

# FAFCO

## Solar Pool Heater

# ST Installation Manual



### About F A F C O Solar Pool Heaters:

- Largest selling solar pool heating systems in the United States since 1969
- Over 2 million solar pool heaters installed worldwide
- Best design in the industry with patented even flow distribution and highest solar performance
- Made of a specially formulated UV resistant polymer that won't rust, corrode, or scale

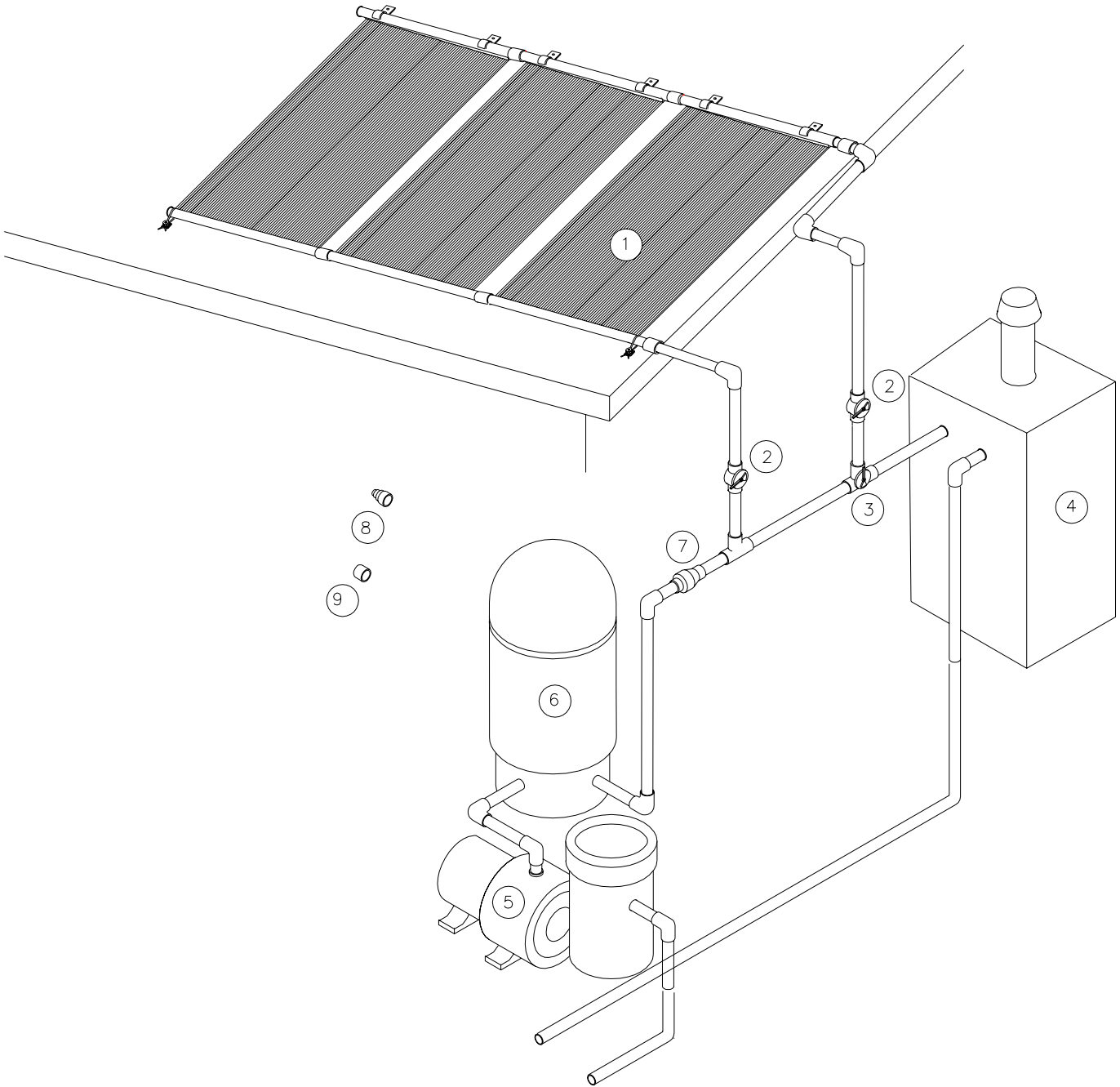
### **Attention:**

This manual provides a detailed step-by-step procedure for the installation of the FAFCO solar pool heating system. The directions should be followed properly and only recommended FAFCO components and hardware should be used in order to provide a trouble free system that provides free service, savings, and enjoyment.

# CONTENTS

|   |    |
|---|----|
| System Diagram. . . . .                                   | 3  |
| What Do The Components Do. . . . .                        | 4  |
| Before You Start . . . . .                                | 5  |
| What Can You Expect . . . . .                             | 5  |
| System Performance. . . . .                               | 5  |
| Site Selection . . . . .                                  | 6  |
| Optimum Orientation . . . . .                             | 6  |
| Panel Requirements . . . . .                              | 6  |
| Panel Mounting System. . . . .                            | 6  |
| Additional Parts Required . . . . .                       | 7  |
| Panel Installation Sequence. . . . .                      | 7  |
| Mounting the Solar Collectors. . . . .                    | 8  |
| Built Up Roofing. . . . .                                 | 9  |
| Panel Couplings. . . . .                                  | 9  |
| Vacuum Relief and End Caps. . . . .                       | 9  |
| Feeding Water In and Out of the Solar Collectors. . . . . | 10 |
| Pool Equipment Plumbing . . . . .                         | 11 |
| Before You Call for Service. . . . .                      | 12 |
| Optional Automatic Solar Controls . . . . .               | 13 |
| Specifications . . . . .                                  | 14 |

# SYSTEM DIAGRAM



# **WHAT DO THE VARIOUS COMPONENTS DO?**

## **1. The Solar Collectors**

These 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**

