



MC Series Gas-Fired Circulating Heater



INSTALLATION

START-UP

MAINTENANCE

PARTS

Models
MC50 / MC80
MC99 / MC120



CAUTION

When installing models manufactured after July 7, 2008, you will notice additional selections on the control installer menu that will not apply to this unit. **DO NOT CHANGE THESE FACTORY SETTINGS.** Refer to the Control Program Reference Chart within this manual for selections that apply to this model.

⚠ WARNING

This manual must be used by a qualified installer/service technician. Read all instructions in this manual before installing. Perform steps in the given order. Failure to comply could result in substantial property damage, severe personal injury, or death.

NOTICE: *HTP reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.*

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.

⚠ WARNING

IF THE INFORMATION IN THIS MANUAL IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR LOSS OF LIFE. DO NOT STORE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be provided by a qualified installer, service agency, or the gas supplier.

FOR YOUR SAFETY READ BEFORE OPERATING

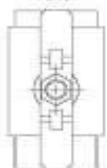
WARNING: If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

- A.** This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance
 - Do not touch any electric switch; do not use any phone in your building
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
 - If you cannot reach your gas supplier, call the fire department.
- C.** Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D.** Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

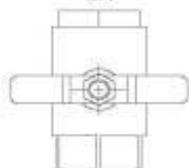
OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove front cover.
6. Turn gas shutoff valve to "off". Handle will be across the piping, do not force.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
8. Turn gas shutoff valve to "on". Handle will be in line with piping.
9. Install Front Cover.
10. Turn on all electric power to appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

GAS VALVE
ON



GAS VALVE
OFF



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove Front Cover.
4. Turn gas shutoff valve to "off". Handle will be across the piping. Do not force.
5. Install Front Cover.

SPECIAL ATTENTION BOXES

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important product information.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

FOREWORD

This manual is intended to be used in conjunction with other literature provided with the MC Series Gas-Fired Heater. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications including the National Fuel Gas Code, ANSI Z223.1-2002, be reviewed in their entirety before beginning any work.

Installation should be made in accordance with the regulations of the local code authorities and utility companies which pertain to this type of water heating equipment.

FOR THE INSTALLER

WARNING

This manual must only be used by a qualified heating installer/service technician. Read all instructions in this manual before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

This appliance must be installed by qualified and licensed personnel. The installer should be guided by the instructions furnished with the heater, and with local codes and utility company requirements. In the absence of local codes, preference should be given to the National Fuel Gas Code, ANSI Z223.1-2002.

INSTALLATIONS MUST COMPLY WITH:

Local, state, provincial, and national codes, laws, regulations and ordinances.

The latest version of the National Fuel Gas Code, ANSI Z223.1, from American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131.

In Canada – CGA No. B149 (latest version), from Canadian Gas Association Laboratories, 55 Scarsdale Road, Don Mills, Ontario, Canada M3B 2R3. Also, Canadian Electrical Code C 22.1, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

Code for the installation of Heat Producing Appliances (latest version), from American Insurance Association, 85 John Street, New York, NY 11038.

The latest version of the National Electrical Code, NFPA No. 70.

NOTE: The gas manifold and controls met safe lighting and other performance criteria when undergoing tests specified in ANSI Z21.10.3 – latest edition.

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PART 1: GENERAL SAFETY INFORMATION

A. PRECAUTIONS

This appliance is for indoor installations only. Clearance to combustible materials: 0" top, bottom, sides and back. Front must have room for service, 24" recommended. (A combustible door or removable panel is acceptable front clearance.) This appliance has been approved for closet installation. Do not install this appliance directly on carpeting. For installation on combustible flooring. Category IV vent systems only.

WARNING

INSTALLER – Read all instructions in this manual before installing. Perform steps in the order given.

USER – This manual is for use only by a qualified heating installer/service technician. Refer to user's information manual for your reference. Have this heater serviced/inspected by a qualified service technician annually.

FAILURE TO ADHERE TO THE GUIDELINES ON THIS PAGE CAN RESULT IN SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

WARNING

NOTE: If the heater is exposed to the following, do not operate until all corrective steps have been made by a qualified serviceman:

1. FIRE
2. DAMAGE
3. WATER

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN UNDERWATER. Immediately call a qualified service technician. Replace any part of the control unit that has been under water.

B. IMPROPER COMBUSTION

CAUTION

Do not obstruct combustion and ventilating air flow. Adequate air must be provided for safe operation.

C. GAS

WARNING

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be provided by a qualified installer, service agency, or the gas supplier.

Should overheating or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.

D. WHEN SERVICING THE HEATER

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow heater to cool.

E. HEATER WATER

- Do not use petroleum-based cleaning or sealing compounds in a heater system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use “homemade cures” or “patent medicines”. Substantial property damage, damage to heater, and/or serious personal injury may result.
- Continual fresh make-up water will reduce heater life. Mineral buildup reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen by make-up water can cause internal corrosion in system components. Leaks in the heater or piping must be repaired at once.
- If you have an old system with cast iron radiators, thoroughly flush the system (without heater connected) to remove sediment. The high-efficiency heat exchanger can be damaged by build-up or corrosion due to sediment.
- When the heater is used to supply potable water, do not connect it to any heating system or component(s) previously used with a non-potable water-heating appliance.

 WARNING

NEVER use any toxic chemical, including automotive, standard glycol antifreeze, or ethylene glycol made for hydronic (non-potable) systems. These chemicals can attack gaskets and seals in heaters, are poisonous if consumed, and can cause injury or death.

F. WINTERIZING

NOTE: Consider piping and installation when determining heater location.

To winterize the heater, drain the entire system. Then apply air pressure to the drain valve and allow air and water to escape from the purge valve (see piping instructions).

Once you have evacuated as much water as possible, pump non-toxic, NSF food grade propylene glycol, FDA rated as GRAS (Generally Recognized As Safe), into the system. Consult the glycol manufacturer for specific instructions on concentration percentage as well as freeze and burst protection methods. Check the volume and concentration of antifreeze to assure protection is adequate to protect the entire system from freezing. When pumping, allow air and remaining water to escape from purge valve. When the stream coming out of the purge valve matches the color of the non-toxic glycol, the system is adequately filled.

Finally, it is recommended to start the circulation pump and allow the system to circulate for at 30 minutes to completely blend any trapped water that might be in the system with the glycol.

PART 2: BEFORE YOU START**A. WHAT'S IN THE BOX**

Also included with the heater:

- Temperature and Pressure Relief Valve
- Pressure and Temperature Gauge
- Intake PVC Tee with Screens
- Exhaust PVC Coupling with Screens
- Plastic hose and Instructions for Purging Heat Exchanger

- Installation Manual
- Warranty

B. HOW THE HEATER OPERATES

Modulation Condensing Technology is an intelligent system that delivers highly efficient water heating, while maximizing efficiency by measuring the data parameters of your system.

Stainless Steel Heat Exchanger

The highly efficient and durable stainless steel heat exchanger is designed to extract the last bit of energy from flue gas before it is exhausted.

Modulating Combustion System

Modulation during operation is based on supply temperature and desired temperature set point. The set point used for the control depends upon the programmed central heating curve. The heating curve slope can be changed by the installer to better fit system needs. The control monitors the system to regulate burner output during operation to match system demand. This increase in efficiency allows for substantial fuel savings.

Gas Valve

The gas valve senses suction from the blower, allowing gas to flow only if the gas valve is energized and combustion air is flowing.

Swirl Plate System

The gas valve swirl plate controls air and gas flow into the burner, assuring better mixing for improved combustion.

Supply Water Temperature Sensor

This sensor monitors heater output water temperature (system outlet/supply). The control module adjusts the heater firing rate so the outlet/supply temperature is correct.

Return Water Temperature Sensor

This sensor monitors the return water temperature (system inlet/return). The control module reduces or increases heater input, depending on how close the inlet/return water temperature is to the outlet water temperature.

Temperature and Pressure Gauge

Allows the user to monitor system temperature and pressure.

Control

The integrated control system monitors inlet/return and outlet/supply water temperature and regulates fan speed to regulate the unit's BTU output. This allows the unit to deliver the required amount of heated energy and nothing more.

Flue Pipe Adapter

The flue pipe adapter may be positioned so that the installer is able to find a position that will best facilitate the exhaust and combustion air pipe connections with the least number of elbows in even the most challenging of situations.

Burner

Constructed of metal fiber and high grade stainless steel, the burner uses pre-mixed air and gas and provides a wide range of firing rates.

Electrical Field Connections with Terminal Strips

The electrical cover plate allows access to the line voltage and low voltage terminal strips. Attach line voltage conduits to the three holes at the right of the line voltage terminal strip for power, CH pump and

DHW pump. Route low voltage wires through the opening to the left of the low voltage terminal strip (see Field Wiring Instructions, Part 9).

Condensate Drain Connection

As this is a condensing high efficiency appliance, the unit has a condensate removal system. Condensate is nothing more than water vapor, derived from combustion products and similar to an automobile when it is initially started. It is very important that the condensate line slopes away from the heater and down to a suitable inside drain.

If the condensate outlet on the heater is lower than the drain, you must use a condensate removal pump (kit p/n 554200 available from HTP.) In addition, local authorities may require a condensate neutralizer to neutralize the condensate. Condensate neutralizers are made up of lime crystals, marble or phosphate chips. Neutralizers can be installed in the field by the installer and purchased from HTP (p/n N1100).

It is also very important not to expose the condensate line to freezing temperatures or any type of blockage. Plastic tubing must be the only material used for the condensate line. Steel, brass, copper or other materials will be subject to corrosion or deterioration. A second vent may be necessary to prevent condensate line vacuum lock on a long horizontal run. Also, an increase in pipe size may be necessary to allow condensate to drain properly. Support of the condensation line may be necessary to avoid blockage of the condensate flow.

Spark Ignition

The burner flame is ignited by applying a high voltage to the system spark electrode. This causes a spark from electrode to ground.

The Vision 1 Optional System

By controlling the temperature delivered to the central heating circuits based on outside temperature, the Vision 1 System allows the installer to take this highly efficient heater and make it even more efficient. The Vision 1 System is also a two temperature system, using one temperature for central heating and the other for use with an indirect water heater. This allows the user to increase the temperature supplied to the indirect water heater to get a faster recovery by prioritizing the flow at a higher temperature than may be needed for the central heating circuits (this requires two separate circulators). You must follow the piping, wiring, and programming instructions located in the Vision One section of this manual.

C. OPTIONAL EQUIPMENT

Below is a list of optional equipment available from HTP:

- Indirect Tank Sensor (Part # 7250P-325)
- Outdoor sensor (Part # 7250P-319)
- Wall Mounting Kit (Part # 7450P-211)
- 2" Stainless Steel Outside Termination Vent Kit (V500)
- 3" Stainless Steel Outside Termination Vent Kit (V1000)
- 2" PVC Concentric Vent Kit (Part # KGAVT0501CVT)
- 3" PVC Concentric Vent Kit (Part # KGAVT0601CVT)
- 3" Polypro Vent Kit (Part # 8400P-001)
- 3" Polypro Pipe (33' length Part # 8400P-002, 49.5' length Part # 8400P-003)
- U.L. 353 Compliant Low Water Cut-Off Interface Kit with Manual Reset (Part # 7450P-225)
- Alarm System (Part # 7350P-602) (to monitor any failure)
- Condensate Pump (Part # 7250P-320)
- Condensate Neutralizer (Part # 554200)
- Vision 1 Outdoor Sensing System (Part # 7250P-622)

These additional options may be purchased through your HTP distributor.

PART 3: PREPARE LOCATION

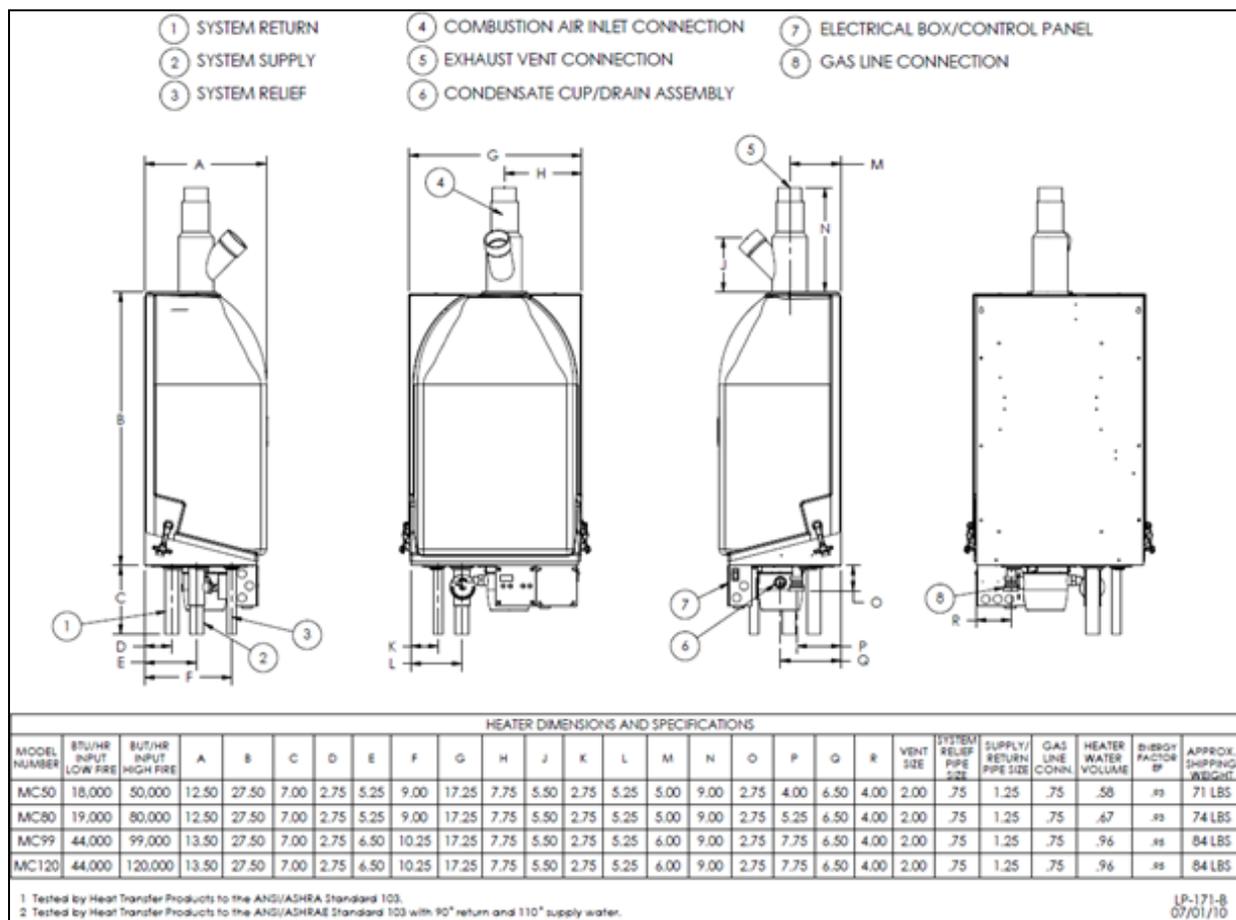


Figure 1 –Specifications – LP-171-B

Before considering location, many factors need to be addressed. Piping, Venting, and Condensation Removal are just a few of the issues that need attention prior to the installation of the heater. Please read the entire manual, as it could save time and money.

A. BEFORE LOCATING THE HEATER

Check for nearby connections to:

- System water piping
- Venting connections
- Gas supply piping
- Electrical power
- Condensate drain

Check area around heater. Remove any combustible materials, gasoline, and other flammable liquids.

⚠ WARNING

Failure to keep heater area clear and free of combustible materials, liquids, and vapors can result in substantial property damage, severe personal injury, or death.

The heater gas control system components must be protected from dripping water during operation and service.

If replacing an existing heater, check for and correct any existing system problems, such as:

- System leaks
- Heater is located in a condition that could cause the system to freeze and leak.
- Incorrectly-sized expansion tank
- Excessive glycol which will affect the heater system operation
- Clean and flush system when reinstalling a heater.

B. CLEARANCES FOR SERVICE ACCESS

See Figure 2 for recommended service clearances. If you do not provide the minimum clearances shown, it may not be possible to service the heater without removing it from the space.

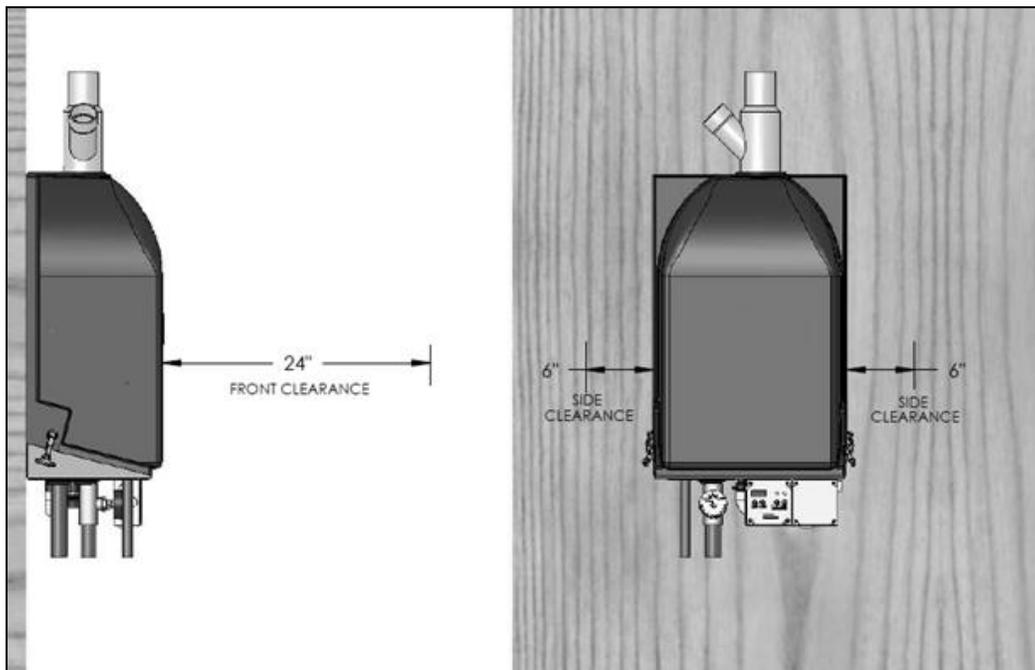


Figure 2 – Required Clearances

⚠ WARNING

The space must be provided with combustion/ventilation air openings correctly sized for all other appliances located in the same space as the heater. The heater cover must be securely fastened to prevent the heater from drawing air from the heater room. This is particularly important if the heater is in a room with other appliances. Failure to comply with the above warnings could result in substantial property damage, severe personal injury, or death.

C. RESIDENTIAL GARAGE INSTALLATION

PRECAUTIONS

If the heater is located in a residential garage, per ANSI Z223.1:

- Mount the bottom of the heater a minimum of 18" above the floor of the garage, to ensure the burner and ignition devices are well off the floor.
- Locate or protect the heater so it cannot be damaged by a moving vehicle.

D. EXHAUST AND INTAKE AIR VENTS

The heater is rated Category IV (pressurized vent, likely to form condensate in the vent) and requires a special vent system designed for pressurized venting.

⚠ WARNING

Vents must be properly supported. Heater intake and exhaust connections are not designed to carry heavy weight. Vent support brackets must be within 1' of the heater and the balance at 4' intervals. Heater must be readily accessible for visual inspection for the first 3' from the heater.

You must also install air intake piping from outdoors to the heater flue adaptor. The resultant installation is categorized as direct vent (sealed combustion). **NOTE:** To prevent combustion air contamination, see Table 1.

Intake and exhaust must terminate near each other and may be vented vertically through the roof or out a side wall. Intake and exhaust venting methods are detailed in the Venting Section. Do not attempt to install the heater using any other means. Be sure to locate the heater such that the air intake and exhaust vent piping can be routed through the building and properly terminated. The air intake and exhaust vent piping lengths, routing and termination method must all comply with the methods and limits given in the venting section.

E. PREVENT COMBUSTION AIR CONTAMINATION

Install intake air piping for the heater as described in the Venting section. Do not terminate exhaust in locations that can allow contamination of intake air.

PRODUCTS TO AVOID	AREAS LIKELY TO HAVE CONTAMINANTS
Spray cans containing fluorocarbons	Dry cleaning/laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes/cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric or Muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, laundry detergents, and cleaning solvents	Garages and workshops
Adhesives used to fasten building products	

Table 1 - Contaminant Table

⚠ WARNING

You must pipe outside air to the heater air intake. Ensure that the intake air will not contain any of the contaminants above. For example, do not pipe intake air vent near a swimming pool. Also, avoid areas subject to exhaust fumes from laundry facilities. These areas always contain contaminants. Contaminated air will damage the heater, resulting in possible substantial property damage, severe personal injury, or death.

NOTE: DAMAGE TO THE HEATER CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY. (Refer to the limited warranty for complete terms and conditions).

F. REMOVING AN EXISTING HEATER FROM AN EXISTING COMMON VENT SYSTEM

⚠ DANGER

Do not install the heater into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible substantial property damage, severe personal injury, or death.

⚠ WARNING

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

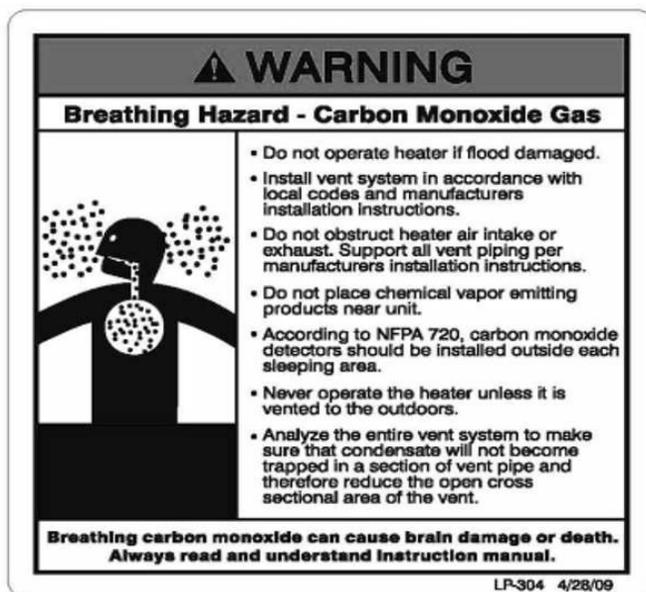


Figure 3

spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.

4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.

5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.

6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.

7. Any improper operation of the common venting system should be corrected to conform to the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the system should approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1.

When removing an existing heater, follow the steps below with each appliance remaining connected to the common venting system in operation, while other appliances remaining connected to common venting system are not operating.

1. Seal any unused openings in the common venting system.

2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion or other deficiencies that could cause an unsafe condition.

3. If practical, close all building doors, windows and all doors between the space in which the appliance remains connected to the common venting system located and other

PART 4: PREPARE HEATER

WARNING

UNCRATING HEATER – Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

CAUTION

COLD WEATHER HANDLING – If the heater has been stored in a very cold location (BELOW 0°F) before installation, handle with care until the plastic components come to room temperature.

A. REMOVE HEATER FROM BOX

The heater is easy to handle. Care must be taken to place it in a safe location prior to installation to prevent damage to the bottom mechanical connections.

B. WALL MOUNTING CONSIDERATIONS

These heaters are wall mounted. Use only the wall mounting instructions included in installation envelope.

WARNING

The wall must be capable of carrying the weight of the heater and its related components. The weights of the heaters are approximately:

MC-50 – 71 lbs.
 MC-80 – 74 lbs.
 MC-99 – 84 lbs.
 MC-120 – 84 lbs.

Failure to comply with above could result in substantial property damage, severe personal injury, or death.

C. WALL MOUNTING INSTRUCTIONS

WARNING

This heater is heavy and awkward to lift. It is recommended and safer to install the heater with two people. Use caution as to not drop the heater, which could damage the heater and cause property damage and/or personal injury. Verify that the heater is securely mounted before leaving unsupervised.

The wall must be vertically plumb and capable of carrying the weight of the heater and its related components.

The building frame (studs) must be 16" on center. If not, you must use 1/2" minimum plywood 24" x 48", fastened with at least (14) #12 x 3" (3/16" x 3") round head tapping screws to the frame of the building to provide proper support for the heater. Alternate methods of mounting must not be used. (ex. toggle bolts, hollow wall anchors) or any other fastener other than #12 x 3" (3/16" x 3") round head tapping screws.

CAUTION

If the heater is not vertically plumb, improper and unsatisfactory operation may occur, causing excessive condensation build-up, nuisance fault codes, and unnecessary maintenance.

D. INSTALLATION STEPS

1. Prior to lifting the heater onto the wall, use the enclosed template to level and locate the 2 primary (#12 x 3" [3/16" x 3"]) round head tapping screws, leaving about 1/4" between the screw head and the wall surface to allow for access to the keyway slot located in the back of the heater panel. It is extremely important that the line on the template is level when locating the first 2 screws. Failure to do so will result in an uneven or out of level installation.
2. Remove the heater cover. Locate the 2 keyway slots over the screws. Then lower the heater onto the smallest part of the keyway slot.
3. Once the heater is mounted on the first 2 screws, finish tightening the screws to the back panel. Then install the 6 additional screws of the same size to the back panel holes. This will provide additional strength and support to the heater.

PART 5: HEATER PIPING

CAUTION

Never use dielectric unions or galvanized steel fittings when connecting to a stainless steel storage tank or heater. Use only copper or brass fittings. Teflon thread sealant must be used on all connections. All piping and components connected to the heater must be approved for potable water systems.

A. GENERAL PIPING INFORMATION

CAUTION

Use two wrenches when tightening water piping at heater. Use one wrench to prevent the heater return or supply line from turning. Failure to prevent piping connections from turning could cause damage to heater components.

1. The water supply should be shut off while connecting the heater. A manual control valve must be placed on the inlet connection to the heater. Unions can be used on both the hot and cold water lines for future servicing and disconnection of the unit.
2. Purge the water line to remove all debris and air. Debris will damage the water heater.
3. If the heater is to be used as a potable water source, it must not be connected to a system that was previously used for non-potable purposes.
4. Ensure that the water filter on the heater is clean and installed.
5. New plumbing typically has contamination in the lines. Please flush the system before connection.

CAUTION

The heater control module uses temperature sensors to provide both high limit protection and modulating temperature control. The control module also provides low water protection by sensing the water pressure. Some codes/jurisdictions may require additional external controls.

B. RELIEF VALVE

The relief valve must comply with the standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems (ANSI Z21.22)* and/or the standard *Temperature, Pressure, Temperature and*

Pressure Relief Valves and Vacuum Relief Valves, CAN1-4.4, as well as all local codes. In addition, the relief valve must be rated to the maximum BTU/hr rating of the heater.

The *American National Standard (ANSI Z21.10.3) / Canadian Standard (CSA 4.3)* do not require a combination temperature and pressure relief valve for this heater. However, a combination temperature and pressure relief valve may be required by local codes.

Connect discharge piping to safe disposal location following guidelines in the WARNING below.

