LEGEND HYDRONICS

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M-8100EP

ENGINEERED PLASTIC MANIFOLD SERIES

Installation Guide

Introduction

The M-8100EP Pro Manifolds with Integrated adaptor are designed for use in Hydronic radiant panel heating and cooling applications. They are available in various sizes, configurations, and options with many accessories. Consult your local Representative for project specific requirements. In most cases the manifold is shipped in the box pre-assembled requiring only the mounting of the Integrated Adaptor and then mounting to the wall before attaching the radiant tubing and performing system start-up procedures. Therefore, we are recommending the following sequence for complete installation of the manifold.

A. Assemble Manifold Components

B. Mount Manifold

C. Connect the Radiant Tubing

D. Pressure Test

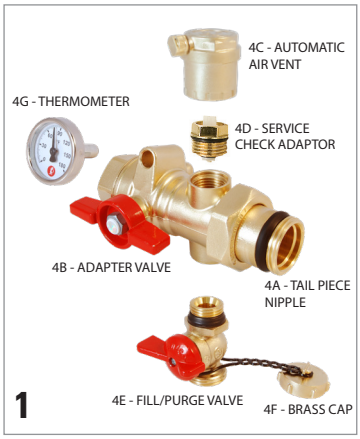
E. Fill & Purge the System

F. Balance the Manifold

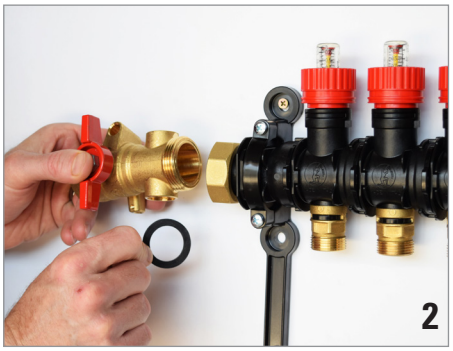
G. Addition or removal or expansion modules.

A. Assemble Manifold Components

1. A complete manifold consists of both a **Supply** and **Return Header**, each with a **Integrated Adapter** (M-8100P manifolds) **End Plug** and **Manifold Mounting Brackets**. These components are shipped together except the Integrated Adaptor, (see step 2) See Section H if the manifold requires reconfiguration, replacement, etc. . . The Headers in the M-8100 Manifold Series are assembled at Legend based on each projects requirements, with built-in loop isolation valves (supply & return) and flow gauges (supply only) that require no assembly or tightening.



2. **Mounting of the Integrated Adapter:** (included with M-8100P manifold kits) The Integrated Adapter includes an Automatic Air Vent, Service Check Adaptor, Thermometer and a Fill/Purge Valve **(1)**. Do not install any components onto the Adapter until it is tightened[1] in its final position and orientation. The Integrated Adaptors are sold in pairs, the red-handle valve is for the supply manifold header and the blue-handle valve is for the return manifold header; both are installed the same way.



a) **Mount the Adapter.** Remove the nut and tailpiece from the Integrated Adaptor and set them aside, but keep the flat EPDM gasket. Orient the adaptor body so that the handle can be operated comfortably once the manifold is mounted. Insert the EPDM gasket into the Tailpiece Assembly Nut of the Manifold **(2)** and then hand thread the Assembly Nut onto the body of the Integrated Adaptor. Once the Integrated Adaptor is positioned as needed, hold it in place and finish tightening the nut with a pipe wrench or Channel-locks.

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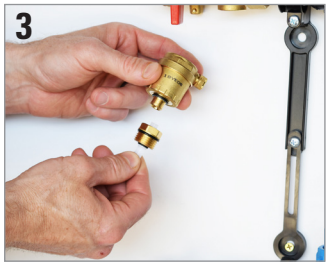
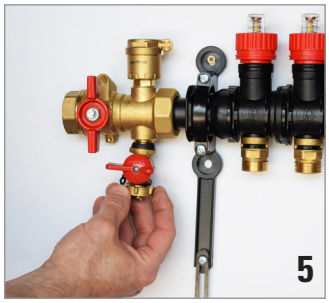
b) **Automatic Air Vent**. The Air Vent should always be installed onto the 1/4" x 1/2" **Service Check Adapter** (included with the Automatic Air Vent) in a vertical position. Thread the 1/4" male threads of the Air Vent into the Service Check Adapter hand tight **(3)**. Thread the male end of the Service Check Adapter into an upper 1/2" port on the Integrated Adapter until tight[1] **(4)**.

