

BOSS™



RHINO
SOLAR PANELS

Installation Manual & Training Manual for Rhino Rigid Solar Systems



**Australian Made Solar Pool Heating
Proudly Manufactured by:**

BOSS™
POOL HEATING

Tough and Durable Rhino Rigid Solar Panel Systems

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.

Contents

Technical Specifications	4
Panel Sets and Parts	5
PAR6 & PAR3 Panel Sizes and Options	6
PRO6 & PRO3 Panel Sizes and Options	8
Introduction	10
Planning and Designing the System	11
Panel Sets and Balanced Flow	13
Single Row - (One Array)	13
Single Row / Split Feed - Two Arrays	13
Double Row / Parallel Feed - Two Arrays	14
Parallel Feed - Two Banks	15
Parallel Feed / Different Roof Slopes - Two Banks	16
Series Feed / Opposing Roof Falls - Two Arrays	17
Parallel Feed / Triangular Roof - Two Banks, One Array	18
How Many Panels Should I Join Together?	18
How to Install Rhino Rigid Solar	20
Steps 1 - 4	20
Steps 5 - 12	21
Steps 13 - 22	22
Step 23	23
Appendices	24
Appendix 1: Choosing the Correct Panels and Roof for Your Install	24
Appendix 2: Plumbing Considerations, Getting Around Obstacles and Automatic Drain Down	26
Appendix 3: Marking the location of the Roof Mounts	30
Appendix 4: Installing the Roof Mounts on Metal Roofs	31
Appendix 5: Installing the Roof Mounts on Tiled Roofs	33
Appendix 6: How to Connect the Solar Panels Together (Installing the Ring Clamp Assembly)	35
Appendix 7: Connecting the Panel System to the Supply and Return Lines	36
Appendix 8: Installing the End Caps	37
Appendix 9: Connecting the Supply and Return Lines from the Roof to Ground Level	38
Appendix 10: Plumbing Configurations	41
Appendix 11: How to Install a VacRel®	46
Appendix 12: How to Install a Pressure Gauge	47
Appendix 13: How to Install the Drain Tube	48
Appendix 14: How to Install the TufFilta®	49
Appendix 15: Operating and Check out Procedures	50
Appendix 16: Pressure Testing the System	51
Appendix 17: Troubleshooting	52
Appendix 18: Maintenance Schedule	55
Panel Pressure Drop	56

Technical Specifications

Product Name		Rhino Rigid Solar Pool Heating Panel
Manufacturer	Boss Polymer Technologies PTY LTD	
Place of Manufacturer	Victoria, Australia	
Solar Panel Type	Unglazed Flat Plate	
Solar Panel Configuration	Polypropylene Strip Panel	
Certification	• Certified ICC 901\SRCC 100-2015, • Performance Rated ISO 9806 • Certified Hail Resistance ISO 9806 • Climate Care SPASA Australia	
Materials: • Header & Collector • Roof Clamp System • Panel to Panel Couplings • PVC Pipe Coupling	• Co-Polypropylene - High Heat, High Impact, UV Stabilised • Glass Reinforced Polypropylene - High Heat, High Impact, UV Stabilised • Polypropylene - High Heat, High Impact, UV Stabilised • CPVC - Chlorinated Polyvinyl Chloride, High Heat, High Impact, Solvent Crack Resistant, UV Stabilised	
Number of Tubes	PAR3: 30 Tubes PAR6: 60 Tubes	
Tube Outside Diameter	10.5mm	
Tube Inside Diameter	8mm	
Tube Wall Section	1.25mm	
Tube Pitch	15.7mm	
Header Pipe Outside Diameter	51mm	
Header Pipe Wall Thickness (Rhino Platinum)	5.5mm	
Header Pipe Wall Thickness (Rhino Pro)	3.0mm	
Average Wet Weight (panel + water)	6.42kg/m ²	
Maximum Recommended Operating Pressure at 60°C	500 kpa	
Panel Pressure Drop	Refer page 56	

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Panel Set and Parts



Rhino Platinum Panels

043_PAR3_010
043_PAR3_014
043_PAR3_018
043_PAR3_023
043_PAR6_018
043_PAR6_026
043_PAR6_034
043_PAR6_042

Rhino Pro Panels

043_PRO3_C1
043_PRO3_C2
043_PRO3_C3
043_PRO3_C4
043_PRO6_C1
043_PRO6_C2
043_PRO6_C3
043_PRO6_C4



043_612
Rhino Ring Clamp



043_613
Rhino Roof Mount



272_507
Rhino End Caps



272_512
CPVC Pipe Coupling



043_535
Flexible Coupling Assembly



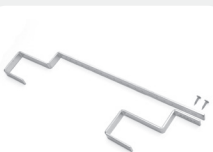
272_659
Flexible Elbow Joint



043_521
Rhino Manifold Plug



043_MDK
Manual Drain Down Kit



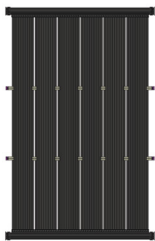
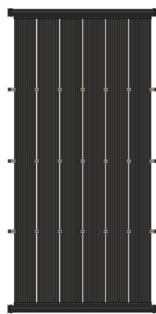
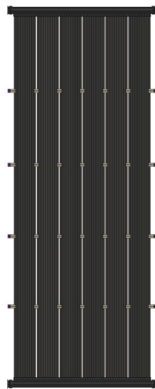
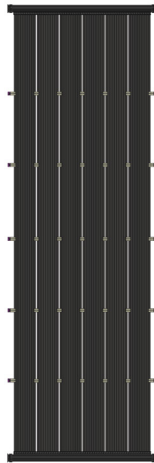
043_525
Tiled Roof Bracket Assembly

**NEED SUPPORT ON
INSTALLING THE
SYSTEM?**

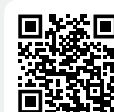


**SCAN
ME!**

PAR6 Full Width Platinum Panels

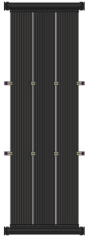
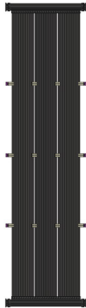
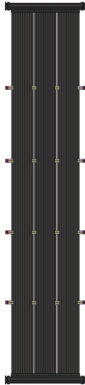
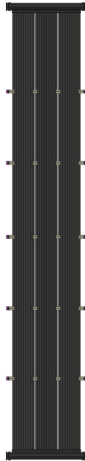
FULL WIDTH PANEL SIZES: PAR6				
Rhino Rigid Part Number	043_PAR6_018	043_PAR6_026	043_PAR6_034	043_PAR6_042
Panel Length, mm	1675	2430	3195	3970
Panel Width, mm	1070	1070	1070	1070
Panel Gross Collector area, m ²	1.77	2.59	3.40	4.23
Panel Active Collector Area, m ²	1.5	2.3	3.0	3.8
Rec. Flow Rate Litres per minute per panel	7.1	10.4	13.6	16.9
Panel Weight (wet) kg	12.72	17.66	22.05	26.28
Climate Care Certified	YES	YES	YES	YES
SRCC Certified	YES	YES	YES	YES
Multilayered Technology	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector
				

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

PAR3 Half Width Platinum Panels

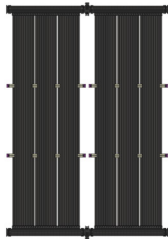
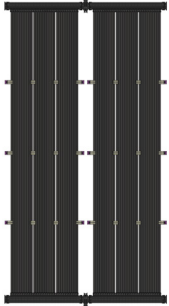
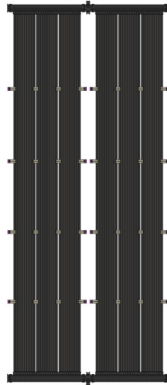
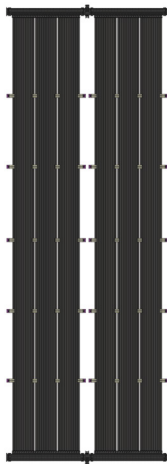
HALF WIDTH PANEL SIZES: PAR3				
Rhino Rigid Part Number	043_PAR3_010	043_PAR3_014	043_PAR3_018	043_PAR3_023
Panel Length, mm	1675	2430	3195	3970
Panel Width, mm	575	575	575	575
Panel Gross Collector area, m ²	0.96	1.39	1.83	2.28
Panel Active Collector Area, m ²	0.7	1.1	1.5	1.9
Rec. Flow Rate Litres per minute per panel	3.8	5.5	7.3	9.1
Panel Weight (wet) kg	6.38	8.83	10.84	12.92
Climate Care Certified	YES	YES	YES	YES
SRCC Certified	YES	YES	YES	YES
Multilayered Technology	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector
				

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

PRO6 Full Width Pro Panels

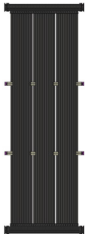
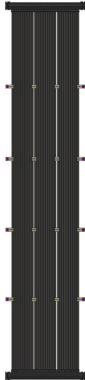
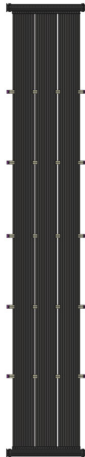
FULL WIDTH PANEL SIZES: PRO6				
Rhino Rigid Part Number	043_PRO6_C1	043_PRO6_C2	043_PRO6_C3	043_PRO6_C4
Panel Length, mm	1655	2417	3180	3950
Panel Width, mm	1044	1044	1044	1044
Panel Gross Collector area, m ²	1.74	2.53	3.32	4.13
Panel Active Collector Area, m ²	1.5	2.3	3.0	3.8
Rec. Flow Rate Litres per minute per panel	7.1	10.4	13.6	16.9
Panel Weight (wet) kg	12.02	16.96	21.35	25.58
Climate Care Certified	YES	YES	YES	YES
SRCC Certified	YES	YES	YES	YES
Multilayered Technology	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector
				

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

PRO3 Half Width Pro Panels

HALF WIDTH PANEL SIZES: PRO3				
Rhino Rigid Part Number	043_PRO3_C1	043_PRO3_C2	043_PRO3_C3	043_PRO3_C4
Panel Length, mm	1655	2417	3180	3950
Panel Width, mm	525	525	525	525
Panel Gross Collector area, m ²	0.87	1.26	1.66	2.06
Panel Active Collector Area, m ²	0.7	1.1	1.5	1.9
Rec. Flow Rate Litres per minute per panel	3.8	5.5	7.3	9.1
Panel Weight (wet) kg	6.38	8.83	10.84	12.92
Climate Care Certified	YES	YES	YES	YES
SRCC Certified	YES	YES	YES	YES
Multilayered Technology	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector	Composite Solar Collector
				

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Introduction

Purpose and Scope

The intent of this installation guide is to equip the reader with sufficient knowledge to design and install a Boss Pool Heating Rhino Rigid Solar System under normal circumstances. To ensure that the Systems and Components function as well as perform correctly. However, it cannot possibly address all situations or requirements. 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 short cuts, 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

Before You Start

- Ensure you have taken all necessary safety precautions before beginning
- As the installer, you are responsible for exercising good judgment when installing Rhino 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 Rhino Solar 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 Rhino Solar panels whenever possible, whilst the panel will take your weight, panels generally have less grip when compared to normal roof surfaces, particularly when wet. Ideally, panels should be installed with ample clearance around the assembled panels to allow accessed 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 obstacle. 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 panels are free of water in order to avoid freeze damage. This includes installation, hand over 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.

Planning and Designing the System

Required Tools for Installation



Standard
Caulking Gun



Type P PVC
Cement & Primer



Impact Driver or
Drill



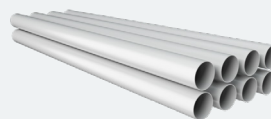
Flat Head & Phillips
Head Bit



Masonry Drill
Bits



Appropriate Safety
Equipment



Don't forget. You will also require 40mm
PVC pipework to plumb your system

Other Required Tools

Other required tools for installation of the Rhino Rigid Solar System can include: Screwdrivers, chalk/string line, chalk or marking pen, suitable fixing screws, pliers, spirit level, pipe cutter or hacksaw, tape measure and harnessing gear.

Definitions

What Is a Bank of Panels? A single Bank of panels is where a set of multiple panels of the same length are interconnected at both the Top and Bottom Headers by a Ring Clamp Assembly only. When panel Banks are separated by PVC pressure pipe, the system has more than one Bank.

What is an Array? A single **Array** is an interconnected lot of Panels (may be various length panels and may be mounted on different roofs) with ONLY One Supply Inlet and ONLY One Return Outlet.

What Is an Extension? If Banks of panels are interconnected at more than TWO connection points, then any **additional** interconnection is referred to as an **Extension**.

What is a System? A system refers to the total solar pool heating system to heat one volume of water.

Important Note:

Both flexible coupling types (straight and 90 Degree) are interchangeable. It is the responsibility of the installer to select the type most appropriate for the site and plumbing design, ensuring a flexible coupling is installed at both the supply and return connections.



