

HELIOL 2009
Revised 04/09



Before attempting installation, read these instructions carefully. This manual contains easy to follow step-by-step procedures to properly install a Heliocol system. A little time spent understanding the system and its parts will assure a successful, trouble-free installation. If you have any product or installation questions regarding this installation, contact your Heliocol Representative. When working on or around your roof or pool, please take care to avoid hazards such as electrical wires and loose shingles. CAUTION! Safety comes first!

NEW FLORIDA WIND CODE REQUIREMENTS

Heliocol installations have a tremendous advantage over monolithic panel installations in terms of fulfilling the new Florida Wind Load Code Requirements adopted by the State of Florida in January, 2001. In order for your installation to comply with this new code, be sure to refer to the FLWC Installation Manual Addendum. Your Heliocol representative can provide you with this.

It is important to recognize that this manual outlines the recommended installation methods and practices as prescribed by the factory. It is designed to aid a seasoned contractor or novice do-it-yourself individual while providing optimum protection for the products. It is not designed to override any local codes or ordinances. Also, these are the minimal requirements; additional hardware or protection may be required in hazardous environments or in areas subject to extremes of weather or microburst climate events. In those areas, the local expertise of the contractor may be relied upon in coordination with factory approval for special installation considerations.



Introduction

WELCOME TO THE HELIOCOL FAMILY

Heliocol Solar Panels are manufactured utilizing state of the art solar technology and the most advanced production techniques. Heliocol collectors are sleek and simple, yet the patented over-molded design makes Heliocol durable enough to last a lifetime. However, a professional installation is very important to the overall success of a system. Installed properly, a Heliocol System will be virtually maintenance free as it captures free, abundant and reliable heat from the sun year after year. Whether you are a seasoned contractor or a homeowner installing your own system, this manual will give you a great deal of valuable information.

Take time to read through this manual. It will guide you through the most efficient way to correctly install a Heliocol Solar System. By following this step by step guide, your system will meet the installation standards recommended by the factory (see disclaimer on page 1). In addition, because we've included techniques and tips gathered from experienced Heliocol contractors throughout the country, using this installation will save you time and effort.

INSTALLATION MANUAL TABLE OF CONTENTS

INTRODUCTION.....	3
GETTING STARTED	4
PANELS & INSTALLATION KITS	6
PARTS LIST.....	7
SOLAR PANEL LAYOUT AND HYDRAULICS.....	8
CONNECTING THE SOLAR PANELS TOGETHER	11
MOUNTING THE SOLAR PANELS USING GATOR CLAMPS	12
MOUNTING THE SOLAR PANELS ON A FLAT ROOF.....	14
ASSEMBLY OF ROW SPACER KITS	15
CONNECTING THE SOLAR PANELS TO THE FEED AND RETURN LINES	16
RUNNING THE FEED AND RETURN LINES FROM THE ROOF TO GROUND LEVEL	17
CONNECTING THE FEED AND RETURN LINES TO THE FILTRATION SYSTEM	20
PRESSURE TESTING THE SYSTEM	21
OPERATING & CHECK OUT PROCEDURES	22
TROUBLESHOOTING	23



Getting Started

Before you start your installation, here are a few important tips:

1) **CAUTION - SAFETY COMES FIRST!**

There is no substitute for safety. Always exercise extreme caution, care and good judgments when working on or around a roof or pool area.

- **Please take care to avoid hazards such as overhead electrical wires or loose shingles.**
- **Be sure to secure ladders so they will not slip or fall.**
- **Do not allow extension cords to lie in the pool or in standing water.**
- **Wear shoes with proper tread to prevent slipping on the ladder or sloped roof areas.**
- **Disconnect all power to the pool equipment when installing an automatic control system.**

- 2) Always consult with the proper authorities or check with your local building department for the permit requirements and codes applicable before you start your job.
- 3) Before starting any work, determine the location of your system and prepare a schematic drawing of the installation area. Include the location of the feed and return lines in this drawing. Roof areas often times look bigger than they really are, so be sure to measure the available area before making your schematic. Be sure the planned placement of the panels will allow the panels to drain when the pool pump shuts off.
- 4) To insure a trouble-free system, don't take shortcuts. Whenever possible, panels should be installed so that they are accessible without being walked on. Walking on the collectors should only take place when absolutely necessary. (Never walk on panels when they are wet as they present a significant slip hazard)
- 5) Familiarize yourself with all of the Heliocol components and plumbing materials that you will need to complete the installation. Here is a list of materials most commonly used:

PIPE

Use pressure rated Schedule 40 PVC pipe. You may prefer to use black, as opposed to white, PVC pipe on the roof for aesthetic reasons. Black PVC is sometimes difficult to find and some people have inquired about the use of black ABS pipe instead. **DO NOT USE ABS PIPE.** ABS pipe does not have the UV inhibitors that PVC pipe has so it does not hold up in the sun nearly as well as PVC pipe. After several years of exposure it may become brittle and crack.

PIPE FITTINGS

Use PVC SCHEDULE 40 pressure rated fittings to match your PVC pipe. Be sure **NOT TO USE** "plumbers" fittings or DWV fittings (Drain, Waste and Vent). Black PVC fittings are difficult to find. Some installers use spray paint to paint them black. Use a high quality paint, preferably with UV inhibitors if at all possible. Do not use inexpensive "discount store" brands. They will fade and peel very quickly.

PVC CLEANER AND CEMENT

It is important to both CLEAN and CEMENT each PVC joint. Use a quality brand name product and refer to the product's label for specific directions for use. Before applying cement, be sure to clean each fitting and pipe end with the PVC Cleaner or "primer". Soon after cleaning each part, apply ample cement first to the fitting and then to the pipe end. Insert the pipe end into the fitting with a slight twisting motion until it seats to evenly distribute the glue. Hold it in this position for 5 to 10 seconds to allow the joint to set-up. Finally, wipe excess cement off of joint and pipe. **When gluing CPVC fittings to PVC pipe, such as the Heliocol HC-117 Pipe Connector, it is necessary to use a good quality CPVC cement.**

NOTE: Cold weather slows the set-up process for PVC glue. If installing in colder climates, refer to PVC glue manufacturer's charts for curing times.



MISCELLANEOUS

Depending upon your specific job, you will need other plumbing items and materials such as: PVC valves, stainless steel lag bolts, polyurethane caulk, silicone spray, pipe straps, black electrical wire ties, electrical wire nuts, 18ga-22ga sensor wire, 12ga-14ga electrical wire with ground, teflon tape, concrete anchors and screws, electrical conduit, etc. Be sure to use quality products that will withstand direct sunlight year after year.

TOOLS

Planning ahead and having the proper tools and materials on the job will make your installation much easier. Typical tools and materials that are useful to have are:

- Flat head and Phillips head screwdriver
- Power drill with bits, 5/16" and 7/16" sockets
- Pipe cutter or hacksaw
- Garden hose
- Channel lock pliers
- Caulking gun
- Ladder

NOTE: While this manual explains how to install Heliocol Solar Panels properly in typical situations, it cannot address all the unique or individual circumstances possible. If you have any installation questions, contact your Heliocol Representative for assistance. As the installing contractor, you are responsible for exercising good judgment when installing Heliocol Systems to protect the long term integrity of the collectors as well as the mounting surfaces.



Panels & Installation Kits

HELIOCOL COMPONENTS

There are three Heliocol components to each system - panels, panel kits, and row kits. For each Heliocol Panel that you install, you will need a **Panel kit**. For each row (bank) of panels that you install, you will need a **ROW KIT**. To go around vents or pipes larger than 6", [chimneys, skylights or changes in roof elevations], you will need a **ROW SPACER KIT**. Refer to the kit contents table below for more information regarding these kits.

HC-PK: PANEL KIT

One of these kits is required for each panel. It contains the parts necessary to connect the panels together and mount them on the installation surface.

HC-RK: ROW KIT

One of these kits is required for each row (bank) of panels. It contains the parts necessary to connect the panels to the feed and return lines.

HC-RSK: ROW SPACER KIT

One of these kits is required if you need to bypass a vent pipe, or obstacle larger than 6". It also is used to connect panels that are on different roof levels or that are facing different directions into one row. It contains the parts necessary to connect the panels to the PVC pipe between them.

