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HOT$_2$O SYSTEM INTRODUCTION

Welcome to the Hot$_2$O system! We hope you enjoy your new solar water heating system for years to come! Our goal at FAFCO is to provide you with a high quality, long-lasting product that will save you money over time.

This Hot$_2$O Installation and Maintenance Manual includes information about your system, and provides planning and installation instructions.

Please view the video and read all supplied materials BEFORE starting your installation process! Reading the materials will help make sure your installation goes safely and smoothly!

The Hot$_2$O website can provide links to information on energy rebates and tax credits!

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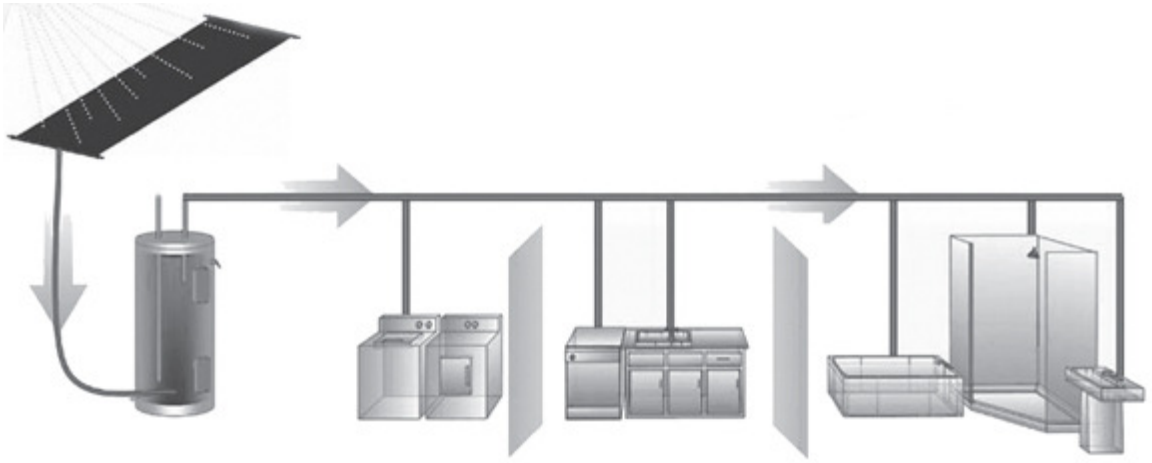
Visit us on the web at www.hot2o.com

HOT$_2$O SYSTEM OVERVIEW

How the System Works

The FAFCO Hot$_2$O system is designed to capture energy from the sun, and use that energy to help heat your hot water. The system effectively converts solar energy to heated water. By taking advantage of the sun's solar energy, you need less gas or electric power to heat your hot water.



Solar energy is absorbed by the solar collector and is transferred to water as heat. The heated water in the solar collector transfers its heat to your water heater. Hot water is drawn from your water heater to various household fixtures and appliances such as clothes washer, dishwasher, bath, shower, and other fixtures.

Since water in your hot water heater is "pre-heated" by solar energy, your water heater doesn't have to work as hard. This means that you use less electricity or gas (depending on your system) to provide hot water to your home! Conserving energy results in lower utility bills!

Hot2O Solar Collectors

The solar collectors are mounted on your roof and transfer the sun's energy to water which is in turn used to heat your water heater. The best location for the collectors is on a south facing roof, although consideration must also be given to your water heater location.

Electric Water Heater Setup (Single Tank Installation)

The Hot$_2$O system can be installed directly to your electric water heater. The heat collected by the Hot$_2$O system is transferred through a heat exchanger and into your hot water heater.

Gas or Electric with Solar Storage Tank (Double Tank Installation)

The solar storage tank is required for gas water heaters and can provide additional capacity for electric water heaters. A solar storage tank is used to hold water heated by the solar collectors through the heat exchanger. This solar heated water is drawn through the water heater and into your home, causing your water heater to use less energy. The ideal storage tank is an electric water heater. They are well insulated and already have the required plumbing connections. A 40 gallon electric water heater can be purchased for about $250.

INSTALLATION OVERVIEW

The Installation manual contains detailed instructions about how to install your new Hot$_2$O system. Each installation section includes a list of tools and parts needed for that portion of the installation.

You should plan for the installation to take about two days. The length of time it takes to install your system depends on your experience with Do-It-Yourself projects and the options you chose to install.

Three gallons of undiluted non-toxic propylene glycol can be added to each drainback tank to protect against freezing. Non-toxic propylene glycol can be purchased at a local automotive store. In some jurisdictions, plumbing codes require FDA approved propylene glycol be used. Consult your local plumbing code, building department or a professional plumber to ensure that the approved glycol solution is used.

If you have any questions about installing your system, please visit our website!

Tool List

- Safety glasses (recommended)
- Knee pads (optional)
- Sturdy Ladder
- Power Drill
- 1-1/4 “ spade bit or hole cutter bit
- 1” Hole saw or paddle bit
- 7/8” Hole saw
- 1/4 Inch Drill Bit
- 9/16 inch socket driver
- 7/16 Inch Socket
- #1 Phillips screw driver
- #2 Phillips screw driver
- 10 Inch Adjustable Wrench
- Channel lock pliers
- Pliers
- Wire Cutters
- Tin snips
- Hammer
- Large putty knife
- Caulking gun
- Tape measure
- Stud Finder
- Level

Important Tubing Installation Notes:

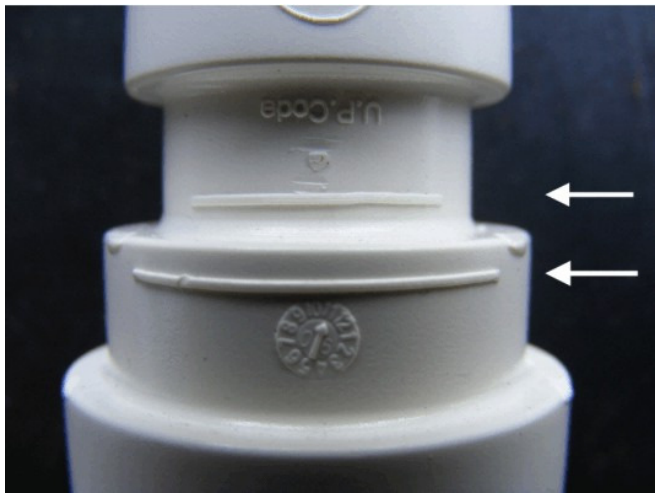
The tubing and push fitting system used in your Hot2O kit are designed for ease of installation and maintainance, providing a worry free seal when installed correctly.

When cutting tubing, use the provided cutters and make sure the cut is even and straight across the end of the tubing. Inspect the length to be inserted into the fitting for damage.

For all tubing connections, the Hot2O system tubing is inserted into push fittings.

It is important that the tubing be inserted FULLY into the fitting to properly seal.

The photo at right shows the markings on the side of the fittings that indicate how far the tubing should be inserted. Measure the end of the tubing with these marks to be sure it is fully inserted.



WARNING!

Failure to observe safe practices on a roof or other elevated structure may result in FALLING, which can cause SERIOUS INJURY, or even DEATH!

Unless you are familiar with working on roofs, and have the proper ladders and safety equipment for roof work, you should consider hiring a professional with the necessary qualifications to do the solar collector installation.

FAFCO **strongly recommends** that **TWO PEOPLE** perform the solar collector installation!

Failure to observe safe practices when working on Hot Water heaters may result in SCALDING, BURNS, or ELECTRICAL SHOCK,

Electric water heaters use 240 Volt AC power. You should open the circuit breaker before working on an electric water heater. Verify that power is off at the water heater by checking with a volt meter at the junction box on top of the water heater. If you cannot locate the breaker, open the home main supply breaker. Do not apply power to an empty electric water heater. The heating elements will be damaged. Gas water heaters (natural gas and propane) have pilot lights that are always lit. This is a burn hazard. Your pilot should be off, and gas supply turned off before emptying a gas water heater! FAFCO recommends that you consult a professional plumber or electrician if you have questions or concerns!

CAUTION!

Changes to your existing home plumbing may require building permits. Plumbing installations are subject to building code restrictions and requirements. Building codes vary greatly between states, and between counties.

Building code violations could create unsafe conditions in your home and impact future home sale. Check with your local county building code officials to determine what (if any) permits or restrictions apply to your home Hot$_2$O Solar Installation! FAFCO is NOT responsible for building code violations!

PLANNING COMPONENT LOCATIONS

Planning your component locations is one of the **most important steps** to make sure your Hot$_2$O system performs properly. Careful planning also helps make sure your installation process goes as smoothly as possible!

Solar Collector Planning

It is important to choose the best roof location to install your solar collector. If you are installing more than two collectors, the roof location must be large enough for the number of solar collectors you plan to install. The main things to consider for your solar collector site are:

- Distance from your water heater
- Roof Direction
- Roof Size and Angle
- Attic or Crawl Space
- Roof Jack Penetrations

Distance From Your Water Heater

The location should be as close as possible to the water heater. The closer your collector is to the water heater, the shorter the tubing run will be. The maximum recommended tubing length to the solar collector is 100 feet. The Hot$_2$O system comes with 80 feet of tubing. Additional tubing may be ordered from your dealer. Also important in determining the length of tubing run is the minimum ¼ inch per foot slope required for system drainage. As the tubing run gets longer it is more difficult to maintain this slope.