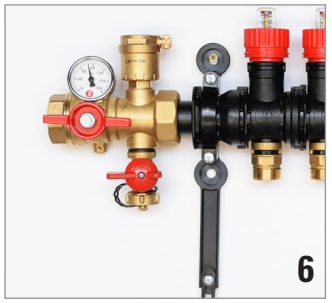
c) **Fill/Purge Valve**. Thread the male end of the Fill/Purge Valve into a lower 1/2" port of the Adapter until tight[1]. Orient the Fill/Purge Valve so that the handle can be operated comfortably once the manifold is mounted **(5)**. The opposite end of the Fill/Purge Valve has a 3/4" male garden hose thread (GHT) port and includes a **brass cap** with **plastic tether**. The plastic tether should slide over the end of the GHT port end of the Fill / Purge Valve. The brass cap, with EPDM gasket included, should be threaded on to the GHT port of Fill / Purge Valve until ready to use.

d) **Thermometer**. Install the thermometer into the friction fit port on the side of the adaptor **(6)**.

f) Repeat steps a) through d) above for both the upper (supply) and lower (return) manifold.





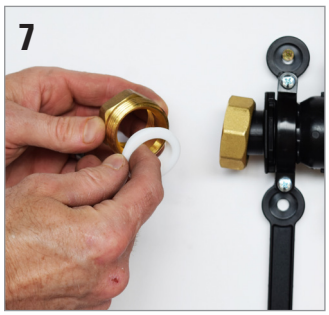


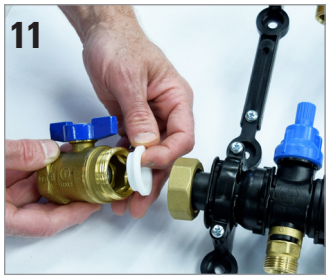
Alternate Isolation Valve Set-ups:

3. **Mounting of the Angled Valve set:** The Angled Valves are sold in pairs, the red-handle valve is for the supply manifold header and the blue-handle valve is for the return manifold header; both are installed the same way. Insert the **Plastic Adaptor** into the male threaded end of the **Brass Bushing (7)** and then thread the Brass Bushing into the Brass Union Nut on the M-8100 manifold **(8)**. Use two wrenches to tighten the Brass Bushing into the Union Nut. The angled valve set includes one **Offset Adapter (9)**. Determine if the supply or return line needs the offset and thread the Offset Adapter and the shorter valve adapter. Then attach and tighten the valve into the Brass Bushing until tight[1] **(10)**. For the other valve, insert the tapered side of the plastic adapter into the valve body **(11)** and attach the manifold union nut. The piping between the supply and return should clear of each other **(12)**.

4. **Mounting of Basic Valve set:** The Basic Valves are sold in pairs, the red-handle valve is for the supply header and the blue-handle valve is for the return manifold; both are installed the same way. Remove the nut and tailpiece assembly from both of the valves and set these parts aside. Insert the tapered side of the **Plastic Adaptor** into the end of the Basic Valve **(11)** and thread the valve into the manifold nut and tighten. Use two wrenches to tighten the valve and manifold nut together. Repeat this for the other valve.

