BOSS™
POOL HEATING

Installation Manual for Flexible Strip Solar Systems

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ECOGREEN™
NANOTEK™
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PROSOLAR™



AUSTRALIAN MADE

UP TO 15 YEAR WARRANTY

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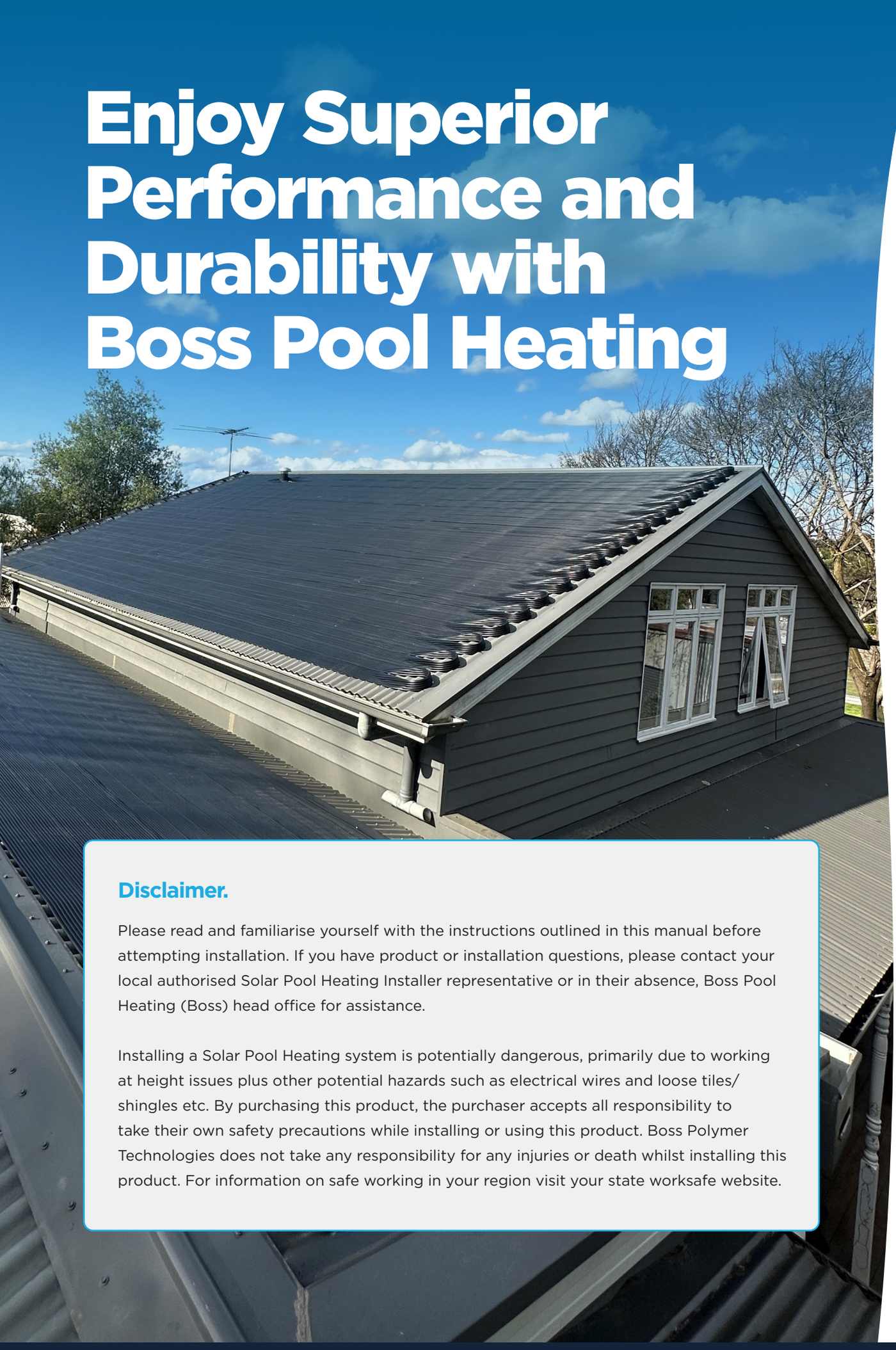
CLIMATE CARE CERTIFIED

ADAPTS TO ALL ROOFS

Australian Made Solar Pool Heating
Proudly Manufactured by:

BOSS™
POOL HEATING

Enjoy Superior Performance and Durability with Boss Pool Heating



Disclaimer.

Please read and familiarise yourself with the instructions outlined in this manual before attempting installation. If you have product or installation questions, please contact your local authorised Solar Pool Heating Installer representative or in their absence, Boss Pool Heating (Boss) head office for assistance.

Installing a Solar Pool Heating system is potentially dangerous, primarily due to working at height issues plus other potential hazards such as electrical wires and loose tiles/ shingles etc. By purchasing this product, the purchaser accepts all responsibility to take their own safety precautions while installing or using this product. Boss Polymer Technologies does not take any responsibility for any injuries or death whilst installing this product. For information on safe working in your region visit your state worksafe website.

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Introduction

Purpose and Scope

The intent of this installation guide is to equip the reader with sufficient knowledge to design, install and operate a Boss Pool Heating Nano-X™, EcoGreen™, NanoTek™, UltimateBlue™ or ProSolar™ strip solar system under normal circumstances, so that the system and its components perform correctly.

This guide cannot address every situation or requirement. If you have any questions or issues, please contact your local authorised representative or, in their absence, Boss Pool Heating's head office for assistance.



Safety Precautions

When installing a solar system, always exercise extreme caution when working with heights or around water; do not use shortcuts, as there is no substitute for safety. The installer of any Boss Pool Heating System (or component) must accept responsibility for assessing and implementing safety systems and procedures in accordance with all regulatory and moral requirements. The potential to fall from a roof is a major risk along with electric shock, exposure to harmful UV radiation and heat exhaustion. It is expected that the reader installing the system uses all necessary safety harnessing, scaffolding, safety railing and suitable footwear.
It is also expected that the reader is aware of any electrical shock hazards, weather conditions, the roof condition, roof access methods, pitch angle, and sun protection when deciding to install the system.
For more information on working safely with heights, check out the Safe Work Australia 'Working at Heights' website for more information.



https://www.safeworkaustralia.gov.au/safety-topic/hazards/working-heights

Planning and Designing the System

Calculate the surface area of the pool. For a rectangular pool; multiply the width by the length. For a circular pool, multiply π (3.14) by the squared radius of the pool. ($A = \pi r^2$).

In Australian Southern states, the recommended amount of collector will be 80 - 100% of the calculated surface area of the pool. In Australian Northern states, the recommended amount of collector will be 60% - 80% of the surface area of the pool.

To calculate the square metres of Collector required, simple multiply the pools surface area (m^2) by the desired percentage (%) and divide by 100.

Determining where to mount the collector

Orientation: Appropriate system orientation is essential to achieve the optimum solar energy available. North facing pitched roofs provides an ideal mounting location, followed by flat roofs. If this is not possible, then a West facing installation is the next best option, followed by an East facing installation. South facing roofs are not recommended as well as Roof pitches above 28°(beyond this we recommend rigid panels such as our RhinoPlatinum™ and RhinoPro™ range)

Shading: Roof shading from obstacles, trees or other buildings must be considered when selecting a suitable roof installation site. However, a degree of shading can be compensated by installing a greater percentage of Solar Collector.

Wind: Where possible, the collector should also be installed in a location that is relatively sheltered to avoid any extreme wind damage.



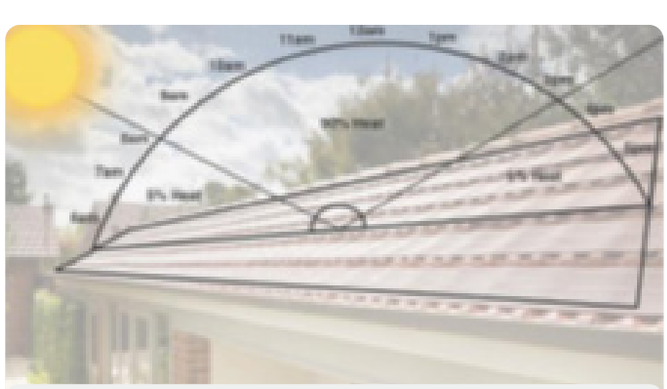


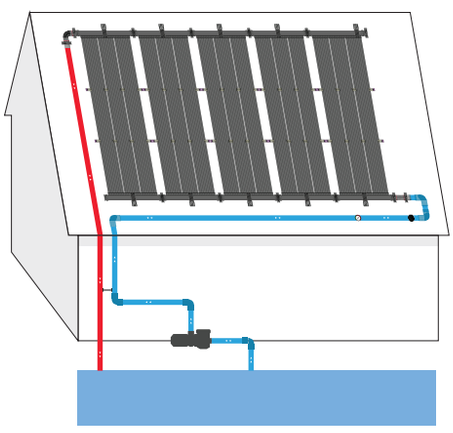
Figure 1: North Facing Roof and the Sun's Trajectory

Introduction

Boss Pool Heating Strip Solar Collector Range

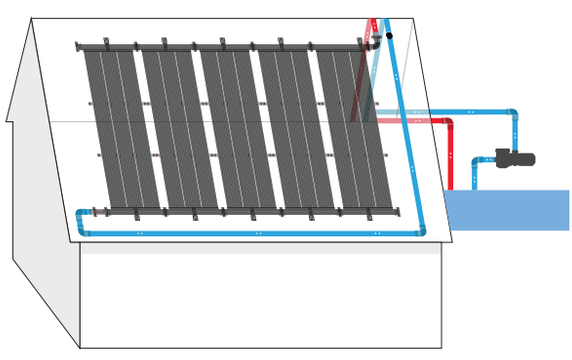
The Boss Pool Heating strip solar system consists of various components; when these are assembled they are referred to as the 'system' within this manual. Utilising the latest patented technology, the Boss Pool Heating strip solar collector range is only available from their specified installers and distributors. With the ability to employ up to four different materials into a single profile within the multilayered range; the Boss Pool Heating strip solar collector range is the most technically advanced and best performing strip collector profile range on the market.

System Configuration



Self-Draining: A system in which the collectors and all exposed pipework drain back to the pool by gravity when the pump stops. No part of the solar loop rises above the collectors to trap water.

Maximum operating pressure 100 kPa (14.5 psi).



Flooded: A system in which part of the solar loop rises above the collectors so water cannot drain back to the pool by gravity, most commonly where the plumbing runs up and over a roof ridge. The system will not drain automatically and water remains standing in the collector tubes when the pump stops.

Maximum operating pressure 50 kPa (7.25 psi).

Top Feed / Bottom Feed: The point where the supply plumbing connects to the array, into the top header or into the bottom header. It describes the connection only and does not determine whether a system drains. Drainage is described by the two terms above.

Panel Bank: A continuous row of panels joined directly to one another, header to header. Maximum 16 panels per bank regardless of panel length.

Array: A set of panels served by one pair of supply and return connections. Maximum collector area 538 ft^2 (50 m^2) per array.

Split Feed: A single row divided into two separately fed banks, used where the row would otherwise exceed the maximum panels per bank.

Series Feed: Two banks plumbed one after the other, used where the banks sit on different roof slopes.

Parallel Feed: Two or more banks fed from a common supply, each returning to a common return.

Pipework and Orientation

Supply Line: The pipe carrying pool water from the equipment pad to the array, sometimes referred to as feed line.

Return Line: The pipe carrying heated water from the array back to the pool.

Header: The molded manifold running along the top and bottom edges of a panel, into which the collector tubes connect.

Roof Fall: The direction and degree of slope across the roof surface. The array and its pipework are set so the fall runs towards the supply side, so water drains back down the supply line when the pump stops. Marked on the layout drawings.

Equipment Pad: The location of the pool pump, filter and controller.

Components

VacRel® (VRV): Boss vacuum relief valve. Allows filtered air into the system when the pump stops so the system can drain. Also prevents vacuum crush of the pipework and collector tubes. One per system. Labelled Vacuum Relief Valve (VRV) on the layout drawings.

TufGauge®: Boss pressure gauge, installed in the supply line close to the array to read system operating pressure.

Absorber: The black collector panel bonded to the roof surface, made up of collector tubes running between the top and bottom headers.

Collector Tube: An individual water channel within the absorber.

Operation and Limits

Maximum Operating Pressure: The highest pressure the system may run at, read at the TufGauge®. Set by the drainage configuration: 100 kPa (14.5 psi) self-draining, 50 kPa (7.25 psi) flooded. These are ceilings, not targets. Exceeding them can damage the collectors and will void the warranty.

Automatic Drain Down: Water draining back to the pool by gravity each time the pump stops, without intervention. Requires a self-draining configuration.

Manual Drain Down: Draining the system by opening drain valves. Required on flooded systems and on any system that cannot drain automatically.

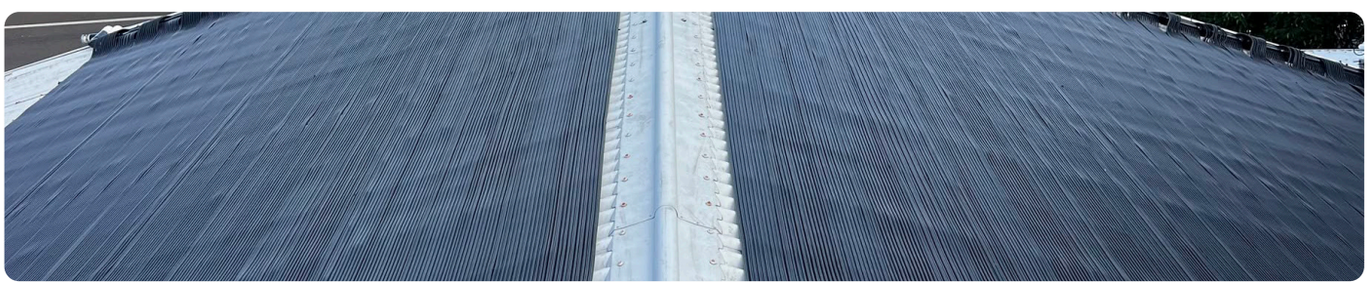
Stagnation: Water standing in the collector tubes when the system is not running. Stagnant water reaches high temperatures, which softens the tubing and reduces its resistance to pressure when the pump next starts.



Introduction

Before You Start

- Ensure you have taken all necessary safety precautions before beginning
- As the installer, you are responsible for exercising good judgement when installing flexible strip solar to protect the long-term integrity of the collectors as well as the mounting surface(s)
- Check the code and permit requirements from your local building department before commencing any works
- Familiarise yourself with all Boss flexible strip solar ancillaries, components and plumbing materials required to complete the installation
- To ensure that you avoid breaking/cracking any roof tiles, try to walk on the 'crease' of the tile, not the middle. If you break a tile you should replace it. On tin roofs, walk on the screw/nail line. Walking elsewhere may cause the metal roof to crease.
- For safety reasons, avoid standing or walking on the flexible collectors whenever possible, whilst the panel will take your weight, collectors generally have less grip when compared to normal roof surfaces, particularly when wet. Ideally, collectors should be installed with ample clearance around the assembled solar collectors to allow access without being walked on.
- A Schematic Drawing should be prepared before starting any work. Ensure you have accurately measured the available roof space and marked any roof protrusions or obstacles. This will allow you to determine the appropriate location and orientations of your system.
- In regions prone to frost conditions, ensure you take appropriate actions to guarantee that the collectors are free of water in order to avoid freeze damage. This includes installation, handover documents and training.
- Depending upon your installation, additional plumbing materials and items may be required. When selecting additional material please ensure you select:
    - Quality products that are capable of withstanding long-term direct UV exposure
    - 40mm PVC pipes and fittings, pressure rated to Class 9 or higher
    - Use good quality PVC Primer and Type P Cement
- Do not use ABS, "plumber's" fittings, DWV fittings (drain, waste, and vent) or a lower standard substitute.
- It is important to remember that no two installations are exactly alike. However, most standard installations do share similarities.
- This manual covers the most common Australian roof types (tile and metal). It does not cover all roof materials (e.g. polycarbonate, shingles, or specialty roofing systems). If you are unsure about compatibility with your roof type, contact a Boss representative before commencing installation.