Roof Direction

For homes in the northern hemisphere, the best installation site is a roof facing true south. Many homes do not have a roof that faces directly to true south. Use the following guidelines for choosing which of your roof surfaces is best for your solar collectors:

- **First choice** is a roof facing due south
- **Second choice** is a roof facing between southeast and southwest
- **Third choice** is a roof facing between southeast and northeast, or southwest to northwest
- **Fourth choice** is a roof facing between northwest and northeast

Trees or other buildings must not shade the roof site. Keep in mind that as the seasons change, the sun changes its location in the sky. Areas that are clear in the winter might be shaded by tree and shrub growth in the summer. The sun appears lower in the southern sky during winter months, and higher during the summer months. A solar surveying device (such as the one sold at www.solarpathfinder.com) may help determine the best location for your solar collection setup.

Roof Angle (Pitch)

The roof should have a minimum angle of 10 degrees. This is sometimes referred to as 2 in 12.

If you have a flat roof or a very steep roof, a rack may provide a way to adjust the mounting angle. Please visit the FAFCO website for roof rack information.

Roof Size

The standard Hot$_2$O kit comes with 48 square feet of solar collector divided between two panels. Your roof will need a clear area measuring 6½'X14' for the solar collectors and associated fittings. Add 4½' to the width for each additional collector kit you install.

When measuring, keep in mind that the collectors may be oriented in any direction as long as there is minimum ¼ inch per foot tilt for drainage.

Your system requires roof penetrations for the supply and return tubing. Roof jacks are provided to seal the tubing penetrations. Each penetration will be located within 6-12" of 2 diagonal corners of your solar collector. Make sure you select a roof site that allows room for your collector AND your roof jacks!

The tubing penetrations on your roof should be located over an attic or crawl space that is not blocked by a beam, chimney or other obstruction. You will need to enter this area to run supply and return tubing between the solar collectors and your water heater area. Your attic or crawl space will need to allow the tubing run to slope at least ¼ inch per foot from the solar collector to your water heater.

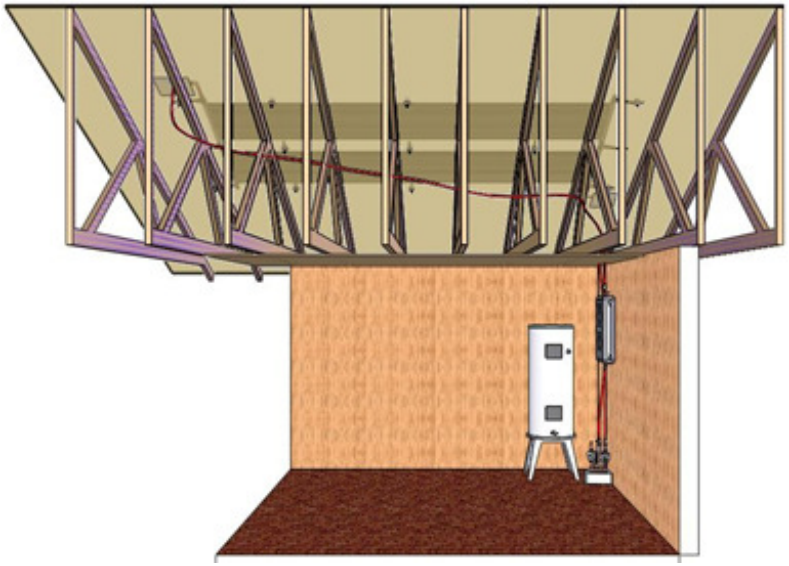
Item	Description
1	Solar Collectors
2	Lower Roof jack
3	Upper Roof jack
4	Collector Header Straps
5	Collector Body Straps

Tubing Run Planning

Now that you know the approximate location of your water heater, solar collectors, and your roof jacks, you can estimate the length of tubing you will need.

Estimate the distance from BOTH roof jack locations to your water heater. Take into account the vertical AND horizontal distance the tubing must run. Add an extra ten feet for a safety margin. The total is an estimate of how much tubing you will need for your installation.

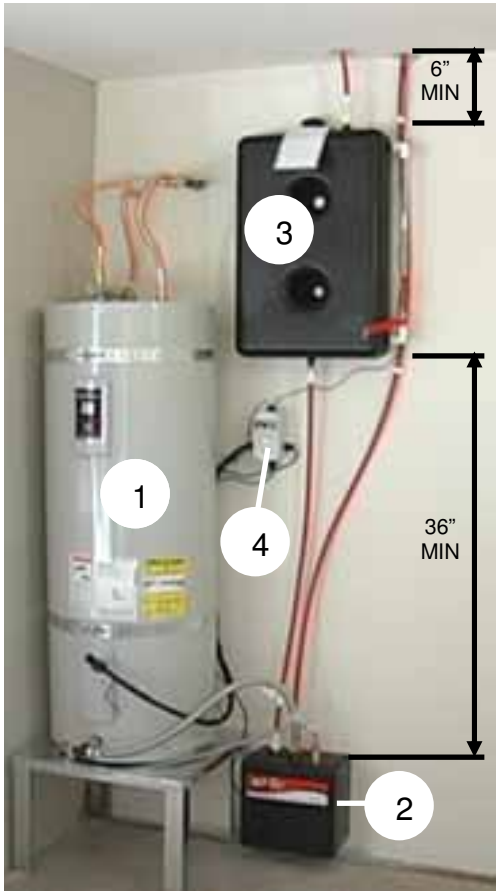
If your tubing runs need to go outside your building, make sure the tubing is covered with UV resistant material such as UV resistant tape or insulation wrap, or vinyl or metal downspout.



Example Tubing Run

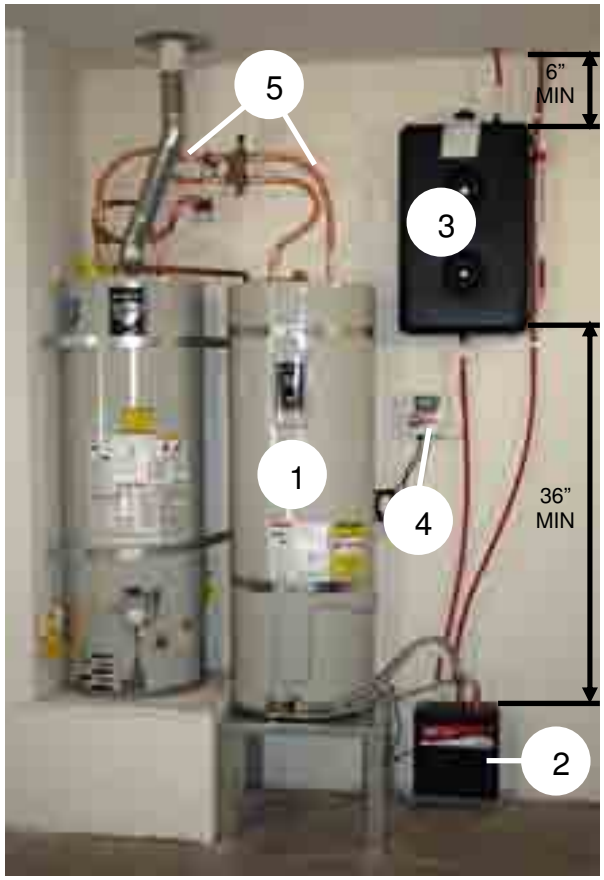
Solar Component Planning

The components for your Hot2o system will be hung on a wall in a 2½ - 3' wide space adjacent to your water heater or solar storage tank. These components are the drainback tank, circulation module, and controller.



Single Tank Electric

Item	Description
1	Water heater (Single Tank) Solar Storage Tank (Double tank)
2	Circulation Module
3	Drainback Tank
4	Solar Controller
5	Solar Storage Plumbing (Double Tank)



Double Tank Gas

SOLAR COLLECTOR INSTALLATION

Solar Collector Installation Overview

Installing your solar collectors correctly is extremely important for proper operation of your Hot$_2$O system. After reading the planning steps, you have a good idea of your proper roof type and correct collector location.

For the solar collector installation you will need:

