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Installation Guide

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Primary Parts

System Types

Radiana can be used for the following system types.

- 2 Pipe Ceiling Cooling
- 2 Pipe Ceiling Heating and Cooling
- 2 Pipe Ceiling Cooling with UFH control
- 2 Pipe Ceiling Heating Only
- 4 Pipe Ceiling Heating and Cooling
- 4 Pipe Ceiling Heating and Cooling with UFH control
- 4 Pipe Ceiling Cooling with UFH Control

Primary Components

Energy Source
The Radiana system consists of one or more Energy Sources depending on system type and size (Air Source Heat Pump, Ground Source Heat Pump, Chiller, Boiler).

Pump(s)
The Radiana system will require one main pump for supply to the Radiana Panels. A4 pipe system will require an individual pump for heating and cooling. A subsequent pump will be required to supply each dehumidifier unit.

Mixing Valves
Radiana uses mixing valves with actuators to control the water flow temperature.

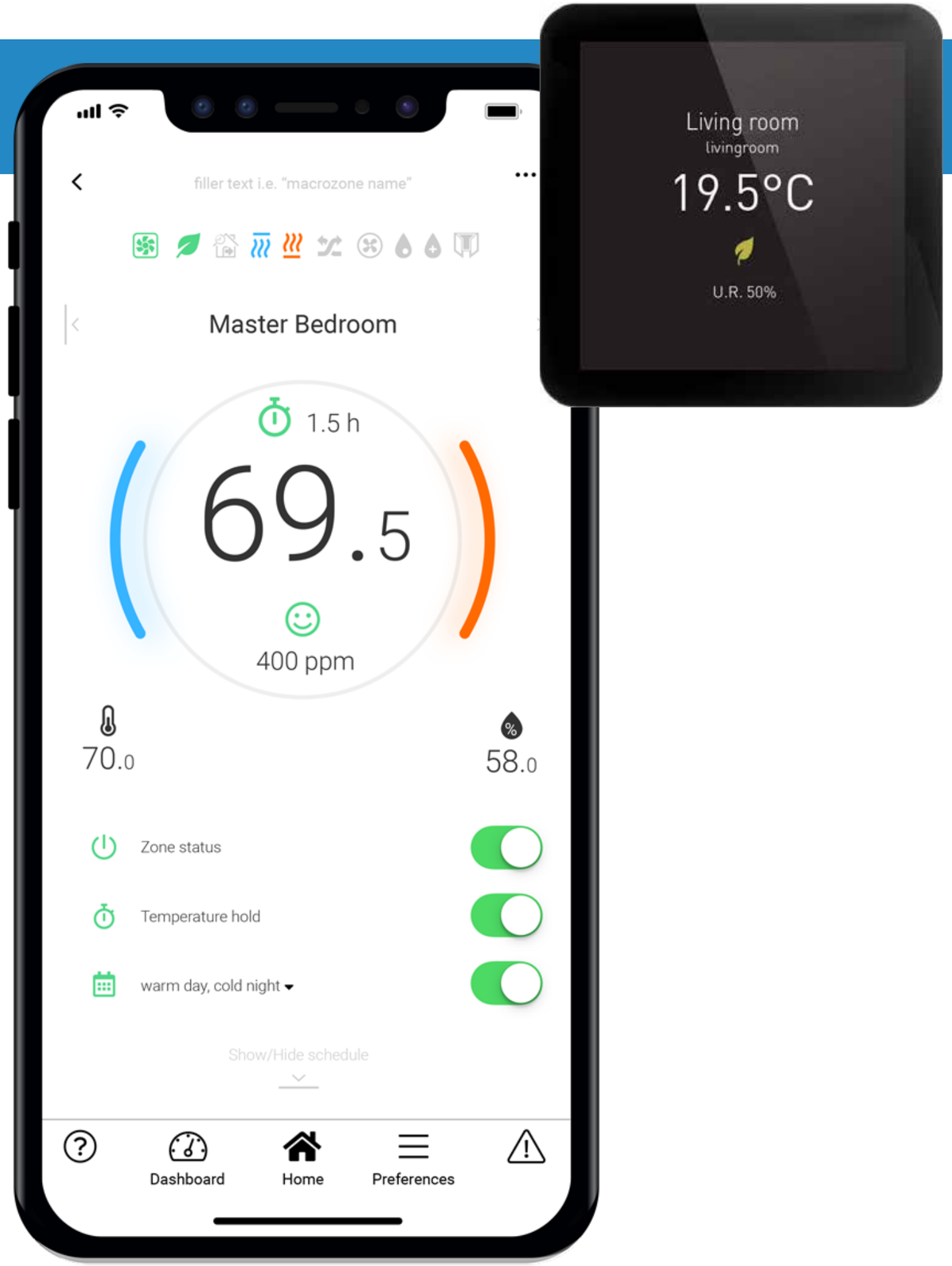
Sensors
The Radiana System uses one external sensor to record outside temperatures and one sensor on the water flow.

Buffer Tank and Expansion Vessel
A Radiana system would normally have a buffer tank and Expansion vessel. A 4 pipe system would have a separate buffer tank and expansion vessel for cooling and heating.

Insulation
All Primary pipework is to be insulated to prevent any condensation.

Manifold Locations
The ceiling manifold should be mounted in a location suitable for artery pipework to run to the ceiling being served. Space for primary pipework running to the buffer vessel should also be taken into consideration. The manifold should also be placed in an area that can be easily accessed for maintenance and servicing of the manifold components and valves and for filling, flushing, and draining of the system water.

Dehumidifier and Ventilation Locations
The dehumidifier or MVHR units should be mounted horizontally above a ceiling or in an accessible service space. Consideration of the need for ductwork from a central location as well as the typical needs of ductwork to outside and to each room will be required for sufficient dehumidification of the property. Each ventilation device will also require independent flow and return pipework from the buffer tanks or main energy source and a drain for condensate water.



Radiana controls include these components

Smart Base
This is the main wiring centre for the control system. One Smart Base should be located at each manifold.

Smart Air
This wring centre looks after the ventilation system. We recommend this is located next to the primary smart base.

Smart Display
This is the master Display and there will be one display per Radiana system. This should be located where it can be easily accessed for occupier control of the system.

External Sensor and Flow Sensor
The external temperature sensor should be located outside in an area that will not be within direct sun light. The water flow sensor should be located on the flow pipework feeding the ceiling, after the mixing valve.