Important. Collector Amount Requirements.

The amount of collector required can also depend on a variety of factors such as the customers expectations of the solar output, the use of a pool blanket or cover on the pool, the climate in relation to where the customer is located, the pool's total area including depth, volume, shape and exposure to wind, colour of the interior and other factors, the roof and its pitch and orientation to the sun and shading as well as the proximity of the system to the pool. The closer the system is to the pool, the better in reduction in heat loss and pump pressure loss.

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Flexible Solar Components Detail

Calculating the Required Components

Based on the design of the system, the Installer will need to identify and calculate the required amount of components in order to adequately install the system.



Solar Collectors

Using your created schematic diagram, calculate the amount of solar collector (pictured left) is required for the solar systems installation.





The TufMan™ Manifolds

Using your schematic diagram, work out how many times the collector is attached to the TufMan™ manifolds for both the supply and return, each attachment equates to one TufMan™ manifold.

As a general guide, to work out how many manifolds you require, the rule of thumb is 2 × per “U” loop or run. Alternatively, measure the length of roof space available where you want the manifolds to go and divide by 330mm – 400mm (depending on cut or uncut manifolds as outlined in this manual). The length of an angled manifold system (manifolds parallel to hip or valley) using the 500mm TufMan™ manifolds will need to be determined on site.

Note: The TufMan™ manifolds are offered at either 400mm or 500mm lengths and can be trimmed to suit your application.



Loop Return Manifolds (TufReturn™ Manifolds)

Loop return manifolds, known as the TufReturn™, are an optional component. Using the schematic diagram work out how many times the TufReturn™ loop return manifolds are attached to the ends of the collector as it loops back towards the manifold system. This is usually easy to calculate for 'U' loop systems where generally half the amount of TufReturn™ manifolds are required compared to the total amount of TufMan™ manifolds.

Note: Care needs to be taken when calculating for a 'S' serpentine flow design as the TufReturn™ manifolds will be positioned on both sides of the TufMan™ manifold system.



Flow Balance Pipe to Manifold Assembly

The length of the flow balance pipe will be similar to the length of the manifold system, the Installer should refer to their schematic diagram to calculate this. It is recommended that a greater length than required should be ordered, to allow fine tuning to occur on-site.

Note: The final assembly will require adhering two 90º elbows and 1 end cap.



Mounting the Manifold System to the Roof:
See ***Appendix 6: 'Roof Assembly and Attachment for Tiles and Corrugated Metal Roofs'*** for more information.

Mounting the Collector to the Roof:
See ***Appendix 4: 'Manifold Length & Strip Collector Assembly'*** for more information.

Flexible Solar Components Detail

Supply and Return Pipes

Using the schematic diagram work out how many linear metres of pipe are required to connect the manifold system to the TufFilta™ and pool return.

Note: All pipework should be designed and installed to allow for thermal expansion and contraction, without applying stress on associated components such as the TufMan™ manifolds.

Tip!

To estimate your required flow rate, multiply the system size (m^2) by **1.8** for the minimum L/min and **4.8** for the maximum. Example: a $30m^2$ system requires **54–144 L/min**.
*Note: Always check the **pump's head vs. flow performance curve** in the manufacturer's documentation to ensure the selected pump meets your system's requirements.*



Pump Selection
Different solar circuits typically have different solar pump requirements:

Separate Circuit: Generally one dedicated solar pump is required for a separate solar circuit system.
Simultaneous/Retro/Via Filtration: For a simultaneous circuit/ connection system one dedicated solar pump is usually sufficient, however extra care is required with designing and commissioning a simultaneous type of system
Manual Diverter Valve: Typically there is no need for a dedicated solar pump for a manual diverter valve connection system, however extra care is required with designing and commissioning this type of system.



Filter and Strainer
The Boss TufFilta™
As a general rule, use one TufFilta™ per average system.



Vacuum Relief Valve (VRV)
VacRel™
As a general rule, use one VacRel™ per average system.

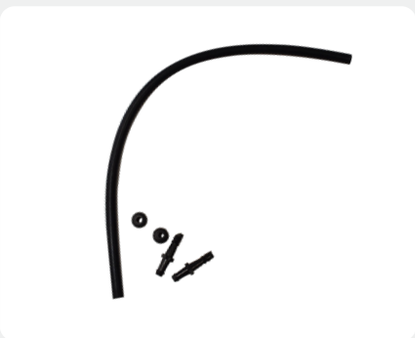


Automatic Solar
Digital Controller
As a general rule, use one Controller per average system.



Collector Barb Locking Collars

To calculate the required quantity of TufCollar™ rigid collar components for the system, multiply the total quantity of TufMan™ manifolds used by the number of barbs per TufMan™ manifold. Additionally, if TufReturn™ manifolds are to be used, simply multiply the total number of TufReturn™ manifolds by twenty.



Drain Down Kit

2 x TufBarbs™ and 2 x grommets are used for the drain tube when combined with 2 x TufCollars™.



System Pressure Gauge The Boss TufGauge™

As a general rule, use one TufGauge™ per system.

Flexible Solar Components Detail



PVC Pipe and Fittings

White PVC pipe and fittings are generally available from most plumbing and hardware dealers; however, black is generally more difficult to source; Boss offers fittings in both colour options. Using the schematic diagram, work out the length and quantity of each component required to plumb the entire system.

Note: Pressure pipe and fittings shall comply with AS 1477 and be Class 9 or higher



Saddle Clamps

Using the schematic diagram work out how many saddle clamps are required to support the pipework (excluding manifolds) for the entire system based on being:

- Spaced at a maximum of 1800mm apart on the vertical wall
- Spaced at a maximum of 900mm apart on horizontal surfaces
- Multiple tightly spaced saddles under eaves.



Type N Cement and Primer / Silicone Lubricant

For gluing PVC to PVC use a quality brand name in a type N cement and primer, this is easily sourced from plumbing or hardware outlets. As a general rule, 250ml of type N cement and primer is sufficient per average system. Aerosolve 302 silicone lubricant is the recommended form of silicone lubricant. Generally one 300g silicone can will be sufficient for four average-sized systems.

Positive Pressure Considerations

For a solar pool heating system to operate correctly and efficiently, the system requires the pool water to be pumped evenly through each individual collector strip, at a combined flow rate between 1.8 and 4.8 litres per minute per square metre of collector (reference AS3634 8.1a) and a system hydraulic pressure appropriate to the installation (refer to ***Appendix 11: 'Troubleshooting System Pressure'*** and ***Appendix 12: 'Troubleshooting Return System Pressure).***

In order to achieve this balanced flow rate and desirable system pressure across the entire collector system, the Installer must consider and design for:

• The correct sized pump and plumbing system to adequately deliver the required amount of pool water up to the roof, through the solar system and back to the pool.

• The correct manifold and plumbing layout to allow the required volume of pool water to be evenly distributed to, and returned from the individual collector strips, at an appropriate pressure.

• An optimum and even flow length of collector strip, as the distance between the supply and return manifold will influence efficiency; back pressure and flow rate.

Negative Pressure Considerations (vacuum)

For a solar pool heating system to operate correctly and efficiently, the system requires the pool water to return to the pool without creating a negative pressure (vacuum) within the collector tubes. This requirement is for both:

1. Pump on with the system fully operational, and
2. Pump off with the system water draining back to the pool.

It is therefore critical that an internal positive and negative pressure test is conducted and appropriately documented prior to system handover. Failure to adhere to these guidelines may result in major non-repairable damage to the system such as but not limited to: barb blow off, collector tube bulging or bursting, or vacuum crushing of the collector tubing that will ultimately result in the tube splitting along the internal flex/crush line.

Note: Installers must design and install their systems to accommodate the hotter months of the year, where the collector has been heat-softened and is therefore more susceptible to the effects of internal positive pressure and vacuum.

Internal System Pressure

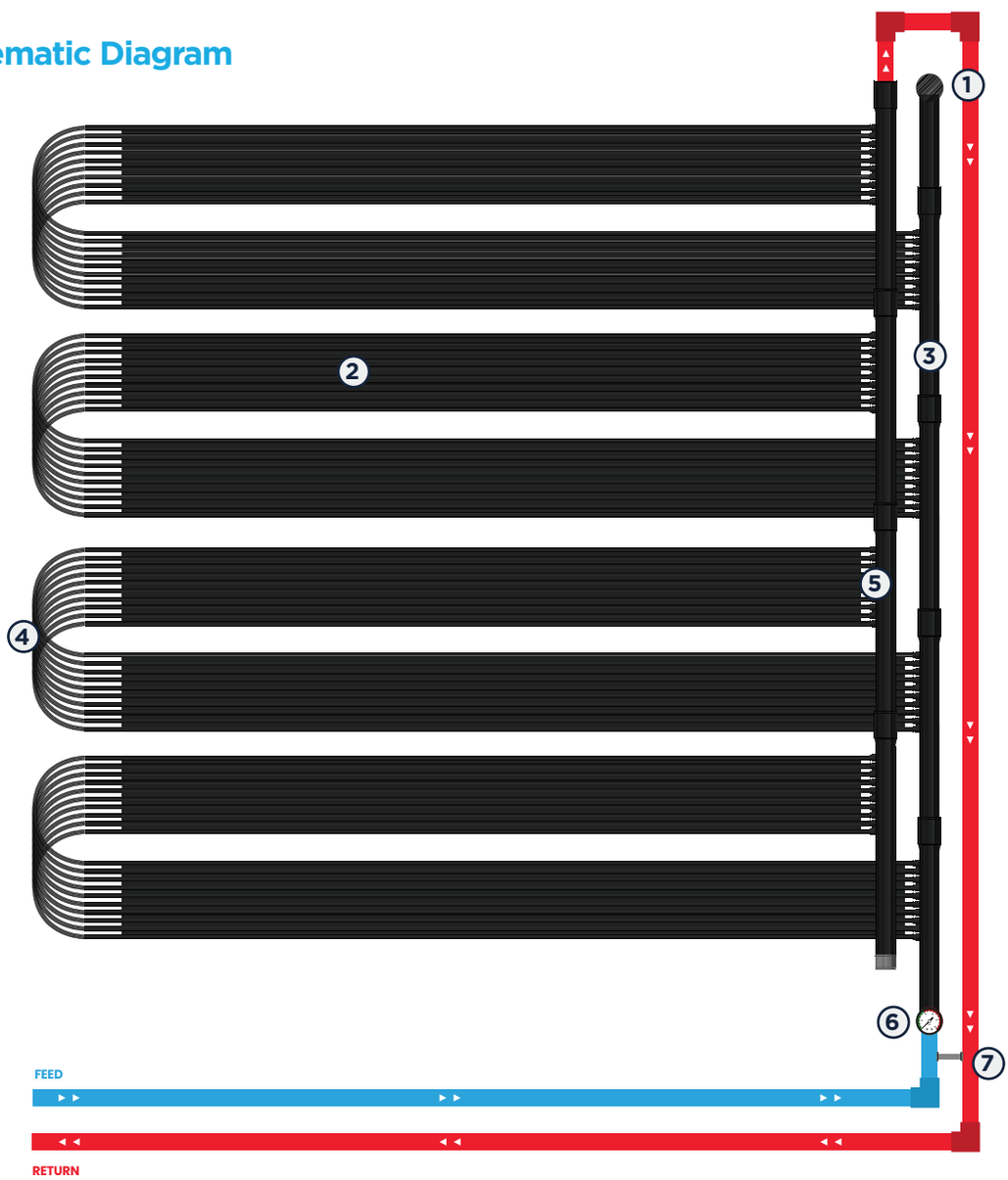
Refer AS 3634-1989 Section 6 and Appendix A3 and A4.
Many factors can influence both positive and negative pressure within the system and must be taken into consideration during the design, installation and the final testing of the system prior to handover.

Planning and Designing the System

Preparing a Schematic Diagram Design

It is highly recommended that the Installer prepares a schematic diagram with dimensions. This design should include detailing on the roofs surface, location of the collector system, location of manifold system, supply and return pipework from the solar pump back to the pool, and relative position to the pool. The following diagram outlines a basic system layout as a sample.

Basic Schematic Diagram



01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit

Note: You must ensure that the manifolds are able to move freely with expansion when installed.

Required Tools for Installation



Standard Caulking Gun



Type N PVC Cement & Primer



Impact Driver or Drill



Masonry Drill Bits



Appropriate Safety Equipment

Other Required Tools

Other required tools for installation of a Flexible System can include: TufTool™, screwdrivers, chalk/string line, chalk or marking pen, suitable fixing screws, pliers, spirit level, pipe cutter or hacksaw, tape measure & harnessing gear.

Determine the Most Appropriate Location for the Manifold System

The Boss TufMan™ 400mm and 500mm long manifolds allow the Installer to position the manifold system virtually anywhere within the solar system. The TufMan™ is used for the vast majority of installations where the manifold system is installed at a right angle to the collector run. For installs where the Installer requires the manifold system to match the angle of the roof's hip or valley, the longer 500mm TufMan™ should be used (see Figure 2).

When deciding the most appropriate manifold design, due attention should be paid to the most appropriate location and layout of the loop return. A number of factors should be considered i.e.: aesthetic appeal, appropriate design to achieve the desired collector roof coverage, automatic drain down, roof obstacles and incursions, and locating the manifold system as close as possible to the solar pump.



Figure 2: 500mm TufMan™ Manifold



Figure 3: TufReturn™ Manifold

Installing the System

Step 1

Before starting the strip solar installation or getting on the roof, the Installer must determine the collector size and best location of the strip solar system along with required ancillaries and components by selecting an appropriate collector and roofing configuration found in ***Appendix 1: Basic Collector and Roof Plumbing Configurations.***

Step 2

Once the collector and roofing configuration has been selected, determine where the supply and return pipes will need to be mounted. Then, retrofit your supply and return pipes as per the diagrams found in ***Appendix 2: 'Plumbing Diagrams.'***

Note: Ensure that the system is designed and installed to protect against water stagnation and boiling. See ***Appendix 3: 'Hydraulic Pressure and System Design'.***

Step 3

Ensure that the roof is dry, clean and clear of any moss or other dangers. Double check that you have all the required equipment, components and tools as well as what has been mentioned in this manual to complete the job with a plan, correctly and safely. It is also strongly recommended that the Installer familiarises themselves with the 'Appendices' in this manual before continuing.

Step 4: Manifold System Installation

4.1: TufMan™ Premium Manifold

(See 4.2 for 10:1 Manifold)

Step 4.1.1: Understanding the design and location of the manifold system is critical during the early stage of the installation process. It is therefore highly recommended that the Installer spends ample time allocating and planning prior to engaging in any cutting or bonding and referring to their schematic diagram. Another tip is to take the balance pipe, VacRel™ and a number of elbows and other fittings to confirm position and orientation of the connecting flow and return pipework.

The type of roof will have an impact upon the spacing required between your collector runs. By trimming the male end of the TufMan™ manifold and balance pipe (if necessary), the spacing between the collector strips can be altered to suit the tile spacing, or other spacing requirements. See ***Appendix 4: 'Manifold Length & Strip Collector Assembly'.***



Step 4.1.2: Glue the TufMan™ manifolds together using the correct cementing procedure (see ***Appendix 5: 'TufMan™ Manifold Gluing Procedure'***), while also checking the length and spacing as you continue the installation.

Tip!
Remember to measure twice and cut once.

