INSTALLATION GUIDE

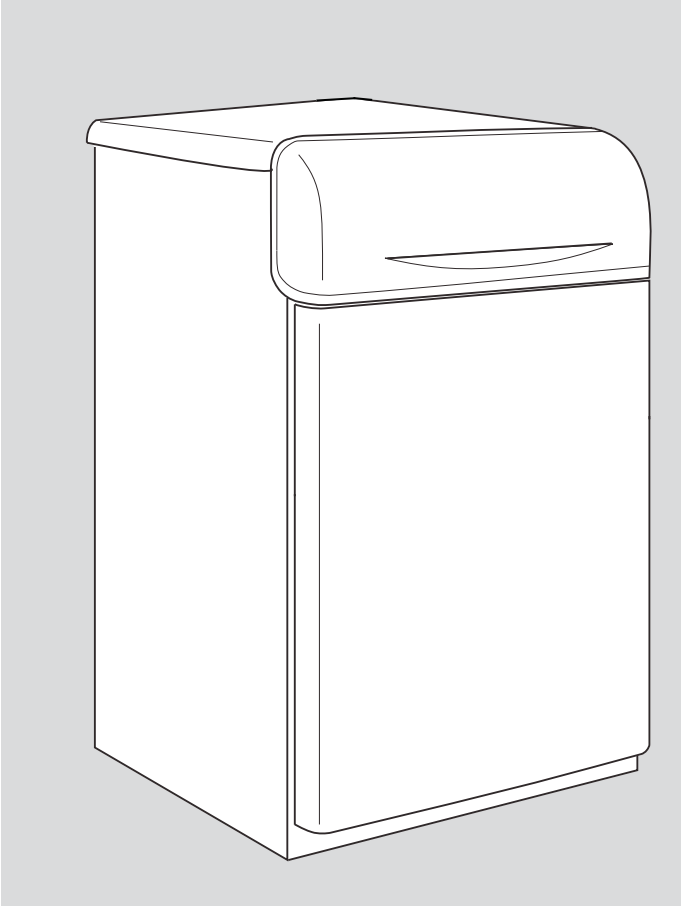
ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES

IMPORTANT—This Document is **customer property** and is to remain with this unit. Please return to service information pack upon completion of work.

*GRWF130A94A0A

*May be “A” or “T”

Direct Vent Gas Fired Water Boiler with Cast Iron Heat Exchanger



18-CG02D1-4

1.0 Safety Considerations

IMPORTANT: Read this entire manual before beginning installation procedures.

Read this manual carefully before attempting to install, operate, or perform maintenance on this boiler. Installation, service, and maintenance should be performed by qualified technicians only.

NOTE: "Warnings" and "Cautions" appear at appropriate places in this manual. Read these carefully. Your personal safety and the proper operation of this heating product require that you follow them carefully. The manufacturer assumes no liability for installations or services performed by an independent dealers.

Safety signal words are used to designate a degree or level of seriousness associated with a particular hazard. The signal words for safety markings are WARNING and CAUTION.

⚠ WARNING

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

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices and hazards involving only property damage.

1.1 WARNINGS

⚠ WARNING

THE INFORMATION IN THIS GUIDE IS FOR USE BY INDIVIDUALS HAVING ADEQUATE ELECTRICAL AND MECHANICAL BACKGROUND NECESSARY TO INSTALL BOILER PRODUCTS. ANY ATTEMPTS, BY UNQUALIFIED PERSONS, AT PLUMBING, INSTALLING OR REPAIRING A BOILER MAY RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE. THE MANUFACTURER OR SELLER CANNOT BE RESPONSIBLE FOR THE INTERPRETATION OF THIS INFORMATION, NOR CAN IT ASSUME ANY LIABILITY IN CONNECTION WITH ITS USE.

⚠ WARNING

ELECTRICAL HAZARD

DISCONNECT POWER BEFORE INSTALLING OR SERVICING THE BOILER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

TURN OFF MAIN GAS VALVE BEFORE INSTALLING, PERFORMING MAINTENANCE OR SERVICING A BOILER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

EXPLOSION HAZARD

PROPANE GAS IS HEAVIER THAN AIR AND MAY COLLECT IN ANY LOW AREAS OR CONFINED SPACES. IF THE GAS BOILER IS INSTALLED IN A BASEMENT, AN EXCAVATED AREA OR A CONFINED SPACE, IT IS STRONGLY RECOMMENDED TO CONTACT A GAS SUPPLIER TO INSTALL A GAS DETECTING WARNING DEVICE IN CASE OF A GAS LEAK.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

NOTE: The manufacturer of your boiler does not test any detectors and makes no representations regarding any brand or type of detector.

⚠ WARNING

EXPLOSION HAZARD

ODORANT FADE MAY MAKE THE GAS UNDETECTABLE EXCEPT WITH A WARNING DEVICE. IF THE GAS BOILER IS INSTALLED IN A BASEMENT, AN EXCAVATED AREA OR A CONFINED SPACE, IT IS STRONGLY RECOMMENDED TO CONTACT A GAS SUPPLIER TO INSTALL A GAS DETECTING WARNING DEVICE IN CASE OF A GAS LEAK.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

NOTE: The manufacturer of your boiler does not test any detectors and makes no representations regarding any brand or type of detector.

⚠ WARNING

FIRE HAZARD
DO NOT INSTALL THIS BOILER WHERE COMBUSTIBLE PRODUCTS AND FLAMMABLE LIQUIDS ARE STORED OR WHERE FLAMMABLE VAPORS ARE PRESENT.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z221.1/NFPA 54 and/or CAN/CGA B149 Installation Codes.
8. After it has been determined that each appliance connected to the venting system properly vents where tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

⚠ WARNING

BURN HAZARD

ALLOW BOILER TO COOL DOWN PRIOR TO SERVICING OR PERFORMING MAINTENANCE.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

The following warning complies with State of California law, Proposition 65.

⚠ WARNING

HAZARDOUS GASES!
EXPOSURE TO FUEL SUBSTANCES OR BY-PRODUCTS OF INCOMPLETE FUEL COMBUSTION IS BELIEVED BY THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS, OR OTHER REPRODUCTIVE HARM.

⚠ WARNING

SAFETY HAZARD

DO NOT BYPASS SAFETY CONTROLS

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

FIRE HAZARD

DO NOT INSTALL THIS BOILER DIRECTLY ON CARPETING. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE..

NOTE: THIS PRODUCT IS APPROVED FOR INSTALLATION ON COMBUSTABLE FLOORING MATERIALS EXCEPT FOR CARPET.

⚠ WARNING

SAFETY HAZARD

THESE BOILERS ARE NOT APPROVED OR INTENDED FOR INSTALLATION IN MANUFACTURED (MOBILE) HOUSING, TRAILERS, OR RECREATIONAL VEHICLES.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

DO NOT USE THIS UNIT IF ANY PART HAS BEEN UNDER WATER. IMMEDIATELY CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE BOILER AND TO REPLACE ANY PART OF THE CONTROL SYSTEM AND ANY GAS CONTROL WHICH HAS BEEN UNDER WATER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

HEAVY OBJECT HAZARD

A BOILER IS A HEAVY OBJECT. DO NOT HANDLE OR WORK UNDER A BOILER WITHOUT PROPERLY SECURING IT THROUGH SHORING, BLOCKING OR CRIBBING. FOLLOW ALL STATE AND FEDERAL CODES AND OSHA REGULATIONS AND GUIDELINES FOR HANDLING THE BOILER DURING INSTALLATION AND SERVICING.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ 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 or use gasoline or other flammable vapors or 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.**

— DO NOT RELY ON SMELL ALONE TO DETECT LEAKS. DUE TO VARIOUS FACTORS, YOU MAY NOT BE ABLE TO SMELL FUEL GASES.

- **U.L. recognized fuel gas and CO detectors are recommended in all applications, and their installation should be in accordance with the manufacturer's recommendations and/or local laws, rules, regulations, or customs.**

— Installation and service must be performed by a qualified installer, service agency or the gas supplier.

The following warning complies with State of California law, Proposition 65.

⚠ WARNING

This product contains fiberglass wool insulation!

Fiberglass dust and ceramic fibers are believed by the State of California to cause cancer through inhalation. Glasswool fibers may also cause respiratory, skin, or eye irritation.

PRECAUTIONARY MEASURES

- Avoid breathing fiberglass dust.
- Use a NIOSH approved dust/mist respirator.
- Avoid contact with the skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves, and eye protection.
- Wash clothes separately from other clothing: rinse washer thoroughly.
- Operations such as sawing, blowing, tear-out, and spraying may generate fiber concentrations requiring additional respiratory protection. Use the appropriate NIOSH approved respirator in these situations.

FIRST AID MEASURES

Eye Contact – Flush eyes with water to remove dust. If symptoms persist, seek medical attention.

Skin Contact – Wash affected areas gently with soap and warm water after handling.

1.2 CAUTIONS

⚠ CAUTION

Do NOT install the boiler in a corrosive or contaminated atmosphere.

1.3 Notes

The following notes must be followed during the installation, servicing, and operation of this boiler:

1. **NOTE:** This device must only be used for the purpose for which it is specially designed. This unit is designed to heat water to a temperature below boiling point at atmospheric pressure and must be connected to a hydronic heating system and/or a water supply system for domestic use, compatible with its performance, characteristics and its heating capacity. Any other use is considered improper.

2. **NOTE:** These instructions do not cover all variations in systems or provide for every possible contingency. Should further information be desired or particular problems arise which are not covered sufficiently by this manual, contact your local distributor for assistance.

3. **NOTE:** Use only with the type of gas approved for this boiler. Refer to the boiler rating plate.

4. **NOTE:** Install this boiler only in a location and position as specified in "Locations and Clearances."

5. **NOTE:** Provide adequate combustion and ventilation air to the boiler space as specified in "Air for Combustion and Ventilation."

6. **NOTE:** Combustion products must be discharged outdoors. Connect this boiler to an approved vent system only as specified in the "Venting" section of this guide.

7. **NOTE:** Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in "Gas Piping."

8. **NOTE:** Always install the boiler to operate within the boiler's intended operating temperature range.

9. **NOTE:** The boiler is not to be used for temporary heating of buildings or structures under construction.

10. **NOTE:** Wear appropriate gloves, arm sleeve protectors, and eye equipment when servicing or maintaining this equipment.

11. **NOTE:** Verify system is leak free at startup. During routine boiler maintenance check integrity of system to be sure there are no leaks. A leak will result in a continuous flow of make up water leading to premature heat exchanger failure. Minerals will build up inside heat exchanger sections reducing performance and cause section failure. The additional oxygen added to the system from make up water speeds corrosion inside the heat exchanger. Maintenance and cleaning must be performed at least once every year.

NOTE: This product must be gas piped by a licensed Plumber or Gas Fitter in the Commonwealth of Massachusetts.

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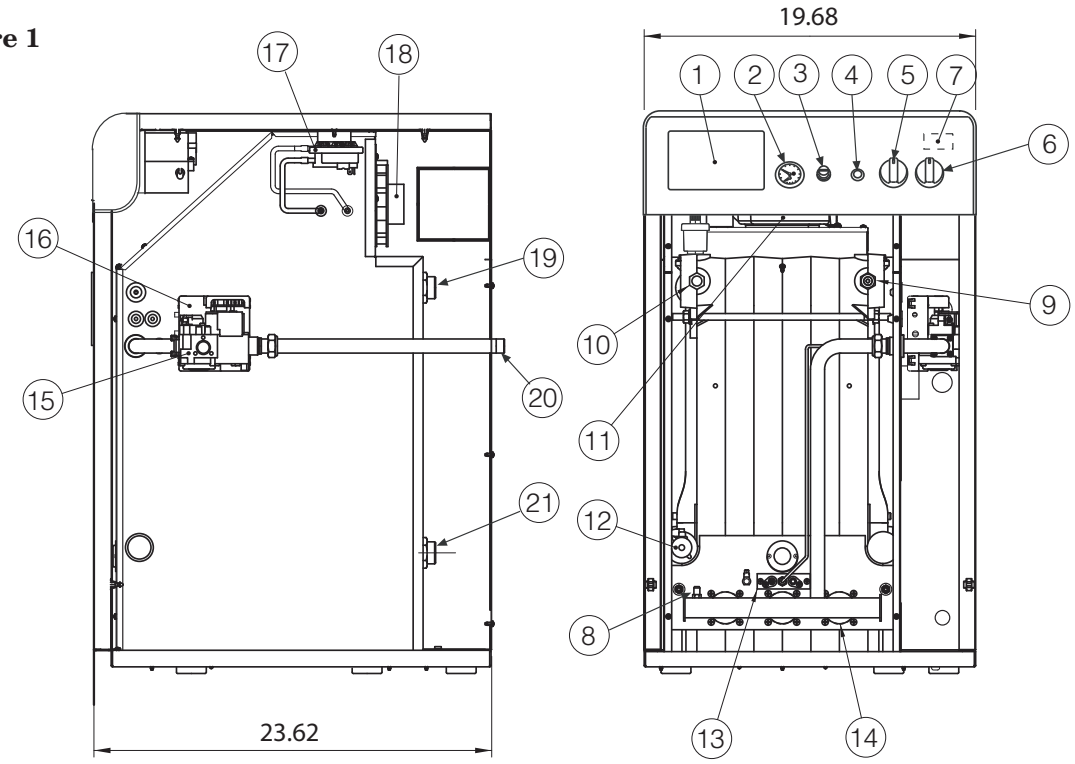
Figure 1



1. **Blank Cover Plate***
2. **Pressure-Temperature gauge**
3. **Unused space for Optional Manual Limit Reset Switch**
4. **Service light**
5. **Supply water thermostat**
6. **Service switch (on/off)**
7. **Water temperature limit switch (automatic reset, located behind the control panel inside the control box)**
8. **Gas manifold pressure port**
9. **Pressure gauge connection with check valve**
10. **Thermo-well**
11. **Fan**
12. **Boiler Drain**
13. **Pilot light unit**
14. **Main Burner**
15. **Gas Valve**
16. **Ignition Control Module**
17. **Air pressure switch**
18. **Vent connector collar**
19. **Supply - 1" NPT male**
20. **Gas Connection - 1/2" NPT male**
21. **Return - 1" NPT male**

***For Future Optional Accessory**

2.0 Pre-Installation Information & Instructions

Material in this shipment has been inspected at the factory and released to the transportation agency without known damage. Inspect exterior of crate for evidence of rough handling in shipment. Unpack carefully. If damage to contents is found, report the damage immediately to the delivering agency.

2.1 Parts Included

a) Gas fired, direct vent, cast iron water boiler with electronic ignition

b) Factory wired high water temperature limit switch - auto reset type

c) Factory installed brass ball valve boiler drain. Ball valve rotates 360^0. Depending on the initial position of the ball valve, each 1/4 turn will open or close the valve

d) Factory installed temperature - pressure gauge

e) Four Adjustable leveling feet, installation required

f) ASME approved relief valve and piping - installation required

g) Ship with literature package - Installer's Guide, Service Facts, Functional Parts List, and User's Information Guide

h) Manual gas supply shut off valve - installation required

i) Z-vent special gas vent adapter, 3" female x 3" female

2.2 General Specifications - Table 1

Product Specifications	
Model	*GRWF130
Ratings	
Input BTUH	130,000
DOE Output BTUH	110,000
Net (I=B=R®) Output BTUH	96,000
AFUE	84.3
Natural Gas Supply	
Pilot gas orifice Qty X ID	1 x 0.40mm
Main gas orifices Qty X ID	3 x 3.10mm
Supply pressure (in. w.c.)	7.0
Manifold pressure (in. w.c.)	3.6
Flow rate BTUH	130,000
LP Gas Supply	
Pilot gas orifice Qty X ID	1 x 0.24mm
Main gas orifices Qty X ID	3 x 1.90mm
Supply pressure (in. w.c.)	11.0
Manifold pressure (in. w.c.)	10.6
Flow rate BTUH	130,000
Heating	
Max working temperature °F	230
Maximum working pressure (psig)	60
No. sections	4
No. burners	3
Boiler water content (gal.)	3.06
ASME Pressure Relief Valve (psi)	30
Dimensions, weights connections	
Height (inches)	33.46
Width (inches)	19.69
Depth (inches)	24.21
Shipping Weight (lb.)	364
Net Weight (lb.)	320
Gas system connection	1/2” NPT male
Heating water supply	1” NPT male
Heating water return	1” NPT male
Electrical power supply V / Ph / Hz	115 / 60 / 1
Minimum Circuit Ampacity (amps)	less than 2.0
Maximum Overcurrent Protection (amps)	15

* May be “A” or “T”

2.3 Codes & Regulations

The manufacturer assumes no responsibility for equipment installed in violation of any code or regulation.

Codes and local utility requirements governing the installation of gas fired equipment, wiring, plumbing, and flue connections must be adhered to. In the absence of local codes, the installation must conform with the:

a) National Fuel Gas Code ANSI Z223.1 "latest edition" or CAN/CGA B149 Installation Codes. The latest code may be obtained from the American Gas Association Laboratories, 400 N. Capitol St. NW, Washington D.C. 20001

1-800-699-9277 or www.aga.org

b) Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1 where required.

c) National Electrical Code NFPA -70.

This boiler is classified Category III according to ANSI Z21.13 and under the "latest edition" provisions of NFPA54/ANSI Z223.1 and CAN/CGA 149 installation codes. Category III boilers operate with a positive vent static pressure and with a vent gas temperature that avoids excessive condensate in the vent. Installation of the vent system must be in accordance with the National Fuel Gas Code, NFPA54/ANSI223.1 or applicable provisions of local building or fire codes.

It is recommended that Manual J of the Air Conditioning Contractors Association (ACCA) or A.R.I. 230 be followed in estimating heating requirements. When estimating heating requirements for installation at Altitudes above 2000 ft., remember the gas input must be reduced (See GAS INPUT ADJUSTMENT).

2.4 Locations & Clearances

⚠ WARNING

FIRE HAZARD

DO NOT INSTALL THIS BOILER DIRECTLY ON CARPETING.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

NOTE: THIS PRODUCT IS APPROVED FOR INSTALLATION ON NON-COMBUSTIBLE FLOORING MATERIALS EXCEPT FOR CARPET.

⚠ WARNING

FIRE HAZARD

DO NOT INSTALL THIS BOILER WHERE FLAMMABLE LIQUIDS ARE STORED OR WHERE FLAMMABLE VAPORS ARE PRESENT.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

SAFETY HAZARD

THESE BOILERS ARE NOT APPROVED OR INTENDED FOR INSTALLATION IN MANUFACTURED (MOBILE) HOUSING, TRAILERS, OR RECREATIONAL VEHICLES.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

WATER HAZARD

DO NOT USE THIS UNIT IF ANY PART HAS BEEN UNDER WATER. IMMEDIATELY CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE BOILER AND TO REPLACE ANY PART OF THE CONTROL SYSTEM AND ANY GAS CONTROL WHICH HAS BEEN UNDER WATER. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

a) Location Considerations

The location of the boiler is normally selected by the architect, the builder, or the installer. However, before the boiler is moved into place, be sure to consider the following requirements:

1. Is the location selected near the chimney or vent?

2. Do all clearances between the boiler and the enclosure equal or exceed the minimum stated in the clearance table?

3. Is there sufficient space for servicing the boiler and other equipment? A minimum of 36" front and top accessibility to the boiler must be provided. Any access door or panel must permit removal of the largest component.

4. Are the ventilation and combustion air openings large enough and will they remain unobstructed? If outside air is used, are the openings set above the highest snow accumulation level? (See page 18 for Combustion and Ventilation section)

5. The boiler is approved for installation directly on combustible and non-combustible flooring. **Do not install on carpet.**

6. Ensure the boiler structure will support the weight of the boiler**.**

7. Locate the boiler so that all system components are protected from water damage during operation or service.

8. In some applications, boilers may need to be raised above the floor level to reduce the risk of water damage.

9. In garage applications, refer to ANSI Z223.1 for guidance.

10. All boilers installed above the level of heat emitters must have a low water cut-off device installed. Refer to National, State or Local codes for guidance.

11. Slowly scaling if only 1/8" in here.

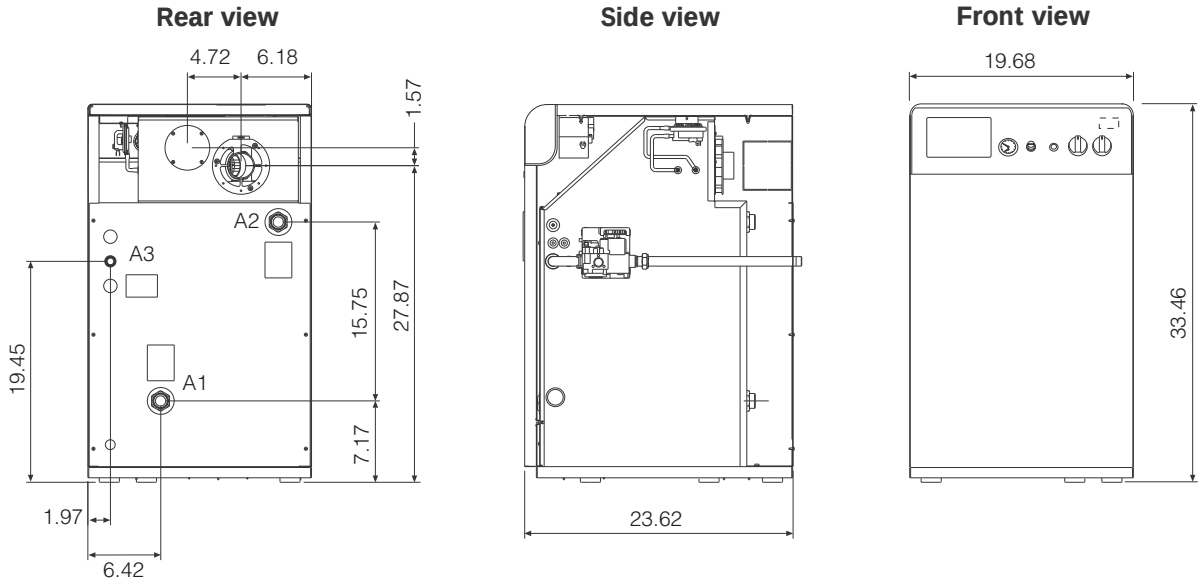
b) **Minimum Clearances**

Table 2

	Minimum Clearances for Combustion	Recommended Clearances for Service
Top	6”	36”
Right Side	6”	24”
Left Side	6”	6”
Front	18”	30”
Back	6”	6”

2.5 Outline Drawings

Dimensions and Connections - Figure 2



All dimensions are in inches

Table 3

Type and model	A1 Heating Return	A2 Heating Supply	A3 Gas Inlet
*GRWF130	1"	1"	1/2"

* May be "A" or "T"

NOTE: All threads are NPT, male connections

3.0 Installation Instructions
3.1 Uncrating Boiler

⚠ WARNING

SAFETY HAZARD

WHEN MOVING THE BOILER TO THE INSTALLATION LOCATION, ENSURE THE STRUCTURE (I.E. FLOORS, STAIRS, PEDESTALS) CAN SUPPORT THE WEIGHT OF THE BOILER, DOLLY AND OTHER MOVING EQUIPMENT AND THE PERSONNEL MOVING THE BOILER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

SAFETY HAZARD

BEFORE SETTING THE BOILER AT THE INSTALLATION LOCATION ENSURE THE FLOOR STRUCTURE WILL SUPPORT THE WEIGHT OF THE BOILER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

HEAVY OBJECT HAZARD

A BOILER IS A HEAVY OBJECT. DO NOT HANDLE OR WORK UNDER A BOILER WITHOUT PROPERLY SECURING IT THROUGH SHORING, BLOCKING OR CRIBBING. FOLLOW ALL STATE AND FEDERAL CODES AND OSHA REGULATIONS AND GUIDELINES FOR HANDLING THE BOILER DURING INSTALLATION AND SERVICING.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ CAUTION

Use caution when inserting and removing safety blocks. Make sure boiler will not fall off safety blocks.