WARNING

To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge.
- Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible.
- The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F or greater.
- Do not pipe discharge to any location where freezing could occur.
- No shutoff valve may be installed between the relief valve and heater or in the discharge line. Do not plug or place any obstruction in the discharge line.
- Test the operation of the relief valve after filling and pressurizing the system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, immediately replace with a new properly rated relief valve.
- Test relief valve at least once annually to ensure the waterway is clear. If valve does not operate, turn the heater "off" **and call a plumber immediately.**
- Take care whenever operating relief valve to avoid scalding injury or property damage.
- For heaters installed with only a pressure relief valve, the separate storage vessel must have a temperature and pressure relief valve installed. This relief valve shall comply with *Relief Valves for Hot Water Supply Systems, ANSI Z21.22 / CSA4.4.*

FAILURE TO COMPLY WITH THE ABOVE GUIDELINES COULD RESULT IN FAILURE OF RELIEF VALVE OPERATION, RESULTING IN POSSIBILITY OF SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

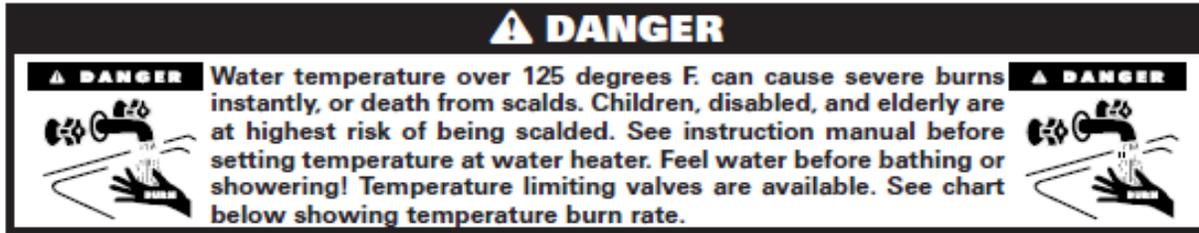
WARNING

Hot water outlet pipes can be hot to touch. Insulation must be used for hot water pipes below 36" to protect children against injuries due to scalds.

NOTE: If a relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. **DO NOT PLUG THE RELIEF VALVE.** An expansion tank may be required.

APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F	More than 5 minutes
125°F	1 ½ to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 ½ seconds
155°F	About 1 second

Table 2



C. SEPARATE LOW WATER CUTOFF

A low water cutoff may be required by state and local codes, or by some insurance companies. A low water cutoff is also required if the heater is installed above the piping level. Check code requirements before installing the heater.

If required:

- Use an electrode probe type low water cutoff designed for hydronic installations.
- Install in a tee on the supply piping above the heater.
- Follow low water cutoff manufacturer's instructions.

D. BACKFLOW PREVENTER

Use a backflow preventer specifically designed for hydronic heater installations. This valve should be installed on the cold water fill supply line per local codes. (See piping details at the end of this section.)

CAUTION

All piping methods shown in this manual use primary/secondary connection to the heater loop. This is to avoid the possibility of noise or actuator problems in zone valves because of the high-head heater circulator. For other piping methods, consult your local HTP representative or refer to separate piping details in this manual.

E. SYSTEM WATER PIPING METHODS

EXPANSION TANK AND MAKE-UP WATER

1. Ensure expansion tank size will handle heater and system water volume and temperature. Allow 3 gallons for the heater and its piping.

CAUTION

Undersized expansion tanks cause system water to be lost from relief valve and make-up water to be added through fill valve. Eventual failure can result due to excessive make-up water addition. **SUCH FAILURE IS NOT COVERED BY WARRANTY.**

2. Expansion tank must be located as shown in Piping diagrams, or following recognized design methods. See tank manufacturer's instructions for details.

3. Connect the expansion tank to the air separator only if the separator is on the suction side of the circulator. Always install the system fill connection at the same point as the expansion tank connection to the system.

4. Most chilled water systems are piped using a closed type expansion tank.

DIAPHRAGM (OR BLADDER) EXPANSION TANK

Always install an automatic air vent on top of the air separator to remove residual air from the system.

F. CIRCULATORS

CAUTION

DO NOT install automatic air vents on closed-type expansion tank systems. Air must remain in the system and return to the tank to provide its air cushion. An automatic air vent would cause air to leave the system, resulting in water-logging the expansion tank.

CAUTION

DO NOT use the heater circulator in any location other than the ones shown in this manual. The heater circulator is selected to ensure adequate flow through the heater. Failure to comply could result in unreliable performance and nuisance shut downs from insufficient flow.

SIZING SPACE HEAT SYSTEM PIPING

1. See Piping Details in this section. In all diagrams, the space heating system is isolated from the heating loop by the primary/secondary connection.

2. Size the piping and components in the space heating system using recognized design methods.

G. HYDRONIC PIPING WITH CIRCULATORS, ZONE VALVES, AND MULTIPLE HEATERS

This heater may function in a closed loop 15 psi system. An optional water pressure switch ensures adequate pressure in the system. The heater will not operate without a minimum of 10 psi water pressure. This assures you that if the system does have a leak, the heater will lock out (PRO on the display) before it damages the heat exchanger.

The included temperature and pressure gauge allows the user to monitor the system pressure and outlet temperature from the heater. It is important to note that the heater has a minimal amount of pressure drop that must be calculated when sizing the circulators. Each installation must also have an air elimination device that will remove air from the system.

Observe minimum 1" clearance around all un-insulated hot water pipes when openings around pipes are not protected by noncombustible materials. On a heater installed above radiation level, some states and local codes require a low water cut off device (See Part C this section). If the heater supplies hot water to heating coils in air handler units, flow control valves or other devices must be installed to prevent gravity circulation of heater water in the coils during the cooling cycle. Chilled water medium must be piped in parallel with the heater.

CAUTION

The heater should not be operated as a potable hot water heater. Operating this heater as a potable water heater will VOID warranty.

1. Connect the system return marked "Heater In".
2. Connect the system supply marked "Heater Out".
3. Install purge and balance valve or shut off valve and drain on system return to purge air out of each zone.
4. Install a back flow preventer on the cold feed make-up water line.
5. Install a pressure reducing valve on the cold feed make-up water line, (15 psi nominal on the system return). Check temperature and pressure gauge, which should read minimum pressure of 12 psi.

6. Install a circulator as shown in piping details (this section). Make sure the circulator is properly sized for the system and friction loss.
7. Install an expansion tank on the system supply. Consult the tank manufacturer's instruction for specific information relating to expansion tank installation. Size the expansion tank for the required system volume and capacity.
8. Install an air elimination device on the system supply.
9. Install a drain valve at the lowest point of the system. NOTE: The heater cannot be drained completely of water without purging the unit with an air pressure 15 psi.
10. The safety relief valve is installed at the factory. Pipe the discharge of the safety relief valve to prevent injury in the event of pressure relief. Pipe the discharge 6" above the drain to a drain. Provide piping that is the same size as the safety relief valve outlet. **Never block the outlet of safety relief valve.**

H. CIRCULATOR SIZING

The heat exchanger has pressure drop which must be considered in your system design. Refer to the graph in Figure 4 for pressure drop through the heat exchanger for recommended pump selection at a 20Δt design.

The chart below represents various system temperatures and their respective flows and friction loss through the heater, which will aid circulator selection.

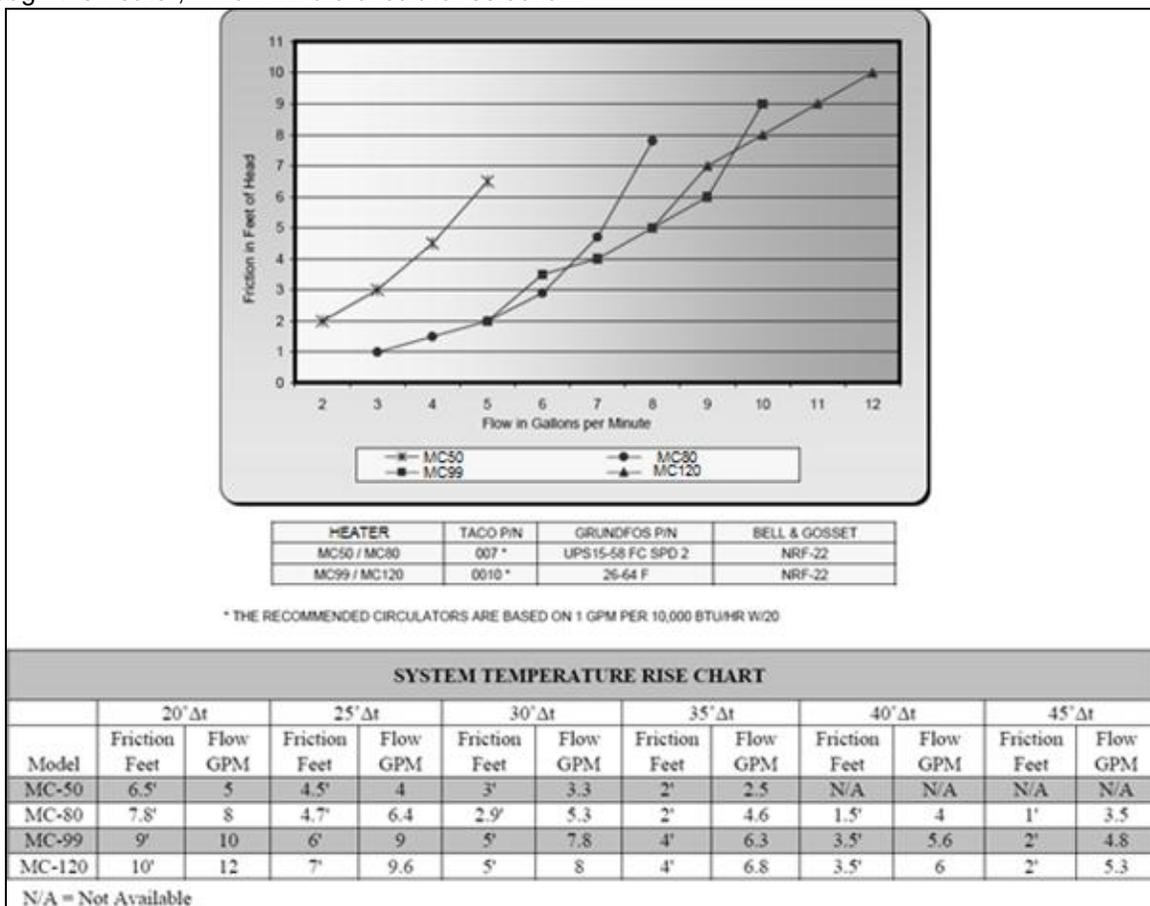


Figure 4 – Pressure Drop Graph and Temperature Rise Chart – LP-171-F NOTE: The recommended circulators are based on 1 gpm per 10,000 btu/hr with 20Δt.

I. FILL AND PURGE HEATING SYSTEM

- Attach the hose to balance and purge hose connector or drain valve and run hose to nearest drain.
- Close the other side of the balance and purge valve or the shut off valve after the drain.
- Open first zone balance and purge or drain valve to let water flow out the hose. If zone valves are used, open the valves one at a time manually. (NOTE: You should check valve manufacturer's instruction prior to opening valves manually, so as not to damage the valve.)
- Manually operate fill valve regulator. When water runs out of the hose, while it's connected to the balance and purge valve or drain you will see a steady stream of water (without bubbles). Close balance and purge valve or drain to stop the water from flowing. Disconnect the hose and connect it to next zone to be purged.
- Repeat this procedure for additional zones (one at time).

CAUTION

For installations that incorporate standing iron radiation and systems with manual vents at the highest points: Follow the above section and, starting with the nearest manual vent, open until water flows out. Then close vent. Repeat procedure, working your way toward furthest air vent. It may be necessary to install a basket strainer in an older system where larger amounts of sediment may be present. Annual cleaning of the strainer may be necessary.

Upon completion, make sure that the fill valve is in automatic position and each zone balance and purge or shut off is in an open position and zone valves are positioned for automatic operation.

WARNING

Use only inhibited propylene glycol solutions, specially formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems. Glycol mixtures should not exceed 50%.

1. Glycol for hydronic applications includes inhibitors that prevent it from attacking metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level.
2. The glycol solution should be tested at least once a year and as recommended by the glycol manufacturer.
3. Anti-freeze solutions expand more than water. For example a 50% by volume solution expands 4.8% in volume for a temperature increase from 32° F to 180° F, while water expands 3% with the same temperature rise. Allowances must be made for this expansion in the system design.
4. A 30% mixture of glycol will result in 15% BTU output loss and a 5% increase in head against system circulator.
5. A 50% mixture of glycol will result in 30% BTU output loss and a 50% increase in head against system circulator.

CAUTION

It is highly recommended that you carefully follow the glycol manufacturer's concentrations, expansion requirements, and maintenance recommendations (pH additive breakdown, inhibitor reduction, etc.) You must carefully figure the additional system friction loss, as well as the reduction in heat transfer coefficients.

J. ZONING WITH ZONE VALVES

1. Connect heater to system as shown in 1A and 1B in Piping Details when zoning with zone valves. The primary/secondary piping shown ensures the heater loop will have sufficient flow. It also avoids applying the high head of the heater circulator to the zone valves.
2. Connect DHW (domestic hot water) piping to indirect storage water heater as shown.

K. ZONING WITH CIRCULATORS

1. Connect heater to system when circulator zoning as shown in 1C and 1D in Piping Details when zoning with circulators. The heater circulator cannot be used for a zone. It must supply only the heater loop. Install a separate circulator for each zone.
2. Connect DHW (domestic hot water) piping to indirect storage water heater as shown.

L. MULTIPLE HEATERS

1. Connect multiple heaters as shown in 1E and 1F in Piping Details.
2. All piping shown is reverse return to assure balanced flow through the connected heaters.
3. Each connected heater must have its own circulator pump to assure adequate flow.
4. Connect DHW (domestic hot water) piping to indirect storage water heater as shown.

M. PIPING DETAILS

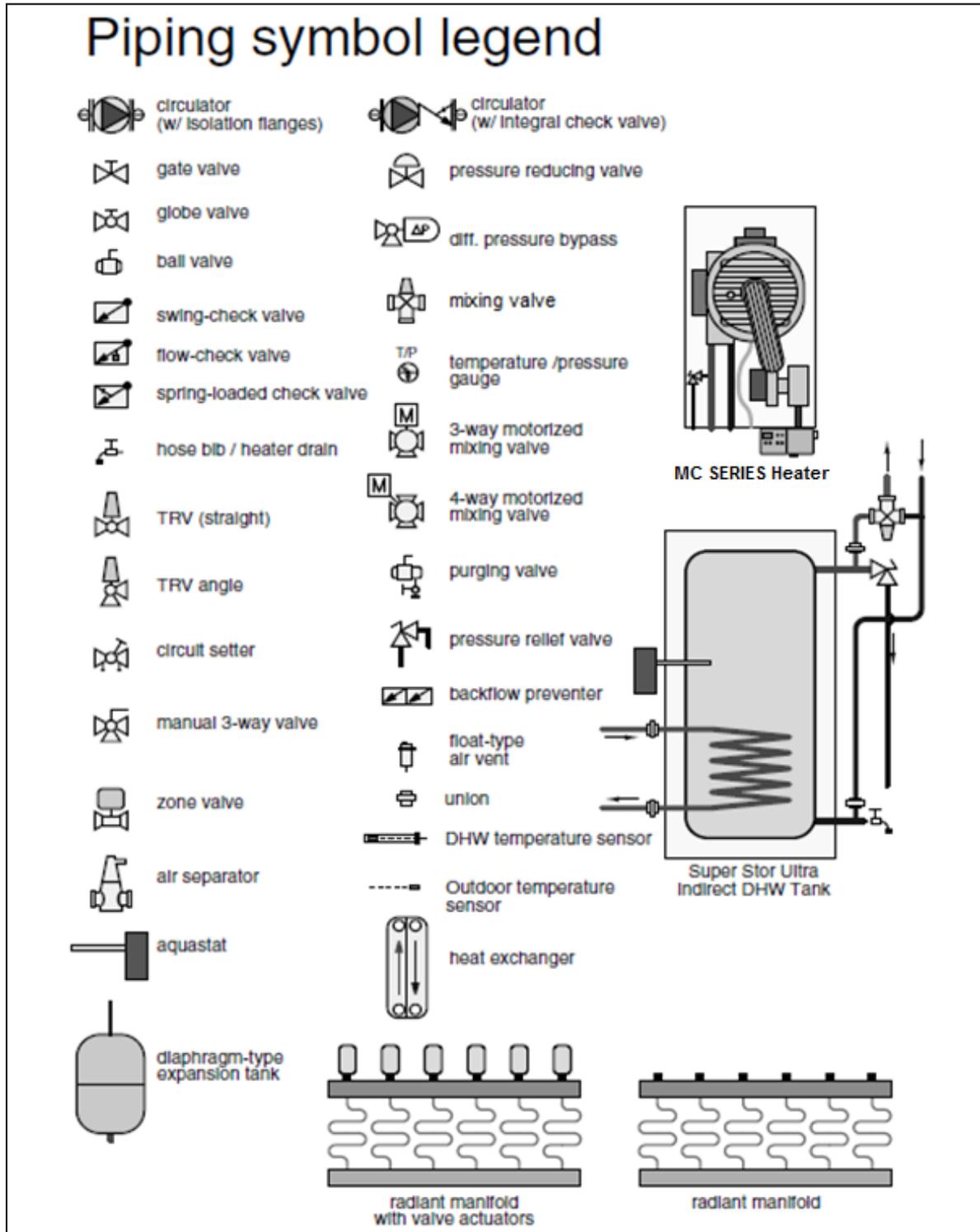


Figure 5

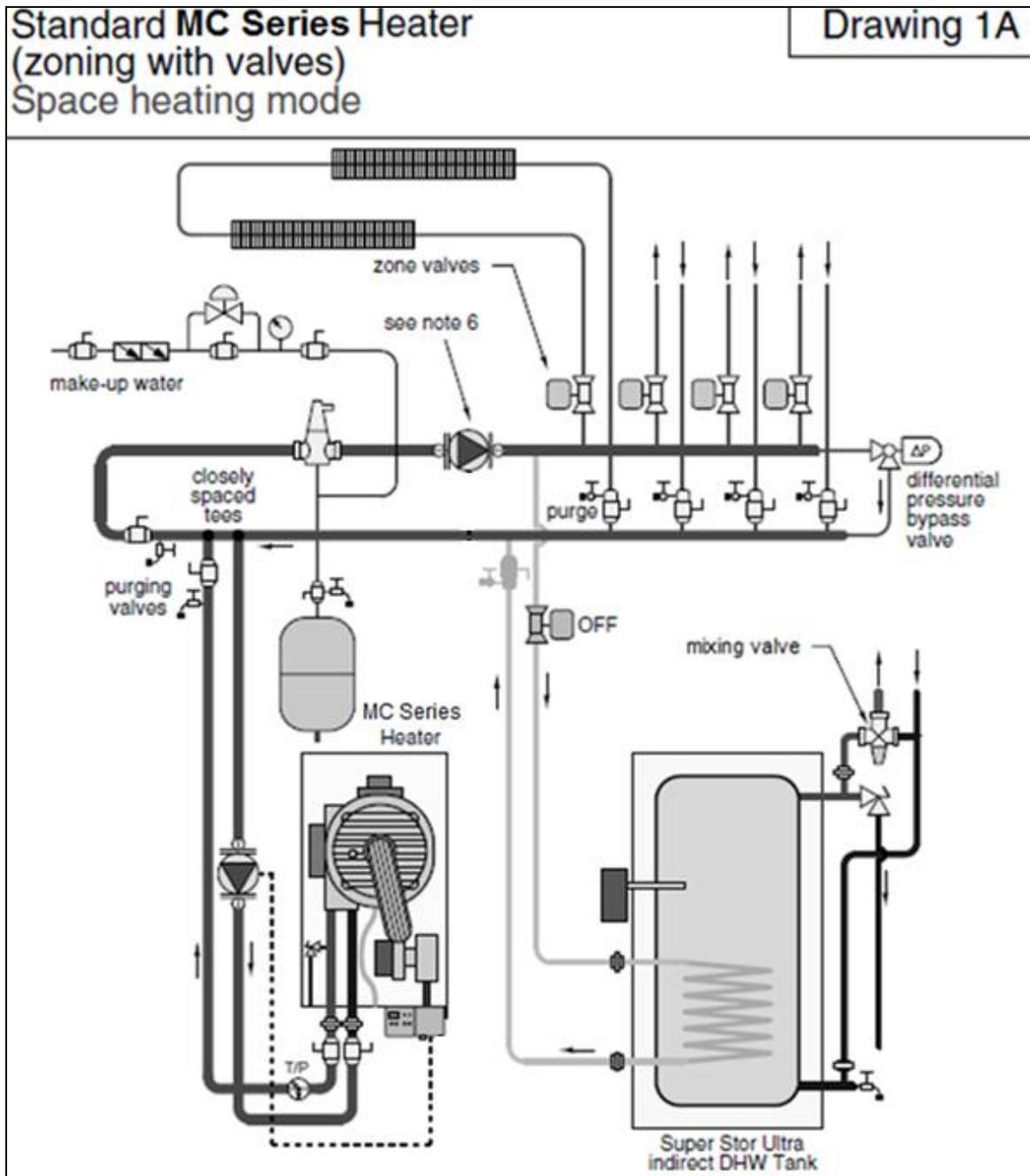


Figure 6

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

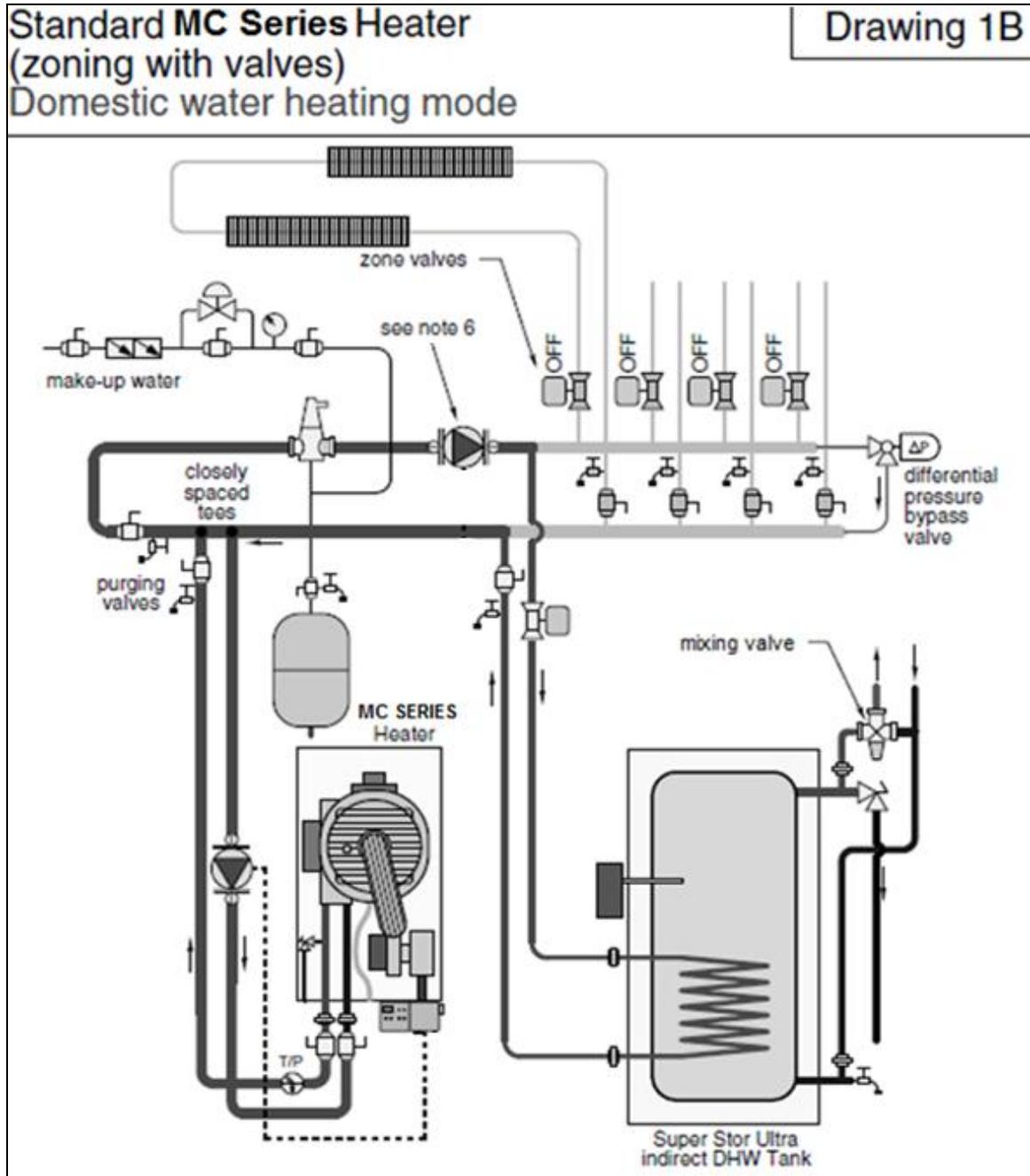


Figure 7

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

Standard MC Series Heater Preferred piping (zoning with circulators) Space heating mode