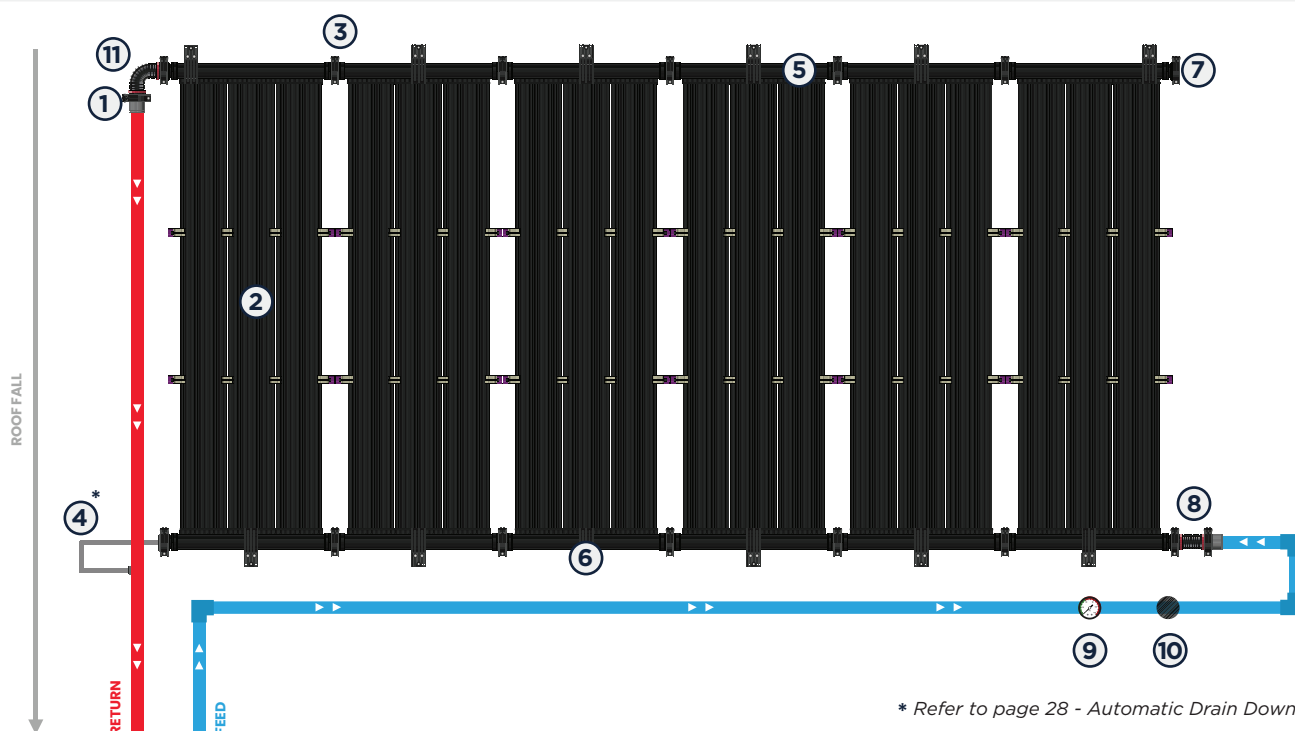
Straight Flexible
Coupling Assembly



90° Flexible
Coupling Assembly

Panel Sets and Balanced Flow

Single Row - (One Array)

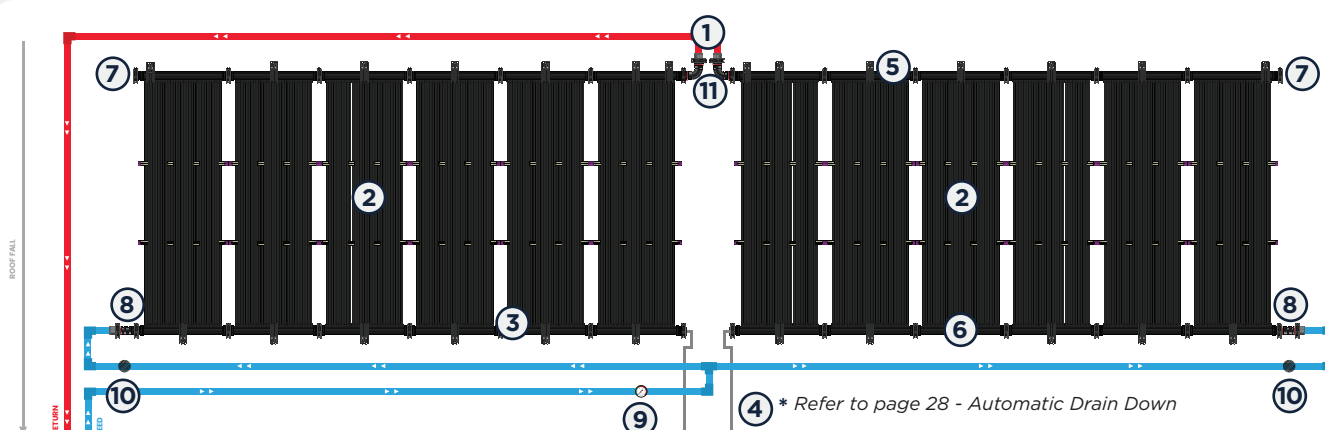


- 01. CPVC Coupling
- 02. Rhino Rigid Solar Panel
- 03. Rhino Ring Clamp Assembly
- 04. Drain Down Kit

- 05. Rhino Header Pipe
- 06. Rhino Roof Mount
- 07. Rhino End Cap
- 08. Flexible Coupling Assembly

- 09. TufGauge Pressure Gauge
- 10. VacRel Vacuum Relief Valve
- 11. Flexible 90 Degree Coupling

Single Row / Split Feed - Two Arrays



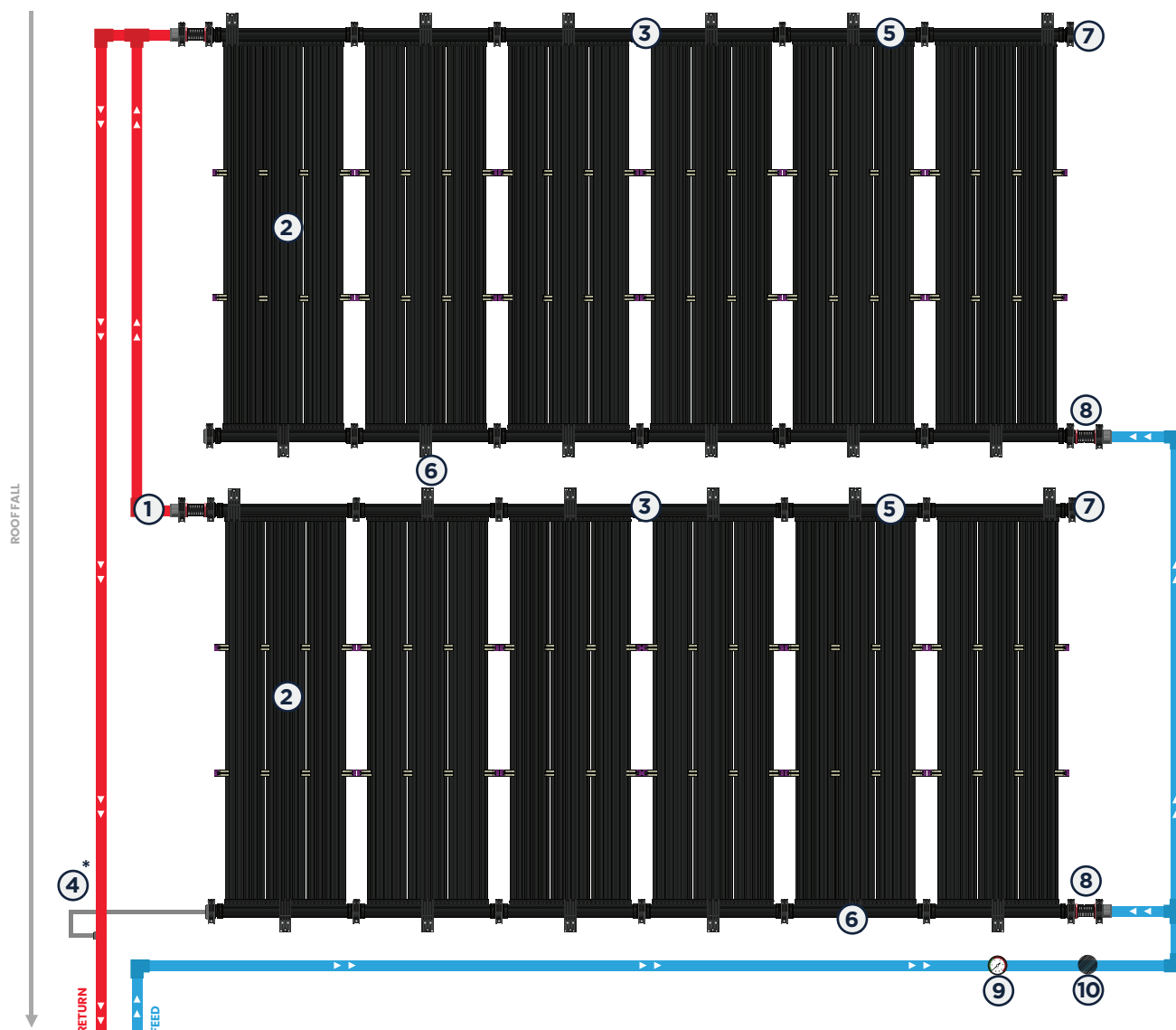
- 01. CPVC Coupling
- 02. Rhino Rigid Solar Panel
- 03. Rhino Ring Clamp Assembly
- 04. Drain Down Kit

- 05. Rhino Header Pipe
- 06. Rhino Roof Mount
- 07. Rhino End Cap
- 08. Flexible Coupling Assembly

- 09. TufGauge Pressure Gauge
- 10. VacRel Vacuum Relief Valve
- 11. Flexible 90 Degree Coupling

Panel Sets and Balanced Flow

Double Row / Parallel Feed - Two Arrays



* Refer to page 28 - Automatic Drain Down

- 01. CPVC Coupling
- 02. Rhino Rigid Solar Panel
- 03. Rhino Ring Clamp Assembly
- 04. Drain Down Kit

- 05. Rhino Header Pipe
- 06. Rhino Roof Mount
- 07. Rhino End Cap
- 08. Flexible Coupling Assembly

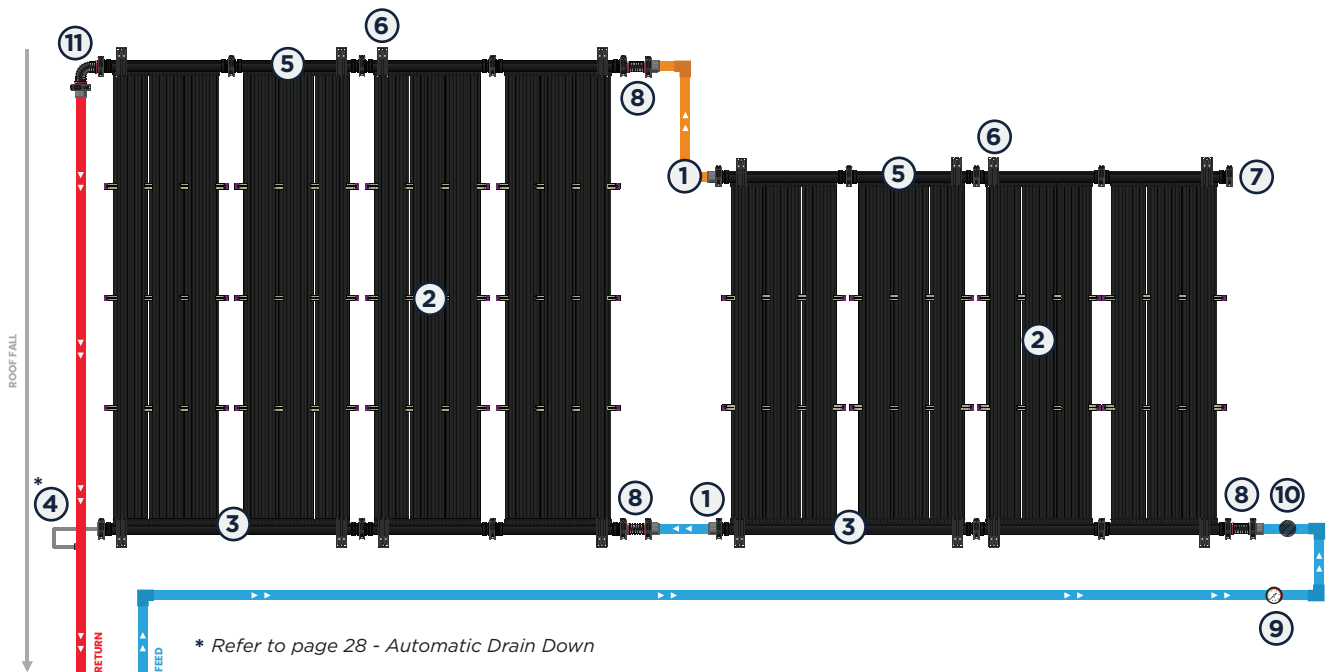
- 09. TufGauge Pressure Gauge
- 10. VacRel Vacuum Relief Valve

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Parallel Feed - Two Banks



- 01. CPVC Coupling
- 02. Rhino Rigid Solar Panel
- 03. Rhino Ring Clamp Assembly
- 04. Drain Down Kit

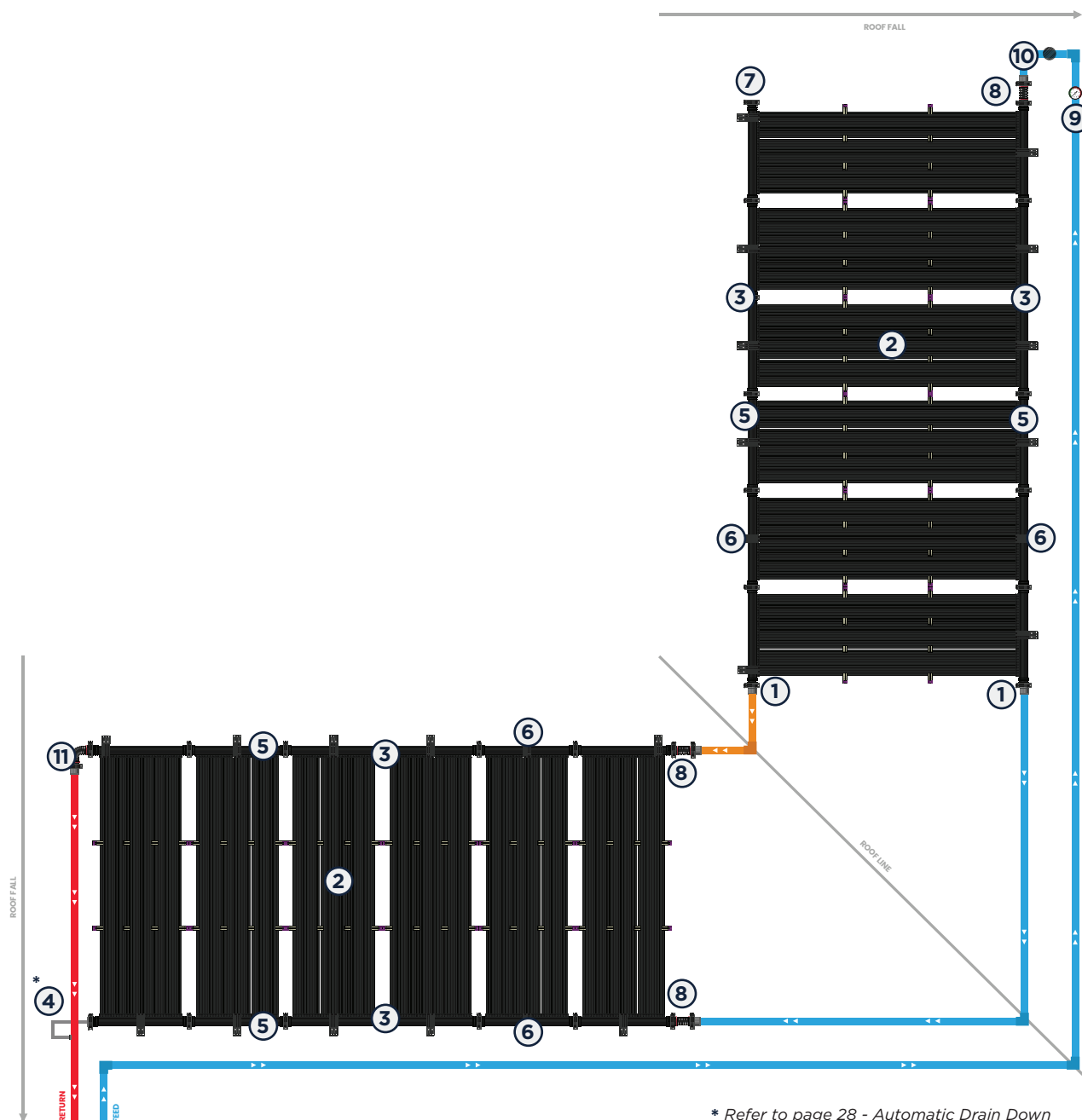
- 05. Rhino Header Pipe
- 06. Rhino Roof Mount
- 07. Rhino End Cap
- 08. Flexible Coupling Assembly