[1]**Note:** *These parts seal together and to the manifold with an EPDM gasket (o-ring). One quarter (1/4) turn beyond "hand-tight" is normally sufficient to seal properly. If turning beyond 1/4 turn is required to align gauges and handles then do so, up to one (1) full turn beyond "hand-tight".*





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B. Mount the Manifold

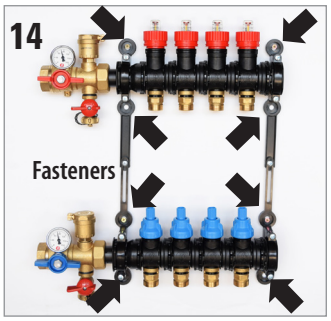
1. The manifold location is normally determined during project design prior to installation. If the location was not previously selected or the selected location is no longer suitable due to project changes; a new location can be chosen based upon the following criteria: It should be located near the area (radiant panel) where the tubing is to be installed in order to avoid long circuit tails. It should be located so that it is accessible during and after project construction for initial start-up procedures (Sections D through G) and periodic system maintenance and/or troubleshooting.

2. The manifold may be mounted in any orientation: vertical, horizontal, or even inverted; the only exception being that the header with the flow gauges must always be the supply header; receiving flow from the mechanical room and distributing it into the radiant panel (floor, ceiling, etc. . .). The best orientation for installation access and later maintenance and/or troubleshooting is in the horizontal position on a wall.

3. Use a screwdriver to adjust the bracket spacing of the two headers **(13)**.

4. The manifold should be installed using appropriate fasteners for the mounting surface and sized to fit the mounting holes in the brackets **(14)**. The manifold should be mounted in its permanent location prior to installing the radiant tubing; adjustments after the tubing is connected, concrete is poured or floor coverings are installed, are very difficult. A temporary support may be built if the walls are not yet in place. Ensure that the manifold is level and has adequate clearance on the sides for the distribution piping connections to / from the mechanical room. The minimum clearance is 20" (40 cm) between the bottom of the manifold and the top of the finished floor (right). Ideally, the manifold will be mounted with the upper (supply) header 40" (1.0 m) above the floor.

5. The manifold should never be mounted without the proper brackets. The M-8100EP Manifolds are sold with the brackets. The brackets are provided for secure mounting, proper alignment and isolation of vibration and noise. Do not install the manifold without these brackets.



C. Connect the Radiant Tubing

1. Slide the end of the tubing through the appropriately sized Tube Bend Support (800-305 for 3/8" & 1/2" tubing or 800-304 for 5/8" & 3/4" tubing) **(15)** before attaching the manifold connector (photo). Position the 90° bend support on the tubing as it turns out of the floor, up into the manifold, typically 3 to 4 feet below the mounted manifold (photo). At this approximate location, the bend support should extend several inches vertically above the finished floor height. Tubing Bend Supports protect the tubing as it transitions to and from the thermal mass (radiant floor) and help align the convergence of several tubing loop ends at the manifold location for a neat, professional appearance **(16)**.

2. Manifold tube connectors are not included with the manifold; they are sold separately. Use the appropriate tube connectors for the type and size (below a through g/h) of radiant tubing.

Tube Connectors (810-142EP, -143EP, -144EP, -145EP) are for PEX or PE-RT tubing manufactured in compliance with ASTM F 876 (PEX) or ASTM F 2623 (PE-RT).

Note: *The Legend, M-8100 EP series manifold and are not compatible with the M-8000 Modular Brass, M-8200 Precision Brass or M-8300 Stainless Steel Manifold tube connectors, or other manufacturers' tube connectors.*

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(Radiant Tubing cont.')

3. After the manifold is securely mounted in its final position, begin to connect the radiant tubing. The tubing should be connected to the manifold as it is being installed. For the best results, start each loop by attaching the tubing to the upper (supply) header **(17)**.

4. Try to avoid crossing loops by attaching the end of the loop to the header port on the side (end) of the manifold closest to the area to be covered by that loop. It is also recommended to attach both ends of each loop to corresponding supply and return header ports on the manifold. For example, port 1 (to the far left as facing the manifold) on both the supply and return header should have attached the beginning and end of the same loop.

5. Each loop on the manifold should be labeled according to the area or room it covers on the project for future trouble shooting purposes **(18)**. The installed length of each loop should also be noted on the manifold and recorded on the project plans for output and balancing calculations (see Section F; Balance the Manifold). Sticker labels are provided with the M-8100EP Manifold Kits (See photo).