Failure to obey caution could result in personal injury.

1. Move crated boiler as close as possible to the location to be installed. Uncrate the boiler using a saw to cut the four bottom corner posts even with the top of the pallet. The top of the crate can then be lifted off of the boiler. See Figures 3 and 4.

When boiler is ready to be uncrated, use a saw to cut the four vertical corner boards just above the base of the crate.

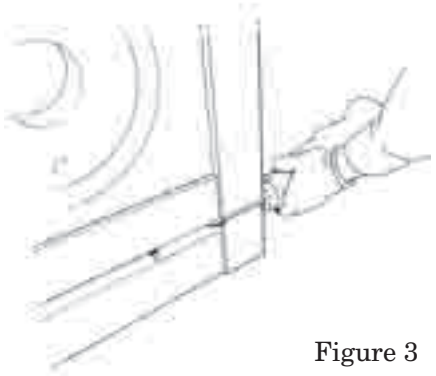


Figure 3

Figure 4

2. If the boiler cannot be moved with crate assembled, uncrate the boiler and use an appliance dolly of structure worthy to carry the boiler to move the boiler to the selected location. If required, the boiler jacket may be removed to simplify handling (see section 3.2, 5 a through f). Use a saw to cut the four corner posts even with the top of the pallet. The top of the crate can then be lifted off of the boiler.
3. Remove boiler front access panel (Figure 17). Locate and remove the four bolts securing the boiler base to the pallet.

3.2 Setting Boiler

1. Verify the floor structure where the boiler will be set can support the weight of the boiler.
2. Locate the boiler so all components are protected from water damage during operation.
3. As required, raise the boiler above the floor level to reduce the risk of water damage.
4. Consult ANSI Z223.1 for garage applications.
5. Move the boiler to the installation location with an appliance dolly. If required, the boiler jacket may be removed to simplify handling.

To remove the boiler jacket, follow the steps listed below.

a. Remove the front access panel (see Figure 17).

b. Remove the top access panel (see Figure 18).

c. Raise the cover on the control panel (See Figure 18) and locate the screw access holes at the top left and right of the panel. Insert a phillips screwdriver and remove the two screws. Lower the control box.

d. Remove the left and right boiler jacket panels by removing the phillips screws securing the panels. See Figure 20.

e. Move and set the boiler.

f. Reassemble the boiler jacket, control panel and front access panel. Leave the top panel off until the boiler is leveled using the adjustable feet.

3.3 Leveling the Boiler

1. Locate the leveling feet (4) shipped in a bag with the boiler.

2. Tilt the boiler toward the front and place a safety block under the rear of the boiler beyond the front side of the rear flat adjustable feet location. The back of the boiler must be elevated high enough to facilitate installation and adjustment of the leveling feet. See Figure 5. Install the adjustable feet. Remove the safety block.

3. Tilt the boiler toward the rear and place a safety block under the front of the boiler just beyond the back side of the boiler front adjustable feet location. The front of the boiler must be elevated high enough to facilitaqte installation and adjustment of the leveling feet. See Figure 6. Install and adjust front leveling feet. Remove the safety block.

4. Remove the top panel from the boiler. Place a torpedo level on top of the metal control box. Adjust leveling feet to make sure boiler is level using steps 2-3.

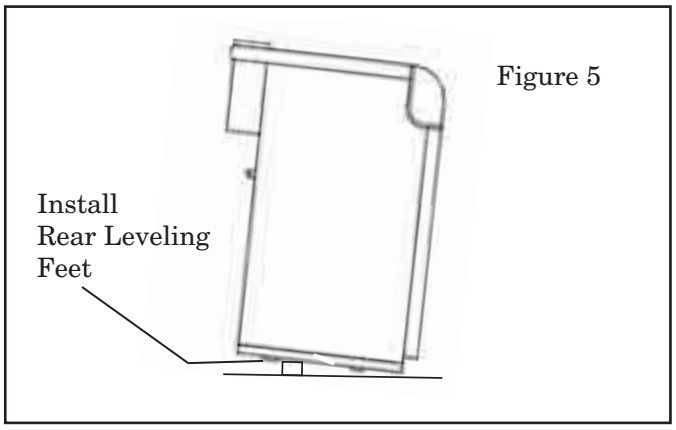


Figure 5

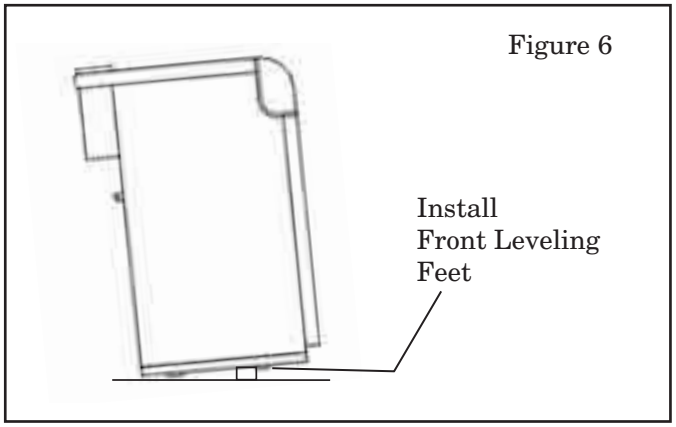


Figure 6

3.4 Water Connections and Piping Systems

⚠ WARNING

CONTAMINATION HAZARD.

AIR IN BOILER PIPING SYSTEM LEADS TO OXYGEN CONTAMINATING THE SYSTEM. OXYGEN CONTAMINATION LEADS TO CORROSION AND PREMATURE BOILER FAILURE. THE BOILER STANDARD LIMITED WARRANTY DOES NOT COVER OXYGEN CONTAMINATION OF BOILER OR SCALE DEPOSITS CAUSED BY MAKE UP WATER ADDED TO THE SYSTEM.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

NOTE: DO NOT use the water system pipes to ground electrical appliances.

For good operation and long life of the boiler, the piping system must be well proportioned.
If the supply and return pipes follow a path where air pockets could form in certain places, it is advisable to install air vents at these points. Also, install a discharge device at the lowest point in the system to allow complete draining of the system.

If the boiler is installed at a lower level than the system, it is advisable to install a weighted flow check valve in the supply line to prevent the natural circulation of system water when the system is off.

The return water temperature to the boiler must be above 110° F. The temperature drop between the delivery manifold should not exceed 68° F.

Before installation, carefully flush the system with water to remove residues or impurities that could affect the boiler's operation and service life.

Piping

1. The supply and return water connections are located on the back of the boiler.
2. The installation of piping shall be in accordance with National, State and local codes.
3. Supply and Return connections are 1" NPT male. When connecting supply and return water lines, use a good quality pipe joint compound. For locations, see Figure 7.
4. Gas connection is a 1/2" NPT male. See Figure 7.
5. Boiler drain ships factory installed. See Figure 8.
6. Use good quality joint compound that is resistant to the chemical reaction with liquified petroleum gasses.
7. It is advisable to install isolation valves between the boiler and heating system and on the inlet and outlet side of all hydronic system components for service. This allows the boiler or components to be isolated from the system if necessary.
8. Ensure the hydronic system is properly supported so that no stress is applied to the boiler connections.

Figure 7

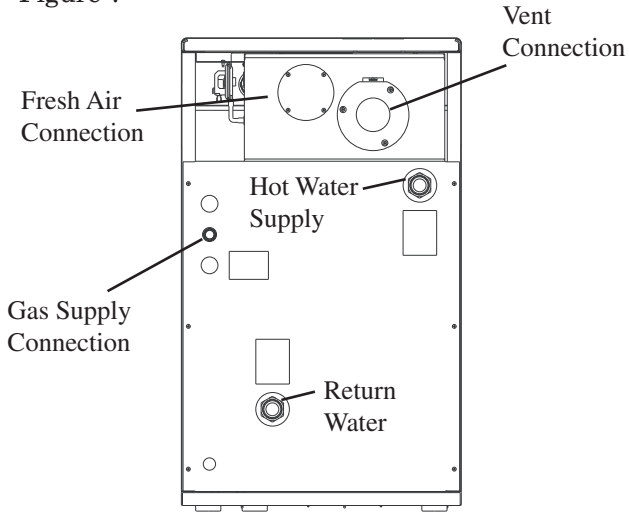
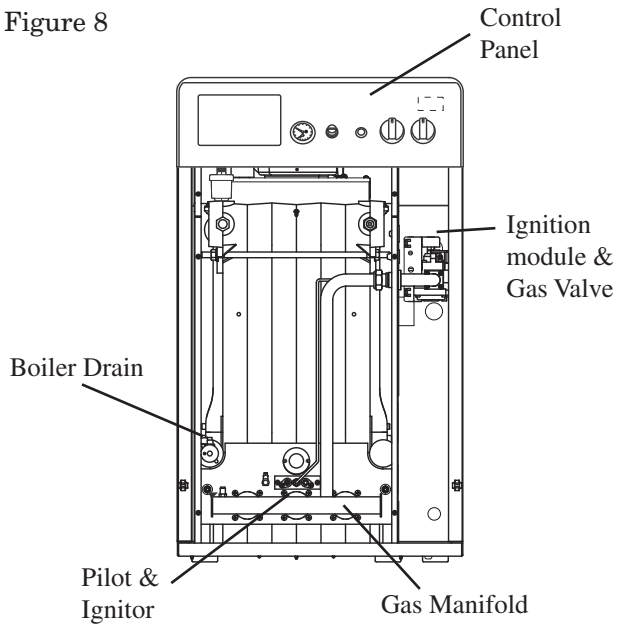


Figure 8



⚠ WARNING

SAFETY HAZARD.

PRESSURE RELIEF VALVE OUTLET MUST BE ROUTED TO WITHIN 6" OF A FLOOR DRAIN OR OTHER AREA SAFE FOR DISCHARGE OF HOT WATER AND SAFE FROM FREEZING. THIS PIPE MUST BE FULLY 3/4" IN SIZE THE ENTIRE LENGTH AND IT MUST NOT CONTAIN ANY RESTRICTIONS, TRAPS, VALVES, PLUGS, OR CAPS.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

Characteristics of system water

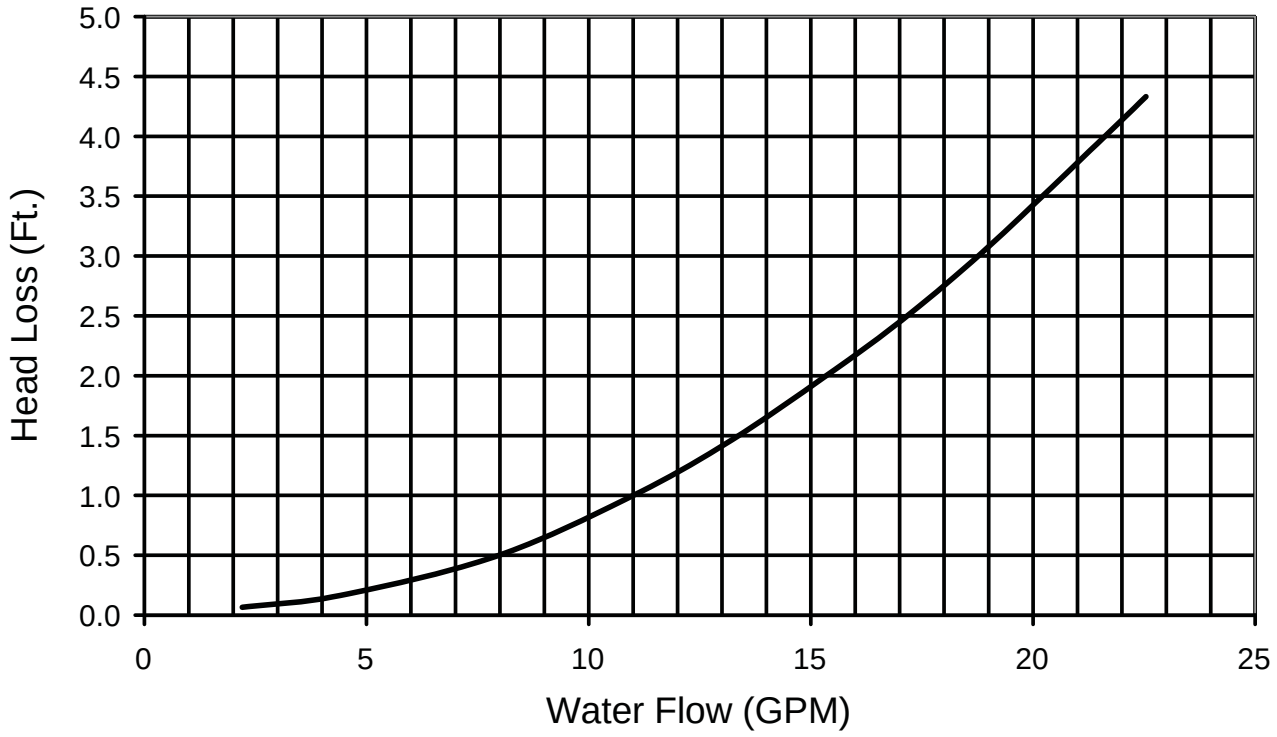
In the presence of water harder than 14 grains per gallon, we recommend the use of suitably conditioned water in order to avoid possible scaling in the boiler, caused by hard water, or corrosion produced by aggressive water. It should be remembered that, because of its low thermal conductivity, even scaling of just a few mm thick causes significant overheating of the boiler walls leading to premature boiler failure.

Water treatment is indispensable in the case of very large systems (containing large amounts of water) or with frequent introduction of replenishing water in the system. If partial or total emptying of the system becomes necessary under these conditions, it is advisable to refill it with treated water.

Proper boiler operating pressures

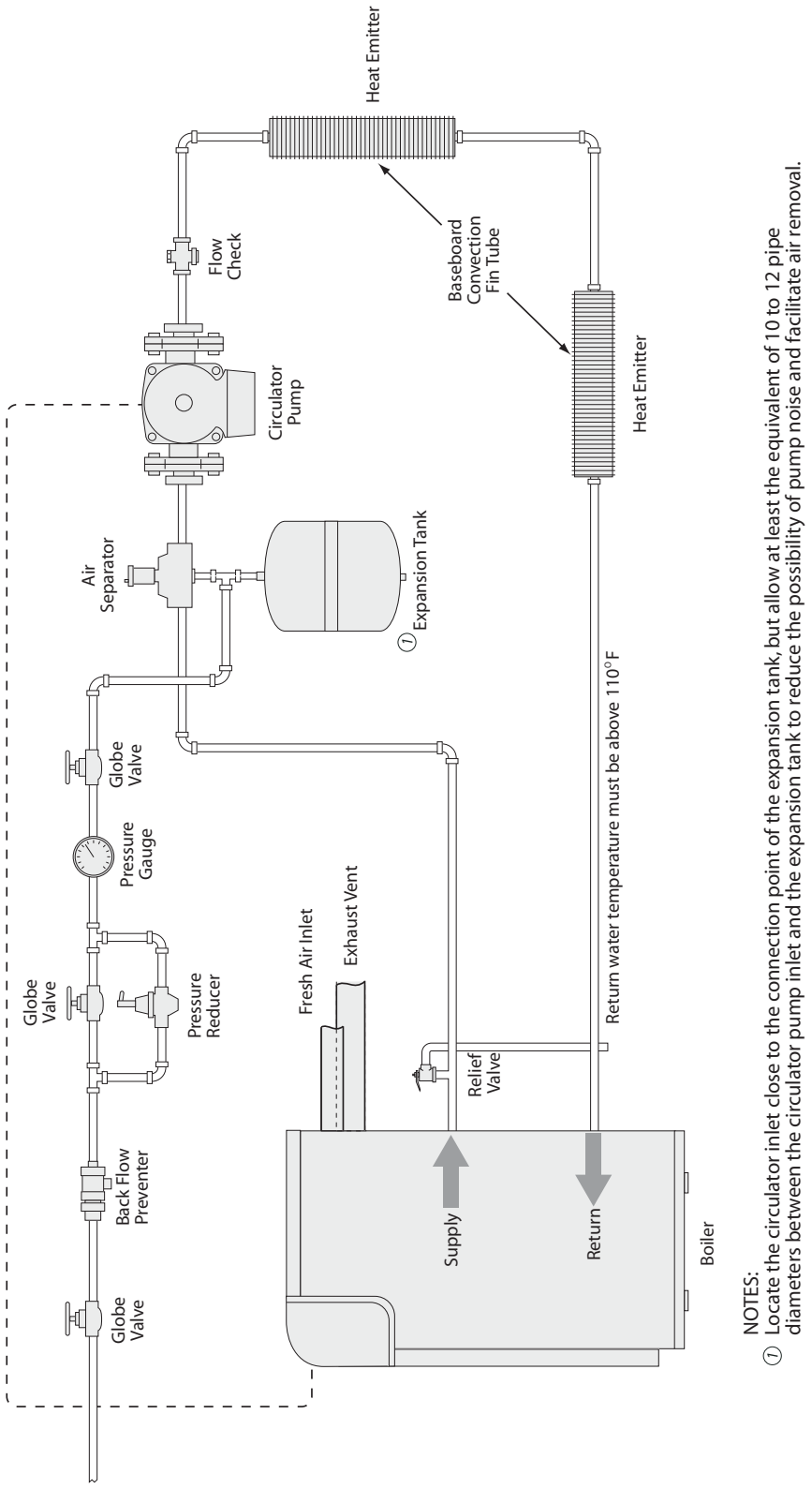
The system pressure when cold should be about 12psi. For correct operation of the boiler, when hot, its pressure should be between 18-24 psi.

Figure 9 - Head Loss versus Flow Chart for Models *GRWF130



I. Typical System Piping Diagrams

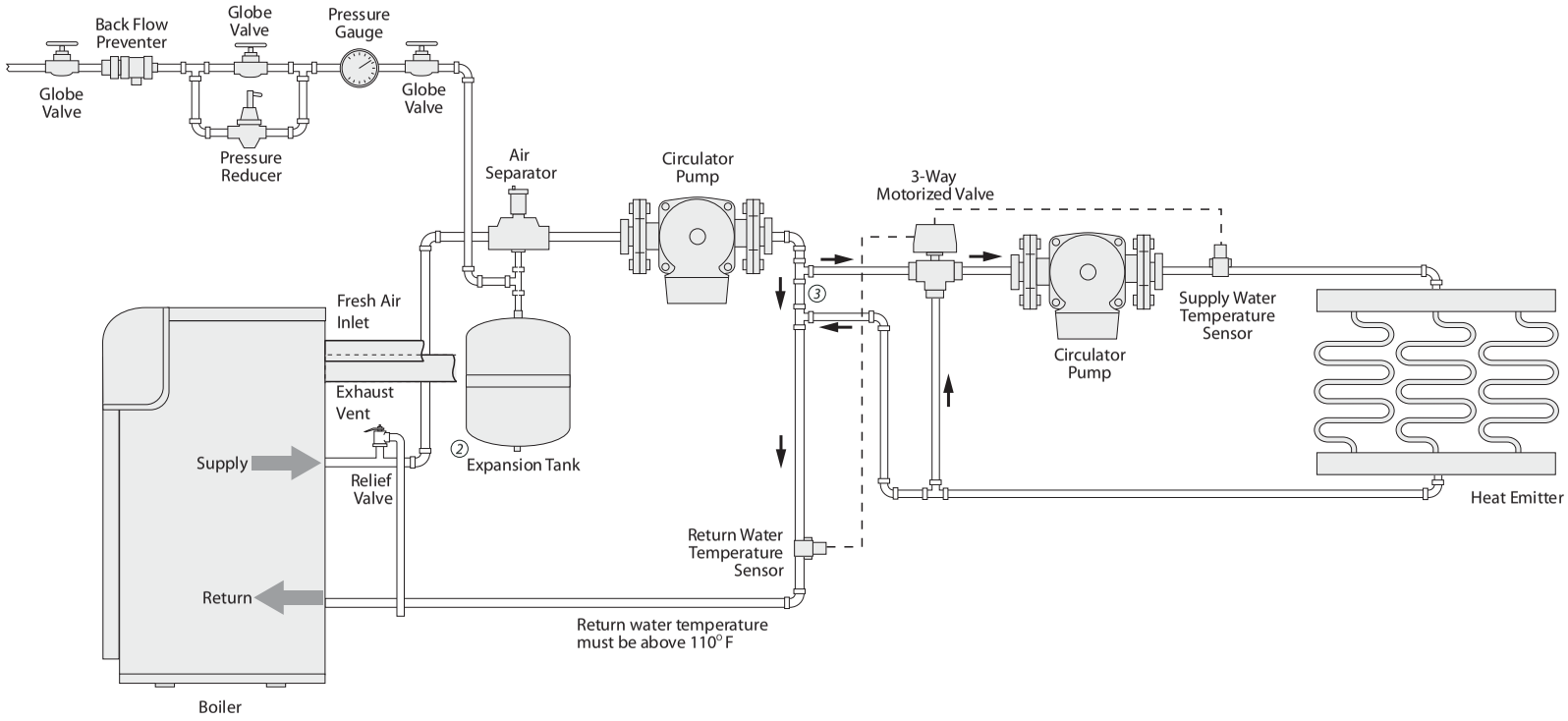
Typical System Piping Diagram
Single Zone System - High Temperature with Low Mass Heat Emitters



NOTES:
① Locate the circulator inlet close to the connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump inlet and the expansion tank to reduce the possibility of pump noise and facilitate air removal.