- 09. TufGauge Pressure Gauge
- 10. VacRel Vacuum Relief Valve
- 11. Flexible 90 Degree Coupling

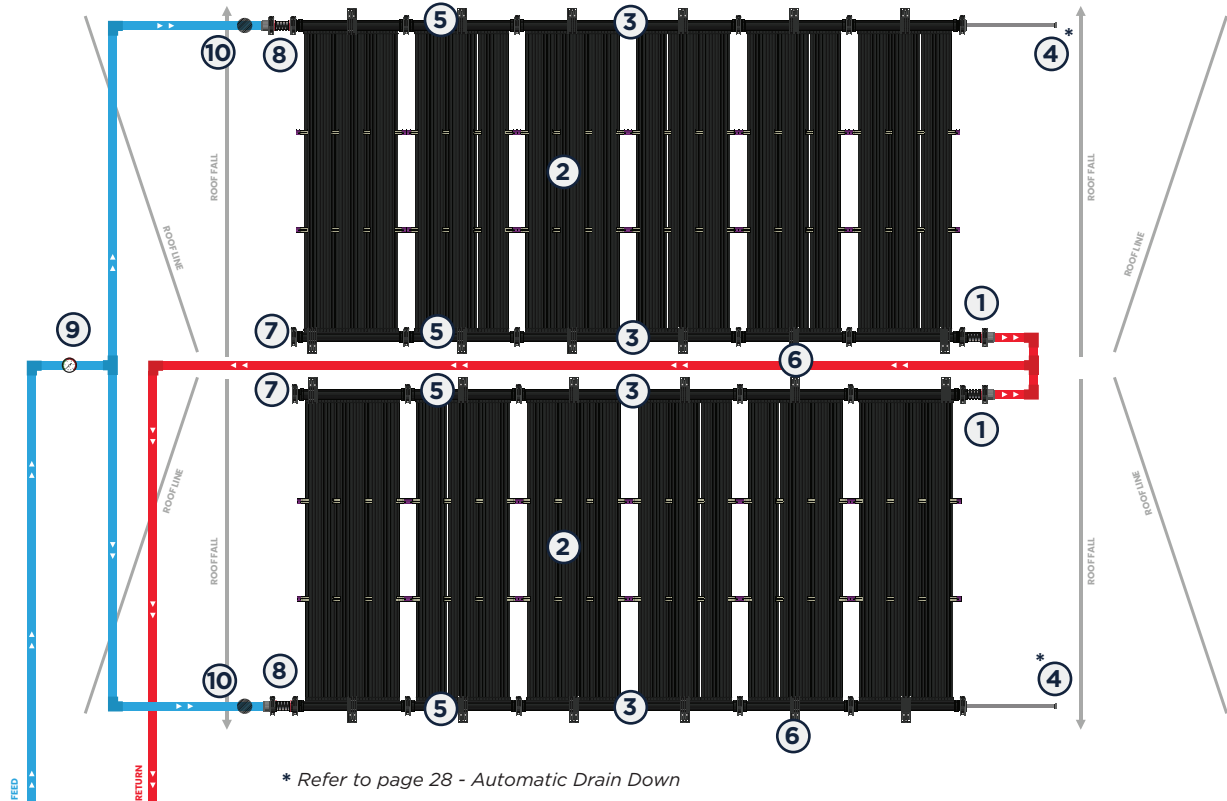


Panel Sets and Balanced Flow

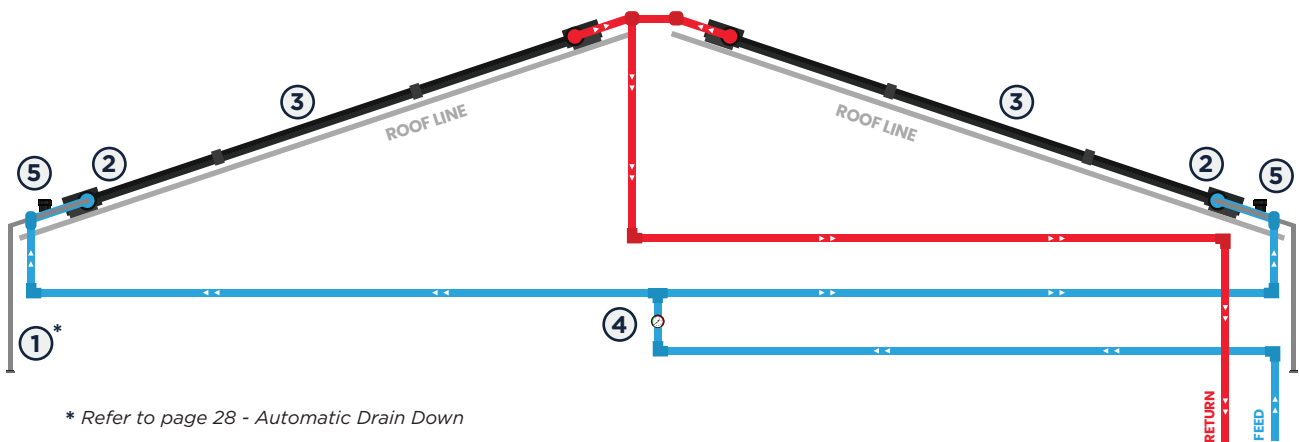
Parallel Feed / Different Roof Slopes - Two Banks



Series Feed / Opposing Roof Falls - Two Arrays



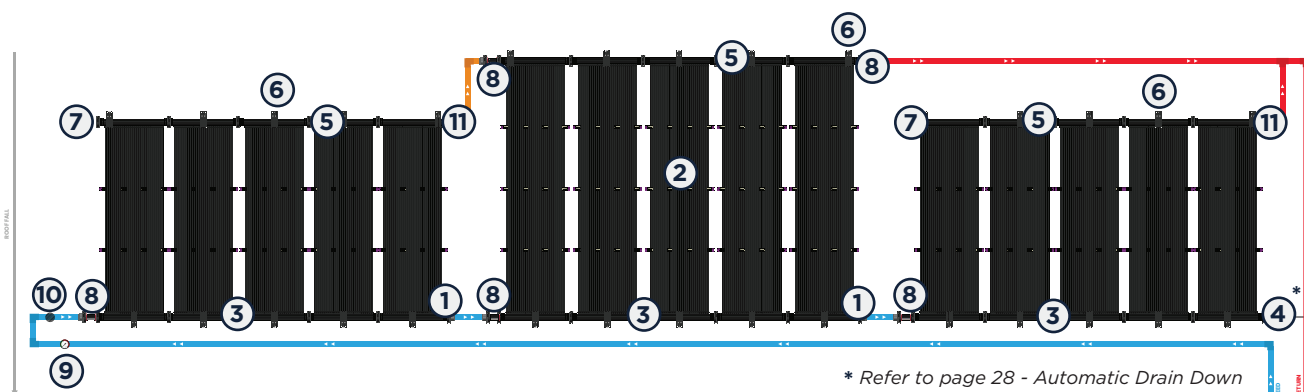
- | | | |
|-------------------------------|--------------------------------|--------------------------------|
| 01. CPVC Coupling | 05. Rhino Header Pipe | 09. TufGauge Pressure Gauge |
| 02. Rhino Rigid Solar Panel | 06. Rhino Roof Mount | 10. VacRel Vacuum Relief Valve |
| 03. Rhino Ring Clamp Assembly | 07. Rhino End Cap | |
| 04. Drain Down Kit | 08. Flexible Coupling Assembly | |



- | | | |
|----------------------|-----------------------------|--------------------------------|
| 01. Drain Down Kit | 03. Rhino Rigid Solar Panel | 05. VacRel Vacuum Relief Valve |
| 02. Rhino Roof Mount | 04. TufGauge Pressure Gauge | |

Panel Sets and Balanced Flow

Parallel Feed / Triangular Roof - Two Banks, One Array



- 01. CPVC Coupling
- 02. Rhino Rigid Solar Panel
- 03. Rhino Ring Clamp Assembly
- 04. Drain Down Kit

- 05. Rhino Header Pipe
- 06. Rhino Roof Mount
- 07. Rhino End Cap
- 08. Flexible Coupling Assembly

- 09. TufGauge Pressure Gauge
- 10. VacRel Vacuum Relief Valve
- 11. Flexible 90 Degree Coupling

How Many Panels Should I Join Together?

The most common and preferred configuration is in a continuous row. However, there are recommended limits to the number of panels that can be installed in this way due to potentially excessive thermal expansion/contraction issues and correct water flow throughout and across the panel array.

Please Note: Always design and install the system to allow for thermal expansion and contraction.

Part Number	Panel Model							
	PAR3_010 & PRO3_C1	PAR3_014 & PRO3_C2	PAR3_018 & PRO3_C3	PAR3_023 & PRO3_C4	PAR6_018 & PRO6_C1	PAR6_026 & PRO6_C2	PAR6_034 & PRO6_C3	PAR6_042 & PRO6_C4
Maximum Panels/Bank*	16	16	16	16	9	9	9	9
Potential Header Movement (Width)*	88mm	88mm	88mm	88mm	93mm	93mm	93mm	93mm
Potential Collector Movement (Height)*	15mm	21mm	28mm	35mm	15mm	21mm	28mm	35mm

* Data Numbers are Indicative

Balanced Flow

Wherever possible the return PVC line should have the shortest possible run back to the pool to reduce heat loss as much as possible (Figure 1).

If the system exceeds the maximum number of panels per continuous row (see table on previous page) or across separate roofs, splitting the system is very beneficial (Figure 1 and Figure 2). Never plumb the supply inlet and return outlet to the same end of a panel array as this will reduce heating performance as it doesn't allow for a balanced and even water flow across the array. (Figure 3).

Where systems exceed the maximum number of panels per continuous row, it may be necessary to increase the supply and return PVC pipe size to cater for the additional flow rate. **Refer page 40 - Table: 01**

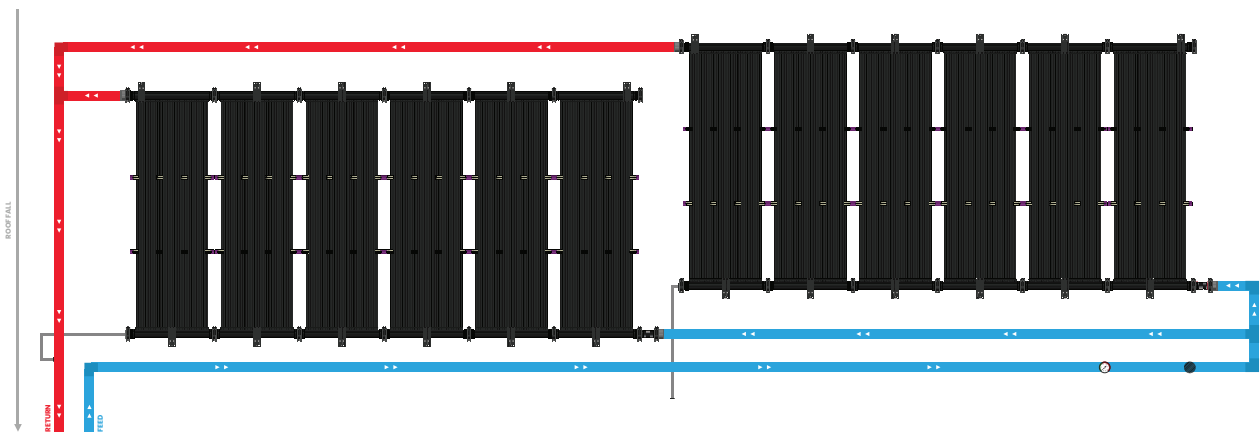


Figure 1: Reverse End Return (Larger PVC Pipe)

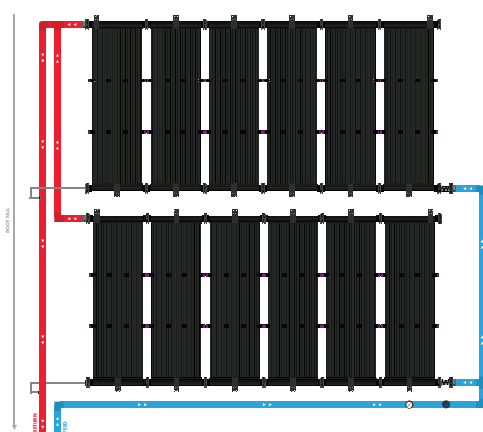


Figure 2: Double Row (Larger PVC Pipe)

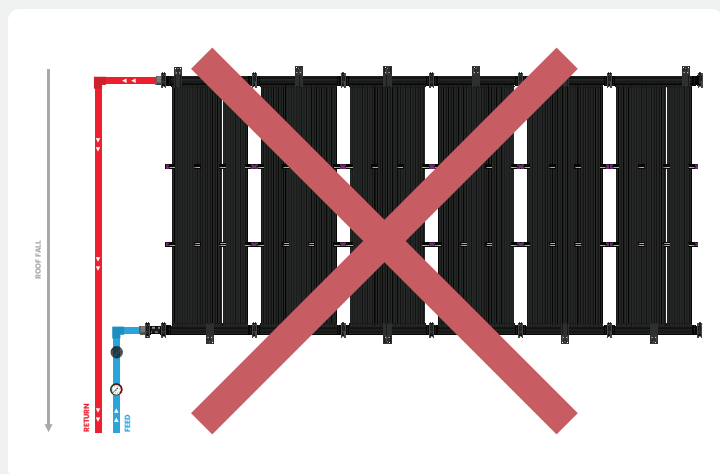


Figure 3: Same End Return

How to Install Rhino Rigid Solar

Step 1

Determine the roof/s where the panels will be installed, taking into consideration the space, orientation, roof protrusions, roof slope and shading. Refer **Appendix 1 'Choosing the Correct Panels and Roof for Your Install'**

Step 2

Take into consideration the position of the plumbing, what obstacles are on your chosen roof and making sure the system can automatically drain down. For more information refer **Appendix 2 'Plumbing Considerations, Getting Around Obstacles and Automatic Drain Down'**

Step 3

Choose an appropriate position for the top roof mounts. Measure out a datum point and mark with a chalk line. To allow for proper drainage for winterisation, please ensure the line has a slight slope of approximately 25mm per 3 metres down towards the supply side of the array.