Drawing 1C

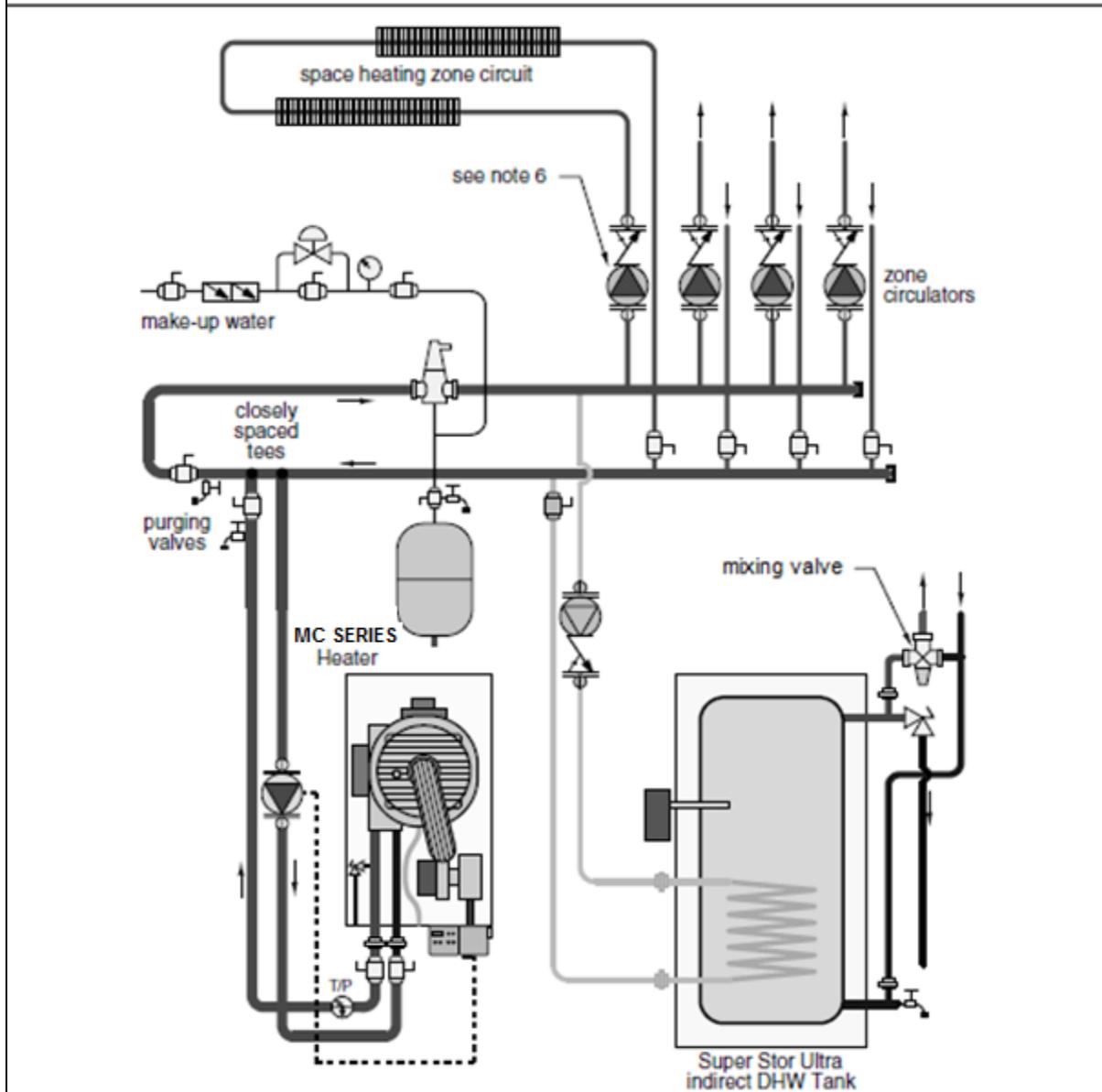


Figure 8

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

Standard MC Series Heater (zoning with circulators) Domestic water heating mode

Drawing 1D

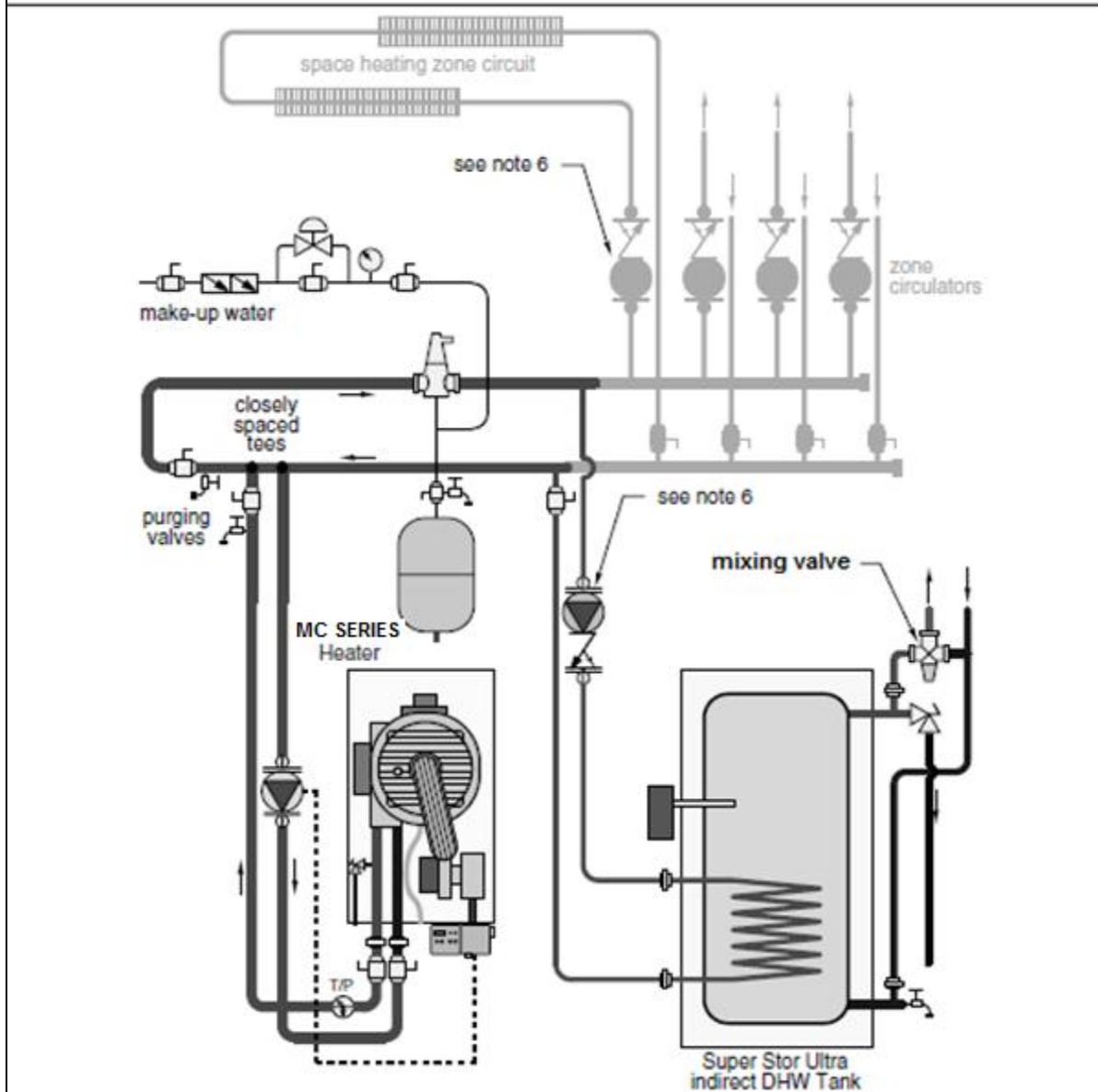


Figure 9

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

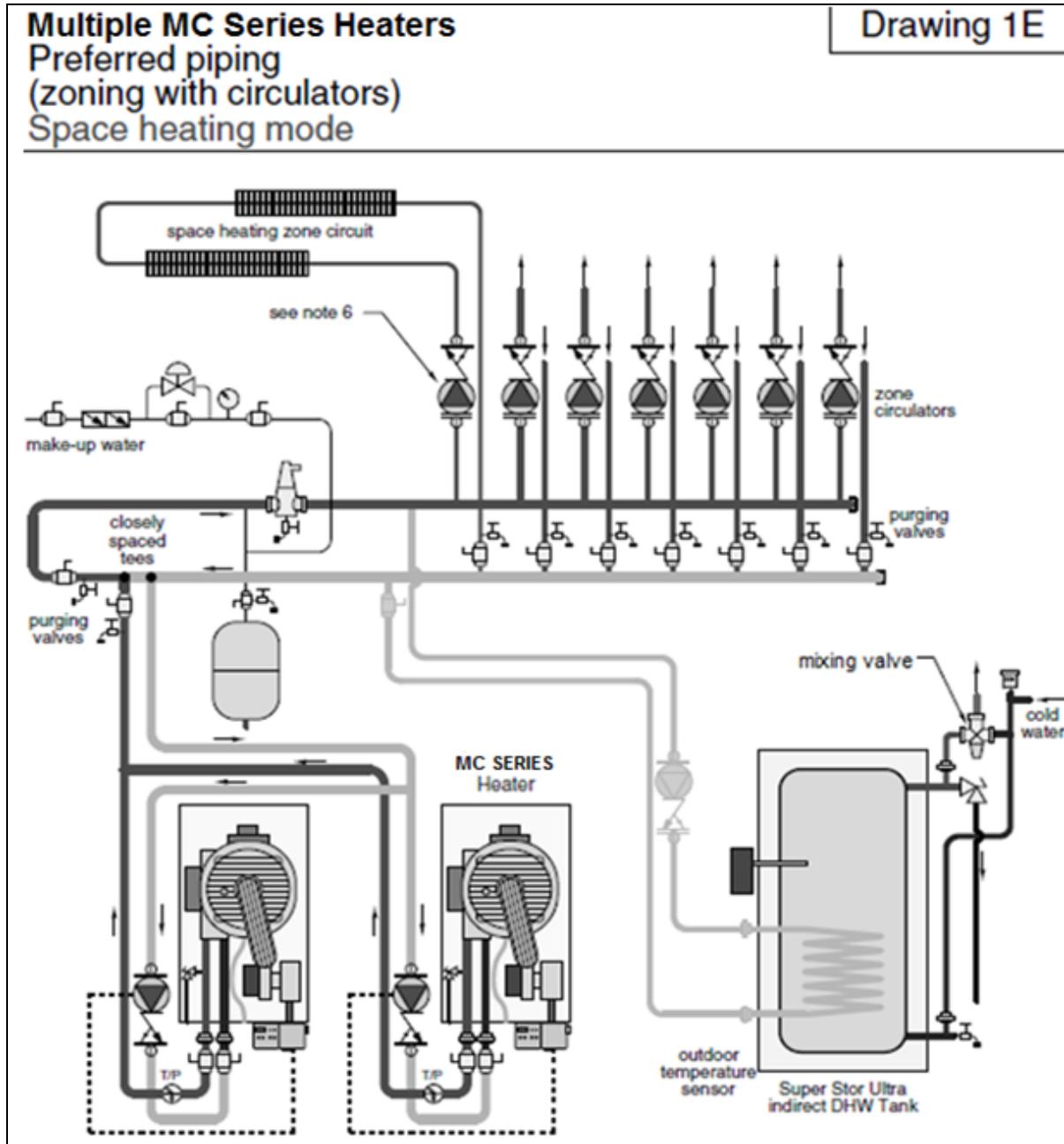


Figure 10

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

Multiple MC Series Heaters
Preferred piping
(zoning with circulators)
Domestic water heating mode

Drawing 1F

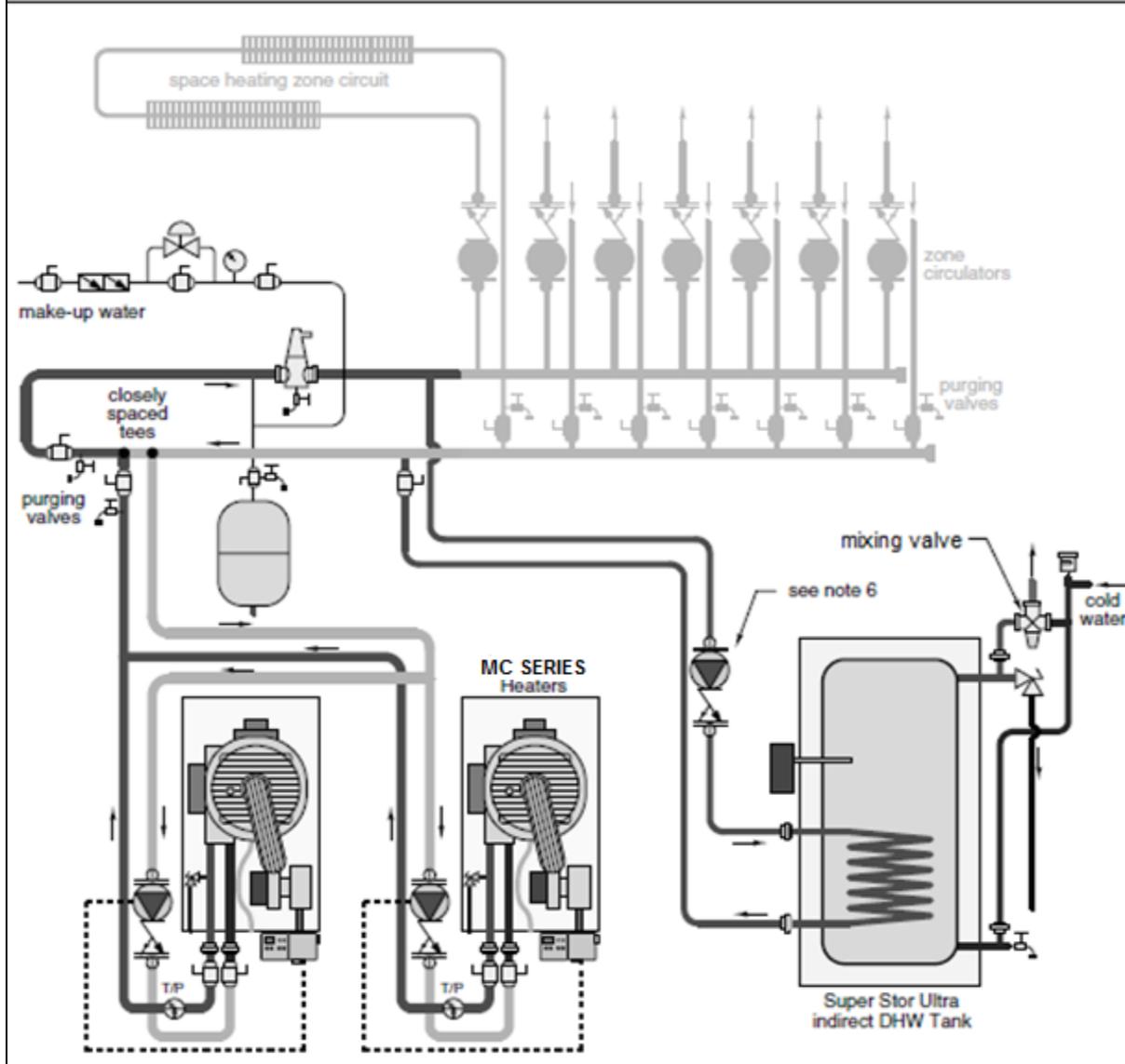


Figure 11

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

PART 6: PIPING WITH OPTIONAL VISION 1 SYSTEM (DHW PRIORITY WITH OUTDOOR RESET)

A. VISION 1 SYSTEM PIPING

It is important that the system piping is done correctly when using the Vision 1 System. Follow the piping diagrams 2A through 3G when piping your heater. All general piping practices should still be maintained.

B. ZONING WITH ZONE VALVES USING VISION 1

1. Connect the heater to the system as shown in piping details 2A through 2C.
2. Connect the DHW circulator (P2) directly to the heater as shown in the piping details. The heater circulator (P1) will shut down when there is a DHW demand.

C. ZONING WITH CIRCULATORS USING VISION 1

1. Connect the heater to the system as shown in piping details 3A through 3G.
2. Connect the DHW circulator (P2) directly to the heater as shown in the piping details. The heater circulator (P1) will shut down when there is a DHW demand.

D. PIPING DETAILS WITH THE VISION 1 SYSTEM

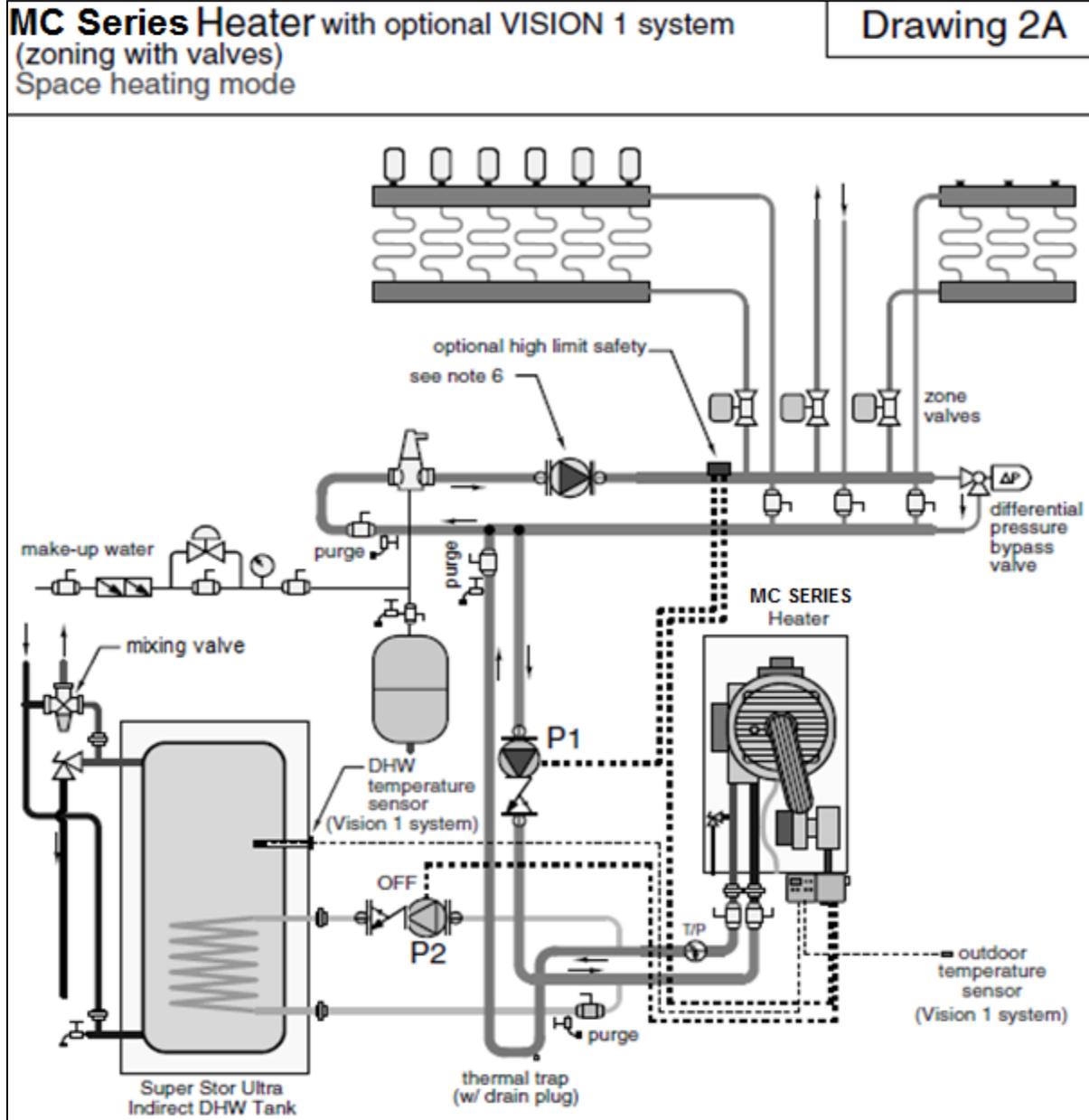


Figure 12

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

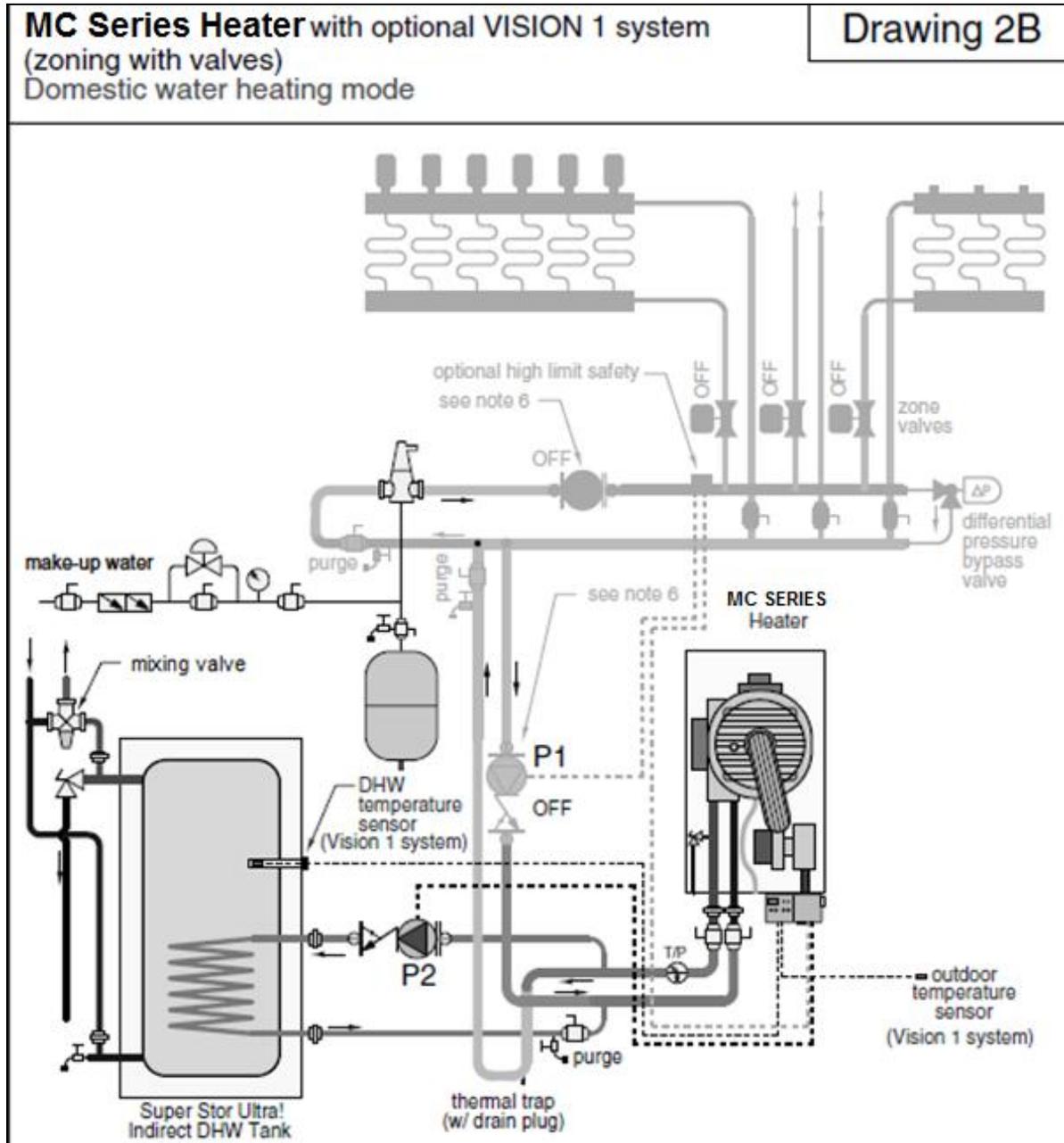


Figure 13

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

MC Series Heater with optional VISION 1 system
 (zoning with valves)
 Space heating mode (w/ submixing)

Drawing 2C

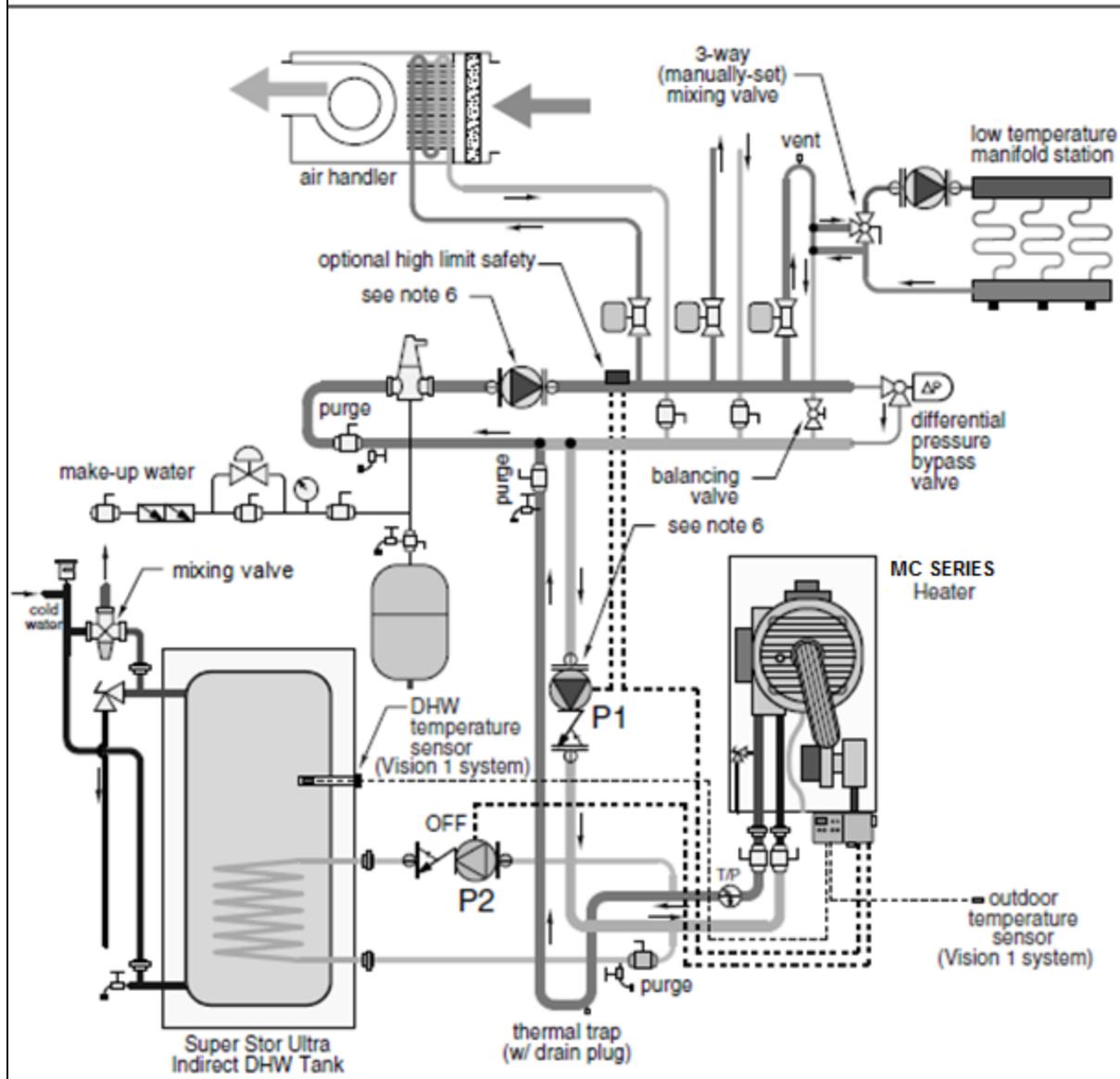


Figure 14

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

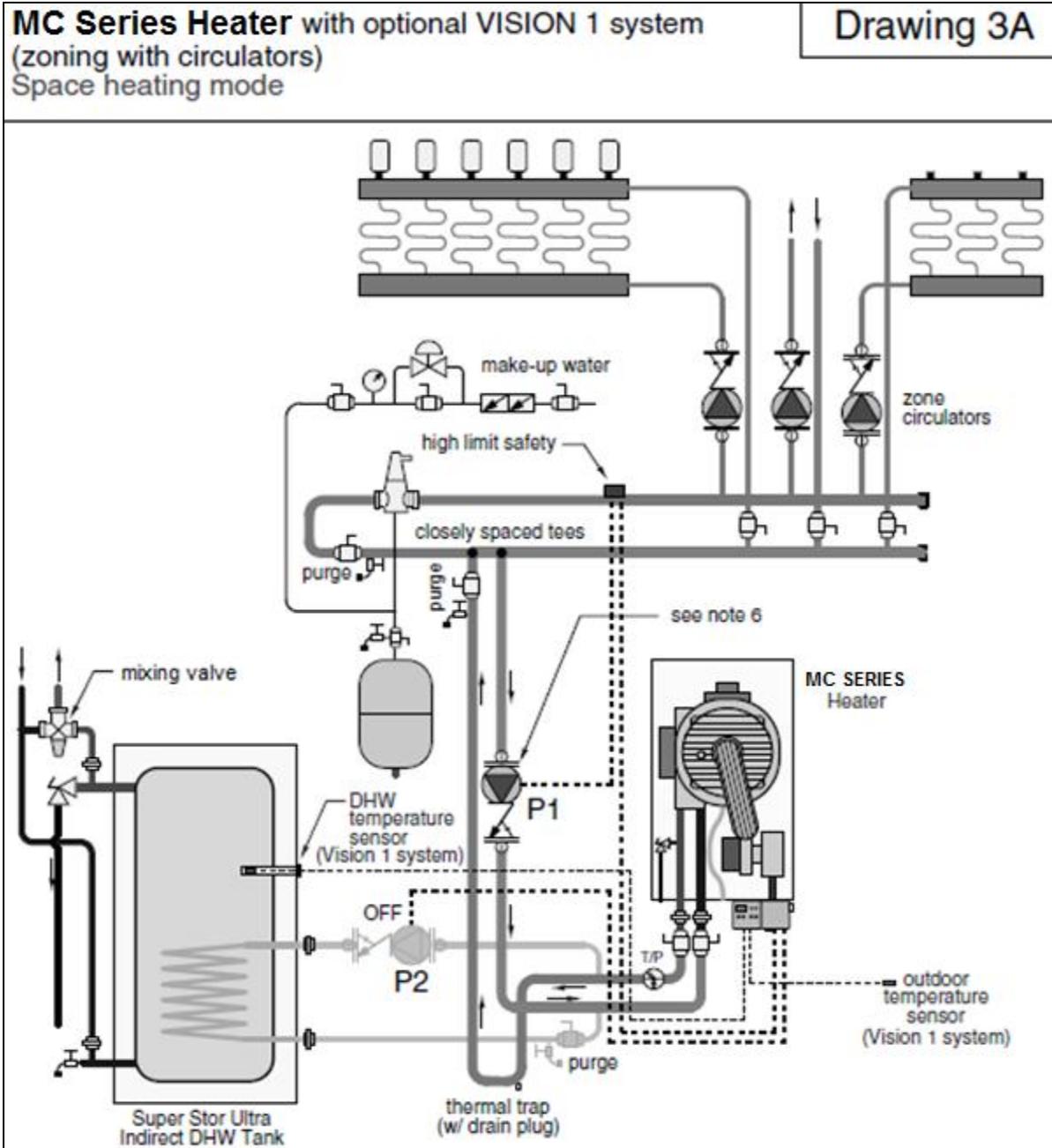


Figure 15

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

MC Series Heater with optional VISION 1 system
 (zoning with circulators)
 Domestic water heating mode