OTHER KITS

HC-PTK: Pressure Testing Kit

This kit gives you the components you need to pressure test the system once the installation is complete.

HC-RTK: Repair Tool Kit

In the event a panel is damaged, this kit contains everything needed to make a repair to a riser tube.

KIT CONTENTS

<u>PART NO.</u>	<u>DESCRIPTION</u>	HC/PK	HC/RK	HC/RSK	HC/PTK	HC/RTK
HC-106A	END CAP		2			
HC-110 Short	GATOR CLAMP	2				
HC-110 Long	GATOR CLAMP	2	2	2		
HC-113	PLASTIC PANEL CLAMP (Top, Bottom, Latch & Gasket)	2	2	4		
HC-117	PIPE CONNECTOR				1	
HC-140	1/2" BALL VALVE				1	
HC-141	0-60 PSI PRESSURE GUAGE				1	
HC-142	PRESSURE TEST 'T' ASSEMBLY					1
HC-130	PIN INSERT TOOL					1
HC-133	1/4" CHISEL					

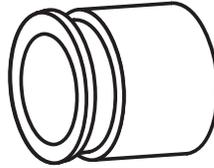
OTHER INSTALLATION COMPONENTS REFERRED TO IN THIS MANUAL

HC-110BTS	BARREL TILE SPACERS	HC-126	1/4" X 2" STAINLESS STEEL LAG BOLT
HC-111	FLANGE	HC-127	100 TAPCONS 1/4"X 1-1/4" W/ DRILL BIT
HC-116	3/8" X 4" STAINLESS STEEL LAG BOLT	HC-1790	PVC 1/2lb. CHECK VALVE
HC-120	1/2" BRONZE ELBOW	HC-3344	THREE WAY NON-POSITIVE VALVE
HC-121A	VACUUM BREAKER	HC-5210	PVC BALL VALVE (Isolation)
HC-124	G CLAMP		
HC-125	1/4" X 1-1/2" STAINLESS STEEL LAG BOLT		

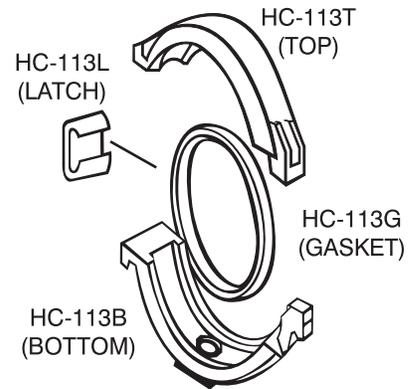
Parts List



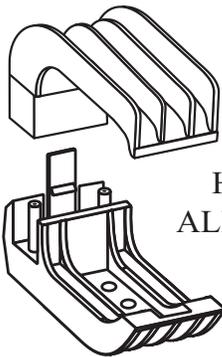
HC-106A
END CAP



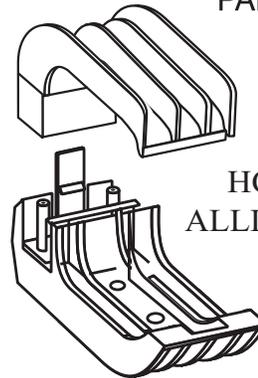
HC-117
PIPE CONNECTOR



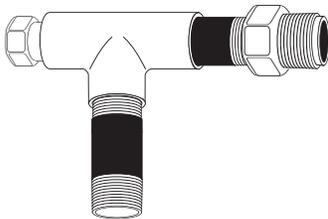
HC-113
PANEL CLAMP



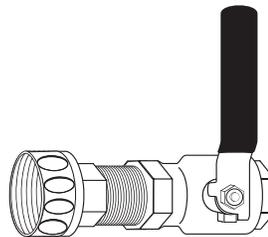
HC-0110 SHORT
ALLIGATOR CLAMP



HC-0110 LONG
ALLIGATOR CLAMP



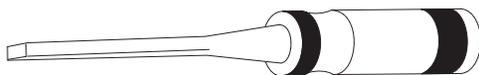
HC-142
PRESSURE TEST "T" ASSEMBLY



HC-140
1/2" ball valve



HC-141
PRESSURE GAUGE



HC-133
1/4" CHISEL

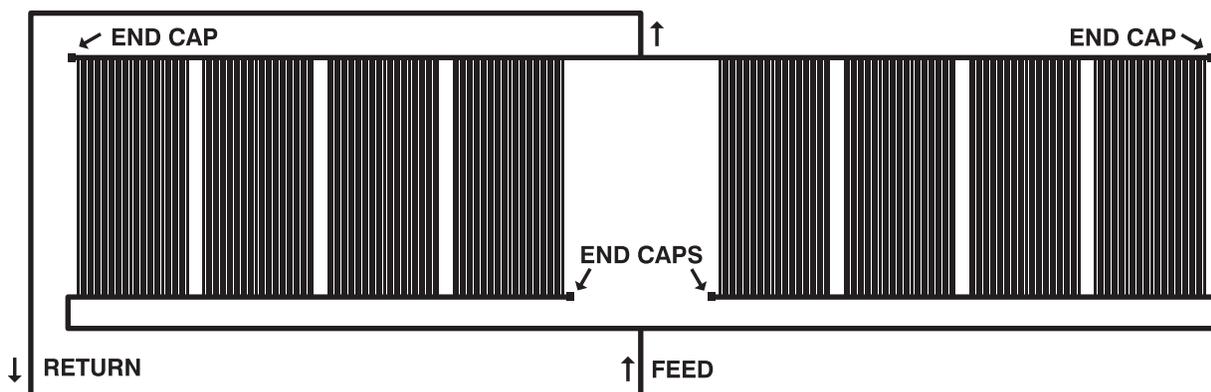
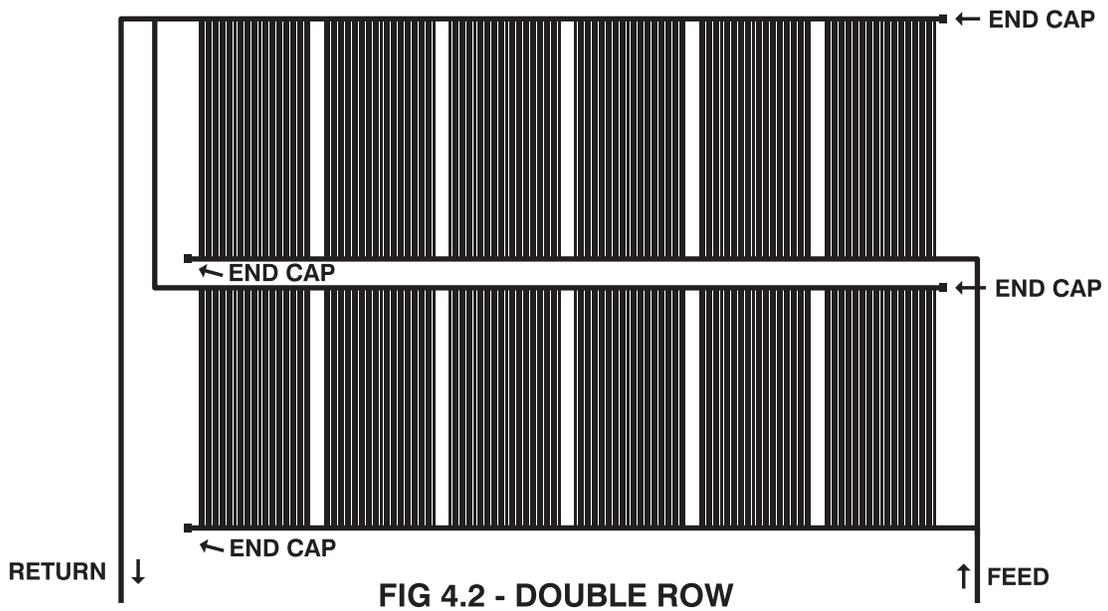
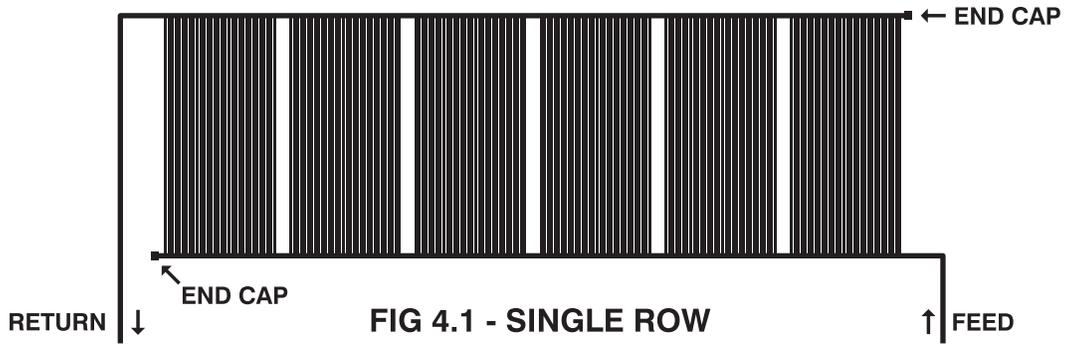