These two valves 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 (i.e. winterization).

## **3. Diverter Valve**

Diverts the pool or spa water to the Solar Collectors.

## **4. Your Heater**

It is only needed for supplemental heat boost. You turn the heater off and on manually, or use automatic controls.

## **5 & 6. Your Pump and Filter**

These are compatible with your FAFCO Solar System and will continue to do their job whether or not the solar is turned on. When cleaning the filter the solar system should be isolated to prevent debris from entering the system.

## **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**

The recommended location is at the highest point in your system, but it can also be installed at other locations to break the vacuum and allow the Solar Collectors to drain.

## **9. End Caps**

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

## **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.

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.

## **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 items #1 & 2 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 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 ideal location for the solar panels is a SOUTH-FACING PITCHED ROOF, near the pool. With the panels facing true south, for the Northern Hemisphere, the optimum inclination is as follows:

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

## **PANEL REQUIREMENTS**

See your dealer for sizing requirements.

A minimum of 65% to 100% 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 600 to 800 sq. ft. of panel 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, and brackets necessary to join the solar panels together and to secure them in place are included with the panel kits. The 1/4" 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. 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” Corrosion Resistant 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**

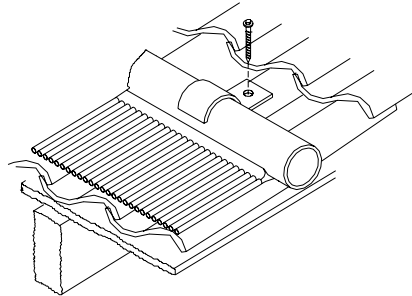
When transporting panels to the roof or rack and while positioning panels before mounting, be sure they do not strike or drag over any sharp surfaces (such as nails, corners of ladders or roof eaves).

