FAFCO

Solar Pool Heater

Installation Manual

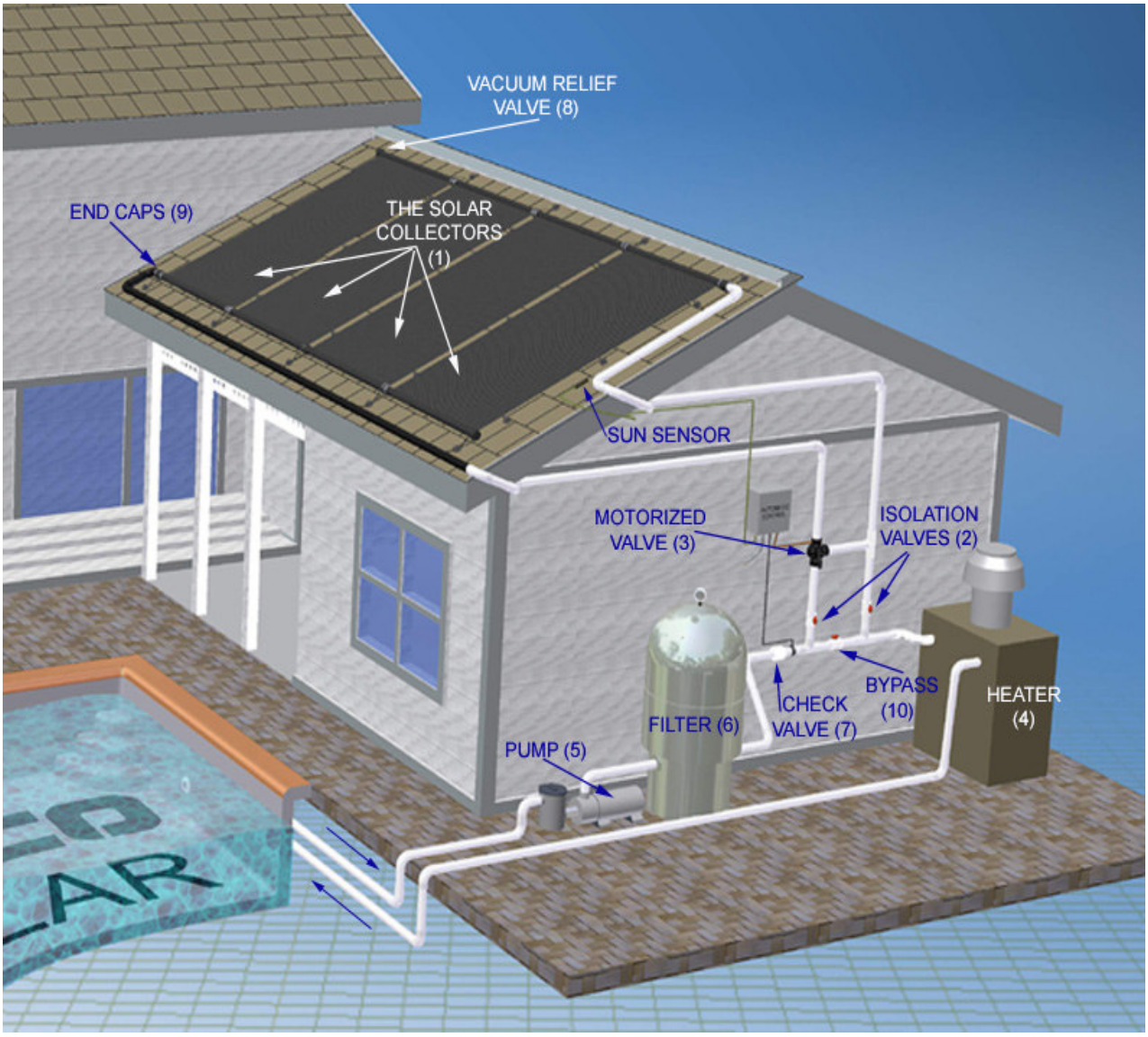
Since 1969, our goal has been to design, test, and produce a solar heating system that will let you get additional swimming pleasure from your pool. Keep this manual within easy reach and refer to it often.