HC-130
PIN INSERT TOOL



Solar Panel Layout & Hydraulics

Shown below are the THREE most common Solar Panel installations:





ROOF ORIENTATION

Ideally, collectors should be located on a South facing or flat roof or on an elevated ground mounted rack facing South. The next best orientation is West and finally East. A collector should never be installed on a North roof without a reverse rack in the Northern Hemisphere.

CHOOSING THE RIGHT SIZE COLLECTOR

The roof space available to you will determine which model collector to use. Since Heliocol manufactures collectors in six different sizes, you have great flexibility in what you can design. The six panel sizes are:

Model#	Size
HC-8	1' x 8'
HC-9.5	1' x 9.5'
HC-10.5	1' x 10.5'
HC-12.5	1' x 12.5'
HC-30	4' x 8'
HC-38	4' x 9.5'
HC-40	4' x 10.5'
HC-50	4' x 12.5'

Whenever possible, the largest panel (HC-50) should be used. This will:

- reduce your total collector cost
- reduce labor and installation material cost
- reduce the length of the solar array
- reduce the number of roof penetrations
- produce a more attractive installation

However, unique roof designs may require a combination of different size collectors to best cover the roof area.

PANEL CONFIGURATIONS

There are many ways to configure a solar array. The most common and preferred is in one continuous row as in Fig. 4.1. There are, however, recommended limits to the number of panels that can be installed this way to achieve even flow throughout the array. The maximums are:

Model #	Maximum per row
HC-30	12
HC-40	10
HC-50	8

These maximums can be exceeded if there is high flow or substantial back pressure on the system which will force adequate flow through every panel. When you have more than the maximums, though, you should either use the Double Row layout as in Fig. 4.2 or the Single Row Split Feed layout as in Fig. 4.3. Of course, the Double Row can also be used for smaller installations when space is a problem.

PUMP HORSEPOWER

The horsepower of your swimming pool filtration pump must be adequate to supply the solar system with enough water to provide the recommended flow rate necessary for the panels being installed. These recommended rates in gallons per minute (GPM) are: **(0.1gal/sq ft)**

Model #	Minimum Flow
HC-10.5	1 GPM
HC-12.5	1 GPM
HC-30	3 GPM
HC-40	4 GPM
HC-50	5 GPM

For example; if you are installing Ten HC-40 panels, your pump must be able to deliver 40 GPM to the solar array. These flow rates may be exceeded by as much as 100% without any detrimental impact on the performance of the system. The existing pool recirculation pump is typically adequate for recirculating the water through the solar system. Generally, a 1 horsepower pump is sufficient for a standard pool solar system unless there is an unusually long pipe run, a high roof or a large number of panels. If you are not sure what your pump flow rate is, consult your Heliocol Representative or Pump Manufacturer for the pump's flow characteristics.



PLUMBING

It is important that you use the proper size PVC pipe for the size of the solar array. Under sizing the pipe will produce too much restriction to the water flow and unnecessarily reduce the flow rate to the panels. Use the following as a guide:

Flow Rate	Recommended pipe size
0 to 45 GPM	1½"
46 to 80 GPM	2"

For larger flow rates, consult your Heliocol Representative for the proper pipe size or alternative series plumbing techniques which will reduce the necessary flow rates on larger systems.

Plumbing runs should be as short as possible and the "Hot Return" pipe should have the shortest run to reduce potential heat loss in this pipe. Pipes should be supported with pipe clamps or "G" clamps at least every 4 feet to prevent sagging. (Check with plumbing code in local jurisdiction.) The pipe clamp used on pipe returns across a roof should be 1/2" larger than the pipe diameter to allow for expansion and contraction. The pipe clamp used on a vertical or horizontal run on the same side of a building should be the same size as the pipe diameter to prevent vibration and to assure a professional looking installation.

Since 90 degree elbow fittings produce a high restriction to flow, you will want to use as few as possible. Keep this in mind when planning your plumbing runs. Their use cannot be avoided, but with careful forethought, you will use the least number possible. Occasionally, the use of two 45 degree fittings will eliminate a 90, but it is not necessary to always use them as this will run up the expense of your materials.

BALANCED FLOW

When you have to split a solar system as in Fig. 4.2 or Fig. 4.3, it is critical that the shown plumbing runs be followed to assure equal water flow through both rows of panels. Since water will follow the path of least resistance, if one plumbing run is shorter than the other, more water will flow through it than through the longer one. Keep this in mind if you design a panel layout different than the examples. Your Heliocol Representative can also assist with this and explain the use of "balancing valves" on larger systems.

If you are installing the solar panels on a flat roof or flat ground rack, the top (return) header of the panel should be at least 3" higher than the bottom (feed) header to assure equal flow through all of the tubes of all the panels. (See Page 14). To achieve even distribution of water throughout the row of panels, proper flow rates and a little back pressure should be present.

AUTOMATIC DRAIN DOWN

The panels and the PVC pipe should be installed so the water will drain out of them when the pool pump shuts off. This is especially important in areas of the country where freezing conditions occur. (The Heliocol Solar Pool Panels are warranted against internal freezing when installed to allow for drain down.) To allow for the water to drain a vacuum breaker HC-121 is installed on the solar feed line above the non-positive 3-way valve as shown on page 19, FIG. 12.1. (Non-positive means that the valve allows for water to drain back through the valve even when in the off position. If you have a 3-way valve that is not non-positive you can make it so by drilling an 1/8" hole in the diverter) If, as a result of a unique roof design or adverse pool equipment location, it is not possible to achieve complete automatic drain down, manual drain down valves should be installed in appropriate places in the plumbing or at the end of the bottom (feed) header. Instead of installing an End Cap HC-106A at the end of the header you would place a pipe connector HC-117, a 1½" slip x 1½" threaded PVC reducer bushing along with a ½" Boiler Drain HC-140. These valves should be opened when shutting down the system for the winter months or when freezing conditions are possible. Your Heliocol Representative can assist you with the parts necessary for manual drain down installations.

Install (2) SS Screws(#6x3/4) to secure gator top to gator bottom assembly.

Connecting the Solar Panels Together

In subsequent pages of this installation manual, you will be instructed to connect Heliocol panels together by using the HC-113, plastic panel clamps. It is helpful to familiarize yourself with this procedure ahead of time. To assure a proper connection follow these steps:

1. Lay two panels next to one another with panel spacer bars on the bottom. Lay an HC-113 Plastic Panel Clamp top, bottom, gasket and latch at both ends where the headers meet. (Fig 5.2 - A)
2. Clean the groove of both headers.
3. Spray the Panel Clamp with a **silicone** spray only. (An easy way to do this is to put all of the gaskets in one plastic bag. Spray silicone into the plastic bag to lubricate all of the gaskets at once).
4. Insert gasket into the groove of one of the headers. (Fig 5.2 - B)
5. Place the bottom half (see Fig. 5.3) of the plastic panel clamp (HC-113) under the header end with the larger flat portion facing the roof. (Fig 5.2 - C)
6. Seat both headers together by inserting the gasket into the opposite header groove and placing the ends of both headers into the open space in the plastic panel clamp bottom. (Fig 5.2 - D)
7. Interlock the top half of the Plastic Panel Clamp with the tab on the bottom half. Swing top half closed over top of headers. Lock both halves of the clamp together using the Latch. (**NOTE:** Slide large end of Latch over small end of Plastic Panel Clamp assembly. (Fig 5.2 - E & F)
8. Use channel lock pliers to tighten the Latch grip by squeezing it with reasonable force until it seats flush or even slightly farther so it cannot slide out of its position. (Fig 5.2 - G)
9. Repeat the procedure to connect the bottom headers of the panels.