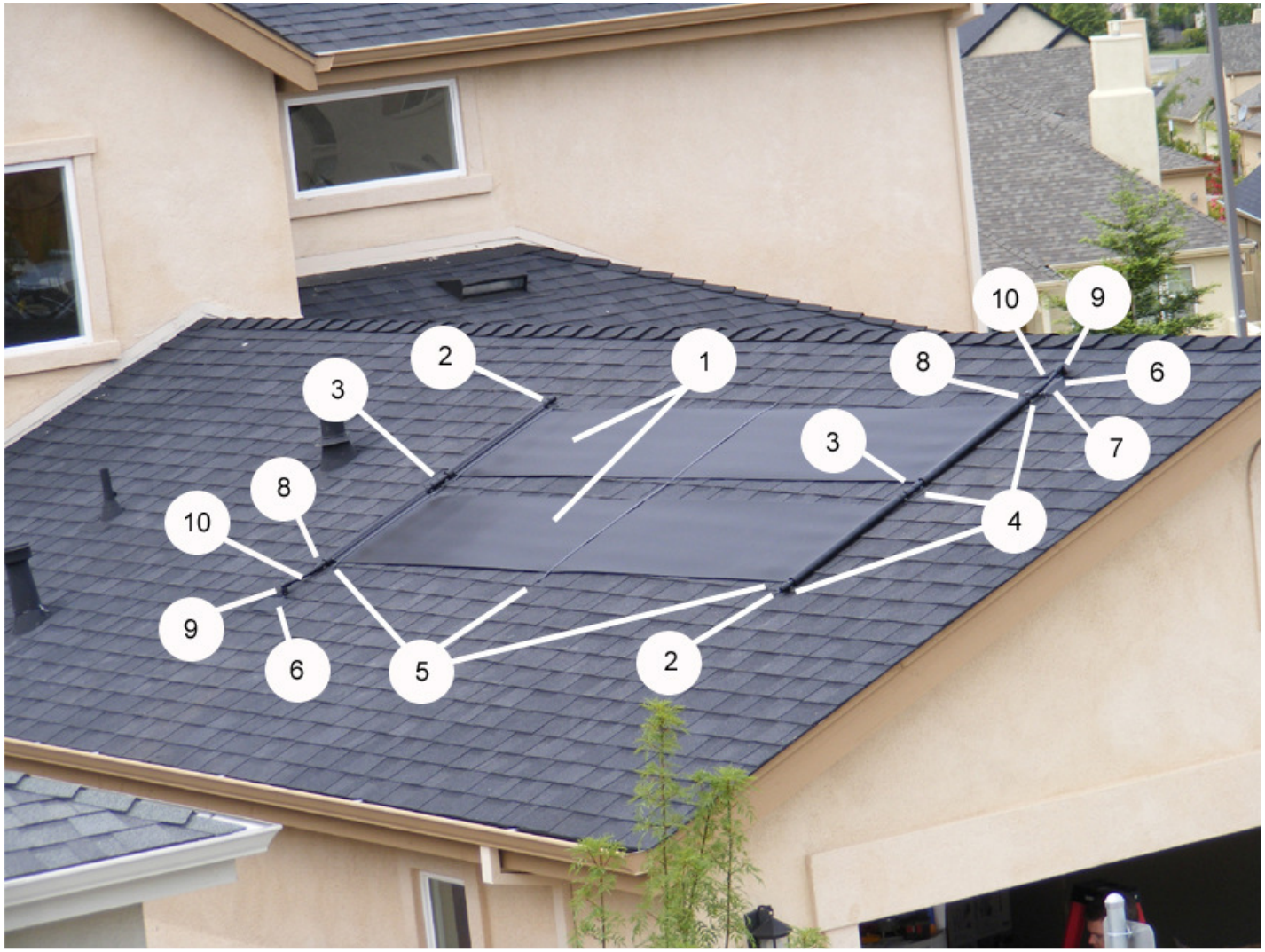
Tools

- Safety glasses (recommended)
- Knee pads (optional)
- Tape measure
- Marking tape
- 9/16 inch socket driver

Parts

- 2 Solar collectors
- 2 End caps
- 2 Header connectors (¾" Union)
- 17 Lag screws, ¼ inch by 2 inch
- 3 Body straps
- 3 Header straps

NOTE: The procedure included in this manual is for composition asphalt roofs. If you do not have a composition asphalt roof, look in the section titled "Other Roof Types" for additional information.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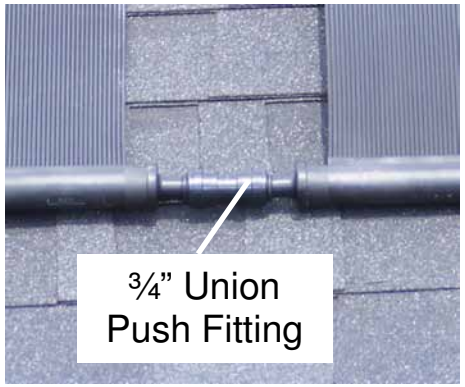
Item	Description	Comments
1	Solar collectors	Install with minimum ¼" per foot slope
2	¾" End Caps	
3	¾" Union Push Fittings	
4	Header Strap	Install on high end of collectors. Use roofing sealant with 2" lag screws
5	Body Strap	Install 2-4" from header and across center of panels. Use roofing sealant with 2" lag screws 1-2" from panel edge.
6	Roof Jacks	Seal with roof sealant and roofing nails
7	Roof Sensor	From Controller Box
8	¾" to ½" Reducer Push Fittings	Wrap with UV tape
9	½" Elbow Push Fittings	Wrap with UV tape
10	Tubing	Wrap with UV tape

Solar Collector Installation Instructions

1	Carefully carry the solar collector(s) onto the roof. Do not drag the solar collectors over a surface that could damage the plastic panels.	
2	Unroll collectors over the eave of your roof, allowing them to flatten out. On windy days, be careful during this step! Hold the collectors down if necessary!	
3	Connect the solar collector headers with the (2) ¾" union push fittings.	

4	Lay the collectors in place and mark the four corner locations.	
5	The roof jacks will be installed diagonally at the highest header end and lowest. Place the roof jacks in their approximate location. Make sure the roof is large enough to fit the collectors and both roof jacks.	
6	Install end caps on each header end opposite of roof jack locations	

6	Install the header straps on the higher collector header as follows: Start at the center and wrap header strap around union push fitting and apply roof sealant at the lag screw location 4-6 inches from header.	
7	Drive in the strap lag screw with a 9/16 socket. Use tin snips to cut off excess strap. Cover bolt with roof sealant.	
8	Repeat steps 6 and 7 for the two end header straps.	

9	Lay body strap across collectors, 2-4 inches from header. Apply roof sealant at lag screw location, 1-2 inches from collector edge.	
10	Drive a lag bolt through the strap (You can pre-drill a hole the strap if desired).	
11	Repeat steps 9 and 10 between the panels and at other edge. Cut off excess roof strap with tin snips. Cover all bolts with roof sealant.	

12	Install second body strap 2-4 inches from other header.	
13	Measure to center of collectors and install third body strap as before.	

Roof Jack Installation

The roof jacks are used to seal the tubing penetrations for the supply and return tubing that will eventually be connected to your collectors. Exercise care when installing to insure a good seal.

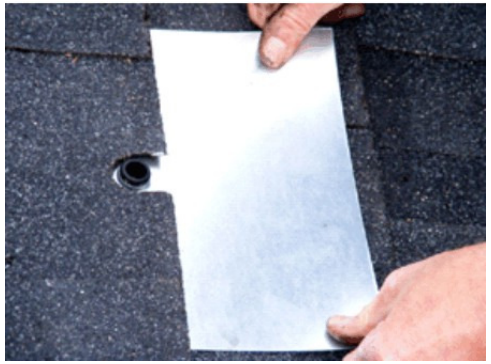
Tools

- Safety glasses (recommended)
- 1-1/4 " spade bit or hole cutter bit
- Caulk gun
- Tin snips
- Hammer
- Large putty knife

Parts

- 2 Roof jacks
- 1 Roof sensor (found in controller box)
- 1 Tube of roof sealant
- 12 Galvanized roofing nails, 1½ inch

1	Note: Install the upper roof jack first Place the roof jack over the measured marks. Mark the roof penetration location (middle of the roof jack).	
2	Move the roof jack. Drill a 1-1/4 inch roof penetration hole directly through the roof and into the attic or crawl space. If a truss blocks the hole, move 1-2 inches either direction and try again. The roof jack will cover the unused hole.	
3	Cut a notch in the roofing material as pictured.	

4	Place the roof jack in position over the hole and determine how far the roof jack needs to slide under the roofing material.	
5	Use a metal putty knife to pry up enough roofing material for the roof jack to slide under the tile.	
6	Test fit the roof jack by sliding up under the loosened roofing material. If the roof jack will not slide in place, trim to fit. Remove the roof jack.	

7	Drop the roof sensor wire through the upper roof penetration. Note: This step only applies to the upper roof jack.	
8	Place the roof jack back in position over the roof sensor to check for fit. The roof sensor should have enough lead to place it out of any potential shadows. Remove the roof jack.	
9	Apply sealant to the area under the loosened roofing material. Make sure to add enough sealant to firmly hold the roof jack in place.	

10	Apply sealant to the roofing material that will be covered by the roof jack. On the upper roof jack, make sure not leave gaps in the sealant around the roof sensor wire! Use enough sealant to hold the roof jack in place.	
11	Slide the roof jack under the loosened roofing material and into position. Press down firmly on the roof jack.	
12	Secure the roof jack in place using the roofing nails provided.	

13	Apply sealant to the area between the loosened roof material and the roof jack. Use enough sealant to seal the roofing material to the roof jack.	
14	Cover the exposed nail heads with roof sealant.	
15	Repeat steps 11 through 24 for the lower roof jack. Note:	

16	(Optional) You may paint the roof jacks to match your roof color, if desired.	

Other Roof Types

If your roof is not composition asphalt, you will need to determine the best mounting method. For roof surfaces that are not flat, racks such as the one described will support the solar collectors to reduce the chance of damage. If you are not sure how to mount the rack to your roof, consult an experienced roofer.

Metal Roofs

If the metal roof is installed on a plywood surface, you may proceed using the normal installation method. If the metal roof is installed on fir strips, the mounting hardware must penetrate into the fir strip to insure a good seal and to avoid bending the metal surface. If screw heads protrude above the surface of the roof, a substrate must be used to prevent damage to the panels.

Open Beam Roofs

Any ceiling with exposed beams must be checked to avoid the screw ends from penetrating into the interior space. Call FAFCO for alternate installation methods.