Congratulations, the FAFCO pool heating system you are installing is the largest selling solar pool heating system in the United States today.

The solar collectors are built to commercial standards with large 2-inch, Schedule 40 headers and specially formulated polymer extrusions. All accessories are an integral part of the system design and should not be substituted.

The installation procedures in this manual have been proven in hundreds of thousands of panel installations throughout the world. To insure years of trouble-free service, they should be followed with the exacting attention to detail that went into the design and manufacturing of your system.

CONTENTS


VACUUM RELIEF VALVE (8)
END CAPS (9)
THE SOLAR COLLECTORS (1)
SUN SENSOR
MOTORIZED VALVE (3)
ISOLATION VALVES (2)
BYPASS (10)
CHECK VALVE (7)
FILTER (6)
HEATER (4)
PUMP (5)

WHAT DO THE VARIOUS COMPONENTS DO?

1. The Solar Collectors

are the heart of your system. They are the heat exchangers that collect the sun's heat and transfer it to the fast-flowing water that is being pumped through them from bottom to top for optimum efficiency.

2. The Isolation Valves

two valves which are manually operated to isolate the solar system from the filtration system—primarily used when backwashing the filter, or at any time it is desirable to isolate the Solar Collectors.

3. Motorized Valve

recieves a signal from the auto control and diverts the pool or spa water to the Solar Collectors.

4. Your Heater

is only needed for supplemental heat boost. You must turn the heater off and on manually.

5 & 6. Your Pump and Filter

are compatible with your FAFCO Solar System and will continue to do their job whether or not the solar is turned on. Your filter can be safely cleaned without damage to the solar system by following the instructions in this Owner's Manual.

7. Check Valve

When the Pump (5) shuts off, the Solar Collectors (1) will drain. The Check Valve prevents the water in the panels from flowing backwards through the Filter (6) and backflushing it into the pool.

8. Vacuum Relief Valve

is installed at the highest point in your system to allow the Solar Collectors to drain.

9. End Caps

seal the headers on the end Solar Collectors in the System.

10. Bypass

When the bypass is 100% open the water flows directly to your pool. When partially closed the bypass regulates flow to the pool. When the bypass is closed all water is diverted to the solar panels.

BEFORE YOU START

Always read complete installation manual instructions before starting. If you have any installation problems or questions, consult your local FAFCO distributor. Remember to always conform to your local building codes.

WHAT YOU CAN EXPECT FROM YOUR SYSTEM

As wonderful and abundant as solar energy is, performance results are conditional. With systems being installed in every part of the world with widely varying weather and climatic conditions, temperature results may vary. With these considerations in mind, and assuming you're having sunny weather with your system on, **you can expect it to:**

1. Heat the water 2 to 5 degrees F. every time it passes through the system.
2. Raise your pool's temperature 5 to 15 degrees F. over a period of several days of good weather.
3. Eliminate or significantly reduce the cost of operating your fossil fuel pool heater, but not necessarily replace it, during the colder less sunny months (a pool cover will enhance #2 & 3 above).
4. Give you years of trouble free service.

SYSTEM PERFORMANCE

The performance of the system is directly proportional to the number of panels installed. More panels than the minimum required will increase the ability of the system to heat a swimming pool under marginal weather or orientation conditions. Remember, minimum coverage equals minimum benefits. Always consider increases of panel area on a percentage basis. For example: 10-panel system plus one panel equals a 9% increase.