6. For 3/8", 1/2" & 5/8" tubing (Tube & Composite Tube Connectors) connections:

a) Ensure that the tubing is cut squarely using a proper tube cutter.

b) Slide the hex nut (with the threads towards the manifold) onto the tubing **(19)**.

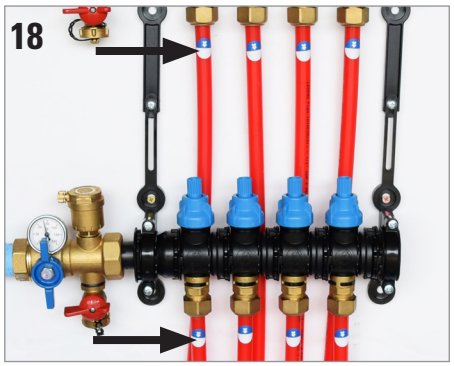
c) Slide the split ring washer onto the tubing **(19)**.

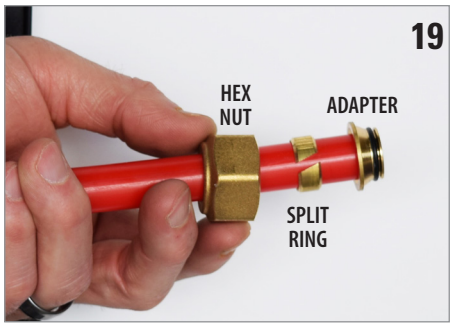
d) Insert the barbed end adapter into the tubing until flush with the end of the tubing **(19)**.

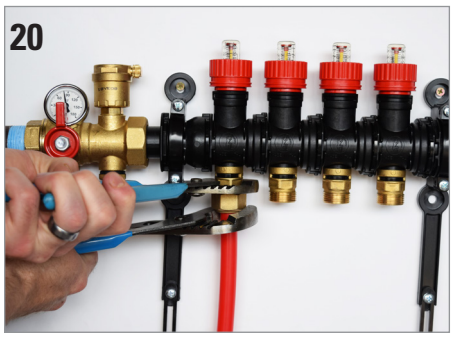
e) Place the end adapter into the selected port ensuring that the o-ring is seated properly into the manifold port.

f) Hand-tighten the hex nut onto the male threads of the manifold port while supporting the tube and keeping the end adapter square in the port. It should turn on smoothly as the fitting is aligned.

g) Once the hex nut is hand tight, use an adjustable wrench and turn it no more than 1/2 turn. Do not over tighten, as this may destroy the integral o-ring **(20)**.







Note: *The Legend, M-8100 EP series manifold and are not compatible with the M-8000 Modular Brass, M-8200 Precision Brass or M-8300 Stainless Steel Manifold tube connectors, or other manufacturers' tube connectors.*

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For 3/4" tubing (19)

a) Ensure that the tubing is cut squarely using a proper tube cutter.

b) Install the o-ring in the manifold bushing. Attach the manifold bushing to the selected manifold port (the hex end of the bushing closest to the header) ensuring that the o-ring is seated properly into the manifold port. Thread the bushing onto the port by hand until it stops.

c) Slide the hex nut (with the threads towards the manifold) onto the tubing **(21)**.

d) Slide the split ring washer onto the tubing **(21)**.

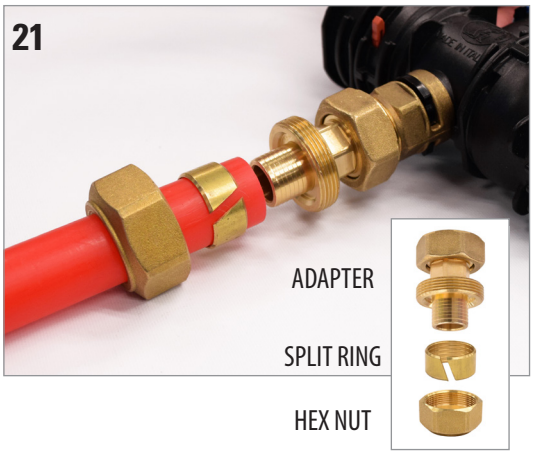
e) Insert the barbed end adapter into the tubing until flush with the end of the tubing **(21)**.

f) Place the end adapter into the manifold bushing.

g) Hand-tighten the hex nut onto the male threads of the manifold bushing while supporting the tube and keeping the end adapter square in the manifold bushing. It should turn on smoothly as the fitting is aligned.

h) Once the hex nut is hand tight, use an adjustable wrench and turn it no more than 1/2 turn. Do not over tighten, as this may destroy the integral o-ring.

