Techno-Solis Installation Manual

Read the complete installation manual and Owners Manual before beginning the installation.

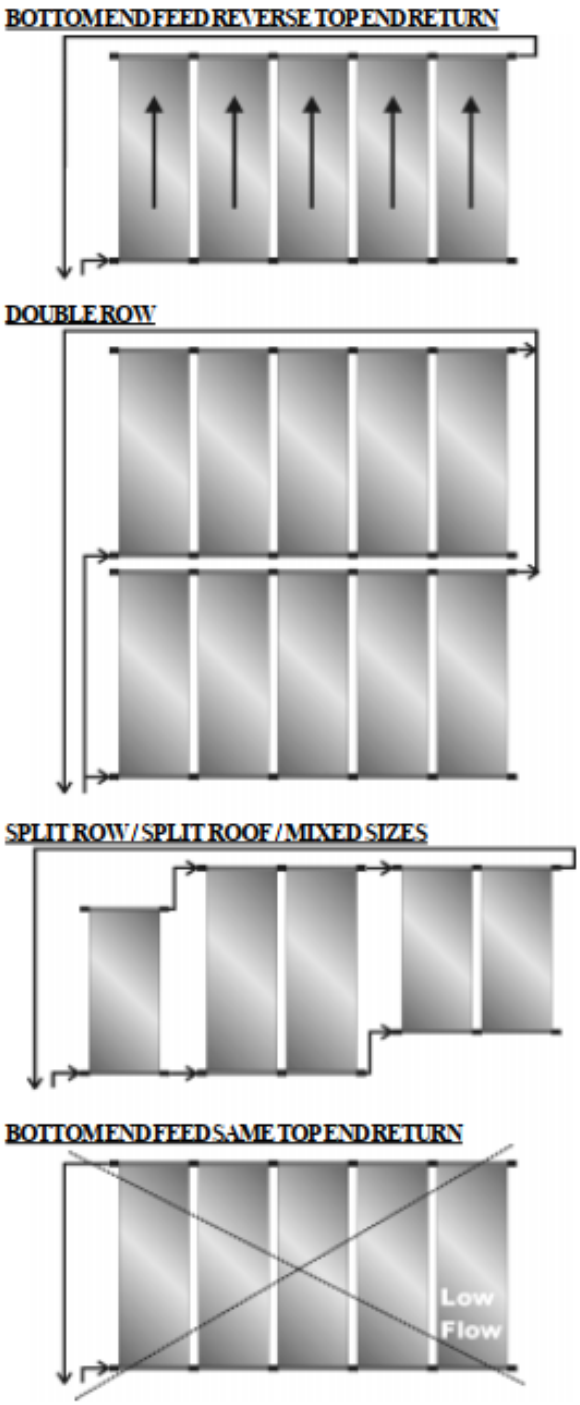
Sizing the System Use the "Simplified Sizing Guide for Solar Pool Heaters" to determine the total system size required in square footage. Once the required area has been calculated, select the appropriate panel size. Panels are available in 4' x 8' (32 square feet), 4' x 10' (40 square feet), and 4' x 12' (48 square feet). Divide the total required square footage by 32, 40, or 48—based on the panel size chosen—to determine the number of panels needed. Whenever possible, select larger panels, as they generally offer a lower cost per square foot.

Installation Location Determine the roof area(s) where the solar panels will be installed. In the Northern Hemisphere, panels should face south for maximum efficiency, followed by flat, west, or east orientations, in that order. Panels must never face north. To ensure proper drainage, panels must be mounted at a minimum tilt of 15°. In tropical and subtropical climates, panels may be installed on flat roofs; however, in areas subject to freezing temperatures, water must be circulated through the system during freezing conditions to prevent panel damage. Solar panels can be installed on most common roofing materials, including shingle, barrel tile, flat tile, metal, cedar shake, built-up gravel, and modified roofing systems. The system may also be installed on an aluminum or wood ground-mounted rack system. For additional information regarding rack or flat roof installations, please contact our technical support team.

Verify Space Requirements Determine the available roof area for the installation. Each panel measures 48 inches wide and requires a 3-inch gap between absorbers for mounting, resulting in a total width of 51 inches per panel. Panels are installed side by side in a row, with each panel requiring 51 inches of horizontal space. For example, seven 4' x 10' panels would require 357 inches horizontally and 120 inches vertically. Panel rows may be split to accommodate large obstacles, to stack one row above another, or to install panels on separate roof sections; however, each split requires a "Split Kit." Panels may be spaced around small vents up to 5 inches without a Split Kit, provided the obstruction falls between panels and a 6-inch rubber connector is used. Each row requires a minimum clearance of 3 inches on all sides to allow for feed and return plumbing. Refer to the chart below for typical system space requirements, noting that the overall length includes the additional 3 inches on each side. While different panel sizes may be combined within a system, we recommend contacting technical support for assistance with these types of installations.

