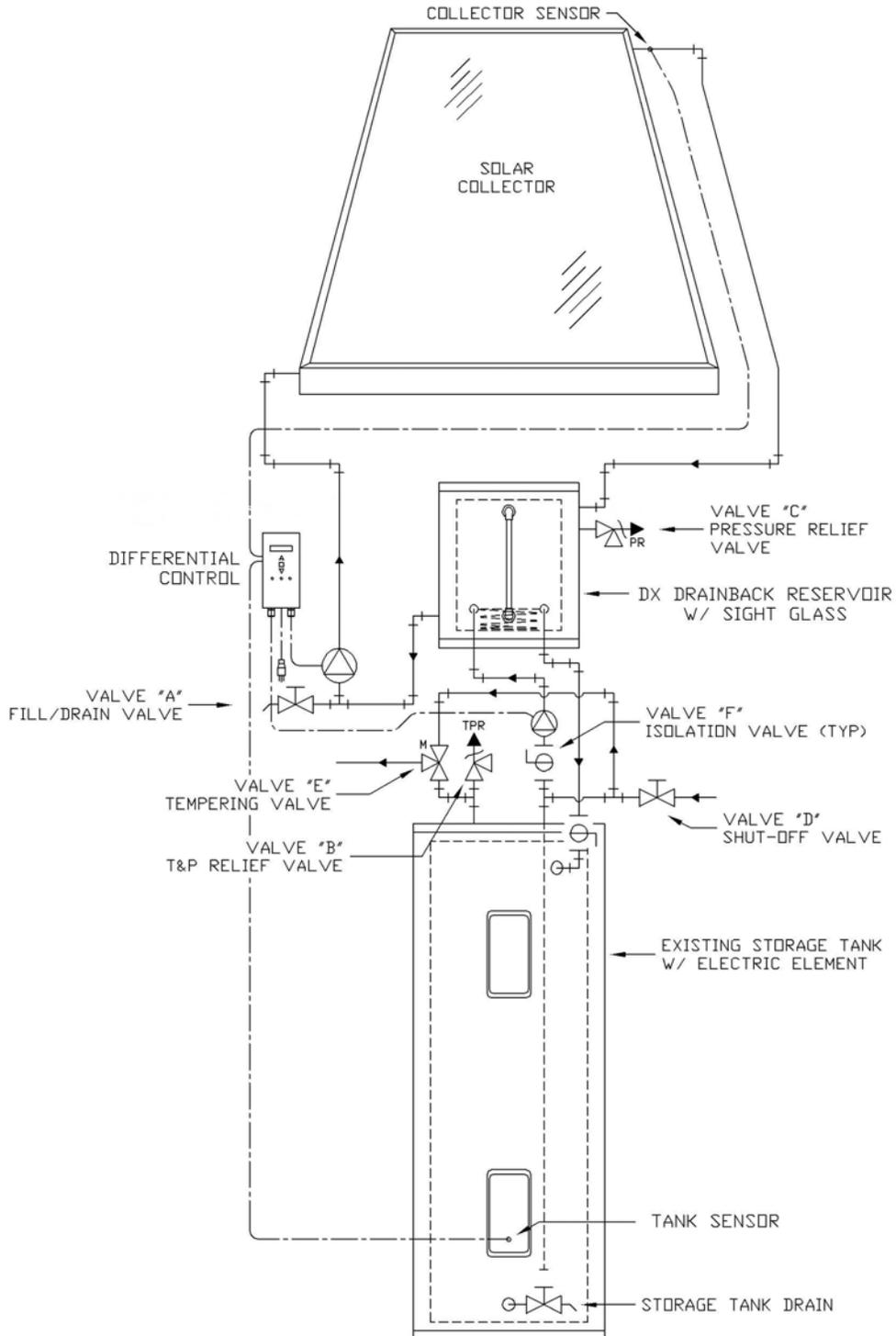
The collector and collector plumbing should be sloped back toward the drainback reservoir at 1/4" per foot minimum to allow the system to drain.