If you are installing on a metal roof, mark the line ideally over a batten.

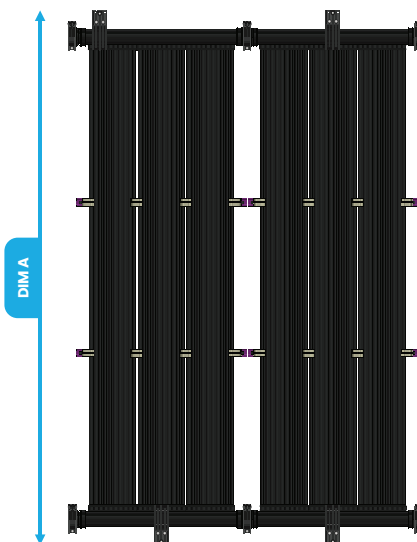
If you are installing on a tiled roof, ensure that the line is 50mm above the bottom of the tile, to allow any built-up debris above the header pipe to be washed away by the natural flow of the water. If the pipe is installed too close to the bottom edge of the upper tile, the natural

water flow would not be able to wash any built up debris away, therefore potentially causing roof leaks as the water builds up behind the debris and flows under the roof tiles.

*Please note: If a slope is not possible, perhaps due to a unique roof design, then automatic drain down will not occur. In this instance, please ensure you install manual drain down, refer **Appendix 2: 'Automatic Drain Down, on page 28'***

Step 4

Using the **diagram and table below**, create a horizontal sloping line where the bottom Roof Mounts will be installed.



Panel Model	DIM A	Panel Model	DIM A
PAR3_010/PAR6_018	1775	PRO3_C1/PRO6_C1	1775
PAR3_014/PAR6_026	2530	PRO3_C2/PRO6_C2	2530
PAR3_018/PAR6_034	3295	PRO3_C3/PRO6_C3	3295
PAR3_023/PAR6_042	4070	PRO3_C4/PRO6_C4	4070

Step 5

Move to the top chalk line and mark the location of the Roof Mounts, see **Appendix 3 'Marking the location of the Roof Mounts'**

Step 6

Install the lower half of the Roof Mounts, ensuring you are following the steps outlined for your particular roof type surface. If you are installing on a metal roof, refer to **Appendix 4 'Installing the Roof Mounts on Metal Roofs'**.

If you are installing on a tiled roof, refer to **Appendix 5 'Installing Roof Mounts on Tiled Roofs'**

Step 7

Hang the panels into the Lower Half of the installed Roof Mounts.

Step 8

To stop the panel/s from sliding off the roof, place the Upper Half of the Roof Mount over the Lower Half and push them down lightly, **do not fasten the screws** as you may need to remove the roof mount to complete panel to panel connections.

Step 9

Join the panels together along the top of the system using the procedure outlined in **Appendix 6: 'How to Connect the Solar Panels Together (Installing the Ring Clamp Assembly)'**

Step 10

Moving to the bottom of the system, follow the instructions outlined in step 9 to connect all panels together using Ring Clamp Assemblies.

Step 11

Install the two (2) supplied screws into the Roof Mount to secure its Upper Half to its Lower Half. Continue until all Roof Mounts have been secured.

Step 12

Connect the Supply and Return lines to the panel array in accordance with the steps outlined in **Appendix 7 'Connecting the Panel System to the Supply and Return Lines'**

Steps 13 - 23 on next pages.

How to Install Rhino Rigid Solar

Step 13

Install the end caps on the opposite corners to the supply and return lines, see **Appendix 8 'Installing the End Caps'** for details.

Step 14

Run the Supply and Return lines down the side of the building to the equipment pad, ensuring you use the appropriate 45° or 90° elbows and saddle clamps, see **Appendix 9 'Connecting the Supply and Return Lines from the Roof to Ground Level'**

Step 15

Connect the Supply and Return lines as per your chosen plumbing configuration, see **Appendix 10 'Plumbing Configurations'**

Step 16

Install a Vacrel®, see **Appendix 11 'How to install a Vacrel'**

Step 17

Install a TufGauge®, see **Appendix 12 'How to Install a Pressure Gauge'**

Step 18

Install a Drain Tube, see **Appendix 13 'How to Install the Drain Tube'**

Step 19

Install a TufFilta®, see **Appendix 14 'How to Install the TufFilta® Inline Solar Filter'** for details.

Step 20

Allow 24 hours for all adhesives to set prior to pressurising the system. To pressurise the system, *follow the steps outlined in* **Appendix 16 'Pressure Testing the System'**

Step 21

Now that the system is fully installed and pressure checked, complete your final operating and check-out procedures found in **Appendix 15 'Operating and Check-out Procedures'**

Step 22

If you encounter any issues, consult **Appendix 17 'Troubleshooting'**

Step 23

Formally instruct the homeowner through a required maintenance schedule to keep their new system working at peak performance, see **Appendix 18 'Maintenance Schedule'**



**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

Appendix 1: Choosing the Correct Panels and Roof for Your Install

Determine the roof(s) where the panels will be installed, taking into consideration the space, orientation, roof protrusions and shading. The selected roof(s) should be exposed to the sun for most of the day, with minimal shading or obstructions. The best orientation depending on your hemisphere as outlined in the following table:

Orientation Priority	Southern Hemisphere	Northern Hemisphere
Best Option	North Facing	South Facing
Second Best	West	West
Third Best	East	East
Fourth Best	Flat Roof. 'See Appendix 2'	Flat Roof. 'See Appendix 2'
Not Recommended	South Facing	North Facing

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

Determine how the Rhino Solar panels will fit on the roof(s) and select an appropriate panel configuration. The most common and preferred configuration is in a continuous row. Remember to plan for any roof obstructions when selecting a Rhino panel configuration.

Select the appropriately sized Rhino Solar panel(s) to suit your desired configuration and mounting location. Use larger panels where possible to minimise panel connections, lower installation time and reduce costs.

Before undertaking any work, it is important to prepare a detailed Schematic Drawing/Diagram outlining the position and dimensions of the panel(s), Supply and Return pipe work in relation to the roof surface and pool location.

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Calculating How Many Panels Are Required

To identify how many panels will be needed, you must first calculate the surface area of the pool in m^2 and then calculate the panel size and quantity required based on the combined systems Panel Net (Active) Collector Area (m^2) as a percentage (%) to the Pools surface area (m^2).

The following section will give you the information needed to calculate the total square metres of panels required.

Calculating the Surface Area of a Rectangular or Square Pool

To calculate the surface area of a rectangular or square pool multiply the width of the pool by its length (width x length = surface area). For example, if the pool is 9 metres by 5 metres then the surface area of the pool is 45 square metres (m^2).

Calculating the Surface Area of an Oddly Shaped Pool

To calculate the surface area of an oddly shaped pool:

Visit Google Map Developers at https://www.mapdevelopers.com/area_finder.php

Ensure you select the "Satellite" option to view and measure your pool surface area.

Calculating the Size and Quantity of Rhino Panels Required

The size and quantity of Rhino Panels required must be large enough and correctly positioned on the roof to heat the pool efficiently. For the average customer and installation, it is generally accepted that in cooler climates such as Melbourne or San Francisco, the total surface of the Rhino Panels should be equal to between 80% - 100% of the pools surface area. In warmer climates such as Queensland or Florida, panels should cover between 60% - 80% of the surface area of the pool, according to Australian Standards AS3634:2022.

This amount may vary depending on several factors, including: Customers Expectation, Pool Blanket use, Climate, and the Available Roof Space.

To calculate the required total panel surface area, simply multiply the pools surface area (m^2) by the desired percentage (%) and divide by 100. For example, to provide 80% surface area of Rhino panels for a 45 square metre pool, $36m^2$ of Rhino Panels would be required.

Appendices

Appendix 2: Plumbing Considerations, Getting Around Obstacles and Automatic Drain Down

Getting Around Obstacles

There are several options when you need to install around an obstacle such as Skylights and Flues, the method depends on the dimensional size of the obstruction and its location.

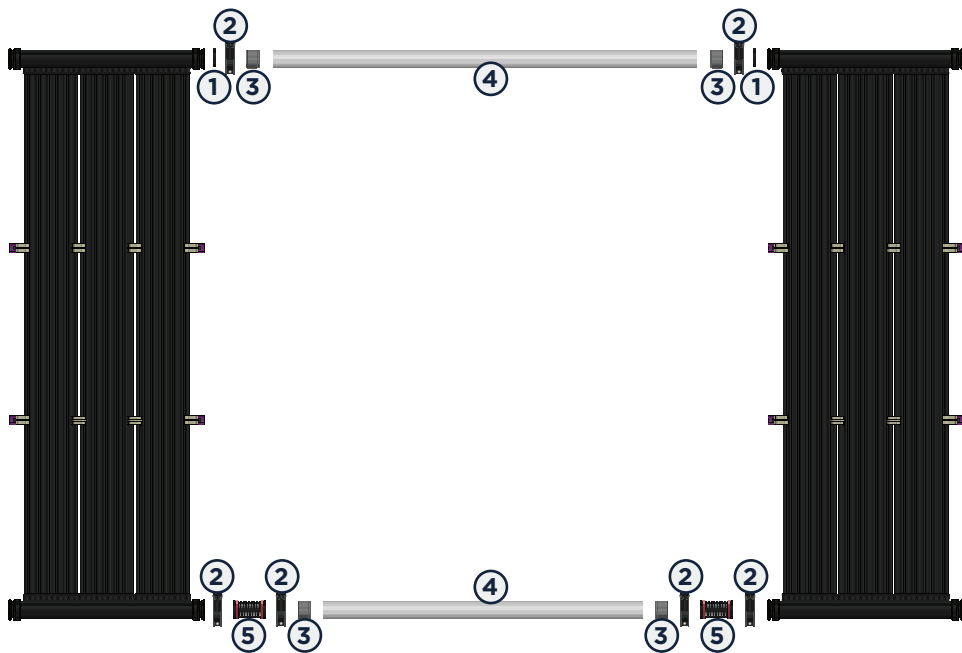
If the obstacle is greater than 80mm the traditional method is to arrange the panels either side of the obstacle and then bridge the obstacle gap between the two (2) joined panels on either side of the obstacle using **PVC Pipe Spacers**.

An alternative method is to either fully remove and plug any interfering collector strips from the headers or to cut the collector strip around the obstacle and then plug the Headers wherever the collector tubes have been cut and removed. The decision to use either method is up to the installer and the size and location of the obstacle, however Rhino Manifold Plugs can be a more convenient, faster, and aesthetically appealing option for smaller obstructions.

PVC Pipe Extensions

When you need to install panels either side of an obstruction greater than the normal 80mm gap between two joined panels, the traditional PVC pressure pipe, Pipe Spacer method to circumnavigate the obstacle is generally used:

- Step 1:** Measure the length of the obstruction and cut two pieces of 40mm PVC pressure pipe long enough to circumvent the obstacle. You may need to take an additional 40mm into consideration to account for the 2 x CPVC Pipe Couplings or a further 100mm to account for any rubber flexible coupling/s where required.
- Step 2:** Once you have deburred the PVC pipe(s), prime and cement two (2) CPVC Pipe Couplings to either end. Ensure that you use Type P PVC cement and primer.
- Step 3:** Connect the PVC Pipe Spacer assembly to each Header Pipe to bridge the gap, using two (2) Ring Clamp Assemblies per PVC Pipe Spacer, see **Appendix 6 for instruction on installing the Ring Clamp Assembly**.
- Step 4:** To prevent the PVC pipe from sagging, you may consider installing additional Roof Mounts along the top PVC pipe at regular intervals. For the bottom PVC pipe, you will also need to allow for thermal expansion/contraction of the Solar Panels can be installed. This may not be necessary if the distance is less than 600mm (24 inches).