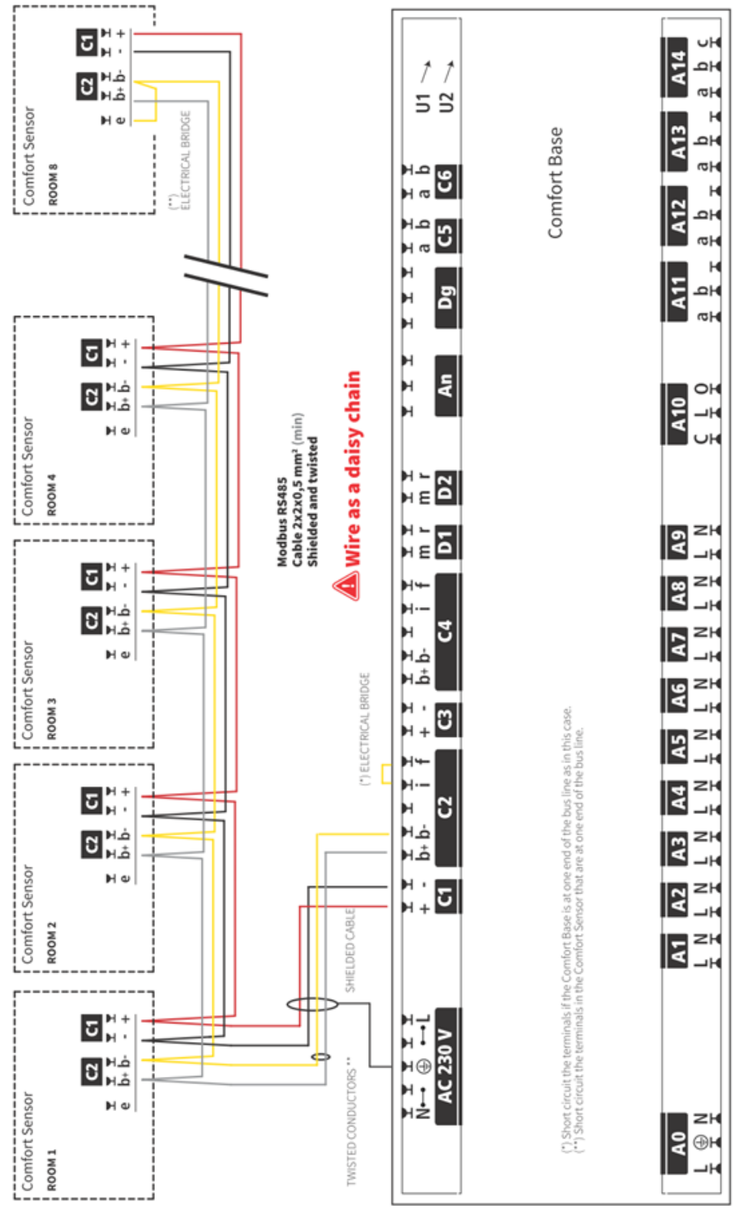
Ventilation Display
This display is directly from the Ventilation unit (if being used). This should be located where it can be easily accessed for occupier control of the system ventilation. If it is not being used the display can be left within the electrical housing of the ventilation unit for service/maintenance purposes only.

Room Sensors or Thermostats

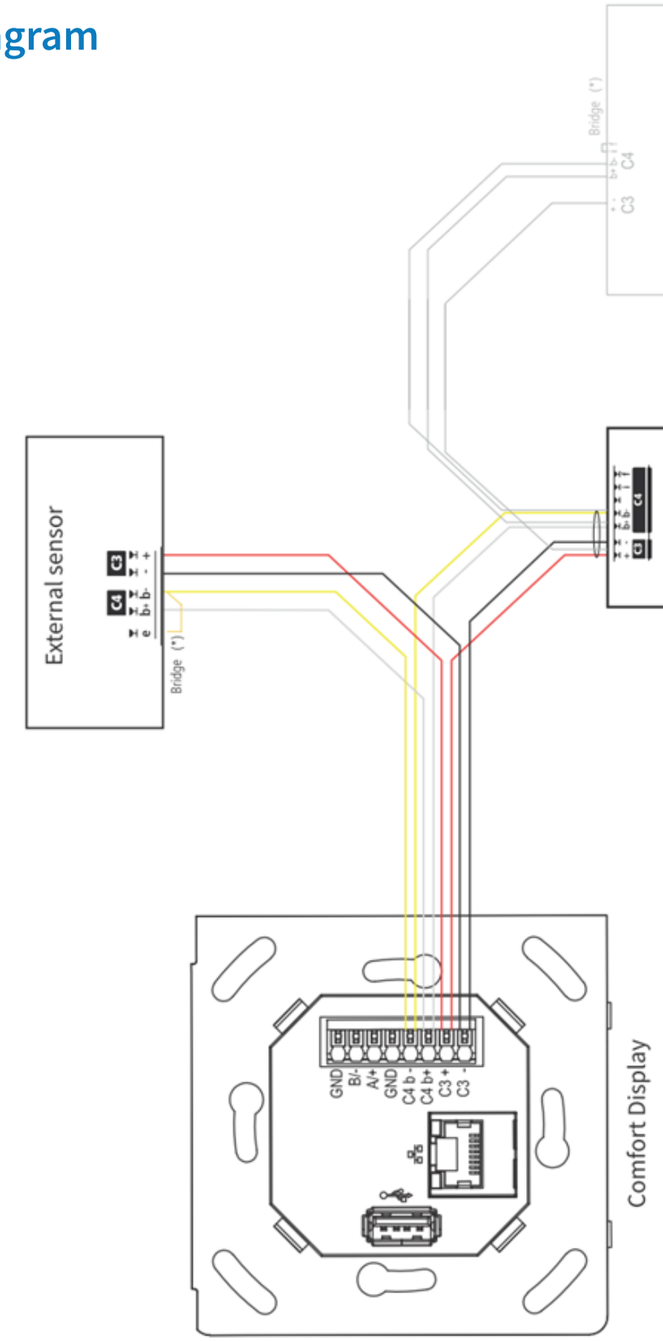
Each controlled zone will have one room sensor (temperature and humidity) or room Thermostat. For areas that require heating only we also have a heating only room sensor (temperature only). These should be located in the zone to be controlled and recommended at a hight of 1.2 to 1.5 meters from floor level, out of direct sunlight and not on an external wall.