# Panels	Overall Length	# Panels	Overall Length
3	13'3"	8	34'6"
4	17'6"	9	38'9"
5	21'9"	10	43'0"
6	26'0"	11	47'3"
7	30'3"	12	51'6"

Typical Panel & Plumbing Layouts Refer to the typical layouts shown below when planning your installation. Do not install more than 12 panels in a single row; larger systems should be divided into multiple rows. Water should be fed into the bottom corner of the panel array and returned from the opposite top corner. Never use a bottom-end feed with a return at the same top end, as this configuration reduces efficiency in the panels at the opposite end of the row. All bottom headers and feed plumbing must be installed to allow for gravity drainage. In tropical or subtropical climates, panels and plumbing may be installed level; however, in northern climates, the system must be installed with a ¼-inch per foot slope toward the feed line. Refer to the owner's manual for specific draining requirements. All return lines from separate panel rows must connect at the highest point of the system.



Installation Materials Below is a standard list of materials required for a typical installation.

PANEL KIT (1 per Panel, 1 per Row/Double Row, 1 per Split)

Kit includes	Qnty
3" Rubber Coupling	2
Stainless Hose Clamp	5
Stainless #14x2" 3/8 Hex Screw	4
Stainless Header/Strap Clip	4

ROW KIT (1 per Row)

Kit includes	Qnty
End Plug	2
Pipe to Panel Adapter	2

Note: 2" System Plumbing Standard; 1½" Kits by request

DOUBLE ROW KIT (1 per Double Row)

Kit includes	Qnty
2" Tee	2
End Plug	2
Pipe to Panel Adapter	2

SPLIT KIT (1 per Split)

Kit includes	Qnty
Pipe to Panel Adapter	4

Note: 2" Split Plumbing Standard; 1½" Kits by request

PLUMBING KIT (1 per System)

Kit includes	Qnty
1½" ID / 2" OD 3-Way Valve	1
1½" ID / 2" OD Check Valve	2
2" PVC 90 Elbow	18
2" PVC 90 Street Elbow	2
2" PVC Coupling	8
2" PVC Tee	1
2" x 1 1/2" PVC Flush Bushing	1
2 1/2" Galv 2 Hole Pipe Clamp	12
Stainless #14x1½ " 3/8 Hex Screw	28
Tube Sealant	1

HOLD DOWN STRAP

Size	Straps	Ft
4'x8'	2	9
Size	**Straps**	**Ft**
4'x10'	3	13.5
Size	**Straps**	**Ft**
4'x12'	3	13.5

PVC PIPE per Ft (typical amount shown below)

# of Panels	Ft	# of Panels	Ft
4	100	5 - 7	120
# of Panels	**Ft**	**# of Panels**	**Ft**
8 - 12	140	13 - 18	160

Note: For Tile Roof Installations, request & use Tapcon screws

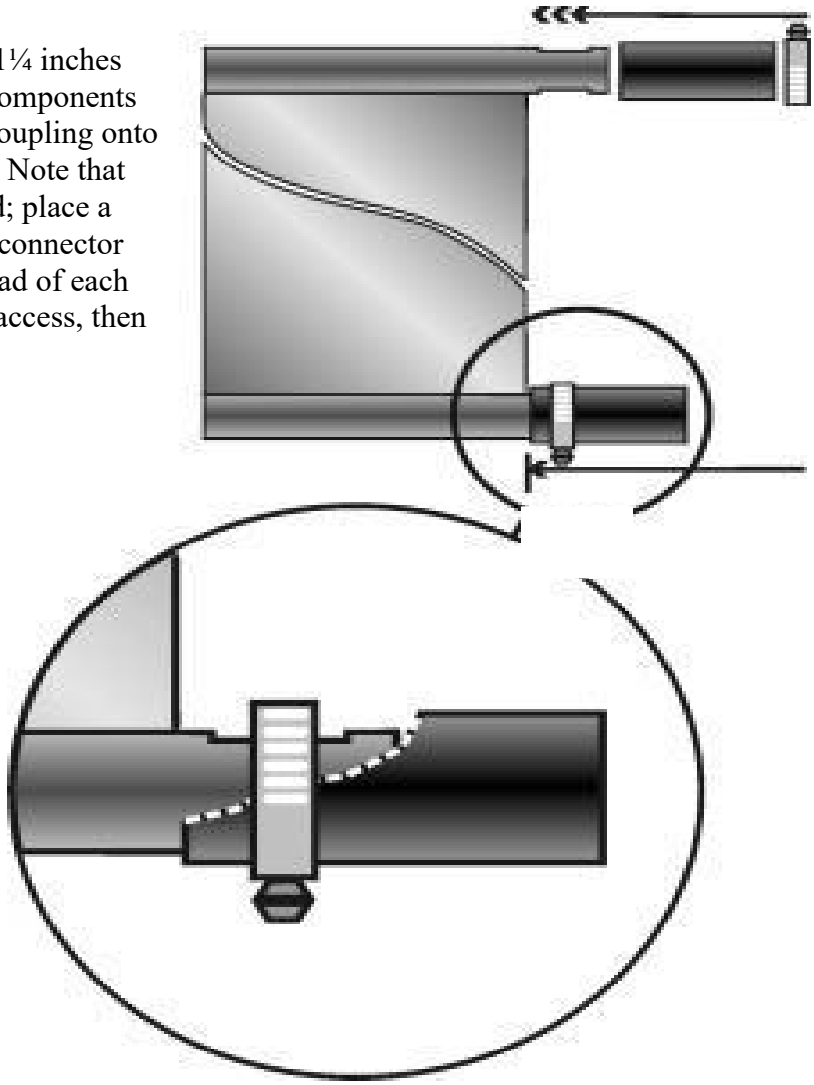
General Tools Required The following tools are required for a typical installation: a ¼-inch variable speed drill, 5/16-inch and 3/8-inch nut drivers, a caulking gun, chalk line, tape measure, level, hacksaw or pipe cutter, and PVC glue and cleaner.