NOTE: Now using (4) Gator Clamps, neither the top or bottom header touches the roof .

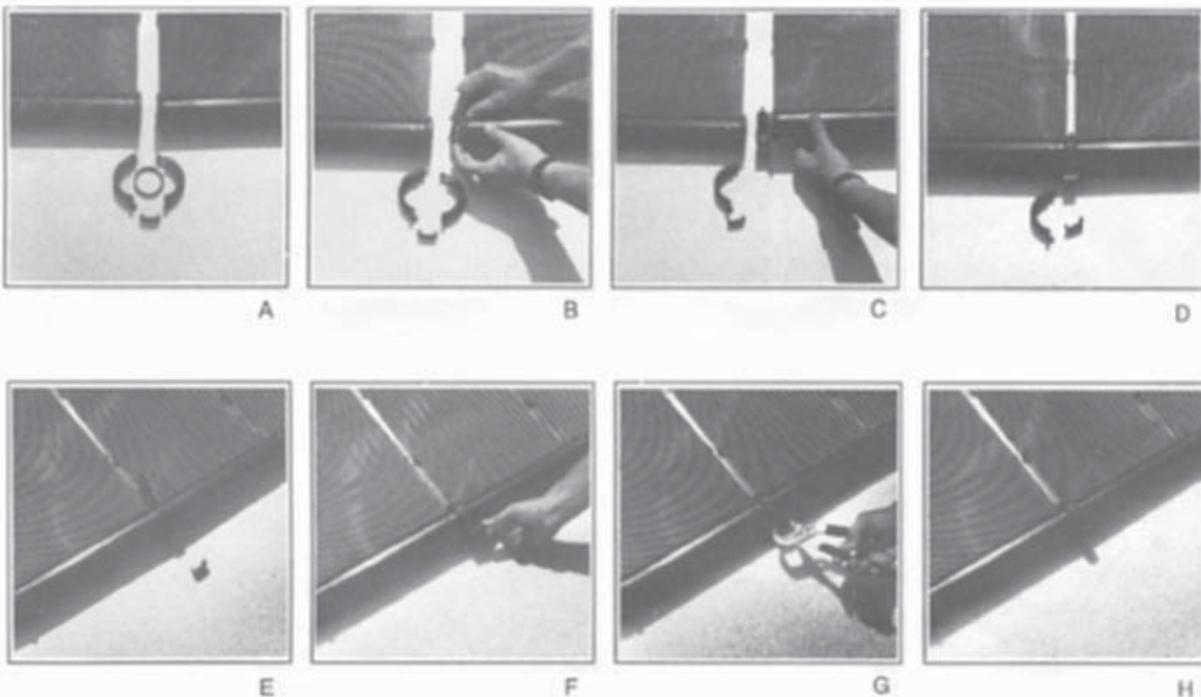
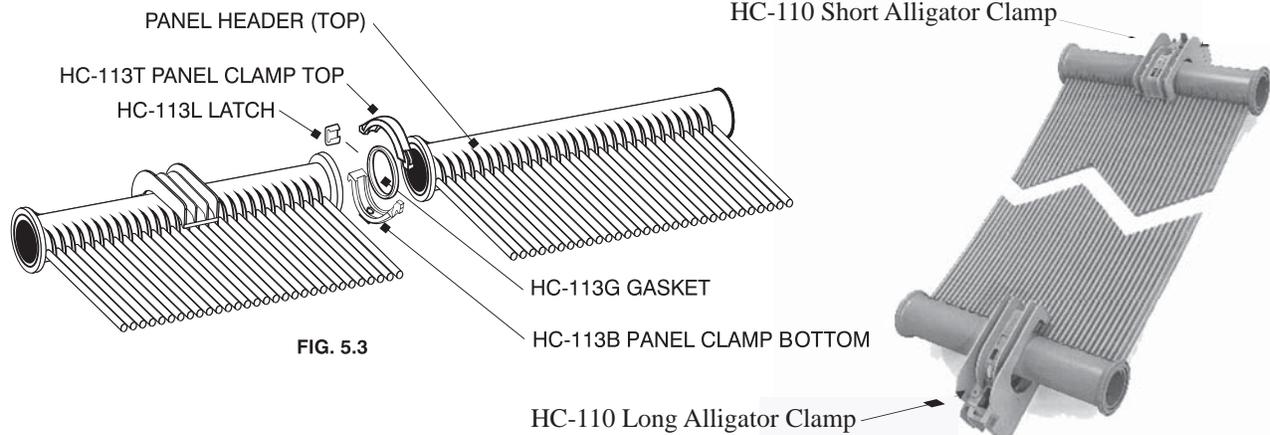


FIG 5.2

Mounting the Solar Panels Using Alligator Clamps

The beauty of the “GATOR CLAMP” installation method is its simplicity. It can be used on just about any type of roof or rack installation.

MOUNTING THE SOLAR PANELS USING ALLIGATOR CLAMPS



For rack systems, asphalt shingle roofs or tile roofs follow these simple steps:

1. Snap a chalk line across the roof or rack where you want the top edge of the collectors to be located. Since the panels should slope slightly down toward the feed end of the array for proper drainage.
2. Position the first Gator Clamp on the chalk line 6 inches in from the top corner of the first panel. The first panel will be the one that is connected to the feed line at the bottom header.
3. Subsequent Gator Clamps should be spaced out evenly along the chalk line every 24". Each Gator Clamp can be located anywhere along the top header to match up to the spacing of the roof rafters **as long as there is a 2" space between the edge of the Gator Clamp and the ribs on the panel header that exist every one foot**. This allows for horizontal expansion and contraction. For Barrel Tile roofs, each Gator Clamp needs to be positioned so that it is centered on the top ridge of a tile.
4. Since normal horizontal expansion and contraction of an array of panels takes place every day as panels heat up and cool down, it is preferable to lock the center of each array in place so that the expansion and contraction takes place evenly to the left and right of this center point. The center panel of an array may be locked in place by locating the Gator Clamps on that panel adjacent to the left and right of **one** of the header ribs. (See Figure 5.5) These Gators should be attached using two lag bolts as opposed to one. **Do not use this procedure more than once on any array of panels.**
5. Apply ample sealant to both the bottom and top of the lower hole on the bottom portion of the Gator Clamp. (Figure 5.7A) Position the bottom portion of the Gator Clamp perpendicular to the chalk line with the lower hole being placed right on the chalk line. Lag the Gator to the roof through the lower hole using a 3/8" x 4" S.S. Lag Bolt. (Figure 5.7B) For Barrel Tile Roofs, place 4 HC-110BTS Barrel Tile Spacers underneath each Gator Clamp by inserting the four feet of the Barrel Tile Spacer into the four corners of the bottom of the Gator Clamp. (Figure 5.8)
6. The bottom of the Gator is designed to grip the roof's surface to avoid rotation back and forth; however, if the roof surface is particularly hard or slick you can use an additional lag bolt in either the top or center hole.
7. To ensure proper spacing, hang the top headers of panels in the bottom portion of the Gators attached to the roof as you go. Once again, be sure Gator Clamps are at least 2" away from each ridge along the header. (Figure 5.7D)
8. Once all Gators are properly lagged to rack or roof surface, and all the collectors are hung in place, connect the top headers of each collector using HC-113 Panel Clamps. Snap the top portion of each Gator Clamp over the panel header onto the bottom portion of each Gator Clamp by pushing down firmly (Figure 5.7C)
9. Install (2) SS Screws (#6x3/4) to secure Gator top to Gator bottom assembly.

9. Attach the bottom headers of the collectors with HC-113 Panel Clamps.
10. Locate and mount the Gator Clamps (2ea) along the bottom header, aligned with the upper header gators. The bottom gator should be installed allowing a large gap on the top allow for contraction of
12. Attach feed and return lines following Heliocol's published guidelines.
12. The corners of where the feed and the return are located should be fastened down by Pipe Straps that are also supporting the pipe.