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 member (stringers) and mark as appropriate for placement of the hold down clamps.
  - c) If you are constructing a rack for the panels be sure to consult your distributor for proper pitch and dimensions.
2. Place two hold down brackets on each top header in the system.
3. Lay down the first panel. Be certain it is straight and square on the roof.
4. Couple all panels in a bank together.
5. 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.
6. Secure the hold down brackets to hold bank of panels in place.
7. Install the vacuum relief valve and end caps.
8. Connect supply and return pipes to panels.
  - a) These pipes should be routed so that the system will drain completely when the pump shuts off. Additionally, a drain plug or hose bib can be installed at the lower portion of the system, which will allow the system to be drained manually when freezing conditions occur.
9. Be sure the return pipe(s) are from the common high point of the system.

# MOUNTING THE SOLAR COLLECTORS

## TOP HEADER BRACKET

1. Locate hold down bracket on roofing above subroof or sheathing. (Do not attempt to attach clamps to roof material only!)
2. Mark and drill a pilot hole.
3. Inject the sealant into the pilot hole and on the bottom of the hold down bracket.
4. Put the lag screw into the hold down bracket and tighten into the roof structure.

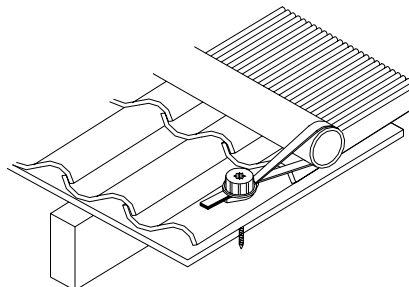


Top Header Detail

## BOTTOM HEADER TIE-DOWN

The bottom header is secured with a cap, base and vinyl strap in the following manner:.

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:
  - A. Locate mounting base on roofing above subroof or sheathing. (Do not attempt to attach bases to roof material only!)
4. Mark and drill a pilot hole.
5. Inject the sealant into the pilot hole and into the circular cavity on the bottom of the base.
6. Put the lag screw into the mounting base and secure the mounting base to the roof.
7. Lay the panel strap through the mounting base. Panel straps can be put through single or doubled over.
8. Screw on a mounting cap and hand tighten. A 1/2" 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).



Bottom Header Detail



## **BUILT UP ROOFING**

A tar and gravel roof requires special care. For further instructions contact your local FAFCO dealer.

## **PANEL COUPLINGS**

1. Short couplers (3 1/2" rubber couplers) are used to join the panels together and to attach the end cap and vacuum relief valve.
2. Long couplers (5 1/2" rubber couplers) or Short couplers (3 1/2" 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 (identified by two holes in cap) should be used to seal the top header on END panels (place in the highest point of the system). Use 1 vacuum relief per system or per bank.
2. End caps are used to seal headers on end panels.

## **FEEDING WATER IN AND OUT OF THE SOLAR COLLECTORS**

Since the panel headers and FAFCO coupling hardware are all 2", it is advisable to adapt the existing pump house plumbing to 2" by the use of adapters (usually 1-1/2" 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 coupler over panel header and install clamp close to the lip.
2. Insert a CPVC adapter (with lip) into the coupler.
3. Glue 2" PVC feed and return pipes to the adapters.

NOTE: It may be easier to first glue the adapter to the pipe, then insert it into the 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 pipe fittings 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 "Freezing Conditions") 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 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, the pipes must be buried 12" 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 state to state always consult your local building inspector or a qualified roofing contractor for specific instructions for your area.

## **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. Is the timer 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, so 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.

### **Tiny Champagne Bubbles**

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 8:00pm and 8:00am are acceptable. This precaution prevents air from entering and possibly damaging pool cleaning equipment during the startup of your solar system.

## **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 manufacturers directions in installing these controls to ensure their proper operation and your satisfaction.