Drawing 3B

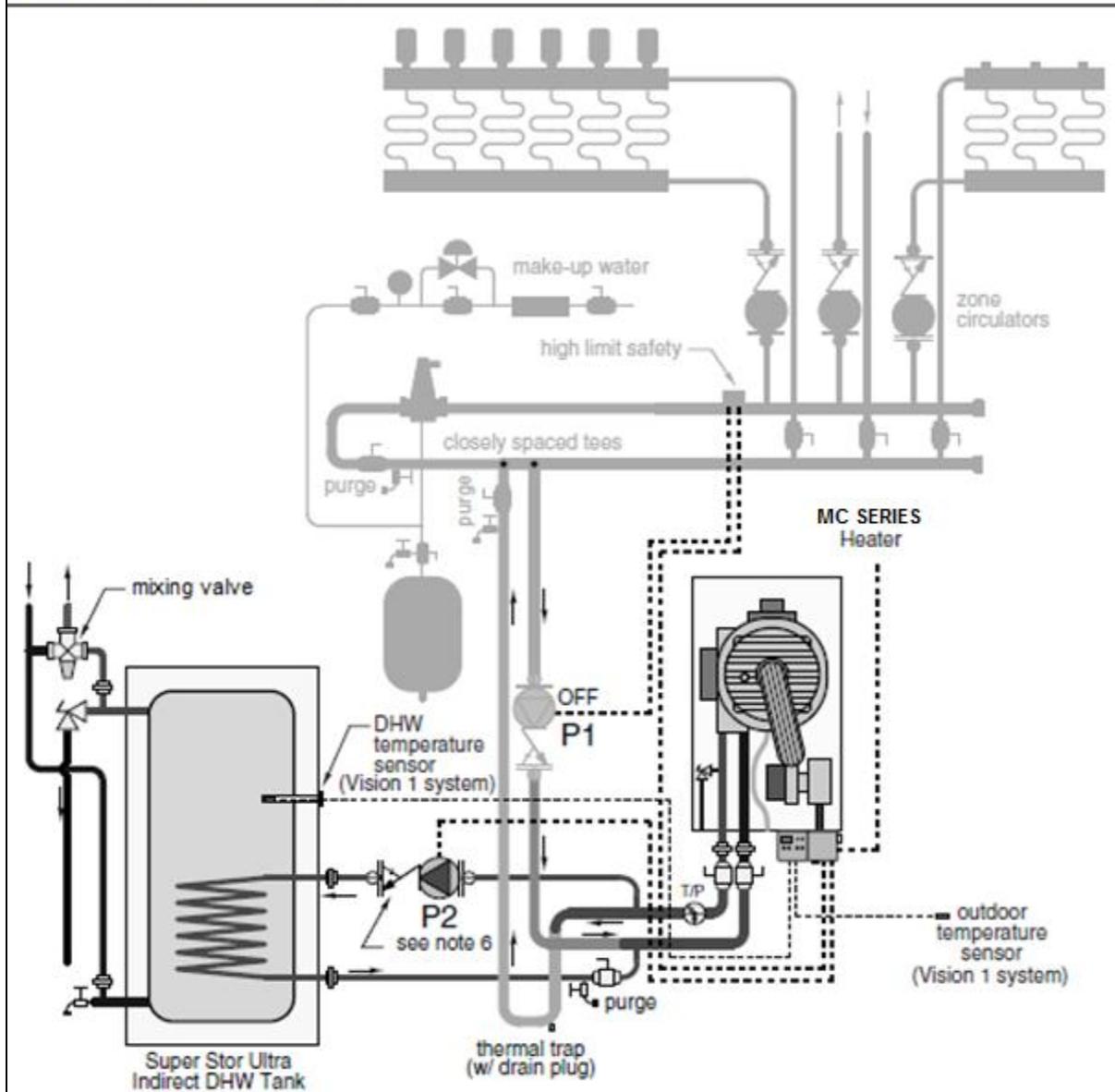


Figure 16

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

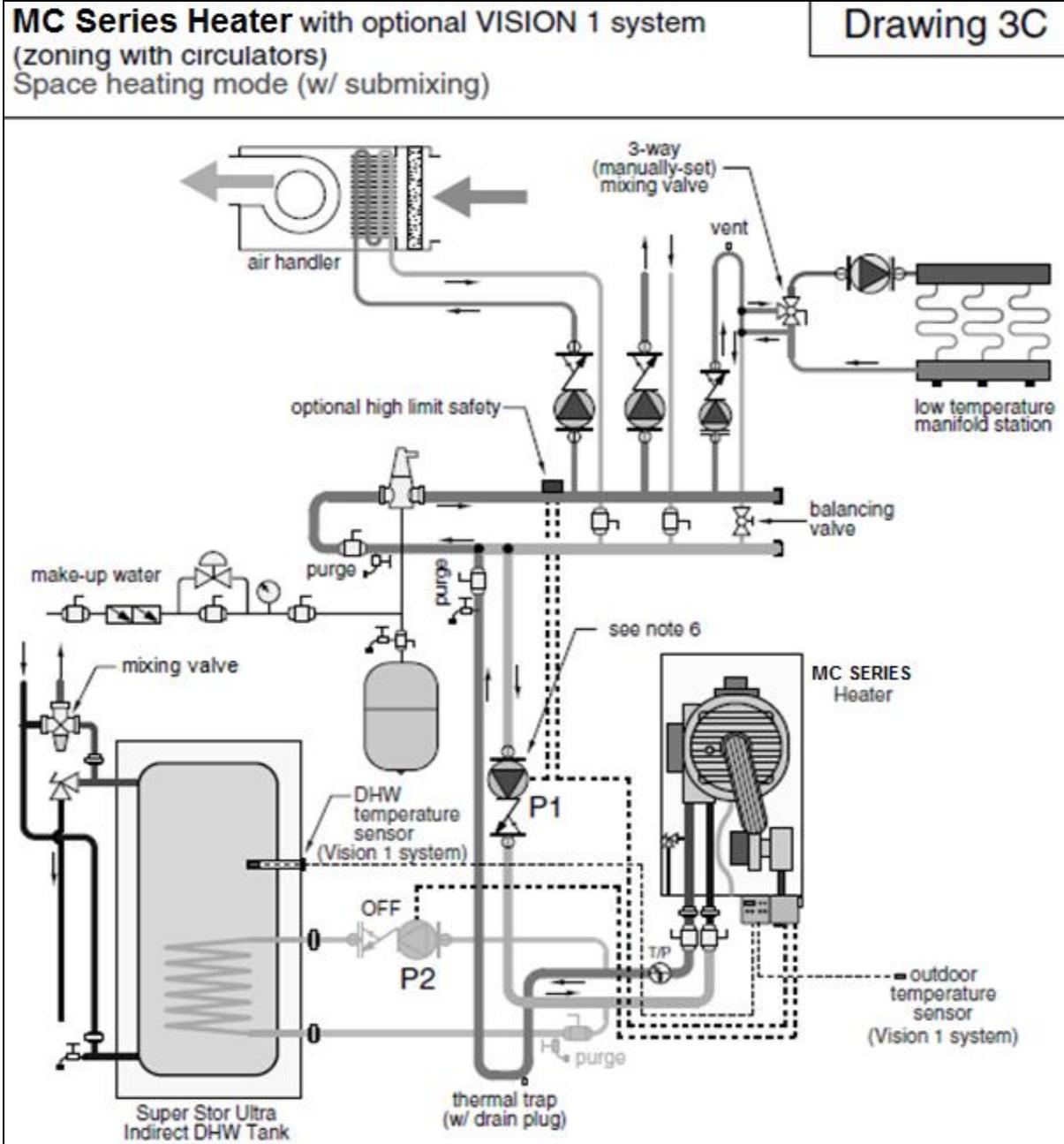


Figure 17

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

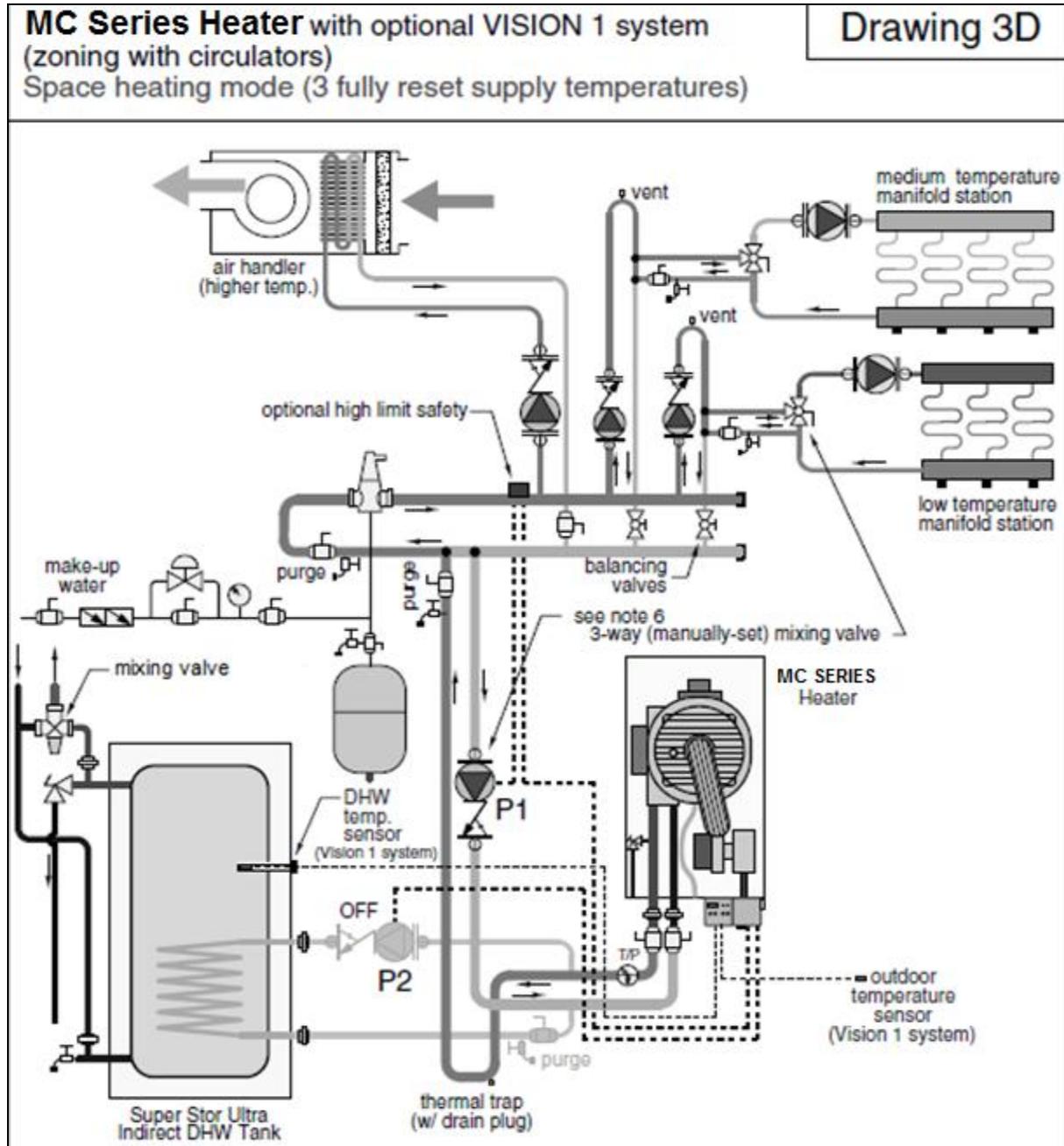


Figure 18

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
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6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

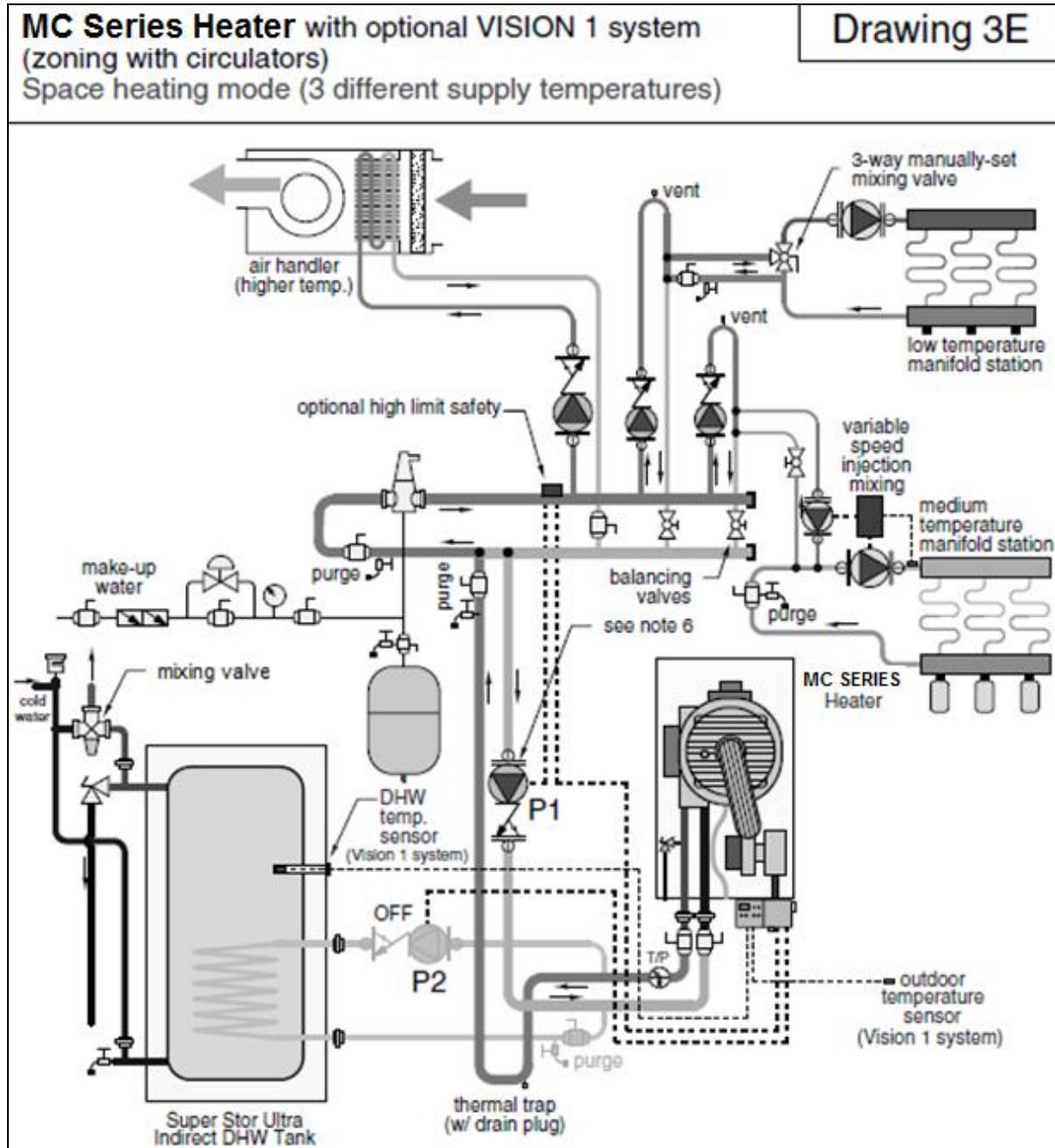


Figure 19

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
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8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

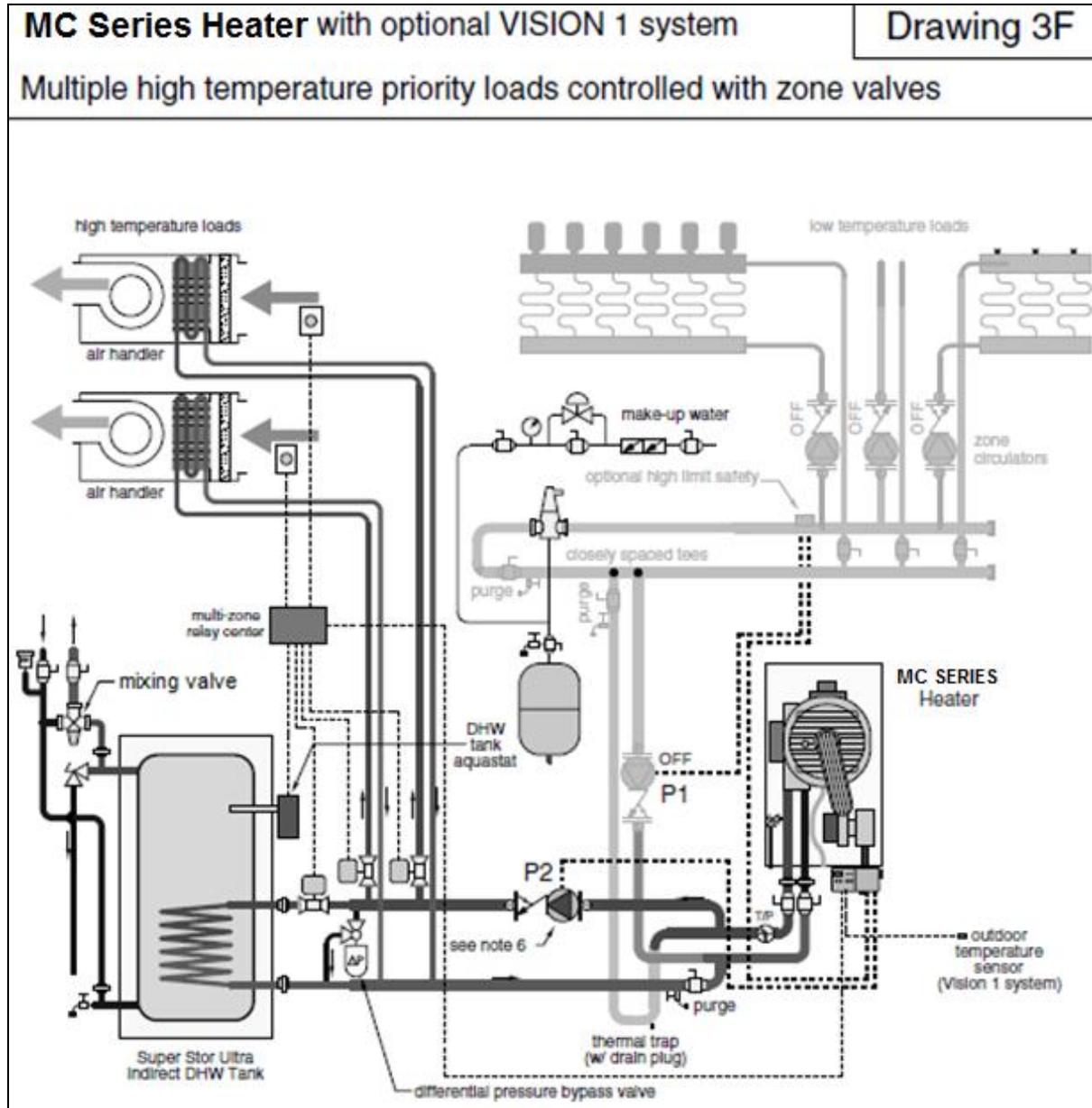


Figure 20

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

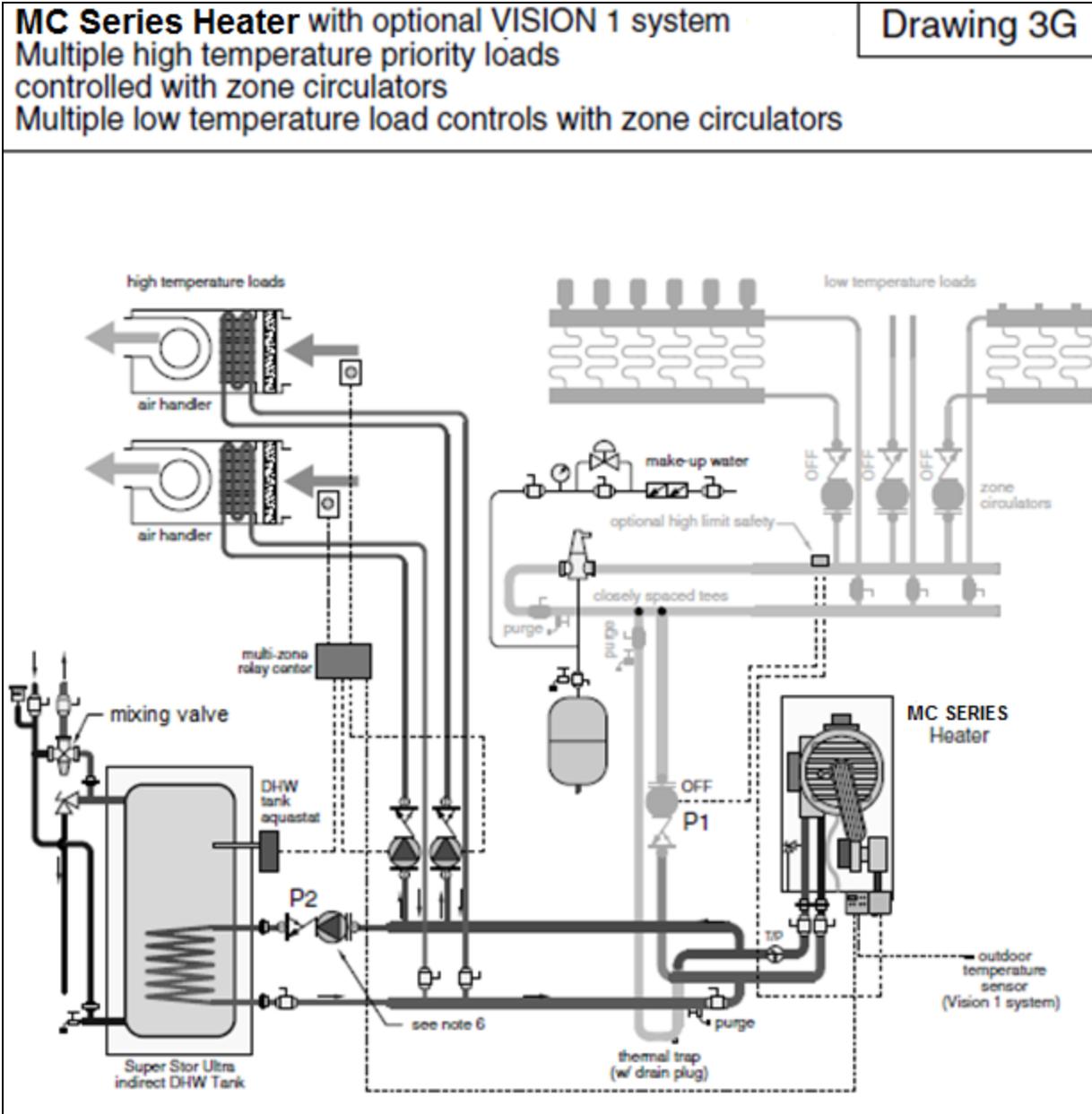


Figure 21

NOTES:

1. This drawing is meant to demonstrate system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting an indirect water heater is 1".
5. The **minimum** pipe size for connecting the unit is 1.25".
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with the circulator flanges as an alternative.
7. Optional Vision 1 system includes temperature sensors for DHW and outdoor air and must be purchased separately.
8. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
10. **Winterization:** When winterizing the unit, put a drain valve on both the supply and return between the union and the shut-off connection.

PART 7: VENTING, COMBUSTION AIR, AND CONDENSATE REMOVAL

DANGER

The heater must be vented as detailed in this Venting Section. Ensure exhaust and intake piping complies with these instructions regarding vent system. Inspect finished combustion air intake and exhaust piping thoroughly to ensure all joints are well secured, airtight, and comply with all applicable code requirements, as well as with the instructions provided in this manual. Failure to properly install the vent system will result in severe personal injury or death.

A. GENERAL

DANGER

This vent system will operate with a positive pressure in the pipe. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure.

Follow the venting instructions below carefully. Failure to do so will result in substantial property damage, severe personal injury, or death.

1. Install the water heater venting system in accordance with these instructions and with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, CAN/CGA B149, and/or applicable provisions of local building codes.
2. This water heater is a direct vent appliance and is listed as a Category IV appliance with Underwriters Laboratories, Inc. VENT AND INTAKE AIR VENT.
3. This water heater must be vented with materials, components, and systems listed and approved for Category IV appliances.