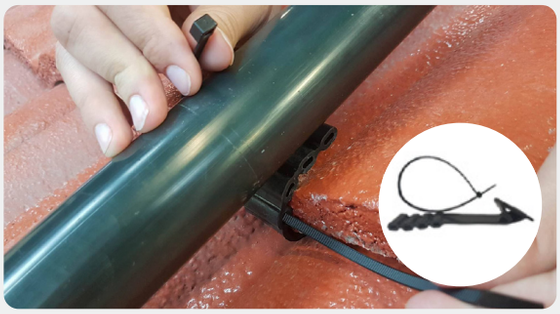
Step 4: Manifold System Installation continued

4.1: TufMan™ Premium Manifold

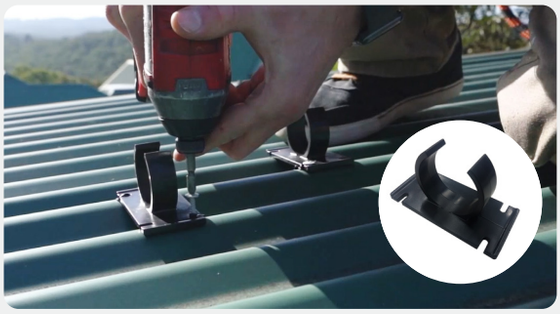
(See 4.2 for 10:1 Manifold)

Step 4.1.3: Secure the assembled TufMan™ manifolds in place with EzyClips or EzyTies depending upon your roofs surface, see ***Appendix 6: 'Roof Assembly and Attachment for Tiles and Corrugated Metal Roofs'.***

These fixings should be installed with a gap of less than 100cm between neighbouring clips. Do not make clips or straps too tight as they must allow for thermal expansion and contraction.



Roof Assembly for Tiled Roof.



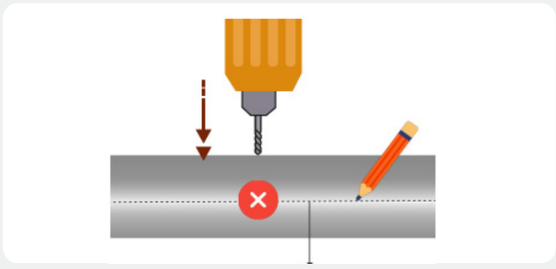
Roof Assembly for Corrugated Metal Roof.

Step 4: Manifold System Installation continued

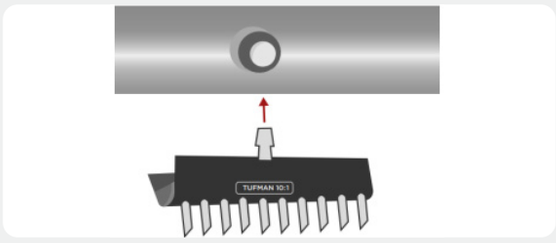
4.2: 10:1 Manifold Installation

Step 4.2.1: Refer to Step 4.1.1 (first paragraph)

Step: 4.2.2: Mark the position of the first 10:1 manifold, then, using the Boss-supplied counterbore tool, drill a hole. Ensure the hole is round without any ovaling, clean and free of swarf and burrs.



Step 4.2.3: Lubricate the 10:1 barb and push the 10:1 manifold grommet into the drilled hole until it is seated and locked into position. Be wary of overspray as this can be a slip hazard.



Step 4.2.4: Once the 10:1 manifold is firmly seated, loop and secure the supplied cable ties through 2 holes and secure around the PVC pipe, then tighten until firm.

Step 4.2.5: Secure the assembled manifolds in place with EzyClips or EzyTies depending upon your roofs surface, see ***Appendix 6: 'Roof Assembly and Attachment for Tiles and Corrugated Metal Roofs'.***

Installing the System

Once the manifold system has been established and associated components prepared for assembly, the Installer should ensure that the VacRel™ is positioned at the highest point of the system with the centre line of the VRV as vertical as possible.

Step 5

Cement the final pipework and the VacRel™ Vacuum Relief Valve (VRV) in the desired location and orientation. Keep the VRV vertical by using either 45° or 90° elbow, depending on the roofs pitch.

Bond the supply, balance and return pipes to the appropriate PVC fittings and VacRel™ as per the schematic diagram and the chosen configuration design.

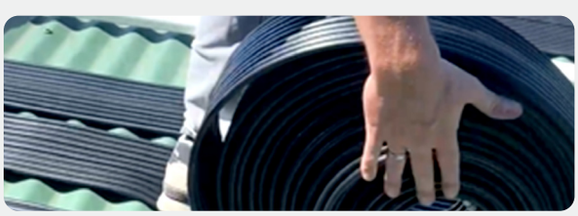


Step 6

Now that the manifold system is in place and secured to the roof with the supply, balance and return pipework with VacRel™ to the system, the Installer can now carefully place the required quantity of solar collector rolls on the roof of the installation.

It is important that the manifold system and its supply and return connecting pipes are securely installed onto the roof's surface; in order to resist external forces, such as wind. However, the entire system must also be installed to allow for all thermal movements; without inducing longitudinal or lateral stress on the manifold system. Lateral stress for example may be induced from incorrectly installed collector or supply/return pipework. Additionally all pipework should be designed and installed to allow for thermal expansion and contraction, without applying undue stress on associated components.

Step 7



Starting at the top of the manifold system, uncoil the collector (one at a time, for a maximum of 3 runs) away from the manifold system.

Step 8

When you reach the required distance, make a loop and continue to uncoil it back towards the manifold system, this return end of the system is referred to as the loop return or 'U' loop.





Important. Unpacking Solar Coils

The solar coils are designed to be straight with rounded tubes. However, when first removing them from the packaging, they may need some time to relax and straighten out from being tightly coiled and packaged before being glued down. To relax the coils, lay them down in a straight line in the sun so they can relax back into shape. During winter periods these coils may take longer to relax.



Using TufReturn™ Manifolds?

You have the option to install TufReturn™ manifolds, or elect for the more common method of looping the collector. The U Loop method is more cost effective but not as aesthetically pleasing compared to the flat look of the TufReturn™ .

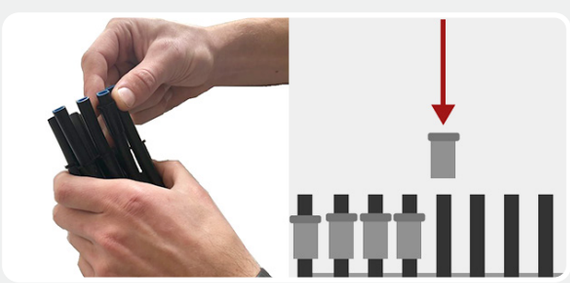
This is usually easy to calculate for 'U' loop systems where generally half the amounts of TufReturn™ manifolds are required compared to the total amount of TufMan™ manifolds.

Step 9 - For TufReturn™

Beginning with one end of the collector, strip and remove the connecting web between the collector tubes back by approx 150mm.

Step 10

Slide the required number of TufCollars™ over each individually stripped collector tube, ensuring that the larger shouldered end of the TufCollar™ is facing the cut end, so that once installed, they will face the manifold assembly.



Step 11

Bunch the individual collector tubes together in one hand, and spray a minimal amount of silicone spray lubricant down into each individual tube.

Then, spray or wipe a minimal amount of silicone spray lubricant onto each individual corresponding barb connector.

Note: The use of a cloth under or around the spray site is a good technique to control over spray. The Installer should also wipe their hands regularly with a clean cloth.

Installing the System

Step 12

Slide each individual collector tube onto its corresponding barb connector ensuring full engagement.

Step 13

Using the TufTool™, slide each individual TufCollar™ towards the main body of the manifold ensuring full engagement of the TufCollar™ over the tube and barb assembly.



Step 14

Before cutting the remaining non-connected collector end, confirm the cut length by ensuring that the loop return end of the collector is completed as per the selected design and dimensions. Also ensure that the collector run is lying straight, flat and in a fully relaxed position, ready for final installation on the roof.

Step 15

Once satisfied with Step 14, cut the free, non installed end of collector runs to the desired length if required. This cut should be made at the point where the base of the barbs meets the manifold pipe.

Tip! Bypassing An Obstacle?

If the obstacle falls between two solar coils: Simply run the solar coils around the obstacle, allowing the tubes around the obstacle to bunch slightly while keeping the coils as straight and neat as possible.

If the obstacle falls in the middle of the solar coil: Using a pair of scissors carefully cut the webbing between the tubes (being careful not to cut the tubes) until it's large enough for the obstacle to fit. Slide the coil over the obstacle, allowing the tubes to bunch slightly.

SCAN ME TO SEE HOW IT'S DONE

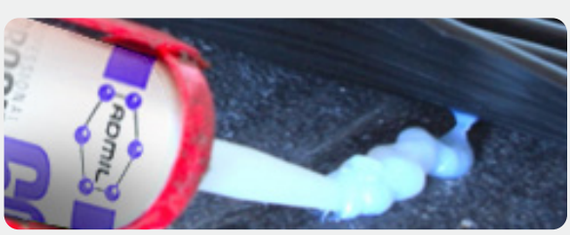
Step 16

Connect the freshly cut end to the manifold system, as per steps 9 - 13. Remember to install the collector runs in a relaxed state, such that it is not applying lateral force against the manifold system.

Step 17

Ensure the roof and collectors are dry, clean and straight before applying a generous amount of Boss approved silicone between the roof's surface and the underside of the collector. As you apply press down firmly and work your way down the roof and apply silicone no more than 600mm apart. This gap may need to be decreased depending on your wind region and/or steepness of the roof.

Refer to ***Appendix 4: 'Manifold Length & Strip Collector Assembly'*** for more information.



Step 18

Once satisfied with the above assembly, repeat steps 7 to 17 for two collector runs at a time until the system is complete.

Important. Walking on Collectors

The Installer must never walk on wet or freshly glued collectors. Cool and dry collectors may be walked on carefully, however if the collector is hot with objects beneath it, you may puncture the tubing.

Step 19

Plumbing the System: The Installer must ensure the manifold and collector system is securely fastened to the roof according to all instructions in this manual and is satisfied with the previous instructions and the approved configuration and diagram of the system.

Attach the supply and return pipes to the supply, TufMan™ manifold, return and balance pipe, TufFilta™, solar pump and pool return outlet according to the approved plumbing configuration diagram, and as per: AS3634:2022.

Step 20

Ensure that any other required components that require installation to the system are also met as per this manual such as, but not limited to the TufGauge™, equaliser tube, TufFilta™ and any other components that may need to be plumbed to the system such as digital controllers, pumps and sensors.

Step 21
Simultaneous Connected Systems

Plumbing Connections: The existing filter pump will generally be a higher powered pump compared to a dedicated separate solar pump.

Continued on page 22

Installing the System

Step 21 continued

As a result, always connect the solar system downstream after the main pool filter and before any gas heater/heat pump.

Ensure that a one way check valve is included in the upstream line of the solar connections.

Important. Please Read

Never plumb across a salt chlorinator, that is, solar suction on one side and solar return on the other side of the chlorinator. This will reduce water flow through the chlorinator and may affect its operation.

Step 22

Installing the Roof Sensor: The roof sensor should be installed at the same time as the manifold pipes. Install the roof sensor and then run the cable back along the supply and return pipework to the digital controller. The roof sensor needs to be in a position where it receives the same amount of sun as the collector itself. Do not adhere the roof sensor to the collector itself.

Installing the Pool Water Sensor: The pool water sensor is best positioned close to the solar pump discharge, so that in the event of loss of prime, it will shut the pump down via the solar controller's over-temperature cutout facility.

When joining sensor cables, the Installer must take care to ensure that all moisture is excluded from the two connections. The Installer should solder the joint and then completely seal the connection, as this prevents moisture from entering the connection.

When installing a pool water sensor, do not join sensor cables underground. Always ensure that the sensor cable used is long enough. When running pipes underground, the trench should be a minimum of 300mm deep. The sensor cable should be run in conduit and cable-tied underneath one of the pipes to protect it from future damage.

Step 23

Install the assembled TufGauge™ by first drilling an 8.5mm hole in the PVC supply pipe in the appropriate position and orientation. See ***Appendix 7: 'How to Drill into PVC Pipework'*** for more information. Clean and lubricate the hole before fully inserting the tapered end of the grommet into it. Lubricate the brass barb only with silicone lubricant, and insert it into the rubber grommet, ensuring full engagement. For additional information view ***Appendix 8: 'Installing the Pressure Gauge'.***



Step 24

To install the drain down tube, begin by drilling an 8.5mm hole in the PVC supply and return pipes, in the appropriate position and orientation. See ***Appendix 7: 'How to Drill into PVC Pipework'*** for more information. Ensure the drilled wad, swarf and burrs are removed to prevent them from entering the system.



Step 25

Insert the rubber grommets into the holes, tapered end first. Insert the two header barbs into the grommets and slide the collector tube over the barbs. Dipping the components in soapy water can make this process easier. See ***Appendix 9: 'Installing the Drain/Equalizer Tube'*** for more information.

Step 26

Install any remaining components including the TufFilta™, see ***Appendix 10: 'Installing the TufFilta™ for Independent Systems'*** for more information on the installation of the TufFilta™. Details regarding how to correctly mount the roof sensor can be found in the information pack attached to your supplied pool controller.





Allow 24 hours for all adhesives to set prior to pressurising and commissioning the system.

Commissioning the System

Important. Please Read

Commissioning the system is one of the most important steps for any solar installation. Performed correctly, commissioning should highlight any faults within the system prior to handover. Refer to AS3634:2022 Section 9 and ensure that all relevant testing, procedures and documentation detailed there and in this installation manual are followed and that your handover and warranty documentation is thorough and comprehensive. We recommend the Installer ensures that the householder understands the importance of proper pool chemical maintenance (Refer to AS 3633-1989), both for the negative effect it can have on their system and more importantly on their health.

Step 27

Start by first switching the system on.

Step 28

Prime the pump by filling the lint pot with water, once filled start the pump via the manual mode on the digital controller. Once primed, air should purge from the system and back to the pool via the pool return outlet for only a short period of time. After a few minutes inspect the pool's return outlet, if endless bubbles continue this may be due to air entering the system via the VacRel™ VRV. Once air bubbles clear after several minutes, continue with the following steps. If air bubbles continue, see ***Appendix 12: 'Troubleshooting Return System Pressure'***

Step 29

Survey the entire system for leaks. The suggested method is to inspect the roofs surface for water dribbling towards the gutters. By following the dribbles up the roof you will generally find the source of the leak. If a leak is found in the collector, see ***Appendix 13: 'How to Repair a Damaged Collector'*** for repair instructions. Repair and re-test as necessary.



Step 30

Go to the pressure gauge and check the reading. The recommended pressure range for a **Bottom Feed System** is between 1 and 100 kPa max. The recommended pressure range for a **Top Feed System** is between 1 and 50 kPa max.

If the pressure is ideal, continue with the following steps. If the pressure is too high or low, see ***Appendix 11: 'Troubleshooting System Pressure'*** for more information.

Step 31

With the solar system operating and stabilised for a few minutes, turn the solar pump off, immediately inspect the VacRel™ by listening for the sound of air being sucked back into the system. Air should easily re-enter the solar system as the pool water fully drains back to the pool without creating a vacuum within the system. At the same time inspect multiple sections of the solar collectors to ensure that the system's circular tubes remain undistorted. Distorted tubes may be an indication of internal vacuum and must be remedied immediately.

Note: Failure to adhere to these guidelines may result in major damage to the system.

Step 32

Recheck the system pressure after the system has been operating for a few minutes to ensure it has stabilised. Refer to the mounted TufGauge™ pressure gauge to determine the system's pressure. The gauge should operate within the recommended pressure range provided that the system has been installed according to this manual.

Reminder. Please Read

Bottom Feed Systems: Designed and installed to automatically fully drain with a TufFilta™ fitted - 100 kPa max (15 psi)

Top Feed Systems: Installed with a TufFilta™ fitted - 50 kPa max (7 psi)

Step 33

If the gauge is reading zero, adjust the valve on the return line to obtain a small positive pressure reading.