Panel Installation The following procedure applies to shingle roofs; for other roof types, including flat roofs, refer to the section on Special Roof Requirements. Begin by establishing a horizontal chalk line across the roof to mark the top of the system. This line must provide ¾-inch clearance above and below it to allow for mounting the header clip on a flat surface. For tile roofs, position the line approximately 2 inches above the bottom of the tile. In northern climates, the line must be sloped ¼ inch per foot toward the feed end to ensure proper drainage.

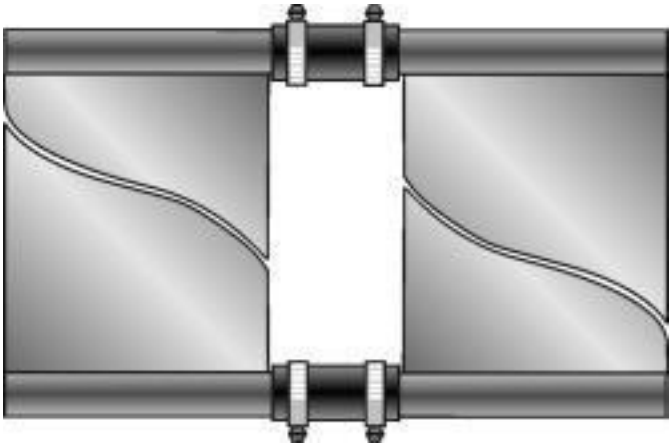
Next, snap a vertical line at a 90-degree angle to the horizontal line at either the left or right end of the installation area to locate the first panel. Allow a minimum of 3 inches of clearance on all sides of the panel row for piping. Inspect the roof carefully for any sharp projections that could damage the panels. If vents, chimneys, or other obstructions are present, lay out the system completely before securing the panels in place.

Install the panels from left to right (or right to left), working toward the opposite end. Techno-Solis panels feature a header design in which the mounting board attaches at the center of both the bottom and top headers. This design helps reduce the buildup of snow, leaves, and debris near the header area of the absorber surface. Panels may be installed with either side facing up and can be reversed after five or more years to extend their service life.

7.1: Position the top header approximately 1¼ inches below the horizontal chalk line. Using the components from the Panel Kit, install a 3-inch rubber coupling onto the right-end top and bottom header outlets. Note that each header outlet has a groove near the end; place a stainless hose clamp over each rubber hose connector and align it with the groove. Position the head of each clamp facing outward and upward for easy access, then tighten securely until snug.