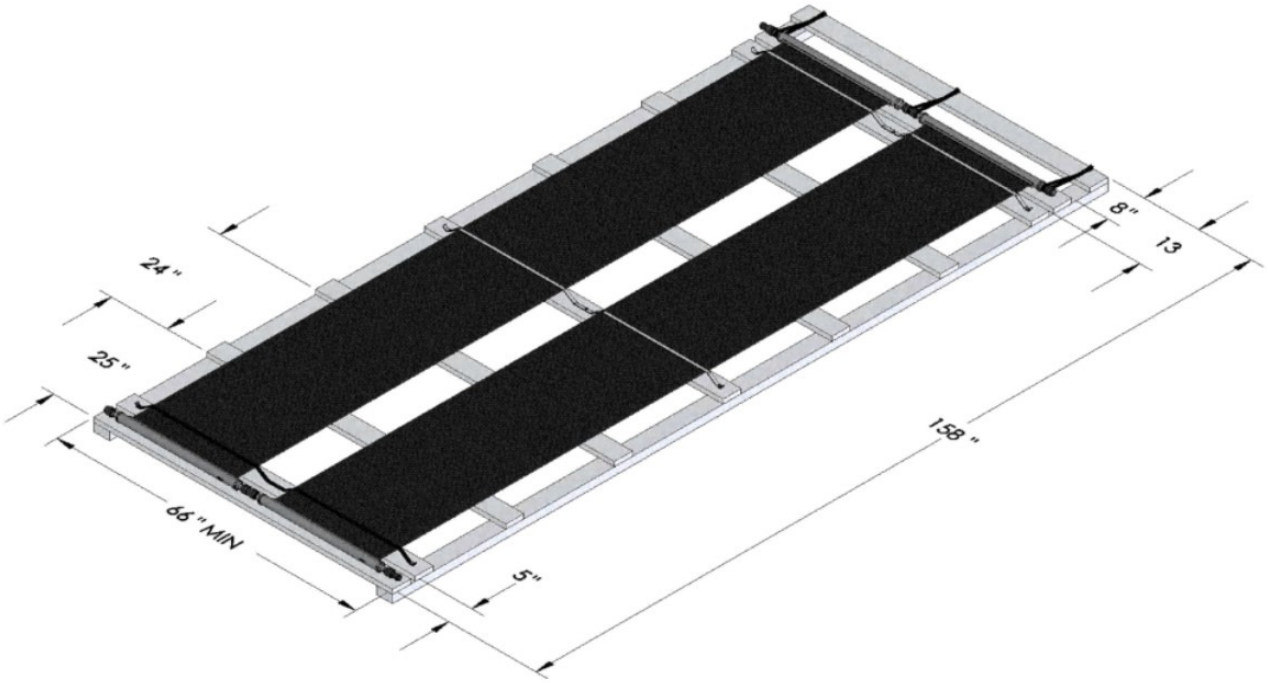
Rubber or Asphalt Modified

This type of roof is typically installed flat. Using a 2” to 2-1/2” fender washer under the mounting hardware will provide additional mounting surface. Be sure to use a generous amount of sealant under the washer, between the washer and the mounting hardware, and on top of the mounting screw.

Roof Rack

This is a suggested method for constructing a rack for mounting solar collectors to flat, tile, gravel, and shake roofs. Materials may vary, but FAFCO recommends galvanized steel framing, aluminum, PVC or ABS pipe (3/4-1" DIA). The object is to support the solar collector off the roof surface to avoid abrasion and conforming to roofing shape (barrel tile).

- Adjust width (66" MIN) to mount to attic trusses or barrel tile peaks.
- Mount to roof at minimum 6 locations, 1 in each corner and 1 in the middle of each side.
- Use appropriate screw for mounting directly to tile.
- Use lag screws to attic trusses when possible.
- For flat roofs, add approximately 28" length legs for vertical mount, 12" legs for horizontal mount at high end.



Note: FAFCO assumes no responsibility or liability for roof rack installation. FAFCO offers no warranty coverage for roof rack installation. Roof rack installation is the sole responsibility of the owner. FAFCO suggests contacting a licensed contractor for assistance, if necessary.

SOLAR COMPONENTS INSTALLATION

Solar Components Installation Overview

Tubing and push fittings are used in this section. Review the Installation Overview section as to their installation.

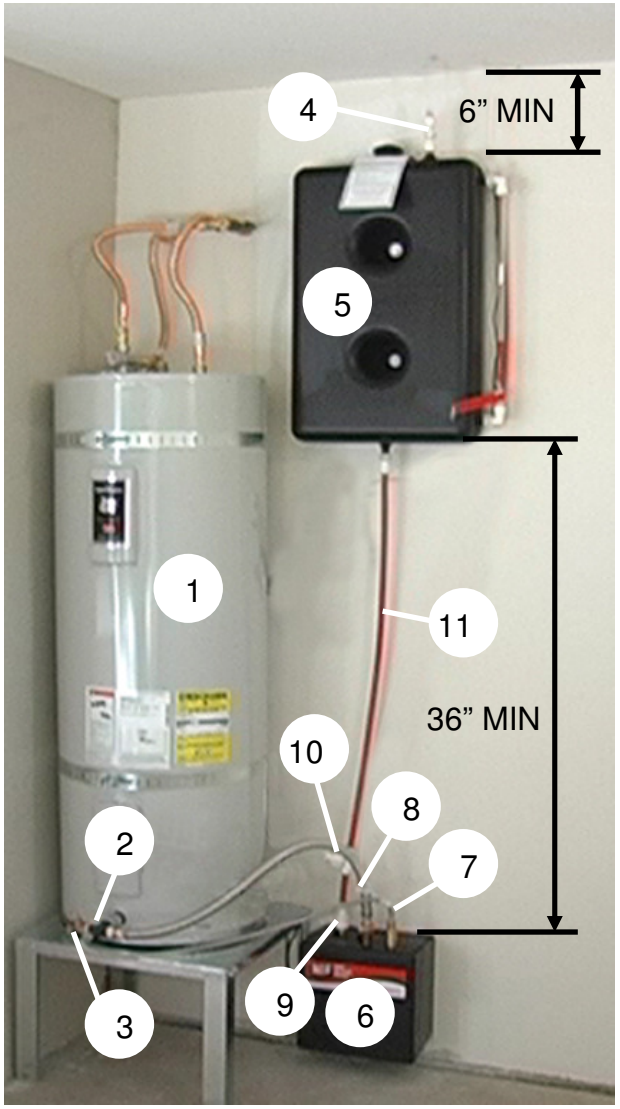
For the solar components installation you will need:

Tools

- Safety Glasses (Recommended)
- Sturdy Step Ladder
- Tape Measure
- Marking Pencil
- Power Drill
- 1/4 Inch Drill Bit
- 9/16” Socket
- 7/16” Socket
- 10 Inch Adjustable Wrench
- Pipe Wrench (Optional)
- Channel Lock Pliers
- #2 Phillips Screwdriver Or Bit
- Stud Finder
- Level

Parts

- 1 Drainback Tank
- 2 Lag Screws With Washers
- 1 Circulation Module
- 2 Lag Screws
- 1 Stainless Steel Flexible Hose, ¾ Inch Fip
- 1 Stainless Steel Flexible Hose, ½Inch Fip
- 1 Coaxial Tank Adapter
- 1 Roll Teflon Tape
- 1 Tube Pipe Thread Compound
- 2 Reducer Push Fittings (¾” To ½”)
- 1 Coupler, ¾” (As Needed)
- 1 Nipple, ¾” (As Needed)
- Tubing
- 1 Throttle Valve
- 1 Drain Valve



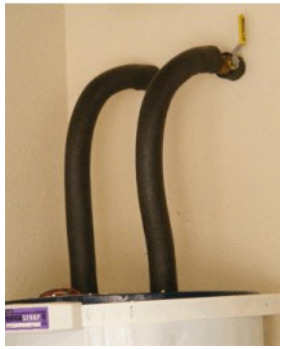
Item	Description	Comments
1	Existing Water heater (Single tank) OR Solar Storage Tank (Double Tank)	
2	Coaxial tank adapter	Be careful not to cross thread. Use Teflon tape and pipe thread compound when installing into tank.
3	Drain Bib	Use Teflon tape and pipe thread compound
4	Throttle Valve	
5	Drainback Tank	Mount to stud, minimum 6” from ceiling and 36” above Circulation Module
6	Circulation Module	Mount to stud on or above floor
7	½” Flexible Stainless Steel Hose	Teflon tape and pipe thread compound not necessary
8	¾” Flexible Stainless Steel Hose	Teflon tape and pipe thread compound not necessary
9	¾” to ½” Reducer	
10	Drain Valve	
11	Tubing	

SET STORAGE TANK IN PLACE

This installation step only applies to double tank Hot2O systems. If you have a single tank electric system, skip this step!

1	Assemble stand if needed to bring storage tank height within 6 inches of water heater height and set adjacent to water heater.	
2	Place water heater on stand and strap if required by local building code.	

Turn Off and Drain Water Heater

1	Make sure the water heater is OFF • Shut off the gas supply (gas water heaters) • Open the circuit breaker and verify with a volt meter at the top of the water heater (electric water heaters)	 
2	Shut the water heater inlet valve. This valve is usually a lever valve near the top, right-hand side of the water heater (shown shut).	
3	Shut off water to the home at the main water shutoff (shown open).	