Typical System Piping Diagram

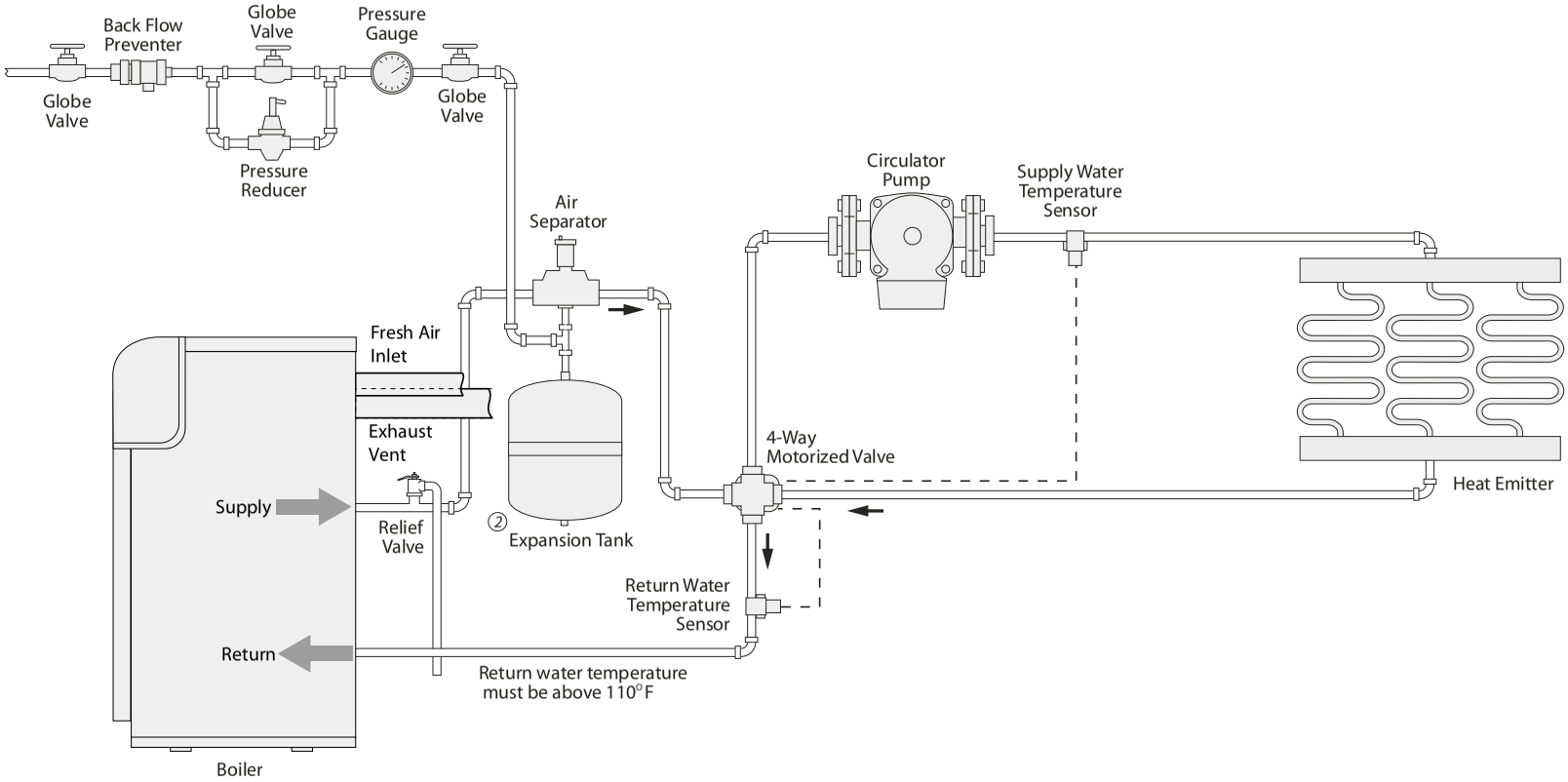
① Primary Secondary Loop with 3-way Motorized Valve
Low Temperature with Low Mass Heat Emitters
or High Temperature with High or Low Mass Heat Emitters



NOTES:
①Protects boiler from too low return water temperature and condensation.
②Locate the circulator inlet close to the connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump inlet and the expansion tank to reduce the possibility of pump noise and facilitate air removal.
③Close coupled Tees

Typical System Piping Diagram

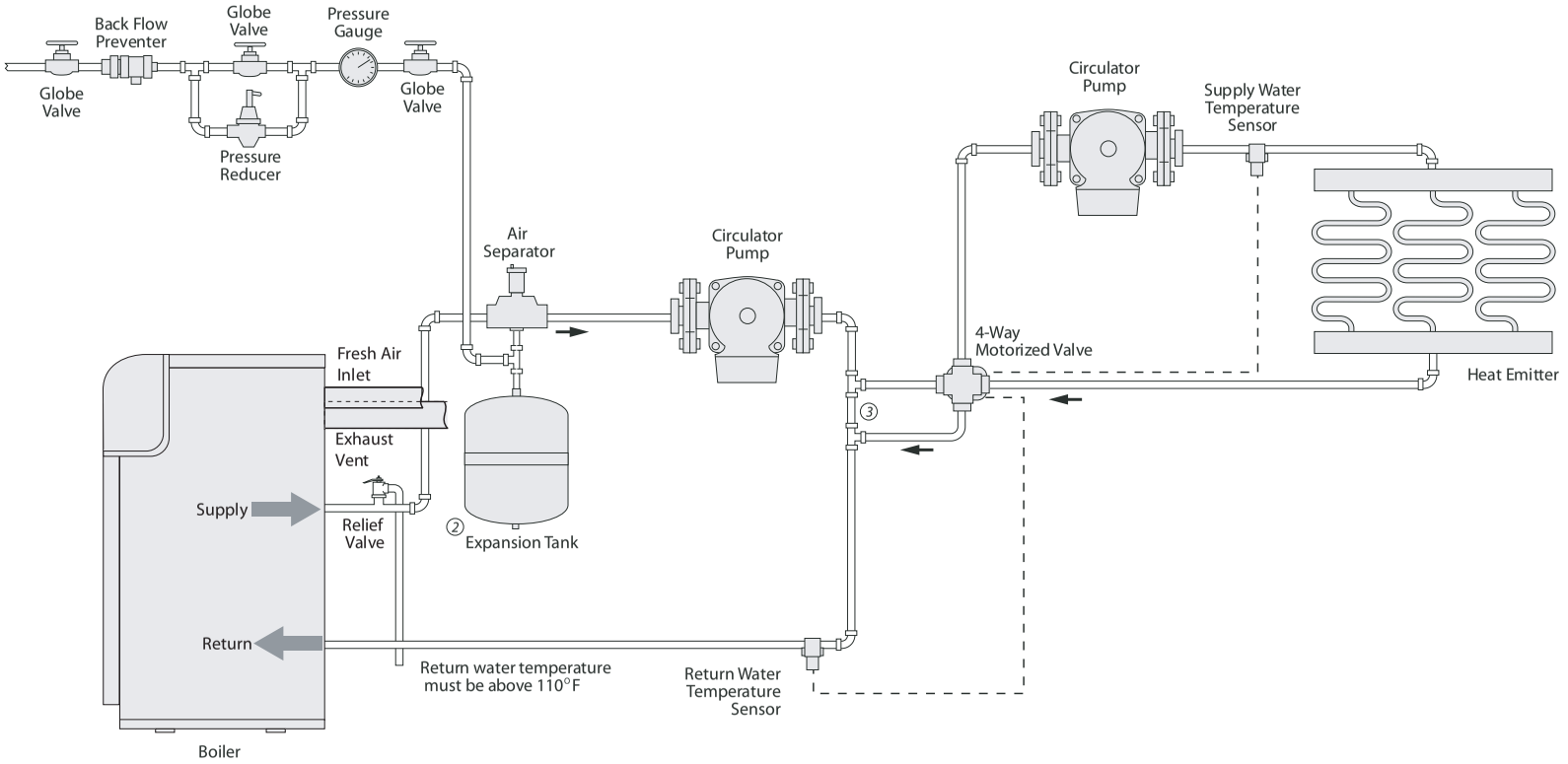
① Primary Secondary Loop with 4-way Motorized Valve with Circulator in Secondary Loop Only
Low Temperarure with Low Mass Heat Emitters
or High Temperature with High or Low Mass Heat Emitters



NOTES:
① Protects boiler from too low return water temperature and condensation.
② Locate the circulator inlet close to the connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump inlet and the expansion tank to reduce the possibility of pump noise and facilitate air removal.

Typical System Piping Diagram

① Primary Secondary Loop with 4-way Motorized Valve with Circulators in Primary and Secondary Loops Low Temperarure with Low Mass Heat Emitters or High Temperature with High or Low Mass Heat Emitters



NOTES:

① Protects boiler from too low return water temperature and condensation.

② Locate the circulator inlet close to the connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump inlet and the expansion tank to reduce the possibility of pump noise and facilitate air removal.

③ Close coupled Tees

3.5 Combustion Air and Ventilation

Important: All aspects of the installation of this boiler, including materials, methods of providing combustion air and methods of venting products of combustion to the outdoors must comply with all local codes and the following national standards:
1) CSA B149.1 (most recent edition) - Natural Gas and Propane Installation Code (Canada)
2) NFPA 54 (most recent edition) - National Fuel Gas Code (US)
3) NFPA 58 (most recent edition) - Liquefied Petroleum Gas Code (US)

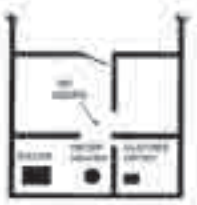
Adequate flow of combustion and ventilating air must not be obstructed from reaching the boiler. Air openings provided in the boiler casing must be kept free of obstructions which restrict the flow of air. Airflow restrictions affect the efficiency and safe operation of the boiler. Keep this in mind should you choose to remodel or change the area which contains your boiler. Boilers must have a free flow of air for proper performance.

Provisions for combustion and ventilation air shall be made in accordance with "latest edition" of Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1, or Sections 7.2, 7.3 or 7.4 of CAN/CGA B149 Installation Codes, and applicable provisions of the local building codes. Special conditions created by mechanical exhausting of air and fireplaces must be considered to avoid unsatisfactory boiler operation.

Boiler locations may be in "confined space" or "unconfined space". Unconfined space is defined in Table 4 and Figure 10.

Fig. 10 **UNCONFINED**

50 CU. FT. OR MORE PER 1000 BTU/HR. INPUT ALL EQUIP. INSTALLED



These spaces must have adequate air by infiltration to provide air for combustion, ventilation, and dilution of flue gases. Buildings with tight construction (for example, weather stripping, heavily insulated, caulked, vapor barrier, etc.), may need additional air provided as described for confined space.

Confined spaces are installations with less than 50 cu. ft. of space per 1000 BTU/hr input from all equipment installed. Air for combustion and ventilation requirements can be supplied from inside the building as in Figure 12 or from the outdoors, as in Figure 13.

Fig. 11 **CONFINED**

LESS THAN 50 CU. FT. PER 1000 BTU/HR. INPUT ALL EQUIP INSTALLED

1. All air from inside the building as in Figure 12: The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. Refer to Table 4, for minimum open areas required.
2. All air from outdoors as in Figure 13: The confined space shall be provided with two permanent openings, one commencing within 12 inches of the top and one commencing within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors. Refer to Table 5, for minimum open areas required.

A variety of potential sources of carbon monoxide can be found in a building or dwelling such as gas-fired clothes dryers, gas cooking stoves, water heaters, boilers and fireplaces. The U.S. Consumer Product Safety Commission recommends that users of gas-burning appliances install carbon monoxide detectors as well as fire and smoke detectors per the manufacturer's installation instructions to help alert dwelling occupants of the presence of fire, smoke or unsafe levels of carbon monoxide. These devices should be listed by Underwriters Laboratories, Inc. *Standards for Single and Multiple Station Carbon Monoxide Alarms, UL 2034* or CSA International Standard, *Residential Carbon Monoxide Alarming Devices,* CSA 6.19.

TABLE 4

Minimum Area in Square Feet for Unconfined Space Installations

Boiler Maximum BTUH / Input Rating	With 8 Foot Ceiling Minimum Area in Square Feet of Unconfined Space
90,000	560
130,000	810
173,000	1080
215,000	1340

TABLE 5

Minimum Free Area in Square Inches Each Opening (Boiler Only)

Boiler Maximum BTUH / Input Rating	Air From Inside	Air From Outside	
		Vertical Duct	Horizontal Duct
90,000	100	25	50
130,000	130	35	70
173,000	175	45	90
215,000	215	55	110

Figure 12

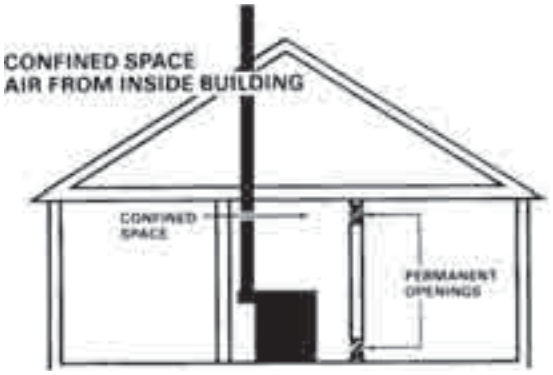
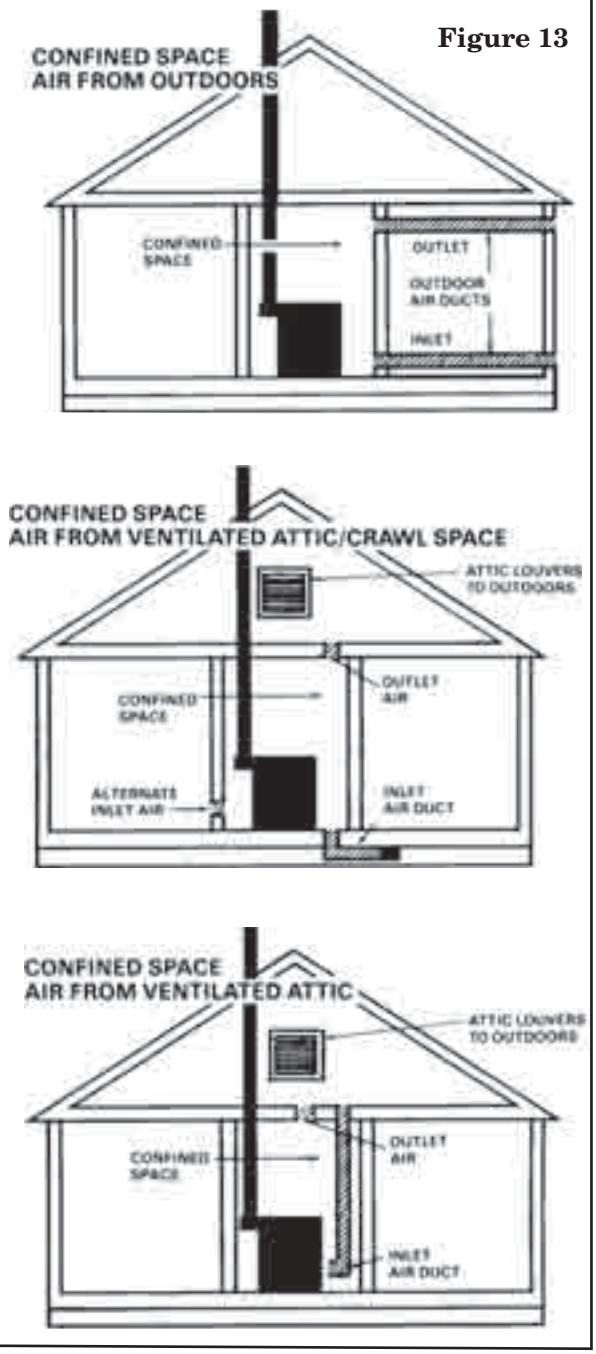


Figure 13



3. The following types of installations will **require** use of OUTDOOR AIR for combustion, due to chemical exposures:
   * Commercial buildings
   * Buildings with indoor pools
   * Boilers installed in commercial laundry rooms
   * Boilers installed in hobby or craft rooms
   * Boilers installed near chemical storage areas.

   Exposure to the following substances in the combustion air supply will also require OUTDOOR AIR for combustion:
   * Permanent wave solutions
   * Chlorinated waxes and cleaners
   * Chlorine based swimming pool chemicals
   * Water softening chemicals
   * Deicing salts or chemicals
   * Carbon Tetrachloride
   * Halogen type refrigerants
   * Cleaning solvents (such as perchloroethylene)
   * Printing inks, paint removers, varnish, etc.
   * Hydrochloric acid
   * Cements and glues
   * Antistatic fabric softeners for clothes dryers
   * Masonry acid washing materials

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z221.1/NFPA 54 and/or CAN/CGA B149 Installation Codes.
8. After it has been determined that each appliance connected to the venting system properly vents where tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

3.6 GENERAL VENTING INSTRUCTIONS

VENT PIPING

⚠ WARNING

FIRE AND CARBON MONOXIDE HAZARD

USE ONLY AN APPROVED AL29-4C® STAINLESS STEEL VENT SYSTEM, PROPERLY INSTALLED, TO VENT FLUE GASES FROM THIS BOILER. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

FIRE HAZARD AND CARBON MONOXIDE HAZARD

DO NOT USE A VENT DAMPER WITH THIS BOILER. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

CARBON MONOXIDE HAZARD

THE EXHAUST VENT SYSTEM MUST BE MADE UP ENTIRELY OF COMPONENTS FROM THE SAME MANUFACTURER AND STYLE. DO NOT MIX BRANDS OR STYLES OF PIPES AND FITTINGS. THE VENT SYSTEM COULD FAIL TO SEAL, RESULTING IN FLUE GAS SPILLAGE INTO THE LIVING AREA. FAILURE TO FOLLOW THIS SAFETY WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE

This boiler is classified Category III according to ANSI Z21.13 and under the "latest edition" provisions of NFPA54/ ANSI Z223.1 and CAN/CGA 149 installation codes. Category III boilers operate with a positive vent static pressure and with a vent gas temperature that avoids excessive condensate in the vent. Installation of the vent system must be in accordance with the National Fuel Gas Code, NFPA54/ANSI223.1 or applicable provisions of local building or fire codes.

For venting the flue gases, this boiler requires a special gas vent system consisting of single wall pipe and fittings, constructed of AL-29-4C® stainless steel. The system must be gasketed and must be water-tight and air-tight. The special gas vent system must be listed by Underwriters Laboratories Inc. as having been tested and conforming to Standards UL 1738 AND ULCS636 such as Z-Vent, Model SVE, Series III or equivelant. This vent system must be provided by the installer. Installation must strictly conform with the vent system manufacturer's instructions. Example instructions from Z-Flex® are included for reference in the appendix at the end of this document.

This boiler includes one 3.00" OD exhaust vent collar suitable for attaching a universal adapter compatible with the special vent system provided by the installer. One 3" Z-Vent Adapter #2SVSNA03.5 (female, both ends) is shipped with the boiler. If a different UL listed vent system supplier is selected, the installer must furnish the appropriate appliance adapter.

Do not mix exhaust venting components made by one manufacturer with those made by another.

Table 6A Category III Boiler - Approved Venting Systems

Vent System	Material	Equivalent Length
Flue Exhaust	3" 90° Elbow, Z-Vent Model SVE, Series III or Equal	3 Equivalent Feet, Each
	3" Rain Cap, Z-Vent Model SVE, Series III or Equal	3 Equivalent Feet, Each
	3" Straight Pipe, Z-Vent Model SVE, Series III or Equal	1 Equivalent Foot, for Each Foot of Straight Pipe
Fresh Air Intake	3" 90° Elbow, Sch 40 PVC	8 Equivalent Feet, Each
	3" Straight Pipe, Sch 40 PVC	1 Equivalent Foot, for Each Foot of Straight Pipe
Fresh Air Intake - Alternate	3" 90° Elbow, B-Vent	3 Equivalent Feet, Each
	1 Foot Length Of 3" Straight Pipe, B-Vent	1 Equivalent Foot, for Each Foot of Straight Pipe

Table 6B Category III Boiler - Approved Vent Pipe Lengths*

With restrictor removed (see instructions below)	The sum of the flue exhaust pipe equivalent length and the fresh air intake pipe equivalent length must be at least 35 feet and not more than 135 feet
With restrictor in place (as shipped)	The sum of the flue exhaust pipe equivalent length and the fresh air intake pipe equivalent length must be less than 35 feet

* Approved pipe length depends on the presence of a flue gas restrictor orifice in the outlet of the combustion fan motor (CFM).

Where sealant is required, use GEIS806 High Temperature Sealant (500°F, 260°C).

This boiler is suitable for either direct vent installation or for installation using indoor combustion air.

For direct vent installations, this boiler may be connected to either a vertical or horizontal two pipe system. The exhaust vent and fresh air intake must not exceed the maximum permissable equivalent feet in length. See table 6A and 6B for vent lengths.

Removal of Restrictor Orifice for Flue Gas Vent Pipe Lengths of 35 Feet or More

NOTE:
Remove the restrictor orifice in the combustion fan motor outlet fitting when the total sum of the equivalent length of the flue gas pipe system and the equivalent length of the fresh air pipe system equals or exceeds 35 feet!