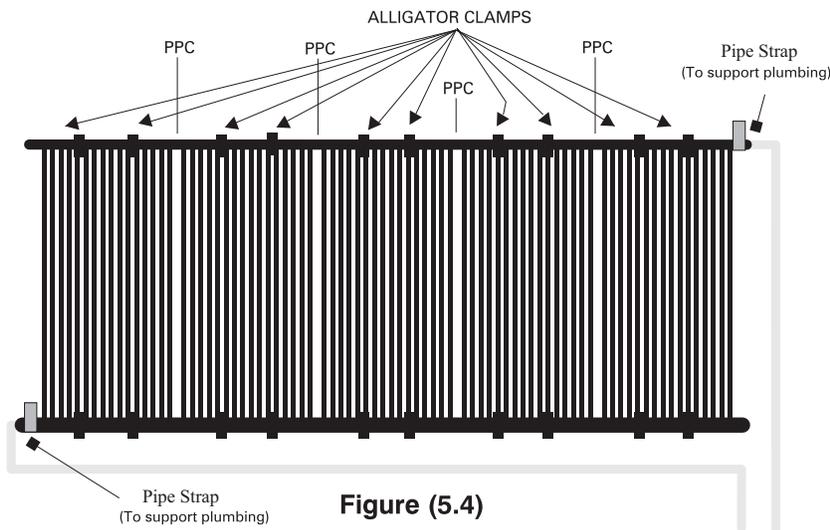


Figure (5.4)

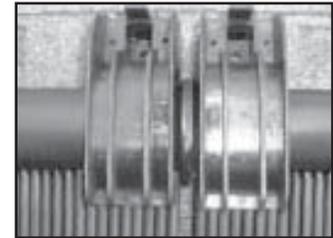


Figure (5.5)

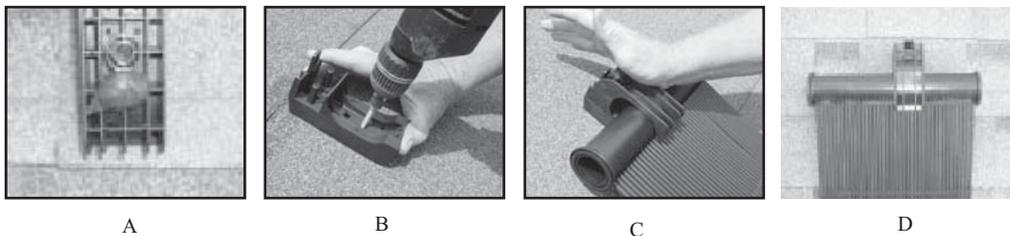


Figure (5.7)

NOTE: *Additional Gator Clamps are required for surfaces with a pitch of 10/12 or greater.

NOTE: To allow for vertical expansion and contraction, any Gators installed on the bottom header must be positioned so that the header is in the middle of the cradle. (Figure 5.9)

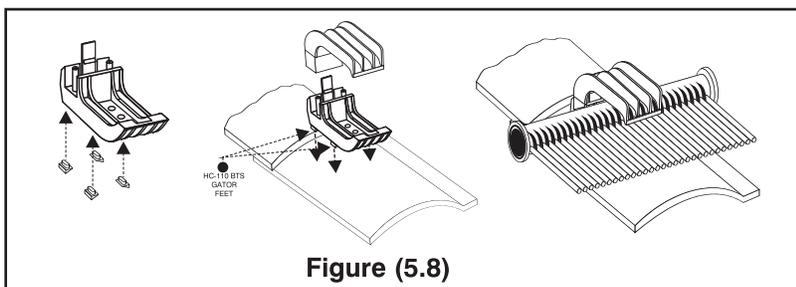


Figure (5.8)

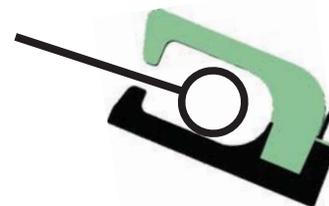


Figure (5.9) 13



Mounting the Solar Panels On a Flat Roof

If you have chosen a flat roof to mount the solar panels, recommended not to penetrate the surface with a lag bolt.

FIBERGLASS COATED, METAL, OR SHINGLED FLAT ROOF

If you have one of these three types of roofs with at least 3" of slope down the panel length, you can use the Alligator method previously described. Use liquid adhesive to secure the HC-110 Alligator clamp to the roof, or use the "Free Floating" method described below.

NOTE: Whenever unglazed solar collectors are installed on a rack, a substrate should be mounted on the rack prior to mounting the panel. This eliminates heat loss and stress created by wind blowing on the back side of the rack. However, if this wind is eliminated by other site specific conditions, (i.e. windbreaks or fences) substrates are not necessarily required.

NOTE: There are all types of flat roof surfaces and as the installing contractor you are responsible for making sure that the installation will not damage the roof surface. If, for example, you have a very soft or rubberized roof surface, you'll want to protect the roof surface with some type of substrate.

NOTE: Please note that all flat roof installations are the same. Please contact your local roofing contractor to ensure your meeting all local codes.

Assembly of Row Spacer Kits

When you need to install panels over an obstruction larger than 6" wide or if the obstruction is less than one foot from a panel header, you'll need a row spacer kit to circumvent the obstruction.

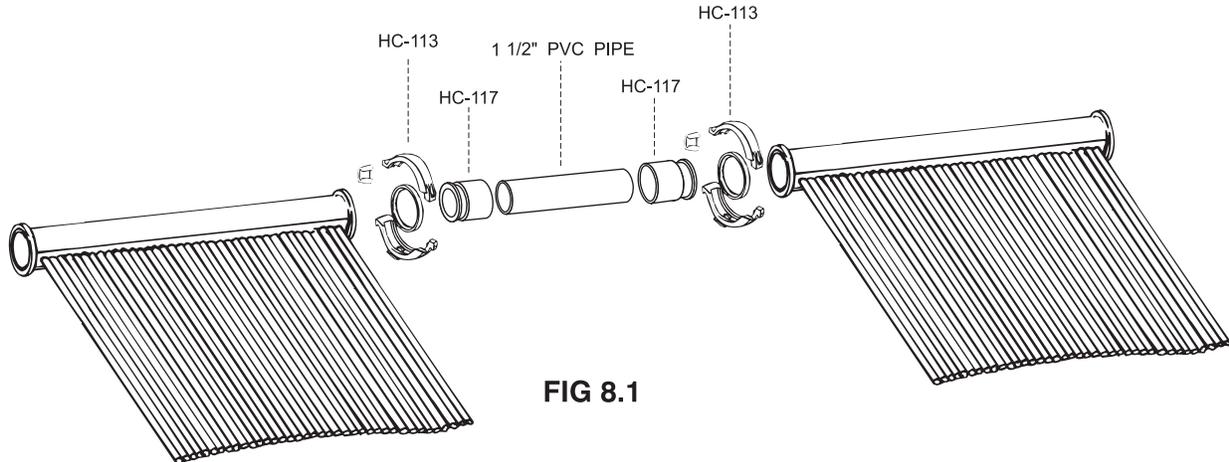


FIG 8.1

HC-RSK

1. Connect the 4 HC-117 Pipe Connectors to the headers of the collectors to be connected with a HC-113 Plastic Panel Clamp using the same procedures outlined in the section on connecting solar collectors together on page 12.
2. Cut two lengths of 1-1/2" PVC pipe long enough to cement the HC-117 Pipe Connectors on each collector to each other.
3. Cement the PVC pipe to the Pipe Connectors as shown in Fig. 8.1.
4. If the distance between the collectors is over 4', a 2" Pipe-Clamp should be used on both pipes to prevent sagging.

NOTE: When gluing the HC-117 CPVC Pipe Connectors, it is necessary to use good quality multi-purpose cement.