Installing systems to operate at greater pressures should only be attempted by highly experienced installers, who fully understand pressure limitations for their particular installation method and geographical location.

Note: Failure to adhere to these guidelines may result in major damage to the system and will void the warranty.

Step 34

If desired, the PVC pipes can be painted with water-based or acrylic paint to match the black manifolds or coloured roof. However, remember that black piping will get hotter than white, and will therefore require more freedom of movement to allow for thermal expansion.



Step 35

Familiarise yourself with the service and maintenance schedule found in ***Appendix 14: 'Service and Maintenance Schedule'.***

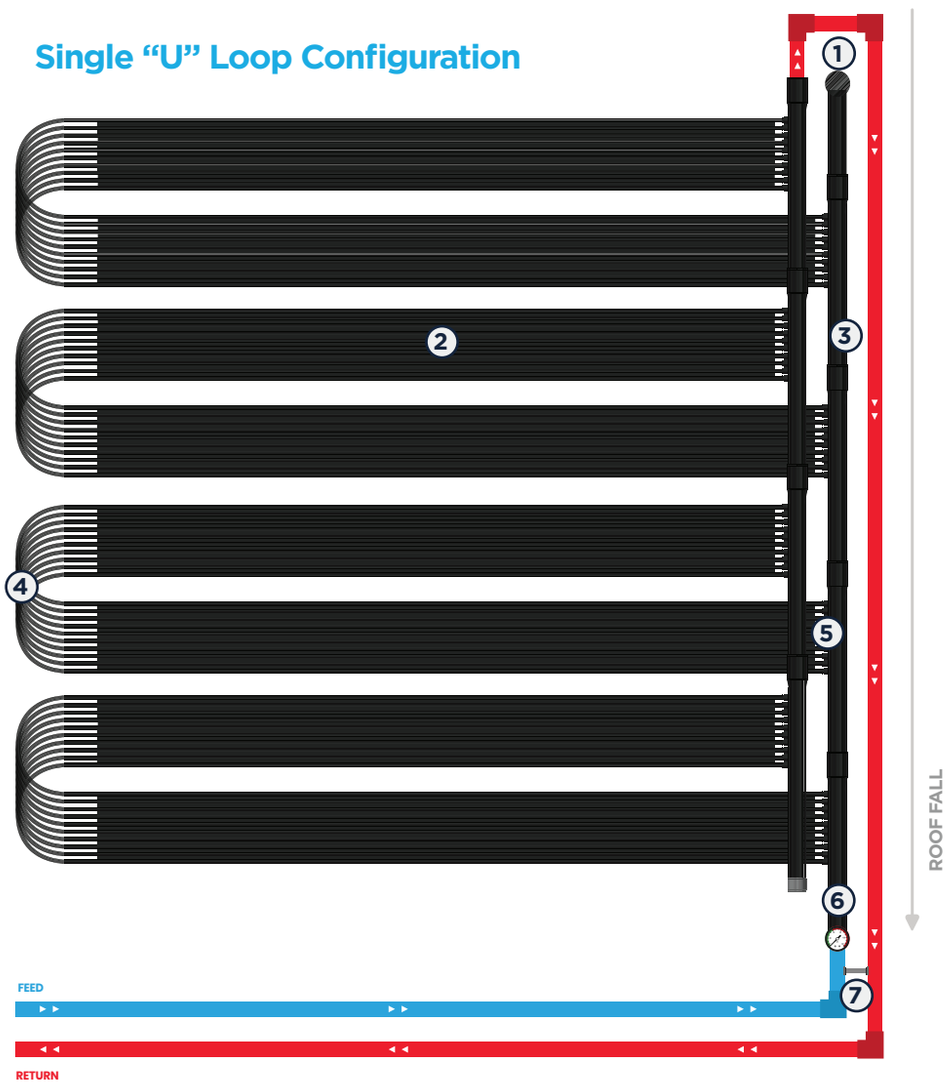
Appendices

Appendix 1: Basic Collector and Roof Plumbing Configurations

All systems must be plumbed with a feed header, return header and a balance pipe to ensure adequate and even water flow throughout the collector.

1.1 Bottom Feed Solar Systems - This should be adopted wherever possible

Single “U” Loop Configuration



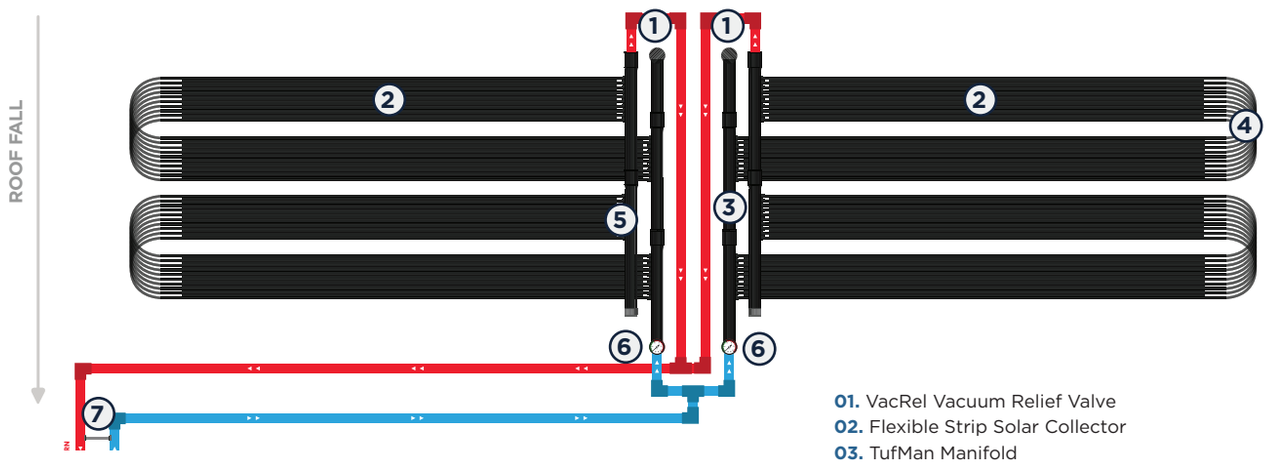
01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit

This plumbing configuration provides:

- Even water flow throughout the collector when the pump is **switched on**
- Swift and efficient drain down back to the pool when the pump is **switched off**

1.1 Bottom Feed Solar Systems continued

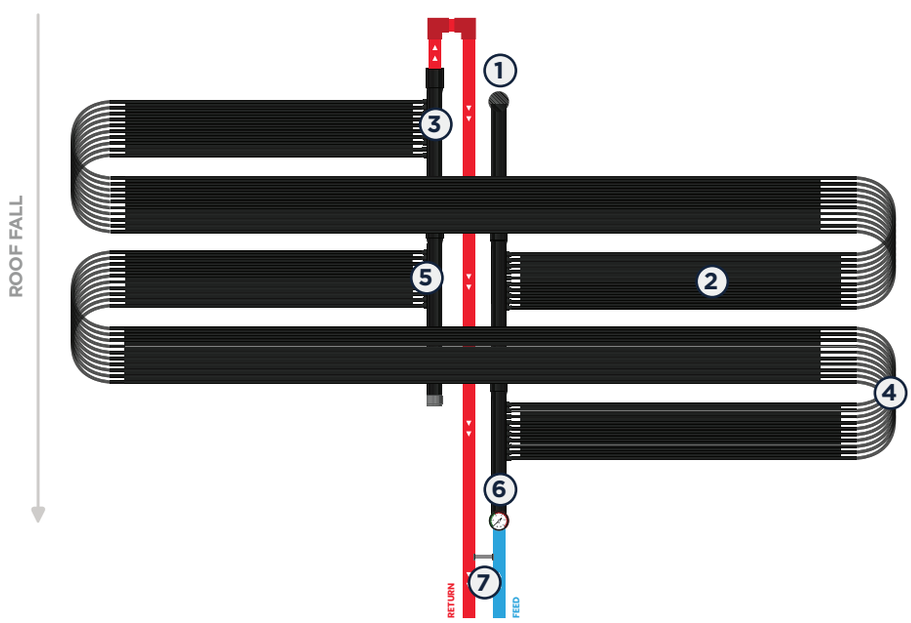
Depending on the roof shape and size, the Installer has the choice to install the **Bottom Feed Solar System** in several different configurations:



Multi "U" Loop Configuration

(for systems larger than 40m^2)

01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit



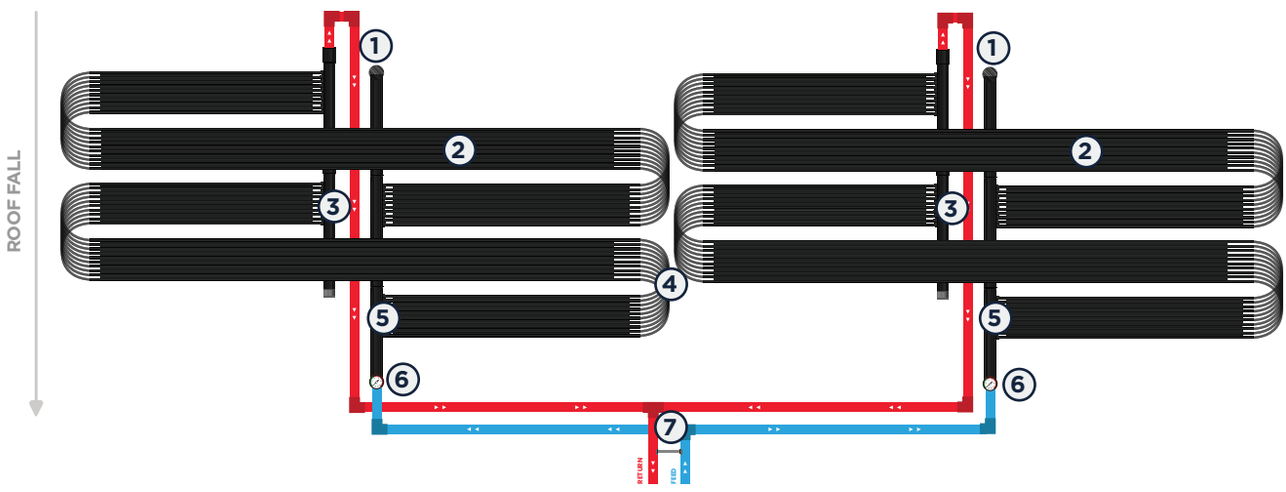
Single Serpentine Configuration

01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit

Appendices

1.1 Bottom Feed Solar Systems continued

Depending on the roof shape and size, the Installer has the choice to install the **Bottom Feed Solar System** in several different configurations:

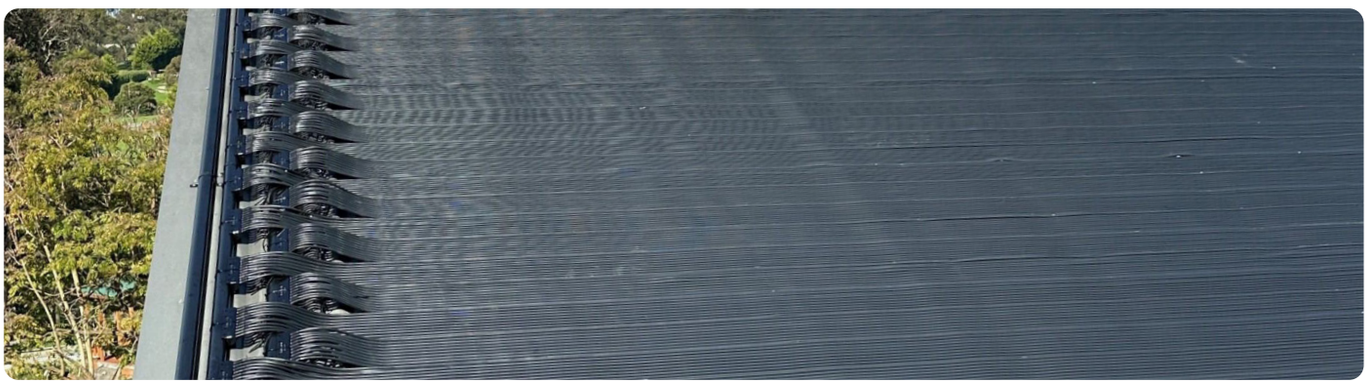


Multi Serpentine Configuration

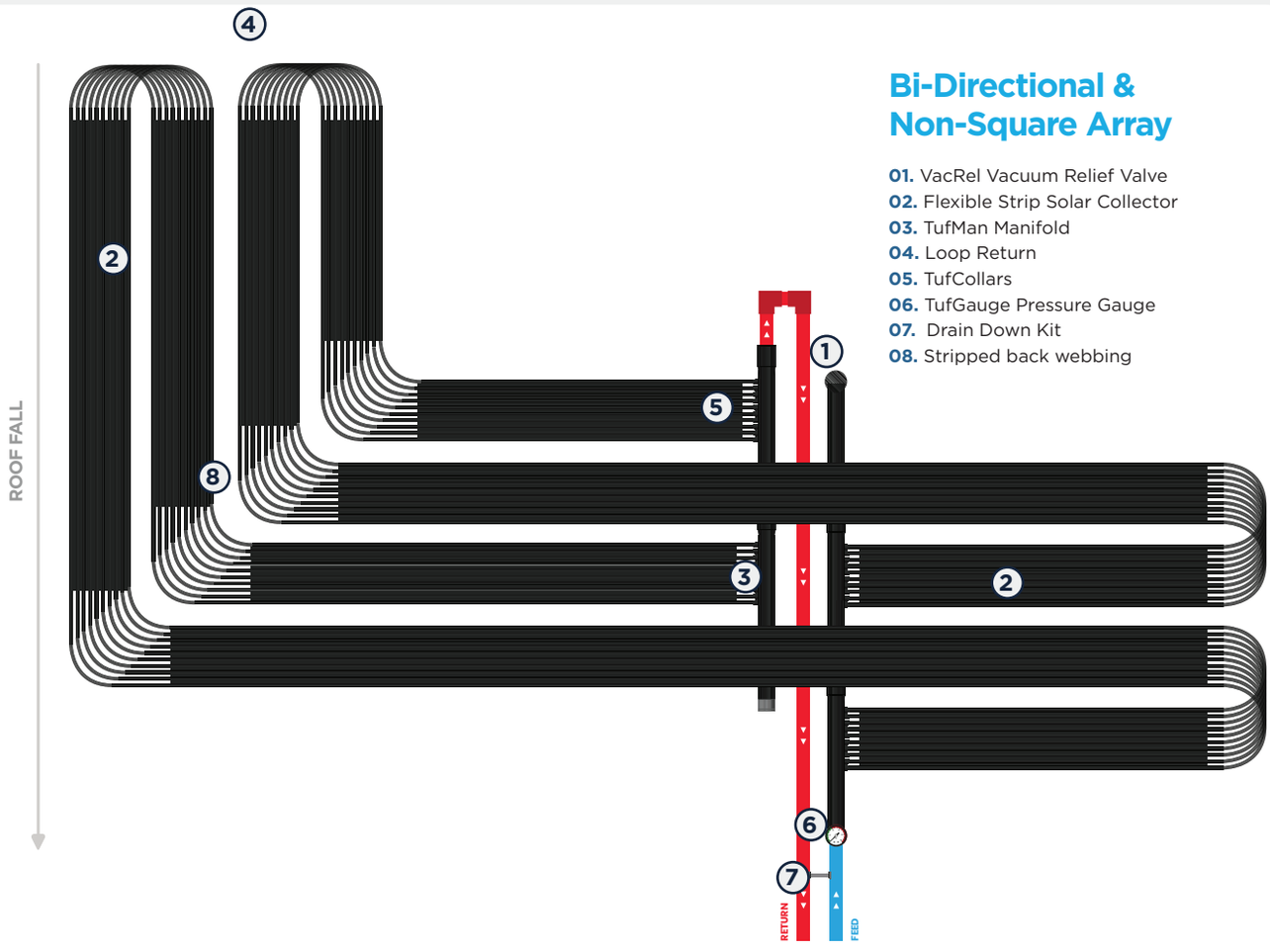
(for systems larger than 40m²)

01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit

Note:
Configurations with varying loop run lengths may result in reduced system efficiency and performance.