Wiring Specification	
Primary Comfort Base	230v power supply
	Bus and power cable for sensors assigned to the base, (Belden 9402)
	Bus (and power cable) for controller, external sensor, and other bases, (Belden 9402)
	Bus cable for ventilation unit, (Belden 9841)
	Water flow sensor, (Belden 8761)
	2 core cabling for voltage to valves, dehumidifier, pump and energy sources
Secondary Comfort Bases	230v power supply
	Bus and power cable for sensors assigned to that base, (Belden 9402)
	Bus cable to other bases, (Belden 9402)
	2 core cabling for voltage to valves
Smart Comfort Display	Bus and power cable, (Belden 9402). Daisy chained with bases and external sensor bus (Must be on an intermediate position on daisy chain run)
External Sensor	Bus and power cable, (Belden 9402). Daisy chained with bases and smart comfort display bus.
Comfort Sensor TandH	Bus and power cable, (Belden 9402). Daisy chained from assigned comfort base
SEE RADIANA SMART INSTALLATION MANUAL FOR FURTHER WIRING INFORMATION AND OPERATION	

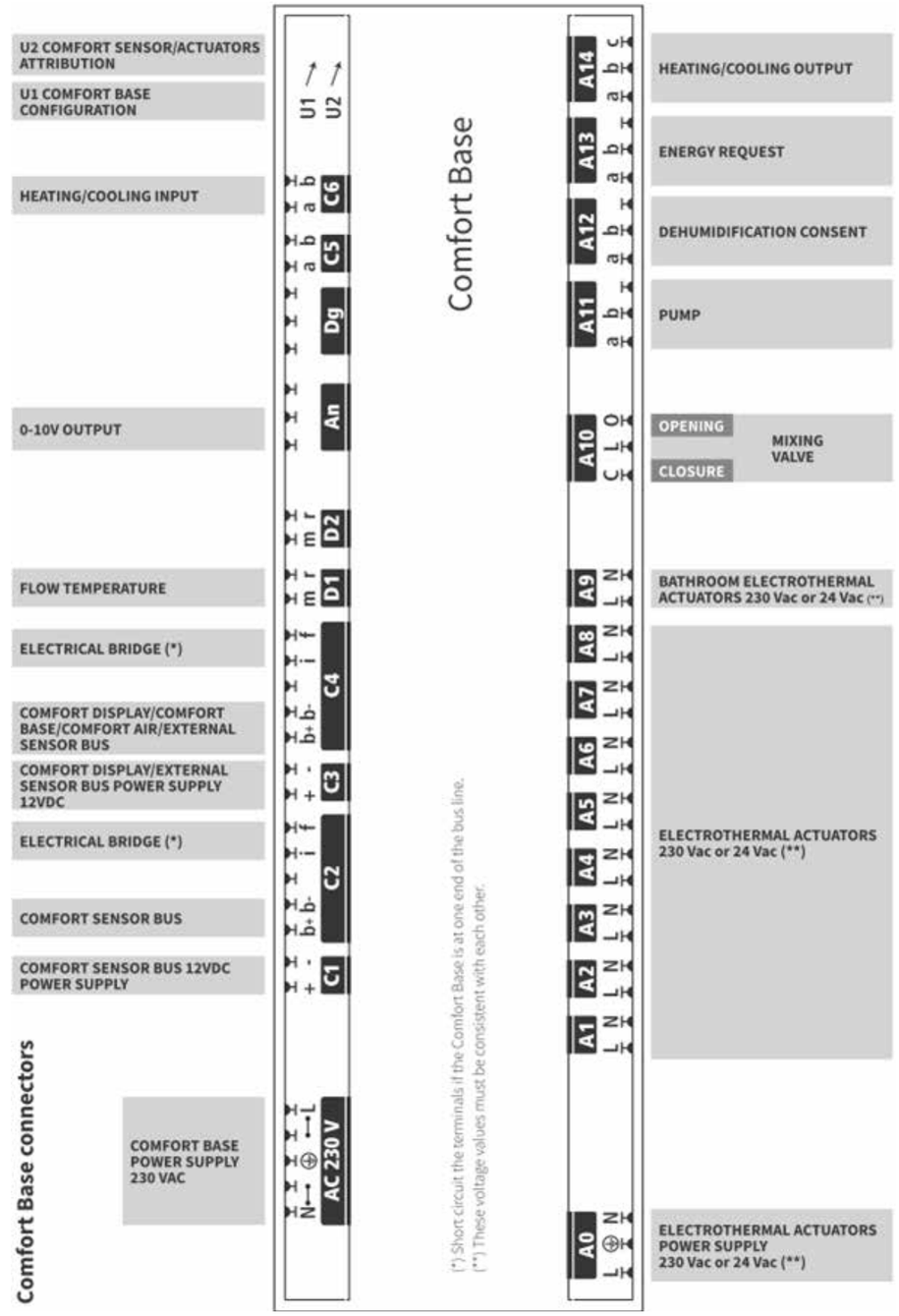
Wiring Diagram



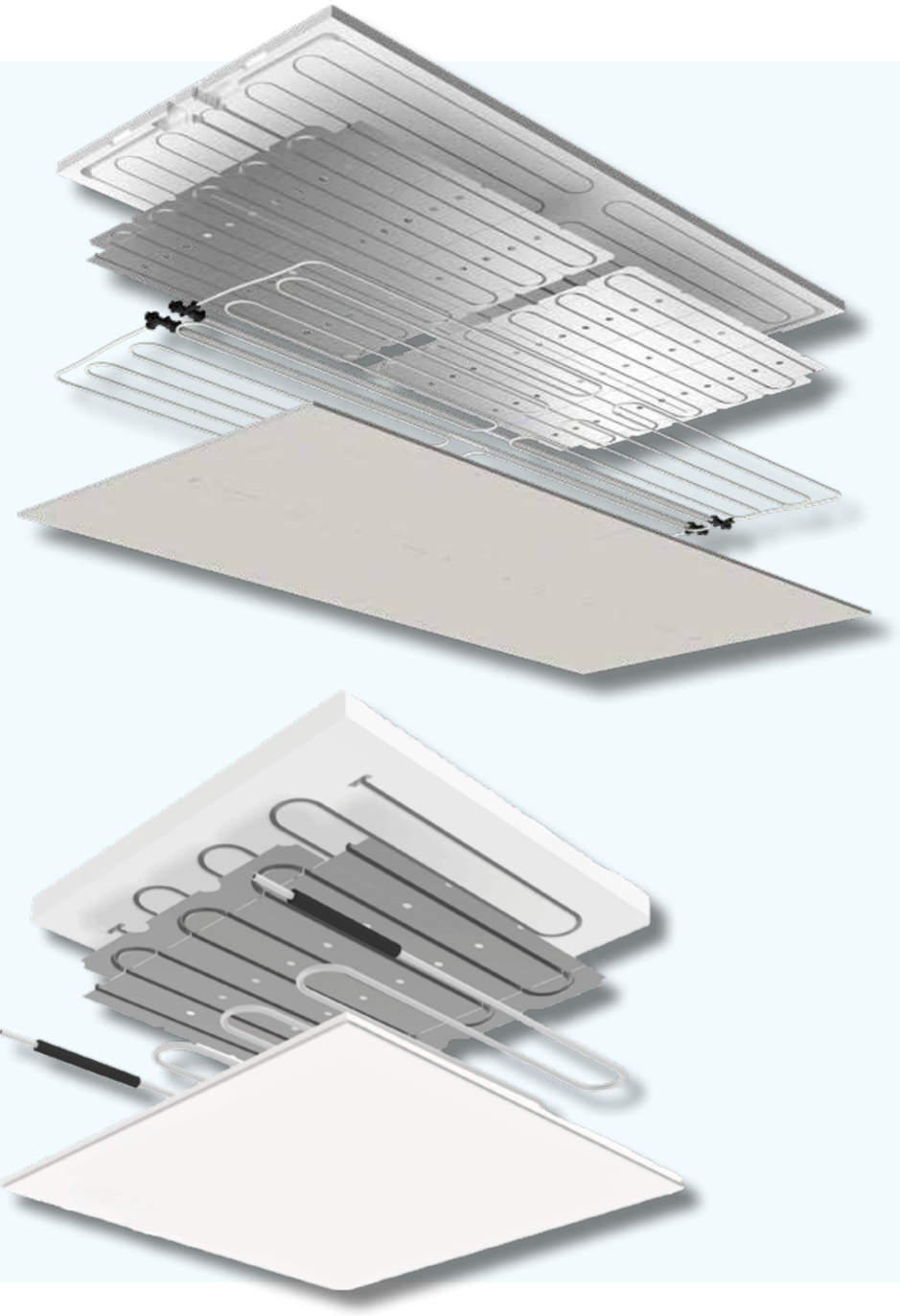
Wiring Diagram



Wiring Diagram



Panel and Tile Installation



Metal Frame Ceiling Requirements

Attention to the construction of the MF ceiling frame and spacing of the Ceiling section or 'top hat', especially where active panels may need to be specially positioned for lighting and other ceiling fixtures and penetrations. The MF5 (Top hat) needs to be fixed to the MF7 with screws opposed to spring clips. The frame should be capable of supporting a minimum of 13kg per square meter. This is without allowing for any lighting or fixtures that also require structural support from the ceiling grid.
Each panel should have a ceiling section or top hat every 400mm perpendicular to the direction of panel pipework. Where ceiling panels are not adjacent or butt joined, planning of the ceiling panel positioning will be required before final positioning of the ceiling section or top hat. This is needed to ensure each end of the ceiling panel has the required ceiling section or top hat support, especially where non-active areas between panels is not 400mm. Panel positioning and the allowance of space to connect the artery pipework between panels and back to the manifold should also be taken into consideration. Artery pipework running above the ceiling grid should be fixed using pipe clips or other suitable fixing to the structural slab.

Timber Frame Ceiling Requirements – Radiana recommends the use of MF grid ONLY

Positioning of the timber frame for the mounting of active panels should be in accordance with lighting layouts and active panel positions. The timber frame should be capable of supporting a minimum of 13kg per square meter. This is without allowing for any lighting or fixtures that also require structural support from the ceiling grid.