***Note:** The Legend, M-8100EP series manifold and are not compatible with the M-8000 Modular Brass, M-8200 Precision Brass or M-8300 Stainless Steel Manifold tube connectors, or other manufacturers' tube connectors.*



3/4" PEX Connector

D. Pressure Test (Air Pressure)

1. After the radiant tubing has been installed, but before it is covered, a pressure test should be performed on the manifold with all Circuit Isolation and Balancing Valves (both supply and return header) open so that the tubing and manifold connections can be checked for leaks. This pressure test can be performed with either air or water depending upon availability and/or local code requirements and is typically done prior to connecting the system supply/return distribution piping to from the mechanical room.

2. Air Pressure Test

a) Thread the male end (1" threads) of the Air Pressure Tester (T-820; sold separately) into the female end of the installed supply Manifold Isolation Valve (red handle) **(22)**. The use of thread sealant (Teflon tape or paste) will help ensure that this connection is air tight. Make sure the supply Manifold Isolation Valve is open and the return Manifold Isolation Valve is closed so that the manifold and radiant tubing system is sealed closed. If using Precision Adapters with Fill/Purge Valves (included with M-8100P manifold kits), make sure these valves (both supply and return) are also in the closed position (photo).

b) Fill the system with air through the Schrader valve on the Air Pressure Tester (T-820) to the required test pressure (continue to step 3 below for recommended test pressures) **(23)**.

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OR

D. Pressure Test (Water Pressure)

1. After the radiant tubing has been installed, but before it is covered, a pressure test should be performed on the manifold with all Circuit Isolation and Balancing Valves (both supply and return header) open so that the tubing and manifold connections can be checked for leaks. This pressure test can be performed with either air or water depending upon availability and/or local code requirements and is typically done prior to connecting the system supply/return distribution piping to from the mechanical room.

2. Water Pressure Test (Manifolds utilizing Precision Adapter with Fill/Purge Valve; included with M-8100P manifold kits)

a) Follow steps 3 through 10 in the "Fill & Purge the System" section of these instructions to purge the air out of the system.

b) Once all of the air has been purged, fill the system with water to the required test pressure (continue to step 3 below for recommended test pressures).

3. Initially fill the system to a pressure the greater of 1.5 times the maximum operating pressure or 100 psi for 30 minutes. Check for leaks, especially at the connections. As the radiant tubing expands, restore pressure, first at 10 minutes into the test and again at 20 minutes. At the end of 30 minutes, a pressure drop of more than 7 psi indicates there is a leak in the system.

4. After 30 minutes, restore the system to test pressure (if necessary), and then maintain pressure for a minimum of 2 hours. At the end of 2 hours, a pressure drop of more than 5 psi indicates there is a leak in the system.

5. After 2 hours, reduce the system pressure to 30 – 40 psi, and then maintain this pressure during the remainder of building construction up to the time at which the system is filled. The system should be monitored during installation of the thermal mass, floor coverings and/or any time where floor penetrations may be necessary.

6. If a leak is present as determined by any step above (3 through 5), visually inspect the system to identify the location and then perform the necessary repairs. A soap and water mix solution can be poured onto the outside of the tubing and connections at potential leak areas to help identify leaks in systems under air pressure test. Upon completion of repairs, repeat the pressure test procedures from the beginning.

CAUTION: When pressure testing with water, ensure that all precaution is taken to prevent the water from freezing.