1.2 Bi-Directional & Non-Square Array



Bi-Directional & Non-Square Array

01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit
08. Stripped back webbing

Maximum length of the longest collector run should not exceed 30m (approx.) from supply to return, 15m out and 15m back.

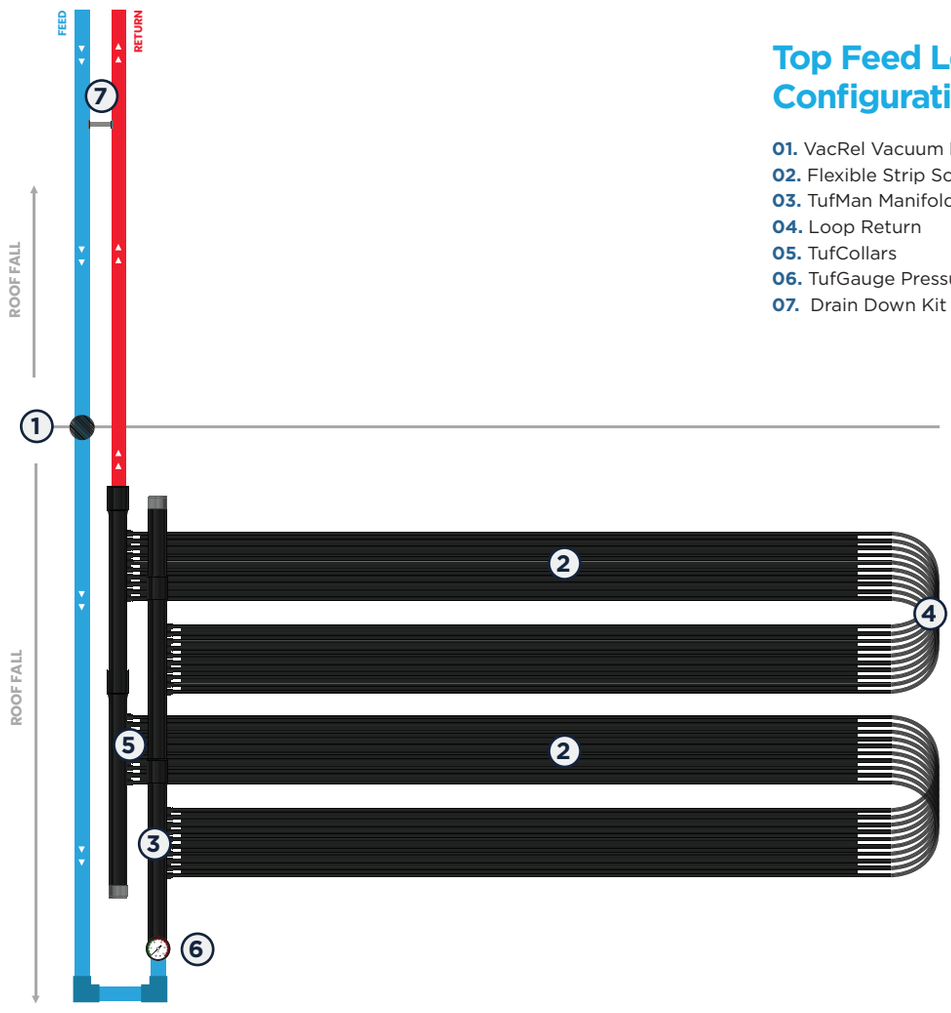
- Collector facets facing different compass directions can only be installed on flat roofs (pitch 30º or less)
- Strip web to allow the collector to go around roof edges and valleys.
- Roof sensor should face a direction between the two array directions, weighted towards the larger array.

Important Information. Opposing Roof Surfaces with One System.

Installing the collector runs on opposing roof surfaces should only be done on flat roofs with a pitch no more than 30º. If this array is selected, the temperature sensor should be installed and positioned at an angle to achieve an average sun exposure of the two collector facets, preferably slanted towards the roof surface with the larger collector area.

Appendices

1.3 Recommended for experienced installers only: Top Feed system



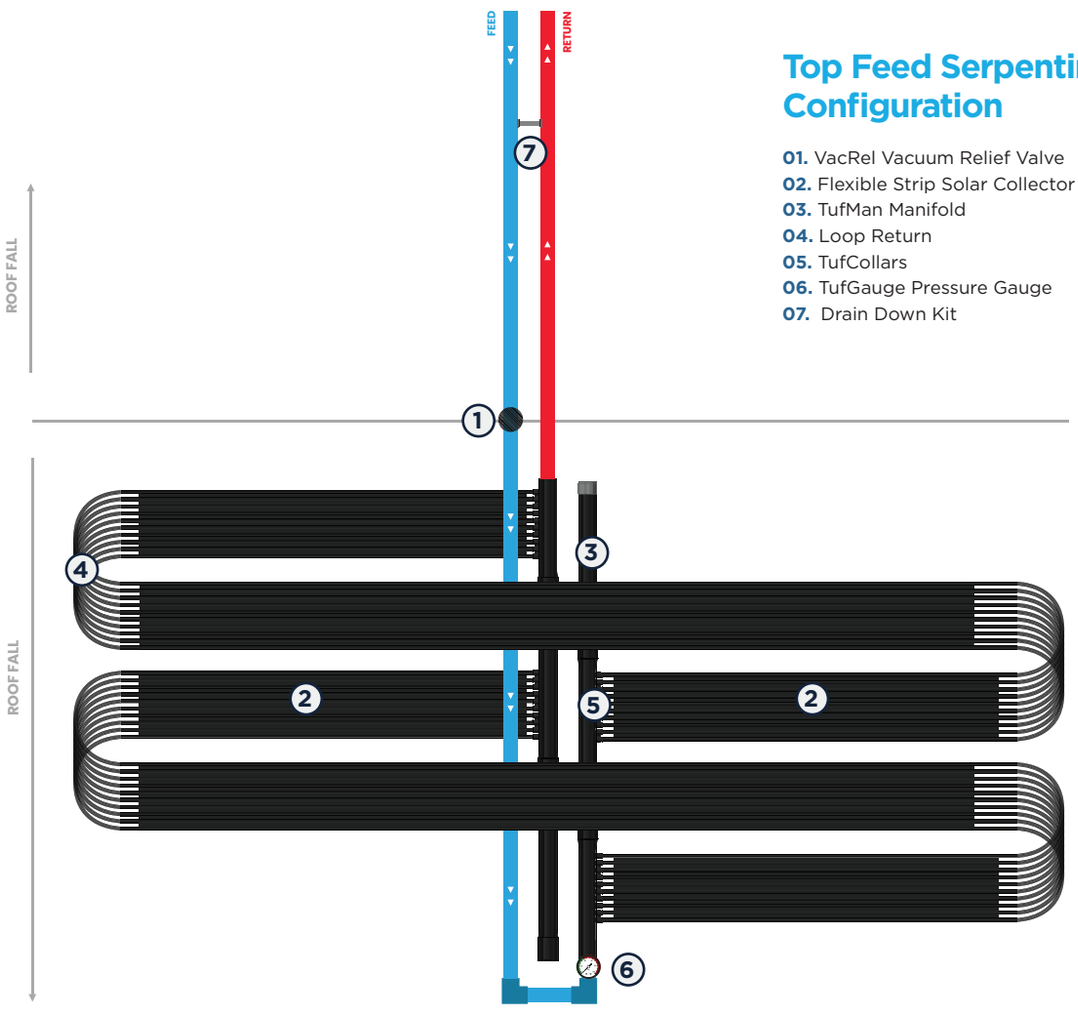
Top Feed Loop Configuration

01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit

All **Top Feed Solar Systems** should be designed to operate at lower hydraulic pressures and to be installed with a flow balance pipe and the VacRel™ at the highest point of the system, ideally on the **supply** line. This plumbing configuration provides:

- Swift air expulsion, hydraulic equilibrium and water flow throughout the collector when the pump is switched on.
- Inefficient or poor drain down back to the pool, with possible water stagnation within the collector tubes with the pump switched off.

1.3 Recommended for experienced installers only: Top Feed system continued



Top Feed Serpentine Configuration

01. VacRel Vacuum Relief Valve
02. Flexible Strip Solar Collector
03. TufMan Manifold
04. Loop Return
05. TufCollars
06. TufGauge Pressure Gauge
07. Drain Down Kit

All **Top Feed Solar Systems** should be designed to operate at lower hydraulic pressures and to be installed with a flow balance pipe and the VacRel™ at the highest point of the system, ideally on the **supply** line. This plumbing configuration provides:

- Swift air expulsion, hydraulic equilibrium and water flow throughout the collector when the pump is switched on.
- Inefficient or poor drain down back to the pool, with possible water stagnation within the collector tubes with the pump switched off.

Appendices

Important. Please Read.

For certain installations, some Installers consider it easier and quicker to plumb the system from above, such as over a ridge capping. Plumbing the supply and return pipes from above the Collector is generally referred to as a Top Feed or Top Flooded Solar System. Top Feed systems have certain limitations and may cause long term operational issues in certain geographical locations and system designs if not correctly installed and monitored, therefore it is the responsibility of the Installer to assess and decide on the most appropriate plumbing configuration.

1.4 Supply & Return Manifolds

Refer to the previous diagrams for the correct TufMan™ supply and return plumbing configurations. It's generally best to install the TufMan™ manifold system nearest to the solar pump and filtration system, with the loop return or TufReturn™ installed further away.

1.5 Vacuum Relief Valve (VRV) VacRel™

All thermoplastic solar systems must be designed and installed to ensure the collector tubes will not distort from their original circular shape at any stage during the life of the system.

Distortion and crushing of the collector tubes especially at time of elevated temperatures, is generally caused by internal vacuum and is referred to as vacuum crush. Vacuum crush generally occurs when the solar pump is off and incoming air is restricted as water is draining back to the pool, or the solar pump is on and water is draining back to the pool faster than the incoming water. The Boss VacRel™ is a high performance Vacuum Relief Valve that provides minimal resistance to the air re-entering the collector tubes. The VacRel™ is rated at a maximum of 10mbar (Air) 'cracking' pressure, with a minimum of 70mm^2 of non-impeded air flow. The VacRel™ has a multi-pass SS mesh filter, designed to protect the valve from airborne contaminants, such as spiders, wasps or ants from entering the valve.

Experience has proven that one Boss VacRel™, installed at the uppermost position of the system will guard against vacuum crush on an average-sized and correctly installed system. For average sized and installed systems, the Installer has the option of positioning the VacRel™ at the highest point of the system, on a 45º elbow on either the top of the supply manifold, or on top of the return and balance pipe. Practice has shown that these two positions are optimal, however, installing the VRV on the return side will require the addition of a two way or three way valve (flow control valve) on the return pipe. This valve is required to control the flow rate/system pressure of the returning water, and stop air being sucked through the VacRel™, which results in undesirable bubbles in the pools return water.

1.6 Separate Suction and Return Plumbing

For solar connections to a new pool, the Installer should recommend that separate flow and return lines be provided by the pool builder. This plumbing configuration separates the solar system from the filtration system and allows the solar pump to operate independently to the filtration pump.

This configuration minimises power consumption and eliminates any issues that may arise due to the operation of the filtration system and any associated equipment such as pool cleaners, chlorinators and fossil fuelled heaters etc.

1.7 Pipe Flow Rates

Flow rates should be between 1.8 and 4.8 litres per minute per square metre of installed panel area. Boss recommends **4 litres per minute per square metre** of installed panel area for optimal heating performance.

A simple calculation method is to multiply the total collector area (m^2) by 1.8 and 4.8 to determine the minimum and maximum required system flow rate (L/min).

Once the required system flow rate has been calculated, select an appropriately sized pump using the manufacturer's flow rate versus head height performance data. The pump must be capable of delivering the recommended flow rate range (1.8 – 4.8 L/min per m^2) across the total panel area at the required system head.

Technical reminder: Whilst static head height is the standard unit of measure for pump selection, installers should confirm that the pump can deliver the required flow rate at the system's Total Dynamic Head (TDH). Pipe length and complexity can increase TDH and reduce flow below the required range. Online TDH calculators are available to assist with this.

Important: Excessive flow can increase system pressure and may cause leaks or other system faults. It is the installer's responsibility to ensure the pump is correctly sized for the solar system and site conditions.

1.8 Balanced Flow

The numerous roof plumbing configurations detail how the pool water enters the bottom of the supply manifold, flooding the collector tubes as well as the return manifold as it fills the system from below, in a direction moving up the roof. Once the system is fully filled, the solar heated return water flows over the top of the return manifold and back to the pool.

Appendices

1.9 Balanced Flow continued

This design not only expels air out of the system, but creates a hydraulic equilibrium and water flow throughout the collector. Some Installers are of the belief that the above instructions are not necessary and that only the supply and return manifolds are sufficient when installing a solar system.

Note: Australian Standards clearly nominate the requirements for a balance pipe, therefore installing any type of system without a balance pipe is an incorrect plumbing configuration and not recommended.

1.10 Drain Tube



It is important to install a drain tube between the supply and return pipes approximately one metre above pump level. The drain tube is comprised of two grommets, two header barbs, two rigid collars and a length (approx. 150mm) of a single stripped out collector tube. The drain tube allows the supply pipe to slowly drain back via the return pipe, this, when combined with a correctly installed system, will allow the collector and supply pipes to automatically fully drain back to the pool, over time, when the pump is switched off.

1.11 Pump



In Australia, most reputable pool builders have adopted the modern approach of designing their pools with a dedicated solar suction and return porting at mid-depth and at opposing ends of the pool. During the pool's installation phase, the pool builder will generally lay and cap the underground separate suction and return plumbing close to the filtration system ready for the Installer. This updated approach, of designing and pre-installing new pools in order to enable easy retrofitting of solar heating, is now an accepted and expected practice within Australia. This practice has subsequently led to increased efficiencies and a reduction in costs; both for the pool owner and pool industry in general.

Note: Due to the rise in use of variable speed pumps, it is important to ensure the speed matches the required flow for use with your solar system.

Boss advises against using Solar PV driven DC pumps, as field experience has shown these to be unsuitable for solar pool heating systems. AC/DC Hybrid pumps are the exception.