B. APPROVED MATERIALS FOR EXHAUST AND INTAKE AIR VENTS

APPROVED VENTING MATERIAL			
Item	Material	Standards for Installation in:	
		United States	Canada
Vent or air pipe and fittings	PVC schedule 40/80	ANSI/ASTM D1785	CPVC and PVC venting must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada, supplying vent material listed to ULC-S636.
	PVC-DWV	ANSI/ASTM D2665	
	CPVC schedule 40/80	ANSI/ASTM F441	
	Polypropylene	ULCS636	
Pipe cement/primer	PVC	ANSI/ASTM D2564	IPEX System 636 Cements & Primers
	CPVC	ANSI/ASTM F493	

DANGER

Do not use Foam Core Pipe in any portion of the exhaust piping from this water heater. Use of Foam Core Pipe will result in substantial property damage, severe personal injury, or death.

Table 3

C. EXHAUST AND INTAKE AIR VENT PIPE LOCATION

1. DETERMINE EXHAUST VENT LOCATION

- a. The vent piping for this heater is approved for zero clearance to combustable construction.
- b. See illustration within this section of clearances for location of exit terminals of direct-vent venting systems.
- c. This heater vent system shall terminate at least 3 feet (0.9 m) above any forced air intake located within 10 ft (3 m). Note: this does not apply to the combustion air intake of a direct-vent appliance.
- d. Provide a minimum of 1 foot distance from any door, operable window, or gravity intake into any building.
- e. Provide a minimum of 1 foot clearance from the bottom of the exhaust above the expected snow accumulation level. Snow removal may be necessary to maintain clearance.
- f. Provide 4 feet horizontal clearance from electrical meters, gas meters, gas regulators, relief equipment, exhaust fans and inlets. In no case shall the exit terminal be above or below the aforementioned equipment unless the 4 foot horizontal distance is maintained.
- g. When adjacent to a public walkway, locate exit terminal at least 7 feet above grade.
- h. Do not locate the exhaust directly under roof overhangs to prevent icicles from forming.
- i. Provide 4 feet clearance from the inside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.

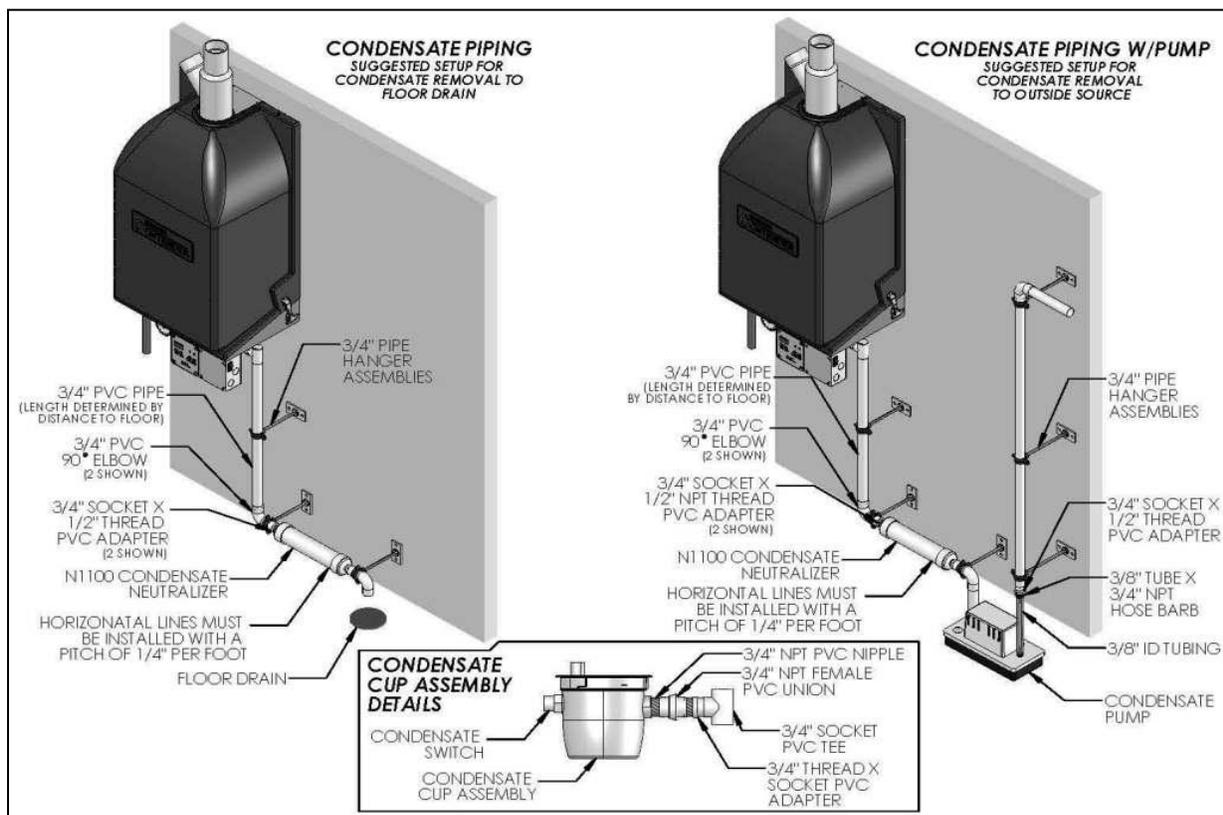


Figure 22 – LP-171-R

2. DETERMINE AIR INTAKE VENT LOCATION

- a. Provide 1 foot clearance from the bottom of the intake air vent and the level of maximum snow accumulation. Snow removal may be necessary to maintain clearances.
- b. Do not locate intake air vent in a parking area where machinery may damage the pipe.
- c. When venting with a two pipe system, maximum distance between intake air vent and exhaust vent is 6 feet (1.8 m). Minimum distance between exhaust vent and intake air vent on single

heater is 10" (0.255 m) center-to-center. Minimum distance between exhaust vents and intake air vents on multiple heaters is 10" (0.255 m) center-to-center.

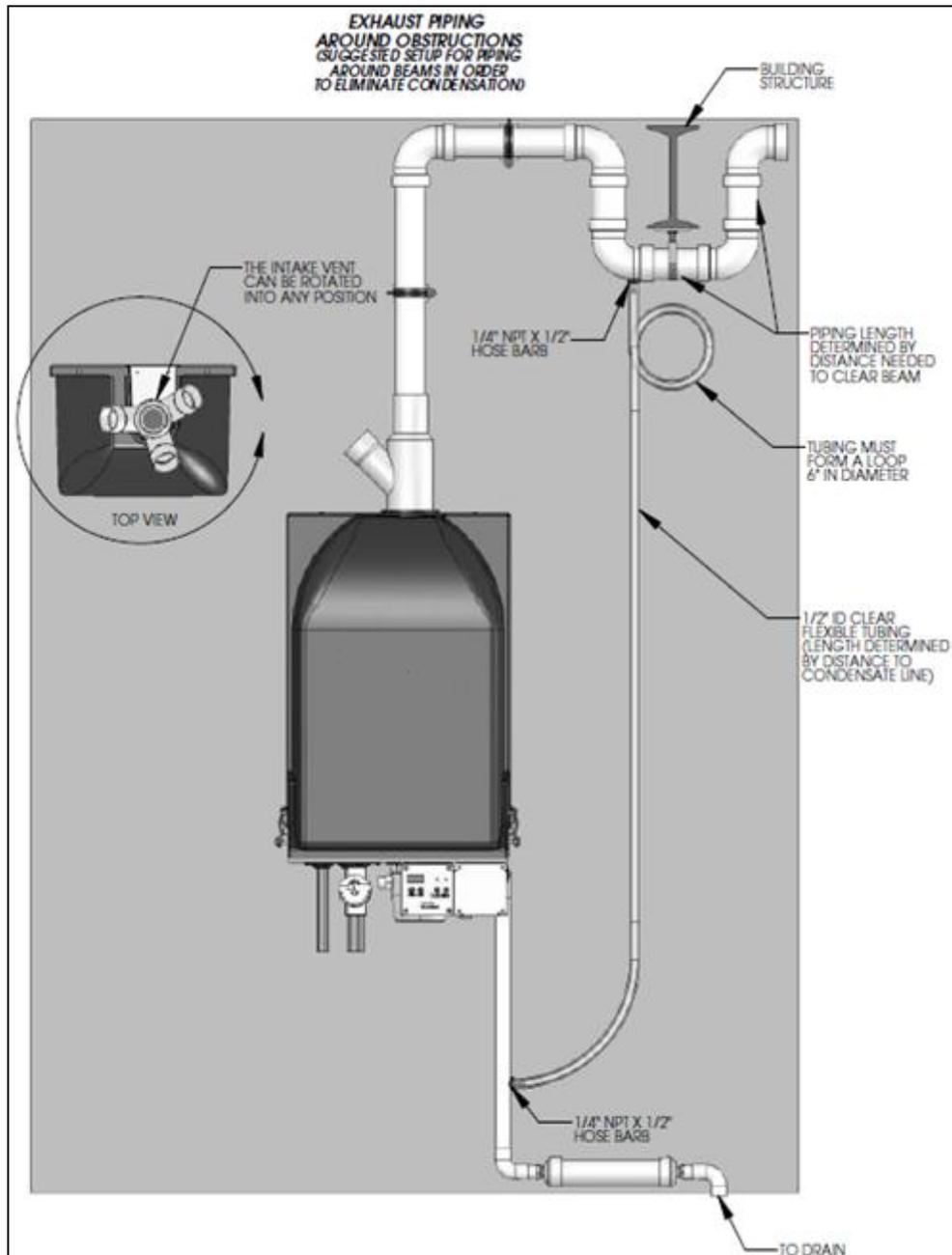


Figure 23 – LP-171-S

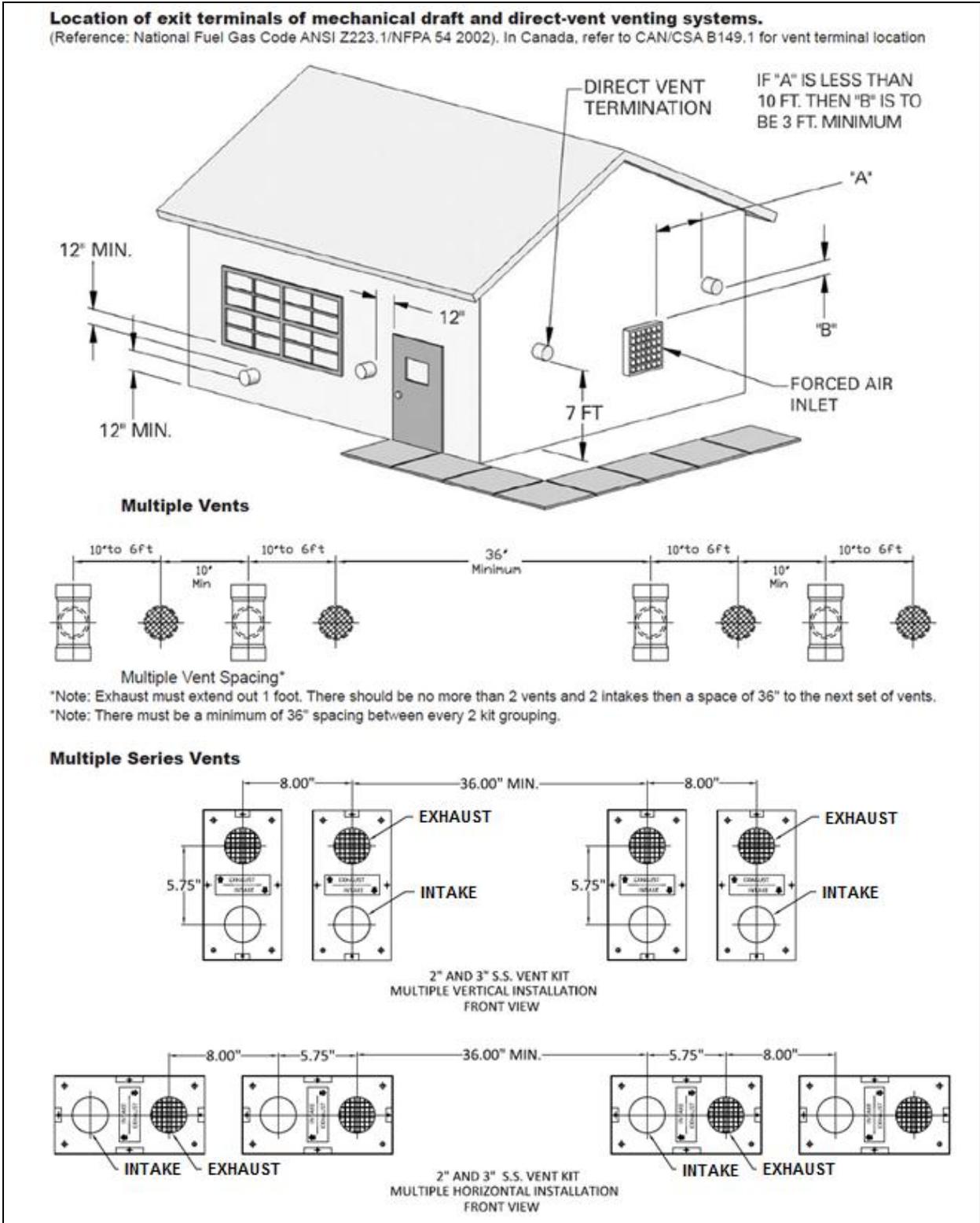


Figure 24

D. ROTATING THE FLUE ADAPTER

The flue adapter on the top of your heater can be rotated 180 degrees to position the air inlet in the optimum location for most venting and air inlet needs. The flue adapter **MUST** be positioned before the exhaust flue is connected to the adapter.

NOTE: Once the exhaust flue is glued to the flue adapter it can no longer be moved.

NOTE: DO NOT glue optional polypropylene vent system.

To rotate the flue adapter:

1. Remove the black heater cover.
2. Inspect the area where the white flue adapter mates to the black plastic heat exchanger. You will notice two red wires and a plastic hose connected to the flue adapter. These will limit the rotation range of the flue adapter.
3. Grasp the entire white PVC flue adapter and rotate it in the direction that will cause the least strain on the hose and red wires until the air inlet is in the desired orientation. After rotation is complete, push downward on the flue adapter to be sure it is completely seated in the black plastic module.
4. Check again to make sure the red wires and clear plastic hose connected to the flue adapter are properly connected and routed.

E. EXHAUST AND INTAKE AIR VENT SIZING

1. The exhaust and intake vent size is 2" or greater.
2. The total combined equivalent length of exhaust vent and intake air pipe should **not exceed 85'** for 2" and 125' for 3".
 - a. The equivalent length of elbows, tees, and other fittings are listed in the Friction Loss Table below:

FRICION LOSS EQUIVALENT IN PIPING AND FITTINGS		
FITTINGS OR PIPING	EQUIVALENT FEET	
	2"	3"
90 DEGREE ELBOW*	5'	5'
45 DEGREE ELBOW	3'	3'
COUPLING	0'	0'
AIR INLET TEE	0'	0'
STRAIGHT PIPE	1'	1'
CONCENTRIC VENT KIT	3'	3'
V500 2' VENT KIT	1'	N/A
V1000 3' VENT KIT	N/A	1'

Table 4 - *Friction loss for long radius elbow is 1 foot less. NOTE: Consult Polypropylene venting instructions for friction loss and pressure drop equivalents.

- b. For example: If the exhaust vent has two 90° elbows and 10 feet of PVC pipe we will calculate:
Exhaust Vent Pipe Equivalent Length = (2 x 5) + 10 = 20 feet.

Further, if the intake air vent pipe has two 90° elbows, one 45° elbow and 10 feet of PVC pipe, the following calculation applies:

Intake Air Vent Pipe Equivalent Length = (2 x 5) + 3 + 10 = 23 feet.

Finally, if a concentric vent kit is used we find:

Total Combined Equivalent Length = 20 + 23 + 3 = 46 feet.

Therefore, the total combined equivalent length is 46 feet which is well below the maximum of 85 feet.

c. The intake air vent pipe and the exhaust vent are intended to penetrate the same wall or roof of the building.

d. Effort should be made to keep a minimum difference in equivalent length between the intake air vent pipe and the exhaust vent.

3. The minimum combined equivalent length is 16 equivalent feet.

4. The maximum combined equivalent length can be extended by increasing the diameter of both exhaust vent and intake air vent pipe equally. However, the transitions should begin a minimum of 15 equivalent feet from the heater.

a. Transitions should always be made in vertical sections of pipe to prevent the condensate from pooling in the vent pipe.

b. Use a 3" x 2" reducing coupling to transition from the 2" connections to a 3" vent.

c. The maximum equivalent length for the increased diameter vent pipes is 125 feet.

d. If the transition occurs at a distance greater than 15 equivalent feet from the heater, the maximum equivalent length will be reduced. See Table 5. The standard vent pipe is 2".

TRANSITION POINT (FT. FROM HEATER)	TEL OF STANDARD 2" VENT PIPE (FT.)	TEL OF OVERSIZED 2", 3", OR 4" VENT PIPE (FT.)	MAXIMUM TEL OF ALL VENT PIPE (FT.)
15	30	95	125
20	40	77-1/2	117-1/2
25	50	60-1/2	110-1/2
30	60	43	103
35	70	26	96
40	80	8-1/2	88-1/2
NONE	85	0	85

Table 5

F. EXHAUST VENT AND INTAKE AIR PIPE INSTALLATION

1. The 2" exhaust vent connection is located on the top, right side of the unit, and the intake is on the top left side. Use only solid PVC or CPVC pipe, or a Polypropylene vent system approved for use with Category IV appliances. FOAM CORE PIPING IS NOT APPROVED.

⚠ WARNING

All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into living space.

2. Remove all burrs and debris from joints and fittings.

3. When using PVC or CPVC pipe, all joints must be properly cleaned, primed, and cemented. Use only cement and primer approved for use with the pipe material. Cement must conform to ASTM D2564 for PVC and ASTM F493 for CPVC pipe. **NOTE: DO NOT CEMENT POLYPROPYLENE PIPE.**

4. Horizontal lengths of exhaust vent must slope back towards the water heater not less than ¼" per foot to allow condensate to drain from the vent pipe.

5. All piping must be fully supported. Use pipe hangers at a minimum of 4 foot intervals to prevent sagging of the pipe where condensate may form.
6. Do not use the heater to support any piping.
7. A screened straight coupling is provided with the heater for use as an outside exhaust termination.
8. A screened inlet air tee is provided with the heater to be used as an outside intake termination.
9. The following information on Table 6 lists optional intake air/exhaust vent terminations available from HTP.

DESCRIPTION	STOCK CODE
2" PVC CONCENTRIC VENT TERMINATION KIT	KGAVT0501CVT
3" PVC CONCENTRIC VENT TERMINATION KIT	KGAVT0601CVT
2" STAINLESS STEEL VENT TERMINATION KIT	V500
3" STAINLESS STEEL VENT TERMINATION KIT	V1000
4" STAINLESS STEEL VENT TERMINATION KIT	V2000
3" POLYPRO VENT KIT	8400P-001

Table 6

G. CONDENSATE REMOVAL SYSTEM

This condensing high efficiency appliance has a condensate removal system. Condensate is water vapor derived from combustion products, similar to an automobile when it is initially started. It is very important that the condensate line is sloped down away from the heater and to a suitable drain.

If the heater condensate outlet is lower than the drain, you must use a condensate removal pump (kit p/n 554200 available from HTP). If required by local authorities, a condensate filter of lime crystals, marble, or phosphate chips will neutralize slightly acidic condensate. This can be installed in the field and purchased from HTP (p/n N1100).

CAUTION

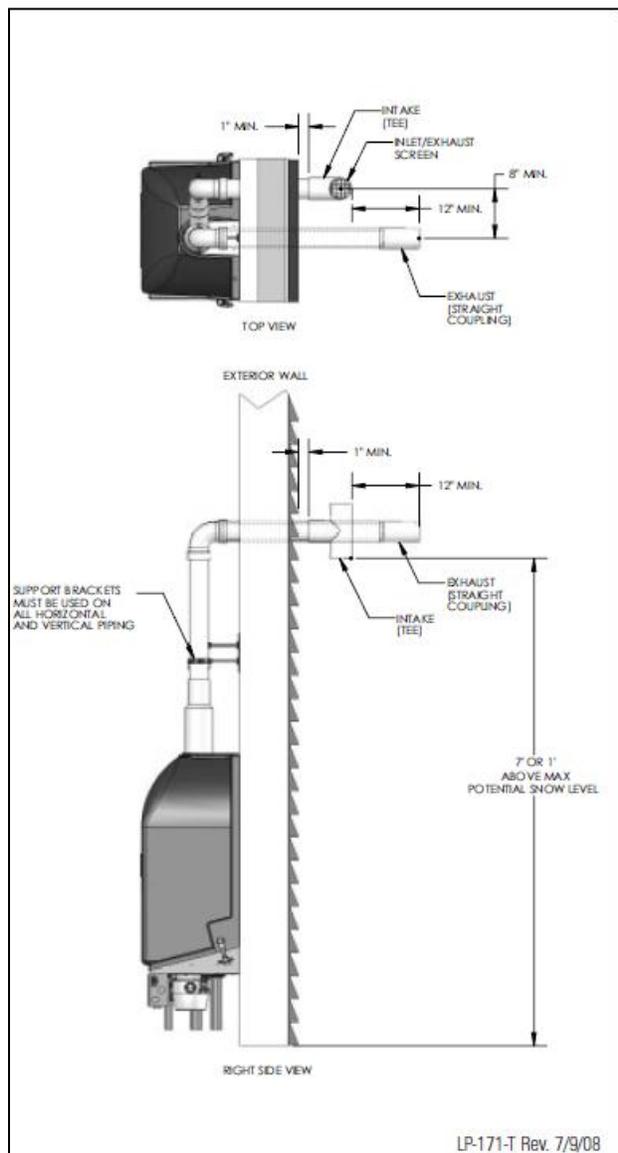
The condensate line must remain unobstructed. If allowed to freeze in the line or obstructed in any other manner, condensate can exit from the heater tee, resulting in potential water damage to property.

When installing a condensate pump, select one approved for use with condensing heaters and furnaces. The condensate pump should have an overflow switch to prevent property damage from spillage.

Condensate from the heater will be slightly acidic (pH from 3.2 to 4.5). Install a neutralizing filter if required by local codes.

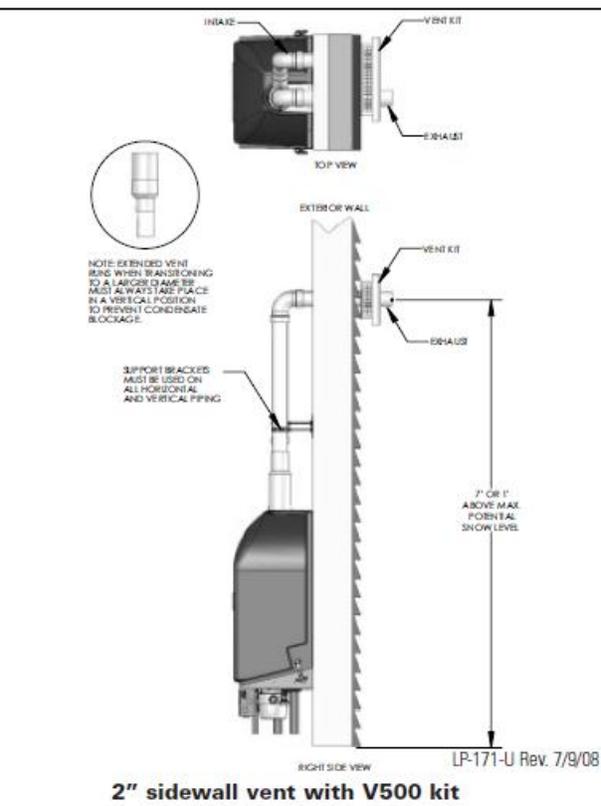
Plastic tubing must be the only material used for the condensate line. Steel, brass, copper or other materials will be subject to corrosion or deterioration. A second vent may be necessary to prevent a condensate line vacuum lock if a long horizontal run is used. An increase in condensate line diameter may be necessary to allow condensate to drain properly. Support of the condensate line may be necessary to avoid blockage of the condensate flow.

H. DIAGRAMS FOR SIDEWALL VENTING

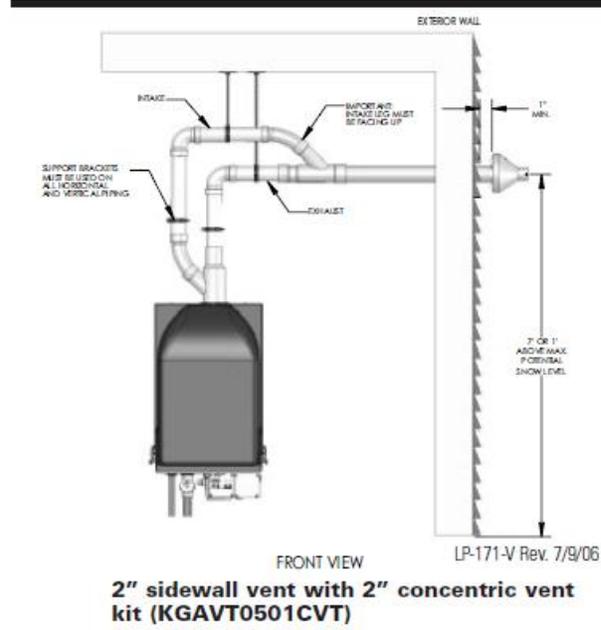


2" sidewall vent with tee (intake) and coupling (exhaust)

****Important Note:** All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of a 1/4" per foot back to the heater (to allow for drainage of condensate).



2" sidewall vent with V500 kit



2" sidewall vent with 2" concentric vent kit (KGAVT0501CVT)

NOTE: When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The heater venting must be readily accessible for visual inspection for the first three feet from the heater.