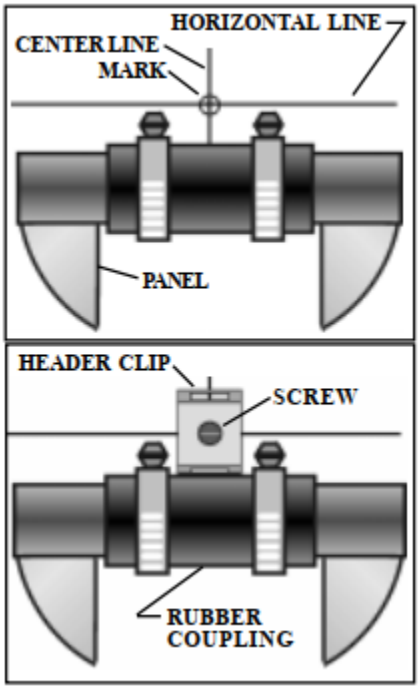


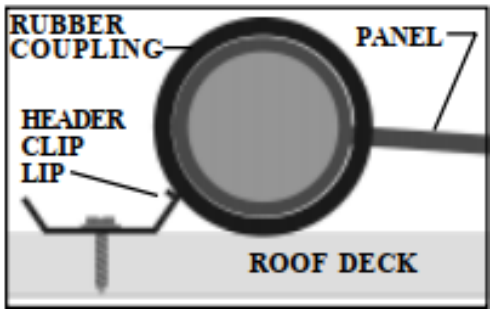
7.2: Slide a hose clamp over both the top and bottom rubber hose connectors. Position the next panel to the right of the first panel and insert its header outlets into the corresponding top and bottom rubber hose connectors of the first panel. Align each hose clamp with the groove on the second panel's header outlet, ensuring the clamp heads face outward and upward for easy access, then tighten securely until snug. When completed, the top and bottom connections should match the diagram labeled Detail B.



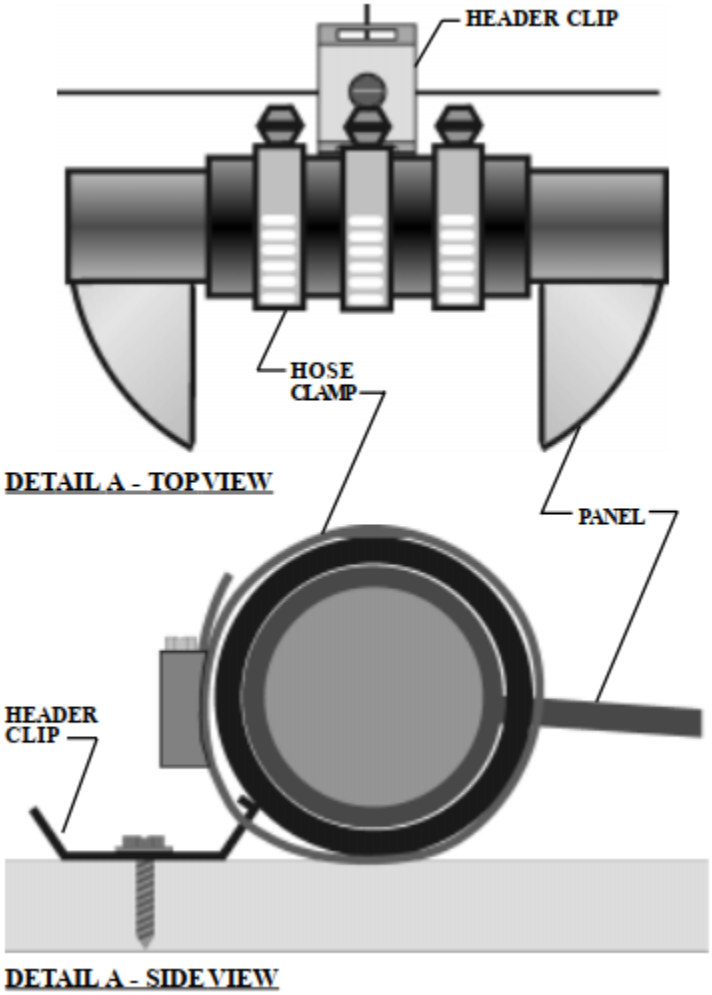
If the roof pitch allows the panels to remain in place without sliding, continue connecting additional panels by repeating Steps 7.1 and 7.2. If the roof is too steep, proceed to Step 7.3.

7.3: Confirm that the panels are properly aligned before securing them. The top edge of the header should run parallel to the horizontal chalk line, and the left edge of the first panel should align with the vertical line. Mark the horizontal line directly above the center of the top rubber hose connector. Apply a generous amount of sealant to the underside of the stainless header clip and position it on the mark with the lip facing the panel. Using a drill and a 3/8-inch nut driver, fasten a stainless #14 x 1½-inch 3/8-inch hex screw through the center hole of the header clip into the roof until secure. The clip should be firmly attached, but take care not to strip the screw in the wood. Ensure the lip of the clip sits squarely against the rubber coupling. Finally, apply a small amount of sealant over the screw head. When finished, the installation should match the referenced diagram.





7.4: Open the last hose clamp and guide the end down through the stainless header clip (the slotted end with the lip), then wrap it around the underside of the rubber hose connector. Close the hose clamp and tighten it securely around the rubber hose connector, ensuring it is firmly seated against the lip of the header clip, as shown in Detail A.