- 01. Seal Ring
- 02. Rhino Ring Clamp Assembly
- 03. CPVC Coupling
- 04. PVC Pipe Extension
- 05. Flexible Coupling Assembly

Manifold/Header Plugs



Rhino Manifold Plug

Option 1

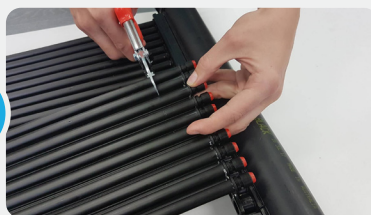
- Cut the collector closest to the obstacle on both sides
- Plug the collector at end open end
- (Clean look, minimal heat loss)

Option 2

- Unclip the collector
- Slide out the section
- Plug the manifold on either side
- (Simple & can re-use collector as a spare)



Cut the tubes around the Collector



Trim away the affected barbs at the top & bottom of the Collector



Insert the Trimmed Down Collector and Manifold Plugs



Insert the Barb Lock for the Finished Assembly



Obstacle in the way of Installation



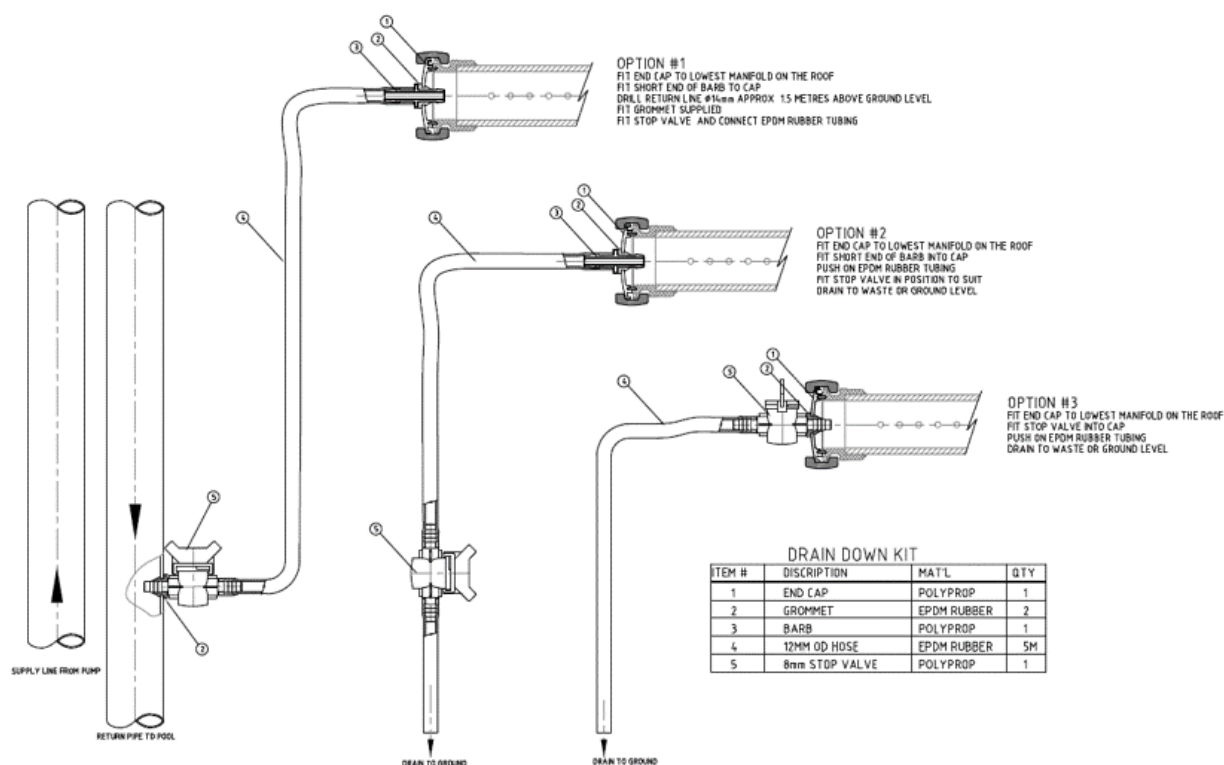
Installed Manifold Plug

Appendix 2: Plumbing Considerations, Getting Around Obstacles and Automatic Drain Down continued

Automatic Drain Down

All Solar Systems should be installed in a manner that will allow the water to drain automatically and completely, each and every time the pump is switched “OFF”. This is extremely important as water left in the system can cause a variety of issues that may affect the integrity of your system. This is especially important in areas subject to frost and freezing conditions.

If the system cannot be designed to automatically drain down, then manual drain down valves must be installed in the plumbing or at the end of the lowest header. If this procedure is employed, it is important to train the pool owner in the proper drain-down procedure for winterising the system.



Appendix 2: Plumbing Considerations, Getting Around Obstacles and Automatic Drain Down continued

Automatic Drain Down continued

Systems installed on flat roofs are more susceptible to incomplete water drainage. In these installations, additional steps may be required to ensure all water is removed from the collectors. This may include opening collector connections and manually lifting the panels to drain residual water prior to the colder months each year.

As an alternative, a suitable automated solar controller with an anti-freeze function (such as the Dontek AS5) may be installed. Where an anti-freeze controller is used, the installer must ensure the function is correctly enabled at commissioning.

The homeowner is responsible for ensuring that the automated solar controller remains powered, uninterrupted and fully operational during colder months. Failure to maintain power to the controller may result in system damage.

Where an anti-freeze controller is not installed or where the anti-freeze function is not correctly enabled or maintained, damage resulting from freezing conditions is not covered under warranty.

Boss Pool Heating is an authorised distributor of Dontek Electronics controllers. For systems requiring anti-freeze protection, Boss recommends the Dontek AS5 or equivalent Dontek controller. Anti-freeze controllers operate by sensing roof temperatures and activating the circulation pump when temperatures fall below a preset threshold (typically between 1-6°C). The pump will cycle intermittently until the roof temperature rises above the selected setting. If utilising a different controller, please consult with the manufacturer and/or the manual provided.

Important: Installers must inform the pool owner of the risks associated with freezing conditions and the importance of maintaining the system during winter. Damage caused by freezing conditions is not covered under warranty.

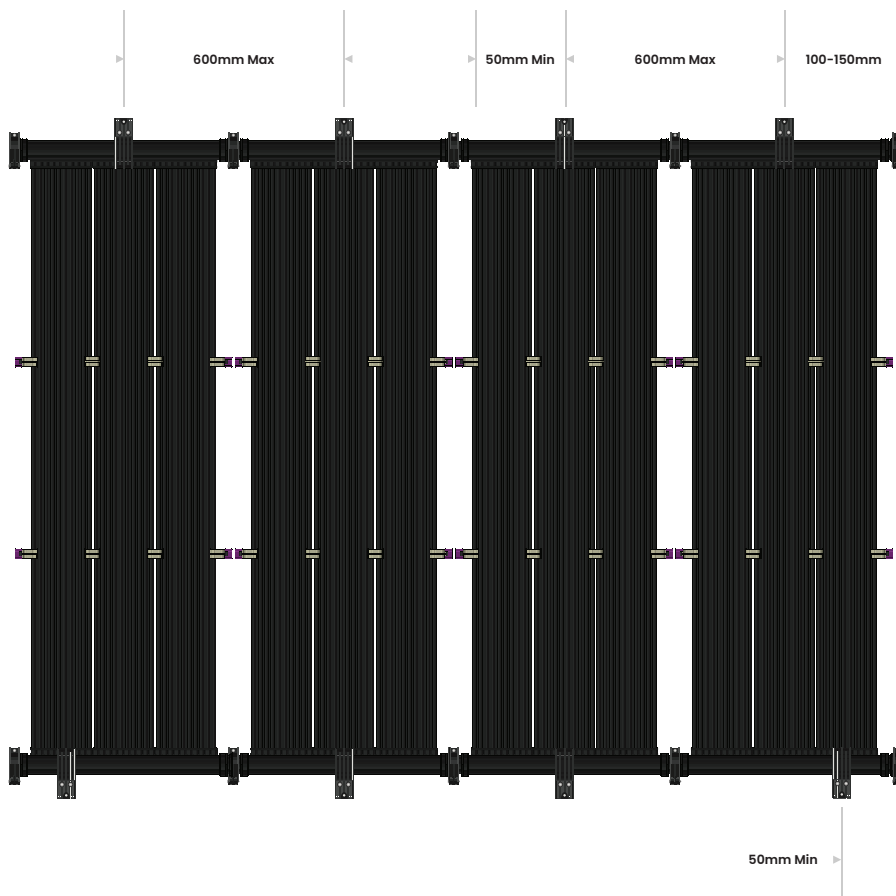
**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

Appendix 3: Marking the location of the Roof Mounts



For Rhino PRO6 panels, the header features a central weld which requires specific mount placement. Install two top roof mounts on either side of the centre weld. Install one bottom mount per panel, alternating the mount position between adjacent panels so the bottom mounts are staggered.

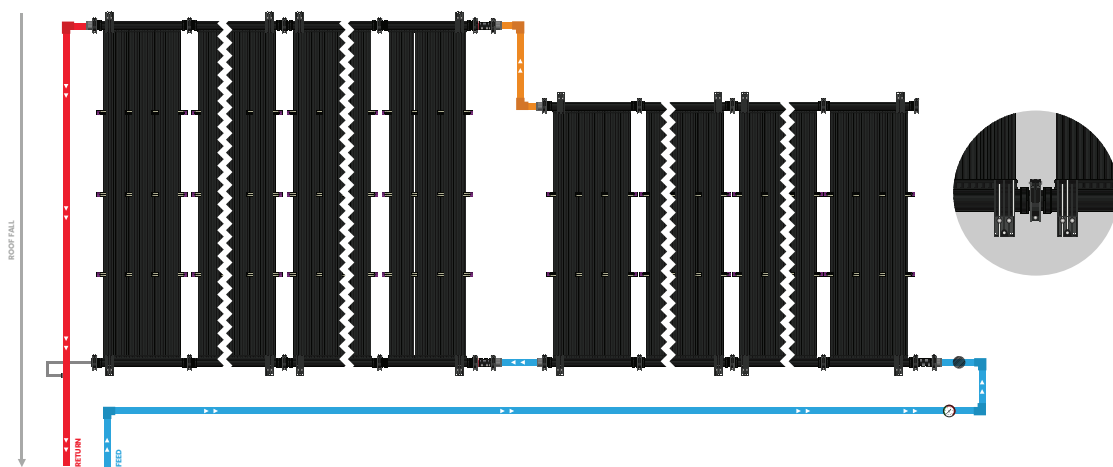
When determining where to position the top Roof Mounts, please remember to:

- Position subsequent Roof Mounts evenly with a gap no larger than 600mm allowing a minimum of 50mm away from any Ring Clamp Assemblies to allow for thermal expansion/contraction of the header pipe. Additional Roof Mounts may be required for particularly steep installations or high wind regions.
- If you are installing on a **Metal Roof**, position the Roof Mounts on the peak of the corrugation and over a truss or batten capable of withstanding the expected external forces/pressures. They can be spaced anywhere along the top header to correlate with the spacing of the roof batten/trusses.
- If installing on a **Tiled Roof**, position on the valley of the tile
- As a general rule for average installations, position all roof mounts 50mm away from all Ring Clamp Assemblies to allow for thermal expansion/contraction. Exceptions apply where roof mounts are used as a central fixed expansion control point to split the thermal movements either side of the 2 x central Roof Mounts.

Appendix 3: Marking the location of the Roof Mounts continued

How to Design Thermal Joints

As a general rule for average installations, position all roof mounts 50mm away from all Ring Clamp Assemblies to allow for thermal expansion/contraction. Exceptions apply where roof mounts are used as a central fixed expansion control point.



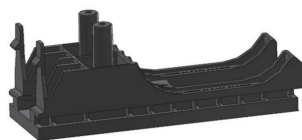
Appendix 4: Installing the Roof Mounts on Metal Roofs

Installing Roof Mounts on Metal Roofs

This section provides steps for installing the TOP Roof Mounts on metal roofs. Before beginning please ensure you have the following components for each Roof Mount that is to be installed:



Boss Approved Silicone



One (1) Lower Half of Roof Mount

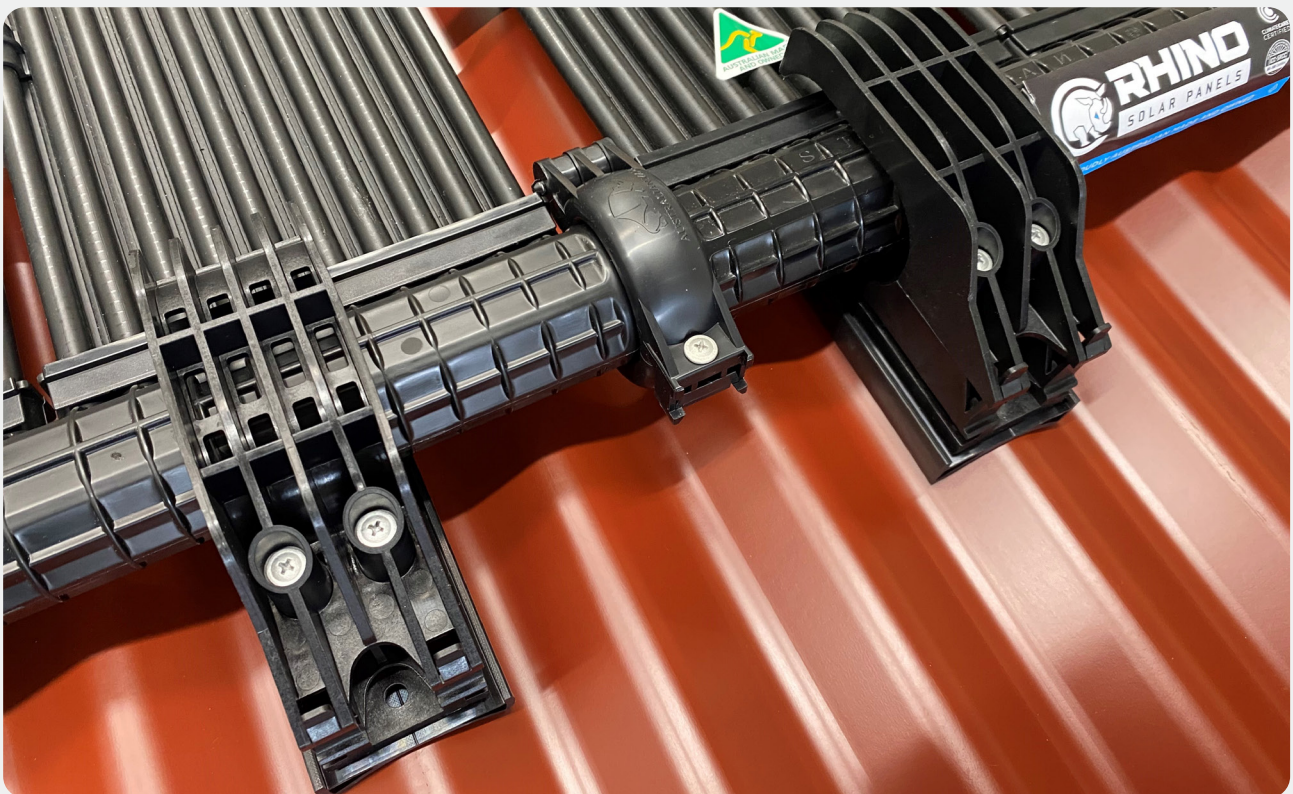


Two (2) Appropriate Roofing Screws

Appendices

Using the upper chalk string line and pre-measurements as a guide:

- Step 1:** Clean and dry the roof surface where the Roof Mount is to be installed.
- Step 2:** Apply a generous blob of silicone into one upper and one lower selected mounting hole on the underside of the bottom half of the roof mount.
- Step 3:** Place the BOTTOM portion of the Roof Mount onto the roof surface using the string line as a guide with the open rounded section facing down the roof.
- Step 4:** Secure the BOTTOM portion of the Roof Mount to the roof, by installing two appropriate screws in the selected mounting holes.
- Step 5:** Repeat steps 1 to 4 until all top Roof Mounts are installed.



NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Appendix 5: Installing the Roof Mounts on Tiled Roofs

Installing Roof Mounts on Tiled Roofs

This section provides steps for installing the Roof Mounts on tiled roofs. Before beginning please ensure you have the following components for each Roof Mount that is to be installed:



One (1) Long & One (1) Short
Tiled Roof Bracket



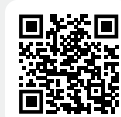
One (1) Lower Half of Roof
Mount



Four (4) Button
Wafer Head Screws

- Step 1:** Lift the tile above the line marked for the Top Roof Mounts and slide the Long Roof Bracket between the two tiles in the valley of the bottom tile. Ensure the Roof Bracket hooks onto the roof batten and apply a generous bead of silicone underneath and on top of the Roof Bracket to insulate it against the tile.
- Step 2:** Lower the tile back down to lock the roof bracket into place.
- Step 3:** Slide the bottom portion of the Roof Mount onto the installed Roof Bracket, with the open rounded section facing the appropriate orientation.
- Step 4:** If installing the top of the system roof mounts, secure the bottom portion of the Roof Mount in the desired location using appropriate screws. If installing the bottom of the system roof mounts, DO NOT fasten them to the tile brackets so as to allow for thermal expansion and contraction.

**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

Installing Roof Mounts on Tiled Roofs continued



Figure 1



Figure 2

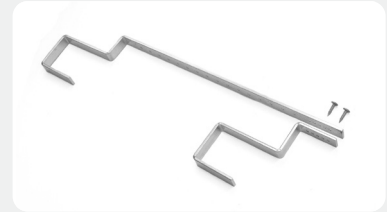


Figure 3

- Step 5:** Lift the tile below and slide the Short Roof Bracket underneath until it hooks onto the roof batten below (*Figure 2*). Lower the tile back down to lock the roof bracket into place.
- Step 6:** Secure the Short Roof Bracket to the Long Roof Bracket using two (2) appropriate screws (*Figure 3*)
- Step 7:** Repeat steps 1 to 6 until all top Roof Mounts are installed.



NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



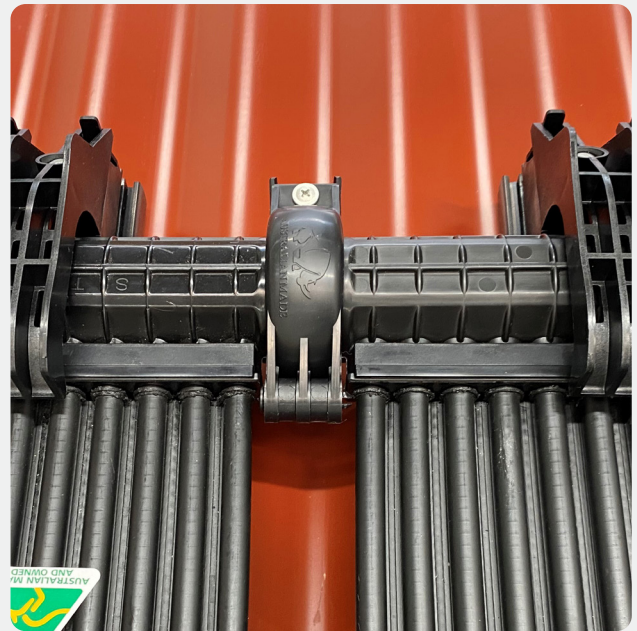
SCAN ME!

Appendix 6: How to Connect the Solar Panels Together (Installing the Ring Clamp Assembly)

To install the Ring Clamp Assembly:



1 x Ring Clamp Assembly
1 x Seal Ring
1 x Button Screw

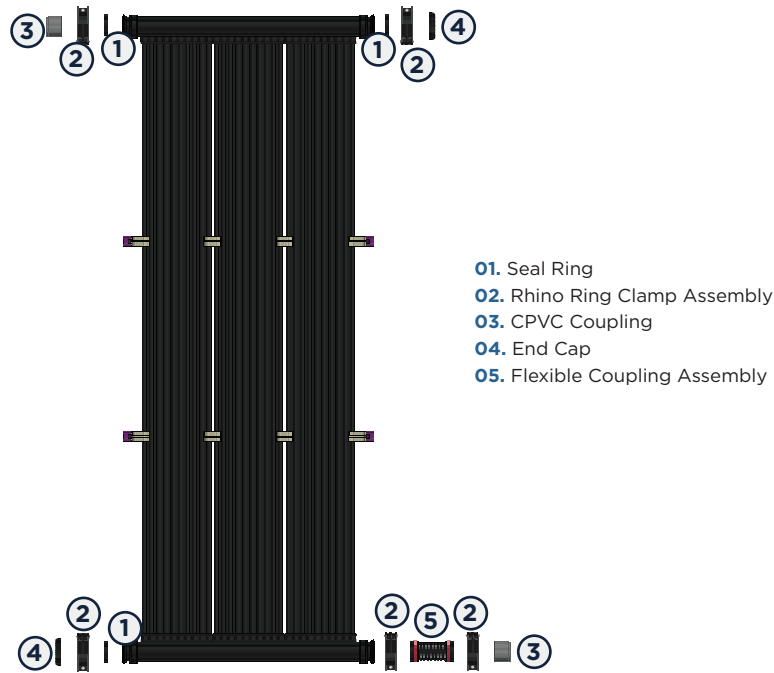


- Step 1:** Clean both interconnecting coupling grooves and mating surfaces of the two components being connected (Header/s, End Cap or PVC Coupling) with a clean rag.
- Step 2:** Insert one (1) Seal Ring into either mating coupling groove.
- Step 3:** Push the two couplings together ensuring that the inserted Seal enters the opposing mating groove while placing the bottom portion of the Ring Clamp Assembly under the coupling components you are connecting.
- Step 4:** Hinge the top half of the Ring Clamp Assembly over the coupling components and squeeze the top and bottom portions together until the two (2) retaining lock fingers securely clip and lock the two halves of the Ring Clamp together.
- Step 5:** Using a Phillips Head Screwdriver, permanently lock the two halves of the hinged Ring Clamp Assembly together using the One (1) supplied button screws. Tighten until secure.

Important: Ensure the seal has not been pinched during assembly. The ring clamp should close with minimal force. If resistance is encountered, check that the seal ring and flanges are correctly aligned.

Appendices

Appendix 7: Connecting Panel System to the Supply & Return Lines



Step 1: Locate the corners of the solar array where the Supply and Return lines will connect. The Supply Line should connect to the bottom header, on the side furthest from the pool. This connection must use a rubber flexible coupling and plumbing practices that allow for thermal expansion and contraction of the panels in both linear and lateral directions. The Return Line should connect to the top header, on the side closest to the pool. This allows heated water to return to the pool via the shortest path. As the top header typically experiences less thermal expansion, a rubber flexible coupling is still recommended, although a PVC coupling may be suitable in some installations.

Important: Ensure the solar array and plumbing are installed in a way that allows the system to expand and contract freely without placing stress on the panels or pipework.

Step 2: On the supply side of the array (bottom/furthest away), attach one side of the Rubber Flexible Coupling directly onto the panel array and the CPVC Coupling to the other side using the Ring Clamp Assembly (see **Appendix 6 for instructions**).

Step 3: On the Return side of the array (top, closest) attach a CPVC Coupling or rubber flexible coupling directly onto the panel using the Ring Clamp Assembly (see **Appendix 6 for instructions**).

Step 4: Plumb both the Supply and Return PVC pressure pipes to the corresponding CPVC Couplings using good plumbing techniques and high-quality equipment and supplies. Please also ensure that all pipe work has been adequately supported using pipe clamps with adequate consideration and allowance for thermal expansion / contraction in both linear and lateral directions for both panels & pipe work.

Appendix 8: Installing the End Caps

Caps are generally used to plug any free end of the solar array; these End Caps are generally installed at opposite the corners to where the Supply and Return lines are located.

To install the End Caps:



- Step 1:** Clean both interconnecting coupling grooves and mating surfaces of the two components being connected with a clean rag.
- Step 2:** Insert one (1) Seal Ring into either mating coupling groove.
- Step 3:** Push the two couplings together ensuring that the inserted Seal Ring enters the opposing mating groove while placing the bottom portion of the Ring Clamp Assembly under the coupling components you are connecting.
- Step 4:** Hinge the top half of the Ring Clamp Assembly over the coupling components and squeeze the top and bottom portions together until the two (2) retaining lock fingers securely clip and lock the two halves of the Ring Clamp together.
- Step 5:** Using a Phillips Head Screwdriver, permanently lock the two halves of the hinged Ring Clamp Assembly together using the one (1) supplied button screw. Tighten until secure.

**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

Appendix 9: Connecting the Supply and Return Lines from the Roof to Ground Level

While these steps are useful, they cannot possibly cover every type of installation. Therefore, the installer may need to adapt these steps to suit unique roof designs or other unusual, unforeseen site constraints.

Before beginning, it is important to note that:

- The entire system, including pipework, must accommodate thermal expansion and contraction.
- Return pipework should always take the shortest, most direct path back to the pool.
- Aesthetically, the supply and return pipes should be kept as close to the gutters, valleys and ridges as possible.
- Plumbing skills and knowledge will be required, particularly when installing over hips or valleys.
- The use of plumbing fittings should be kept to a minimum.
- Where possible 2 x 45° elbows should be used instead of 90° elbows for less water flow restriction.
- All pipes should have a slight “downhill” slope to aid in automatic drain down.
- Pipework must be independently supported using appropriate plumbing clamps as the panel mounting hardware is not designed to support the weight of plumbing pipework.
- Each array must be supported using roof mounts positioned at the four corners of the array (covered in Appendix 3). Mounts should be installed as close to the corners as possible while still allowing the collectors to expand and contract during thermal movement.

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Appendix 9: Connecting the Supply and Return Lines from the Roof to Ground Level continued

- Step 1:** If not already installed, cement a PVC 90° elbow and a short length of 40mm PVC pressure pipe to the CPVC coupling mounted to the return outlet of the array using a Type P primer and cement. This elbow should face down towards the bottom header.
- Step 2:** Moving to the Supply line, cement a PVC 90° elbow and a suitable length of 40mm PVC pressure pipe to the CPVC coupling mounted on the rubber Flexible Coupling with the 90° elbow facing down away from the system.
- Step 3:** Identify where the Supply and Return pipes will go over the edge of the roof and mark this spot with chalk. If possible, these pipes should be installed at the exact points where they will fasten into the existing system or into pipes coming from another location. Where possible, ensure pipework going over the roofs edge is lower than the bottom header to ensure full automatic drain down.
- Step 4:** Accurately measure and record the distance from the Supply and Return elbows to the marked points. Ensure that you include the depth of the elbow socket in your measurements.
- Step 5:** Cut your PVC pipes to suit the measured lengths. Clean and de-burr the pipes and prime and cement into the elbows.
- Step 6:** If you are not experienced in plumbing PVC pipe, it is a good idea to lay out and connect the pipes and fittings before cementing them.
- Step 7:** Examine the system and ensure the pipes are as short, straight, and tight to the building as possible. Once you are satisfied, go back and cement all fitting and pipework. Ensure you double check that all parts have been properly cemented.
- Step 8:** Adequately secure all pipe work whilst allowing for thermal movement with the appropriate pipe clamps, bolts or screws with adequate silicone sealant.

**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

PVC Pipe Selection (Supply / Return)

Selecting the correct sized PVC pressure pipe for your solar array is essential to ensuring the solar system runs efficiently. Selecting a pipe that is too small will result in the water flow being restricted to the solar panels and unnecessarily increase pump power consumption. To select the correct sized pipe, use the following table as a guide:

Table: 01 - Flow Rate - Recommended Pipe Diameter (AS 1477 Class 9)

Litres Per Minute	Pipe Diameter (mm)
Less than 170	40
170 to 300	50
300 to 600	65

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 (m²) 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 m²) 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.

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Appendix 10: Plumbing Configurations

Not every system will be like the one outlined in the diagrams following. Some will have additional equipment, a different type of filter or the pipes may be reversed. Either way, the diagram should help you to gain an understanding of the flow of water from the pool, through the system and back to the pool. These diagrams outline most of the components necessary to appropriately plumb the system. Please study and familiarise yourself with the diagram and required components.