SITE SELECTION

The ideal location for the solar panels is a SOUTH-FACING PITCHED ROOF, near the pool, with enough space for mounting the required number of panels. However, an installation on a west-facing roof is acceptable for summer heating, if the panel area is increased. Northern exposures are not acceptable and eastern exposures tend to be about 50% effective and, therefore, marginally economical. Fortunately, the modular nature of the solar panel makes it easy to tailor the system to a specific site. Be certain that trees or other structures do not shade the location you select. Remember, the effectiveness of a solar system is directly dependent upon the amount of direct sunlight that the panels receive.

The FAFCO solar panels require a mounting space 50 7/8" wide for each panel. When computing the actual installed dimensions of the entire system, allow an extra 12" around the perimeter of the bank to accommodate mounting apparatus, plumbing fittings, and system accessories.

OPTIMUM ORIENTATION

The panels should be facing true south, for the Northern Hemisphere, with the inclination as follows:

1. For year-round heating: equal to latitude of installation.
2. For summer heating: equal to latitude minus 10° to 15°
3. For winter heating: equal to latitude plus 10° to 15°. The inclination must always exceed 10° to ensure proper drainage.

PANEL REQUIREMENTS

A minimum of one-half to three-quarters of the pool's surface area in solar panels is the recommended "rule of thumb" for sizing a swimming pool solar heating system. (Example: 800 sq. ft. pool needs 400 to 600 sq. ft. of panel area.)

MINIMUM RECOMMENDED COVERAGE

SOUTH FACING:

- Collector surface area equal to 60% of pool surface area.

WEST FACING:

- Collector surface area equal to 75% of pool surface area.

EAST FACING:

- Collector surface area equal to 100% of pool surface area.

PANEL MOUNTING SYSTEM

The FAFCO solar panels will provide years of trouble-free service if they are installed properly. All of the clamps, couplers, straps, and brackets necessary to join the solar panels together and to secure them in place are included with the panels. The ¼" stainless steel lag screws recommended for use with mounting brackets are not included because the proper length varies considerably with different types of roofing. The FAFCO panel mounting system is designed specifically for the purposes of:

1. Accommodating the differential expansion and contraction associated with thermoplastic materials under different temperature conditions.
2. Providing a secure method of holding the panels in place during windy conditions (it is recommended to temporarily remove the panels if hurricane conditions are expected).
3. Allowing flexibility in attaching the mounting brackets to most roof designs.

ADDITIONAL PARTS REQUIRED

In addition to the parts supplied with your panels, you will need to purchase the following items from your local hardware store:

- ¼” Stainless Steel Lag Bolts (length to fit your roof structure)
- Pipe Brackets
- PVC Pipe-2"
- PVC Fittings-2"
- PVC Solvent Cement
- PVC Primer
- Black Paint
- Sealant (compatible with your roof material)

PANEL INSTALLATION SEQUENCE

When transporting panels to the roof or rack and while positioning panels before mounting, be sure they do not strike or are dragged over any sharp surfaces (such as nails, corners of ladders, or roof eaves).

1. Survey area to confirm proper fit.
   a) If multi-bank installation, plan piping configuration.
   b) If roof is cedar or shake shingle, locate sub-roof support members (stringers) and mark as appropriate for placement on top, bottom, and panel body tie down brackets.
   c) If you are constructing a rack for the panels, be sure to consult your distributor for proper pitch and dimensions.
2. Lay down the first panel. Be certain it is straight and square on the roof. Simply lay substrate underneath each panel.
3. Couple all panels in a bank together.
4. Make sure panel alignment on the roof is straight. The panel bottom header should be inclined toward the end cap approximately ¼" every ten feet to ensure drainage.
5. Secure 3 or 4 top ties to hold bank of panels in place.
6. Secure the panels with the remaining caps, bases, and strap.
7. Install the vacuum relief valve and end caps.
8. Connect supply and return pipes to panels. These pipes should be routed so that the system will drain completely when the pump shuts off.
9. Be sure the return pipe(s) are from the common high point of the system.