"DXR" DRAINBACK SYSTEMS
(50 GAL STORAGE - TOP CONNECT)



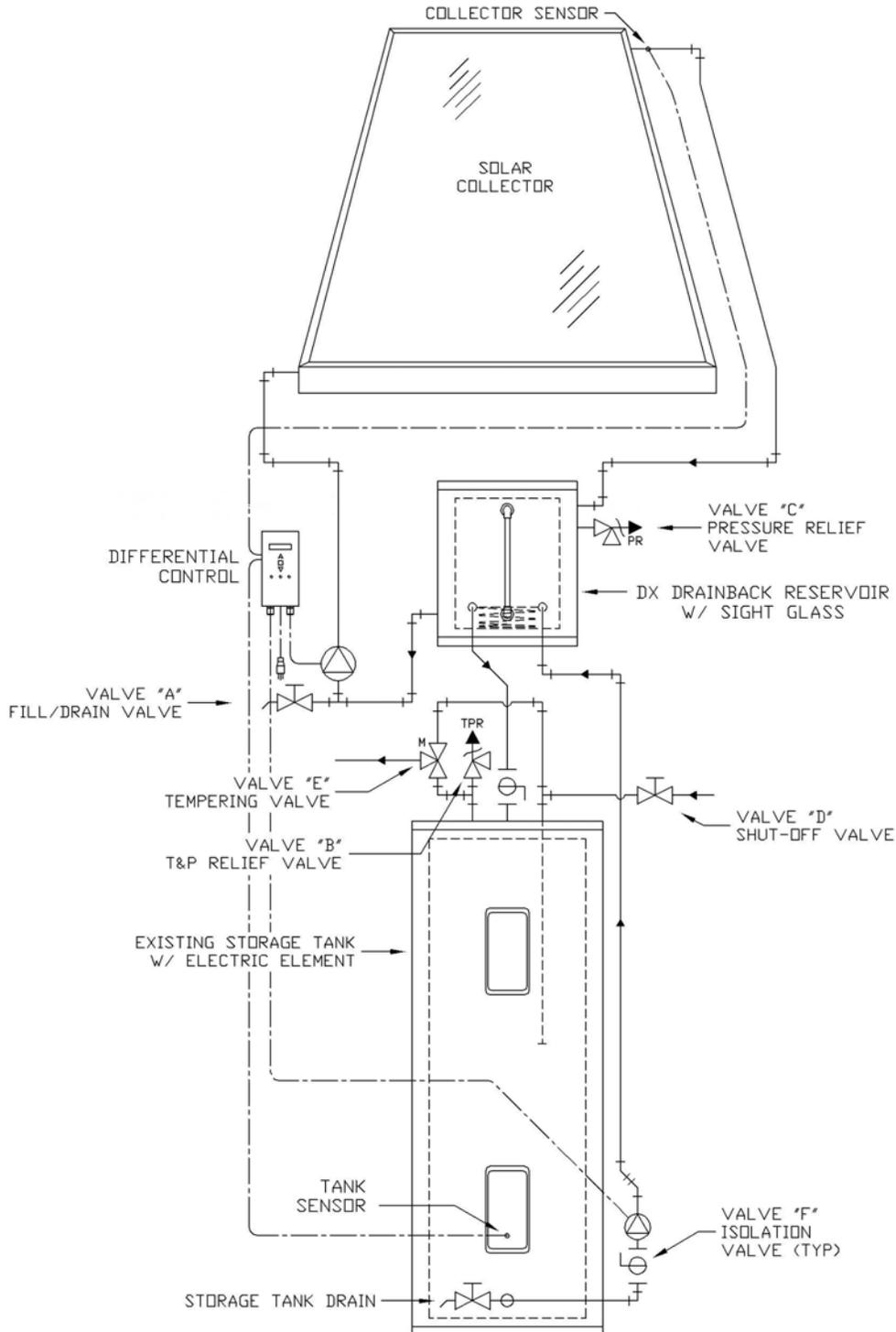
The collector and collector plumbing should be sloped back toward the drainback reservoir at 1/4" per foot minimum to allow the system to drain.

"DXR" DRAINBACK SYSTEMS (50 GAL STORAGE - SIDE CONNECT)



The collector and collector plumbing should be sloped back toward the drainback reservoir at 1/4" per foot minimum to allow the system to drain.

"DXR" DRAINBACK SYSTEMS
(50 GAL STORAGE - BOTTOM CONNECT)



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www.aetsolar.com · info@aetsolar.com

Document: Drainback_DXR_Retrofit_Manual