See Plumbing Configuration Diagram Options From Pages: 42 - 45

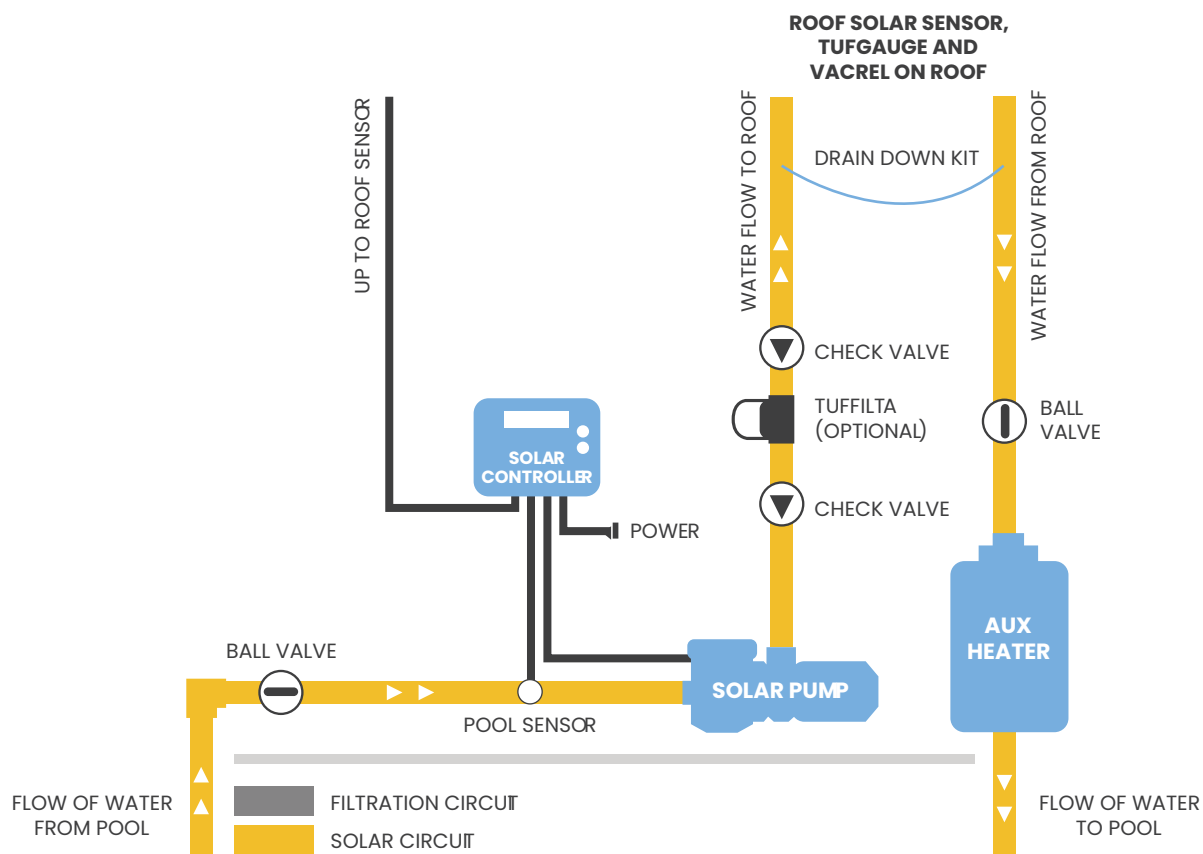
**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

Independent / Separate System



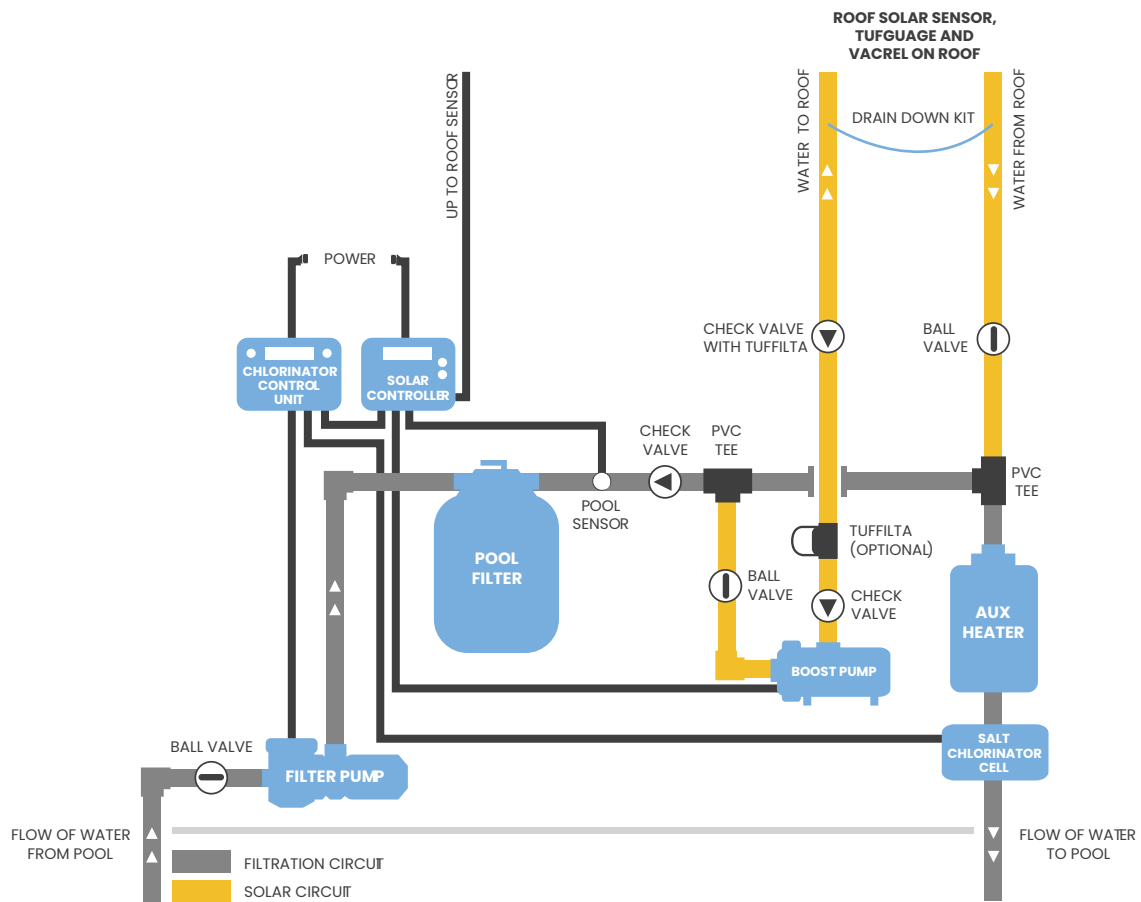
The pool water is pumped directly from the pool to the solar collector/absorber and then back. This configuration requires the pool builder to plan for solar or for solar provisions to have been pre-installed. It is simple to install and does not interrupt the filtration system. This type of plumbing allows the Solar System to operate independent of the filtration system and generally uses less power than integrated systems.

Requires:

- 1 x AS5 Digital Solar Controller or similar
- 1 x Check Valve (also known as a Non-Return or One-Way Valve)
- 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.

Simultaneous / Integrated / Retro Configuration



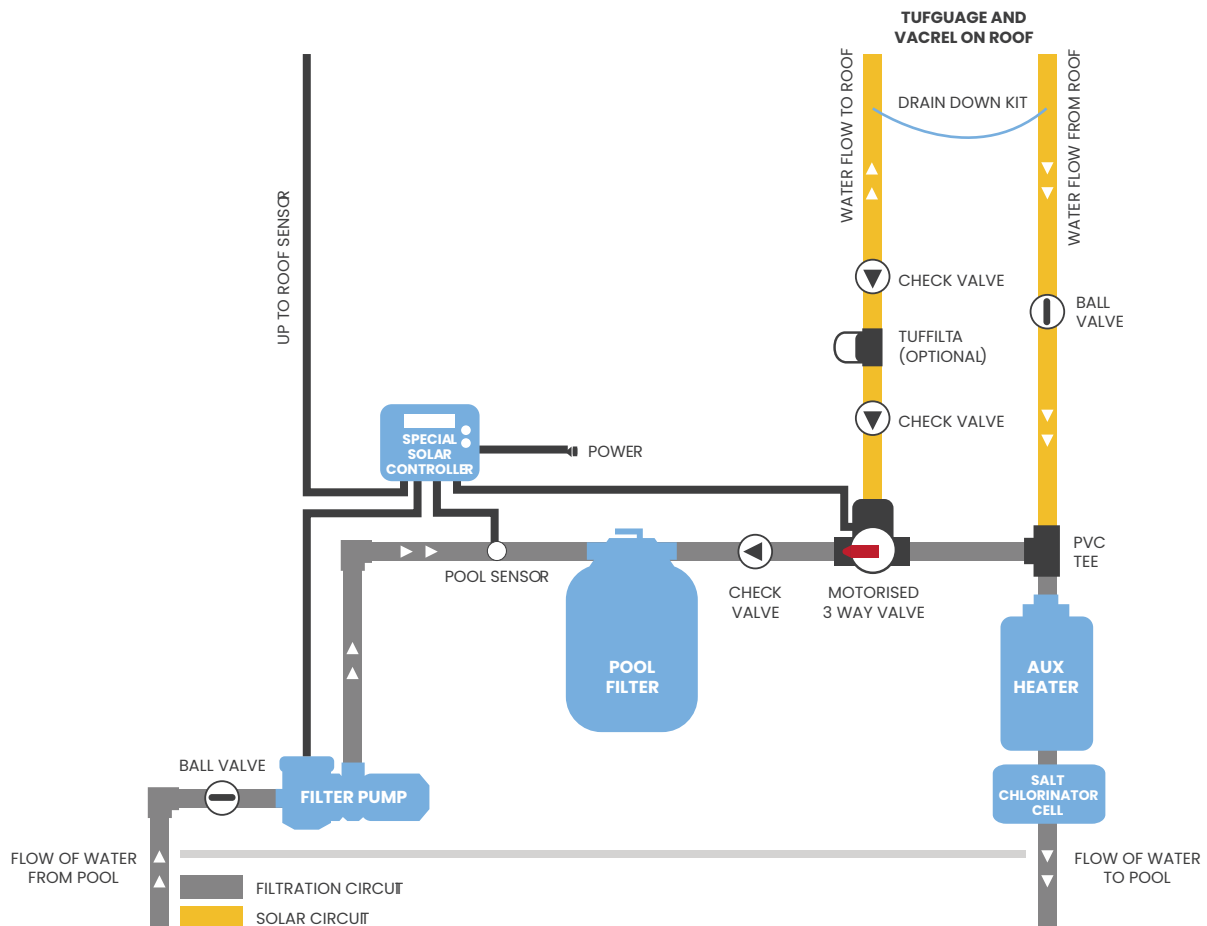
Involves diverting the flow of water after the filtration system. This system is usually adopted when the solar suction and return lines don't exist, as it is an easy way to retro fit a solar system without affecting any other part of the pool structure. A Solar Booster pump can be used to push the filtered 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.

Auto Diverter Valve System



The Auto Diverter Valve System gives you the advantages of an Integrated / Simultaneous / Retro Fit System without the need for a Booster Pump. However the special controller and motorised valve are more expensive and require more effort and skill to set the valve correctly. 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 Check Valve (also known as a Non-Return or One-Way Valve)
- 1 x Motorised Valve
- 2 x PVC Tee
- 1 x Special Digital Controller (such as the AquaSmart 5 AV controller or similar)

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

Appendix 11: How to Install a VacRel®

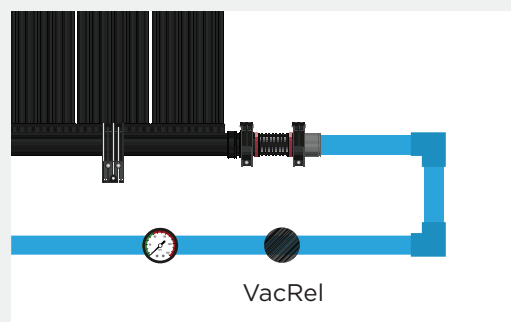
The VacRel® is a high-performance Vacuum Relief Valve for Solar Pool Heating. It has been designed to allow filtered air to easily enter the system, therefore assisting in the drain down process and reducing the risk of vacuum crush of the PVC pipework.

Installation Position of the VacRel®

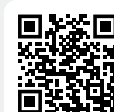
The ideal position for the VacRel® on a Rhino Rigid Solar Pool Heating System is in a 40mm PVC Tee-Fitting on the supply line. The Tee should be glued so that the VacRel® will sit vertically once installed.

Steps for Installation:

- Step 1:** Take note of where the VacRel® is to be installed.
- Step 2:** Glue a 40mm PVC Tee-Fitting into its appropriate position using standard plumbing techniques, making sure the upper socket is as vertical as possible.
- Step 3:** Apply primer and glue to both the fitting and VacRel® before gluing into place. Clean any excess glue so that the top cap can still be removed in future for maintenance.
- Step 4:** Wait 24 hours for all solvents to fully set before pressurising the system.



NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Appendix 12: How to Install a Pressure Gauge

The TufGauge® Pressure Gauge assists the pool professional with setting the correct system pressure and helps to monitor and maintain the ongoing 'health' of the system.

Installation Position of the TufGauge®

The Boss TufGauge pressure gauge should be installed in the Supply Pipe and close to the panel array. This is the point of maximum pressure in the solar circuit.

Steps for Installation:

- Step 1:** Mark the location of where the TufGauge is to be installed.
- Step 2:** Using a pre-blunted 8.5mm drill bit, carefully drill a hole on the marked location.
- Step 3:** Clean any swarf or burrs from the newly drilled hole.
- Step 4:** Insert the grommet, without using a lubricant.
- Step 5:** Lubricate the barb and carefully push into the grommet.



Pressure Testing / Setting

With the solar system operating and stabilised for a few minutes, refer to the mounted TufGauge pressure gauge to determine the systems pressure. The Gauge should operate within the recommended pressure range outlined on the dial. If the gauge is reading zero, adjust a ball valve on the return line to obtain a small positive pressure reading.

**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

Appendix 13: How to Install the Drain Tube

A Drain Tube will assist the Panels to slowly drain from the supply pipe back to the pool automatically via the return pipe when the pump is switched off.

Before beginning, please ensure you have:

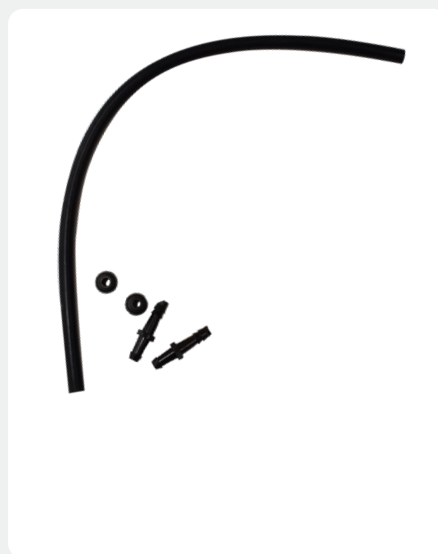
Requires:

- Two (2) Grommets
- Two (2) Header Barbs
- One (1) 150mm (approx.) length of tube

To install the drain tube:

- Step 1:** Mark the location of Drain Tube. The Drain Tube should be installed between the supply and return pipes approximately one metre above pump level.
- Step 2:** Using a blunted 8.5mm drill bit, drill a hole in the PVC supply and return pipes in the appropriate position and orientation.
- Step 3:** Ensure the drilled wad, swarf and burrs are removed to prevent them from entering the system.
- Step 4:** Insert the rubber grommets without the use of lubricant into the holes tapered end first.
- Step 5:** Insert the barbs into the rubber grommets.
- Step 6:** Slide the two Collars over the collector tube with the lips towards the cut ends.
- Step 7:** Push the collector tube onto the barbs.
- Step 8:** Slide and lock the collars over the tube and barbs.