Boiler is shipped with a flue gas vent pipe restrictor orifice in place. This orifice must be removed if the total sum of the equivalent length of the flue gas pipe system and the equivalent length of the fresh air pipe system equals or exceeds 35 feet!

To remove the vent pipe restrictor orifice:
1. Remove the flue gas vent pipe adapter from the discharge fitting of the combustion fan motor (CFM) (see Figure 13A).
2. Remove the flexible gasket from the discharge fitting of the CFM (see Figure 13B).
3. Remove the flue gas vent pipe restrictor orifice (see Figure 13C.)
4. Replace the flexible gasket in the discharge fitting of the CFM (see Figure 13B).
5. Replace the flue gas vent pipe adapter (see Figure 13A).

FRESH AIR (COMBUSTION AIR) PIPING

PVC pipe may be used for fresh (combustion) air. This boiler includes one pre-installed 3.5" OD combustion air vent collar suitable for attaching a schedule 40 PVC fitting or coupling. Use silicone sealant to seal and hold the fitting

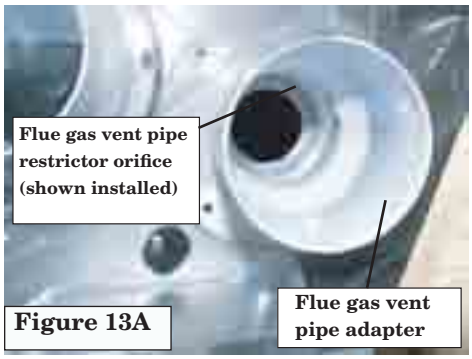


Figure 13A

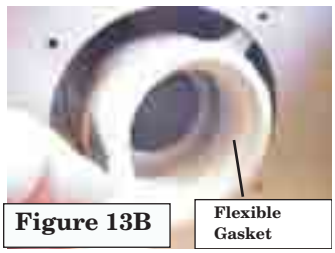


Figure 13B

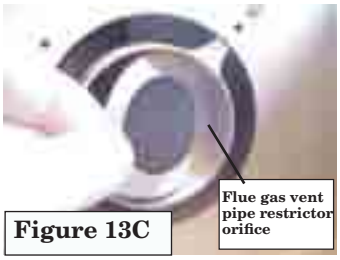
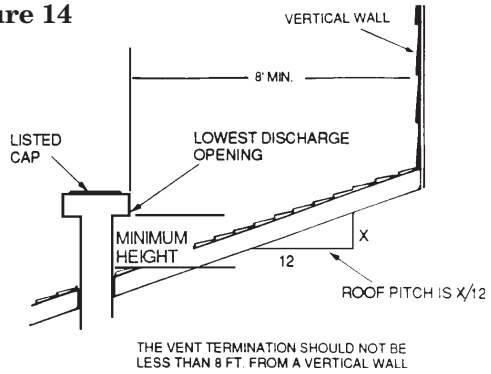


Figure 13C

Figure 14



in place. As an alternative, B-Vent may be used for fresh air. A 3" OD collar for fresh air is shipped loose with the boiler for connecting to the 3" metal vent pipe. If B-Vent is used, replace the installed 3.5" OD collar with the 3" OD collar provided with the boiler. Exhaust vent and fresh air intake system components to be supplied by the installer.

General Venting Guidelines

a) Connect the vent system to only one appliance.

b) The minimum clearance between vent pipes and combustible materials must be six inches.

c) Avoid an excessive number of bends.

d) Horizontal runs should pitch upward at least 1/4" per foot. See Figure 14 and Table 7.

e) Horizontal runs should be as short as possible.

f) Horizontal pipe runs must be supported by hangers, straps, or other suitable material in intervals at a minimum of every 3 feet.

g) When vent pipe connection must pass through walls or partitions of combustible material, a thimble must be used and installed according to local codes.

h) Vent pipe through the roof should be extended to a height determined by the National Fuel Gas Code or local codes. It should be capped properly to prevent rain water from entering the vent. Roof exit should be waterproofed.

i) A boiler shall not be connected to a chimney or flue serving a separate appliance designed to burn solid fuel.

j) Apply other good venting practices as stated in the venting section of the National Fuel Gas Code NFPA54/ANSI Z223.1 "latest edition".

k) **Vent connectors serving appliances vented by natural draft or non-positive pressure shall not be connected into any portion of a mechanized draft system operating under positive pressure.**

TABLE 7
Gas Vent Termination

Roof Pitch	Minimum Height
Flat to 7/12	1.0 Feet*
Over 7/12 to 8/12	1.5 Feet
Over 8/12 to 9/12	2.0 Feet
Over 9/12 to 10/12	2.5 Feet
Over 10/12 to 11/12	3.25 Feet
Over 11/12 to 12/12	4.0 Feet
Over 12/12 to 14/12	5.0 Feet
Over 14/12 to 16/12	6.0 Feet
Over 16/12 to 18/12	7.0 Feet
Over 18/12 to 20/12	7.5 Feet
Over 20/12 to 22/12	8.0 Feet

* This requirement covers most installations

NOTE:

The manufacturer of your boiler does not test any detectors and makes no representations regarding any brand or type of detector.

THROUGH THE WALL VENT TERMINATIONS (excerpted from NFPA54 - National Fuel Gas Code - See illustration in Appendix C.

A mechanical draft venting system shall terminate at least 3 ft (0.9 m) above any forced air inlet located within 10 ft (3.0 m).

Exception No. 1: This provision shall not apply to the combustion air intake of a direct-vent appliance.

Exception No. 2: This provision shall not apply to the separation of the integral outdoor air inlet and flue gas discharge of listed outdoor appliances.

A mechanical draft venting system of other than direct-vent type shall terminate at least 4 ft (1.2 m) below, 4 ft (1.2 m) horizontally from, or 1 ft (300 mm) above any door, operable window, or gravity air inlet into any building. The bottom of the vent terminal shall be located at least 12 in. (300 mm) above grade.

The vent terminal of a direct-vent appliance with an input of 10,000 Btu/hr (3 kW) or less shall be located at least 6 in. (150 mm) from any air opening into a building and such an appliance with an input over 10,000 Btu/br (3 kW) but not over 50,000 Btu/hr (14.7 kW) shall be installed with a 9 in. (230 mm) vent termination clearance, and an appliance with an input over 50,000 Btu/hr (14.7 kW) shall be at least a 12 in. (300 mm) vent termination clearance. The bottom of the vent terminal and the air intake shall be located at least 12 in. (300 mm) above grade.

Through-the-wall vents for Category II and Category IV appliances and noncategorized condensing appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment. Where local experience indicates that condensate is a problem with Category I and Category III appliances, this provision shall also apply.

⚠ WARNING

HAZARDOUS GAS WARNING

EXPOSURE TO FUEL SUBSTANCES OR BY-PRODUCTS OF INCOMPLETE FUEL COMBUSTION IS BELIEVED BY THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

NEVER TEST FOR GAS LEAKS WITH AN OPEN FLAME. USE COMMERCIALLY AVAILABLE SOAP SOLUTION MADE SPECIFICALLY FOR THE DETECTION OF LEAKS TO CHECK ALL CONNECTIONS. A FIRE OR EXPLOSION MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR LOSS OF LIFE.

3.7 Gas Supply Connections

This unit is set up for rear installation of gas piping. The installation of piping shall be in accordance with piping codes and the regulations of the local gas company. Pipe joint compound must be resistant to the chemical reaction with liquified petroleum and natural gases.

Refer to piping Table 8 for delivery sizes. Conneect gas supply to the unit, using a ground joint union and a manual shut-off valve as shown in Figure 15. A 1/2" manual shut-off valve is included with boiler and must be installed in the supply gas line.

Install the manual shut-off valve in plain sight and in an accessible location within close proximity to the boiler. The valve can be installed on either the right side, left side or rear of the boiler. When the shut off valve is installed in the rear of the boiler, locate the valve above the boiler for easy visibility and access.

National codes require a condensate drip leg to be installed ahead of the controls as shown in Figure 15.

The boiler must be isolated from the gas supply piping by closing its individual manual shut-off valve during any pressure testing of that system at test pressure in excess of 1/2 psig.

⚠ CAUTION

Use a backup wrench on the gas line when connecting the Tee, dripleg, union and manual shut off valve to prevent damage to the gas valve and manifold assembly. Tee, drip leg, and union are supplied by the installer.

Use a backup wrench on the gas line when connecting or removing pipes or fittings to or from the boiler gas lines. Note the attachment points in Figure 16.

Figure 15

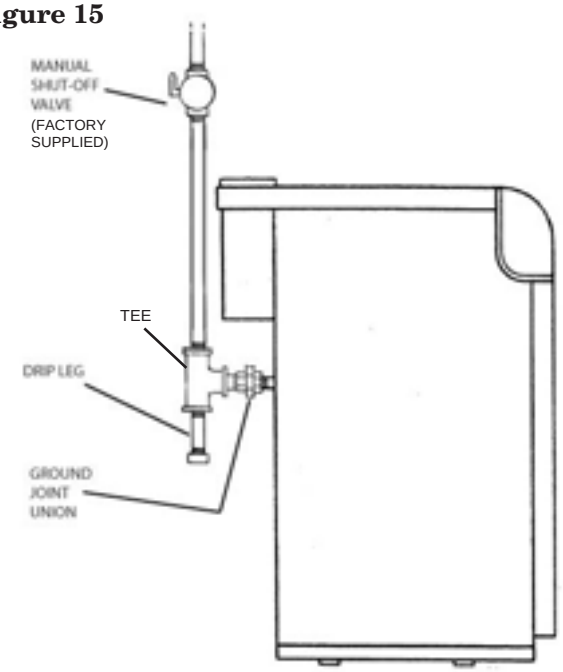
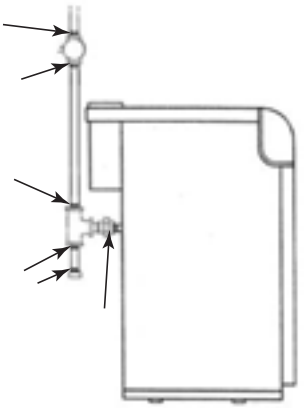


Table 8							
Natural Gas Only							
Table of cubic feet per hour of gas for various pipe sizes and lengths							
Pipe Size	Length of Pipe						
	10	20	30	40	50	60	70
1/2	132	92	73	63	56	50	46
3/4	278	190	152	130	115	105	96
1	520	350	285	245	215	195	180
1 1/4	1050	730	590	520	440	400	370
This table is based on pressure drops of 0.3 inch W.C and 0.06 SP.GR gas							

Figure 16

Typical connections where backup wrench should be used.



Natural Gas Supply Pressures: Maximum pressure to the gas valve for natural gas is 13.8" W.C. Minumum pressure is 5.0" W.C.

Liquid Propane Gas Supply Pressures: Maximum pressure to the gas valve for propane is 13.8" W.C. Minimum pressure is 11.0" W.C.

3.8 LP Conversion

⚠ WARNING

ELECTRICAL HAZARD

BEFORE CARRYING OUT ANY OPERATION INSIDE THE BOILER, DISCONNECT THE ELECTRICAL POWER SUPPLY AND CLOSE THE MANUAL GAS SHUT OFF VALVE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

Table 9	
Boiler Model #	LP Conversion kit Part Number
*GRWF130A94A0A	BAYLPK01AWBLRA
*May be "A" or "T"	

The boiler ships configured to burn Natural Gas (NG). To convert to LP use the conversion kits in Tables 9.

LP conversion requires 3 changes:

- Change ignition STEP regulator dial on gas valve from Natural Gas to Liquid Gas (Liquid Propane-LP)
- Change natural gas pilot orifice to LP orifice.
- Change natural gas main burner orifices to LP orifices.

Liquid Propane (LP) Conversion Instructions

1. Remove boiler front access cover. First, pull at the top of the panel and rotate outwards. Then, lift up to remove. See Figure 17.
2. Remove the top panel by lifting upwards. Four pins, one located in each corner of the top, hold the top panel in place. See Figure 18.

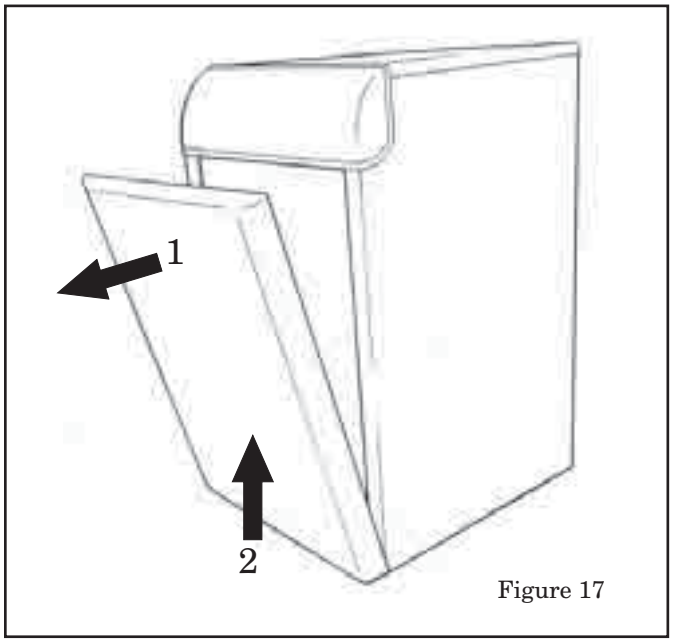


Figure 17

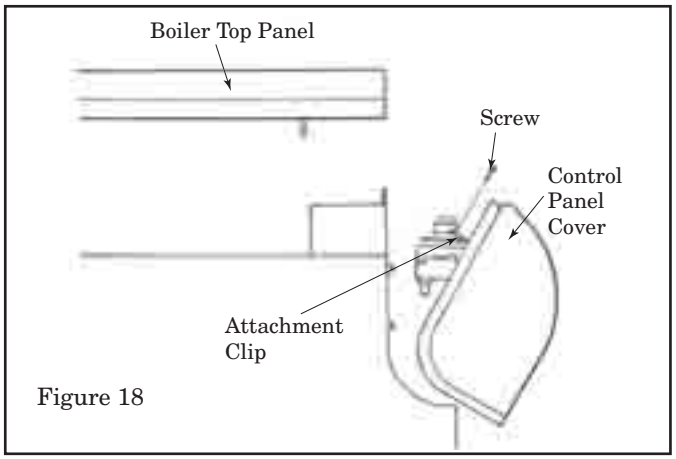


Figure 18

3. Open the control panel and remove two screws that are through attachment clips. See Figure 18.
4. Remove the burner box cover by removing four screws. See Figure 19.

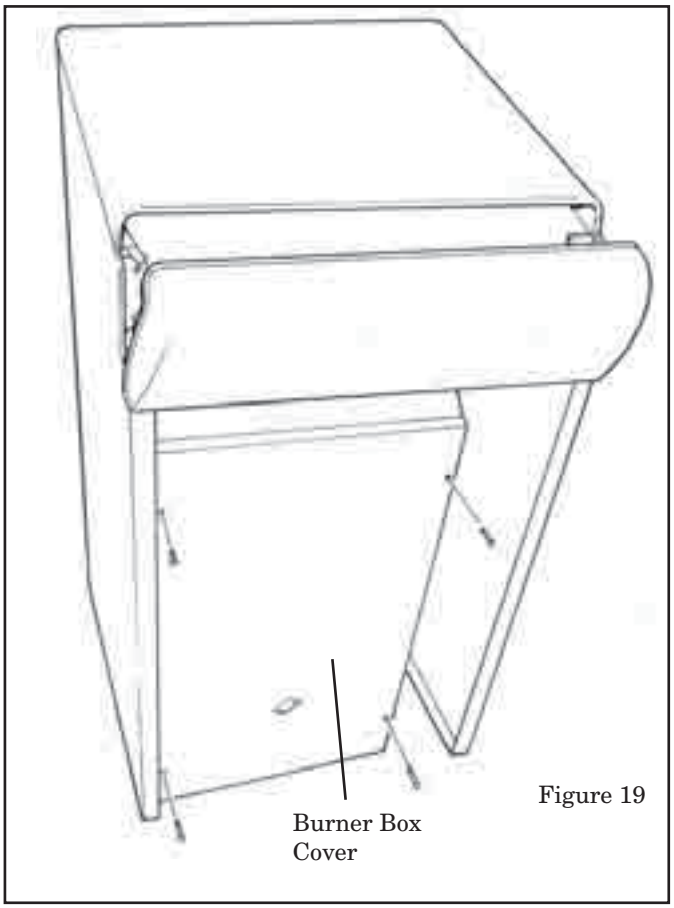


Figure 19

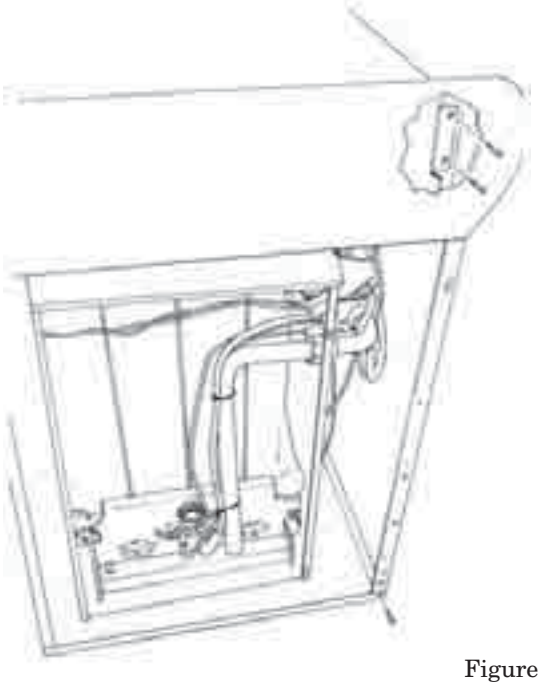


Figure 20

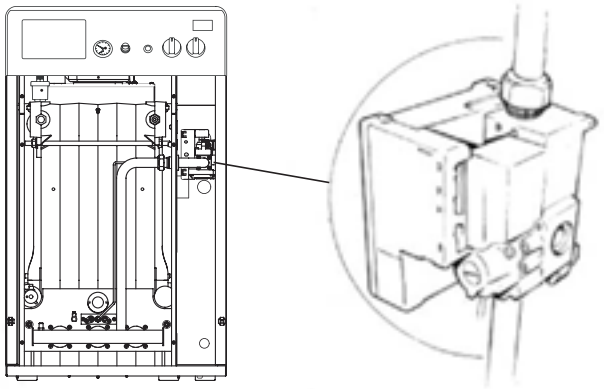
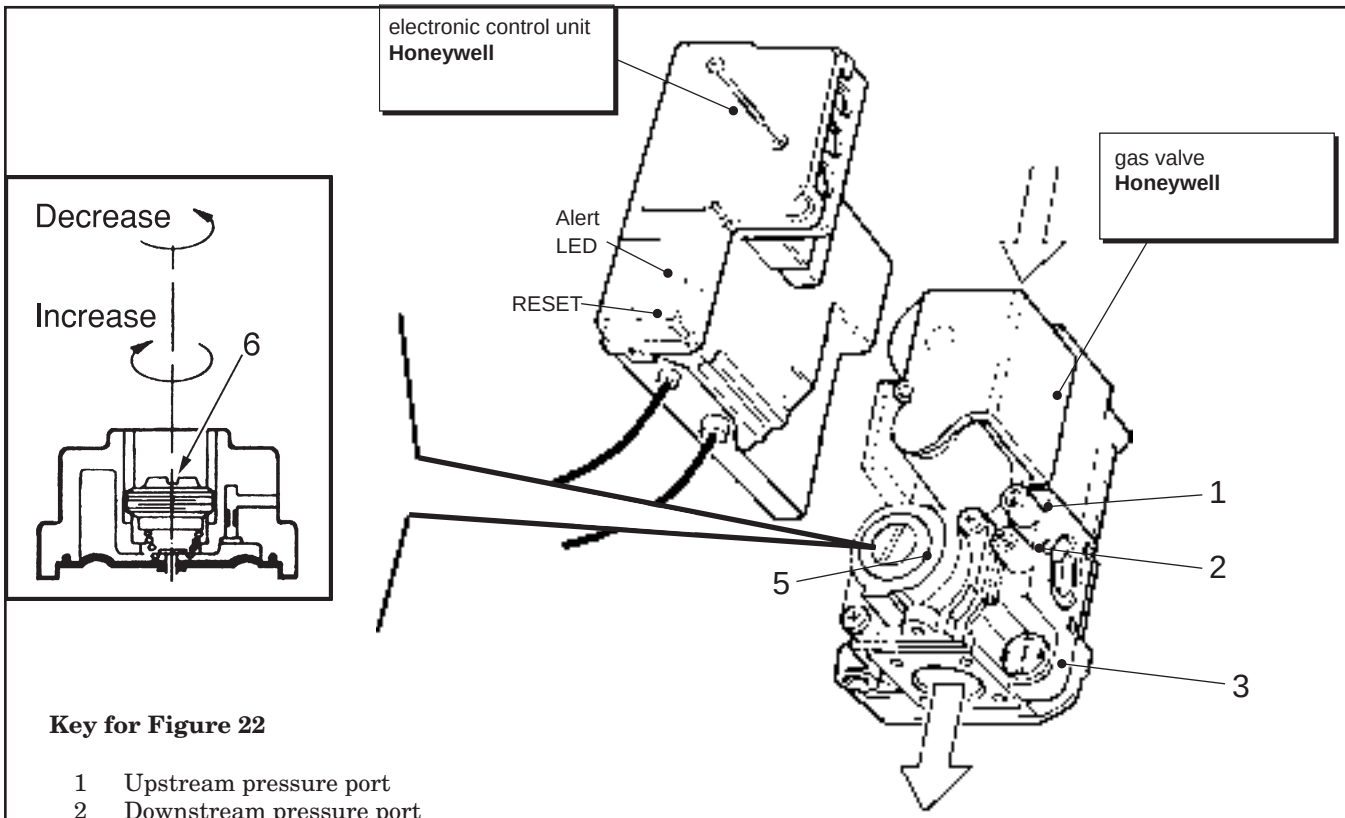


Figure 21

5. Remove the right side panel by removing three screws on the front and four screws on the back of the right side panel. See Figure 20.
6. Locate gas valve. See Figure 21.
7. Remove Natural Gas/Liquid Propane cover located on the gas valve using a flat blade screwdriver. See Figure 22.
8. Rotate the dial with the arrow pointing at Natural Gas to the Liquid Propane setting. See Figure 22.
9. Replace the Natural Gas/Liquid Propane cover.