MOUNTING THE SOLAR COLLECTORS

BRACKET INSTALLATION

1. Locate mounting base on roofing above subroof or sheathing. (Do not attempt to attach bases to roof material only!)
2. Mark and drill a pilot hole.
3. Inject the sealant into the pilot hole and into the circular cavity on the bottom of the base.
4. Put the lag screw into the mounting base and secure the mounting base to the roof.
5. Lay the panel strap through the mounting base. Panel straps can be put through single or doubled over.
6. Screw on a mounting cap and hand tighten. A ½" ratchet may be used to tighten the cap if desired. (Use caution not to "spin" the base, as this will break the seal of your sealant.)

BUILT UP ROOFING

A tar and gravel roof requires special care. For further instructions contact your local roofing contractor.

TOP AND BOTTOM HEADER TIE-DOWN

Both the top and bottom ties are secured the same way. Use the webbed strap for the top ties and the stretchy vinyl strap for the bottom ties.

1. Pass the strap around the rubber coupler.
2. Mark a spot 4" to 7" from the header pipe of the panel.
3. Secure a mounting base at the spot you marked per the instructions above.
4. Place the strap around the header and lay both ends of the strap through the mounting base and screw on a cap.

PANEL BODY TIE-DOWNS

1. Begin installing panel body straps with an end panel.
2. Locate a mounting base 10" (±5") down from the top header.
3. Locate the same base 2" from the panel body.
4. Be certain the mounting base lag screw is located so it will penetrate the subroof or sheathing.
5. Mark and drill a pilot hole.

6. Inject sealant and secure base.
7. Pass a panel body strap through the base and double it back.
8. Screw on a bracket cap and tighten.
9. Locate the next mounting base 9" (±5") up from the bottom panel header.
10. Repeat steps 5 through 8.
11. Locate the next mounting bracket base centered between the other two bases.
12. Repeat steps 5 through 8.
13. Now go to the other side of the panel.
14. Locate the next mounting bracket base exactly the same distance down from the top header as the mounting base on the other side.
15. Center the bracket base and secure following steps 5 through 8.
16. Pass the already secured panel body strap through the base. Pass a new panel body strap through the same base from the other direction.
17. Screw on a mounting cap and tighten. (Be sure that the panel body strap is tight.)
18. Repeat steps 14 through 16 for the other two panel body straps, aligning them per the brackets already mounted.
19. Continue mounting brackets and straps across the complete bank of panels being certain to follow carefully the instructions for sealing and mounting brackets properly.

PANEL COUPLINGS

1. Short couplers (3 ½" rubber couplers) are used to join the panels together and to attach the end cap and vacuum relief valve.
2. Long couplers (5 ½" rubber couplers) are used whenever panels are joined to PVC pipe.
3. When coupling panels together, the clamps must be positioned close to the lip of the header.
4. The vacuum relief valve and end cap clamps must also be positioned close to the lip of the header.
5. Tightening clamps:
   a) Tighten all clamps as they are installed.
   b) When you have completed the solar installation, retighten all clamps with the system on and water circulating through the collectors.
   c) Care must be taken when tightening clamps to ensure they are not installed crooked.

NOTE: It may be necessary to split the bank of panels in order to avoid obstructions on the mounting surface, or use multiple banks of panels to accommodate specific site requirements. Split packs or bank packs are available for use in this case.

VACUUM RELIEF AND END CAPS

1. The vacuum relief valve should be used to seal the top header on END panels, (i.e. always place in the highest point of the system). Use 1 vacuum relief per bank.
2. End caps are used to seal headers on end panels.