4	Connect a garden hose to the drain connection at the bottom of your water heater. Make sure discharge end of the hose is in a safe place for hot water to flow. Slowly open the drain valve.	
5	As water heater is draining, open the pressure relief valve on the side or top of the heater. When heater is empty, remove hose, close drain valve, and relief valve	

Installing the Coaxial Tank Adaptor

For double tank setups, perform these steps on the storage tank.
For single tank setups, perform these steps on your existing electric water heater.

1	Carefully remove the drain fitting from the bottom of the unit.	
2	Inspect the open drain hole for rust or dirt. Clean if needed.	
3	Wrap the coaxial tank adapter threads with Teflon tape.	

4	Coat the coaxial tank adapter threads with pipe thread compound. This “double seal” prevents leakage from the coaxial connector!	
5	Install the coaxial tank adapter into the drain hole. Be careful not to cross-thread the adapter. Do not over tighten. The thichkness of water heater sidewalls vary. You may need to extend the coaxial tank adapter using the ¾” nipple and ¾” coupler provided. Use Teflon tape and pipe thread compound on all connections.	
6	Wrap the coaxial tank adapter drain threads with Teflon tape, and then coat the threads with pipe thread compound.	

7	Screw the new drain fitting onto the coaxial tank adapter.	

Mounting the Drainback Tank

1	Locate a wall stud near the desired drainback tank mounting position.	
2	Hold the drainback tank in place near the mounting site. The top of the drainback tank should be between 6 and 12 inches from the ceiling.	
4	Hold the drainback tank in place over the new mark. Raise the drainback tank straight upwards until the tubing (at the top) touches the ceiling. Mark the location where the tubing touches the ceiling. Make a second mark directly above the sight glass tube.	

5	Support the drainback tank such that the bottom fitting is off the floor. Pull tubing out about 6 inches and push on throttle valve.	
6	Push tubing back into drainback tank until end of tube touches the bottom of the tank.	
7	Move the drainback tank back to the correct mounting location. Drive the top bolt into the wall stud. Do not tighten all the way. **If you miss the wall stud, repeat your measurements!**	

7	Use a level to set the drainback tank straight.	
8	Drive the bottom bolt into the wall stud. Do not tighten all the way. **If you miss the wall stud, repeat your measurements!** Recheck that the tank is level. Finish mounting the drainback tank by tightening the mounting bolts (top and bottom).	

Installing the Circulation Module

1	Mark two hole locations 6-¾ inches apart on the wall along the stud at least 4” off the floor to the bottom location and 38” from the top location and the bottom of the drainback tank. Check for level and drive two lag screws leaving about a ¼ gap to the wall.	
2	Carefully set the circulation module onto the mounting bolts. Make sure the mounting is sturdy. If necessary, adjust the mounting bolts for a tight fit.	
3	Connect the flexible hoses to the threaded pipes on top of the circulation module. The flexible hoses only fit one way (small to small and large to large) Do not use Teflon tape or pipe thread compound on these connectors!	

4	Screw the supply side (larger) flexible hose onto the coaxial tank adapter opposite from the drain valve. Do not over tighten this connection! Do NOT use Teflon tape on this connection!	
5	Screw the return side (smaller) flexible hose onto the coaxial tank adapter. Do not over tighten this connection! Do NOT use Teflon tape on this connection!	
6	Push the ¾ to ½ inch reducer push fittings over the smooth pipes on top of the circulation module as shown.	

7	The pipe must be inserted to the indicated depth to ensure a good seal.	
9	Cut 6-8 inches of tubing and install on circulation module to connection marked “FROM BOTTOM OF DRAINBACK TANK.” Install drain valve. Cut length of tubing to install between drain valve and bottom of drainback tank and install.	

TUBING INSTALLATION

Tubing Installation Overview

Follow these instructions carefully! Good planning and careful measurements make your installation process much easier and MUCH SAFER!!

Tubing and push fittings are used in this section. Review the Installation Overview section as to their installation.

After completing the solar collector and solar components installations, you need to connect tubing between the two locations! There will be tubing runs in the following locations:

- From the solar collector headers to the roof jacks
- Inside the attic or crawl space from the roof jacks to the drainback tank and circulation module

Remember to maintain a ¼ inch per foot slope for complete draining of the system!.

If your tubing runs have to go outside your building, make sure the tubing is covered with UV resistant tape, or use some other method to protect the tubing. Examples of how to shield the tubing include UV-resistant insulation and tape, and vinyl or metal rain gutter.

This tubing is NOT UV resistant! Do not leave tubing in sunlight! Use UV tape to wrap all tubing and tubing connectors that are exposed to sunlight!

Tubing Installation Tools List

Tools

- Safety glasses (recommended)
- Sturdy step ladder
- Tubing cutter
- Tape measure
- Marking pencil
- Power Drill
- 1” Hole saw or paddle bit
- #2 Phillips screwdriver or bit
- Pliers
- ¼” Drill Bit

Parts

- 1 tubing roll (80 feet)
- 8 Tubing clips
- 8 screws
- Zip ties (in controller box)
- 1 Two-Lead cable for Sensor (50 feet). Located in controller box. for the single tank kit, this lead is attached to the controller.
- 1 Splice, Located in controller box
- 2 Reducer push fittings (¾” to ½”)
- 4 elbow fittings
- UV-resistant tape

Example Tubing Run From Upper Roof Jack

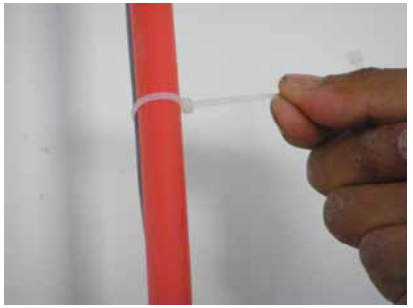
Tubing Installation Instructions

1	Drill two 1-inch holes through the ceiling at the previously marked locations above the drainback tank.	
2	Push tubing up through hole on right.	
3	In attic, pull enough tubing through hole to reach the lower roof jack.	

4	With helper on roof, push approximately 1 foot of tubing through the lower roof jack penetration. Tubing may be lubricated with silicon grease or water.	
5	Install tubing clip up by the roof jack and clip tubing in place.	
6	Continue installing clips every 3 to 4 feet maintaining a minimum slope toward the ceiling penetration of ¼" per foot.	

7	Cut tubing to length to connect to the circulation module at outlet marked “TO SOLAR COLLECTOR AT CLOSEST BOTTOM HEADER”.	
8	Slide tubing flange over tubing up to ceiling.	
9	Install to circulation module.	

10	Push tubing through ceiling hole on left and repeat steps 3-6 for the right ceiling hole to upper roof jack tubing run.	
11	Cut tubing to length, push tubing flange on tube and connect to throttle valve. . Remember to measure against valve to the indicated mark before cutting.	
12	Drill a ¼” hole about 1½-2” from the right ceiling hole.	

13	Push the two-lead roof sensor wire through. For single tank setups, this wire is attached to the solar controller.	
14	Pull wire into attic. Strip of about 1 inch of jacket to expose leads. Cut off stripped ends of roof sensor wire and splice to the roof sensor wire. Make sure wires are fully inserted before clamping closed.	
15	Zip tie the sensor cable to the tubing every 3 to 4 feet for support.	
16	Cut about four feet of tubing and take it to the roof.	

17	Install ¾ to ½ inch reducers on the collector headers at roof penetrations.	
18	At the lower roof jack, cut penetrating tubing to 4 inches. Install elbow connector.	
19	Cut a length of tubing to reach between elbow and connector on collector. Remember to measure against connectors to the indicated marks. Install tubing.	

20	Push tubing back through the roof jack until elbow is flush. Wrap exposed tubing and connectors with UV-resistant tape.	
21	Repeat steps 15 through 18 at upper roof jack location.	
22	Use roof sealant to affix roof sensor to roof. The roof sensor should not be placed in a shadow!	

SOLAR STORAGE TANK ADD-ON KIT INSTALLATION WITH ANTI-SCALD KIT

Double tank setups require modifications to your water heater plumbing.

Tools

- Safety glasses (recommended)
- Adjustable wrench
- Channel lock pliers

Parts

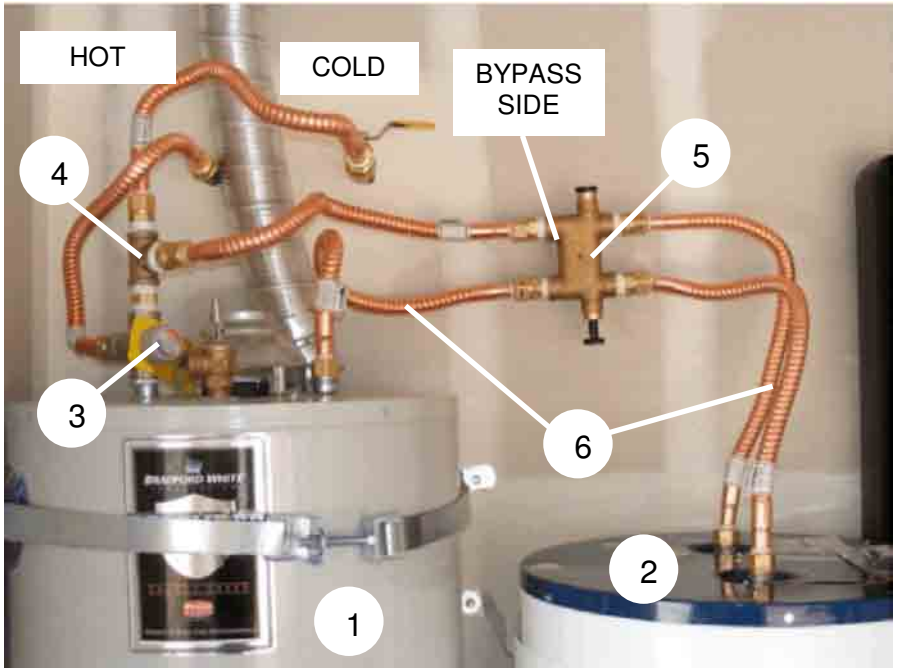
Solar Storage Add-on Kit PN 730

- 1 By-pass valve
- 4 Copper flex hose with adaptors
- 1 Compression to ¾" NPT adaptor (if needed)
- 3 Dielectric ¾" nipples