IMPORTANT: If either the main inlet or outlet of the gas valve is disconnected for any reason, the flat sealing ring gasket located between the gas valve and the pipe must be replaced with a new flat sealing ring gasket to ensure a leak-proof seal. New gaskets are available as replacement parts. Spares are also shipped with the boiler, located near the gas valve. See instructions and illustrations below for re-assembly. When reconnecting the gas supply pipe or gas manifold assembly to the valve, use a new flat sealing ring gasket between the end of the pipe and the inlet (or outlet) of the valve, and engage the nut with the external threads of the valve to secure the joint. Be sure the gasket remains in place and carefully tighten the nut, hand-tight.Using an adjustable wrench, further tighten the nut ¼to ½turn (or about 2 flats) beyond hand-tight. Do not over-tighten. Be sure to use adequate opposing torque with a backing wrench, in order to prevent displacement of the gas valve or other piping.Check this and all joints for leaks according to the startup andcheckout procedures found elsewhere in this document before returning the boiler to service

Figure 21A



Key for Figure 22

1 Upstream pressure port
2 Downstream pressure port
3 Natural Gas / LP Regulator Cover
4 Ignition “STEP” regulator
5 Manifold Gas Pressure Adjustment Cover
6 Gas pressure adjustment screw

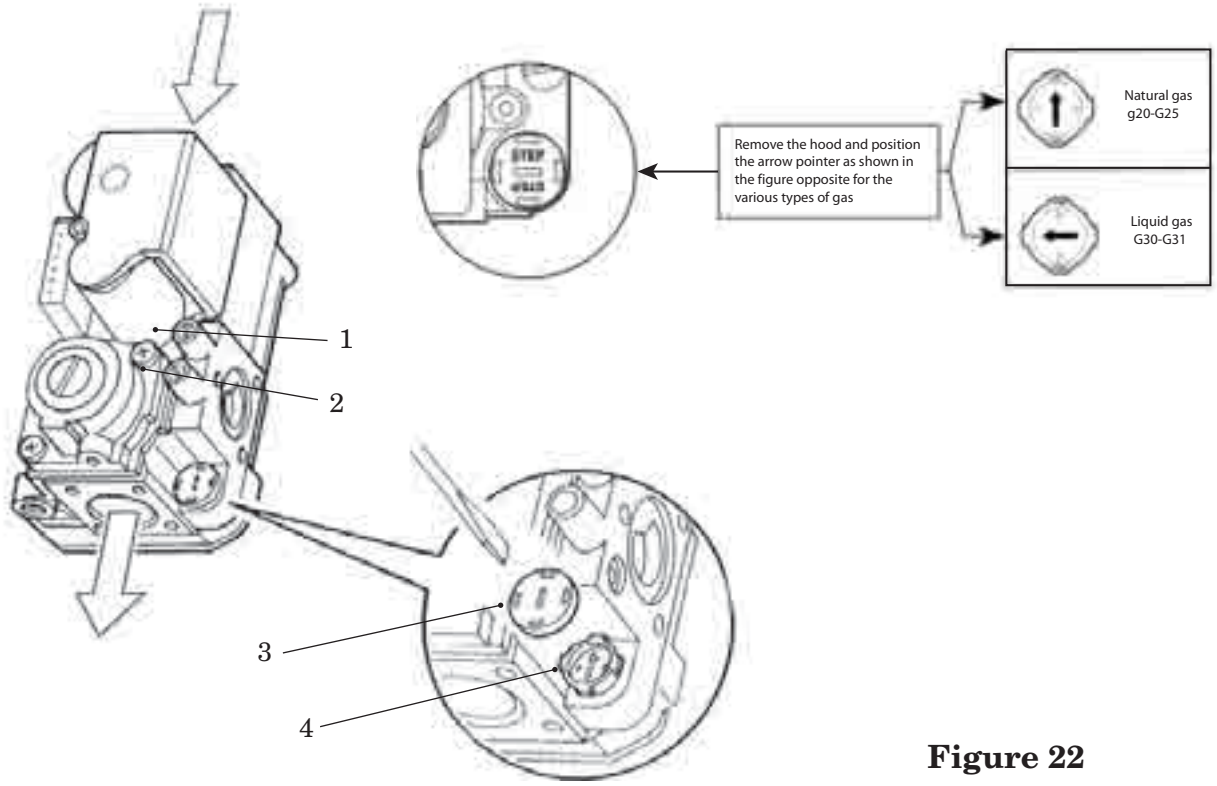


Figure 22

10. Disconnect pilot gas supply tube, flame sensor wire, and ground wire from the pilot and ignitor assembly. See Figures 23, 24 and 25.
11. Carefully remove the two screws holding the pilot and ignitor assembly.
12. Remove the assembly and set in a safe place. See Figure 25.
13. Replace the natural gas main burner orifices in the manifold with the liquid propane orifices shipped in the LP conversion kit. See Figure 26.
14. Reattach the pilot and ignitor assembly with the two screws previously removed.
15. Replace the natural gas pilot orifice with the liquid propane pilot orifice shipped in the LP conversion kit. See Figire 25.
16. Reattach the pilot gas supply tube, flame sensor wire, ignitor wire, and ground wire to the pilot and ignitor assembly.
17. Replace the front burner box cover. Leave the right side panel off until completion of the start-up and adjustment procedure in section 4.0. Access is needed to check the inlet and outlet gas valve pressure.
18. Place the adhesive backed label, shipped with the boiler, on the vestibule panel that states the boiler has been converted to LP gas. Ensure all information has been filled out on the label. See Figure 27.
19. Before firing up the boiler, see and perform Startup and Adjustment Procedures in section 4.0 for pressure adjustment.

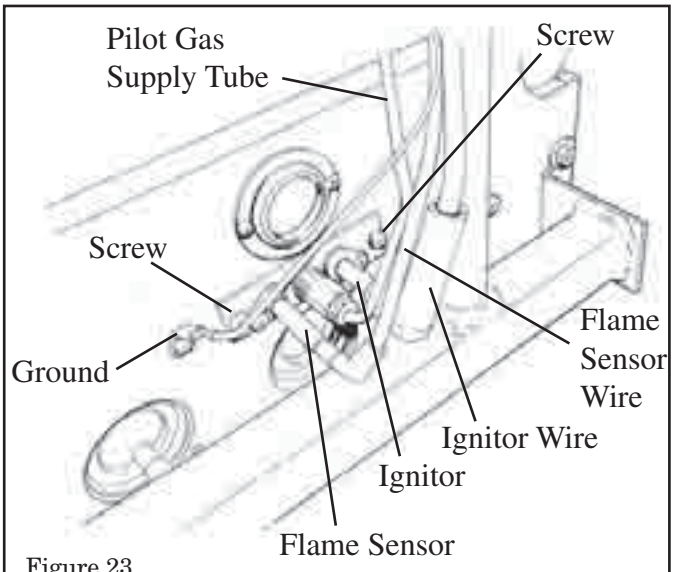


Figure 23

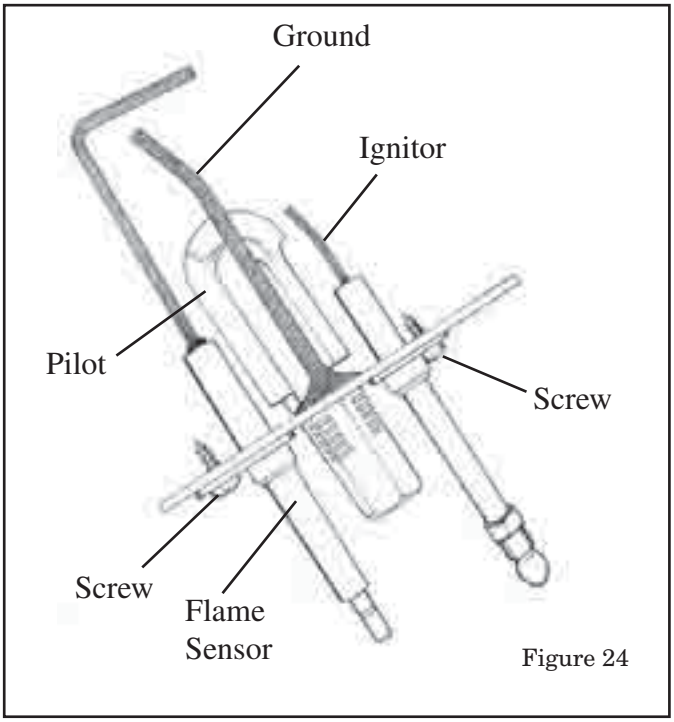


Figure 24

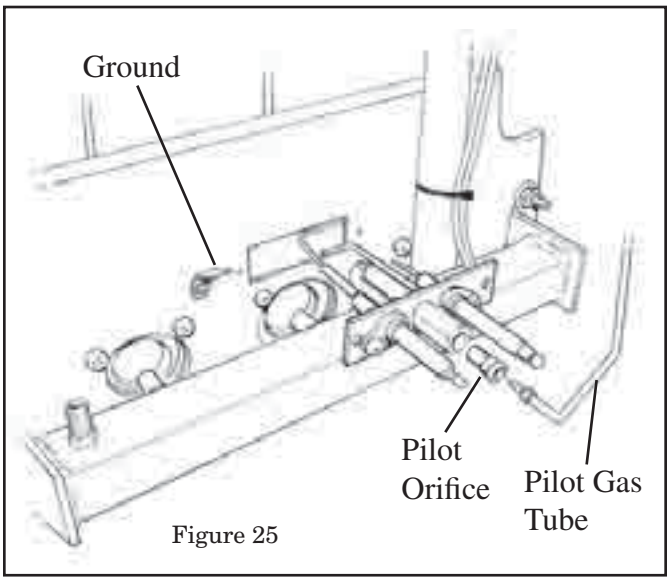


Figure 25

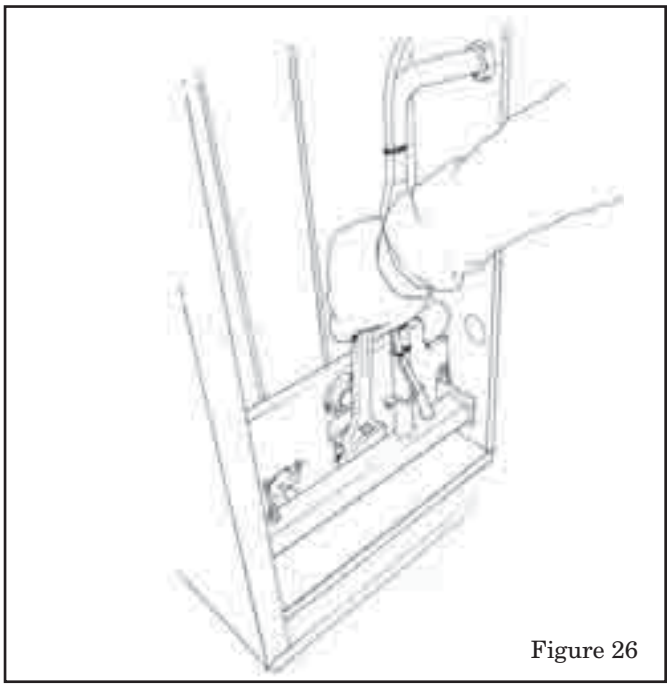


Figure 26

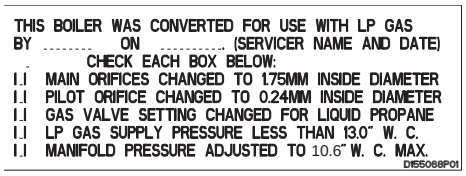


Figure 27

3.9 High Altitude Derate

This boiler is designed to operate up to altitudes of 2000 feet without any adjustments. At altitudes from 2000 to 4500 feet, the manifold pressure must be adjusted according to the table. Table 10 shows the maximum manifold pressures for both natural gas and propane gas at the varying altitudes. At altitudes below 4500 feet, no orifice tube changes are required.

Table 10 - High Altitude Applications

Altitude		0-2000 Feet Altitude				2001-4500 Feet Altitude		
Model	Gas Type	Maximum manifold pressure (In. W.C.)	Heat Input Maximum (BTU/h)	Heat Output Maximum (BTU/h)	Gas Type	Maximum manifold pressure (In. W.C.)	Heat Input Maximum (BTU/h)	Heat Output Maximum (BTU/h)
*GBWF090A93AVA	NG	3.6	90,000	73,800	NG	2.9	80,100	65,700
	LP	10.6			LP	8.5		
*GBWF130A94AVA	NG	3.6	130,000	106,500	NG	2.9	115,700	94,800
	LP	10.6			LP	8.5		
*GBWF173A95AVA	NG	3.6	173,000	141,500	NG	2.9	154,000	126,000
	LP	10.6			LP	8.5		
*GBWF215A96AVA	NG	3.6	215,000	176,100	NG	2.9	191,400	156,800
	LP	10.6			LP	8.5		
*GRWF130A94A0A	NG	3.6	130,000	107,400	NG	2.9	115,700	95,600
	LP	10.6			LP	8.5		

NOTES: 1. * May be "A" or "T"
2. No orifice change is required up to 4500 Feet.

3.10 Lighting Instructions

⚠ WARNING

DO NOT ATTEMPT TO MANUALLY LIGHT THE BURNER. THIS BOILER IS EQUIPPED WITH AN ELECTRONIC (SPARK TO PILOT) IGNITION SYSTEM.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

Each installation must be checked out at the time of initial start up to insure proper operation of all componinet. Check out should include putting the unit through one complete cycle as outlined in the following.

Turn on the main electrical supply and set the thermostat above the indicated temperture. The electronic ignition control will automatically generate a spark, then the gas valve is energized to permit the flow of gas to the burners. After ignition and flame is established, the flame control module monitors the flame and supplies power to the gas valve until the thermostat is satisfied.

The control will attempt to light for 51 seconds and then lock out. To restart the ignition sequence, the reset button must be depressed. After three manual resets within 15 minutes, the control module will go into a hard lockout. To restart the ignition sequence, power to the boiler must be turned off and then on before the ignition sequence can start again.

TO SHUT OFF BOILER

For complete shutdown: Close the manual valve located in the supply gas line. Disconnect the electrical supply to the unit.

Boiler Shutdown in Cold Weather or for Extended Periods of Time

⚠ CAUTION

If power shutdown is performed during the cold weather months, provisions must be taken to prevent freeze-up of all water pipes and water receptacles. Failure to follow this caution could result in property damage.

⚠ CAUTION

If the boiler is left operational and unattended for any extended periods of time, provisions must be taken periodically to ensure the system operation. This is especially important in below freezing weather. If for any reason your boiler should fail to operate, damage could result, such as frozen water pipes.

3.11 Electrical Connections

⚠ WARNING

ELECTRICAL HAZARD

TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACE WITH MOVING PARTS, LOCK UNIT DISCONNECT SWITCH IN THE OPEN POSITION BEFORE SERVICING THE UNIT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

⚠ WARNING

ELECTRICAL HAZARD

THE CABINET MUST HAVE AN UNINTERRUPTED OR UNBROKEN GROUND ACCORDING TO NATIONAL ELECTRICAL CODE, ANSI/NFPA 70- "LATEST EDITION' AND CANADIAN ELECTRICAL CODE, CSA C22.1 OR LOCAL CODES TO MINIMIZE PERSONAL INJURY IF AN ELECTRICAL FAULT SHOULD OCCUR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

⚠ CAUTION

The integrated boiler control is polarity sensitive. The hot leg of the 115 VAC power must be connected to the BLACK field lead.

The boiler must be installed in accordance with local codes; or in the absence of local codes, with the National Electrical Code, ANSI/NFPS 70 "latest edition" or Canadian Electrical Code, CSA C22.1.

Connection to the power supply

The boiler must be connected to single-phase, 115 Volt-60 Hz electric service.

Three holes for 1/2" conduit connections are located on the back of the control box.

ELECTRICAL CONTROL BOX

To access the electrical components and the low voltage terminals inside the control box, follow the sequence in Figure 28.

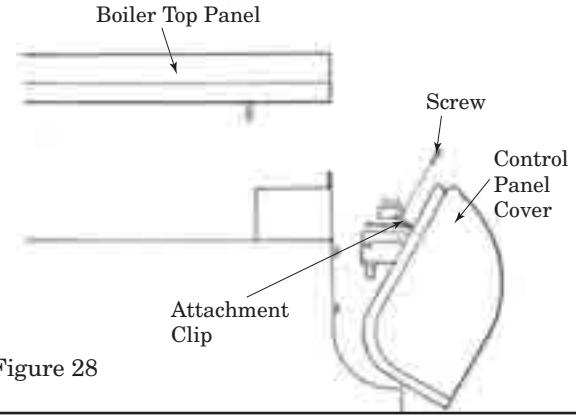


Figure 28

The layout of the terminals for various connections is provided in the wiring diagrams and schematic on pages 38 and 39.

NOTE: Do NOT use the gas pipes to ground electrical appliances.

Opening the front panel

To open the front panel, see the sequence in Figure 29. At top of front panel, pull edges of the panel forward. The panel will rotate on bottom hinge brackets. Then remove panel off of hinges at bottom of the panel by lifting upwards.

⚠ WARNING

GAS AND ELECTRICAL HAZARD
BEFORE CARRYING OUT ANY OPERATION INSIDE THE BOILER, DISCONNECT THE ELECTRICAL POWER SUPPLY AND CLOSE THE MANUAL GAS SHUT OFF VALVE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

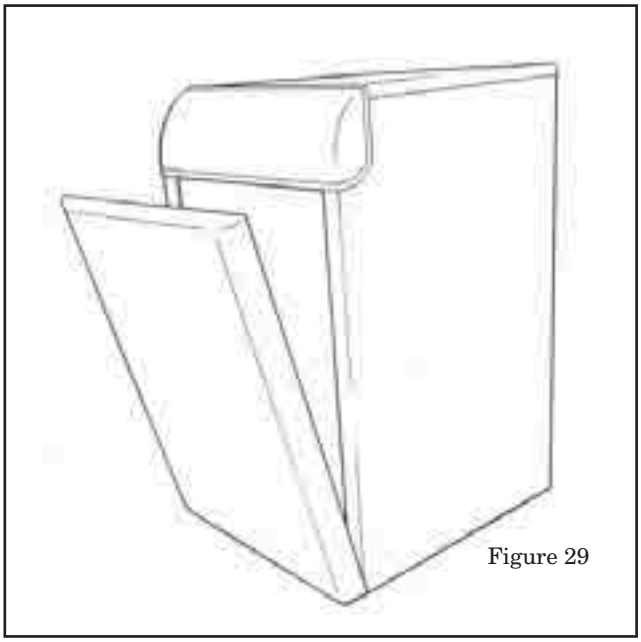


Figure 29

Make wiring connections to the boiler as indicated on enclosed wiring diagram. As with all gas appliances using electrical power, this boiler shall be connected into a permanently live electric circuit. It is recommended that it be provided with a separate "circuit protection device" electric circuit. The boiler must be electrically grounded in accordance with local codes; or in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70 "latest edition" or Canadian Electrical Code, CSA C22.1.

All field supplied wiring must be NEC Type T copper wire [167° F. (75° C)] installed in accordance with wiring diagrams supplied with the boiler. A disconnecting means must be located within sight from, and readily accessible to, the boiler.

You may also refer to the SERVICE FACTS literature for the boiler wiring diagrams.

3.12 Installation Instructions for replacing the Factory Installed Automatic-reset Water Temperature Limit with the Optional Manual Reset Water Temperature Limit Accessory

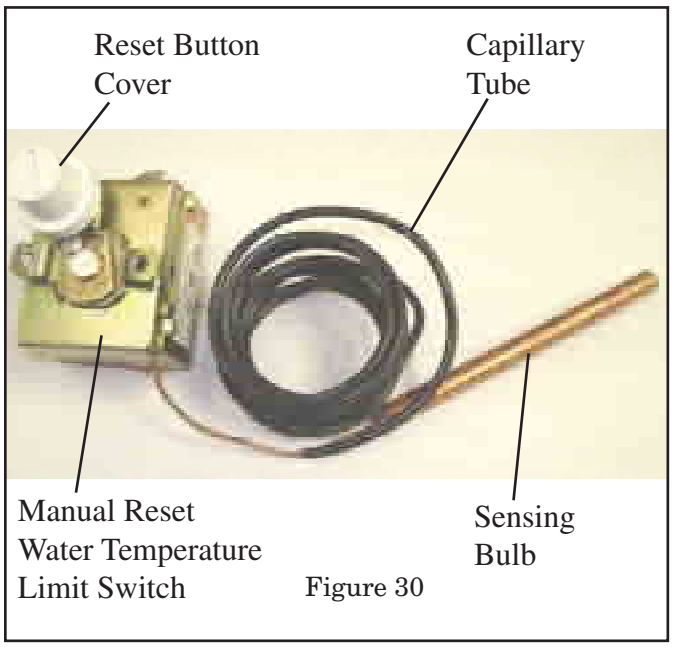


Figure 30

REMOVING THE EXISTING AUTO-RESET WATER TEMPERATURE LIMIT

⚠ WARNING

ELECTRICAL HAZARD

SHUT OFF POWER TO THE BOILER BEFORE BEGINNING THIS INSTALLATION.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

Steps to remove the existing auto-reset water temperature limit switch.