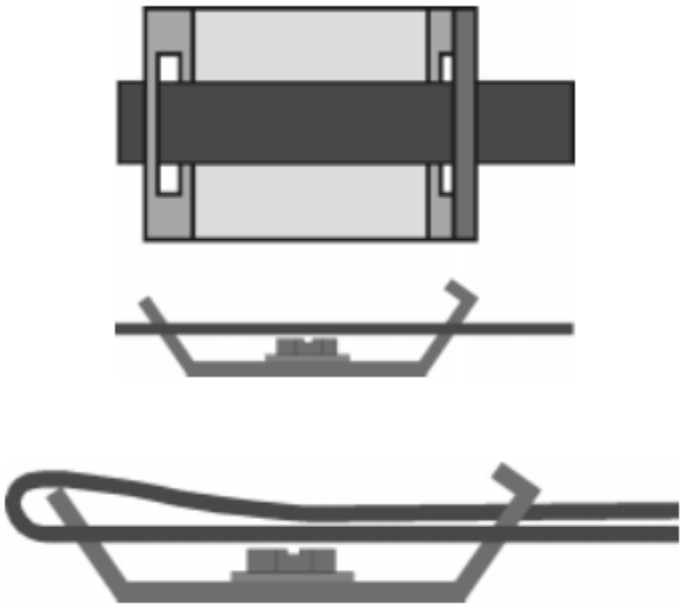


Repeat 7.1 through 7.4 until all panels in the row have been installed. Note that the bottom headers are not secured with a header clip in order to allow for thermal expansion. This movement may cause abrasion on certain roof surfaces. To prevent roof wear, apply silicone to adhere a small piece of galvanized sheet metal (approximately 4 inches by 4 inches) beneath each rubber hose connector.

7.5: The completed row should resemble the Roof Diagram, although the exact appearance may vary depending on the specific layout. To finish the row, use the components from the System Kit. Install a rubber hose connector on each of the four outside panel corners and secure them with hose clamps. At the feed and return corners, insert the pipe-to-panel adapters into the rubber hose connectors, using the end that resembles a header outlet, and secure each connection with a hose clamp. At the remaining two corners, install an end plug, making sure the lip faces inward toward the panel so that it sits between the hose clamp and the panel. Finally, secure the two top end rubber hose connectors to the roof using header clips, following the same procedure used for each panel.

7.6: The hold-down straps may now be installed, particularly in windy conditions, although many installers prefer to complete this step last. Refer to the Installation Materials Section to determine the required number of straps. The bottom strap should be positioned 12 inches above the bottom header, with the remaining strap(s) evenly spaced between the bottom strap and the top header. Spacing can be marked in advance using a chalk line measured down from the top horizontal line, or by following the shingle lines as a guide. Be sure to leave adequate clearance on each side of the strap line so the strap clips can be mounted on a flat surface.

Install each strap clip in the same manner as the header clips, except the slots should face left to right, regardless of the lip orientation. Position the clips evenly between each panel absorber and secure them with sealant and a stainless #14 x 1½-inch 3/8-inch hex screw. Thread the strap through each side of the strap clips from left to right. At the end of each row, loop the strap back through the inside slot of the clip as illustrated. Before securing the opposite end, pull the strap tight to apply tension, allowing approximately 2 to 6 inches of elongation.



Bottom End Plumbing Refer to the typical plumbing layout when installing the bottom-end plumbing. The solar system tie-in must always be located downstream of the filter. The check valves and 3-way valve are designed to accept 1 ½-inch PVC pipe internally or 2-inch fittings externally. While 1½-inch PVC pipe may be used for bottom-end plumbing, 2-inch PVC pipe is recommended wherever possible, particularly above the 3-way valve and tee.

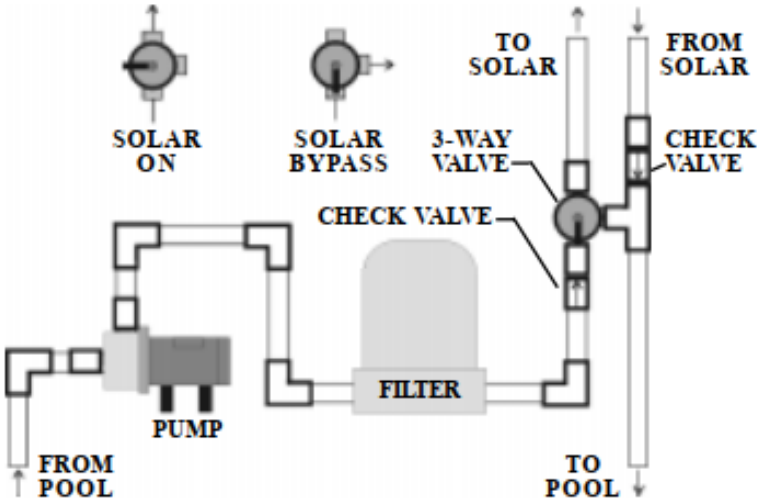
Always use PVC cleaner on all pipe ends and fitting sockets. Apply a generous amount of PVC glue to both surfaces, then immediately insert the pipe into the fitting using a twisting motion. Hold the connection firmly in place for at least 30 seconds. Follow the manufacturer's instructions on the cleaner and glue containers for proper application and curing times.