Please note: Dipping the components in soapy water can make this process easier



Appendix 14: How to Install the TufFilta®

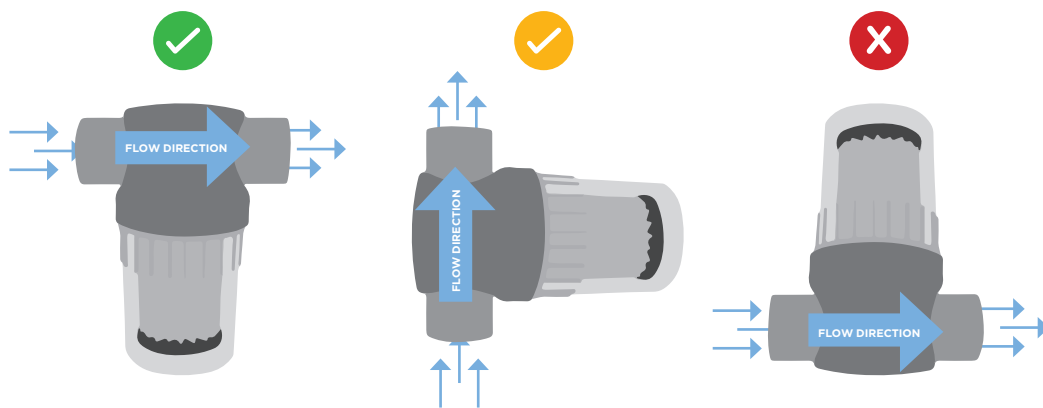
For systems that employ a separate solar pump, independent of the pool filter circuit, it is highly recommended that a TufFilta® is installed on the discharge side of the solar pump.

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 it 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.

Appendix 15: Operating and Check out Procedures

The system should now be fully installed. Before switching the system on, perform a final visual inspection of the entire system. Confirm that:

- The fittings and fixtures are primed and cemented properly.
- All valves are installed correctly and in the right positions.
- The system is properly secured to the roof in a manner that will still allow for thermal expansion and contraction of all components in the linear and lateral directions.
- Screws and bolts are secure, and penetrations sealed.
- Roof Mounts installed and bolted correctly.
- All pipework has been properly secured and supported.
- No part of the panel is rubbing against the roof surface or any obstacle. If it is, it may cause damage to the roof and/or panels.
- The system is configured to drain automatically, or manual drain valves have been installed.
- The Automatic Controller (if installed) has been programmed and is operating correctly.
- The system is secure, neatly finished, and free from defects.

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



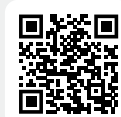
**SCAN
ME!**

Appendix 16: Pressure Testing the System

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 hand over. To pressure test the system:

- Step 1:** Allow 24 hours for all PVC Cements/adhesives to set prior to commissioning the system. This time can be used to clean the job site.
- Step 2:** Prime the pump by filling the lint pot with water, once filled start the pump via the manual mode on the Digital Controller.
- Step 3:** 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.
- Step 4:** After a minute or two, inspect the pools return outlet. If bubbles continue to flow endlessly, it may be an indication that air is entering the system via the VacRel®. See Appendix 17 – Air Bubbles
- Step 5:** Once the bubbles reliably stop, check the TufGauge® Pressure Gauge is reading between 50 and 100 kPa (7.25 and 14.5 PSI).
- Step 6:** Check the system and panels for leaks while the system is operating. The suggested method is to inspect the roof surface for water running towards the gutters. By following the water path up the roof, you will generally locate the source of the leak. Rectify the leak and re-test as necessary.
- Step 7:** Once you are satisfied that the system is running properly, switch it off and listen to the VacRel®. Air should be entering the system through the VacRel® and water should be draining back to the pool.

**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendix 17: Troubleshooting

Air Bubbles are appearing in the pool returns when the system is running

Cause:

Air bubbles are a result of air entering the system. This could be caused by air entering through the pump or through the vacuum relief valve, you can find out what the cause is by:

- **Listening to the pump**

If the pump is making a lot of noise, then it is likely that air is being sucked into the system through an air leak on the supply (suction) side of the pump. This makes the pump inefficient and therefore it will make more noise as a result.

- **Listening to the VacRel (Vacuum Relief Valve)**

With the pump and system operating and stable, inspect the VacRel by listening for any potential sound of air being sucked into the VacRel. The VacRel should be quiet and if it isn't, it is most likely due to negative pressure within the array therefore allowing air to be drawn through the VacRel. The negative pressure within the array will generally be caused by the pool water falling faster from the roof (return) compared to the water being pumped up to the roof (supply).

Solution - When air is entering through:

The Pump	The Vacuum Relief Valve
Check that the pumps filter basket lid is on tight. If the lid is on tight, but you still suspect air is entering through this point, remove, clean, lubricate or replace the O ring on filter basket as needed.	With the pump off and being careful not to lose any of the components, remove and clean the VacRel as needed. *Note: Vacrel components can be reconditioned or re-placed using the Boss Universal Reconditioning Kit (Part No. 045_0291).
If the pump has a clear lid, look inside and see if air bubbles appear. If they are present, use a garden hose to run water over the pumps lid and joints and look to see if the bubbles stop. If they stop, locate and fix the leak.	If the solar system is plumbed off the filtration system, clean the pool filter and backwash to reduce pressure.
If the pump does not have a clear lid, listen to the pump noise for a smoother operating sound, locate and repair any leaks.	Check the filter cartridge in the TufFilta.
If the pool is using a suction type pool cleaner, try removing it to see if the air bubbles clear up. If they do, only use the cleaner while the system is turned "OFF".	Fit a ball valve to the return pipe and slightly adjust the valve to apply a low positive water pressure within the system, remove the handle if possible, to avoid tampering.

When running my hand over the panels, some areas are hot to touch

Cause:

While conducting the final commissioning of the system you noted that a section of the collector panels appears noticeably hotter to touch compared to other sections of the panel. While it is normal for the top of the panels to be slightly warmer than the bottom, no part of the panel(s) should be hot. Hot spots indicate that there is no/low water flow through this part of the panel. This can be due to two factors, issues with the pump or improper installation, you can find out what the cause is by:

- **Checking your calculations**

Go back and check that you have calculated and selected the right sized pump for your installation. If you have not, then this is likely to be the problem.

- **If your calculations are correct**

Then your issue is most likely going to be due to improper installation.

Solution - When the issue has been identified as:

The Pump	Improper installation
Be sure that the filter is clean and backwash to reduce pressure.	If the system is a single row array with adequate flow, try increasing the back pressure by fitting a ball valve to the return pipe and slightly adjust the valve to provide additional internal water pressure and even out the flow throughout the panels.
The pump may not be big enough to provide the system with enough water. You can check this by using a flow meter. Increase the pump horsepower as required.	Check that you have not exceeded the maximum allowance of panels for a continuous row. If you have, then change the array to an appropriate double row or single row split feed configuration.
If the pool is using a suction type pool cleaner, try removing it to see if this eliminates the issue. If it does, only use the cleaner while the system is turned "OFF".	If the installed system is a double row or single row split feed system with an adequate flow, try installing a ball valve on the return side of the set of panels that are the coolest, then adjust the ball valve to force the flow through the warmer panels by means of adding backpressure to the cooler panels.

**NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS
POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT
OUR WEBSITE BY SCANNING THE QR CODE.**



**SCAN
ME!**

Appendices

The water coming from the return outlets of the pool is not as warm as it should be

Cause:

Use the back of your hand to feel the temperature of the returning water, if you notice it is not coming back as warm as you may expect for the size of the solar system and the sun's energy being applied to the panels at that time, it may be an indication that water may be flowing too quickly through the system. If water flow is too great, the water may feel not as high as you may expect, however if correctly plumbed etc the solar panels will still be gaining the available solar energy / m².

Solution:

Double check the size of the pump is correctly sized and if it is you may decide to fit a ball valve to the return pipe and slightly adjust the valve to slow the flow through system to bring it within the specified range of 1.8-4.8 L/min per m².

Note: Restricting the flow of a pool pump may increase the energy cost of running the pump.

Double check the system has been installed correctly to provide balanced and even flow across all solar panels.

It is also important to note that the pool water will not significantly increase in temperature during the cooler months or on days that are cold, windy, and/or cloudy, this is compounded if there are consecutive days of these listed conditions. This is normal seasonal operation and is outside the heating capability of a solar system.

There is a slight leak from a seal during pressure testing

Solution:

Mark the position of the leak and switch off the pump. Using a flat tipped screwdriver, carefully remove the barb lock and pull the collector panel strip out of the manifold. Inspect to ensure all rubber seals are in place, undamaged, intact and clean. Replace any damaged seals if required. Once complete, insert the collector back into the manifold and secure using the barb lock.

***Note: Replacement seals are available under Part No. 272_520E.**

NEED SUPPORT ON INSTALLING THE SYSTEM? CALL BOSS POOL HEATING FOR SUPPORT ON 03 9561 2159 OR VISIT OUR WEBSITE BY SCANNING THE QR CODE.



SCAN ME!

Appendix 18: 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 – Plumbing Considerations, Getting Around Obstacles and Automatic Drain Down (Pages 28 - 29). 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.			✓

Appendices

Panel Pressure Drop

Pressure Drop - ICC901 / SRCC100-401.16:

The pressure drop across the collector using a heat transfer fluid prescribed by the manufacturer shall be determined in accordance with Section 2B of ISO 9806.

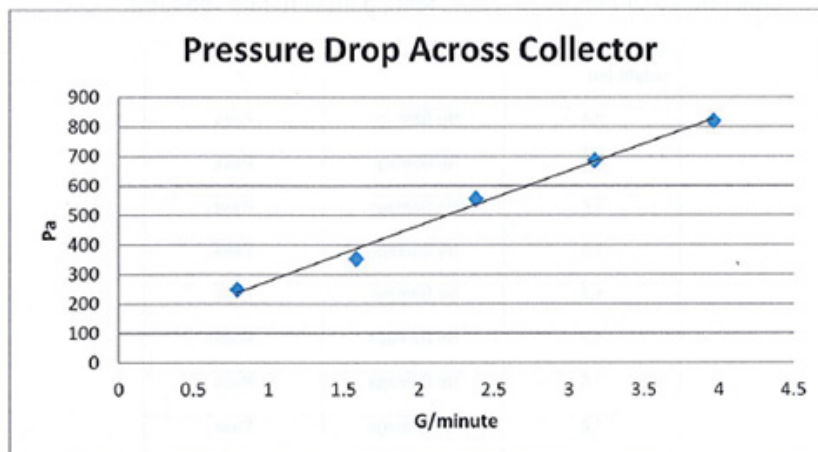
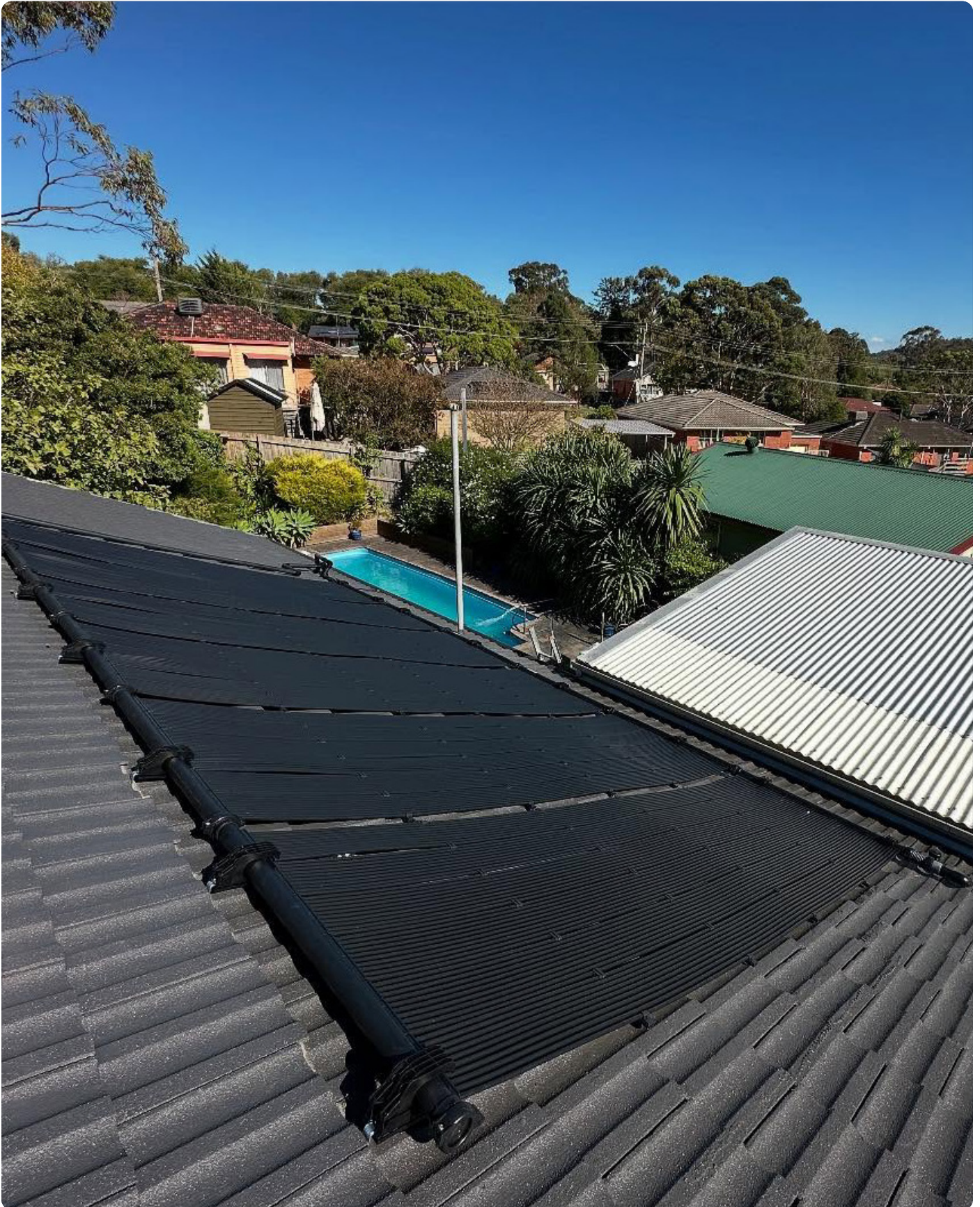


Chart: Pressure Drop Pa vs G/min

Pressure Drop Across Collector				
ml/s	L/min	G/min	Pa	Psi
50	3	0.792516156	250	0.03625
100	6	1.585032312	354	0.05133
150	9	2.377548468	557	0.080765
200	12	3.170064624	687	0.099615
250	15	3.96258078	821	0.119045
Fluid Temperature (deg C)			21.3	
Ambient Temperature (deg C)			25.6	



BOSS™



RHINO
SOLAR PANELS

End of Document



**Australian Made Solar Pool Heating
Proudly Manufactured by:**

BOSS™
POOL HEATING