1. Open the control panel and locate the existing auto-reset water temperature limit. See Figures 31 and 32.

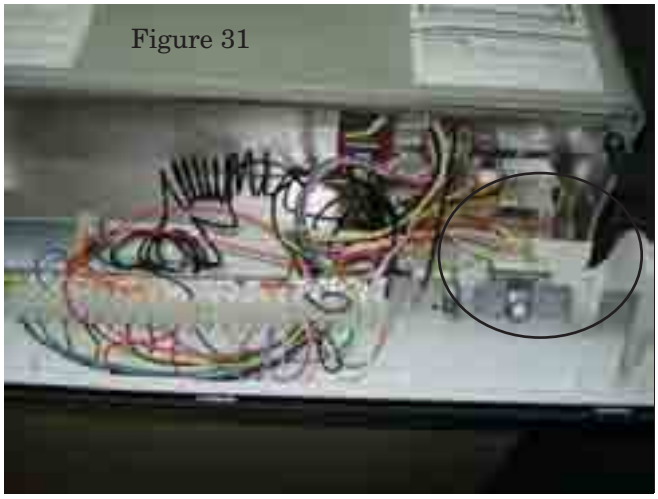


Figure 31

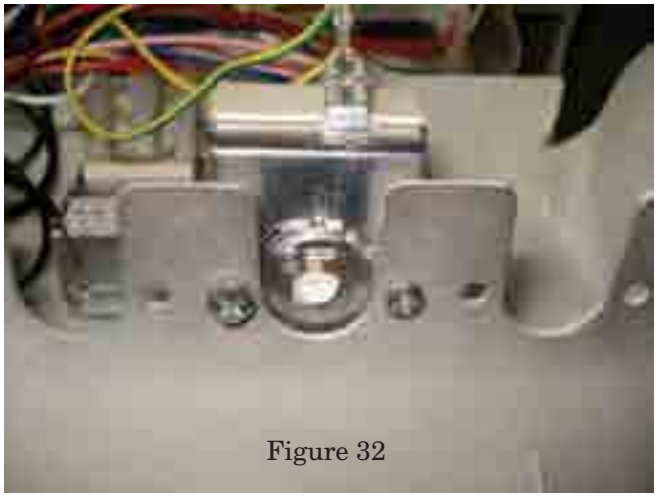


Figure 32

2. Remove the existing auto-reset water temperature limit and discard the screws. See Figure 33.

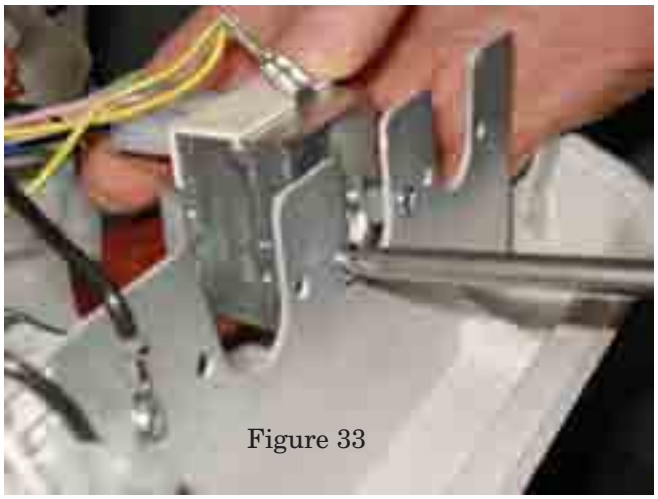


Figure 33

3. Remove the wires from the existing auto-reset water temperature limit. See Figure 34.

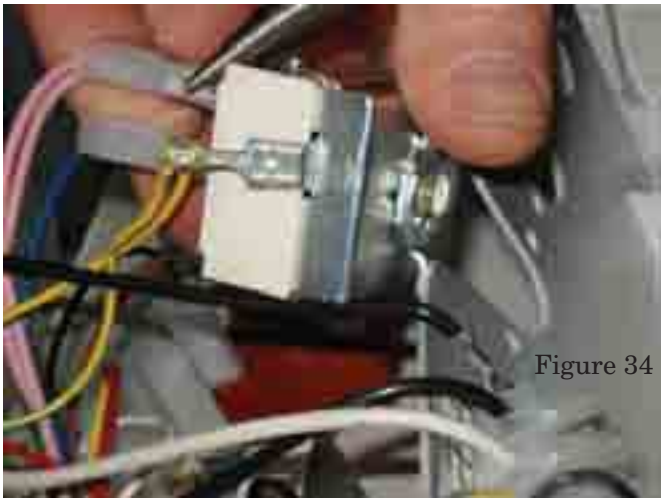


Figure 34

4. Remove the panel to gain access to the strain relief cable clamp. See Figure 35.

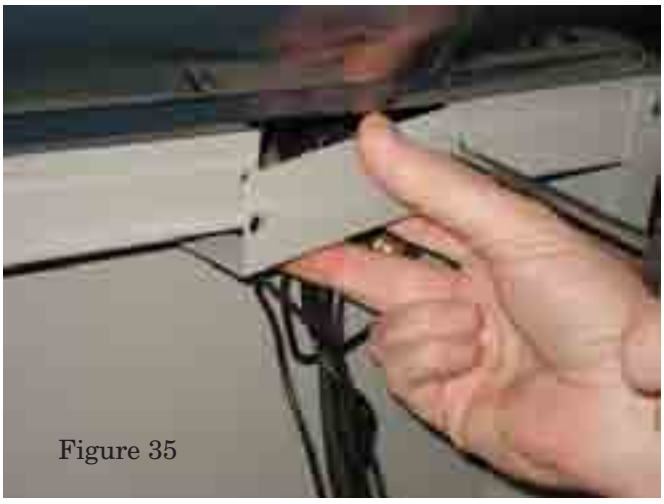


Figure 35

5. Loosen the strain relief cable clamp with a screwdriver. See Figure 36.

Figure 36

6. Locate the capillary tube of the existing auto-reset water temperature limit and remove it from the strain relief clamp. See Figure 37.

Figure 37

7. Remove the spring clip and the sensing bulb of the existing auto-reset water temperature limit switch from the boiler temperature well. Do not remove the bulbs of the adjustable supply water thermostat and temperature gauge. See Figure 38.

Figure 38

8. Remove the cable ties to isolate and remove the capillary tube of the existing auto-reset water temperature limit switch. See Figure 39.

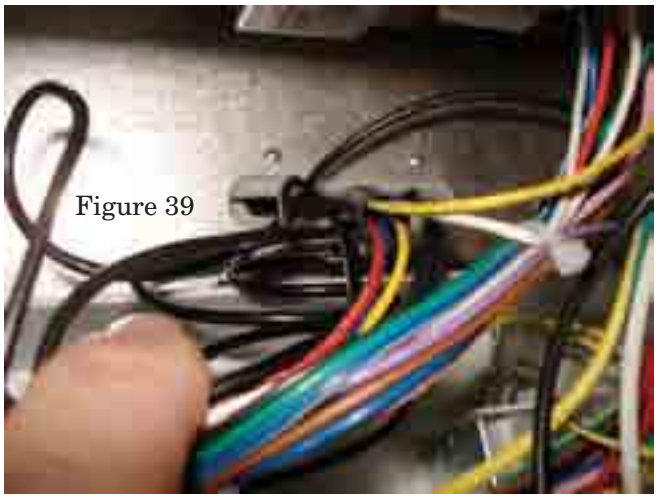


Figure 39

INSTALLING THE NEW MANUAL-RESET WATER TEMPERATURE LIMIT

1. Remove the cover from the reset button on the new manual reset water temperature limit switch by turning counter clockwise. See Figure 40.

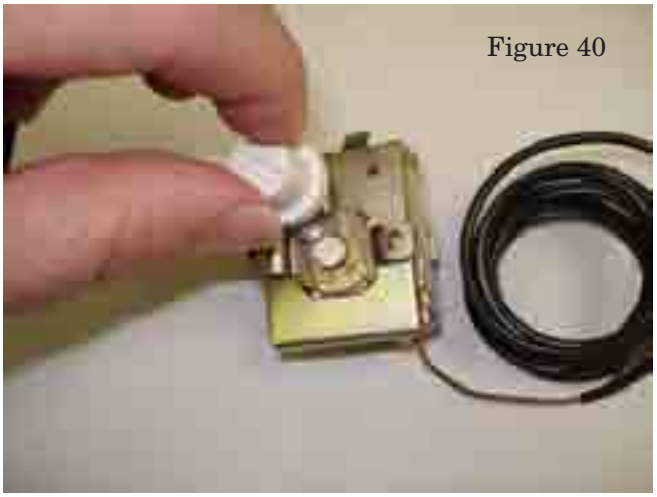


Figure 40

2. In a similar manner, remove the locking nut from the new manual reset water temperature limit. See Figure 41.

Figure 41

3. Insert the manual reset push button of the water temperature limit through the hole in the control panel. See Figure 42.

Figure 42

4. Center the reset button in the hole and secure with a locking nut. Use needle nose pliers. See Figure 43.

Figure 43

5. Replace the reset button cover on the new manual reset water temperature limit switch. See Figure 44.

Figure 44

6. Attach the wires removed earlier from the auto-reset water temperature limit to the new manual water temperature limit. See Figure 45.

Figure 45

7. Carefully unroll the capillary tube of the new manual reset water temperature limit and feed the sensing bulb through the strain relief clamp. See Figure 46.

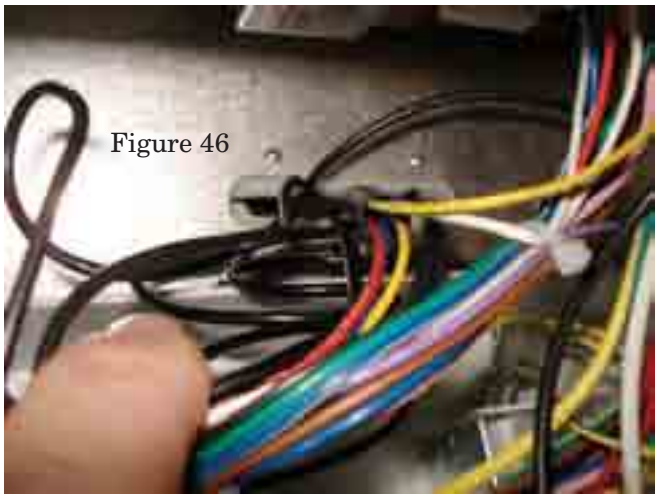


Figure 46

8. Place the bulb of the new manual reset water temperature limit along with the existing adjustable supply water thermostat and thermometer gauge bulbs in the boiler temperature well and secure with a spring clip. See Figure 47.

Figure 47

9. Route the capillary tube of the manual reset water temperature limit with the other capillary tubes, dress neatly and secure with new cable ties. See Figure 48.

Figure 48

10. Tighten the strain relief cable clamp with a screwdriver. See Figure 49.

Figure 49

11. Replace the strain relief access panel, close and secure the control box, and replace the front and top boiler panels. Restore power and check out limit switch operation per boiler installation instructions. See Figure 50.

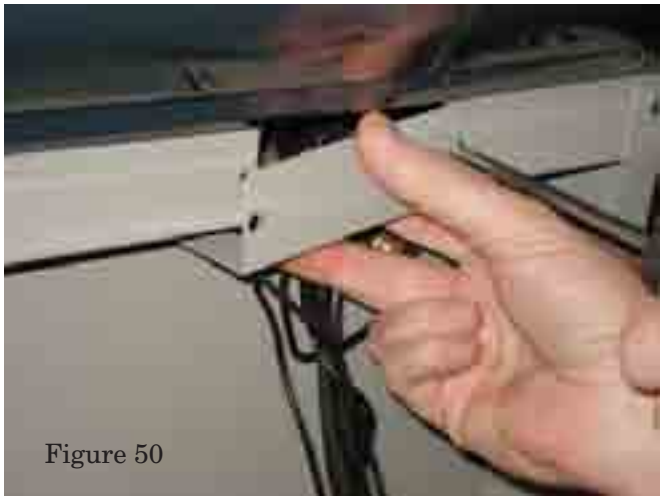


Figure 50

3.13 Supply Water Thermostat (SWT) Settings Above 180°F

The adjustable SWT knob includes a factory installed rotation stop that prevents supply water temperature settings below 140°F or above 180°F. Under no circumstances should the SWT knob be modified to allow temperature settings below 140°F. Lower settings may allow corrosive condensation from flue products, decreasing the life of the boiler.

Some applications may call for supply water temperature settings above 180°F. For these applications, the SWT rotation stop may be modified to allow the SWT to be set as high as 194°F. (Note: modifying the stop to allow higher maximum setting will also result in a corresponding increase in the minimum SWT temperature setting.)

Follow the steps below to reset the SWT rotation stop to allow water temperature settings up 194°F:

1. Remove the knob from the adjustable SWT by pulling the knob directly outward away from the boiler.
2. Look on the back of the knob and find the metal rotation stop in one of the numbered positions (see Figure 51). This metal stop should have been factory set to position 1 or 7.
3. Remove the metal stop from the knob by grasping it firmly with needle nose pliers and pulling it directly outward. See Figure 52.
4. Place the metal stop in position 5 by grasping it firmly with needle nose pliers (see Figure 53) and pushing it directly inward. Note: Positions 1, 5 and 7 are the only approved locations for the SWT rotation stop.
5. Replace the modified knob by aligning with the flat on the shaft of the SWT and pushing firmly on the SWT. Make sure that the indicator mark on the front of the knob is between the proper modified setting range as marked on the boiler. If not, remove the knob and rotate the shaft of the SWT as appropriate so that the indicated adjustment range will be between approximately 155°F and 195°F.

Figure 51

Figure 52

Figure 53

4.0 Start-Up and Adjustment

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD
FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS FOR THE VENTING SYSTEM BEING PLACED INTO OPERATION COULD RESULT IN CARBON MONOXIDE POISONING OR DEATH.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

⚠ WARNING

FIRE OR EXPLOSION HAZARD
FAILURE TO FOLLOW STARTUP AND CHECK-OUT PROCEDURES COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

4.1 Preliminary Inspections

System Start-Up and Adjustment must be carried out by qualified installers.

The following checks and procedures must be followed at Start-Up and whenever maintenance or service is performed:

With gas and electrical power "OFF"

1. Verify the boiler system is filled with water and make sure all the air in the boiler and the system has been vented.
2. Verify there are no water leaks in the boiler or system.
3. Verify the electrical system is properly connected and grounded.
4. Visually inspect the venting system for proper size, horizontal pitch and vent termination, and determine there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause and unsafe condition.
5. Determine that the chimney or vent is acceptable to the authority having jurisdiction.
6. Make sure there are no flammable liquids or materials in the same room with the boiler.
7. Open the manual On/Off gas valve, located in the supply gas line. See Figure 14. Check all gas connections for leaks with a soapy solution - **DO NOT CHECK WITH AN OPEN FLAME.**

Check Supply Gas Pressure

1. Disconnect power to the boiler.
2. Make sure all gas appliances are off, including the boiler.
3. Close the manual On/Off gas valve located in the supply gas line.
4. Open inlet pressure port located in gas valve. To open valve, use a screwdriver. See Figure 54.
5. Attach flexible tubing from manometer to the inlet pressure port. See Figure 55.
6. Open the manual On/Off valve located in the supply gas line.
7. Reconnect power to boiler and cycle on. Set the room thermostat for continuous heating operation as required. The boiler must be operating to check the supply gas pressure.
8. Verify static inlet pressure is between 7-14" Water Column (W.C.). If the pressure is not in this range, do NOT operate the boiler until the inlet pressure has been adjusted to fall within this range.
9. Disconnect power from boiler
10. Close the manual On/Off valve. Remove the flexible tubing from inlet port and close the inlet pressure port using a screwdriver.

Combustion and Input Check

1. Make sure all gas appliances are off except the boiler. Open the manual On/Off gas valve and turn on the electrical power to the boiler.
2. Set the room thermostat for continuous heating operation as required.

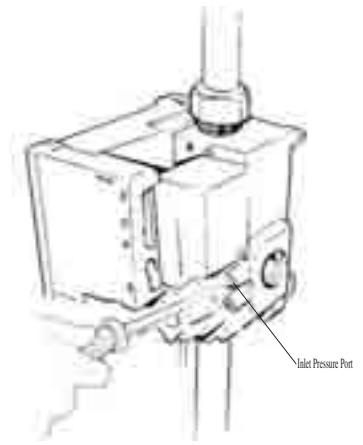


Figure 54

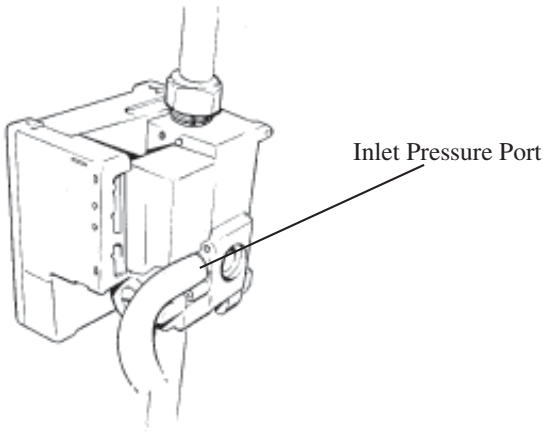


Figure 55

3. Verify the boiler On/Off switch is On. Turn the boiler supply water thermostat knob to the desired setting. See Figure 1. The boiler will begin to function automatically.

If the boiler does not light, refer to the Troublshooting section of the Service Facts, shipped with the boiler.

4. Clock the gas meter with the boiler operating (determine the dial rating of the meter) for one revolution.
5. Find the "Sec" column that matches the number of seconds checked to check one revolution of the meter. See Table 12.
6. Read the "Flow" column opposite the number of seconds clocked.
7. Use the following factors <u>if necessary</u>:
   For 1 Cu. Ft. Dial Gas Flow CFH = Chart Flow Reading /2
   For 1/2 Cu. Ft. Dial Gas Flow CFH = Chart Flow Reading /4
   For 5 Cu. Ft. Dial Gas Flow CFH = 10X Chart Flow Reading /4
8. Multiply the final Figure by the heating value of the gas obtained from the utility company and compare to the nameplate rating. This must not exceed the nameplate rating.
9. Changes can be made by adjusting the manifold pressure. To adjust the manifold pressure:
   a) Turn off all electrical power to the boiler and close the manual On/Off gas valve.
   b) Open outlet pressure port located in gas valve. (To open valve, use a screwdriver) See Figure 56.
   c) Attach flexible tubing from manometer to the gas valve outlet pressure port. See Figure 57.
   d) Remove the regulator adjustment screw cap on the gas valve for manifold pressure adjustment. See Figure 22, item 5 and 6.
   e) Open the manual On/Off gas valve and turn on the electrical power to the boiler.

Table 11	
Manifold Pressure Settings	
Fuel	Pressure
Natural Gas	3.6" W.C.
LP Gas	10.6" W.C.

Table 12							
Gas Flow in Cubic Feet Per Hour							
2 Cubic Foot Dial							
Sec.	Flow	Sec.	Flow	Sec.	Flow	Sec.	Flow
8	900	29	248	50	144	82	88
9	800	30	240	51	141	84	86
10	720	31	232	52	138	86	84
11	655	32	225	53	136	88	82
12	600	33	218	54	133	90	80
13	555	34	212	55	131	92	78
14	514	35	206	56	129	94	76
15	480	36	200	57	126	96	75
16	450	37	195	58	124	98	73
17	424	38	189	59	122	100	72
18	400	39	185	60	120	104	69
19	397	40	180	62	116	108	67
20	360	41	176	64	112	112	64
21	343	42	172	66	109	116	62
22	327	43	137	68	106	120	60
23	313	44	134	70	103	124	58
24	300	45	130	72	100	128	56
25	288	46	157	74	97	132	54
26	277	47	153	76	95	136	53
27	267	48	150	78	92	140	51
28	257	49	147	80	90	144	50

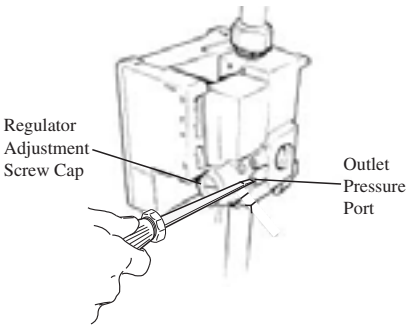


Figure 56

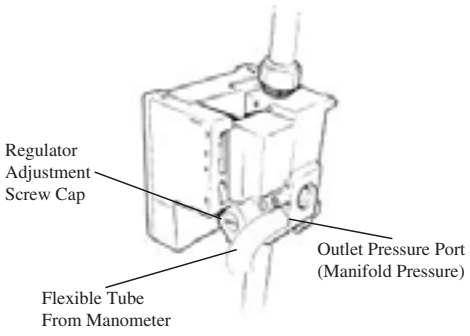


Figure 57

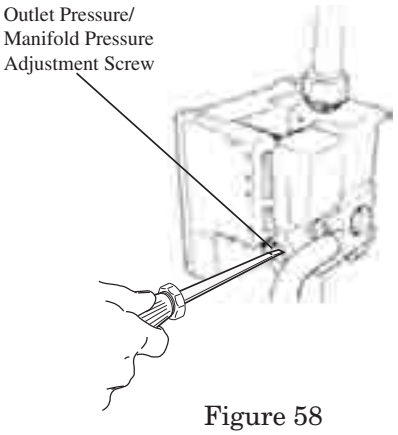


Figure 58

Energize gas valve by setting thermostat above room temperature.

f) Adjust manifold gas pressure, as needed, to achieve desired input capacity. To accomplish this, turn the adjustment screw clockwise to increase the gas flow rate and counterclockwise to decrease the gas flow rate using an flat-head screwdriver. See Figure 58.

g) The final manifold pressure setting shall be no more than 3.6" W.C. with an input of no more than nameplate rating and no less than .7" W.C. of the nameplate rating.

h) Turn off electrical power to the boiler. Close manual On/Off gas valve.

i) Remove the manometer flexible tubing from outlet pressure port and close the outlet pressure port using a screwdriver. See Figure 56.

j) Replace the regulator adjustment screw cap and tighten securely.

k) Open manual On/Off gas valve and then turn on electrical power to the boiler.

l) Using a soap solution, check for gas leaks at the pressure ports and manifold adjustment cover.

⚠ WARNING

SAFETY HAZARD

REPLACE AND/OR TIGHTEN ALL PLUGS REMOVED WHEN ADJUSTING GAS PRESSURE. LEAK CHECK THE FITTING BEFORE PLACING THE BOILER INTO REGULAR SERVICE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN FIRE, EXPLOSION, OR PROPERTY DAMAGE. IMPROPER INSTALLATION, MAINTENANCE OR SERVICING COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.

For LP gasses, the final manifold pressure setting shall be 10.6" W.C. with an input of no more than the nameplate rating and not less than .7" W.C. of the nameplate rating, unless the unit is derated for altitude.