Before cutting any plumbing, determine the layout of all valves and fittings. Cut the return line after the filter in an area with sufficient clearance for the new components. Install a check valve between the filter and the 3-way valve, ensuring the flow direction points away from the filter (the internal cone should face toward the filter). Take care to prevent glue from sealing the cone inside the check valve.

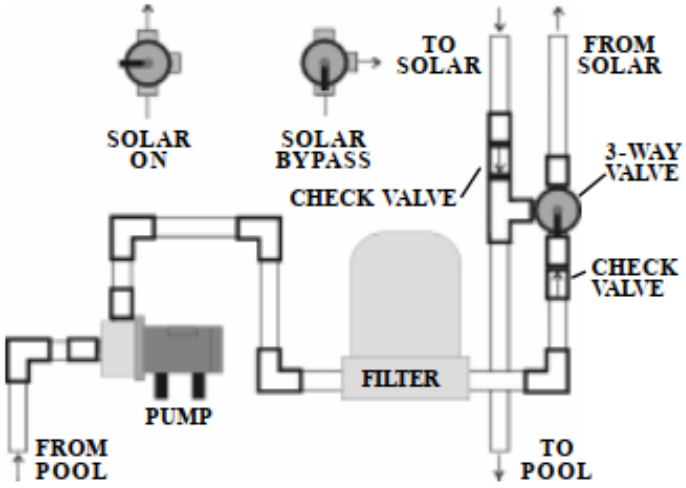
The 3-way valve is typically mounted against the building wall approximately 3 to 4 feet above ground level, with the inlet facing downward and the side outlet facing right. Secure the bottom inlet of the valve to the wall using a 2½-inch galvanized pipe clamp and screws. Connect the plumbing from the check valve to the inlet of the 3-way valve. From there, the plumbing continues up the wall, around the eave, and onto the roof to supply water to the solar panels.

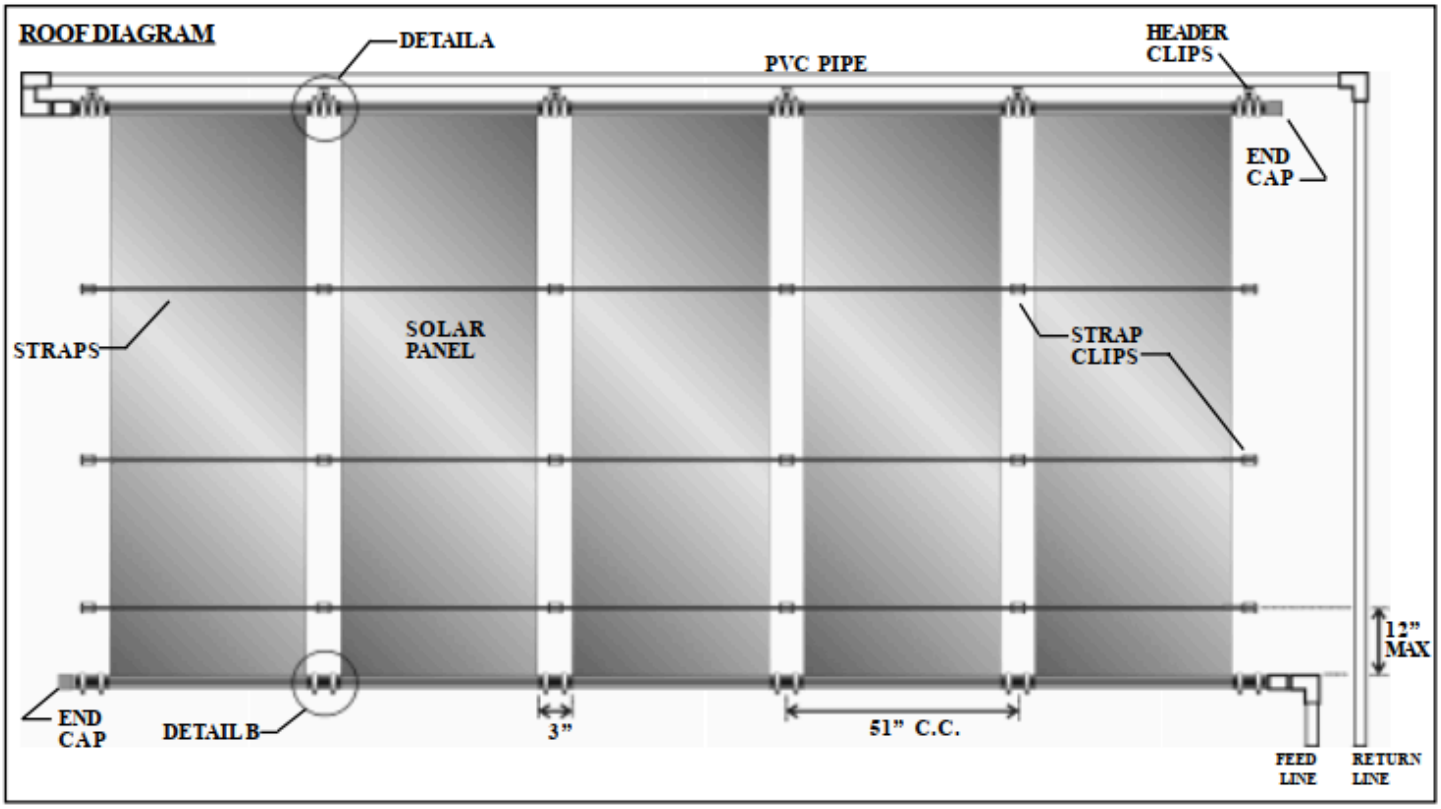
The side outlet of the 3-way valve connects to the side outlet of a 2-inch tee. The return line from the solar panels connects to the top of the tee, and the bottom of the tee ties back into the line leading to the pool return jets. Install a check valve on the solar return line above the tee, with the flow direction pointing into the tee.