FEEDING WATER IN AND OUT OF THE SOLAR COLLECTORS

Long couplers are to be used when joining the panels to rigid PVC piping. Since the panel headers, FAFCO coupling hardware, and control pinch valve are all 2", it is advisable to adapt the existing pump house plumbing to 2" by the use of adapters (usually 1 ½" to 2") which will allow for the use of all 2" PVC piping to and from the collectors. To connect the 2" PVC pipe to the solar panels:

1. Place long coupler over panel header and install clamp close to the lip.
2. Insert a CPVC adapter (with lip) into the long coupler.
   NOTE: The headers are not butted when using long couplers.
3. Use a 2" PVC pipe to glue the feed and return pipes to adapters.
   NOTE: It may be easier to first glue the adapter to the pipe, and then insert it into the long coupler.
4. Always feed the water to the lowest end of the collector bank (never feed to top header). Be certain to always return the water from the highest point in the system.

To ensure symmetry of flow, it is recommended that opposite end returns be installed on banks in excess of 12 solar panels. (No single bank should exceed 17 panels.)

POOL EQUIPMENT PLUMBING

In the most common pool configurations, the pump draws from the skimmer and the main drain. It then pushes the water through the filter and the heater (if there is one), then back to the pool. Plumbing connections for the FAFCO solar pool heater are made between the filter and the heater, so that the solar heated water can return to the pool via the standard heater. If there is no standard heater, the FAFCO plumbing is simply hooked up after the filter. A check valve must be installed after the filter and before the solar lines to prevent backflushing of the filter into the pool when the system is turned off. Pool cleaners and booster pumps should be plumbed before solar.

PLUMBING SEQUENCE

Carefully plan the solar plumbing before cutting into existing piping. Make a mock-up with pipefittings and FAFCO components to determine size requirements. High temperature CPVC pipe is recommended when plumbing close to the heater.

PLUMBING TO AND FROM THE PANELS

Prime consideration should be given to system drainage (see owner's manual "Freeze Protection") and appearance when running pipe from your pool pump and filter unit to the panels and back. Standard 2" schedule 40 PVC pipe is readily available and very easy to work with. Pipe insulation to and from the system is unnecessary because of the relatively small temperature difference of the pool water and daytime air.

The feed and return lines can be buried if that is desirable. To adhere to the uniform plumbing code guidelines (IAPMO), the pipes must be buried 18" below the surface. It is recommended that you check with your local inspectors so that all local codes are met.

The feed and return lines may be plumbed through an overhanging eave or routed around the edge of the roof. A 2" masonry or wood hole saw can easily be rented or purchased at any hardware or tool supply store or tool rental outlet. They attach to any standard drill and the holes can be drilled easily. Allow a minimum of 8"

between the two holes in the eave where the pipes go through to accommodate the roof jacks placed next to one another.

NOTE: Roof jacks are used to seal the roof where the holes are drilled. The pipes simply go through the eave and through the roof jack where they are also sealed. They are available at your local plumbing house. Since roof construction may vary from state to state always consult your local building inspector or a qualified roofing contractor for specific instructions for your area.

FREEZE PROTECTION

A vacuum relief valve is provided with the FAFCO system to allow the panels to drain when the pump shuts off. All plumbing designs should allow for full drainage. The panel material is tolerant of sub-freezing weather provided there is no water within. Consult the owner's manual for further instructions on winter isolation and freeze protection.

1. Turn solar valve off.
2. Turn the pump off.
3. Allow 30 to 40 minutes for any drainage that can take place.
4. Close the isolation valve(s).
5. Use a screwdriver or 5/16" nut driver and loosen the clamps where the feed and return pipes connect to the panel.
6. Remove the pipes from the rubber couplers.
7. Remove the vacuum relief valve and end caps from the panel ends. Raise each panel body and check to be sure no water is present inside panel.
   NOTE: All four corners of each bank of panels should be open.
8. Additional precautions should be taken to protect the pipes from freezing.
9. Be sure to store the clamps, couplers, vacuum relief valve, and end caps where they will not get lost.
10. Wait until the weather warms up, and then simply reverse the procedure.
11. Be sure all water has been drained from collectors.
    NOTE: If panels are installed on a flat roof, they will not drain. In this case, each panel will have to be lifted up and manually drained of all water.