⚠ CAUTION

If, after correctly carrying out the lighting procedure, the burners do not light and the red pushbutton light on the control panel comes on, wait about 15 seconds and then press the pushbutton to reset. The reset controller will repeat the ignition cycle. If the burners do not light after the second attempt, consult the Service Facts "Troubleshooting" section.

NOTE: In case of an electrical power failure while the boiler is working, the burners will go out and re-ignite automatically when power is restored.

Determine that the water pump(s) are operating properly.

Test low water cutoffs, automatic feed controls, pressure, and temperature limit controls, and relief valves to determine they are in operating condition.

4.2 Operating Information

Conditions Affecting System Operation

1. FLUE BLOCKAGE
If the flue is blocked, the induced draft power switch will not close preventing ignition.
2. LOSS OF FLAME OR GAS SUPPLY FAILURE
If loss of flame occurs during a heating cycle (when flame is not present at the sensor), the control module will retry the ignition sequence one time after the sensor cools. If ignition is not achieved, it will lockout the boiler.

The control will attempt to light for 51 seconds and then lock out. To restart the ignition sequence, the reset button must be depressed. After three manual resets within 15 minutes, the control module will go into a hard lockout. To restart the ignition sequence, power to the boiler must be turned off and then on before the ignition sequence can start again.

Control and Safety Switch Adjustment

Limit Switch Check Out
The limit switch is a safety device designed to shut off the burner should the boiler become overheated. Since proper operation of this switch is important to the safety of the unit, it must be checked out on initial start up by the installer.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z221.1/NFPA 54 and/or CAN/CGA B149 Installation Codes.
8. After it has been determined that each appliance connected to the venting system properly vents where tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

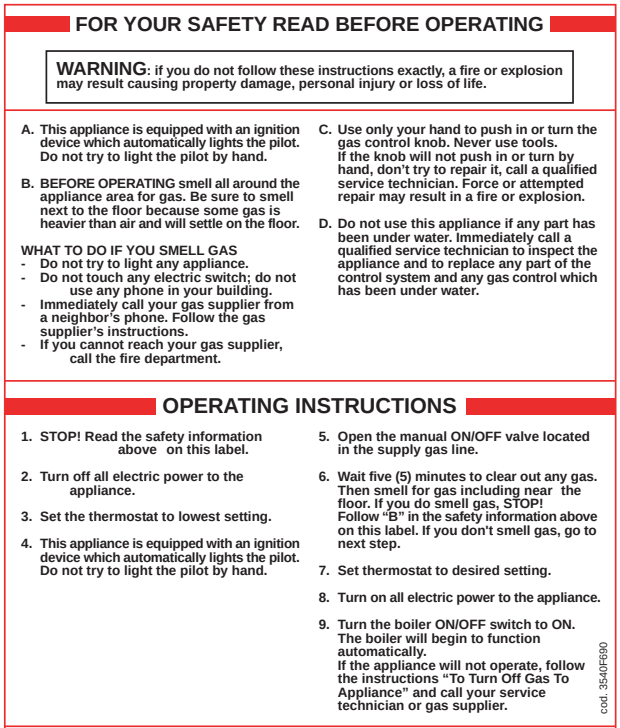
IMPORTANT: To check for proper operation of the Water Temperature Limit switch (WTL), shut off the power to the boiler and TEMPORARILY bypass the supply water thermostat (SWT) with a TEMPORARY JUMPER. TEMPORARILY remove power from the boiler water circulator pump and restore power to the boiler. Burners should come on and operate. Closely monitor the water temperature. DO NOT allow the boiler to overheat excessively during the checkout of the WTL limit switch. When the boiler water temperature reaches 230°F, the burners should turn off automatically. Immediately shut off power to the boiler if the burners did not shut off automatically as the water temperature reached 230°F. The WTL limit switch must be replaced and proper operation of the new WTL verified.

After the boiler cools, REMOVE THE JUMPER from the SWT and RESTORE POWER to the boiler and the boiler water circulator pump.

Boiler Operating Instruction Label

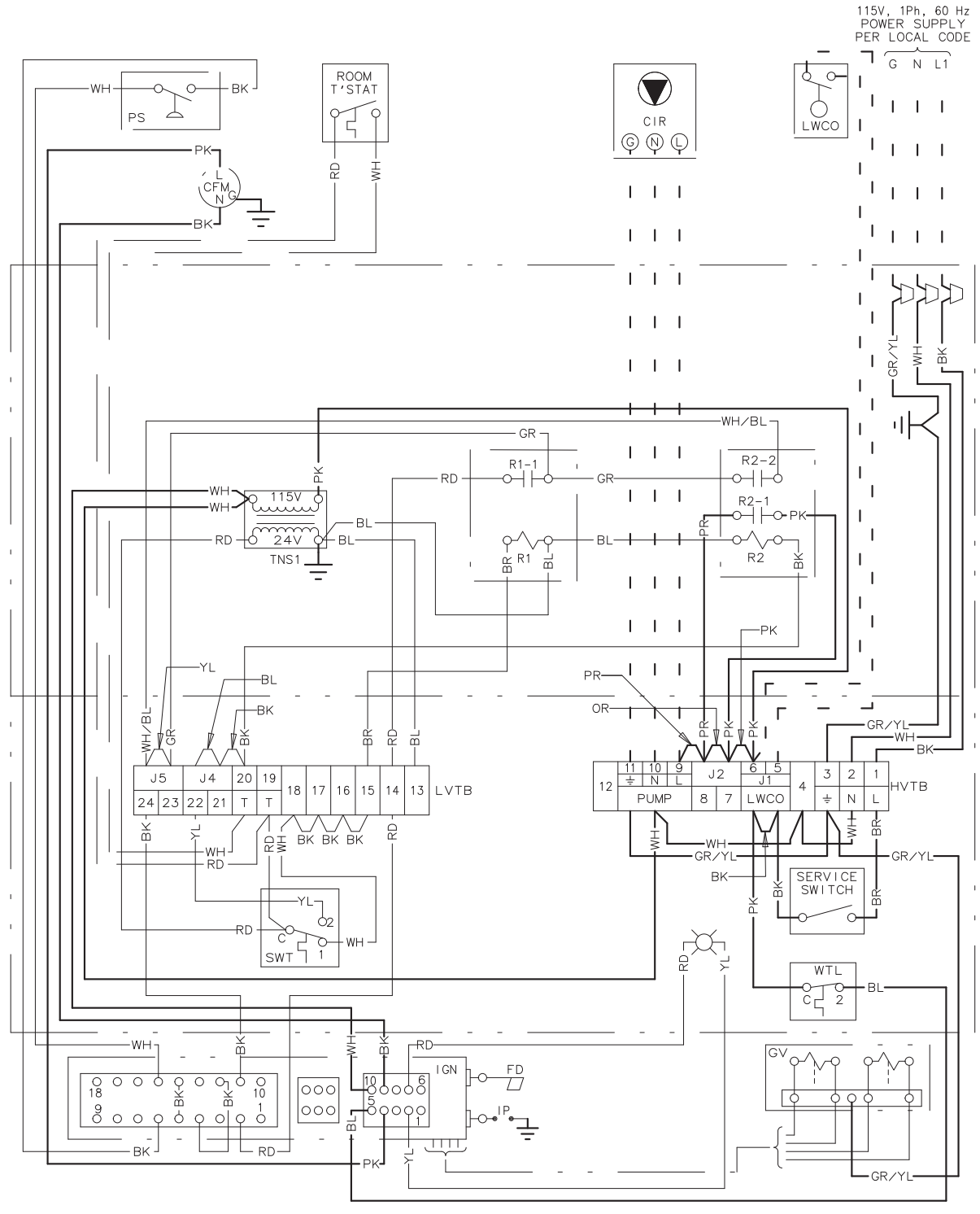
The boiler is shipped with a label on the front of the unit. The label is seen in Figure 59. Read all instructions before operating the boiler.

Figure 59

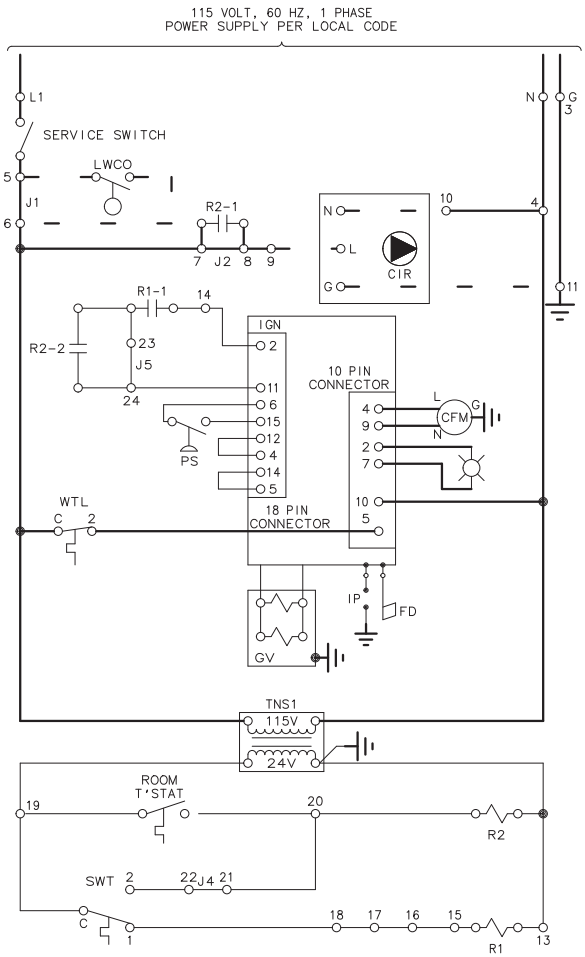


5.0 Technical Data

5.1 Electrical Diagrams



5.2 Schematic Diagram



LEGEND-EQUIPMENT DIAGRAM

- 24 V. / LINE V. — FACTORY WIRING
- 24 V. / LINE V. — FIELD WIRING
- GROUND
- JUNCTION
- WIRE NUT OR CONNECTOR
- COIL
- CAPACITOR
- RELAY CONTACT (N.O.)
- RELAY CONTACT (N.C.)
- THERMISTOR
- INTERNAL OVERLOAD PROTECTOR
- PS PRESSURE ACTUATED SWITCH
- TEMP. ACTUATED SWITCH
- FLUID LEVEL ACTUATED SWITCH
- POL. PLUG FEMALE HOUSING (MALE TERM.)
- POL. PLUG MALE HOUSING (FEMALE TERM.)
- RESISTOR OR HEATING ELEMENT
- MOTOR WINDING
- TERMINAL
- COLOR OF WIRE — BK/BL BLACK WIRE WITH BLUE MARKER
- COLOR OF MARKER

BK BLACK OR ORANGE YL YELLOW
BL BLUE RD RED GR GREEN
BR BROWN WH WHITE PR PURPLE
PK PINK

- FUSIBLE LINK
- LIMIT (POSITION) SWITCH
- LIGHT
- CIRCULATOR PUMP

BLACK J1 LWCO JUMPER (REMOVE WHEN CONNECTING FIELD SUPPLIED LWCO).
ORANGE J2 PUMP CONTROL JUMPER
(SHORT = CONTINUOUS, OPEN = ONLY DURING HEAT DEMAND).
BLUE J4 PUMP OVER RUN JUMPER
(SHORT = OVER RUN WITHOUT HEAT DEMAND, OPEN = NO OVER RUN).

YELLOW J5 JUMPER (SHORT = BURNER CYCLED BY SWT ONLY;
OPEN = BURNER STARTS ONLY WHEN BOTH SWT AND ROOM
THERMOSTAT ARE CLOSED AND BURNER STOPS WHEN
EITHER ROOM THERMOSTAT OR SWT OPENS).

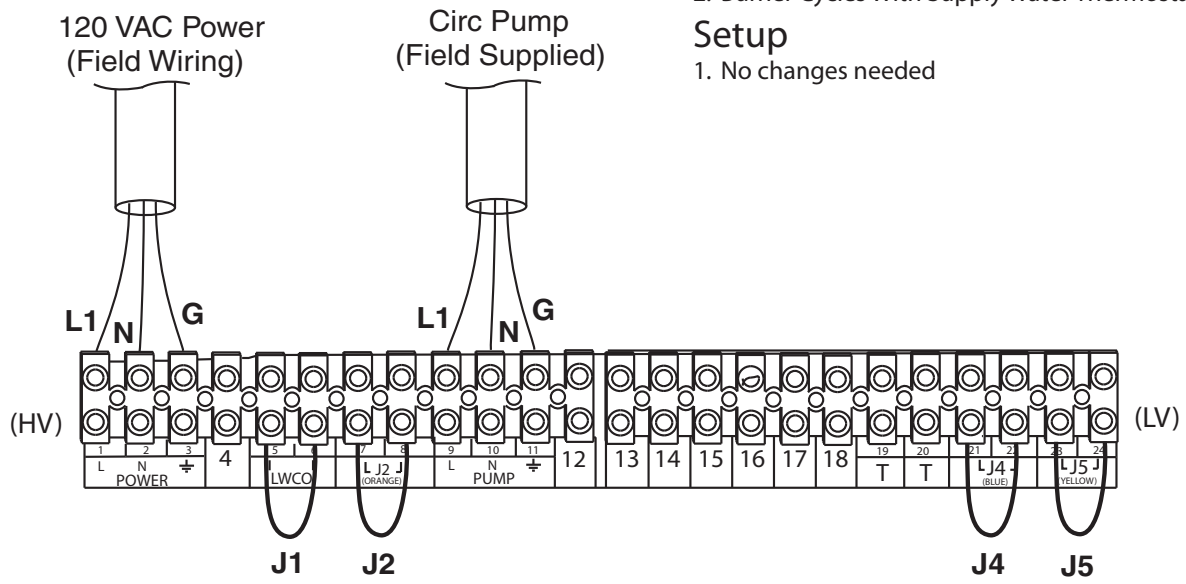
LWCO - LOW WATER CUT OFF
(FIELD SUPPLIED - CONNECT PER MANUFACTURERS INSTRUCTIONS).
*AVD - AUTOMATIC VENT DAMPER (ATMOSPHERIC MODELS ONLY) -
FACTORY PROVIDED, FIELD INSTALLED.
PS - PRESSURE SWITCH (INDUCED DRAFT ONLY)
IP - IGNITOR PROBE
FD - FLAME DETECTOR
IGN - IGNITION CONTROL MODULE
SWT - SUPPLY WATER THERMOSTAT
WTL - WATER TEMPERATURE LIMIT SWITCH
CIR - CIRCULATOR PUMP (FIELD SUPPLIED)
CFM - COMBUSTION FAN MOTOR (INDUCED DRAFT ONLY)
FL - FUSIBLE LINK
GV - GAS VALVE
TNS1 - 24V CONTROL POWER TRANSFORMER
DHSS - DRAFT HOOD SPILLAGE SWITCH (ATMOSPHERIC MODELS ONLY)
HVTB - HIGH VOLTAGE TERMINAL BLOCK (115V)
LVTB - LOW VOLTAGE TERMINAL BLOCK

NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED IN THIS UNIT MUST BE REPLACED, REPLACE IT WITH APPLIANCE WIRING MATERIAL RATED AT 105°C.

5.3 Field Wiring Diagrams

Option 1 - Factory Jumpers in Place



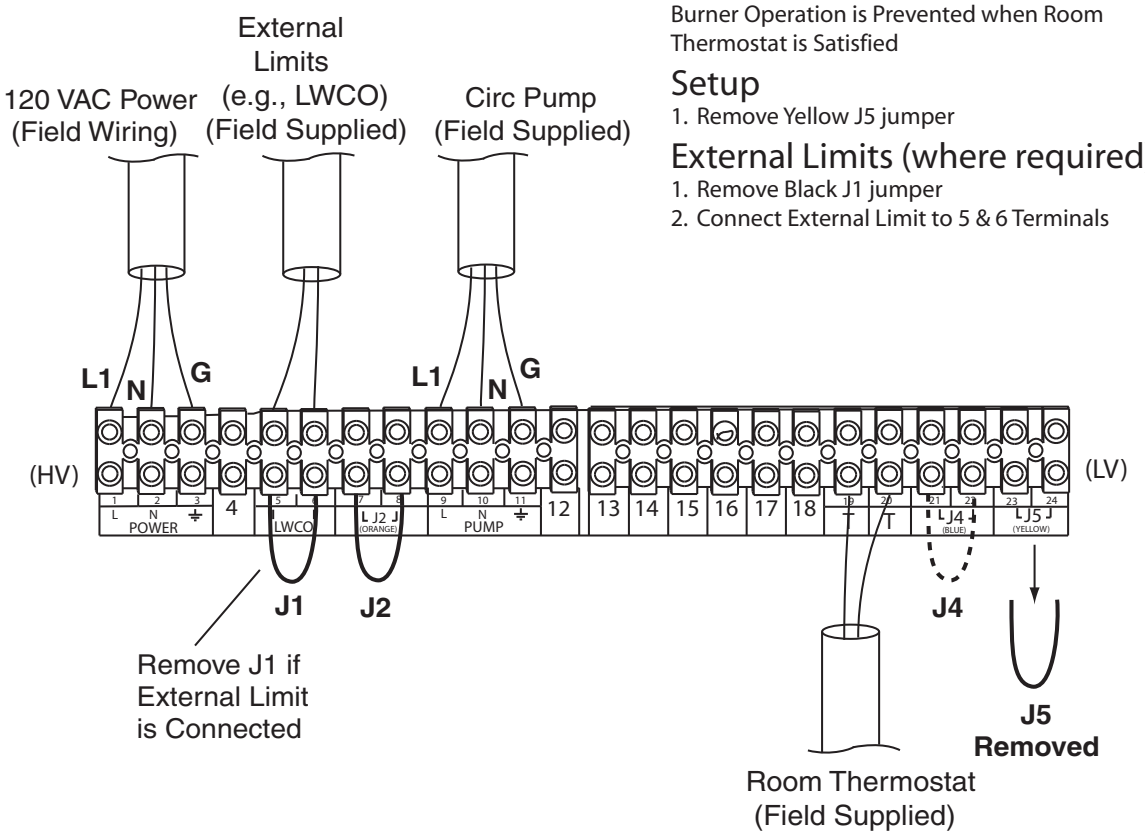
System Configuration

1. Continuous Pump Operation
2. Burner Cycles With Supply Water Thermostat

Setup

1. No changes needed

Option 2 - Field Installed Room Thermostat, Yellow J5 jumper removed



System Configuration

1. Continuous Pump Operation
2. Burner Cycles with Supply Water Thermostat when Call from Room Thermostat is present; Burner Operation is Prevented when Room Thermostat is Satisfied

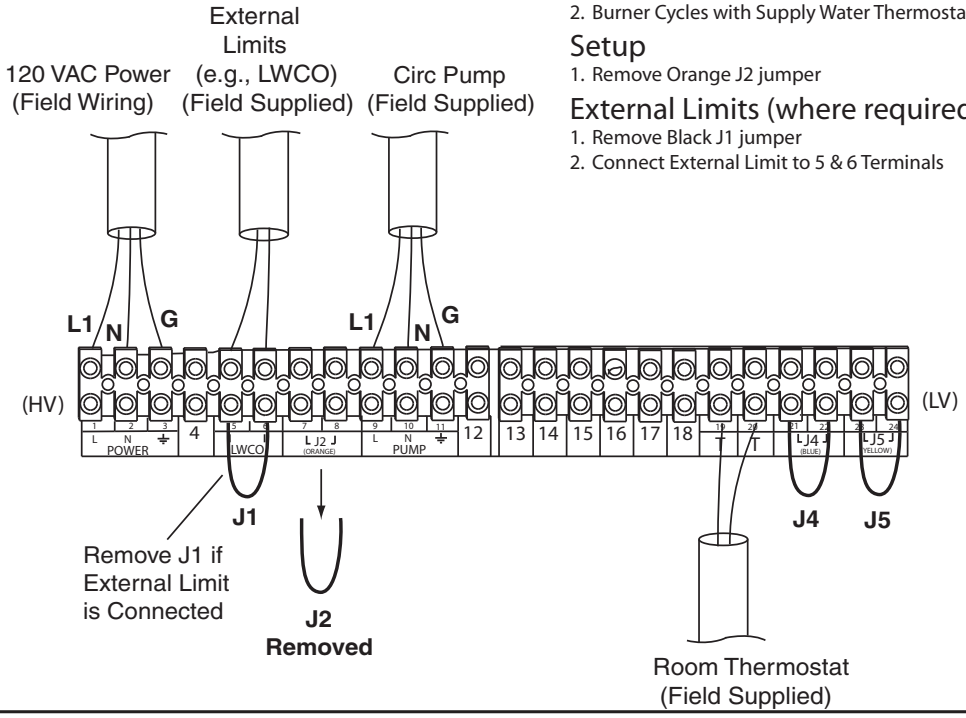
Setup

1. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 3 - Field Installed Room Thermostat, Orange J2 jumper removed



System Configuration

1. Pump Runs on Call from Room Thermostat OR if Water Temperature is Above Supply Water Thermostat setting
2. Burner Cycles with Supply Water Thermostat