# SYSTEM SPECIFICATIONS

**ROOF MOUNTING SPACE:** Width = [Number of panels X 50.875 in. (129 cm)] + 24 in. (61 cm)  
Length = Panel length + 24 in. (61 cm)

**RACK SPACE:** Width = [Number of panels X 50.875 in. (129 cm)] + 2 in. (5 cm)  
Length = Panel length + 6 in. (15 cm)

**FLOW:** Maximum recommended flow = 8 gpm per panel  
3.47 psi head loss (1,817 l/hr, 0.244 kg/cm<sup>2</sup>)  
Minimum recommended flow = 3 gpm per panel  
0.48 psi head loss (681 l/hr, 0.034 kg/cm<sup>2</sup>)  
Recommended flow = 4 gpm per panel  
0.87 psi head loss (908 l/hr, 0.061 kg/cm<sup>2</sup>)

**PANELS PER BANK:** 12 panels single end feed  
(maximum) 17 panels diagonal feed

| <b>PRESSURE:</b> | <b>NORMAL OPERATING PRESSURE</b>  | <b>MAXIMUM INTERMITTENT PRESSURE</b> |
|------------------|---|--------------------------------------|
| 80°F (27°C)      | 0 to 30 psi<br>(0 - 2.2 kg/cm <sup>2</sup> )                                    | 45 psi<br>(3.21 kg/cm <sup>2</sup> ) |
| 212°F (100°C)    | 0 to 5 psi<br>(0 - 0.35 kg/cm <sup>2</sup> )                                    | 5 psi<br>(0.35 kg/cm <sup>2</sup> )  |
| 70°F (21°C)      | Measured burst pressure of panel body = Over 300 psi (21.0 kg/cm <sup>2</sup> ) |                                      |

**TEMPERATURE:** Normal operating temperature = 60°F to 90°F (16°C to 32°C)  
Maximum continuous operating temperature = 212°F (100°C)  
Maximum intermittent temperature (unpressured) = 250°F (121°C)  
Melt temperature = 338°F (170°C)

**WEIGHT:**

|                |   |
|----------------|---|
| Without Water: |   |
| 4 ft. X 8 ft.  | 12.2 lbs (4.54 kg) or 0.38 lbs/ft <sup>2</sup> (1.85 kg/m <sup>2</sup> )  |
| 4 ft. X 10 ft. | 14.3 lbs (5.34 kg) or 0.36 lbs/ft <sup>2</sup> (1.76 kg/m <sup>2</sup> )  |
| 4 ft. X 12 ft. | 16.47 lbs (6.15 kg) or 0.34 lbs/ft <sup>2</sup> (1.67 kg/m <sup>2</sup> ) |
| With Water:    |   |
| 4 ft. X 8 ft.  | 46 lbs (17.2 kg) or 1.44 lbs/ft <sup>2</sup> (7.03 kg/m <sup>2</sup> )    |
| 4 ft. X 10 ft. | 53.8 lbs (20.1 kg) or 1.35 lbs/ft <sup>2</sup> (6.59 kg/m <sup>2</sup> )  |
| 4 ft. X 12 ft. | 61.7 lbs (23.07 kg) or 1.29 lbs/ft <sup>2</sup> (6.28 kg/m <sup>2</sup> ) |

All specifications and dimensions set forth above are as estimated by FAFCO Inc., but are not intended to be precise and should not be relied upon as precise without independent verification. These estimated specifications and dimensions are subject to change without notice. Nothing contained herein is intended or should be construed to expand or extend FAFCO Inc.'s warranty, or establish any express or implied warranties of any nature, other than as contained in the Twelve Year Warranty Agreement. (FAFCO Inc. disclaims any other warranties and assumes no duty to provide notice if it becomes aware of any deficiencies in these estimates.) The reader accepts full responsibility for any use or application of these estimates and specifically understands and acknowledges the limited reliability of these estimates.

**FAFCO, Inc.**  
435 Otterson Drive  
Chico, CA 95928  
Phone:(530) 332-2100  
FAX: (530) 332-2109  
Part # 06957 REV A  
10/06