Most accessories, including auxiliary heaters, chlorine feeders, and pool cleaner pumps, should be installed on the return line after the tee. Automatic pool cleaner pumps must operate at night when the solar system is off, or during the day only after the solar system is already running. Failure to follow this guideline may result in damage to the cleaner pump.



For installations requiring the solar return line to be located on the left side, install the 3-way valve with the side outlet facing left into the tee. Remove the faceplate of the 3-way valve and rotate it 90 degrees clockwise so that the “inlet” marking faces the side of the valve without an outlet, then reassemble the valve.





Pipe Layout Use 2-inch Schedule 40 PVC piping between the bottom-end plumbing and the solar panels. White PVC pipe is recommended due to its durability and long outdoor service life, though it may be painted with a high-quality exterior paint to match the structure or roof. For splits between panel rows, 1½-inch pipe may be used.

All plumbing must be installed to allow for gravity drainage. In tropical or subtropical climates, the panels and piping may be installed level. However, in northern climates, the system must be installed with a slope of ¼ inch per foot toward the pool equipment to ensure proper drainage. The panels should gravity drain back to the pool. Refer to the Owner's Manual for specific draining requirements.

If the plumbing cannot be routed to allow for gravity drainage, install a manual drain valve or drain line, or remove the end plugs to drain the panels when necessary. Support all piping at intervals of every 4 feet using 2½-inch galvanized pipe clamps.

Flow Rate The number of panels selected during system sizing must be properly matched to the pool pump's flow rate to ensure maximum efficiency. The ideal flow rate is 3 to 5 gallons per minute (gpm) per panel, with an acceptable operating range of 3 to 8 gpm per panel. To determine the flow per panel, divide the total gpm produced by the pool pump by the number of installed panels.

Keep in mind that the pump's rated gpm, as listed on the pump or in its manual, does not represent actual operating output. Flow is reduced by pressure losses caused by piping, filters, fittings, and the solar panels (when in operation). Actual flow should be measured using an in-line flow meter or calculated from the pump's performance curve, since increased pressure drop results in decreased gpm. Flow may also be estimated based on manufacturer specifications.

If flow is insufficient, friction loss can often be reduced by minimizing the number of elbows in the plumbing or by using two 45-degree elbows instead of a single 90-degree elbow. If the flow remains below 3 gpm per panel, a larger pump—or an upgraded motor and impeller—may be required.

A simple way to confirm adequate flow is to check the panel surface on a sunny day. The panels should feel cool to the touch, indicating that heat is being absorbed into the water. If flow is excessive, adjust the 3-way valve toward the bypass to divert some water away from the panels, or install a bypass line with a ball valve between the feed and return lines to regulate flow.

A properly sized pool pump and filtration system should circulate the entire pool volume once per day, typically within an 8- to 10-hour cycle. Solar panel sizing is based on circulating the full pool volume through the panels once during each solar day. If the filtration system is undersized or cannot operate for at least 8 hours per day, a booster pump may be required.