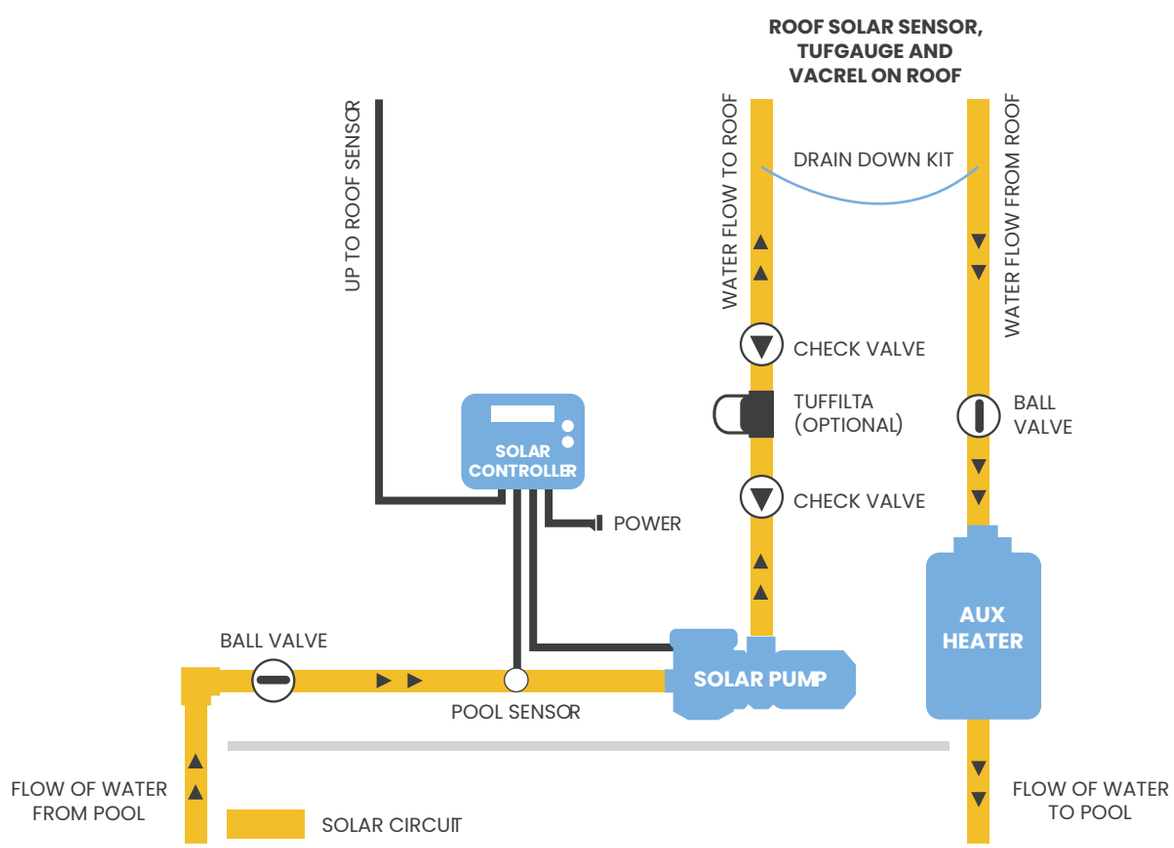
Appendix 2: Plumbing Diagrams

When constructing pipework consider the thermal expansion of long lengths of pipework and the stress this produces on joins.

Important Information. PVC Pipe Spacing and Fitting.

Note: The maximum spacing for PVC 40 pipe supports is 900mm horizontal and 1800mm vertical, less for smaller pipes. When using saddle clamps to secure any pipes or headers, ensure that the pipes or headers can freely slide through the saddle clamp. Omission of this step may result in the failure of pipe fittings and moulded manifolds, due to stresses imposed by thermal expansion. (If temperatures are in excess of 20°C, the horizontal spacing should be reduced by 25% for every 10°C above 20°C. At 60°C, continuous horizontal support is required).

2.1 Separate Circuit Connection



Appendices

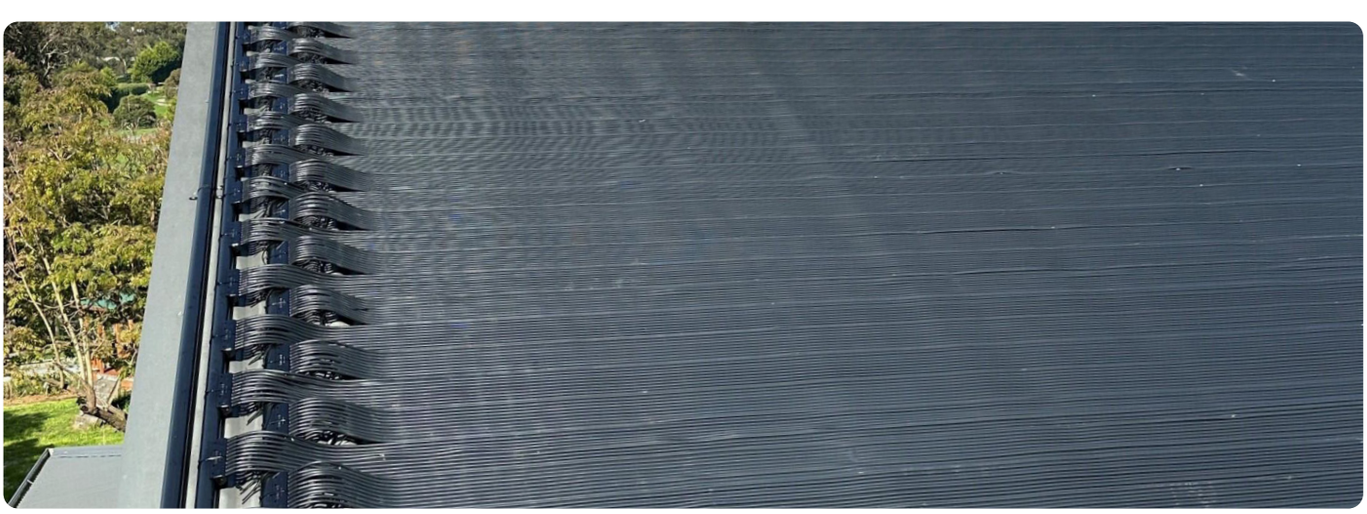
2.1 Separate Circuit Connection continued

The recommended separate circuit pump size guide below should only be used as a general guide when selecting the appropriate separate circuit pump size. The guide is based on an average sized and installed system. Non-average sized and installed systems require the appropriate calculations to determine the correct size based on various factors; such as, but not limited to:

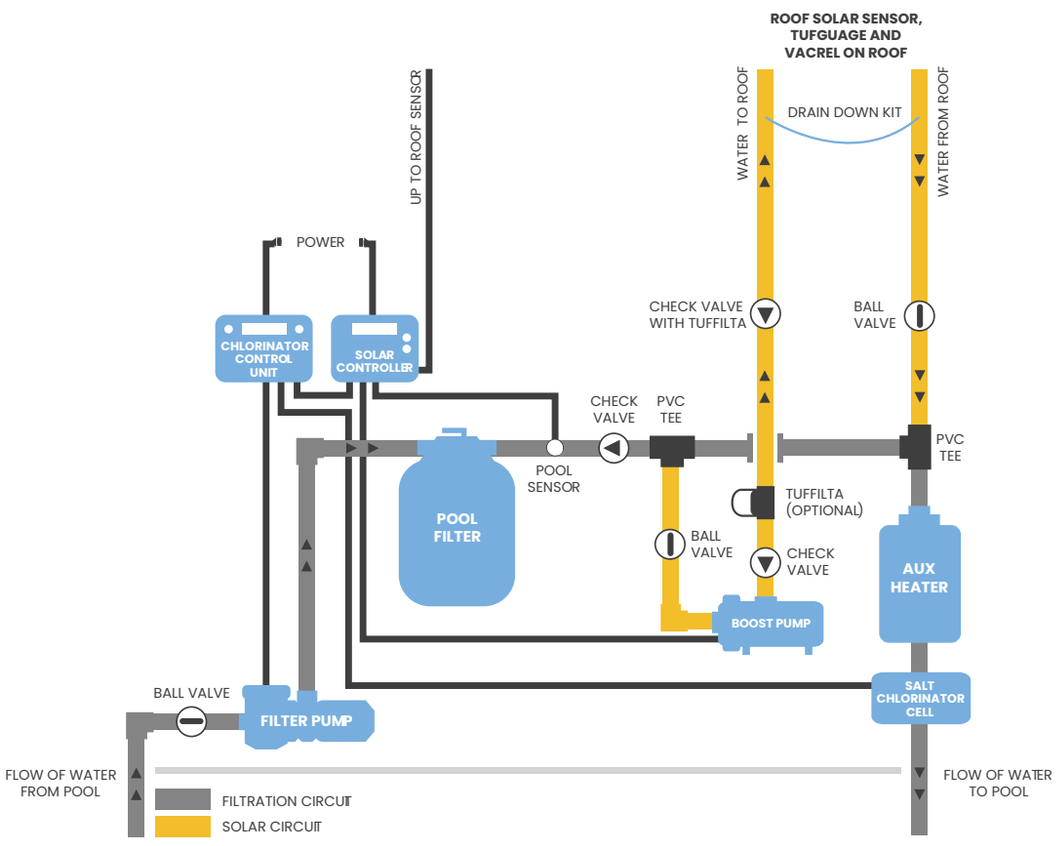
• Pump head height (vertical distance from the pool to the top of the solar system), and
• Flow restrictions (distance from pool to collector or an excessive number of elbows etc)

Refer to suitable technical resources to assist with the selection of an appropriate pump, that will be capable of delivering a sufficient flow rate (1.8 to 4.8 litres per minute per square metre of collector) through the system (refer to AS3634 8.1a).

Note:
• All separate circuits should have a TufFilta™ inline filter/strainer installed after the pump (discharge) to prevent contaminants from entering the solar system.
• All solar pumps must be fitted with a check valve on the discharge line and a hair and lint pot on the supply side.
• Any pump located below water level should be isolated from the pool with a shut-off valve, so that pump maintenance and regular cleaning of the hair and lint pot is possible. (It is important to document and remind the customer that the valve should be closed prior to cleaning and re-opened after cleaning to avoid pump damage).
• Separate circuit solar pumps should never be installed more than one metre above water level as this will invariably lead to priming problems with the potential for pump damage. From time to time this does occur; the only possible cure is to install a check valve as close to the pool as possible to hold prime. However in most cases this is often not possible. Remember to never bury the valve underground for maintenance reasons.



2.2 Simultaneous Circuit / Connection



Involves diverting the flow of water after the filtration system. This system is usually adopted when the solar suction and return lines don't exist, as it is an easy way to retro fit a solar system without affecting any other part of the pool structure. A Solar Booster pump can be used to push the filtered water up to the solar absorber if required. The only disadvantage with this set-up is that the solar can only operate when the filtration system is operating. The plumbing must be installed after the filtration pump and filter - but before any other pool equipment (e.g. chlorinator, heat pump, gas heater etc.).

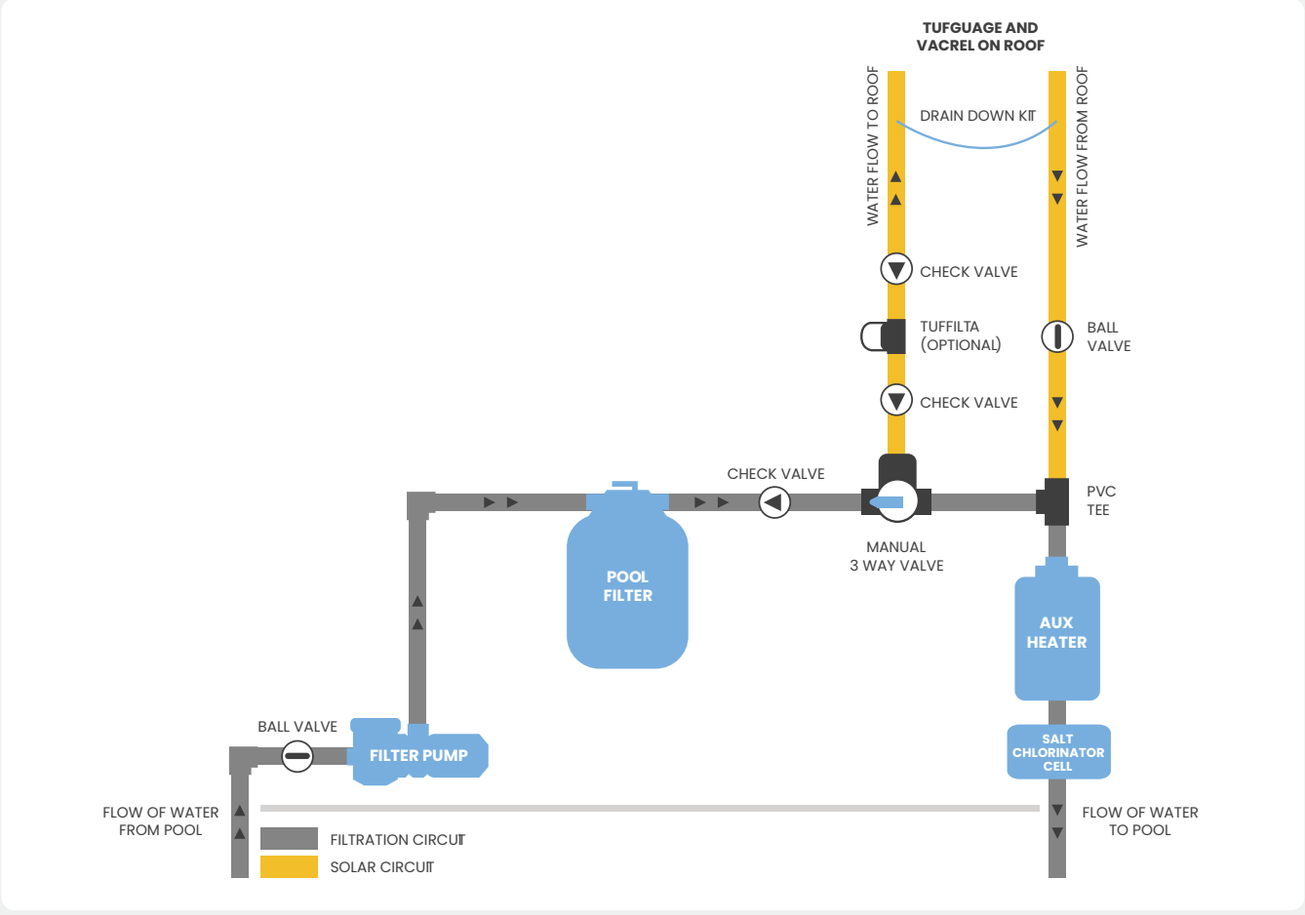
Requires:

1 x AS5CD Digital Solar Controller or similar
1 x Check Valve (also known as a Non-Return or One-Way Valve)
2 x PVC Tee
1 x Solar Pump (that can deliver the flow required as set out in Appendix 9, Page 40)

Important: In accordance with AS3634, Solar heating must be installed before any auxiliary heater (gas heater or heat pump) unless a Parallel design is employed. Incorrect plumbing order may result in system damage and void the product warranty.

Appendices

2.3 Manual Diverter Valve Connection



Involves plumbing into the filtration line and manually opening and closing a 3-way valve to divert water to the solar collector. It requires no digital controller or solar pump and is the cheapest way to plumb the system. However, it will not provide optimum performance for a solar heating system, and due to the limited control, the user must remember to adjust the valve for the system to operate. It also puts extra load on your pump and filter and is therefore only recommend for single story installations with limited head. The plumbing must be installed after the filtration pump and filter - but before any other pool equipment (e.g. chlorinator, heat pump, gas heater etc.). Extra care must be taken to ensure return water does not exceed 40°C as per AS3634.

Requires:

1 x Check Valve (also known as a Non-Return or One-Way Valve)

1 x PVC Tee

1 x 3-Way Manual Valve

Important: In accordance with AS3634, Solar heating must be installed before any auxiliary heater (gas heater or heat pump) unless a Parallel design is employed. Incorrect plumbing order may result in system damage and void the product warranty.