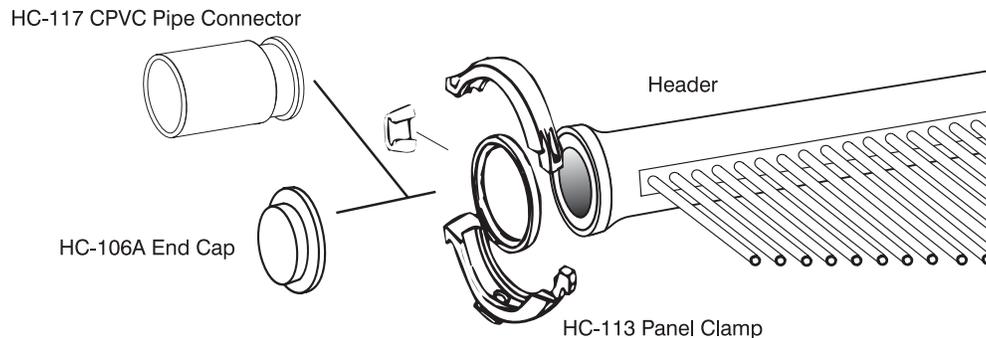
FIG 6.2

Flexible riser tubes are snapped out of the spacer bars to go around small obstructions. FIG 6.2

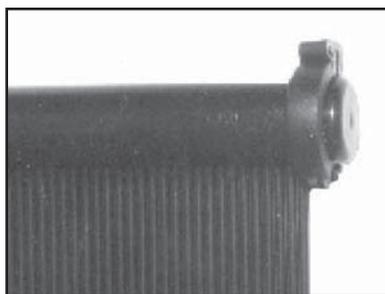
NOTE: Obstructions smaller than 6" can be circumvented by snapping the panel riser tubes out of the spacer bar and spreading them around the obstruction (see Fig. 6.2).

WARNING: THIS SHOULD NOT BE DONE BETWEEN THE HEADER AND THE FIRST SPACER BAR AS IT WILL POSSIBLY PULL THE RISER TUBE OUT OF THE HEADER. THE HELIOCOL WARRANTY DOES NOT COVER LEAKS OCCURRING FROM THIS TYPE OF INCORRECT INSTALLATION. A ROW SPACER KIT SHOULD BE USED FOR THIS SITUATION.

Connecting the Solar Panels to the feed and return lines



1. The feed line will be connected to the low end of the bottom header which should be the corner farthest from the pool pump. The return line will be connected to the top header on the opposite end of the array. This gives the heated pool water the shortest route back to the pool.
2. The HC-106A End Caps will be located on the corners of the solar array opposite of the corners where the feed line & return lines will be. Attach the HC-106A End Caps using the HC-113 Plastic Panel Clamp as described on page 12. (see Fig 10.2-A)
3. Attach the HC-117 Pipe Connectors to the corners of the array where the feed and return lines will be using the HC-113 Plastic Panel Clamp. (see Fig 10.2-B)
4. The HC-117 Pipe Connector allows a 1½" PVC Street 90° to be glued directly into the socket, or a 2" PVC 90° to be glued on the outside. **CPVC GLUE** should be used when attaching PVC fittings or pipe to the Pipe Connectors to provide for a durable connection. A 90° PVC Fitting and vertical pipe run of at least five feet should always be attached to the return line Pipe Connector to allow for lateral expansion and contraction of the return line pipe run.
5. Connect the feed and return pipes using good plumbing techniques.



A

End cap is installed on corners opposite the CPVC Pipe Connectors.



B

CPVC Pipe Connector is ready for attachment to either the feed line (shown) or the return line on the top header.

Figure 10.2



Running the feed and return lines from the roof to ground level

Discussed here is the standard, most straight forward way of running the PVC pipe from the feed and return lines to the equipment pad. Some installations require a more creative approach due to unique roof designs or equipment pad locations. Whenever possible, however, the return line should have the shortest run and all pipes should run slightly “downhill” to allow for automatic drain-down of the plumbing and solar array. As discussed earlier, if this is not possible, manual drain valves should be installed as needed.

If your equipment pad is against your house, you may want to complete the necessary plumbing at the equipment pad before completing this portion of the installation. This allows you to know exactly where the pipes should come down from the roof. If you will be trenching from the equipment pad to the installation location this is not necessary.

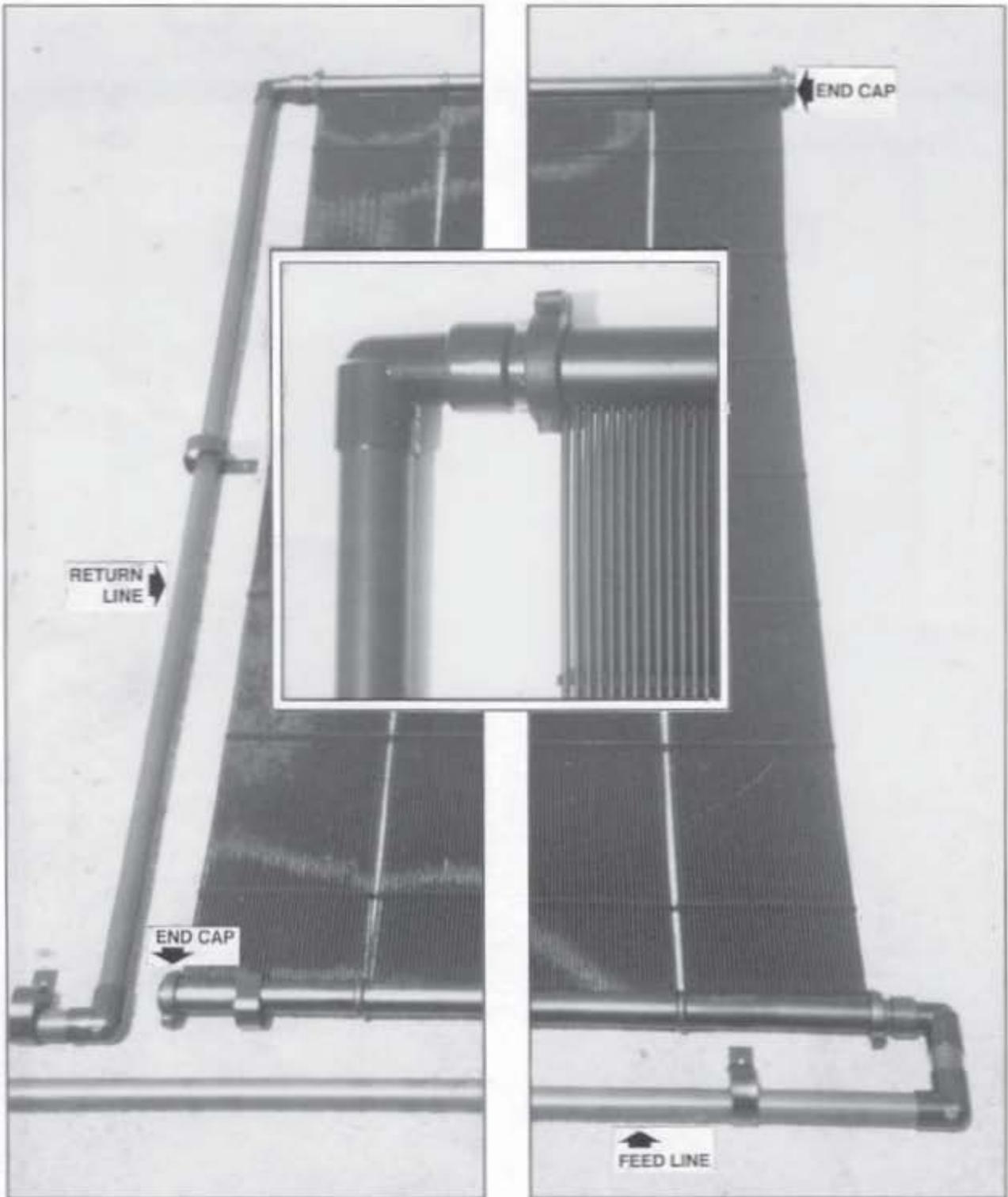
1. Cement the appropriate size PVC 90 degree elbow to the return line stub facing down toward the bottom header. Repeat the process for the feed line header stub and face the elbow down away from the array (see Fig. 11.1, page 18).

NOTE: Whenever cementing, lay a rag on the roof or rack under the joint to avoid dripping cement on the mounting surface. Also, it is a good idea to tape the cans of PVC cleaner and PVC Cement together. They are less likely to tip over and spill this way.