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E. Fill & Purge the System

(Manifolds utilizing Integrated Adapter with Fill/Purge Valve; included with M-8100P manifold kits)

1. Before the system is ready for operation it must be filled with the proper fluid media and purged of air. The proper fluid is determined during design of the system, typically clean, de-ionized water or a water and glycol mixture depending upon the required level of freeze protection and/or corrosion inhibitors. If using a water/glycol solution, mix the glycol into the water thoroughly prior to filling the system. Follow the glycol manufacturer's instructions for proper usage and installation.

2. A complete system fill/purge procedure normally starts in the mechanical room with the boiler and near boiler piping, followed by the distribution (zone) piping to / from the radiant manifolds. In smaller systems the manifolds and radiant tubing can be filled and purged with the distribution piping from the mechanical room. Larger systems, especially those with zones on upper levels, require that the manifold and radiant tubing is filled and purged at the manifold one loop at a time. These instructions are for operation of the manifold during the fill and purge of the manifold and radiant tubing.

3. Make sure the Manifold Isolation Valves (both supply and return) are closed so that the manifold and radiant tubing is isolated from the rest of the system **(24)**.

4. Close all Circuit Isolation Valves on each loop of the return header, by turning the inner blue knob clockwise until it stops **(25)**. If needed, turn the large outer blue cover to allow the inner knob to turn easier.

5. Verify that all Balancing Valves on each loop of the supply header are fully open (they are normally shipped in the open position). To open the Balancing Valves, remove the red protection sleeve, flip it over and re-install it over the base of the flowmeter. Grip the red sleeve and turn the entire flowmeter assembly counter-clockwise about 4 full revolutions **(26)**.

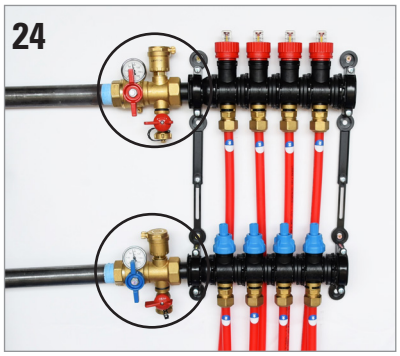
6. Make sure the Fill/Purge Valves on the Integrated Adapters (both supply and return) are closed. Un-thread (counter-clockwise) the brass cap from the GHT ports.

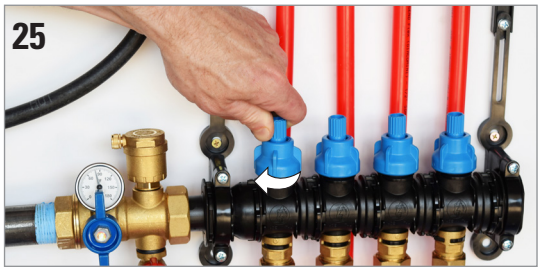
7. Attach a fill hose from the water supply source to the GHT port on the Fill/Purge Valve of the supply header. Attach a drain hose to the same port on the Fill/Purge Valve of the return header. Place the drain hose in a bucket of water **(27)**.

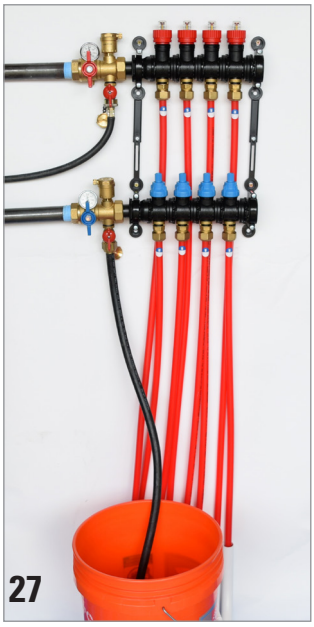
8. Turn on the water supply and open the Fill/Purge Valve on the supply header and then open the Fill/Purge Valve on the return header.