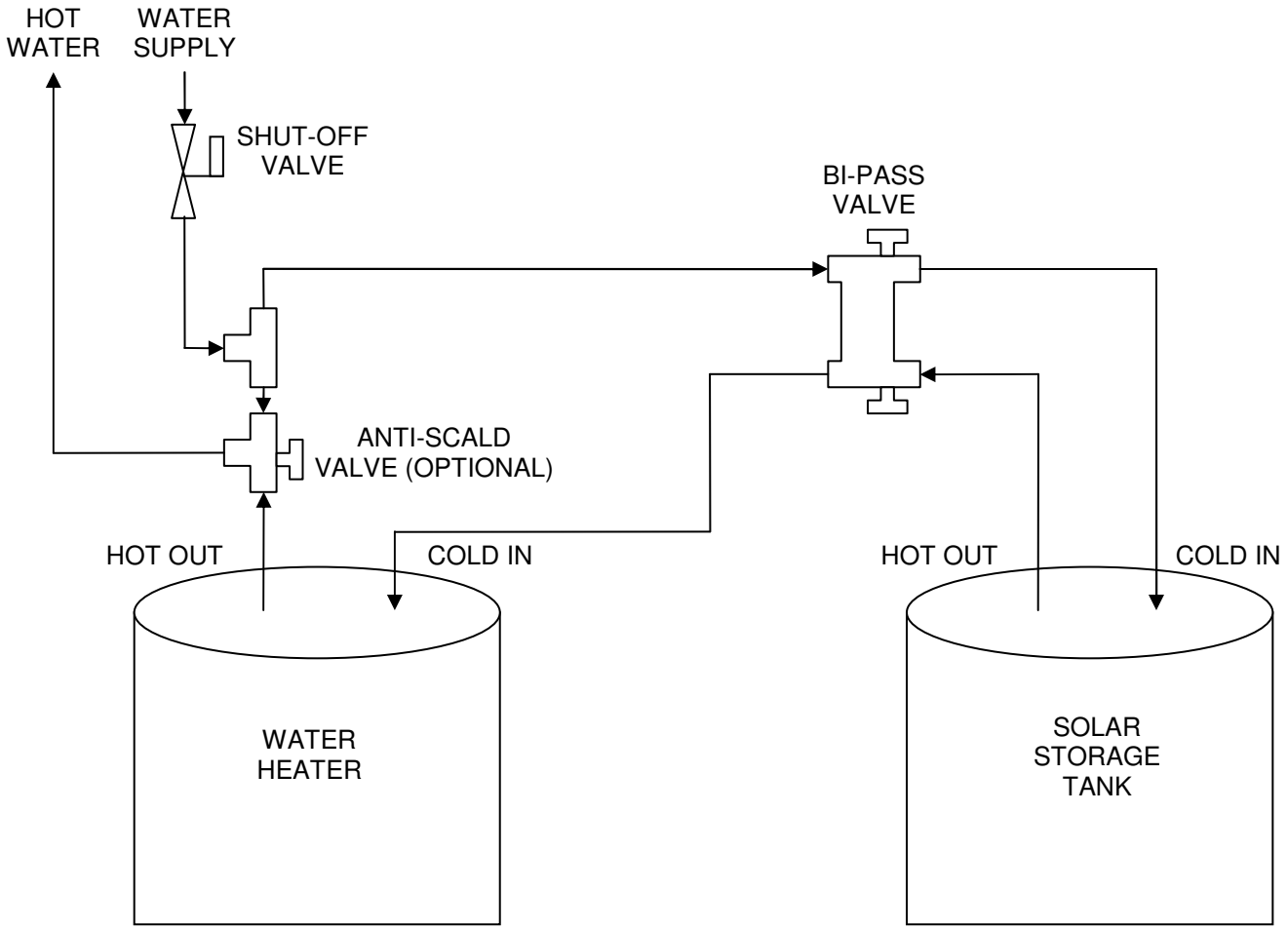
Anti-scald Kit PN 733

- 1 Anti-scald valve
- 3 Copper flex hose with adaptors
- 1 Brass tee, ¾"
- 2 Nipple, ¾"
- 2 Dielectric nipple, ¾"
- 1 Compression to ¾" NPT adaptor (if needed)
- Teflon Tape
- Pipe thread compound

Solar Storage Tank Add_on Kit with Anti-scald Kit



Item	Description	Comments
1	Existing Water Heater	
2	Solar Storage Tank	
3	Anti-Scald Valve	
4	Brass Tee	
5	Bypass Valve	Note orientation. Black valve actuator is on storage tank side.
6	Copper flex hoses with adapters	



Plumbing Connections with Anti-Scald Valve

All pipe thread connections need to be wrapped with Teflon tape and coated with pipe thread compound, all copper flex hose connections do not.

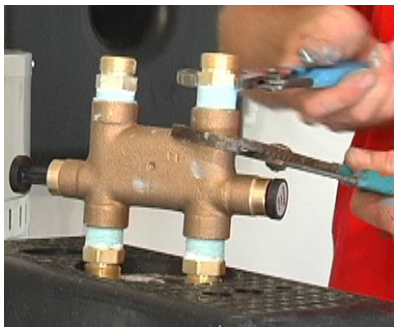
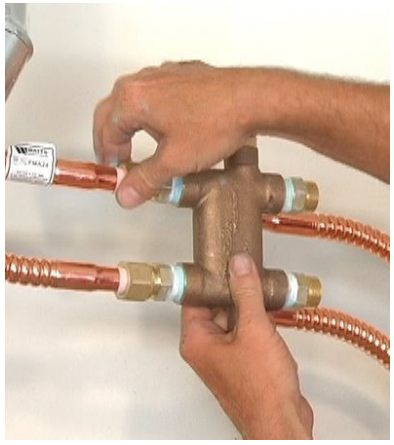
1	Remove heater vent and vent cap from the water heater (gas only)	
2	Disconnect the water heater hoses. Replace if needed.	
3	Check the nipples in the water heater and replace if they are not dielectric. Use Teflon tape and pipe thread compound	

4	Remove the adapters from the copper flex hoses	
5	Wrap the hot water out from the water heater with Teflon tape, coat with pipe thread compound and install anti-scald valve, connection marked “H”.	
6	Wrap pipe thread side of adapter with Teflon tape and coat with pipe thread compound. Install on “MIX” side of anti-scald valve.	

7	Attach hot water hose to “MIX”.	
8	Wrap threads of ¾” nipple with Teflon tape and coat with pipe thread compound. Install on “C” side of anti-scald valve.	
9	Wrap exposed threads on nipple with Teflon tape and coat with pipe thread compound. Install ¾” brass tee.	

10	Wrap pipe thread side of 2 adapters with Teflon tape and coat with pipe thread compound. Install on both sides of brass tee.	
11	Connect cold water in hose to one side of brass tee.	
12	Connect copper flex hose to other side of tee.	

13	Install copper flex hose on cold water inlet to water heater.	
14	Replace heater vent cap	
15	Replace heater vent	

16	Prepare 4 adapters with Teflon tape and pipe thread compound on pipe threads. Install into bypass valve	
17	Install 2 copper flex hoses on the solar storage tank	
18	Note the orientation of the bypass valve. The black valve actuator is on storage tank side. Attach copper flex hose from the brass tee to the top of the bypass valve and the copper flex hose from the water heater cold inlet to the bottom of the bypass valve.	

19	Attach the copper flex hoses from the solar storage tank to the other side of the bypass valve such that the hot water out goes to the cold water in of the water heater.	
20	Make sure all connections are tight.	

If you have any questions or concerns about your plumbing, please contact a licensed plumber for assistance!

A local, licensed professional will be able to help with plumbing connections as well as any building code concerns.

SOLAR CONTROLLER INSTALLATION

Solar Controller Installation Overview

The Solar Controller shipped with your base kit is different depending on whether you chose the solar storage tank option used with gas or electric water heaters, or are installing directly into your electric water heater.

If you are installing into your electric water heater, the controller shipped with your base kit (PN 760) has the ability to control the bottom heating element in the water heater. This unit is factory set to allow the element to operate from 7:00pm to 5:00am daily every day. The controller also monitors the roof temperature and the tank temperature to determine the operation of the solar system.

The controller shipped with base kit for the solar storage tank option (PN 760-1) monitors the roof temperature and the tank temperature to determine the operation of the solar system.