Startup & Testing Refer to the owner's manual for the complete startup procedure. Once the system has been filled with water, inspect all fittings, hose couplings, and panels carefully to ensure there are no leaks. Set the time clock to operate during peak solar hours, typically between 9:00 a.m. and 5:00 p.m. Check the surface of each panel to confirm proper water flow; during startup, the panels should feel cool to the touch as pool water circulates through them. Finally, observe the pool return jets and check for air bubbles, which may indicate air in the system.

Correcting Problems:

Problem: Air bubbles coming from the pool return jets.
Air bubbles indicate poor heat transfer and should be corrected promptly. First, inspect the pool pump basket. If it is not completely free of air bubbles, there may be a suction leak between the pump and the pool. Check that the pool water level at the skimmer is adequate. Inspect and lubricate the pump basket lid O-ring according to the pump manufacturer's instructions. A suction leak may also exist between the pump and the pool plumbing or within the pump's internal gaskets, which may require professional service.

If the system includes an optional vacuum breaker, try relocating it to the bottom header. In some cases, water may drain down from the panels faster than the pump can supply it, allowing air to enter through the rubber connectors. Begin by tightening all hose clamps. If the issue persists, install a ball valve in the solar return line above the tee and slowly adjust it toward the closed position over a five-minute period until the air bubbles stop. If the valve must be closed more than 50%, additional issues may be present. Contact technical support or a qualified professional, as the pool pump may be undersized and unable to provide adequate lift and flow to properly fill the panels.

Problem: Inadequate heating.
Insufficient heating is often caused by inadequate water flow; refer to the Flow Rate section for guidance. The time clock may also be set incorrectly—systems with southern exposure should typically operate from 9:00 a.m. to 5:00 p.m. Heat loss during cooler nights can significantly reduce performance; use a solar pool cover to retain heat when nighttime temperatures drop below 60°F. Shading on the panels can also reduce efficiency—remove any obstructions or adjust the time clock so the system runs only when the panels are exposed to direct sunlight. Finally, the system may be undersized; adding additional panels may be necessary to achieve the desired heating performance.

Special Roof Requirements: Variations to the standard installation procedures are outlined below. For other roof types not listed, contact technical support for guidance.

Flat Tile or Barrel Tile Roofs:
Mounting hardware must be secured to the tile using Tapcon screws supplied with the kit (tile roof must be specified when ordering). Drill a pilot hole using a 3/16-inch masonry bit before inserting the screw. Do not drill into the substrate beneath the tile, as this will cause a roof leak. Position mounting screws 1 to 2 inches above the bottom edge of the tile to take advantage of the overlap between tiles, which provides space between the tile and substrate. On barrel tile roofs, arrange the panel layout so mounting holes align with the tops of the barrel tiles whenever possible. If additional spacing is required, use 6-inch rubber couplings cut to the appropriate length.

Cedar Shake Roofs:
If cedar shakes are installed over plywood, place a galvanized metal flashing (approximately 4 inches by 4 inches) beneath each shake at the mounting penetration point. Center the flashing under the screw location, drill a pilot hole, and apply a generous amount of sealant before installing the screw. If the shakes are installed on fir strips, contact technical support for an alternate installation method.

Flat Built-Up Gravel Roofs:
Exercise caution when working on this type of roof. Ensure the roof is in good condition and completely dry before proceeding. If uncertain, consult a roofing professional. At each mounting location, clear loose gravel from an area approximately 6 inches by 6 inches. Remove embedded gravel at the exact penetration point using a chisel or the back of a claw hammer until a smooth tar surface approximately 2 inches by 2 inches is exposed. Apply a generous amount of sealant beneath the mounting hardware and over the screw head after installation. Using a 2-inch to 2½-inch fender washer beneath the mounting hardware will provide additional surface support. Tighten screws securely, but do not overtighten and strip the plywood. As an alternative, a roofing contractor may install roof curbs for mounting points.

Open Beam Roofs:
Ceilings with exposed beams must be inspected carefully to ensure mounting screws do not penetrate into interior spaces. Contact technical support for alternate installation methods.

Metal Roofs:
If the metal roofing is installed over plywood, standard installation procedures may be followed. If installed over fir strips, mounting hardware must penetrate into the fir strip to ensure proper sealing and to prevent bending the metal surface. If screw heads protrude above the roof surface, use a substrate beneath the panels to prevent damage.

Rubber or Asphalt Modified Roofs:
These roofs are typically flat. Use a 2-inch to 2½-inch fender washer beneath the mounting hardware to increase surface support. Apply a generous amount of sealant under the washer, between the washer and mounting hardware, and over the mounting screw head.

Roof or Ground-Mounted Rack Systems:
Rack systems may be constructed from pressure-treated wood or aluminum. For roof-mounted applications, aluminum is preferred due to its superior strength and longevity. Aluminum rack kits are available. To order a kit or request wood rack design specifications, contact technical support.

Ordering Parts or Technical Support
Phone: 941-209-1422
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