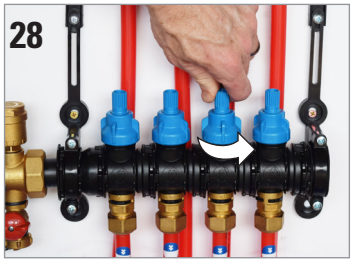
9. Purge the air out of each loop in a logical order, one at a time, closing each loop after it has been purged, before opening the next. Open the Circuit Isolation Valve for the first loop, by turning the inner blue knob counter-clockwise until it stops **(28)**. Air should start to "sputter" out of the drain hose. When the sputtering stops and a steady stream of water flows out of the drain hose; close the Circuit Isolation Valve of the first loop.

10. Repeat step 9, for each of the remaining loops. After the last loop has been purged, open the Circuit Isolation Valve for all of the loops and let any residual air purge out of the manifold.









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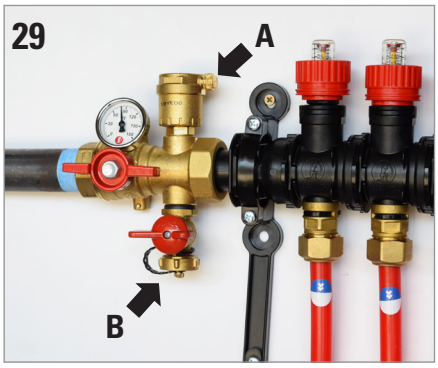
(Fill & Purge cont.')

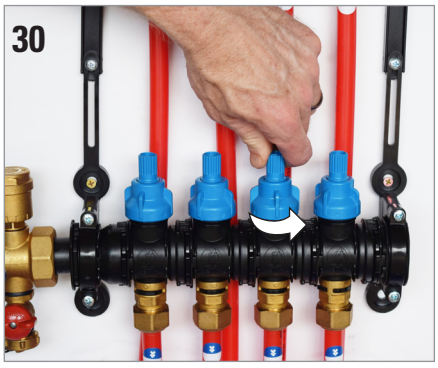
11. Close the Fill/Purge Valve of the return header and let the system fill to operating pressure (typically 12 to 15 psi); then close the Fill/Purge Valve on the supply header. Turn off the water supply source.

12. Make sure that the Automatic Air Vents on the Integrated Adapters (if used) are open so that any small pockets of air remaining in the system are vented during normal operation. The Automatic Air vents can be opened by turning the cap counter-clockwise **(29A)**.

13. Disconnect the fill and drain hoses and cover the GHT ports on the Fill / Purge Valves (both supply and return) with the brass cap by threading it on (clockwise) **(29B)**. The Manifold Isolation Valves can now be opened and the system is ready for operation and/or balancing.

***Note:** Manifold Actuators (800-200, sold separately) should not be mounted on the manifold until after the system has been filled, purged and balanced. They should be mounted as the very last step before system operation. Their installation requires the removal of the Circuit Isolation Valve handles on the return header. Follow the installation instructions provided with the Actuators.*





F. Balance the Manifold

1. The required flow rate for each loop is calculated during system design directly from the heat output (Btu/hr) and ΔT (delta T; temperature difference beginning to end) requirements of that loop. In order for the system to function properly (to be "balanced"), the fluid flow rates in each loop must be set to match the system design flow rates. The design flow rates of a given manifold may or may not be the same on each loop, therefore, "balancing the manifold" does not necessarily mean that the gauges on each loop should be set to the same reading (flow rate), as often construed.

2. To set the flow rate for each loop, follow steps 3 through 9, below. The system must be filled, purged and generally ready for operation, with the exception of manifold actuators, if required. All pumps for all zones in the system must be operational for these procedures, but it is not necessary to have heated or chilled fluid in the system.

3. Turn the entire system on and set the controls (thermostats, zone controls, relays, etc. . .) so that all zones are calling (all pumps are running and/or all zone valves are open) to simulate full design conditions.

4. Make sure the Manifold Isolation Valves (both supply and return) are open and that the manifold and radiant tubing are receiving full flow.

5. Male sure all Circuit Isolation Valves on each loop of the return header are open. They can be opened by turning the inner blue knob counter-clockwise until it stops **(30)**.

6. Verify that all Balancing Valves on each loop of the supply header are fully open (they are normally shipped in the open position). To open the Balancing Valves, remove the red protection sleeve, flip it over and re-install it over the base of the flowmeter. Grip the red sleeve and turn the entire flowmeter assembly counter-clockwise about 4 full revolutions **(31)**.