Figure 25 - Venting

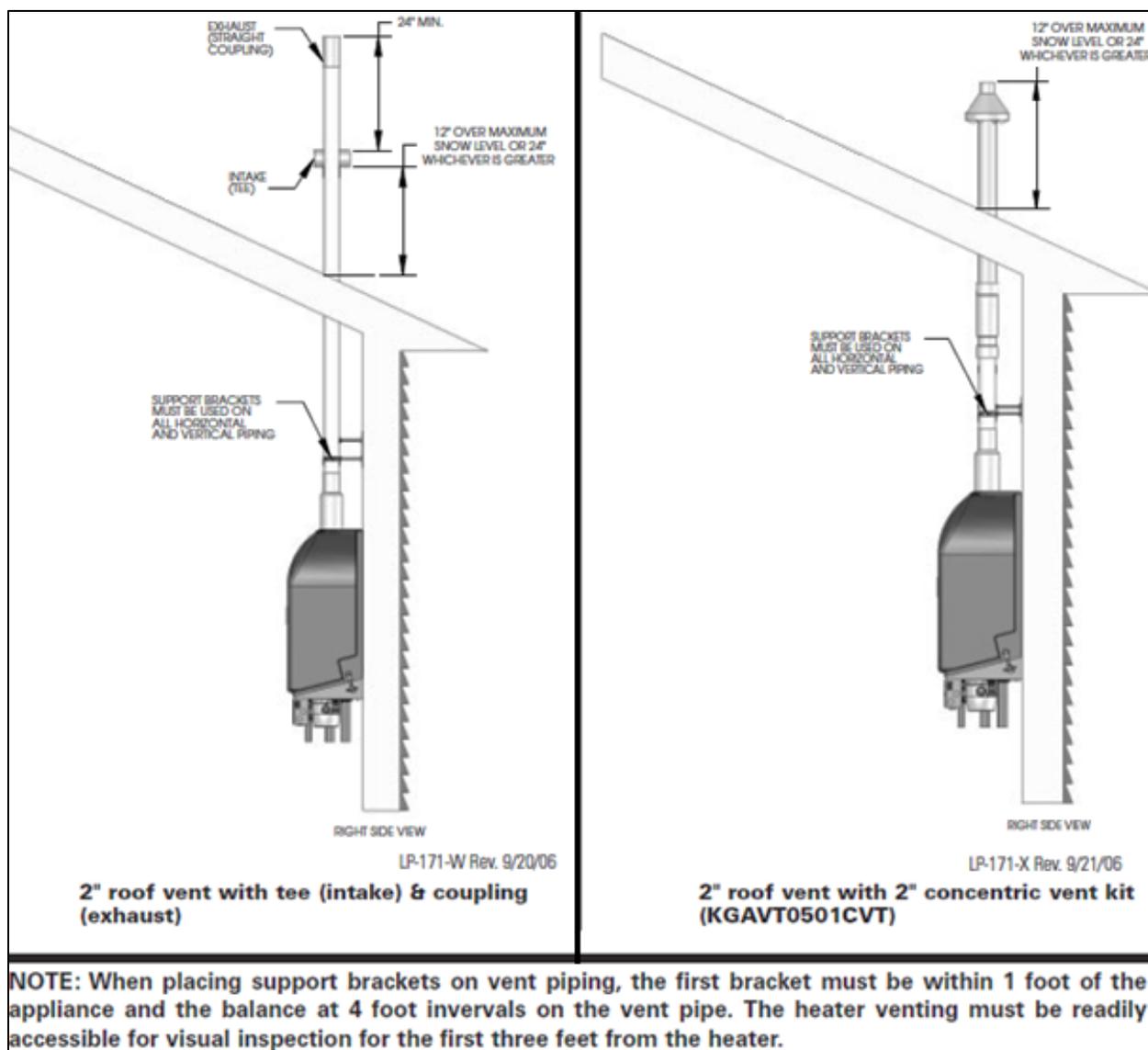


Figure 26 – Venting

PART 8: GAS PIPING

⚠ WARNING

Failure to follow all precautions could result in fire, explosion, severe injury or death!

Connect the gas supply to the system following state and local plumbing codes. Use the supplied ball valve at the inlet to the system. Make sure the gas supply line fits as shown in Figure 27.

CAUTION

Use a pipe wrench to prevent the gas inlet from twisting. Leave the gas valve off until the heater is filled with water and completely purged of air.

The gas supply shall have a maximum inlet pressure of less than 14" water column (350 mm), ½ pound pressure (3.5 kPa), and a minimum of 3.5" water column. The entire piping system, gas meter and regulator must be sized properly to prevent pressure drop greater than 0.5" WC as stated in the National Fuel Gas Code. This information is listed on the rating plate.

It is very important that you are connected to the type of gas as noted on the rating plate: "LP" for liquefied petroleum, propane gas, or "Nat" for natural or city gas. All gas connections must be approved by the local gas supplier or utility, in addition to the governing authority, prior to turning the gas supply on.

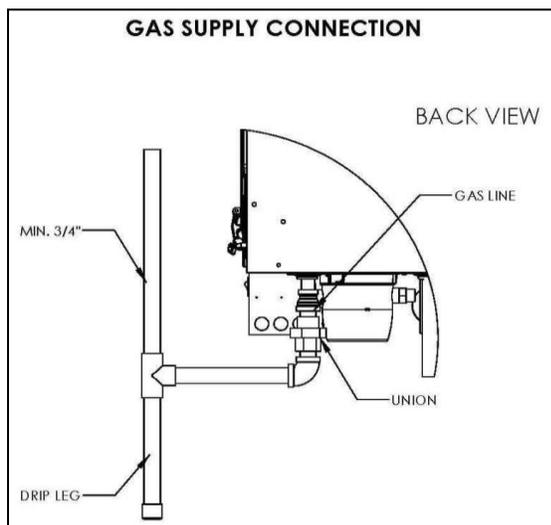


Figure 27 – LP-171-BB

Do not remove the adaptor in Figure 27! It is mandatory that this fitting is used for connection to a field fabricated drip leg per the National Fuel Gas Code. You must ensure that the entire gas line to the connection at the heater is no smaller than ¾".

Once all inspections have been performed, the piping must be leak tested. If the leak test requirement is a higher test pressure than the maximum gas inlet pressure, you must isolate the heater from the gas line to continue leak testing. To do this, you must turn off the factory and field-installed gas cocks. This will minimize the possibility of damaging the gas valve. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" water column, the gas valve must be replaced. Never use an open flame (match, lighter, etc.) to check gas connections.

A. GAS TABLE

Refer to the table below to size the supply piping to minimize pressure drop between meter or regulator and unit.

Maximum capacity of pipe in cubic feet of gas per hour for gas pressures of .5 psi or less and a pressure drop of .3 inch water column.

Nominal Iron Pipe Size (Inches)	Internal Diameter (Inches)	Length of Pipe (Feet)														BTU's Per Hour x 1,000
		10	20	30	40	50	60	70	80	90	100	125	150	175	200	
¾	.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55	
1	1.049	520	350	285	245	215	195	180	170	160	150	130	120	110	100	
1 ¼	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210	
1 ½	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320	

Table 7

It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on the pipe to indicate a leak is present. The gas piping must be sized for proper flow and length of pipe to avoid excessive pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1" WC, the meter, regulator or gas line is undersized or in need of service. You can attach a manometer to the incoming gas drip leg by removing the cap. The gas pressure must remain between 3.5" WC and 14" WC during stand-by (static) mode and while in operating (dynamic) mode at full output.

If an in-line regulator is used, it must be a minimum of 10 feet from the heater. It is very important that the gas line is properly purged by the gas supplier or utility. Failure to properly purge the lines or improper line sizing will result in ignition failure. This problem is especially noticeable in NEW LP installations and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines. The gas valve must not be replaced with a conventional gas valve under any circumstances. As an additional safety feature, the gas valve in this appliance has a flanged connection to the swirl plate and blower.

B. GAS VALVE

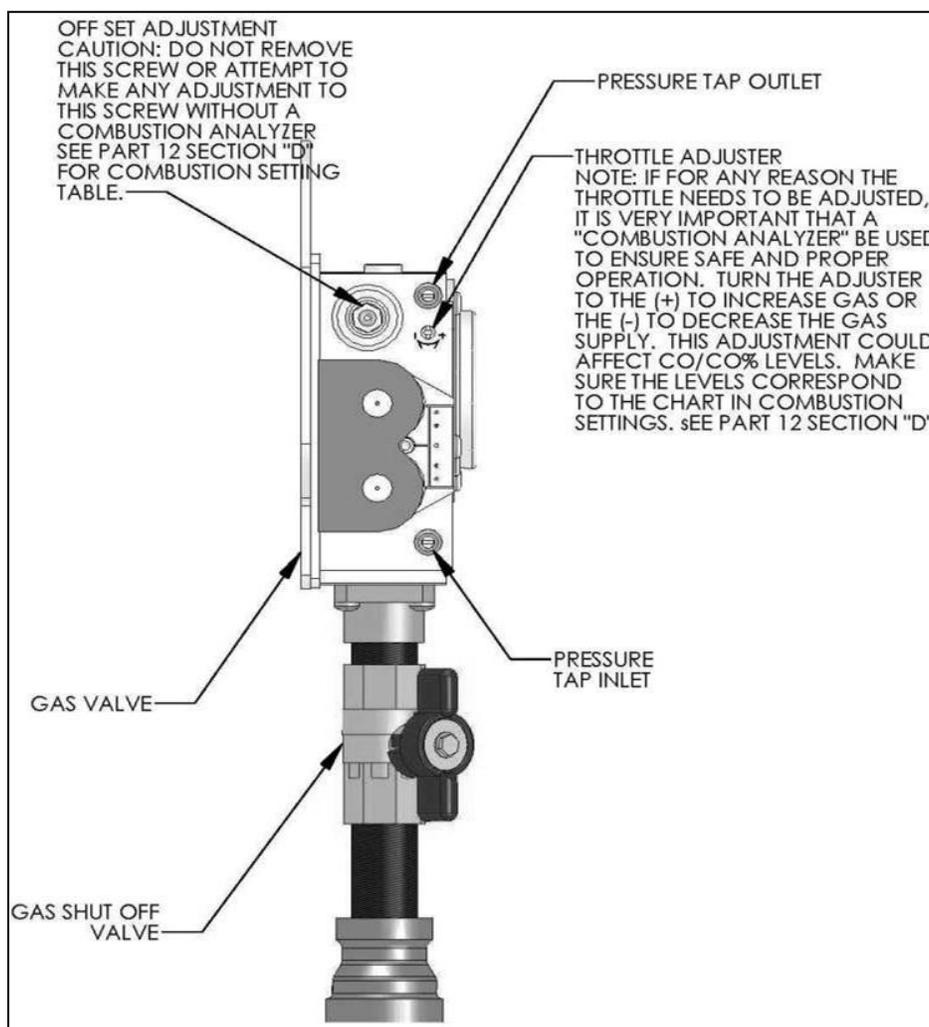


Figure 29 – LP-171-N

PART 9: FIELD WIRING

WARNING

ELECTRICAL SHOCK HAZARD – For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTE: Wiring must be N.E.C. Class 1. If original wiring as supplied with heater must be replaced, use only TEW 105 °C wire or equivalent. Heater must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition.

A. INSTALLATION MUST COMPLY WITH:

National Electrical Code and any other national, state, provincial or local codes or regulations.

In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

B. FIELD WIRING

For your convenience we have located the electrical connection of the heater on the front right hand side of the unit. The electrical junction box has a 24 volt terminal compartment and 120 volt terminal compartment. Each terminal connection is clearly marked to assure correct installation.

C. LINE VOLTAGE WIRING

1. Connect 120 VAC power wiring to the line voltage terminal strip located inside the electric junction box, as shown in Figure 31.
2. Wire the Heater Primary Circulator (P1) to the terminal strip. See wiring diagram in this section.

D. THERMOSTAT

1. Connect room thermostat or end switch.
2. Install thermostat on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sunrays or fireplaces.
3. Thermostat anticipator (if applicable):
 - a. If connected directly to heater, set for 0.1 amps.
 - b. If connected to relays or other devices, set to match total electrical power requirements of connected devices. See specifications of the device and thermostat instructions for details.

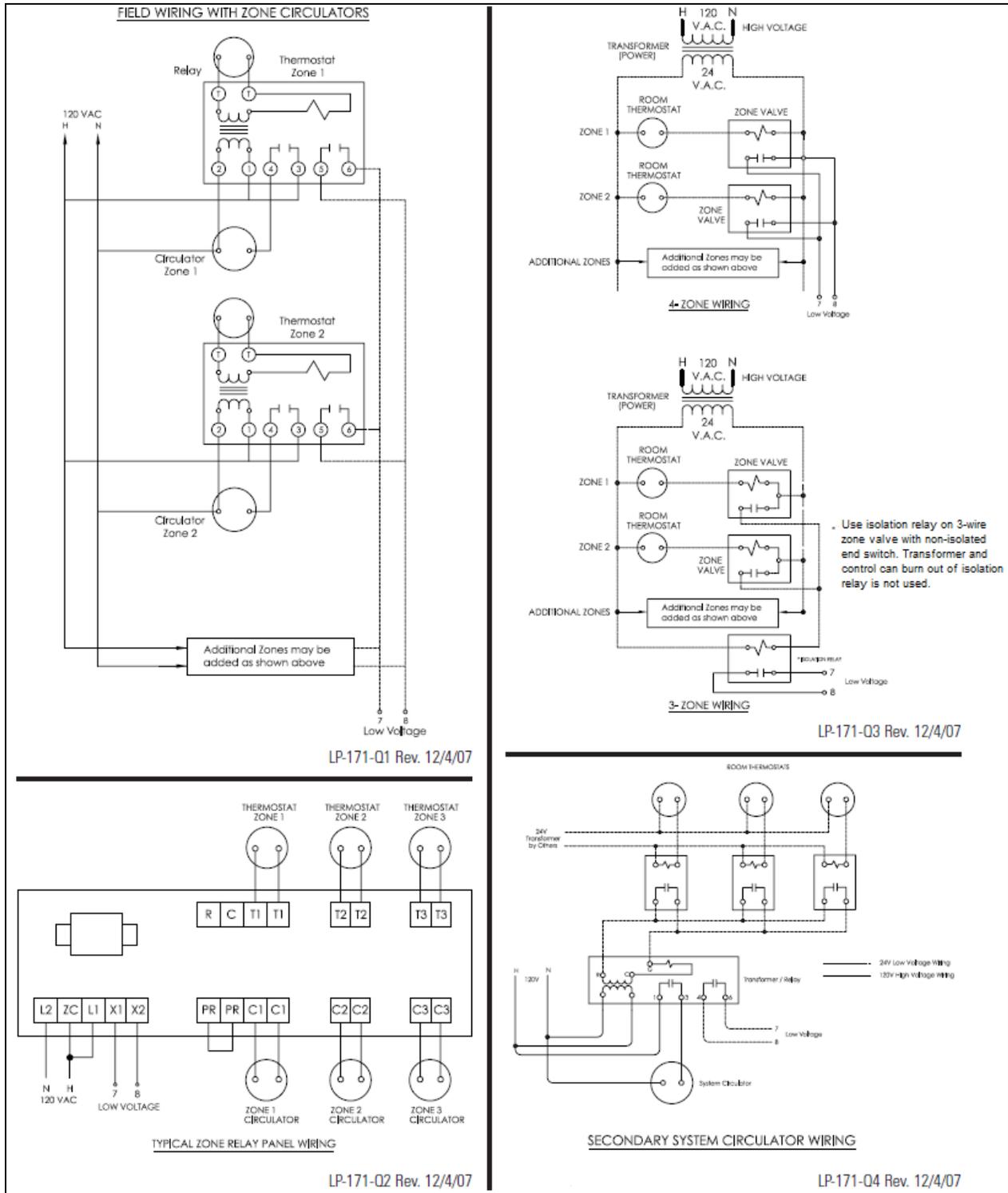


Figure 30

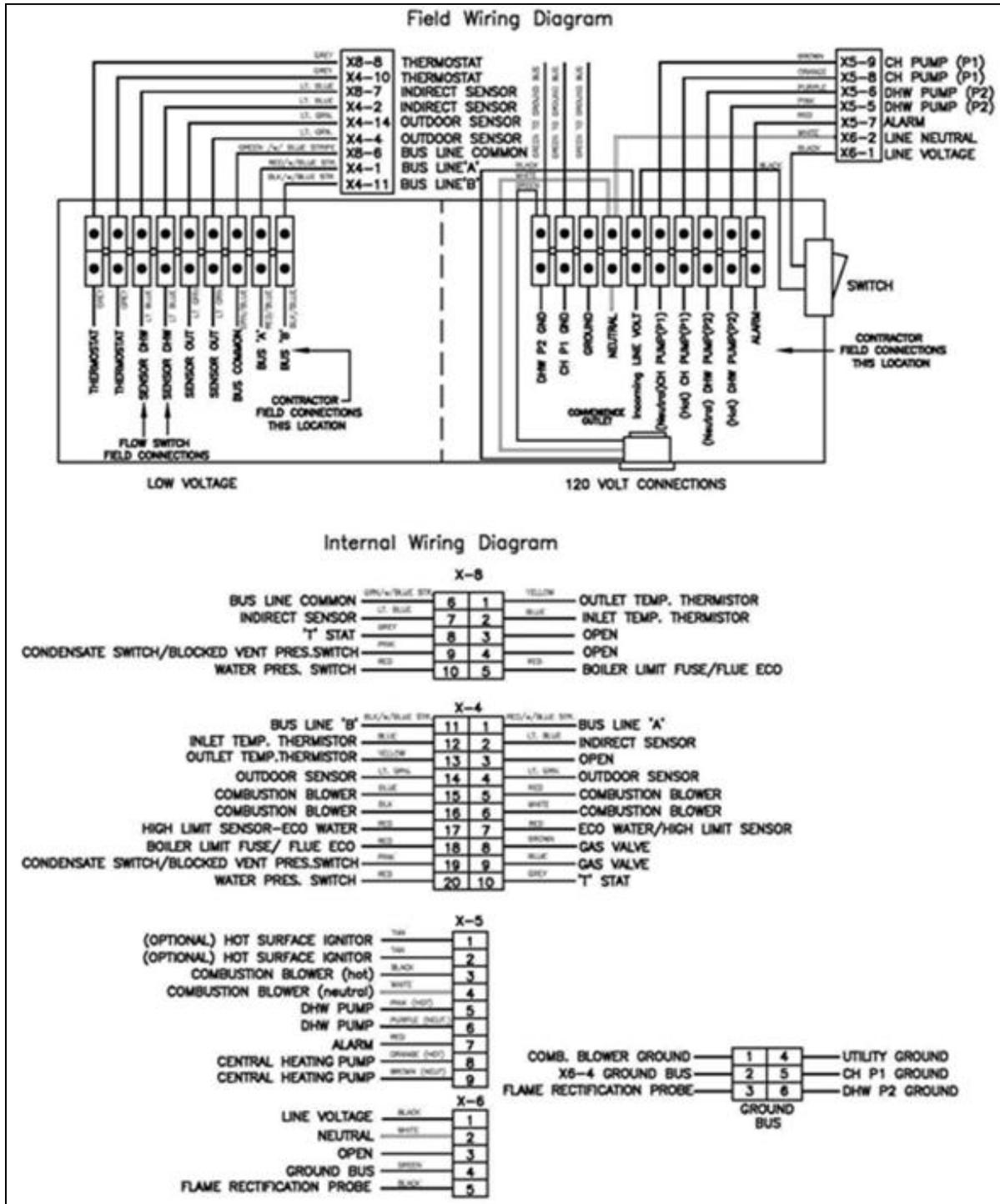


Figure 31

PART 10: FIELD WIRING – VISION 1 OPTION

Outdoor Sensor Function

The user can program the desired supply temperature based on the heat transmitter (baseboard, radiant floor, air handler) that will be used in the installation. Once the outdoor sensor (light green wires) is

connected to the control board, the water temperature of the heater will adjust to run the heater more efficiently and provide greater comfort to the living space.

Connection Specification – Wire 22 AWG maximum to 100 feet or 18 AWG up to 150 feet. Length of wire run cannot exceed 150 feet.

Outdoor Sensor

Connected in the heater junction box, the Outdoor Sensor allows the user to automatically change the temperature going to the central heating loop. Route wires from the heater terminal strip to your outdoor sensor. Place the sensor preferably to the north or northwest or to the side which will be affected by changing weather conditions outside. **NOTE:** Do not locate the sensor in the direct sunlight.

CAUTION

The wire to outdoor sensor must not be laid closer than 6' to line voltage wiring (120/240 V) and must never be in the same conduit.

Indirect Sensor Function

The maximum run time on priority function for the SuperStor Ultra Indirect Fired Water Heater is from 1-60 minutes. The water temperature can only be adjusted when using a sensor (not a mechanical control). Temperature adjustments are from 95 to 185 degrees, plus a differential 1-18 degrees (Note: It is recommended that you do not exceed 5 minutes on the DHW pump post purge cycle to avoid cooling down your DHW tank).

Indirect Sensor

The Indirect Sensor connects to the heater main control. Route wires from the terminal strip to the sensor or the mechanical control, Honeywell part # L4080b1395 (not included in Vision I Package), into the control well located in the front of the water heater. This will allow the installer to control the temperature of the indirect from the heater and give the indirect priority over the central heating circuit. Once the indirect is satisfied, the heater will then switch back to central heating if there is a call for heat. If not, the heater will then shut down.

Indirect Circulator (P2) Program Function

The Indirect Circulator Program Function will automatically start when the water heater sensor reads a call for heat. The installer can also program the post purge function on the circulator. The post purge circulator function ranges from 1-30 minutes.

Indirect Circulator (P2)

The Indirect Circulator connects to the heater terminal strip. Run wire to the SuperStor Ultra Indirect circulating pump. The purple wire is the neutral lead and the pink wire is the hot. This will supply 120 volts directly to the water heater circulator.

Fault Code Alarm Output

The Fault Code Alarm Output connects to the heater main control. Route wire from the heater controller to an external relay or an audible alarm. The red wire will be your hot lead supplying 120 volts. The neutral connection will be connected to the neutral on the incoming power to the heater.

CAUTION

Do not tie neutrals or hot wire leads to any other wires. Go directly from the heater controller to the circulator.

Connection Specification – Wire 18 AWG maximum. Length of wire run cannot exceed 100 feet.

PART 11: START-UP PREPARATION

WARNING

Do not use petroleum-based cleaning or sealing compounds in heater system. Damage to elastomer seals and gaskets in system could occur, resulting in substantial property damage.

A. CHECK/CONTROL WATER CHEMISTRY

NOTE: Heater failure due to improper water chemistry is not covered by warranty.

Sodium less than 20 mGL

Water pH between 6.0 and 8.0

1. Maintain heater water pH between 6.0 and 8.0. Check with litmus paper or have chemically analyzed by water treatment company.
2. If pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chlorine concentration less than 200 ppm

1. Filling with chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.
2. Do not use the heater to directly heat swimming pool or spa water.
3. Do not fill heater or operate with water containing chlorine in excess of 200 ppm.

Clean system to remove sediment

1. You must thoroughly flush the system (without heater connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment.
2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)
3. Flush system until water runs clean and you are sure piping is free of sediment.

Test/replace freeze protection fluid

1. For systems using freeze protection fluids, follow fluid manufacturer's instructions to verify inhibitor level and that other fluid characteristics are satisfactory.
2. Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer instructions.

B. FREEZE PROTECTION (WHEN USED)

WARNING

NEVER use automotive or standard glycol antifreeze, or ethylene glycol made for hydronic systems. Use only freeze-prevention fluids certified by fluid manufacturer as suitable for use with stainless steel heaters, verified in fluid manufacturer literature.

Thoroughly clean and flush any system that has used glycol before installing the new heater. Provide heater owner with a material safety data sheet (MSDS) on the fluid used.

1. Determine freeze protection fluid quantity using total system water content, following fluid manufacturer's instructions. Remember to include expansion tank water content.
2. Local codes may require back flow preventer or actual disconnect from city water supply.
3. When using freeze protection fluid with automatic fill, install a water meter to monitor water makeup. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.

C. FILL AND TEST WATER SYSTEM

1. Fill system only after ensuring the water meets the requirements of this manual.
2. Close manual and automatic air vents and heater drain valve.
3. Fill to correct system pressure. Correct pressure will vary with each application.
 - a. Typical cold water fill pressure for a residential system is 12 psi.
 - b. Pressure will rise when heater is turned on and system water temperature increases. Operating pressure must never exceed 25 psig.
4. At initial fill and during heater startup and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.

WARNING

Eliminate all system leaks. Continual fresh make-up water will reduce heater life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure.

5. The system may have residual substances that could affect water chemistry. After the system has been filled and leak tested, verify water pH and chlorine concentrations are acceptable.

D. AIR PURGING PROCEDURE FOR HEAT EXCHANGER

CAUTION

It is important that you purge the system of air to avoid damage to the heater. Make sure that this procedure is followed before firing the heater.

WARNING

The heater must be room temperature before attempting to purge air from the heat exchanger purge valve. The supplied tubing is rated to 120°F maximum.

The control system allows the installer to run the heater pump and indirect pump manually to assist in purging air from the system. This feature, in combination with the supplied purge hose and fitting on the heat exchanger, will help to remove air from the heat exchanger and hydronic piping system.

To remove air from the system, follow the steps listed below:

CAUTION

Open manual air vent **BY HAND ONLY!** Use of tools, such as wrenches or pliers, can snap or crack the valve. **NOTE: This damage IS NOT COVERED BY WARRANTY!**

1. Take the 5/16" flexible clear tube (rated for maximum temperature of 120°F) provided with the heater and place it over the barbed nipple on the manual air vent as shown in Fig. 32.

2. Fasten the tie wrap (provided) securely around the tube fastened to the barbed nipple on the manual air vent to keep the plastic tube from separating from the barbed nipple while purging the system.

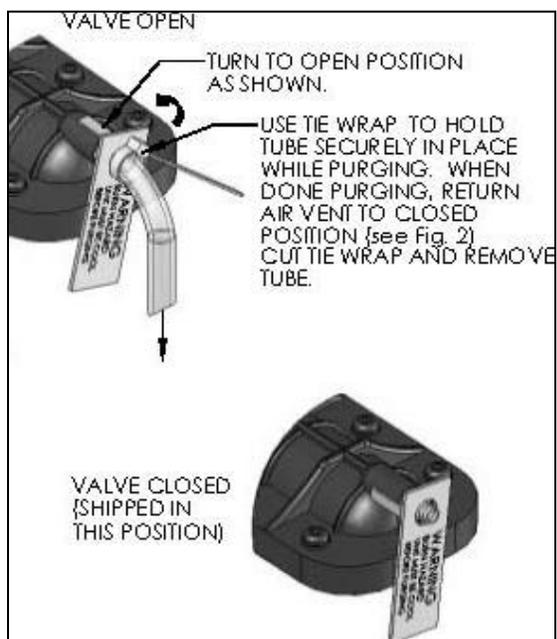


Figure 32

3. Turn the manual air vent to the open position as shown in Fig. 32. Air and water should drain freely from the system.

4. Close the manual air vent when ONLY water flows freely from the end of the hose.

5. Follow the guidelines in Section E in this section to purge each individual zone in the system.

6. Remove any electrical connections to the Thermostat terminals and DHW sensor terminals of the heater. This will prevent the heater from firing when the power is applied.

7. Apply power to the heater, making sure that the thermostat terminals are not connected. The display will show you the temperature of the water and/or air in the heat exchanger.

⚠ WARNING

Do not open purge valve if displayed temperature is greater than 90°F.

8. Press the **[S1]** and **[S3]** keys on the display simultaneously and hold for 1 second. The display will begin alternating between SEP and CH and the heater pump will come on. If you press the **[S2]** key, the heater pump will shut off, the display will begin alternating between SEP and DH and the DHW pump will come on. Using the **[S1]** and **[S2]** keys in this manner you can toggle between running each pump in the system as required to help bleed out all entrapped air. Some good indicators that air is removed include the absence of gurgling noises in the pipes and the pump operation becomes very quiet. Pressing **[S1]** and **[S2]** together at any time will return the heater control to normal operation.

NOTE: IF THE INSTALLER DOES NOT CANCEL THIS FUNCTION BY PRESSING **[S1] AND **[S2]** TOGETHER, THE PUMPS WILL RUN FOR A MAXIMUM OF 20 MINUTES AND SHUT OFF AUTOMATICALLY.**

9. While the pump is running as described above, open the manual air vent on the front of the heat exchanger as shown in Fig. 32 to further assist in removing air from the system.