2. Determine where the feed and return pipes will go over the edge of the roof. If possible, this should be perpendicular to the exact points where they will fasten into the existing system or into pipes coming from another location (see Fig. 12.1, pg. 19).
3. Measure the distance from the return elbow down to the spot that you want to go, across the roof, to the point established above. **Be sure to include the depth of the socket in the elbow in your measurement.** Cut a piece of PVC pipe to this length. Repeat this process for the feed line.
4. If you are not experienced at cutting and fitting pipe, it is a good idea to assemble all pipe and fittings before cementing them just in case you make an error. Clean the burrs off of these cut pipe lengths and insert them into the elbows.
5. Measure across the roof from these pipes to the points established in step 3. Cut and de-burr pipes to these lengths and assemble corner with 90 degree elbows.
6. Continue this process around the edge of the roof and down to the existing plumbing, keeping pipes as short, straight and tight to the building as possible.
7. Once you are satisfied with the plumbing arrangement, go back and cement all joints together using the good plumbing techniques explained in the “Getting Started” section.
8. Secure long pipe runs with C-clamps or G-clamps one size larger than the pipe diameter using (HC-116) 3/8” x 4” Stainless Steel Lag Bolts and polyurethane caulk. Secure vertical pipe runs on the side of buildings with pipe-clamps the same size as the pipe diameter using screws and anchors as needed.

NOTE: All four corners of each row of panels should be securely fastened to the roof. The corners should already be secured with the G-clamps or pipe straps on the plumbing lines connected to the feed and return lines. The top corner opposite the return corner should already be secured by the panel mounting hardware.

NOTE: Be sure to support all of the weight of the plumbing with G-clamps or pipe straps. The mounting hardware is not designed to support the weight of the plumbing in addition to the weight of the collectors.



†



Connecting the Feed and Return lines to the Filtration System

Fig 12.1 on page 19 shows how a typical Heliocol Solar Pool Heating System is plumbed into existing pool plumbing. This drawing may not be just like every system you encounter. The feed and return plumbing on a solar system may be reversed, or it may have a different type of filter, or it may have additional equipment such as a chlorinator, pool cleaner, gas heater, etc. It may also have a long run of plumbing from the pool equipment to the solar panels.

Whether the system is like this or not, Fig 12.1 will help you understand the flow of water from the pool, through the pump, filter, solar system and back to the pool. Study the diagram and become familiar with the valves needed to connect the solar panels to existing plumbing.

Notice that the Union Check Valve is plumbed in after the filter. This prevents the filter from being backwashed by the water draining down from the panels when the pump shuts off. The Three-Way Valve either diverts the water to the solar system or directly back to the pool. This Three Way Valve should be a non-positive valve. This enables the water in the solar system to drain back to the pool when the pump shuts off. (If your 3-way valve is not non-positive you can make it so by drilling an 1/8" hole in the diverter) The Ball Valves on the solar feed and return lines allow you to isolate (completely shut off) the solar system.

1. Study the plumbing after the filter and decide where you are going to install the Union Check Valve and the PVC tee fitting (see Fig 12.1). If you have auxiliary equipment, you may need to re-plumb a portion of your existing plumbing so this equipment is located after the solar system as indicated in Fig 12.1.
2. Cut the pipe after the filter where you have decided to locate the Union Check Valve and where your solar return pipe will attach to your existing pool return line. If your pool plumbing is 1-1/2" and you are running 2" plumbing to your solar system, you should be using 2" valves and piping for all of your new plumbing, so you will need (2) 2"x1-1/2" reducer bushings to adapt your new 2" fittings to the existing 1-1/2" pipe.
3. As discussed earlier in this manual, it is a good idea to assemble all pipe and fittings before cementing them just in case you make an error. Install an Union Check Valve on the pipe coming out of the filter. Be sure that the arrow showing flow direction is pointed **away** from the filter.
4. The Three-Way Valve will be installed next. It may come right next to the Check Valve, or you may have to use some pipe and fittings to locate it off of the main line. As stated earlier, use as few 90 degree elbows as possible.
5. Install the Ball Valve to the solar feed coming out of the Three-Way Valve.
6. Install the HC-121A Vacuum Breaker about 4' up the feed line using a PVC tee and red bushing. Face the tee to the outside as shown in FIG 12.1. Wrap the threads of the Vacuum Breaker with teflon tape and screw it into the 3/4" threaded reducer bushing.
7. Install the second Ball Valve to the solar return line.
8. Now determine where to locate the PVC Tee fitting. The Tee may be located right next to the Three-Way Valve or elsewhere depending on your system. Connect the Tee fitting first to the solar return line, then to the three-way valve, and then to the pool return line.
9. Once you are satisfied with the plumbing arrangement, go back and cement together all joints that you have not already cemented. Use good plumbing techniques and caution not to drip glue or cleaner on existing pool equipment.

NOTE: Use Pipe-Clamps the same size as the outside diameter of your plumbing fittings to secure the pipe and fittings tightly to the wall.



NOTE: WHEN CEMENTING CHECK VALVES, TRY TO DO SO IN A HORIZONTAL POSITION TO PREVENT CEMENT FROM DRIPPING INTO THE SPRING LOADED VALVE AND CEMENTING IT CLOSED! WHEN THIS IS NOT POSSIBLE, USE CEMENT SPARINGLY AND ALLOW IT TO DRY SLIGHTLY BEFORE INSERTING THE PIPE INTO THE SOCKET. WHEN CEMENTING TWO AND THREE-WAY VALVES, EITHER REMOVE THE DIVERTER FROM THE VALVE OR CEMENT WITH THE DIVERTER TURNED AWAY FROM ANY OPEN PORT TO PREVENT THE CEMENT FROM RUNNING ONTO THE DIVERTER AND CEMENTING IT IN PLACE! IN COOLER CLIMATES GLUE DRIES MUCH SLOWER.

For a truly professional looking installation, take time to clean the white PVC pipe. Use a clean rag and pour PVC cleaner on it and then wipe the dirt and identification marks off the pipe. Do this on all exposed pipe. This is also a good preparation if you plan on painting the pipe to match house color.

IF YOU ARE INSTALLING AN AUTOMATIC SYSTEM

The basic difference between the manual system just outlined and an automatic system is the use of a motorized Three-Way Valve. This Three-Way Valve is operated by a differential control which uses sensors to determine if the solar system is warmer or cooler than the pool water. In this way it can shut the solar system off when cloudy conditions exist and thereby generate the optimum performance from your solar investment. It also allows you to select a maximum pool water temperature so the solar system doesn't overheat the pool. It accomplishes this by the use of a sensor on the roof and a sensor installed into the pool plumbing. The directions included with the automatic system components will direct you in the installation of the control and sensors. The Three-Way Valve will be installed as described in the above procedure.

Pressure testing the Heliocol Solar System

Pressure testing the entire solar system provides for a trouble-free installation and takes only about fifteen minutes. Any weak PVC glue joints, fittings or pipe, any improper Panel Clamp connections, will be evident while the system is put under 40 to 50 pounds of pressure.

1. Allow ample time for all glue joints to dry completely. Use this time to wrap up things and to clean up the job site.
2. Wrap the threads of the HC-142 Pressure Test 'T' Assembly, HC-140 ½" Ball Valve and HC-141 Pressure Gauge with Teflon Tape. Replace temporarily the HC-121A Vacuum Breaker with the HC-142 Pressure Test 'T' Assembly. Thread the HC-140 ½" Ball Valve and Pressure Gauge into the Pressure Test 'T' Assembly.
3. Attach a garden hose to the ½" Ball Valve. **Make sure the ½" Ball Valve is in the off position.**
4. Turn the solar system on to allow the pool pump to completely fill the solar system. (If the pool pump is not operational, shut off the Ball Valve on the feed line and use the garden hose to fill the system.)
5. Once the solar system is completely full of water, turn off the pool pump or turn the 3-way valve to by-pass the solar system. **Quickly** turn off the Ball Valves on both the feed and return lines.
6. Turn on the city water to the garden hose and open the ½" Ball Valve on the Pressure Test 'T' Assembly until the Pressure Gauge reads 40 to 50 PSI and then turn off the ½" Ball Valve. Turn off city water.
7. With the system under pressure, check the whole system for any leaks. A drop in pressure on the pressure gauge indicates a leak in the system.
8. If there are leaks, open the Ball Valve on the return line to relieve the pressure. Repair any leaks. Repeat the pressure testing procedures as needed.
9. Return system to normal when through with pressure testing. **Be sure to open both ball valves and replace the Pressure Test "T" Assembly with the Vacuum Breaker.**



Operating and Check-Out Procedures

CONGRATULATIONS: If you carefully followed the steps in this manual, you now have an efficient, professional looking Heliocol Solar Pool Heating System.