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(Balance the Manifold cont.')

7. The flow rate of each loop is indicated on its corresponding flow gauge, located on the top of the supply header. The scale on each gauge reads from 0 to 2 gpm, with 0 gpm at the top of the gauge. The colored indicator rests at the top of the gauge with no flow and lowers down the scale as the flow increases.

8. Adjust the flow rate of each loop by closing (clockwise, to reduce flow) and opening (counter-clockwise, to increase flow) the Balancing Valve. To adjust, remove the red protection sleeve, flip it over and re-install it over the base of the flowmeter. Grip the red sleeve and turn the entire flowmeter assembly **(32)**. The total range of the Balancing Valve from fully open to fully closed, is about 4 turns. Be careful to not over tighten the valve when closing.

9. Start with the loop that requires the lowest flow rate and set that loop to the required flow plus 50%. Proceed to the loop with the next highest flow requirement and set that loop as close as possible to the required flow rate. Continue to the next loop in similar fashion until all loops have been set to their required flow rates. Note that after each loop is adjusted, the flow rates previously set for other loops may change. It is common for each loop to require multiple adjustments before all loops on the manifold are properly balanced.

10. Once all of the Balancing Valves on the manifold have been set for their required flow rates, remove the red protection sleeve, flip it over and re-install it over the base of the flowmeter **(33)**.

11. Repeat the balancing procedures as outlined in steps 3 through 9 above for all manifolds in the system. The manifold is now ready for operation and/or installation of zone actuators[3], as required.

12. Depending on how many zones and pumps are in the system, you may have to adjust the first manifolds that were balanced. They should be rechecked with all pumps and zone valves in operating mode.

G. Mount Circuit Actuators

1. Remove the blue circuit isolation knob from each circuit **(34)**.

2. Install the threaded adapter that is included the circuit actuator **(35)**.

3. Mount the actuator head on the adapter ring **(36)**.

4. Rotate the head 15 degrees clockwise, until you hear the connections click.

5. Push the red button inwards.

[3]***Note:*** *Manifold Actuators (800-200, sold separately) should not be mounted on the manifold until after the system has been filled, purged and balanced. They should be mounted as the very last step before system operation. Their installation requires the removal of the Circuit Isolation Valve handles on the return header. Follow the installation instructions provided with the Actuators.*

M-8100EP

ENGINEERED PLASTIC MANIFOLD SERIES

Installation Guide

H. Addition or removal of modules

1. The M-8100EP manifold series is generally shipped as a fully assembled manifold based on your requirements for circuits per manifold. If in the field the requirements for the manifold change, requiring either more or fewer circuits, the manifold can be adjusted to accommodate the change.

2. It is generally easier to make a change of this type before the manifold is mounted to the wall. If the manifold is already mounted to the wall and it is possible, remove it from the wall and set it on a solid surface.

3. To remove the manifolds from the wall brackets, first loosen the two screws **(37)** from each end and remove the retaining bracket **(38)**.

4. Select the first manifold to adjust and remove the retention clip from between two of the circuit modules **(39)**. Use caution when removing the clip to avoid breaking it.

5. Disassemble the manifold by pulling apart the two halves **(40)**. Do not try to twist as there is an interlocking tab will not allow then to turn.

6. If you are removing a circuit (or multiple circuits), repeat steps 4 and 5 as many times as required.

7. Before you reassemble or add a circuit, you must verify that there is a Teflon **(41)** and EPDM gasket **(42)** on the male end of the module that is to be assembled and that they are installed in the proper order.

8. Gently insert the male end of one module into the other, just until the two gaskets are covered. Then rotate the pieces until the corresponding tabs are aligned, and push the two pieces together **(43)**.

9. Insert the retaining clip into the opening and fully insert the clip **(44)**.

10. For the second manifold, or multiple modules, repeat steps 7 thru 9.

11. Remount the manifolds into the bracket and mount to the wall. See section **(B)** as needed.