10. When all air is removed and water runs freely from the end of the hose, return air vent to the closed position shown in Fig. 32. Cut the tie wrap and remove the tube. Please make sure warning tag is left in place. Stop the pump from running by pressing **[S1]** and **[S2]** together.

11. Reconnect the thermostat and DHW sensor wires to the appropriate terminals on the low voltage terminal strip and fire the heater.

12. If heater makes ping sounds SHUT DOWN IMMEDIATELY and repeat the procedure outlined above until all the air is out of the system. To avoid overheating and damage to the heat exchanger, it is recommended that the heater temperature be brought up slowly if air purging had been a problem.

E. PURGE AIR FROM WATER SYSTEM

1. Purge air from system:
 - a. Connect a hose to the purge valve and route hose to an area where water can drain and be seen.
 - b. Close the heater or system isolation valve between the purge valve and fill connection to the system.
 - c. Close zone isolation valves.
 - d. Open quick-fill valve on cold water makeup line.
 - e. Open purge valve.
 - f. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged. After all the zones are purged, open the manual air vent on the top of the heat exchanger as illustrated in Figure 32. Purge out all air that may have accumulated in the header to avoid air entrapment in the system.

WARNING

Never open the manual air vent while the heater is hot. Allow heater to cool to room temperature to avoid scalding while purging.

- g. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch that system pressure rises to correct cold-fill pressure.
- h. After the system has operated for a while, eliminate any residual air by using the manual air vents located throughout the system.
- i. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with lowest floor. Close vent when water squirts out. Repeat with remaining vents.
- j. Refill to correct pressure.

F. CHECK FOR GAS LEAKS

WARNING

Before starting the heater, and during initial operation, smell near the floor and around the heater for gas odorant or any unusual odor. Remove heater front door and smell interior of heater enclosure. Do not proceed with startup if there is any indication of a gas leak. Repair any leak at once.

WARNING

Propane heater only – Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

G. CHECK THERMOSTAT CIRCUIT(S)

1. Disconnect the two external wires connected to the heater thermostat terminals (low voltage terminal strip terminals 5 and 6).
2. Connect a voltmeter across these two incoming wires. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the incoming wires.
3. There should NEVER be a voltage reading.

4. If a voltage does occur under any condition, check and correct the external wiring. (This is a common problem when using 3-wire zone valves.)
5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to heater low voltage terminal strip. Allow the heater to cycle.

H. CONDENSATE REMOVAL

1. This a high efficiency condensing heater, there, the unit has a condensation drain. Condensate is nothing more than water vapor, derived from combustion products, similar to an automobile when it is initially started. The condensation is slightly acidic (typically with pH of 3 to 5) and must be piped with the correct materials. Never pipe the condensate using steel, copper, brass or other materials that will be subject to corrosion. Plastic PVC or CPVC pipe are the only approved materials. A condensate filter, if required by local authorities, can be made up of lime crystals marble or phosphate chips that will neutralize the condensate. This may be done by the installer or you may purchase a condensate neutralizer from HTP (p/n N1100).
2. The heater is equipped with a $\frac{3}{4}$ pipe connection that runs the condensation line to a local drain. It is very important that the condensate line is sloped away from the heater and down to a suitable inside drain. If the condensate outlet is lower than the drain, you must use a condensate removal pump, available at HTP (#554200). This pump is equipped with two leads that can be connected to an alarm or another type of warning device to alert residents of a condensate overflow, which, if not corrected, could cause property damage.
3. If a long horizontal run is used, it may be necessary to create a second vent to prevent a vacuum lock in the condensate line. Do not expose the condensate to freezing temperatures.
4. Do not expose the condensate to freezing temperatures.
5. It is very important you support the condensation line to assure proper drainage.

I. FINAL CHECKS BEFORE STARTING HEATER

1. Read Startup Procedures within this manual for proper steps to start heater. (See Startup Report to record steps for future reference.)
2. Verify the heater and system are full of water and all system components are correctly set for operation.
3. Fill condensate trap with water.
4. Verify electrical connections are correct and securely attached. Inspect intake piping and exhaust piping for signs of deterioration from corrosion, physical damage or sagging. Verify intake piping and

PART 12: START-UP PROCEDURE

FOR YOUR OWN SAFETY READ BEFORE OPERATING

1. This appliance does not have pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.

3. Turn on gas shutoff valve (located inside of the heater) so that the handle is aligned with the gas pipe. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

4. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

5. The heater shall be installed so the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.)

A. OPERATING INSTRUCTIONS

Remove heater cover. If you smell gas, STOP. Follow listed safety instructions. If you do not smell gas, follow the next steps.

1. Turn on all electric power to appliance.
2. If desired, adjust the temperature set point of the heater. The factory default setting is 180°F. If changes are necessary follow "Adjusting the Set point" in this section.
3. Set the thermostat to the desired setting.
4. If the appliance fails to start, refer to the "Troubleshooting" section in the back of this manual.

B. ADJUSTING THE SET POINT

1. Before changing the temperature from the factory setting of 180 degrees, you must make sure that none of the thermostats are calling for heat. The controller will not memorize a program setting while in a heating cycle.

To adjust the heater temperature simply press in the **[S3]** key for three seconds until you see a flashing **(C)** then an alternate value of **(180)**. This number is the factory set point of the unit, which is 180 degrees. To change the temperature, simply push either **[S1]** or **[S2]** on the display. **[S1]** decreases and **[S2]** increases the heater

temperature. The temperature of the heater can be set as low as 50 Degrees or as high 180 Degrees. These ranges are your minimum and maximum heater temperature ranges.

In addition to changing the temperature, you may also change three more settings in this model: 1. heater differential, 2. indirect setting (**with Vision System option**), and 3. Celsius to Fahrenheit measurement. Simply press **[S3]** to get to next value, the heater differential setting will appear in the display ch and alternating value of 30. This allows the installer to adjust the activation of the burner based on the differential temperature setting of the heater. The burner will not start until the outlet water temperature

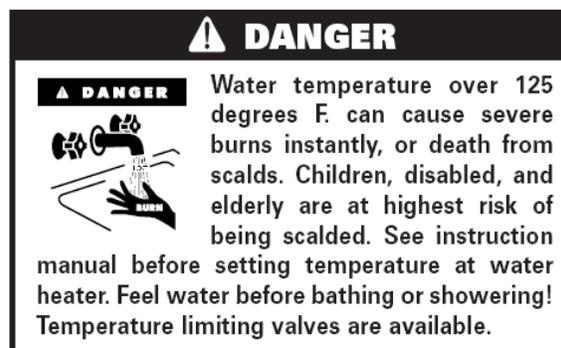


Figure 33 – Scald Warning Label

reaches a temperature equal to the setting for the heater, minus the differential EX: The heater is set to heat at 180°F degrees and the differential is set at 30°F. The burner will not start until the outlet temperature of the system reaches 149°F degrees (180° – 30°F = 150°F).

To adjust, press either **{S1}** (Decrease Value) or **{S2}** (Increase Value) Ranges 5°F to 30°F. Press **{S3}** again and you will see the Indirect Setting de and an alternative value of 119 (with Vision Systems option). To adjust, press either **{S1}** (Decrease Value) or **{S2}** (Increase Value).

The final adjustment in this mode is the Fahrenheit to Celsius measurement. Press **{S3}** again and you will see t and alternating value of F. To change value, press **{S1}** or **{S2}** to choose the correct measurement.

C. STATUS MENU

Installers are also able to check the current status of heater parameters by pressing **{S4}** for 3 seconds. Once activated, the display will show **d1** alternating value of the actual outlet temperature. Actual values are displayed for each function. To view the next value, press **{S4}** to go to the next displayed value. Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, simply press **{S3}** to resume normal operation.

Function Value

d1 — Actual Temperature from outlet sensor
 d2 — Actual Temperature from inlet sensor
 d3 — If using a standard mechanical control, the control will display **1** for closed **0** for open. If the sensor is connected to the SuperStor Indirect Fired Water Heater it will measure the actual temperature (Vision option).

Function Value

d4 — Not used
 d5 — Actual Temperature from the outdoor sensor (Vision option).
 d6 — Actual Fan speed multiplied by 10 (Example: If fan speed displayed is **410** RPM x 10 = 4100 actual fan speed)
 d7 — Actual Ionization current read from Flame Rectification probe
 d8 — Actual Status of the Central Heating Circulator Off = **0**, On = **1**. (Vision option.)
 d9 — Actual Status of the Indirect Fired Circulator Off = **0**, On = **1**. (Vision option.)
 d10 — Actual Status bus communication **co** = connected, **no** = not connected
 d11 — Central Heating Set Point
 d12 — Power On Hours in units
 d13 — Total Central Heat Hours
 d14 — Total Indirect/dhw Hours
 d15 — Passed Ignition Attempts

D. TEST MODE

This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each heater and the combustion settings. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the heater central heating set point. The user will be allowed to increase or decrease the fan speed by pressing in either **{S1}** or **{S2}**.

To activate Test mode, press **{S2}** and **{S3}** together for 1 second. Once activated, you will see **{Ser}** in the display and the actual fan speed. The measurement of the combustion levels should always be taken at the highest and lowest fan speed. After 10 minutes, the Test mode stops automatically. To exit Test mode, press **{S1}** and **{S2}** together for 1 second.

COMBUSTION SETTINGS				
HIGH FIRING RATES and LOW FIRING RATES ON ALL MODELS				
	NATURAL GAS		PROPANE LP	
	Low	High	Low	high
Carbon Monoxide (CO%)	0 – 20 ppm	70 – 135 ppm	0 – 20 ppm	80 – 150 ppm
Carbon Dioxide (CO ₂ %)	8 ½% - 9 ½%	8 ½% - 9 ½%	9 ½% - 10 ½%	9 ½% - 10 ½%

Table 8

FAN SPEEDS				
HEATER	HIGH	LOW	IGNITION	
MC-50	3000	1250	3000	
MC-80	4250	1200	4250	
MC-99	4700	1500	3000	
MC-120	5500	1500	3000	

Table 9

PART 13: START-UP PROCEDURES WITH VISION 1 OPTION

The Vision I option allows the user to have one temperature for central heating and another temperature for the SuperStor Ultra Indirect Fired Water Heater. This enables the user to increase the temperature supplied to the indirect water heater by prioritizing flow at a higher temperature than may be needed for the central heating circuits (this will require two separate circulators). Once the indirect water heater is satisfied, the Vision I system will switch back to the central heating circuit to continue to heat the living space at a temperature based on outside temperature. This gives you a higher comfort level and further increases heater efficiency.

A. PROGRAMMING THE VISION I OPTION

The Vision I option allows the installer to set the system limits and heat curve for the heater. These system limits should not be changed by the user. For future reference, it is important to document your settings within this manual after you program the system parameters.

B. VISION 1 PROGRAM ACCESS

Press and hold **[S3]** and **[S4]** simultaneously for three seconds to begin. You will notice that the display will change to **[000]**. Then, press down **[S1]** until you see **[925]** on the display. This is the pass code. Press and hold **[S3]** for 1 second to confirm the pass code is correct. If the pass code is entered incorrectly, the controller program function will be cancelled and the control returns to normal operation. If the code is entered correctly, the control will switch off the gas valve and purge fan while showing a solid **[--]** in the display. The display will then show a **[1]** alternating to **[de]**. This first function verifies that the control will address the requirements of the indirect water heater.

C. VISION 1 PROGRAM NAVIGATION

Next you will have to press **[S3]** to move through each function. To increase or decrease a value, you will need to press either **[S1]** or **[S2]** to change the default values. If there is no key action for 1 minute, the display returns to normal operation. Changes are effective immediately but not directly stored until the **[S4]** key is pressed down for 3 seconds then the new values are stored. Listed below are the varieties of functions the installer can program into the Vision I System.

NOTE: The heater cannot be programmed when there is a call for heat. See Table 11 in Part 13 to set outdoor reset curve.

START-UP PROCEDURES WITH VISION 1 OPTION		
DEFAULT FUNCTION	FUNCTION VALUE	DESCRIPTION
1	de	Not Applicable
2	149°F	Not Applicable
3	160°F	Maximum domestic delivery water temperature set point the installer will program for indirect water heater. (NOTE: Does not apply if used with mechanical control). Range: 95°F to 160°F.
4	36°F	Not Applicable
5	7°F	Allows the installer to change the differential in the indirect water heater. (Does not apply if used with mechanical control.) Range: 1°F to 18°F.
6	0 Min.	Allows the installer to change the indirect circulator post purge time once the sensor is satisfied. (NOTE: It is recommended that circulator post purge time be set no greater than 5 minutes). Range: 0 to 60 minutes.
7	68°F	Outdoor temperature that you wish the central heating should be disabled – (warm weather shutoff). Range: 41°F to 122°F.
*8	5°F	Changes the minimum outside design temperature. Range: -49°F to 32°F (See Table ? to set outdoor reset curve.)
*9	180°F	Changes the design supply water temperature based on the minimum outside design temperature. Range: 77°F to 180°F.
*10	68°F	Changes the maximum outside design temperature for central heating. Range: 95°F to 32°F.
*11	95°F	Changes the design supply water temperature from the heater based on the maximum outside design temperature. Range: 32°F to 180°F.
12	68°F	Sets the lowest temperature on heater for central heating. Range: 32°F to 180°F.
13	0 Min.	Changes the central heating circulator post purge time once the thermostat is satisfied. Range: 0 to 10 minutes.
14	30 Min.	Sets the maximum run time for the indirect water heater and the minimum run time for central heating. Range: 0 to 60 minutes.
15	0	Bus address (0=zone master 1-8=cascade slave). (Not currently used.)
16	0	Interface Board Activation 0 = not active 1 = active WARNING: Never change the default setting without the heater interface board installed.
17	0	Interface Board Function 0 = Building Management 1 = Enables Tekmar Modulating Control. (Consult with Tekmar to assure the Tekmar Control is compatible.)
18	1	Step Modulation – Regulates the burner output in 6 steps in one-minute intervals. This reduces short cycling. 1 = on 0 = off
19	180°	Indirect heater set point (flow) Temperature default = 119° to 180°
20	1	Not applicable

NOTE: The maximum water temperature leaving the appliance is limited to 185°F.

Table 10 - *Central Heating Curve Function

Central heating demand is detected when the room thermostat closes. When an outside sensor is also connected, the supply temperature will depend on the factory default central heating curve.

To set your heat curve, you will have to set the following parameters:

1. Minimum outside design temperature: **Function 8**.

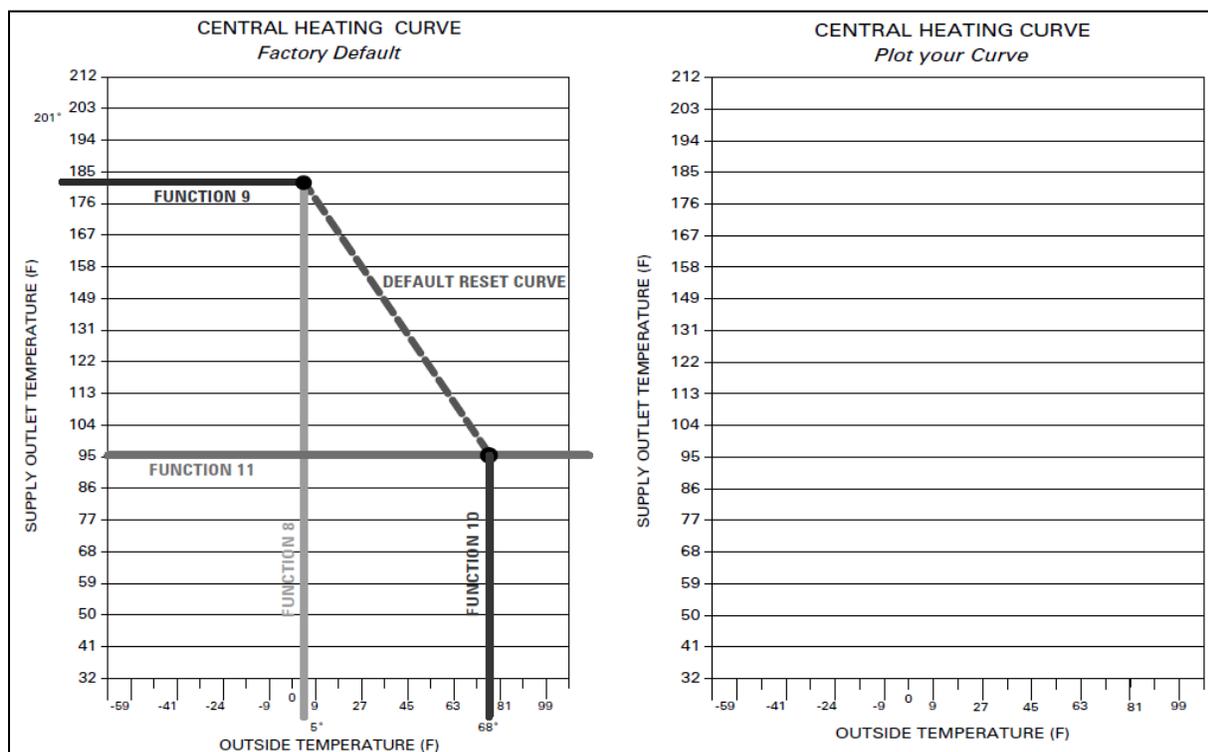


Table 11 – Central Heating Curve – Factory Default

2. Design supply water temperature at the minimum design outside temperature: **Function 9**.
3. Maximum outside design temperature: **Function 10**.
4. Design supply water temperature at the maximum outside temperature: **Function 11**.

NOTE: The homeowner can adjust the heat curve down by adjusting the central heating temperature to a lower setting.

CONTROL PROGRAM REFERENCE CHART		
FUNCTION	DEFAULT SETTING	PROGRAMMED SETTING
1	de	No change allowed
2	149°F	No change allowed
3	160°F	
4	36°F	No change allowed
5	7°F	
6	0 Min.	
7	68°F	
8	5°F	
9	180°F	
10	68°F	
11	95°F	
12	68°F	
13	0 Min.	
14	30 Min.	
15	0	
16	0	
17	0	
18	1	
19	180°F	

Table 12

PART 14: TROUBLESHOOTING

A. ERROR CODE

An error code may occur in the installation of the heater. This condition may lead to a lock out condition of the controller, which will need to be manually reset through the **[S4]**. These temporary codes will help the installer correct the problem before going into a lock out condition, which will require a manual reset.

B. HEATER ERROR

1. When an error condition occurs the controller will display an error code on the display module.
2. These error codes and several suggested corrective actions are included in Table 13.
3. In the case of E00, E13, and E14 this error, if uncorrected, will go into a fault condition as described in Paragraph C (Heater Fault).

C. HEATER FAULT

1. When a fault condition occurs the controller will illuminate the red “fault” indication light and display a fault code in the format (Example: **[F00]**) on the display module.
2. Note the fault code and refer to Table 14 for an explanation of the fault code along with several suggestions for corrective actions.
3. Press the reset key to clear the fault and resume operation. Be sure to observe the operation of the unit to prevent a recurrence of the fault.

WARNING

When servicing or replacing any components of this heater be certain that:

- The gas is off.
- All electrical power is disconnected.

DANGER

When servicing or replacing parts that are in direct contact with heater water, be certain that:

- There is no pressure in the heater. (Pull the release on the relief valve. Do not rely on the pressure gauge reading.)
- The heater water is not hot.
- The electrical power is off.

WARNING

Do not use this appliance if any part has been under water. Improper or dangerous operation may result. Contact a qualified service technician immediately to inspect the heater and repair or replace any part that has been under water.

CAUTION

This appliance has wire function labels on all internal wiring. Observe the position of each wire before removing it. Wiring errors may cause improper and dangerous operation. Verify proper operation after servicing.

CAUTION

If overheating occurs or the gas supply fails to shut off, do not turn off electrical power to the circulating pump. This may aggravate the problem and increase the likelihood of heater damage. Instead, shut off the gas supply to the heater at the gas service valve.

925 CONTROL BOARD ERROR CODES			
CODE	DESCRIPTION	DURATION	CORRECTIVE ACTION
E13	Combustion Fan Speed Low. The heater combustion air fan speed less than 70% of expected.	60 Sec.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
E14	Combustion Fan Speed High. The heater combustion air fan speed is more than 130% of expected.	60 Sec.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
PRO	Water Pressure Switch is Open	Until Corrected	<ol style="list-style-type: none"> 1. Assure that the system pressure is above 10 psig. 2. Check for leaks in the system piping.
FLU	Blocked Vent Pressure Switch open, Condensate Cup Full, Condensate Cup not present	Until Corrected	<ol style="list-style-type: none"> 1. Check the flue vent to be sure it is not blocked or damaged. 2. Check the blocked vent pressure switch operation by applying a jumper. (If the switch is not functioning properly, replace it.) 3. If the condensate cup is excessively full, check the condensate piping system for piping and proper drainage. Repair as necessary. If the condensate cup is not excessively full and is in place, remove the cup and check the operation of the float switch in the cup. The float should pivot freely in the cup and the back of the float should contact the stem of the switch when in the down position. 4. Reinstall the condensate cup. While doing so, check the operation of the cup-in-place switch. The switch should contact the protrusion on the plastic socket that the cup is secured into and trip when the cup is snapped into place. 5. Check to be sure that the 2 pin condensate cup connector is securely plugged into the socket on the bottom of the appliance. 6. If FLU code is still present and the cause not found, check continuity of wiring from the flue switch to the condensate cup connector (pink wires) and from the condensate cup connector through the condensate float switch and condensate cup-in-place switch. These three devices are all wired in series with each other. Repair any wiring or replace defective components if necessary. <div style="text-align: center; background-color: black; color: white; padding: 5px; margin-top: 10px;">  DANGER </div> <p>Do not "Jump Out" any of the devices in this circuit. These devices ensure product safety and must be in place and connected at all times of normal operation.</p>

Table 13

925 Control Board FAULT		
Code	Description	Remedy
F00	High temperature switch limit exceeded 194°F.	<ol style="list-style-type: none"> 1. Check circulation pump operation. 2. Assure that there is adequate flow through the heater by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister. 3. Check thermister reading on supply thermister. Replace switch if faulty.
F01	Vent temperature limit exceeded.	<ol style="list-style-type: none"> 1. Push the red reset button on the vent temperature limit switch. 2. Check the flue temperature during operation using a combustion analyzer. 3. Replace the vent limit switch if faulty.
F02	Interrupted or shorted supply (outlet) thermister.	<ol style="list-style-type: none"> 1. Check the electrical connection to the thermister on the outlet manifold. 2. If connection is okay, replace thermister.
F03	Interrupted or shorted return (inlet) thermister.	<ol style="list-style-type: none"> 1. Check the electrical connection to the thermister on the outlet manifold. 2. If connection is okay, replace thermister.
F05	Supply (outlet) temperature exceeds 230°F.	<ol style="list-style-type: none"> 1. Check circulation pump operation. 2. Assure that there is adequate flow through the heater by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister.
F06	Return (inlet) temperature exceeds 230°F.	<ol style="list-style-type: none"> 1. Check circulation pump operation. 2. Assure that there is adequate flow through the heater by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister.
F09	No flame detected – The heater will make three attempts at ignition before the control goes into this lockout condition. *See spark electrode detail.	<ol style="list-style-type: none"> 1. Watch the igniter through the observation window provided. 2. If there is no spark, check the spark electrode for the proper ¼” gap by holding two quarters together and sliding them through the gap. 3. Remove any corrosion from the spark electrode and flame rectifier probe. 4. If there is a spark but no flame, check the gas supply to the heater. 5. If there is a flame, check the flame sensor. 6. Check any flue blockage or condensate blocks.
F10	Loss of flame signal – The heater will relight 4 times before the control goes into this lockout condition. Will reset in 1 hour.	<ol style="list-style-type: none"> 1. Monitor the gas pressure to the unit while in operation. 2. Assure that the flame is stable when lit. 3. Check to see if the green light on the display module is out while the heater is running. 4. If the green light doesn't come on or goes off during operation check the flame signal on the status menu. 5. If the signal reads less than 1 microampere, clean the flame rectifier probe. 6. If the flame rectifier probe continues to read low, replace it.
F11	False flame signal – The heater will lock out if it senses a flame signal when there should be none present.	<ol style="list-style-type: none"> 1. Turn the gas off to the unit at the service valve. 2. If the flame signal is still present replace the igniter. 3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection. 4. If there is no power to the gas valve, remove the valve and check for obstruction in the valve seat or replace the gas valve. 5. Turn the gas on at the service valve after corrective action is taken.
F13	Combustion fan speed low – The heater will lock out if it senses that the fan speed is less than 70% of expected rate for more than 60 seconds.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
F14	Combustion fan speed high – The heater will lock out if it senses that the fan speed is less than 130% of expected rate for more than 60 seconds.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
F18	Gas Valve Error	<ol style="list-style-type: none"> 1. Make sure the connector is correctly connected to the gas valve. 2. Check the electrical wiring from the valve to the control board. 3. Replace the low voltage wiring harness assembly. 4. Replace control board.
F30	Watchdog	Call factory for further assistance.
F31	Parameter Memory	Call factory for further assistance.
F32	Parameter Memory Write Error	Call factory for further assistance.
F33	Programming Error	Call factory for further assistance.

Table 14

Resistance Tables

OUTDOOR SENSOR (7250P-319)	
OUTSIDE TEMP. (°F)	RESISTANCE (ohms)
-22	171800
-13	129800
-4	98930
5	76020
14	58880
23	45950
32	36130
41	28600
50	22800
59	18300
68	14770
77	12000
86	9804
95	8054
104	6652
113	5522

Table 15

HEATER SENSOR (7250P-059)	INDIRECT SENSOR (7250P-325)
HEATER AND INDIRECT TEMPERATURE (°F)	RESISTANCE (ohms)
32	32550
41	25340
50	19870
59	15700
68	12490
77	10000
86	8059
95	6535
104	5330
113	4372
122	3605
131	2989
140	2490
149	2084
158	1753
167	1481
176	1256
185	1070
194	915
203	786
212	667

Table 16

PART 15: MAINTENANCE

A. MAINTENANCE PROCEDURES

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is in safe efficient operation. The owner can make necessary arrangements with a qualified heating contractor for periodic maintenance of the heater. Installer must also inform the owner that the lack of proper care and maintenance of the heater may result in a hazardous condition. The installer should discuss the contents of the User's Information Manual with the owner.

WARNING

BEFORE EACH HEATING SEASON a trained and qualified service technician should perform the inspections and maintenance procedures as identified in this manual. In addition, the maintenance and care of the heater outlined in this manual must be performed to assure maximum efficiency and reliability. Failure to do so could result in substantial property damage, serious personal injury, or death.

WARNING

The combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)."

- Avoid breathing dust and contact with skin and eyes.
- Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on job site conditions. Current NIOSH recommendations can be found on the NIOSH website at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.
- Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber to prevent dust.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye: Irrigate immediately.
- Breathing: Fresh Air.