Each panel should have a timber fixing point every 400mm perpendicular to the direction of panel pipework. Where ceiling panels are not adjacent or butt joined, planning of the ceiling panel positioning will be required before final positioning of the timber frame or additional timber frame work to ensure the ends of the active panels are supported.

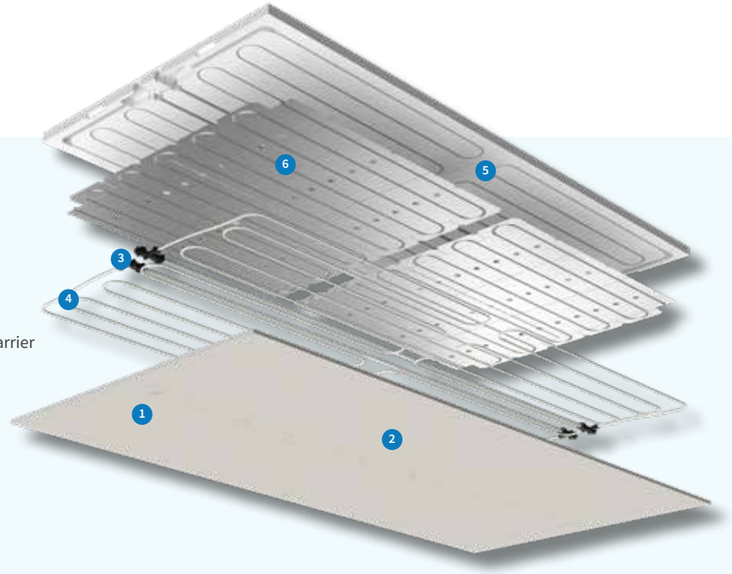
Panel positioning and the allowance of space to connect the artery pipework between panels and back to the manifold should also be taken into consideration. Where artery pipework is to be routed through a timber joist or frame holes through the frame should be made in accordance to building regulations. We recommend a minimum hole of 35mm is made for each insulated artery pipe. Artery pipework running parallel to the joist or timber work should be fixed using pipe clips or other suitable fixing to the structural slab or joist side.

600mm Square Ceiling Grid Requirements

Ceiling grid positioning should be set out in the typical method and in accordance to lighting and ceiling penetrations layout. The ceiling grid should be capable of supporting a minimum of 3.5kg per ceiling tile or 10kg per square meter. This is without allowing for any lighting or fixtures that also require structural support from the ceiling grid.

Active ceiling tiles are to be kept in whole 600mm square sizes and any cut tiles or tiles requiring penetrations should be carried out with non-active tiles.
Artery pipework running above the ceiling grid should be fixed using pipe clips or other suitable fixing to the structural slab.

Fixing, Staggering and Connecting
Radiana Ceiling **Panel**



1. Standard 12.5mm plasterboard face
2. All pipes laser etched on the face
3. Push fit connections with 10 year guarantee
4. 8mm Dowlex PERT radiant tubing with EVOH oxygen barrier
5. 37.5mm EPS board ASTM E84
6. 0.3mm gauge aluminium heat tranfer plates

The installer should start with the panel that is furthest from the manifold or end of the planned artery pipework route. Each panel comes with two artery pipe end plugs and two artery pipe joining sleeves. Place the artery pipework end plugs in the end of the panel to stop the end of the artery pipework run and the straight through sleeves in the end towards the manifold.

Artery Pipe End Cap – Installed

Artery Pipe Straight Through Sleeves - Installed

Once the panel is prepared the installer can lift the panel in to place on the ceiling grid/frame and fix using a minimum drywall screw size of 4.5mm x 75mm and should be evenly spaced across the width of the panel in the ceiling grid/frame.

1

Lifting and Positioning

Modular panels make lifting and positioning with a plasterboard lifter safe and simple.