Single Tank Solar Controller Installation for Electric Water Heater, base kit PN 760

- TURN OFF ALL POWER TO THE ELECTRIC WATER HEATER
- Mount the controller
- Remove and modify the water heater lower access cover
- Install heating element bypass wiring
- Install a heater tank temperature sensor

Tools

- Safety glasses (recommended)
- #1 Phillips screw driver
- #2 Phillips screw driver
- 7/8” Hole saw
- Drill motor

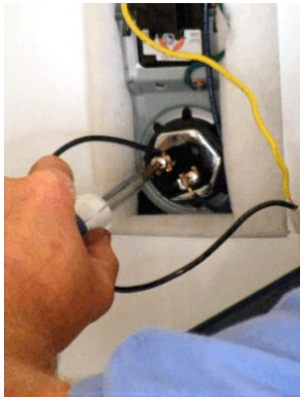
Parts

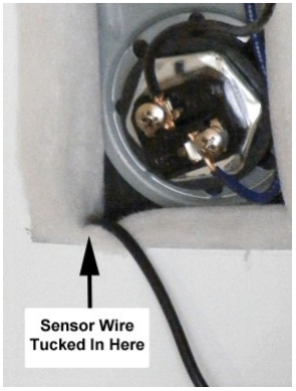
- 1 Controller
- 4 Mounting screws

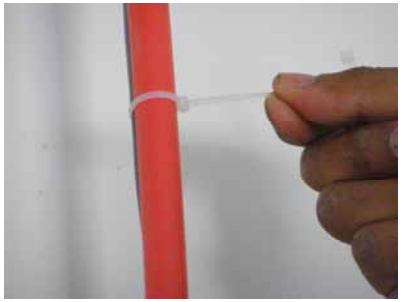
TURN OFF ALL POWER TO THE ELECTRIC WATER HEATER

1	Mount the solar controller onto the wall or on the water heater.	
2	Remove the lower element access cover plate. Remove insulation and plastic cover.	
3	You need to drill a hole in the cover plate. To determine best location for the hole, hold the cover plate next to the wiring and mark the desired hole location with your finger.	

4	Drill a 7/8 inch hole in the cover plate.	
5	Remove connector from leads and mounting nut and washer from conduit	
5	Insert the wiring end of the conduit through the hole and fasten conduit to cover plate.	

6	Find the wire that connects the thermostat to the heater element and disconnect at the element.	
7	Insert the wire you just removed into the connector at the end of the black wire coming out of the controller conduit and tighten screw to secure	
9	Attach the black wire coming from the controller conduit to the open terminal of the heater element.	

10	Locate the sensor labeled “2” attached to the controller	
11	Insert in the water heater underneath the insulation to allow good contact with the tank wall.	
12	Replace the lower heater access cover plate. Be careful not to pinch or cut the sensor wire.	

13	Use zip ties as needed to route sensor wires from the heater and the roof sensors.	
	Plug the controller into a 120-volt outlet. Extension cords are okay.	
15	After going through a startup sequence, the display will show the temperature at the roof, t-1. To display the temperature at the tank, use the down arrow to select t-2. Press and release “SET” to view the time and day of week. If “Er1” is displayed, check the connection to the roof sensor, if “Er2” is displayed, check the connection to the tank sensor.	
	DO NOT PLUG CIRCULATION MODULE INTO CONTROLLER UNTIL YOU HAVE FILLED YOUR WATER HEATER AND DRAINBACK TANK!!	

Double Tank Solar Controller Installation Gas or Electric With Solar Storage Tank, Base Kit PN 760-1

- Mount the controller
- Install the water heater temperature sensor
- Splice or strip roof and heater sensor wires
- Connect sensor wires into controller

Tools

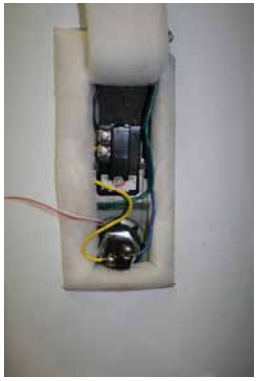
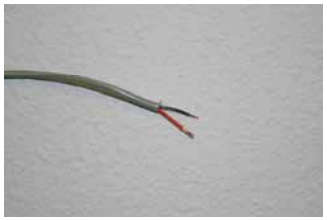
- Safety glasses (recommended)
- #2 Phillips screw driver
- 7/8” Hole saw
- Drill motor
- Wire stripper/cutter
- Pliers

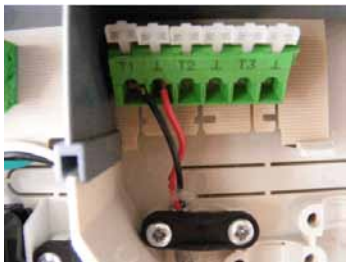
Parts

- 1 Controller
- 3 Mounting screws
- 1 Splice

Double Tank Solar Controller Installation Instructions

1	Remove cover plate from the controller and mount the solar controller onto the wall or on the solar storage tank.	
2	Remove the lower access cover plate from the storage tank. Remove insulation and plastic cover.	
3	Locate the tank sensor in the controller box.	

4	Insert in the water heater underneath the insulation to allow good contact with the tank wall. Run the end of the sensor wire out the bottom or side of the access opening.	
5	Strip jacket on sensor wire back about 1 inch. Cut off stripped ends of sensor leads and splice to sensor wire. Insert wires as far as they will go into splice before clamping closed.	
5	Cut both the roof sensor and tank sensor wires to length such that they can enter through the bottom of the controller Strip off about 1 inch of jacket exposing the individual wires. Strip about ¼ inch of the insulation off each wire.	

6	Attach the ROOF SENSOR wires in the terminal block connectors for T1. Use a small screwdriver to push the white tab up, then insert the wire into the terminal and release the tab. It does not matter which side is red and which is black.	
7	Repeat the process to connect the storage tank sensor to the “T2” terminal.	
8	Replace the controller cover plate and Plug the controller into a 120-volt outlet. Extension cords are okay.	

10	The display shows the temperatures at the roof or at the tank. Use the arrow buttons to toggle between the two.	
11	If the display does not show a temperature when T1 is selected, check the connections to the roof sensor. Likewise, when T2 is selected and not temperature is displayed, check the tank sensor connections.	
	Note: Instructions for operating the controller are in the controller box!	

DO NOT PLUG CIRCULATION MODULE INTO THE CONTROLLER UNTIL YOU HAVE FILLED YOUR WATER HEATER AND DRAINBACK TANK!!

SYSTEM STARTUP

The installation process is ALMOST complete! Follow these steps to start up your system.

1	Remove the aerator screen from a faucet in the home and turn on the hot water. Alternatively, open the hot water on a bathtub faucet,	
2	Open main water valve to house.	
3	Open water valve to Water Heater.	

4	Check your plumbing for leaks and repair as needed.	
5	Keep faucet open until air is purged.	
6	Turn on water heater For electric water heater, turn circuit breaker on For gas water heater, turn on gas and follow the instructions on your water heater to light pilot.	 
7	Fill drainback tank to top of sight glass. For additional freeze protection, add three gallons of non-toxic propylene glycol prior to filling the drainback tank with water.	

8	Inspect tank fittings for leaks and tighten if needed.	
9	Plug circulation module directly into a 120VAC outlet and check for audible operation of circulation module pumps Within 5 minutes, the water level in the drainback tank will stabilize.	
10	Inspect all connections including those on the roof for leaks and repair as needed.	 

11	Plug circulation module into the solar controller.	 
12	Single Tank Set time and day of week using supplied instructions	
13	Double Tank Set switch on side of controller to AUTO (middle position).	

Remember: The Hot$_2$O website has links to information on energy rebates and tax credits!

SYSTEM MAINTENANCE

Maximizing Energy Savings

This system is designed to operate automatically. However, due to weather variation and different amounts of sunlight available throughout the year, the savings will vary from month to month. It is possible to maximize energy savings by scheduling large hot water usage (such as laundry and dishwasher) for the afternoon.

Turning the Solar System Off

In the unlikely event of a problem, it is possible to turn the solar system off while still allowing the water heater to provide hot water for the house. Set the solar controller to “manual off” (double tank) or disconnect the power cord to the circulation module.

Completely Draining the System

If it is necessary to drain the system for service, turn the system off. Install a 5/8” outside diameter tube or equivalent to the drain valve above the circulation module and let the water drain to a safe location outside.

Controller Working Properly (Monthly Check Up)

The solar system uses an automatic controller that turns the solar system on when there is adequate solar energy to capture. To ensure that your solar collectors are turning on during sunny conditions, and not during nighttime, check on a hot day around noon to make sure your system is on. Then check to ensure the system is off at night.

Water Level (Monthly Check Up)

Check your water level when the solar collector is active. The water level should be above the minimum indicator on the drainback tank sight glass. If water is needed, turn off the system first and allow the water to drain into the drainback tank before adding water.

Plumbing on Roof (Every Other Month)

Every other month it's advisable to inspect the tubing and push fitting connections on the roof to ensure they are still adequately protected from sunlight exposure. Insulation can deteriorate and animals or debris can damage it or remove it completely thereby reducing the efficiency of the system and leaving the underlying components vulnerable to damage. If there are any parts of the tubing or push fittings exposed to sunlight, cover them up with additional insulation and UV resistant tape.

Roof Jacks (Before the Rainy Season)

Inspect the roof jacks to make sure they still appear to have a watertight seal. Add polyurethane caulking if there is any chance of water getting around the roof jack.

If you have any questions about your Hot$_2$O system maintenance,
visit our website for assistance!!!

OPTIONAL KITS

PN 731 Solar Collector Add-on Kit

The Solar Collector Add-on Kit adds 48 square feet of collector to your system. It comes with everything you need to add on to an existing system.