BEFORE YOU CALL FOR SERVICE

If The System Does Not Appear To Be Heating The Pool

1. Are the filter and leaf trap clean?
2. Are the times set from about 9 a.m. until about 5 p.m. or for at least 8 hours of operation during solar hours?
3. Have you been refilling the pool with a lot of cold water lately?
4. Has the weather been marginal?
5. If nighttime temperatures are very low, are you using a pool blanket to retain the heat provided by the solar system during the day?
6. Are the panels operating "cool" to the touch on a sunny day? If not, you are not getting water to the panels—check your valve position.

If There Are No Initial Bubbles When Solar Turns On:

1. Ensure that the pump is running.
2. Check the isolation valves to make sure they are open.
3. Make sure the control valve is in the correct position.

If Tiny Champagne Bubbles Continue

past the initial purging of the panels (3-5 minutes), this may be an indication that the water circulation through the panels has been reduced to the point where the vacuum relief valve is admitting air either continuously or intermittently. Check the pump, filter, and leaf trap for cleanliness and proper operation. If the bubbles continue with the solar turned off, check the piping leading to the pump for a suction side leak.

Some small bubbles may always be discharged into the pool due to the particular operating characteristics of the individual system. They do not affect the operation of the system nor impair the proper function of any other pool equipment.

Occasionally Check the Automatic Timer

Power failures, adjustments for Daylight Saving Time, etc. will put it behind. It will be necessary to adjust the timer according to the season so that the solar system will operate during the most beneficial hours of the day.

Pool Cleaner Timer

Special care must be taken when setting the timer for automatic pool cleaning equipment. Set your pool cleaning equipment timer to turn on after the solar system. Typically, operating hours between 12:00 and 8:00 a.m. or p.m. are acceptable. This precaution prevents air from entering and possibly damaging pool-cleaning equipment during the startup of your solar system.

System Specifications

ROOF MOUNTING SPACE:

- Width — (number of panels x 50 7/8") + 24"
- Length — panel length + 24"

RACK SPACE:

- Width — (number of panels x 50 7/8") + 2"
- Length — panel length + 6"

FLOW:

- Recommended flow — 4 gpm per panel (0.88 psi headloss)
- Maximum recommended flow — 8 gpm per panel (3.53 psi headloss)
- Minimum recommended flow — 3 gpm per panel (0.50 psi headloss)

PANELS PER BANK:

- 12 panels single end feed
- (Maximum) 17 panels diagonal feed

PRESSURE:

- Normal Maximum — 30 psi at 80°F
- Operating Intermittent — 45 psi at 80°F
- Burst Pressure — Over 300 psi at 70°F

CORROSION:

- Non-corrosive

WEIGHT:

- Without water—
  - 4’ by 8’ 13.5 lbs or 0.42 lbs/ft^2
  - 4’ by 10’ 15.9 lbs or 0.40 lbs/ft^2
  - 4’ by 12’ 18.3 lbs or 0.38 lbs/ft^2
- With Water—
  - 4’ by 8’ 51.1 lbs or 1.60 lbs/ft^2
  - 4’ by 10’ 59.8 lbs or 1.50 lbs/ft^2
  - 4’ by 12’ 68.5 lbs or 1.43 lbs/ft^2

This manual is designed for residential use only. Commercial systems, or any other system in excess of 20 panels, require further engineering and design. Please contact your local FAFCO distributor.

OPTIONAL AUTOMATIC SOLAR CONTROLS

Various optional, electrically operated solar controllers are available from a variety of manufacturers. These controls allow for varying degrees of automation in the pool environment. Controls may be available from the dealer where you purchased the panels or from a pool supply house. You should read and follow the manufacturer's directions in installing these controls to ensure their proper operation and your satisfaction.

FAFCO, INC.
435 Otterson Drive
Chico, CA 95928
E-mail: www.fafco.com
Phone: 530.332.2100
FAX: 530.332.2109

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