2

Hanging the Panels

No additional structure required – panels are installed on a standard metal frame or timber joist ceiling.

3

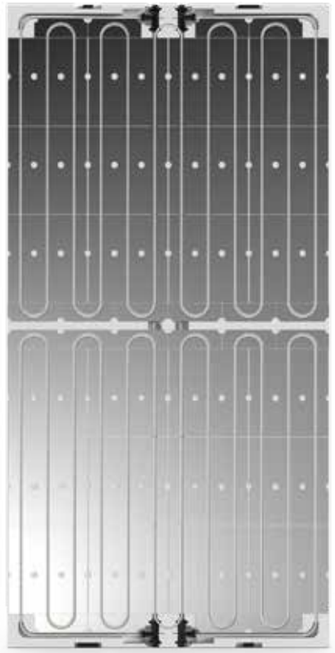
Connecting Panels

Radiana's patented 3 o-ring push fit connector is already installed in the panel make the joining of panels seamless and risk free.

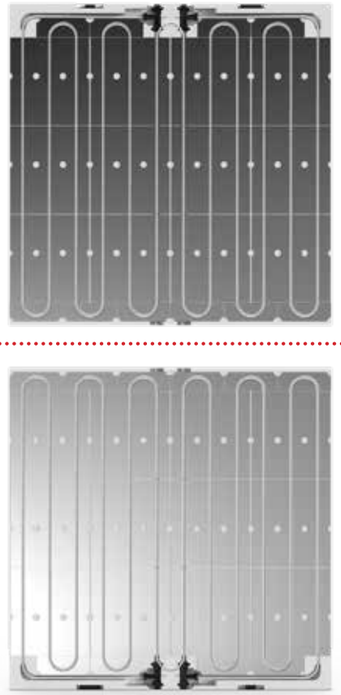
4

Fastening Panels

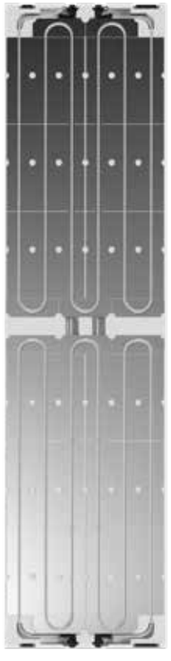
Panels are anchored to the frame using standard 100mm drywall screws. The pipes are laser etched on the panel so that it is clear where to insert the fixings.



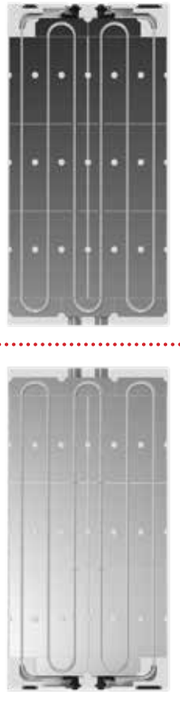
Full Panel



Full Panel cut in half



Slim Panel



Slim Panel cut in half

Screws Required For Each Panel

- Full size panel – 1.2 x 2.4m – 35no. drywall screws
- Half size panel – 1.2 x 1.2m – 20no. drywall screws
- Slim size panel – 0.6 x 2.4m – 21no. drywall screws
- Half size slim panel – 0.6 x 1.2m – 12no. drywall screws

Each panel is designed to be suitable for a butt fit with the previous panel using the straight through sleeves between panels. The next panel can be prepared in a similar way with just the joining sleeves in one end. This panel can then be lifted in to place, butt joined on to the first panel using the joining sleeves already in place and fixed using a minimum drywall screw size of 4.5mm x 75mm and should be evenly spaced across the width of the panel in the ceiling grid/frame. See quantity of screws required above.

Panel placement on the ceiling should be in accordance with lighting and ceiling penetration layout and panel joints staggered by a minimum of 400mm across the ceiling.

Slim panels are delivered in pairs as a whole panel size. These can be cut down the middle to separate in to two without cutting or affecting the pipe layout. Half and Half slim panels are cut from the full size and slim size panels along the marked cut line, cutting the artery pipework on the same line.

Full size and slim size panels are pre-installed with female fittings at each end into which an end plug, joining sleeve or 16mm pipe can be inserted to. Half and half slim panels will have female fittings at one end and a bear pipe the other end where the cut has been made. The pipe will need to be fitted with a 16mm end cap or a fitting to extend the pipework on to the next panel or back to the manifold.

Once all the panels are fixed in place and are connected to neighbouring panels, have end plugs and any half panels have the appropriate fittings on the pipe end of panel, then the artery pipework can be installed to join up a maximum of 8 full panels (or the equivalent to 23.04 square meters of active panels) to one artery pipe pair and extended to the manifold. Where zones include more than 8 panels or an area of more than 23.04 square meters extra artery pipework pairs and ports on the manifold will be needed.

Once all panels are installed, 16mm pre insulated artery pipework is connected back to the manifold.

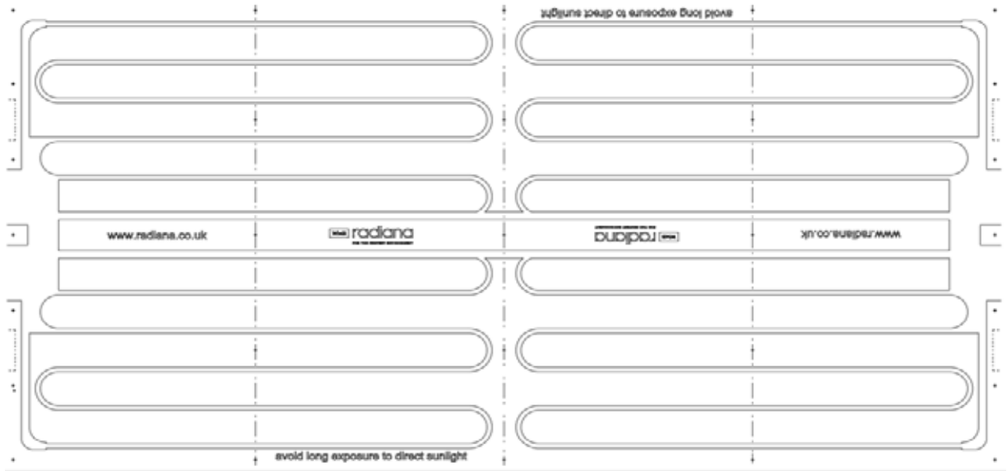
All active ceiling panel pipework should be pressure tested to 4 bar before installing non-active panels or filing the system in with plasterboard. This should be left for 30 minutes to ensure there are no leaks. The system should remain under pressure whilst installing the non-active panels and making any penetrations or fixing points for ceiling mounted fixtures and fittings. See Ceiling Fixtures and Penetrations later in this manual for further detail.