2.4 TufFilta™ In-line Filter / Strainer

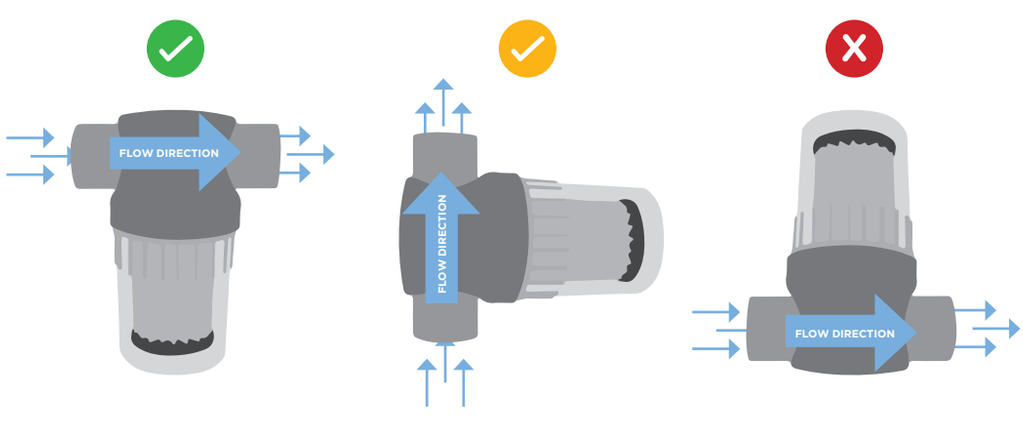
For systems that employ a separate solar pump, independent of the pool filter circuit, it is highly recommended that a TufFilta® is installed on the discharge side of the solar pump.

For systems plumbed through the pool filtration circuit, Boss also recommends installing a TufFilta® inline strainer prior to the solar system, after the pool filter. This helps protect the solar collectors from debris should upstream equipment fail or deteriorate.

The TufFilta® should be positioned to allow for easy access during maintenance and away from any equipment that may be affected by pool water overflowing or splashing during the replacement of the internal cartridge element.

If a TufFilta® is installed, an isolating valve should be positioned on the discharge side of the TufFilta®, this enables the cartridge element to be removed and replaced without excessive drenching the equipment or the person performing the task.

During the swimming season, the TufFilta® should be checked for debris at least once a month or as often as required for the particular installation. If you notice debris collecting in the TufFilta® it is recommended that the cartridge be replaced, and the bowl cleaned. (Replacement filters should be available through your local Boss distributor)



When installing the TufFilta®, ensure that is oriented correctly (as per the images above) and that the flow direction arrow (located on top of the TufFilta®) is facing the correct flow direction. Installing the TufFilta® sideways is acceptable, but do not install the TufFilta® upside down.

Please Note: Many installers assume the solar pump lint pot is sufficient to protect the solar collectors from debris. However, field experience shows this is often not the case. Installing a TufFilta® provides additional protection by capturing debris before it enters the solar collectors.

Appendices

2.6 Automatic Drain Down

Designing a system for protection in warmer-to-hot climates (such as Australia), requires the system to drain down automatically, each and every time the system turns off. There are scenarios where this is not possible and we go over this below.

Water stagnating within the collector's tubing has been evidenced to rise to very high temperatures in particular geographical locations. Consequently heating and softening the thermoplastic collector tubing; affecting the collectors' resistance to excessive stress. When the collector is subjected to this hot stagnant water, the water's weight has the potential (if incorrectly installed) to cause the collector to sag between adhesion lines on steep roofs. It may bulge or rupture the collector tubes due to excessive hydraulic back pressure when the hot stagnant water is being flushed from the collector tubes as the pump is first switched on.

Designed and installed correctly using TufMan™ manifolds, a **Bottom Feed Solar System** combined with the drain tube should fully drain down automatically once the pump is switched off. Cold water flooding the fully drained system cools the hot collector prior to pressurisation, increasing the collectors' resistance to hydraulic pressure.

Top Feed Solar System systems however, tend to not fully drain and are therefore not recommended for certain installations and geographical locations. In certain instances where automatic draining is not possible and alternative designs are not available, it is recommended to utilise controllers that have Anti-Boil. Ensure this is enabled, functioning, and most importantly, the pump is able to provide water when the controller requires this (do not shut the pump off). Extra care must be taken when assessing the system's flow and pressure in the instance your system is designed in such a manner.

Unless the Installer has ample experience and knowledge for their geographical location, it is recommended only installing **Bottom Feed Solar System** as per this manual.

Note: Installing a solar collector system at or below the pool level is not recommended. Whilst flexible systems are typically not susceptible to frost damage, the installer should always take care in colder climates as the manifold system and pipework may be damaged in certain conditions.

2.7 Two Way Valve

The use of a two way valve is sometimes required on the supply side of simultaneous and manual driver systems. The two way valve allows the operator to set the optimum system hydraulic pressure. For simultaneous systems, install one, two way valve on the discharge side of the solar pump. The two way valve may also be used to control the return water for systems installed with the VacRel™ on top of the return pipe, install a two way valve on the return line close to ground level, in order to control the flow rate and stop air from being sucked into the system via the VRV, and undesirable air bubbles appearing in the pool discharge.

Appendix 3: Hydraulic Pressure and System Design

In hot climates, the system should fully drain when the solar pump is not running.

Excessive hydraulic pressure within any section of the collector has the potential to enlarge or rupture the walls of the collector tubes. It may also cause the collector tubes to leak or blow off from the TufMan™ manifolds barbs. Warranty issues resulting from excessive pressure are not covered by the Boss Pool Heating product warranty.

Systems installed with poor or inadequate water straining have the potential to cause blockages due to foreign matter, which may result in stagnant water. Water stagnation may also be caused by flooded systems plumbed from above (such as those capping over a ridge), or by systems installed below the pool level, which have the same potential.

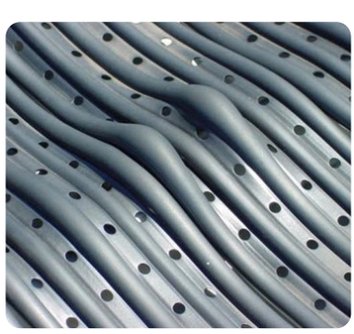
Systems that are designed to harbour stagnant water require appropriate water straining in order to ensure that no foreign matter enters the system. The system will also require a lower system pressure compared to a system that fully drains.

If a system is installed in such a way that water stagnation can occur, it is then the responsibility of the Installer to determine the suitable system design based on their particular requirements, geographical location and experience.

A fully automatic option is the installation of a suitable automated solar controller that has antifreeze/boil protection functions (such as the Dontek AS5 or Dontek AS5RT). This must be preprogrammed prior to or programmed during the installation.

Important Information. Stagnant Water.

Stagnant water within any solar system will then continue to absorb heat for prolonged periods, resulting in excessive temperatures, potentially softening the PVC collector tubing. When the pump is eventually switched on, the hot stagnant water has the potential to resist being flushed away, subjecting the heat softened PVCn tubing to full or partial system pressure. In certain geographical locations, and poor system designs, relatively low operating system pressures have the potential to enlarge or rupture the collector tubes due to these conditions.



Appendices

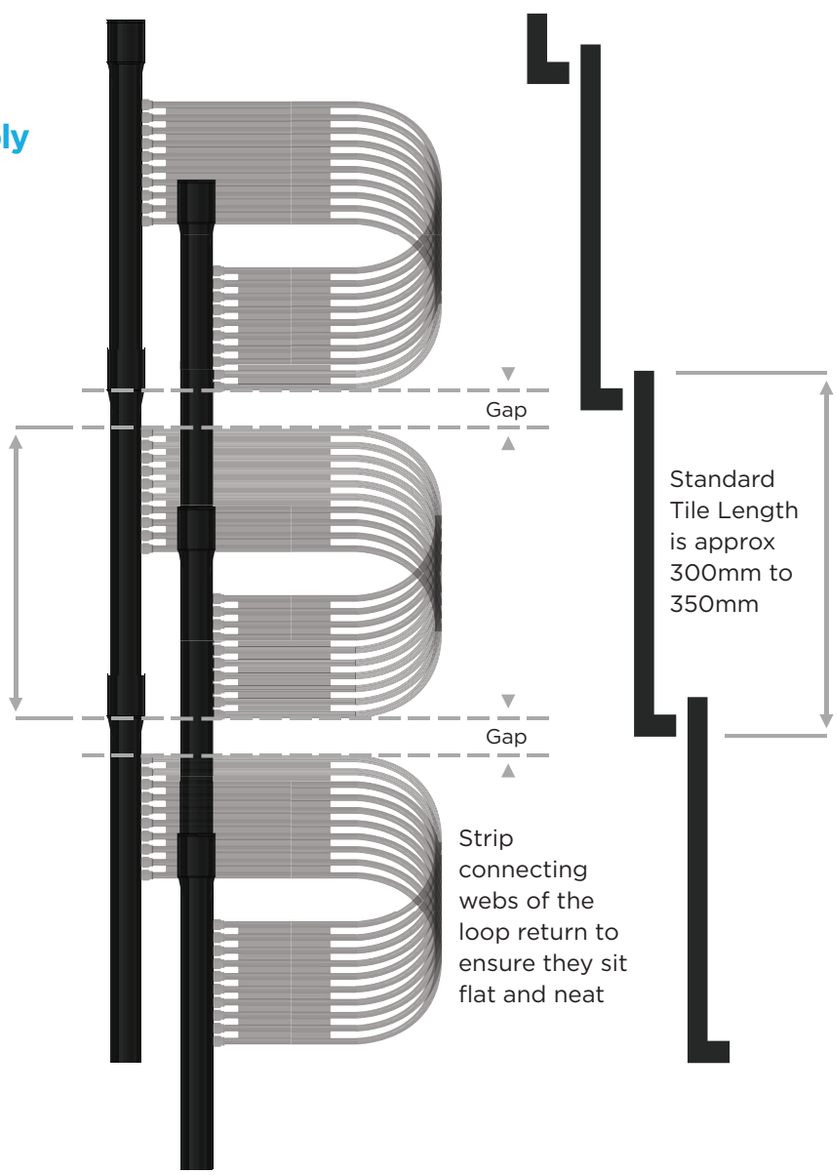
Appendix 4: Manifold Length & Strip Collector Assembly

The length of the moulded manifold has been specifically designed to fit the spacing of standard roof tiles (between 300 and 350mm). Roofs with tiles smaller than standard roof tiles may need to trim the male end of the manifold. This is to ensure the collector is sitting on the flat (or terrace) of the tile, not over the step between tiles (see the below). On metal roofs the male end of the manifold can be trimmed shorter to reduce (or eliminate) the gap between each run of strip collector. Installers should try to minimise the gap between collector runs, without overlapping them. Cutting and joining of the collector tubes or any other component within the system should be kept to the bare minimum. The least amount of cuts and joins results in a reduced potential for leaks and ensures a quality finish.

Manifold Length and Strip Collector Assembly

For tiled roofs, ensure the collector runs across the face of the tile, not the steps

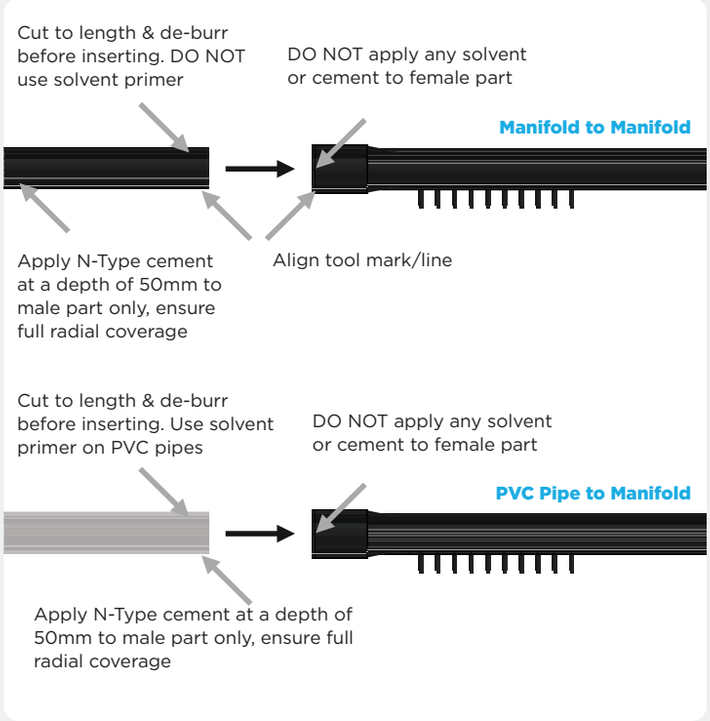
Run a silicone bead 10mm in diameter approximately every 400mm to 500mm

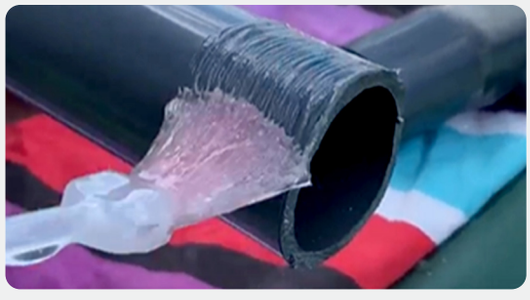


Appendix 5: TufMan™ Manifold Gluing Procedure

To make consistently good solvent cemented transition joints, the following points should be understood:

- Use type N PVC solvent cement only for the manifolds and Vacuum Relief Valve (VRV). Do not use a solvent primer.
- If required, cut the TufMan™ manifold to the required length using the moulded ribs as a guide. Thoroughly de-burr edges and remove any loose material.
- Wipe down joint areas with only a clean cloth to remove dust or other contaminants.
- Apply primer to the PVC-U pipe or fittings only.
- Never apply solvent cement to any female socket of the manifold. Apply adequate solvent cement to the male component/s only for the full 50mm length or five divisions on the TufMan™.
- Insert the male end into the female socket immediately after the solvent cement is applied. Ensure you rotate the male end 360° after insertion to spread the glue within the join.
- Align the longitudinal marks and ensure that the full five divisions are inserted into the female socket; hold components together long enough to ensure retention.
- Wipe away any excess glue residue with a clean cloth to help prevent cement induced stress cracking.
- 24 hours should be allowed for the solvent cement to dry fully before pressurising the system with water.







Appendices

Appendix 6: Roof Assembly and Attachment for Tiles and Corrugated Metal Roofs

Securely install TufMan™ manifolds and pipes to the roof in a manner which allows for thermal movement of all components, without inducing linear or lateral stresses.

When assembling the systems components, power and hand tools will be required. Therefore, Installers should follow safety instructions and wear the appropriate protective gear. Ensure that all electrical cables are secure, and kept separate from potential severing or crushing hazards.

Thermal Movement in Manifold Systems
Longer manifold systems expand and contract more with temperature change. The table below shows the total thermal movement expected between winter and summer (0°C to 80°C).

Manifold length	Total thermal movement
2 m	~14 mm
4 m	~27 mm
6 m	~41 mm

For manifold systems 4 metres and longer, we recommend fitting a TufMan Rubber Coupling (043_0450) to absorb this movement.

The TufMan Rubber Coupling creates a flexible joint between manifolds or PVC pipework to reduce thermal stress in the manifold system. It is also ideal for repairing or extending a TufMan manifold system quickly and easily.

6.1 Tile Roof Mounting of Manifold Assembly



Boss Pool Heating's manifold EzyTies are manufactured from a high grade EPDM rubber and UV stabilised cable tie. The manifold Tie Down Strap clips onto the back of the tile and secures the pipe with a cable tie. **No drilling in tiles is needed with this installation method.**



Using the schematic diagram work out how many manifold Tile EzyTies are required to support the return and supply pipes for the entire system. It's recommended that the straps are spaced no greater than 600mm apart.

Please remember to always mount the manifolds and pipes to the roof in a manner which allows for thermal movement of all components, without inducing linear or lateral stresses.

6.2 Corrugated Metal Roof

Each EzyClip is supplied with two screws, which are installed at opposite corners of the clip.

- Mark the corners where you wish to install the screws and apply a bead of silicone to the roof.
- Place the EzyClip on top and fix using the two supplied screws.
- Snap the PVC manifold system into place.





Using the schematic diagram work out how many EzyClips are required to support the return and supply pipes for the entire system. Please remember to always mount the manifolds and pipes to the roof in a manner which allows for thermal movement of all components, without inducing linear or lateral stresses.