Includes:
(2) 2'X12' solar collectors
(4) ¾" union fittings
(3) collector body straps
(3) collector header straps
(12) 2"X¼" lag screws
(1) roof jack
(1) roof jack plug
(1) drainback tank
(4) 90º ½" elbow push fittings
(2) ½" tee push fittings

PN 733 Anti-Scald Valve Kit

This option adds additional protection against accidental scalding hot water getting to your faucets. The kit provides an adjustable maximum hot water temperature between 120°F and 145°F.

Includes:
(1) anti scald mixing valve
(3) 2' long ¾" copper flex hoses
(1) ¾" brass tee
(2) ¾" brass nipples
(2) ¾" dielectric nipples
(2) ¾" compression to ¾" NPT adapters
(1) roll Teflon tape

PN 730 Solar Storage Tank Add-on Kit

Use this kit with a solar storage tank to increase your hot water capacity.

Includes:
(1) bypass valve
(4) 2' long ¾" copper flex hoses
(3) ¾" dielectric nipples
(1)) ¾" compression to ¾" NPT adapter

SYSTEM TROUBLESHOOTING

Problems with your Hot$_2$O system usually fall into two categories:

- Problems with Flow
- Leaks

Problems with flow

The controller doesn't seem to turn on the pumps

Verify the temperature difference between the roof and the tank is greater than 10ºF.

Check that circulation module is plugged into the controller.

Verify the controller has been properly programmed.

Check the pumps and verify that they are running. Open the circulation module and touch the pump housing to verify they are warm or hot. You should feel a slight vibration or hear a slight hum. You can also use a voltmeter to check for power to them.

The water level in the drainback sight glass does not drop when the solar heater is active

Verify that the circulation module is plugged into the controller.

Use a voltmeter or power sensor to check for power to circulation module outlet on the controller.

Indication of solar-side pump failure, contact FAFCO Inc.

I'm not getting hot water

Verify that the controller is properly set. Refer to the section on setting the controller.

Try adjusting the anti-scald valve to allow for hotter water. This is often the cause.

The solar collector(s) will heat the tank best during clear sky days in the summer, late spring, and early fall. Adding additional solar collectors will increase performance.

You may need a bigger tank or a second solar storage tank.

If necessary, turn up the thermostat(s) on your water heater. Refer to your water heater instruction manual for proper thermostat adjustment and setting.

For single tank electric tanks, verify that the bottom element is activated or solar is providing sufficient heat during large draws.

Problems with water leaks…

Tubing and fitting leaks

Make sure that the tubing is fully inserted into the fittings. If leak persists, remove fitting and check tubing damage and end is cut square.

Solar Collectors Leaks

Verify that the leak is not rain or condensation dripping from the solar collectors.

Leak repair kits (PN 262) are available to repair panel leaks that can occur in the solar collectors.

Drainback Tank Leaks

Inspect and tighten fittings.

Circulation Module Leaks

Open case and inspect and tighten fittings.

If you have any questions about troubleshooting your Hot$_2$O system, visit our website for assistance!!!

WARRANTY INFORMATION

LIMITED THREE-YEAR WARRANTY FOR THE FAFCO SOLAR WATER HEATER
by FAFCO INCORPORATED (FAFCO)
435 Otterson Drive, Chico, California 95928, Phone (530) 332-2100

1. SCOPE OF COVERAGE:

   This warranty applies only to new SDHW solar systems manufactured by FAFCO and installed according to the FAFCO manual and instructions at a premises owned by the consumer/buyer. This warranty applies only to systems installed at a residence.

2. IDENTITY OF WARRANTOR AND WARRANTEE:

   The warranty is extended by FAFCO and is extended only to the original consumer/buyer of the solar collector. This warranty is not assignable and applies only to the original buyer. This warranty terminates upon the sale by the buyer of the premises at which the system was installed.

3. FAFCO'S WARRANTY: LIMITED THREE-YEAR WARRANTY ON SOLAR COLLECTOR, ONE YEAR ON SYSTEM COMPONENTS:

   A. The SDHW solar collectors are warranted to be free from defects in materials and workmanship under normal use and with normal service for the heating of domestic hot water for three (3) years from date of purchase, subject to the terms, conditions, and limitations described herein.

   B. All other components of the FAFCO HOT2O system are warranted to be free from defects in materials and workmanship under normal use and service for the heating of domestic hot water for

one (1) years from date of purchase, subject to the terms, conditions, and limitations described herein.

FAFCO's responsibility for any covered defect during the warranty period shall be limited to the replacement of the defective parts as described below.

4. WHAT IS NOT COVERED:

A. EXCLUSIONS: The above warranty does not apply:

1. To conditions resulting from a defect in a component or part which is not part of the FAFCO collector or system.

2. To conditions resulting, directly or indirectly, from any failure to comply with FAFCO's manual or any of FAFCO's installation or operating instructions.

3. To any conditions, defects, or loss of function, including without limitation internal freezing, resulting directly or indirectly from any failure to perform all reasonable and necessary maintenance and repair in accordance with FAFCO's operating and maintenance instructions.

4. To any conditions, defects, or loss of function resulting from any misuse, abuse, neglect, accident, or alterations.

5. To fading and minor deterioration of exterior surfaces resulting from exposure to the elements, except to the extent that such conditions have a material effect on the system's performance.

B. NO WARRANTY OF PERFORMANCE OF THE SOLAR COLLECTORS AND SYSTEM: FAFCO makes no warranty as to the level of performance of its solar collectors, or as to any particular temperature or level to which the water will be heated. Actual performance will depend upon the amount and intensity of sunlight and other variable factors that FAFCO does not predict and that are beyond FAFCO's control. The performance of the system is heavily dependant upon latitude, related weather conditions, the condition of the roof and other factors.

C. LIMITATIONS ON EXCLUSION FROM COVERAGE: The above warranty shall not apply to conditions that may occur in the normal operation of the system.

5. SOME THINGS BUYER MUST DO

A PROPER INSTALLATION: The system installation must be performed according to the instructions included with the product. The manual is an integral part of FAFCO's SDHW solar systems warranty. Noncompliance with the manual or improper installation will void the buyer's warranty rights. When installing the system the user must consult local codes for applicable standards in all applications.

B. ROUTINE MAINTENANCE: The Buyer must perform all reasonable and necessary maintenance and repair in accordance with FAFCO's operating and maintenance instructions. Noncompliance with this maintenance and repair obligation will void the buyer's warranty rights.

C. KEEPING FAFCO INFORMED: If the buyer believes or becomes aware that any warranted component or part is not functioning properly, the buyer must promptly notify FAFCO. Early attention to a minor problem may help avoid serious problems later. A failure to report a problem on a timely basis may void the buyer's warranty rights.

6. REPLACEMENT:

If FAFCO determines that a defect in material or workmanship that is covered by this warranty has occurred during the warranty period, then, subject to the limitations set forth herein FAFCO will send a replacement unit or components to the original purchaser.

7. NO OTHER EXPRESS WARRANTIES - THESE REMEDIES ARE EXCLUSIVE:

With the sole exception of the express warranty set forth above, FAFCO grants no further warranties and FAFCO neither assumes nor authorizes any third party to establish any other obligations or liability in connection with its products.

NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY FAFCO, ITS DEALERS, DISTRIBUTORS, AGENTS OR EMPLOYEES WILL CREATE A WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THE WARRANTY SET FORTH HEREIN, AND BUYER MAY NOT RELY ON ANY SUCH INFORMATION OR ADVICE. FAFCO HEREBY DISCLAIMS ANY WARRANTIES, WHETHER EXPRESS OR IMPLIED, OF ANY KIND, INCLUDING WITHOUT LIMITATION ANY WARRANTIES REGARDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, WHICH WARRANTIES ARE SPECIFICALLY WAIVED BY BUYER. IN NO EVENT SHALL FAFCO OR ANY OF ITS AGENTS, DEALERS, DISTRIBUTORS OR EMPLOYEES BE LIABLE FOR FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL DAMAGES, INCLUDING ANY LOST PROFITS, INJURY TO GOODWILL, OR LOST SAVINGS DAMAGE TO PROPERTY, OR ANY OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, OR DAMAGES FOR PERSONAL INJURY, RESULTING DIRECTLY OR INDIRECTLY TO BUYER OR ANY OTHER PERSON FROM THE POSSESSION, OWNERSHIP, OR USE OF THE PRODUCT OR SYSTEM OR PARTS DEEMED TO BE DEFECTIVE, EVEN IF FAFCO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR ANY BREACH OF THE ABOVE EXPRESS WARRANTY, FOR NEGLIGENCE OR

OTHERWISE. THIS LIMITATION SHALL APPLY WHETHER A CLAIM ARISES IN CONTRACT, TORT, STRICT LIABILITY OR OTHERWISE. FAFCO'S MAXIMUM LIABILITY TO BUYER, WHETHER ARISING IN CONTRACT, TORT, STRICT LIABILTIY OR OTEHRWISE SHALL NOT EXCEED THE AGGREGATE AMOUNT OF PAYMENTS RECEIVED BY FAFCO FROM BUYER UNDER THIS AGREEMENT.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so this exclusion or limitation may not apply to you. The above warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

IF YOU HAVE ANY QUESTIONS ABOUT YOUR HOT$_2$O SYSTEM WARRANTY,

VISIT OUR WEBSITE FOR ASSISTANCE!!!