Non-active Panel Requirement

Non-active gypsum panels are not supplied by Radiana. Once all active panels are installed the remaining ceiling area can be filled in with 38mmmm EPS insulation backed 12.5mm plasterboard to complete the ceiling surface.

Ceiling Fixtures and Penetrations

All standard gypsum Radiana panels come pre-marked with pipe layout, fixing points and cut lines on the gypsum board surface. These should be used to locate where penetrations and fixings can be made to prevent and avoid damaging the pipework in the panel. The maximum penetration diameter of 70mm is recommended. If larger penetrations are needed a sufficiently sized space should be left between panels to provide a non-active area for the large penetration.



Penetrations and fixings can be made with HSS drill bit or HSS/Bi-Metal hole saw cutter. The panel consists of a gypsum board, aluminium spreader plate and EPS insulation a total panel thickness of 50mm.

Ceiling Finish

Once all ceiling penetrations and fixings have been made the ceiling can be plastered and decorated in the normal way.

PLEASE NOTE: ATTENTION SHOULD BE GIVEN TO THE JOINTING METHOD TO AVOID CRACKING.
See below important steps:

Plaster Skimming*

Key Stages

Boards should be secured with a screw in every marked fixing location per radiant panel

- Boards should not be stepped
- All joints should receive jointing compound as per manufacturers guidance
    - Joints should be taped with paper tape
    - If scrim [mesh tape] is preferred, jointing compound must be applied to secure joint prior to skimming (omitting joint compound will result in cracking)
- Care should be taken to prevent excessive build-up of the ceiling with plaster (we recommend 2mm). The greater the thickness of plaster the less effective the radiant ceiling panels will be.

Drylining*

Key Stages

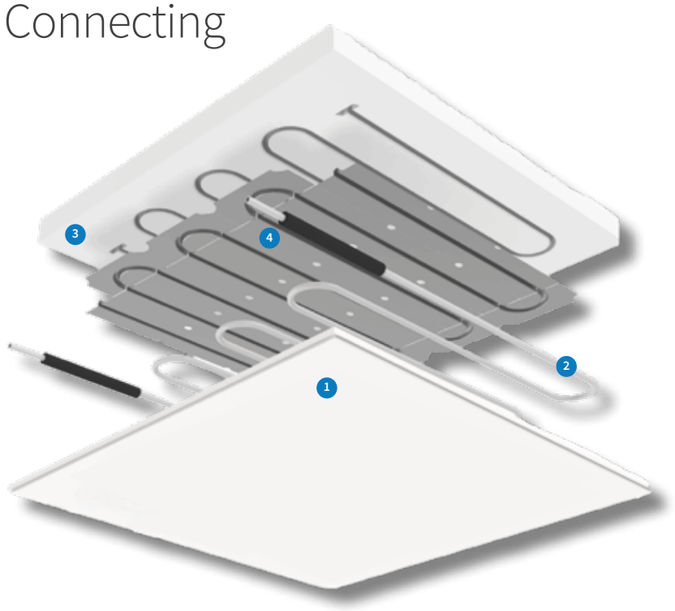
- Boards should be secured with a screw in every marked fixing location per radiant panel
- Boards should not be stepped
- Joints should not be rushed, and care taken to ensure jointing compound is well applied to all joints
- Care should be taken to prevent excessive build-up of the ceiling with plaster (we recommend 2mm).
- The greater the thickness of plaster the less effective the radiant ceiling panels will be.

* please refer to product manufacturers guidance for full instructions.
Ref: https://www.british-gypsum.com/literature/site-book-and-good-practice-guide
SITE BOOK – Full Publication, Page 426

Painting

We recommend using a moisture resistant paint for any Bathroom, WC's, Utility and Kitchen areas that have Radiana panels.

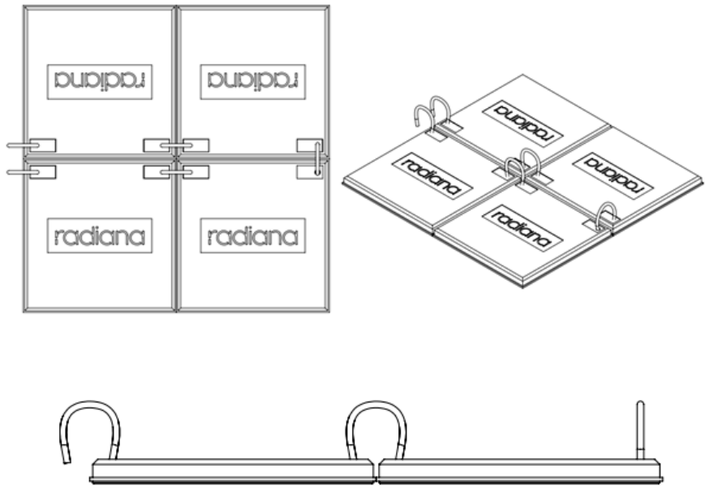
Fixing, Staggering and Connecting Radiana Ceiling **Tiles**

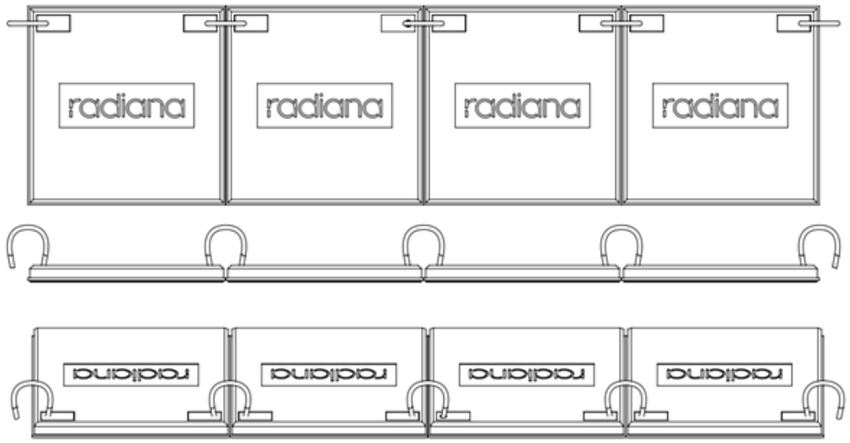


1. Gypsum tile
2. 8mm PERT radiant tubing with EVOH Oxygen barrier
3. EPS insulation
4. 0.5mm gauge aluminium heat transfer plate

The installer should start by planning the ceiling grid position, lighting layout and grill/ceiling penetration layout in the normal way for a ceiling grid. The installer should then begin by fitting the active ceiling panels furthest from the manifold, or end of the artery pipework run. 600mm square active tiles can be connected to each other in series. The tiles are connected to each other with the 8mm pipe from the tile and an 8mm John Guest elbow fitting. All 8mm tail pipework, 8mm elbow fittings and 3-way connectors must be fully insulated to prevent any condensation. No more than 4 active tiles can be connected in series.