B. MAINTENANCE SCHEDULE FOR THE SERVICE TECHNICIAN

The following maintenance should be performed annually by a qualified service technician:

General

- Attend to any reported problems.
- Inspect the interior of the heater jacket area; clean and vacuum if necessary.
- Clean the condensate trap and fill with fresh water.
- Check for water, gas, flue and condensate leaks.
- Verify flue vent piping and air inlet piping are in good condition, properly supported, and tightly sealed.
- Check heater water pressure, piping and expansion tank.
- Check control settings.
- Check ignition electrode. Sand off any white oxide. Clean and reposition.
- Check ignition and ground wiring.
- Check all control wiring and connections.
- Check burner flame pattern (stable and uniform).

Additional Items if Combustion or Performance is Poor

- Clean heat exchanger and flue ways.
- Remove burner assembly and clean burner head using compressed air only.

Once the maintenance items are completed, review service with the owner.

C. COMBUSTION CHAMBER COIL CLEANING INSTRUCTIONS

*Before beginning this procedure, you must have on hand the following items:

- A nylon, stainless or brass brush (not steel)
- A liquid calcium and lime deposit remover
- Gloves, eye protection

1. Shut down the heater by using the following steps:

- a. Close the gas valve, shut down the unit and wait for the unit to be cool to the touch.

- b. Disconnect the condensate hose from the **outside** connection, (**not from the heater side**), so flow can be observed.
- c. Disconnect connections from the gas valve, spark electrode and flame rectification probe and combustion blower.
- d. Remove the (4) screws on the aluminum ½" NPT connector on the gas valve.
- e. Disconnect the wiring connected to the combustion blower motor.
- f. Remove the (4) 10MM nuts from the burner plate assembly to access the coils.
- g. Pull the entire burner plate assembly with blower still attached towards you, while removing or pushing aside any wiring to allow the removal of the assembly.

2. Using a spray bottle filled with calcium and lime deposit remover, spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate hose. If the condensate hose is blocked, let the chemical penetrate for at least 15 minutes or until it drains.

3. Use the nylon, stainless or brass brush (do not use steel) and scrub coils to remove any buildup. Then vacuum the debris from the coils. **WARNING:** Follow above precautions.

4. Spray the coils with clear water, making sure to confine the spray to the area being cleaned (try to avoid getting the back ceramic wall of the unit wet). Flush the combustion chamber with fresh water. At this point, the heater should be ready to power back up.

Before powering up the heater follow the steps below:

- a. Re-install the burner assembly.
- b. Replace the (4) 10MM nuts to the burner plate.
- c. Re-connect all wiring connections.
- e. Replace the (4) screws on the aluminum ½" NPT connector on the gas valve. Turn the gas back on. (**IMPORTANT: CHECK FOR GAS LEAKS.**)
- f. Re-set thermostats (**IMPORTANT: MAKE SURE EXHAUST VENT IS NO LONGER BLOCKED!**)
- g. Turn the heater back on and observe condensate flow.
- h. Re-connect the condensate hose to the outside connection.

D. MAINTENANCE SCHEDULE FOR THE OWNER

CAUTION

The following information provides detailed instruction for completing maintenance items. In addition to this maintenance, the heater should be serviced at the beginning of the heating season by a qualified service technician.

Periodically

- Check area around the unit.
 - Review Table 1 - Contaminant Table, p. 13. If contaminants are found:
 - Remove contaminants immediately from area.
 - If contaminants have been in the area for an extended period, call a qualified service technician to inspect the unit for possible acid corrosion damage.
 - If contaminants cannot be removed, immediately call a qualified service technician to re-pipe the combustion air inlet piping and locate the intake away from contaminated areas.
 - Do not store combustible materials, gasoline, or other flammable vapors or liquids near the unit. If found, remove these materials immediately.
- Check and remove any blockage from the combustion air inlet and ventilation openings.
 - If removing debris does not allow the unit to operate correctly, contact a qualified service technician to inspect the unit and the vent/combustion air system.
- Check the temperature and pressure gauge.

- Ensure the pressure reading on the gauge does not exceed 25 psig. Higher pressure readings may indicate a problem with the expansion tank.
- Ensure the temperature on the LED display panel does not exceed 180°F. Higher temperature readings may indicate a problem with the thermostat operating controls.
- Contact a qualified service technician if problem persists.

Monthly

- Check vent piping.
 - Visually inspect the flue gas vent piping for any signs of blockage, leakage, or deterioration. Ensure that vent piping is properly supported as described in this manual. Notify a qualified service technician immediately if any problems are found.

WARNING

Failure to inspect the venting system and have it repaired by a qualified service technician can result in vent system failure, causing substantial property damage, severe personal injury, or death.

- Check combustion air inlet piping.
 - Visually inspect the air inlet piping for any signs of blockage. Inspect the entire length of the intake to ensure piping is intact and all joints are properly sealed and supported. Notify a qualified service technician if any problems are found.
- Check the pressure relief valve.
 - Visually inspect the primary pressure relief valve and discharge pipe for signs of weeping or leakage.
 - If the pressure relief valve often weeps, the expansion tank may not be operating properly. Immediately contact a qualified service technician to inspect the unit and system.
- Check the condensate drain system.
 - While the unit is running, check the discharge end of the condensate drain tubing. Ensure no clue gas is leaking from the condensate drain tubing by holding your fingers near the opening.
 - If you notice flue gas leaking from the opening, this indicates a dry condensate drain trap. Fill the condensate trap assembly with water. If problem persists regularly, contact a qualified service technician to inspect the unit and condensate line.
 - The service technician must ensure the condensate drain line is not blocked by pouring water through the plug port on the condensate drain assembly. The water should flow out of the end of the drain line. If water does not appear at the end of the drain line, the qualified service technician must clean the condensate line.
 - To fill the condensate drain assembly, remove the cup from the assembly. Slowly pour water into the cup until water appears at the end of the drain line. Stop filling and replace the cup.

WARNING

You must ensure that the condensate cup is securely fastened before restarting heater. Do a final check to ensure proper condensate flow.

Every 6 Months

- Check heater piping and gas supply piping for corrosion or signs of potential leakage.
 - Remove the heater cover and perform a gas leak inspection following Gas Valve Operating Instructions, p. 2 in this manual. If gas or odor leak is detected, immediately shut down the unit following To Turn Off Gas To Appliance procedures on p. 2. Call a qualified service technician.
 - Visually inspect for leaks around the internal heater water connections and around the heat exchanger. Visually inspect the external system piping, circulators, and system components and fittings. Immediately call a qualified service technician to repair any leaks.

⚠ WARNING

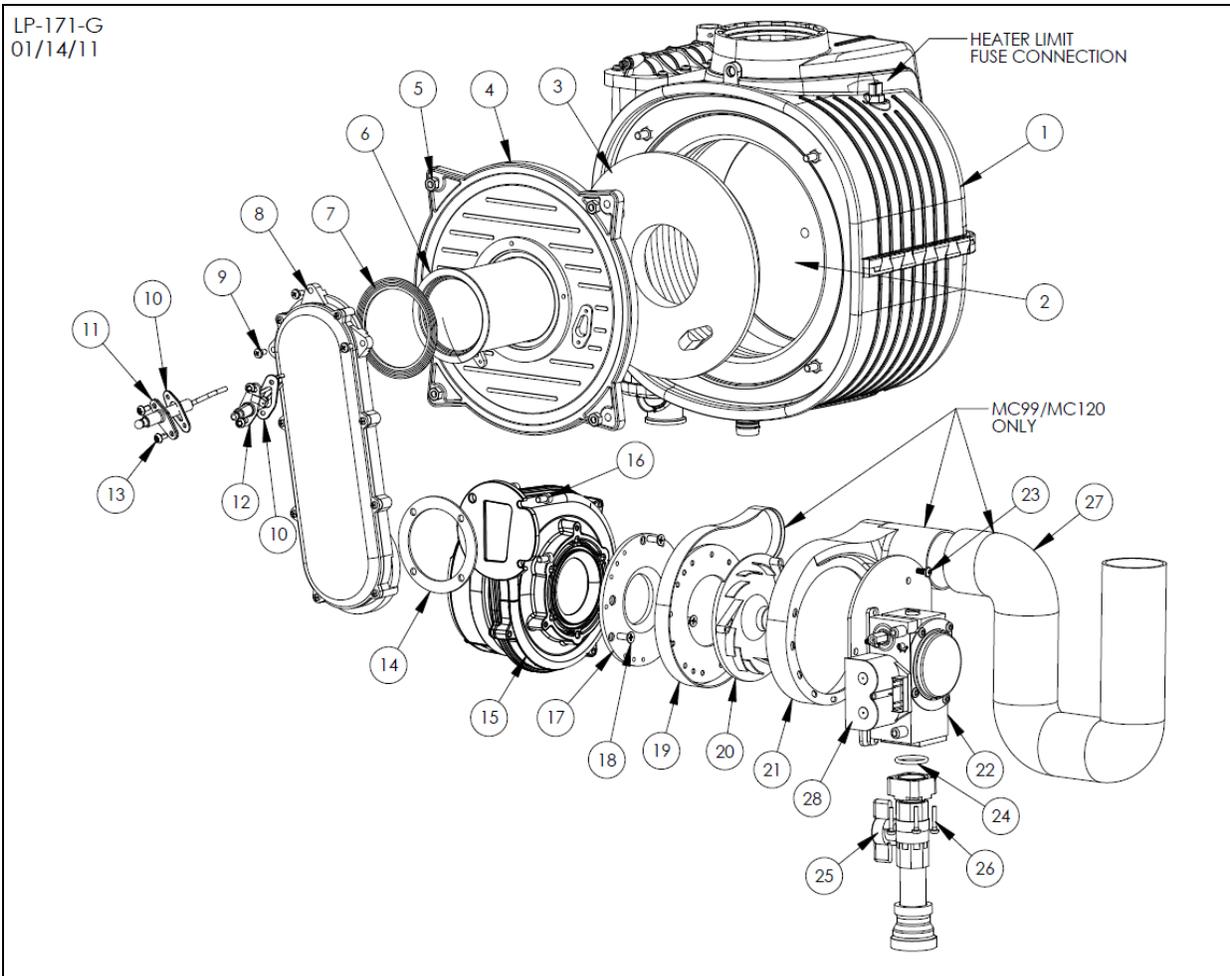
Have gas leaks fixed at once by a qualified service technician. Failure to comply could result in substantial property damage, severe personal injury, or death.

- Operate pressure relief valve.
 - Before proceeding, verify that the relief valve outlet has been piped to a safe place of discharge, avoiding any possibility of scalding from hot water.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation, a discharge line must be connected to the valve outlet and directed to a safe place of disposal. This discharge line must be installed by a qualified service technician or heating/plumbing installer in accordance with this manual. The discharge line must be terminated so as to eliminate possibility of severe burns or property damage should the valve discharge.

- Read the temperature and pressure gauge to ensure the system is pressurized. Minimum is 10 psi. Maximum is 25 psi. Lift the relief valve top lever slightly, allowing water to relieve through the valve and discharge piping.
- If water flows freely, release the lever and allow the valve to seat. Watch the end of the relief valve discharge pipe to ensure that the valve does not weep after the line has had time to drain. If the valve weeps, lift the lever again to attempt to clean the valve seat. If the valve does not properly seat and continues to weep, contact a qualified service technician to inspect the valve and system.
- If water does not flow from the valve when you completely lift the lever, the valve or discharge line may be blocked. Immediately shut the unit down per instructions on p. 2 in this manual and call a qualified service technician to inspect the valve and system.



REPLACEMENT PARTS					
Item #	Description	Part #	Item #	Description	Part #
1	COMPOSITE MODULE	7500P-010 (MC50)	16	SCREWS M5 X 12MM (COMBUSTION BLOWER)	7250P-478
		7500P-012 (MC80)	17	GAS VALVE ADAPTER PLATE (w/SCREWS)	7250P-644
		7500P-014 (MC99/MC120)	18	SCREWS M4 X 12MM (GAS VALVE ADAPTER PLATE)	7500P-105
2	CERAMIC TARGET WALL	7250P-160	19	AIR INTAKE ADAPTER - BLOWER SIDE	7500P-185 (MC99/MC120)
3	BURNER DOOR CERAMIC REFRACTORY	7500P-076	20	GAS VALVE SWIRL PLATE	7500P-091 (MC50)
4	BURNER DOOR (w/NUTS)	7500P-078			7500P-092 (MC80)
5	NUTS - M6 (BURNER DOOR)	7500P-067			7500P-186 (MC99/MC120)
6	BURNER	7500P-015 (MC50)	21	AIR INTAKE ADAPTER - VALVE SIDE	7500P-184 (MC99/MC120)
		7500P-016 (MC80)	22	GAS VALVE (w/SWIRL PLATE, SCREWS)	7250P-448 (MC50)
		7500P-017 (MC99/MC120)			7250P-449 (MC80)
7	GASKET (BURNER)	7500P-074			7500P-180 (MC99/MC120)
8	AIR/GAS CHANNEL (w/TORX SCREWS)	7500P-079	23	SCREWS M4 X 18MM (GAS VALVE)	7250P-716 (MC50)
9	TORX SCREWS (AIR/GAS CHANNEL)	7500P-068		SCREWS M4 X 19MM (GAS VALVE)	7250P-717 (MC80)
10	GASKET (FLAME REC/SPARK ELECTRODE)	7250P-005		SCREWS M4 X 25MM (GAS VALVE)	7250P-718 (MC99/MC120)
11	FLAME RECTIFICATION PROBE (w/GASKET)	7500P-039	24	O-RING (GAS VALVE PIPING ASSY)	7500P-094
12	SPARK ELECTRODE (w/GASKET)	7350P-020	25	GAS VALVE PIPING ASSY (w/O-RING, SCREWS)	7500P-095
13	SCREWS M4 X 8MM (PROBE/ELECTRODE)	7250P-069	26	SCREWS M5 X 12MM (GAS VALVE PIPING ASSY)	7500P-099
14	GASKET (AIR CHANNEL TO COMBUSTION BLOWER)	7500P-075	27	2" FLEX HOSE - 25" LONG	7500P-189 (MC99/MC120)
15	COMBUSTION BLOWER (w/SCREWS)	7500P-031	28	24VAC GAS VALVE COIL ONLY - GREY	7350P-624

Figure 34

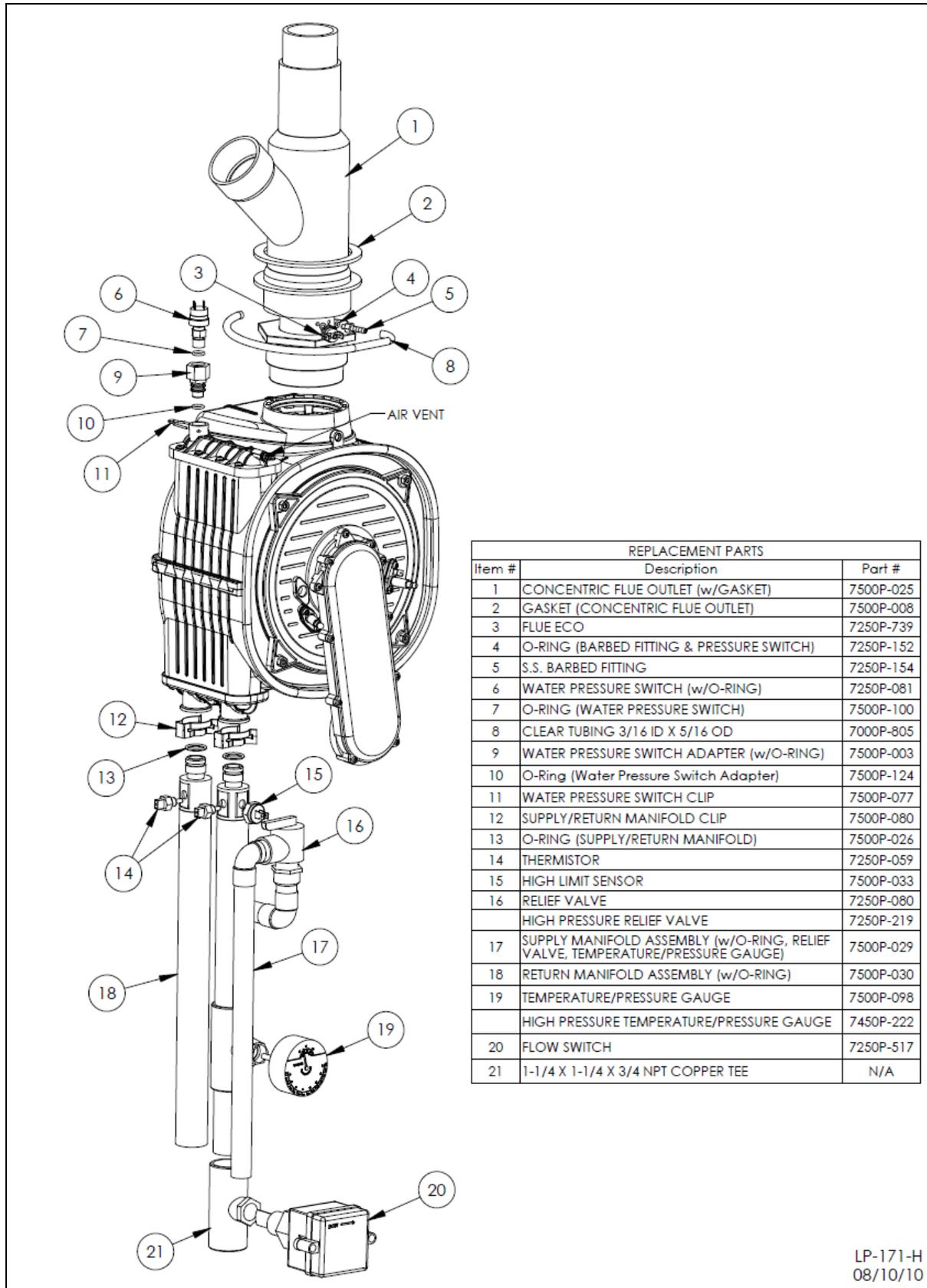


Figure 35

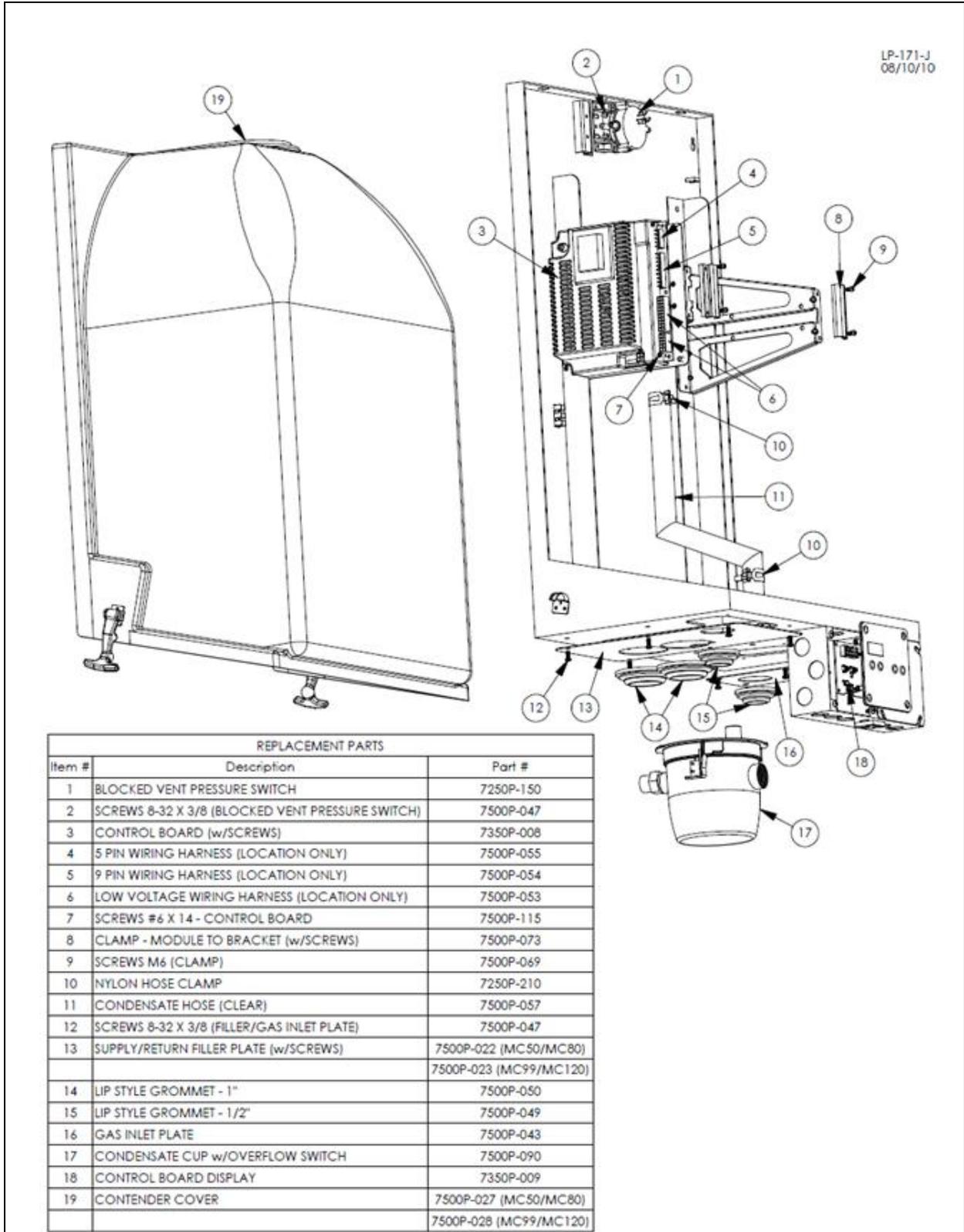


Figure 36

HEATER START-UP REPORT

LIGHT OFF ACTIVITIES		DATE COMPLETED			
1) Fill the heating system	Check all piping and gas connections, verify all are tight				
	Pressurize system (12-15 PSI)	____ PSI			
	Add water to prime condensate cup				
	What percentage of propylene glycol is installed in the system (0-50%)	____ %			
	Verify near heater piping is properly supported				
2) Check gas pipe	Leak test using locally approved methods (consult jurisdictional code book)				
	Check incoming gas pressure (3.5" to 14" W.C.)	____ in w.c.	Static		
	What is the "drop" on light off (No more than 1" W.C.)	____ in w.c.	Dynami c		
3) Check combustion	Check and adjust (if necessary) carbon dioxide content	____% CO2	High Fire	____% CO2	Low Fire
	Check and adjust (if necessary) carbon monoxide content	____ppm CO	High Fire	____ppm CO	Low Fire
4) Verify system operation	Turn up thermostat to verify wiring connections				
5) Record ionization current	Check uA reading at d7 on the status menu (see start-up section)	____ uA	High Fire	____ uA	Low Fire
6) Record system settings	Record heating curve (with optional Vision One kit, record steps)	____*8	____*9	____*10	____*1 1
7) Indirect water heater	Verify safety and operation of the indirect water heater, record settings	____de	____dh		
8) Convert the heater	If necessary, convert the heater to the proper gas type				
	Locate the stickers in the appropriate locations on the heater				
	Verify combustion settings after gas conversion, Carbon Dioxide	____% CO2	High Fire	____% CO2	Low Fire
	Verify combustion settings after gas conversion, Carbon Monoxide	____ppm CO	High Fire	____ppm CO	Low Fire
	Mail in the conversion registration				
Notes:					

Table 17

MAINTENANCE REPORT

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a qualified heating contractor for periodic maintenance of the heater. Installer must also inform the owner that the lack of proper care and maintenance of the heater may result in a hazardous condition.

INSPECTION ACTIVITIES		DATE LAST COMPLETED			
		1 st YEAR	2 nd YEAR	3 rd YEAR	4 th YEAR*
PIPING					
Near heater piping	Check heater and system piping for any sign of leakage, make sure they are properly supported.				
Vent	Check condition of all vent pipes and joints.				
Gas	Check Gas piping, test for leaks and signs of aging. Make sure all pipes are properly supported.				
SYSTEM					
Visual	Do a full visual inspection of all system components.				
Functional	Test all functions of the system (Heat, Safeties)				
Temperatures	Verify safe settings on heater or Anti-Scald Valve				
Temperatures	Verify programmed temperature settings				
ELECTRICAL					
Connections	Check wire connections. Make sure they are tight.				
Smoke and CO detector	Verify devices are installed and working properly. Change batteries if necessary.				
Circuit Breakers	Check to see that the circuit breaker is clearly labeled. Exercise circuit breaker.				
CHAMBER/BURNER					
Combustion Chamber	Check burner tube and combustion chamber coils. Clean according to maintenance section of manual. Vacuum combustion chamber.				
Spark Electrode	Clean. Set gap at 1/4".				
Flame Probe	Clean. Check ionization in uA (d7 on status menu in Start-up Procedures). Record high fire and low fire.				
CONDENSATE					
Neutralizer	Check condensate neutralizer. Replace if necessary.				
Condensate hose	Disconnect condensate hose. Clean out dirt. Fill with water to level of outlet and re-install. (NOTE: Verify the flow of condensate, making sure that the hose is properly connected during final inspection.)				
GAS					
Pressure	Measure incoming gas pressure (3.5" to 14" W.C.)				
Pressure Drop	Measure drop in pressure on light off (no more than 1" W.C.)				
Check gas pipe for leaks	Check piping for leaks. Verify that all are properly supported.				
COMBUSTION					
CO/CO2 Levels	Check CO and CO2 levels in Exhaust (See Start-up Procedures for ranges). Record at high and low fire.				
SAFETIES					
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO. Replace if corroded.				
Water Pressure Switch	Check operation. Check for signs of leakage. Replace if corroded.				
Thermistors	Check wiring. Verify through ohms reading.				
FINAL INSPECTION					
Check list	Verify that you have completed entire check list. WARNING: FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.				
Homeowner	Review what you have done with the homeowner.				

Table 18 - *Continue annual maintenance beyond the 4th year as required.

ADDITIONAL INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

In the Commonwealth of Massachusetts, the installer or service agent shall be a plumber or gas fitter licensed by the Commonwealth.

When installed in the Commonwealth of Massachusetts or where applicable state codes may apply; the unit shall be installed with a CO detector per the requirements listed below.

5.08: Modifications to NFPA-54, Chapter 10

(1) Revise NFPA-54 section 10.5.4.2 by adding a second exception as follows:

Existing chimneys shall be permitted to have their use continued when a gas conversion burner is installed, and shall be equipped with a manually reset device that will automatically shut off the gas to the burner in the event of a sustained back-draft.

(2) Revise 10.8.3 by adding the following additional requirements:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the service of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW, KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2)(a) 1 through 4.

(b) EXEMPTIONS: the following equipment is exempt from 248 CMR 5.08 (2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required to be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approval side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

HTP CUSTOMER INSTALLATION RECORD FORM

The following form should be completed by the installer for you to keep as a record of the installation in case of a warranty claim. After reading the important notes at the bottom of the page, please also sign this document.

Customer's Name:	
Installation Address:	
Date of Installation:	
Installer's Code/Name:	
Product Serial Number(s):	
Comments:	
Installer's Phone Number:	
Signed by Installer:	
Signed by Customer:	

IMPORTANT NOTES:

Customer: Please only sign after the installer has reviewed the installation, safety, proper operation and maintenance of the system. In the case that the system has any problems, please call the installer. If you are unable to make contact, please contact your HTP Sales Representative.

Distributor/Dealer: Please insert contact details.