Appendix 7: How to Drill into PVC Pipework

Drill a 3mm pilot hole in the desired location and ensure the drilled wad, swarf and burrs are removed to prevent them from entering the system. Then, drill with a blunt 8mm drill bit and repeat removing drilled wad, swarf and burrs. You can blunten by grinding small flats in the 2 cutting edges of the drill. Finish by using a 8.5mm drill and once more, thoroughly clean the area, ensuring no remnants of swarf, burrs, or other material remain.

Tip!

It is recommended that the Installer first practice the below procedure on a scrap piece of PVC pipework to limit mistakes when drilling into the actual PVC pipework within the system.

Appendices

Appendix 8: Installing the Pressure Gauge

The TufGauge™ should be installed in the supply/pressure pipe only, just below or close to the first collector strip. This is the point in the solar system where the pressure is at its highest. Drill an 8.5mm hole in the PVC supply pipe and clean the hole of any debris. Refer to "***Appendix 7: How to Drill into PVC Pipework"*** for more information. Insert the tapered end of the rubber grommet into the hole. Lubricate the brass barb only with silicone lubricant, and insert it into the rubber grommet, ensuring full engagement.



Boss TufGauge™



TufGauge™ Installed in the Supply Pipe

Appendix 9: Installing the Drain/Equalizer Tube



The drain tube allows the supply pipe to slowly drain back via the return pipe. This will allow the collector and supply pipes to automatically fully drain back to the pool when the pump is switched off. It is important to install a drain tube between the supply and return pipes with the ideal location being approximately one metre above pump level. The drain tube is comprised of two grommets, two header barbs and a length of a single stripped out collector tube (approx. 150mm).

To install the drain tube, drill an 8.5mm hole in the PVC supply and return pipes in the appropriate position and orientation. Refer to: ***Appendix 7: "How to Drill into PVC Pipework"*** for more information. Ensure the drilled wad, swarf and burrs are removed to prevent them from entering the system. Insert the rubber grommets into the holes tapered end first. Insert the two header barbs into the grommets and slide the collector tube over the barbs. Lubricating the barbs will help make this process easier for the Installer.

Appendix 10: Installing the TufFilta™ for Independent Systems

If the TufFilta™ is installed below the water line, the ball valve can be used to isolate the system. The two way valve is designed to stop water left in the system (that hasn't drained back to the pool) from flooding the area when the TufFilta™ bowl is removed.

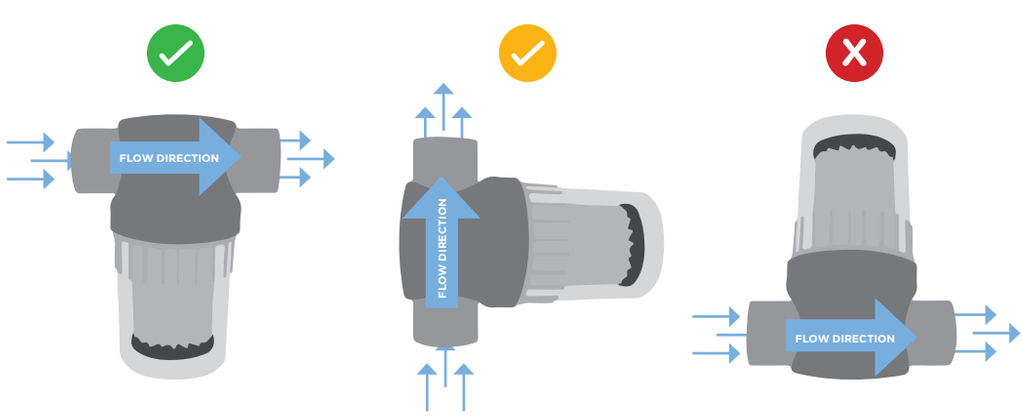


The TufFilta™ should also be checked and cleaned year-round with increasing frequency during the swimming season. Clean the cartridge with a jet of water. If the debris is too ingrained, a replacement cartridge may be required.

Left: TufFilta™ and used elements

Installation Recommendations

It is preferable that the TufFilta™ is installed on the discharge side of the solar pump. An acceptable install method is on its side; however, the preferred installation of the TufFilta™ is in an upright position. Ensure that you do not install the TufFilta™ upside down.



Appendices

Appendix 11: Troubleshooting System Pressure

Table 1: Troubleshooting System Pressure

Pressure Range	Required Action
Pressure is ideal	No action required. Proceed to pressure checking the return (hot) side
Pressure is too high	If the pressure is too high, immediately switch the pump off and determine the cause of the excessive pressure. This may require the installation of extra pool returns, the reduction of the pump power or the installation of a two way valve between the pump and the pressure gauge.
Pressure is too low	If the pressure is too low, ensure that the pool pump is the correct size and doesn't need to be replaced. If the pump size is adequate, you may need to install an additional two way or three way flow-restricting valve on the return line close to the solar pump. Adjust the two way or three way flow restricting valve until you receive a reading above 10 kPa. Remove the handle.



Appendix 12: Troubleshooting Return System Pressure

If bubbles are present in the pool and you have ***Appendix 2: Plumbing Diagrams*** 2.1 or 2.2, please complete the following steps:

Step 1: Switch the system off, and install a two way or three way valve between the return manifolds and the auxiliary heater and/or chlorinator (if present).

Step 2: Switch the system back on, and move to the newly installed two way valve.

Step 3: Constrict flow in the return line using the lever handle by a small increment.

Step 4: Wait a few minutes before checking the pool water. If air continues to bubble, constrict flow by another small increment.

Step 5: Again, wait a few minutes before checking the pool water. If the air bubbles consistently stop, then the system should be set at an acceptable positive pressure.
Note: If the required constriction is greater than 50%, you will need a stronger pump.

Step 6: Recheck that the pressure gauge is within the recommended pressure ranges.

Step 7: Leave the two way or three way valve setting in place permanently by removing the handle.

If you have installed a system with ***Appendix 2: Plumbing Diagrams*** 2.3: Manual Diverter Valve Connection, the following procedure for adjusting the three way valve for manual systems will need to be carried out:

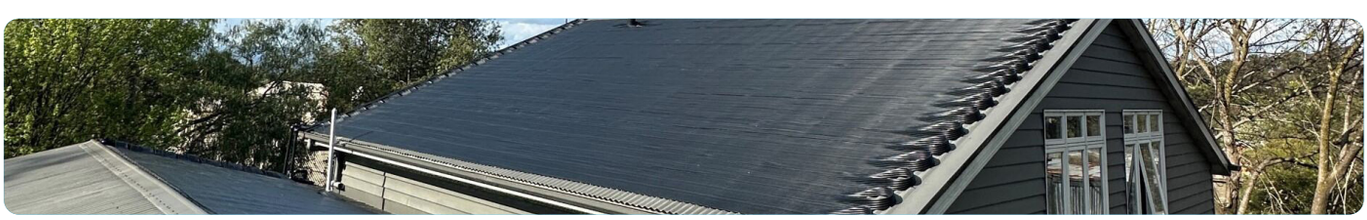
Step 1: This process can be done with the VRV top and O-ring removed. However, be careful not to misplace any components.

Step 2: Open the three-way ball valve by a small increment using the lever handle.

Step 3: Wait a few minutes and check if there is air still bubbling out of the return line.

Step 4: If air bubbles are still present, open the valve by another small increment.

Step 5: Continue opening the valve by small increments, until the air bubbles reliably stop.



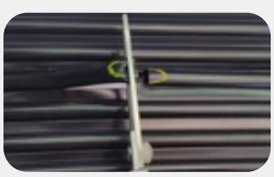
Appendices

Appendix 13: How to Repair a Damaged Collector

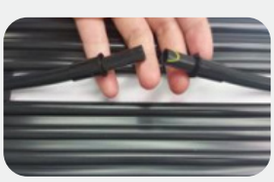
In order to repair a damaged tube, a TufBarb™ joiner barb and two TufCollar™ collars will be required. To repair the damaged collector tube:



Locating the leak



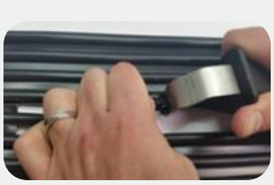
Cutting the leak out



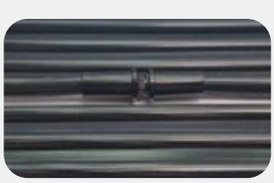
TufCollars™ on each tube



Collector tubes half way onto the TufMan™ barb connector



Using the TufTool™ to fully engage the TufCollars™



Repaired collector tube

Step 1: Locate and mark the position of the leak with chalk.

Step 2: Shut down the pump.

Step 3: Use a sharp blade to carefully cut a 3mm section around the leaking tube being extremely cautious not to nick the other tubes.

Step 4: Strip out the connecting webs on either side of the leak by approximately 100mm.

Step 5: Slide one TufCollar™ over each individually stripped collector tube ensuring that the larger shouldered end of the TufCollar™ is facing the cut end.

Step 6: Spray a minimal amount of silicone spray lubricant down into each individual tube.

Note: The use of a cloth under or around the spray site is a good technique to control over-spray. The installer should also wipe their hands regularly with a clean cloth.

Step 7: Spray or wipe a minimal amount of silicone spray lubricant onto the TufMan™ barb connector, remembering the warnings and tips described in the step above

Step 8: Using your thumb and forefinger slide each individual collector tube halfway onto the TufMan™ barb connector. If you slide the collector too far, the TufCollars™ will be very difficult to engage.

Step 9: Slide each TufCollar™ towards the center of the TufMan™ barb connector.

Step 10: Using the TufTool™, slide each individual TufCollar™ towards the center of the TufMan™ barb connector, ensuring full engagement.

WATCH OUR FOLLOW-ALONG VIDEO TO SEE HOW ITS DONE

Appendix 14: Service and Maintenance Schedule

Maintenance Issue - Service Procedure	Monthly	Pre-Season	Post-Season
TufFilta™ / Strainer Depending upon your pool usage and level of debris, the TufFilta™ / Strainer will need to be checked and cleaned regularly.	✓		
Leaks Check for leaks on a regular basis as leaks can corrode metal roofs and gutters. Leaks should be repaired as soon as possible.		✓	✓
Non-Return Valve The non-return valve (see plumbing diagrams) is a critical system component. Check that the collectors drain fully when the pump stops.		✓	✓
Vacuum Release Valve The vacuum release valve is a critical system component. It should be checked that it is functioning correctly and that the panels drain fully when the pump stops. The PVC piping should never appear collapsed (concave) by negative pressure.		✓	✓
Plumbing Degradation Plumbing should be checked for signs of UV and/or chemical damage. Replace as needed.		✓	✓
Debris Accumulation Check that there is no build-up of debris around pipework or collectors and that rainwater has a clear path to run down the roof surface. For reliable system operation, ensure the collectors and surrounding roof area remain free from debris and biological growth, and that roof drainage paths remain unobstructed in accordance with the roof profile manufacturer's guidelines.		✓	✓
Winterising/Extended Shutdown Prior to winter or off-season shutdown, ensure the system is fully drained of all water. This requirement applies to systems that cannot automatically drain. Failure to fully drain the system may result in water stagnation and/or freeze damage. Refer to Appendix 2.6 – Automatic Drain Down (Page40). During the off season period, installers or homeowners should also conduct the above maintenance checks to ensure system health and a smooth restart for the next swimming season.			✓

Before Final Handover.

It is expected that the Installer will provide adequate and appropriate documentation, training and guidelines to the customer at handover (refer AS3634:2022). For full details in relation to this warranty please refer to: https://bosspoolheating.com.au/support/warranties/

This strip solar heating installation manual must be read in conjunction with Boss Pool Heating's standard terms and conditions and the Boss Pool Heating warranty.
Refer to: https://bosspoolheating.com.au/terms/

Please read this manual carefully, as failure to adhere to these guidelines may void your warranty. Should you require any clarification, please contact our head office within normal business hours, on 03 9561 2159 and request to speak to one of our technical sales consultants, or alternatively email us at sales@bosspoolheating.com.au.

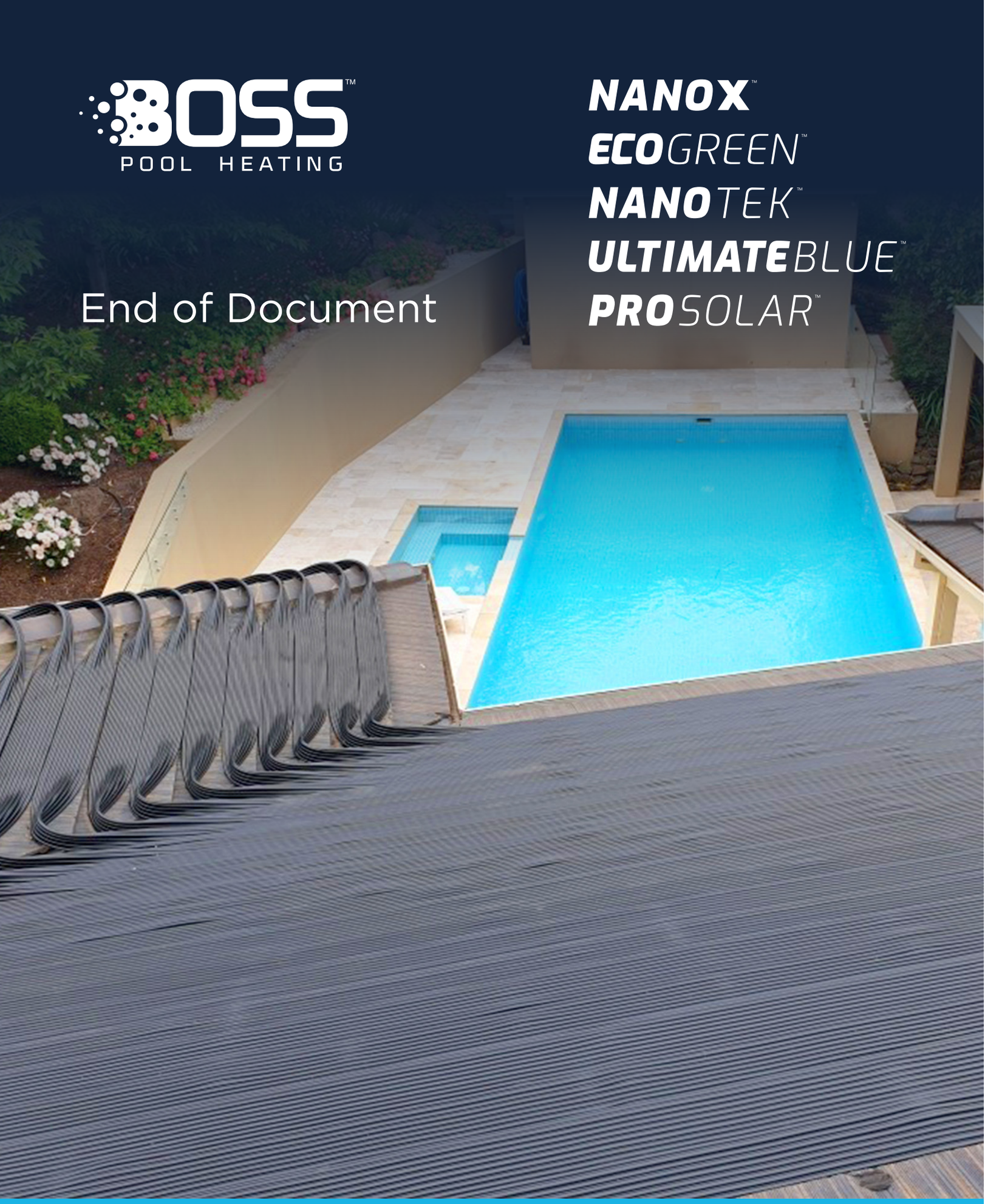
FOR MORE INFORMATION ABOUT BOSS POOL HEATING AND OUR PRODUCTS VISIT OUR WEBSITE OR CALL: (03) 9561 2159.



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