Groups of ceiling tiles are then connected to the artery pipework. The artery pipework should be fixed to the structural ceiling slab and extended to a connection on the manifold. No more than 16 groups of 4 tiles can be connected to each artery pipework pair. Where there are more than 16 groups of 4 tiles extra artery pipework pairs an extra port on the manifold will be needed.





Once all tiles are installed, artery pipework is connected back to the manifold using 16mm pre insulated pipe and Radiana pull fittings. Pipework connected to the manifold and all active ceiling tiles pipework should be pressure tested to 4 bar before installing non-active tiles, lights or any other ceiling fixtures and penetrations. This should be left for 30 minutes to ensure there are no leaks.

Non-active Panel Requirement

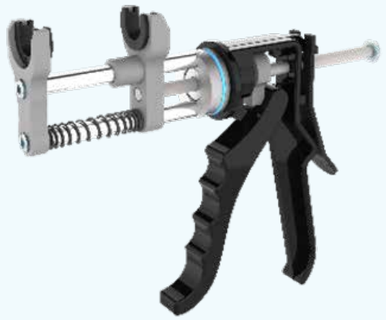
Non-active suspended ceiling tiles can be supplied by Radiana to provide a consistency of tile design and type for the rest of the ceiling area.

Ceiling fixtures and penetrations

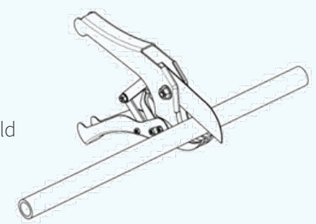
For the 600mm suspended ceiling tiles, there should be no ceiling fixtures or penetrations in active panels. Where there are penetrations or fixtures required to the ceiling a non-active ceiling tile should be used.

Pull Fittings

Radiana supplies their unique 16mm Pull Fittings with all jobs. These fittings are used to connect the 16mm pre insulated pipe from the panels to the manifold. You will need the Radiana Pull fitting Tool and expander to install these parts (supplied with most orders).



To install the fittings:

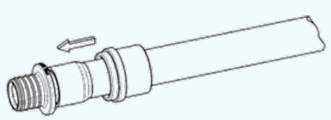


Cutting

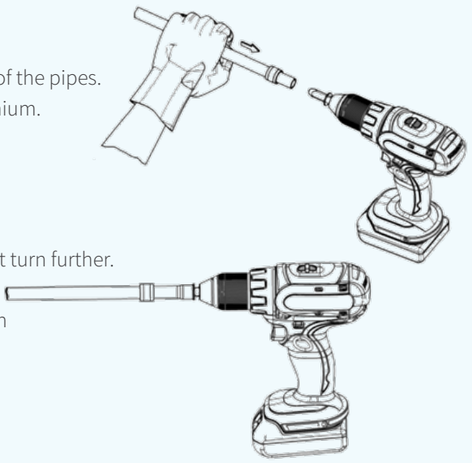
1. Cut the pipe square and without burrs.
2. The pipe needs to be free of any dust, dirt, debris, oils and contaminants as this could affect the pipe during cutting and expansion.

Pressure Sleeve positioning

1. Ensure the direction of sleeves with ribs.
2. Push the pressure sleeve onto the pipe.

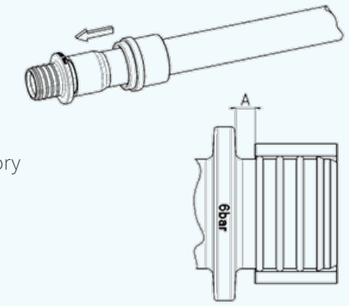


Expansion Procedure with expander adapter



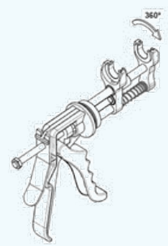
1. Use the expander adapter with an electrical drill/screwdriver.
2. Expanders need to be suitable with type, dimension, and wall thickness of the pipes.
3. Expanders can be used with PEX, PERT and multilayer pipes, with aluminium.
4. Put the expander adapter on the drill head and fix in.
5. Put the drill on a suitable speed.
6. Hold the pipe ready with sleeves and the drill.
7. Push drill start button and slowly push into the pipe.
8. When the pipe touched the expander flange expansion is finished. Do not turn further.
9. Pull out the expander from the pipe.
10. After the expansion process the expander could be hot, do not touch with unprotected hands.

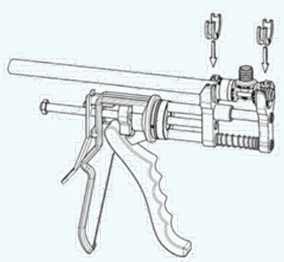
After Expansion



1. Quickly insert the required fitting into the expanded pipe (as far as the end collar).
2. When the pipe has been correctly expanded the fitting can be pushed into the expanded pipe easily.
3. All ribs must be covered by the pipe.
4. After a short time, the fitting is held firmly on the pipe, as the pipe contracts (Memory effect).

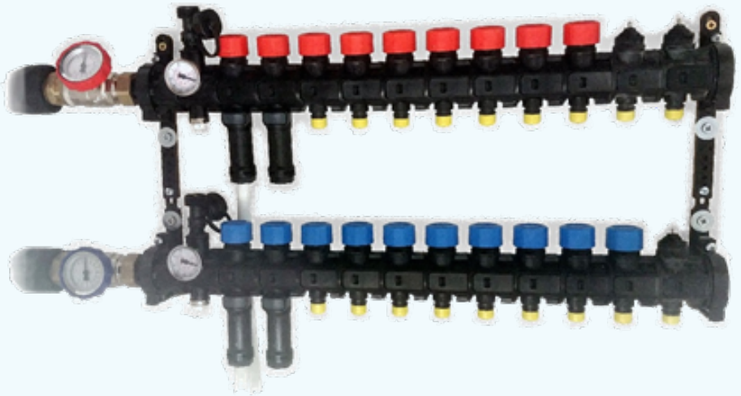
Advanced clamping tool procedure





1. Advanced piston tool for clamping.
2. One hand installation and reduced force for installation.
3. Basic fixed jaws are for 20mm pipes.
4. Insert the 16mm removable adapters.
5. Insert the pressure sleeve joint into the clamping tool.
6. Use the trigger on the tool to push the pressure sleeve fully onto the fitting collar.
7. When the pressure sleeve touches the fittings flange, the assembly process is finished.

Manifold



Radiana Composite Manifold with quick connectors

The ceiling manifold should be mounted in a location suitable for artery pipework to run to the ceiling being served. Space for primary pipework running to the buffer vessel should also be taken into consideration.