Before you run water through the system:

1. Allow the cemented fittings adequate time to dry per manufacturer's directions.
2. Verify that the check valves, control valves and vacuum breaker are installed properly.
3. Verify that all Plastic Panel Clamp Clips are tight.
4. Pressure test the system as described on page 21.
5. Verify that all lag bolts are secure and that adequate sealant was used to prevent any roof leaks.
6. Be sure all panel riser tubes are snapped into the spacer bars (except where they go around obstructions).
7. Be sure that panel riser tubes are **NOT** rubbing on the roof surface between spacer bars. If they are, adjust spacer bars as needed to prevent this or a hole may develop in the riser tube.
8. Be certain that the system will automatically drain down when the pump is shut off or that enough manual drain valves have been included.
9. Verify that all pipe runs are properly supported with pipe clamps.

TURNING THE SYSTEM ON

1. Turn the pool pump off.
2. Turn the Three-Way Valve so the "closed" indicator points toward the pool side of the valve.
3. Be sure that the Ball Valves on the feed and return lines are open.
4. Turn the pool pump on.
5. Set the pool pump timer, if used, so that the pump will run when sun is shining on the solar panels. Usually 10:00 AM to 4:00 PM, but this will vary with geographic location and time of year.
6. When the solar system is running, you should notice:
 - A **slightly** higher pressure reading on the pressure gauge.
 - At midday, if the sun is out, warmer water should be coming into the pool. This water should be 3 - 5° warmer than the pool temperature. Use the back of your hand to better feel the difference in water temperature.
 - All the panels should feel cool to the touch when the sun is on them. (If they are not, see Troubleshooting section)
7. During the cooler months of the year it is essential that the pool surface be covered at night with a "pool blanket" to maintain a comfortable water temperature. Low nighttime temperatures can lower the water temperature more than the solar can recover during the day

TURNING THE SYSTEM OFF

1. Turn the pool pump off.
2. Turn the Three-Way Valve so the "closed" indicator points toward the solar side of the valve.
3. If isolating the panels, close the Ball Valves on the feed and return lines after you are sure all the water has drained out of the panels and plumbing.
4. Turn the pool pump on to filter the pool as needed.

THAT'S ALL THERE IS TO IT. YOU HAVE INSTALLED A HELIOCOL SOLAR POOL HEATING SYSTEM THAT HAS BEEN TESTED AND PROVEN WORLD-WIDE FOR QUALITY AND RELIABILITY. IF YOU RUN INTO ANY PROBLEMS WITH YOUR INSTALLATION OR HAVE ANY FUTURE PROBLEMS, CALL YOUR HELIOCOL REPRESENTATIVE OR OUR CORPORATE OFFICE AT 1-800-506-1994.



Installation Troubleshooting

Trouble spots may arise during the initial installation of your Heliocol Solar Pool Heater. Generally the primary cause of problems, depending on its age, is the existing pool/pump filtration system. Problems can also arise from installer error or oversight. We are confident that your system will work effectively and efficiently when properly installed and matched to your existing pool/pump filter system. This troubleshooting guide is designed to help your installation go smoothly and work properly the first day and every day thereafter.

1: THERE ARE AIR BUBBLES IN THE POOL WHEN THE SOLAR HEATER IS OPERATING

Diagnosis: There may be air coming into the pump through an air leak on the suction side of the pump due to the pump working harder to move the water through the solar system.

Pump Answers:

- a: Be sure pump trap lid is on tight.
- b: Check the "O" ring on the pump trap lid. Clean, lubricate or replace as needed.
- c: If you have a suction type pool cleaner, remove it. If this eliminates the air bubbles, use it only when the solar system is off.
- d: If you have a clear lid on the pump and can see air bubbles in the trap, using a garden hose, run water over the lid and each joint individually to see if the air bubbles will clear up. If there is not a clear lid, listen to pump noise for a smoother operation. Repair any air leaks.

Diagnosis: If the vacuum breaker is installed on the roof, there is not enough water pressure in the solar system to keep the vacuum relief valve closed so it is allowing air to be drawn into the water as it flows by the valve.

Install Answers:

- a: Be sure filter is clean. Backwash to reduce pressure
- b: Locate vacuum breaker on the feed line as shown on page 19 FIG. 12.1, and put solid end cap at end of top header where vacuum relief was located.
- c: Using the {HC-5210}Ball Valve on the return line, throttle back the flow to produce more back pressure on the system.

2: SOME OF THE SOLAR PANELS ARE WARM TO THE TOUCH WHILE OTHERS ARE COOL

Diagnosis: There is not equal flow through all of the panels. Warm panels indicate low water flow.

Pump Answers:

- a: Be sure filter is clean. Backwash to reduce pressure
- b: The pump may not be providing enough water to the solar system. Check water flow using a flow meter. Increase pump horsepower to maintain recommended flow.
- c: If there is a suction type cleaner in the pool, remove it. If this eliminates the problem, use it only when the solar system is off.

Install Answers:

- a: If the system is a single row array and there is adequate flow, using the {HC-5210}Ball Valve on the return line to throttle the flow back to produce more back pressure on the system. This will even out the flow through the panels. If the array contains more panels than the maximum recommended on Page 9 of this manual, change the array to a double row or single row split feed as shown in Fig 4.2 and 4.3.
- b: If the system is a double row or a single row split feed array and there is adequate flow, install an Ball Valve on the return side of the set of panels that are the coolest to throttle back the flow through these panels and force more water through the warmer panels. If any section of the array contains more panels than the maximum recommended on Page 9 of this manual, make changes as needed to correct this.



Installation Troubleshooting

3: WATER COMING FROM THE SOLAR SYSTEM IS NOT AS WARM AS IT SHOULD BE

Diagnosis: The water is flowing too fast through the panels

Install Answers: Test water flow rate. Water flow through a single panel should be less than 10 gallons per minute. Adjust the Three-Way Valve to by-pass some of the water.

Diagnosis: Seasonal normal operation

Answer: In the cooler months of the year, or on cool or partly cloudy days, the temperature rise through the panels may only be 2° or 3°. Use the back of your hand to feel the water temperature difference at the pool return inlet.

HELIOCOL

SOLAR POOL HEATING. ENGINEERED FOR LIFE.

INSTALLATION MANUAL



Heliocol is the first and only solar pool collector in the world to achieve the elite status of ISO9001:2000 Certified. Relatively few manufacturers have the privilege of placing the ISO 9001:2000 emblem on their products. Only those companies performing at the highest levels in their industries can meet the stringent requirements specified by this demanding international standard. The technical and engineering expertise of Heliocol and their relentless pursuit of continuous product improvement have earned them the world renowned ISO 9001:2000 certification. Over the two year process necessary to gain certification, their customer service record, product failure rate, and engineering processes were all carefully scrutinized and found deserving of ISO 9001:2000.



Ortech International is a solar collector rating and testing facility that is recognized globally. Heliocol collectors have carried the prestigious Ortech Certification since 1985.



The solar energy system described by this manual, when properly installed and maintained, meets or exceeds the minimum standards established by the Solar Rating and Certification Corporation (SRCC). This certification does not imply endorsement or warranty of this product by the SRCC.



An Environmentally Safe Product is one that helps to preserve and protect our environment. The Heliocol Solar System does just that. An average pool in the United States, when heated by a gas heater, will introduce into our atmosphere 58 tons of CO₂ and 108 pounds of NO_x over a ten-year period. A Heliocol Solar System that is cost effective, durable, and worry-free will introduce no such health hazards into our air. Your Heliocol system will provide you with natural, safe, and free energy year after year.