Each manifold should have a pair of isolation ball valves connecting to the primary pipework and a pair of push fit quick connectors for each pair of artery pipework runs. The manifold also contains manual air vents and fill/drain points. The manifold should also be placed in an area that can be easily accessed for maintenance and servicing of the manifold components and valves and for filling, flushing and draining of the system water.

Each flow port on the manifold will have an actuator connected. These will need to be wired back to the controller that is controlling the manifold.

Ventilation

For your Radiana superior comfort a dehumidifier will be sized and specified for the property size and supplied according to MVHR (Mechanical Ventilation Heat Recovery) needs. Also, in relation to property and client needs either a standalone dehumidifier or a MVHR with Dehumidification unit should be selected accordingly.

The Radiana dehumidifier location requires attention to ensure ductwork and pipework runs are possible. Some ductwork up to 300mm diameter may be required depending on dehumidifier size and building requirements. **Access to the underside of the ventilation unit is also required for servicing and filter cleaning.**

Once a suitable location is confirmed the unit will need to be mounted, secured to the ceiling slab or structural support from above the unit. We recommend using Uni-Strut and M10 channel bolts and studding to mount accordingly.

Ductwork from the ventilation unit to supply/return manifold plenum locations should be installed and secured to the structural ceiling slab or walls. Secondary duct work from the manifold plenum locations to ceiling/wall terminations in associated rooms should also be installed and fixed accordingly. Supply ducting should be evenly distributed throughout living and bedroom areas. Extract or return ducting should be evenly distributed throughout bathrooms, WC and kitchen areas where smells and air extraction is required.

Manifold plenums and grill plenums can then be installed and secured to structural slab, connecting all primary and secondary duct work accordingly. Care should be taken to prevent crossing of pipework which may result in unbalanced air supply and extract of smells being incorrect or insufficient.

Where a MVHR and dehumidifier unit is being used ductwork to external penetrations for fresh air and exhaust are required. These should be terminated with enough distance to prevent air short circuiting from exhaust to fresh air which would result in exhaust smells being supplied back into the building. Finally, the MVHR with dehumidifier unit includes a clean recirculation duct. This should be ducted to a clean central/circulation area. This is to manage the humidity levels without MVHR if required.

Flow and return pipework from the buffer tank to the ventilation unit is also required and should be connected to the ½” thread connections in the unit through the designated access panel.

Condensation drain(s) are required for all our dehumidifier units. The MVHR Dehumidifiers have two condensation connections. All condensation drains should fall towards foul waste drainage and should be trapped to prevent smell from wastewater/foul.

The ventilation unit requires a 13amp 230v power supply. For full Radiana Climate Control a RS485 single pair plus screen connection to the control box. This ensures the Radiana M Control system can provide full control of humidity and ventilation throughout your property providing the superior comfort that Radiana can deliver.

Filling and Flushing

1. Close both flow and return bar manifold ball valves.
2. Unscrew protective ‘dust cap’ on manifold flow and return bar fill/drain points (located on underside and far end of each bar).
3. Connect hose from fresh/clean water supply to manifold flow bar fill/drain point (using ¾ “ Female BSP hose fitting and jubilee clip).
4. Connect another hose (can be short hose and bucket) to manifold return bar fill/drain point.
5. Open both fill/drain points (by turning in anti-clockwise direction) the ‘square peg’ on the base of fill/drain point, with integrated key on the reverse of the ‘dust cap’.
6. Close all manifold valves (loops) on manifold flow bar by turning in clockwise direction the glass flow meters, (until they can be turned no further).
7. Close all manifold valves (loops) on manifold return bar (actuator head side) by turning in clockwise direction the (blue) protective caps (until they can be turned no further). (N.B. if (blue) plastic protective caps have been removed from the manifold return bar, actuator heads can be used to close loops as they are N/C – please be sure that these are fitted/seated firmly and correctly).
8. Open single loop furthest from ball valves (by reversing operation of steps 6 and 7).
9. Commence delivery of fresh clean water (via hose connected to manifold flow bar fill/drain point).
10. When constant (air free) flow of water from return bar fill/drain point has been achieved…
11. Close single actuator side manifold valve/loop that is being flushed (by repeating step 7).
12. Open next manifold valve/loop (by repeating step 8).
13. Repeat steps 9 to 12 above for each individual manifold valve/loops until completed.

Anti-freeze glycol dosage in the system water should be checked with a refractometer following the instructions supplied with the refractometer. A small sample of water can be taken from the system to check the dosage and any topping up of the unit can be carried out using the system volume and dosage protection levels in the table below.

Propylene Glycol Solution (%)	0%	10%	20%	30%	40%	50%	60%
Temperature (C)°	0°	-3°	-7°	-14°	-22°	-34°	-48°

Consideration should be given to prevent overdosage with glycol as any amount of glycol will reduce the efficiency and output of the heat pump. As a guide 33% glycol dosage will potentially result in the heat pump output reducing by 1kW.

Product Overview

Biocide or biological growth prevention is required in water systems where the water temperature is typically below 50 degrees as this is where biological growth can happen. Corrosion inhibitor or system protectors prevent the corrosion of ferrous and in most cases non-ferrous metals. Ferrous metals are typically included in items like pumps, radiators, boilers and some heat exchangers.

We recommend both corrosion inhibitor and biocide to be dosed into the system as below.

Sentinel X100 – Corrosion inhibitor
Dose: 1 Litre to 100 litre of system water

Provides protection against corrosion and limescale and meets commissioning requirements to minimise risk of invalidating boiler warranty.

Sentinel X700 – Biocide
Dose: 1 Litre to 300 litres of system water

Provides long term system protection against bacterial and fungal contamination. Complements corrosion and scale inhibition products.

Commissioning

Prior to arranging any commissioning visits, ask your customers to complete the Radiana pre commissioning check list.

During commissioning the following items will need to be checked:

Manifold

- Check controls switching correct actuators.
- Do all Valves Open?
- Is there any air in manifold or pipework?
- Has the system by dosed with inhibitor and/or Glycol?
- What is the flow temperature achieved at manifold?

Primary System

- Is the circulator pump running on demand?
- Is the buffer vessel and expansion vessel connected correctly?
- Is the heating/cooling source switching correctly?
- Is the mixing valve operating and being controlled correctly?
- Is the controls communication ok?
- Are the controls working and has training been provided to the end user?

Ventilation

- Record air flows from supply and extract grilles. Adjust dampers as required. Set the required fan speeds.
- Record unit serial number, unit Size and unit type
  Step 1 – supply fan setting
  Step 2 – Extraction fan setting
  Step 3 – Recirculation damper setting

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