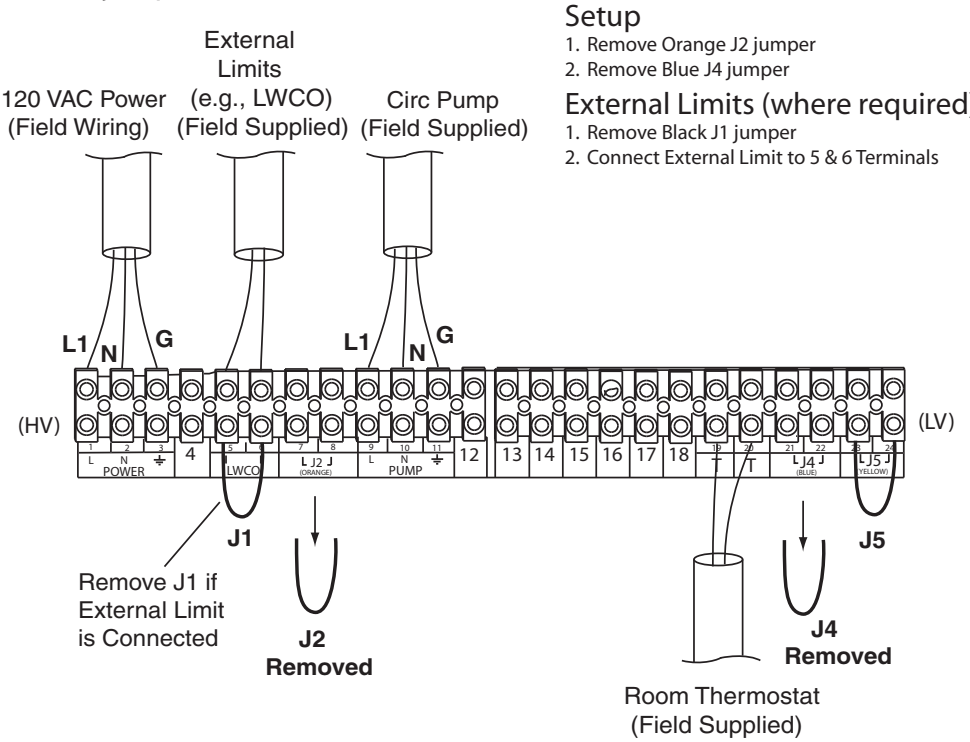
Setup

1. Remove Orange J2 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 4 - Field Installed Room Thermostat, Orange J2 jumper removed, Blue J4 jumper removed



System Configuration

1. Pump Controlled by Room Thermostat
2. Burner Cycles with Supply Water Thermostat

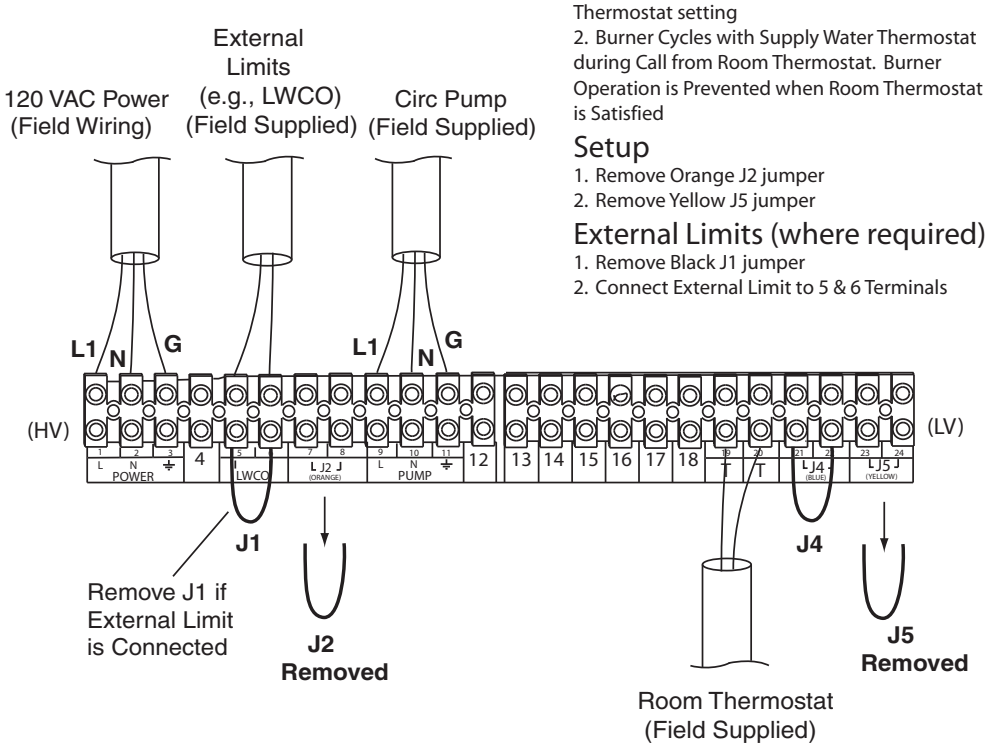
Setup

1. Remove Orange J2 jumper
2. Remove Blue J4 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 5 - Field Installed Room Thermostat, Orange J2 jumper removed, Yellow J5 jumper removed



System Configuration

1. Pump Runs on Call from Room Thermostat OR if Water Temperature is Above Supply Water Thermostat setting
2. Burner Cycles with Supply Water Thermostat during Call from Room Thermostat. Burner Operation is Prevented when Room Thermostat is Satisfied

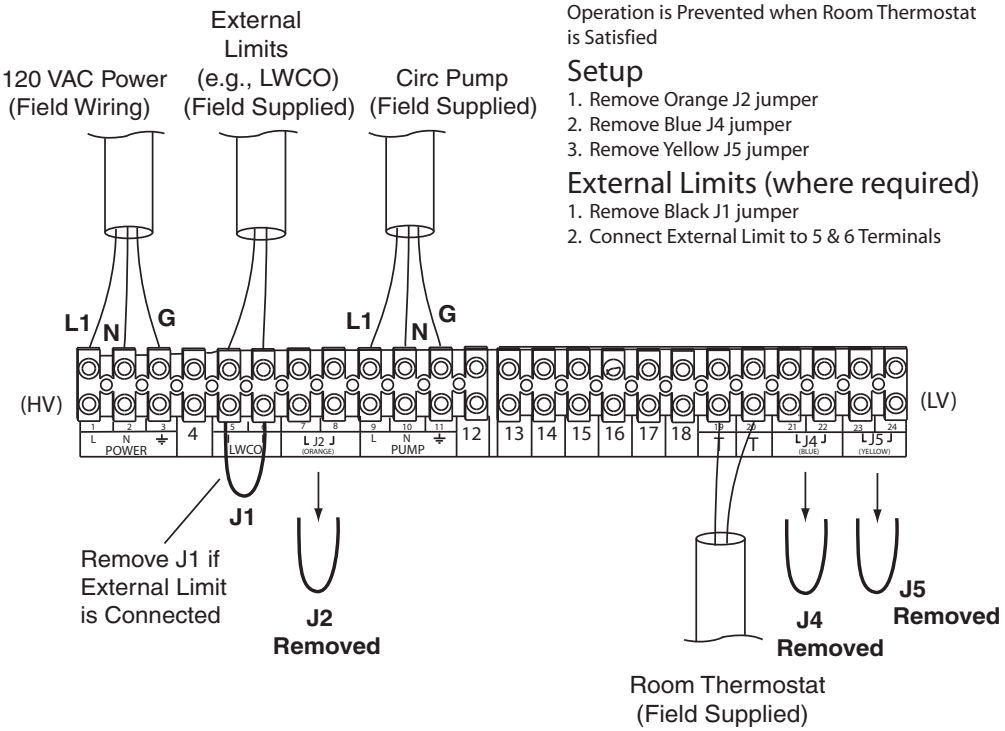
Setup

1. Remove Orange J2 jumper
2. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 6 - Field Installed Room Thermostat, Orange J2 jumper removed, Blue J4 jumper removed, Yellow J5 jumper removed



System Configuration

1. Pump Runs off Room Thermostat
2. Burner Cycles with Supply Water Thermostat during Call from Room Thermostat; Burner Operation is Prevented when Room Thermostat is Satisfied

Setup

1. Remove Orange J2 jumper
2. Remove Blue J4 jumper
3. Remove Yellow J5 jumper

External Limits (where required)

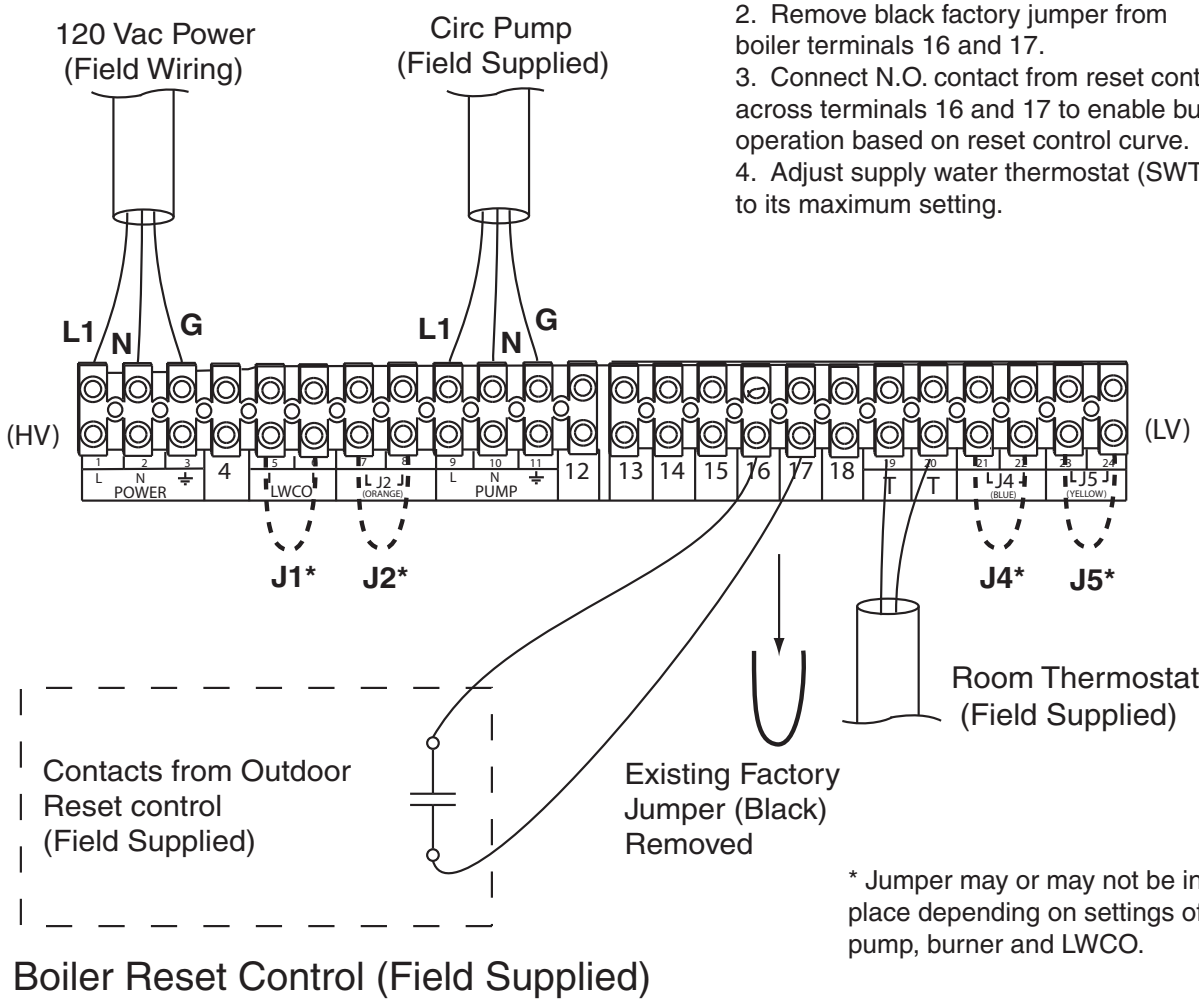
1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Boiler Reset Option - Field Wiring for Field Supplied Boiler Temperature Reset Controls (to Decrease Boiler Water Temperature with Increasing Outdoor Temperature)

Boiler Reset Configuration

NOTE: This Boiler Reset option may be used in combination with any of the other system configuration options and jumper arrangements shown in this document.

1. Use field supplied boiler reset control with water temperature sensor and outdoor temperature sensor. Install according to manufacturer's instructions.
2. Remove black factory jumper from boiler terminals 16 and 17.
3. Connect N.O. contact from reset control across terminals 16 and 17 to enable burner operation based on reset control curve.
4. Adjust supply water thermostat (SWT) to its maximum setting.



6.0 Appendices
6.1 Appendix A - Venting Supplement

(For Illustration and Reference)
See page 20, section 3.6 for General Venting Instructions

Z-VENT

MODEL SVE SERIES III

INSTALLATION AND MAINTENANCE INSTRUCTIONS

SPECIAL STAINLESS STEEL VENTING SYSTEM

FOR GAS BURNING APPLIANCES

CATEGORY II, III, IV

c UL us
LISTED

TESTED AND LISTED BY
UNDERWRITERS LABORATORIES INC.
UL 1738 & BH636

FLEXMASTER CANADA LTD
452 ATTWELL DR.
M9W 5C3
ETOBICOKE, ONTARIO
(416) 679-0045

Z-FLEX US, INC.
20 COMMERCE PARK, NORTH
BEDFORD, N.H.
03110-691
1(800) 654-5600

Visit our web site at www.z-flex.com

SPECIAL STAINLESS STEEL VENTING
For use with Category II, III, IV appliances

Contact Local Building or Fire Officials about Restrictions and Installation Inspections in your area as well as National codes: USA - National fuel gas code ANSI-Z223.1

CANADA -CAN\CGA-B149.1 or .2 Fuel Burning Installation Code

Please refer to appliance manufacturers' instructions to determine proper sizing and connection of venting system to appliance, including maximum horizontal length, maximum height, and installation clearances (air spaces). The proper operation of the vent system and appliance requires parts specified by Z-FLEX with no deletions or substitutions.

PARTS LIST

COMPONENT	3" SYSTEM CAT. #	COMPONENT	3" SYSTEM CAT. #
10 FOOT PIPE	SVEPWC0310	ADJUST. FLASHING	SVSADJ03
8 FOOT PIPE	SVEPWC0308	REDUCER 4" TO 3"	SVSERWC0403
5 FOOT PIPE	SVEPWC0305	FLAT FLASHING	SVSSCS03
4 FOOT PIPE	SVEPWC0304	LOCKING BAND	SVSLBX03
3 FOOT PIPE	SVEPWC0303	FIRESTOP SUPPORT	SVSFSS03
2 FOOT PIPE	SVEPWC0302	FIRESTOP SPACER	SVSFSV03
1 FOOT PIPE	SVEPWC0301	TERMINATION TEE	SVSTTX03
6 INCH PIPE	SVEPWC03.5	TERMINATION BOX	SVSRTX03
90 ° ELBOW	SVEEWC0390	RAIN CAP	SVSRCX03
45 ° ELBOW	SVEEWC0345	TOP SUPPORT	SVSLSX03
HORIZ. DRAIN TEE	SVEDWC03	STORM COLLAR	SVSSCX03
VERTICAL DRAIN TEE	SVEVWC03	Z-VENT SEALANT	GE106X
WALL THIMBLE	SVSWTX03	WM TERM COUPLING	SVSTPX03
WM GV STARTER	SVEWMG03	AMETEK FAN CONN.	SVSACA03
DRAIN TUBE KIT	SVEDTK	WM CGI STARTER	SVEWMFA03

Z-FLEX recommends that an experienced professional who works with venting systems on a regular basis perform the installation. These instructions are intended as a guide to assist a professional installer.

When the **Z-VENT** system is installed, the following should be observed:

1. A venting system that exits the structure through a sidewall or the like, shall terminate not less than 12 inches (254 mm) above the ground (see illustration # 2, page 4).
2. The termination of a system shall be located above the snow line in geographical areas where snow accumulates. The termination area should be kept clear of snow and ice at all times.
3. The vent shall not terminate less than 7 ft. (2.13 m) above a paved sidewalk or driveway.
4. The termination shall be 6 ft. (1.8 m) or more from the combustion air intake of any appliance.
5. The system shall terminate more than 3 ft. (.91 m) from any other building opening, gas utility meter, service regulator or the like.
6. Exterior mounted venting systems should be enclosed below the roof line with a chase to limit condensation and protect against mechanical failure.

NOTES:

A. The Z-FLEX SPECIAL STAINLESS VENT SYSTEM is for use only with appliances having a positive vent pressure of 8" of water column or less.

B. Except for installation in one and two family dwellings, a venting system that extends through any zone above that on which the connected appliance is located shall be provided with an enclosure having a fire resistance rating equal to or greater than that of the floor or roof assemblies through which it passes

C. Do not place any type of insulation in any required air spaces surrounding the venting system.

D. A termination must be used on all installations to assure proper operation and to prevent debris from entering the venting system.

E. The **Z-Vent** system must be free to expand and contract. Pipe must be properly supported. Vertical runs must use firestops as lateral support at each ceiling level and at least one support collar at the base of the vertical run. For vertical runs exceeding 16' (4.88 m), a support collar is required at 16' (4.88 m) intervals. Horizontal runs require a loose fitting metal strap or similar support at each joint.

F. Examine all components for possible shipping damage prior to installation.

G. Proper joint assembly is essential for a safe installation. Follow these instructions exactly as written. Check severeness of joints upon completion of assembly.

H. Check for unrestricted vent movement through walls, ceilings and roof penetrations.

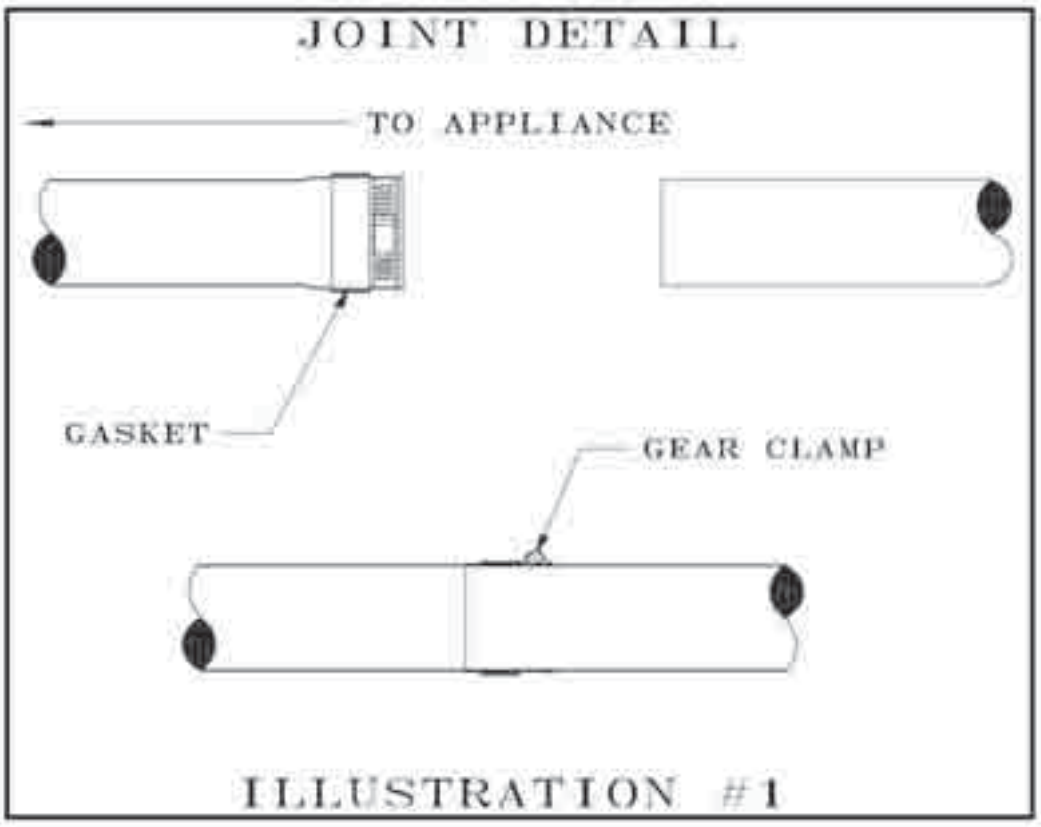
I. Different manufacturers have different joint systems and adhesives. Do Not Mix Pipe, Fittings or Joining methods from different manufacturers.

JOINT PROCEDURE

(see illustration #1 below)

The female end of each Z-Vent III component incorporates a silicone sealing gasket. Examine all components to insure that gasket integrity has remained during shipping. Gaskets must be in the proper position or flue gases could leak resulting in carbon monoxide poisoning.

1. Align pipes and push them together as far as they will go(at least 1.75 inches).
2. Tighten gear clamp to a minimum torque of 40 in/lbs. and a maximum of 50 in/lbs.



CLEARANCE TO COMBUSTIBLES

SYSTEM OPERATING TEMPERATURE	CLEARANCE ENCLOSED		CLEARANCE UNENCLOSED	
	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL
300°F (149°C)	8" (200 mm)	4"(100 mm)	1"(25 mm)	1"(25 mm)
480°F (249°C)	8"(200 mm)	4"(100 mm)	1" (25 mm)	1"(25 mm)

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SIDE WALL VENTING INSTALLATION

(see illustration #2 below)

1. Penetrating a combustible wall requires the use of a wall thimble. The pipe may be mortared in directly without using a wall thimble, if the wall is non-combustible. Install wall thimble into wall, observing the aforementioned rules and/or local building codes. Select the point of wall penetration where the minimum 1/4 " per foot of slope (6.4 mm per 305 mm) can be maintained. A framed opening is required to insert the thimble halves. The thimble is adjustable for different wall thicknesses. Caulk around outside edge of plates as necessary and fasten to wall using suitable screws or nails. The vent pipe must be sealed at wall thimble as per code regarding continuous vapor barrier.

2. The system can now be assembled through the thimble (attach the termination first - note "UP" arrow) and then back to the appliance as per illustration using **JOINT PROCEDURE** as described on page #3. A gear clamp (or locking band) must be installed around the pipe on the inside of wall to trap pipe in position so that the system cannot be moved in or out of wall. This applies to both combustible and non-combustible walls.

3. The system must be supported along its horizontal length at all elbow locations and joints (every forty-eight inches or less) using straps around pipes maintaining clearance to combustibles as per table on page 4.

Any horizontally installed portion of a venting system shall have a slope (upwards for Category II, III, or IV appliances or downwards for Category III or IV appliances) not less than 1/4" (6.4 mm) every 12 inches (305 mm) to prevent collection of condensate at any location in the assembly. Fasteners must not penetrate the components of the system either when joining pipes and fittings or using support straps. The lengths of pipe may be cut on non-expanded end using aviation snips or a hacksaw (24 tpi). The cut end must be filed or sanded smooth before joining. When installing the condensate tube be sure to form a trap by means of a 3" (76.2 mm) loop filled with water. This tube must be 3/8" ID high temperature silicone for at least the first 6 inches (152 mm) and attached with a gear clamp or hose clamp. The effluent must be disposed of according to local regulations.

NOTE: Z-FLEX recommends using a neutralizer kit when using a condensate trap. A condensate pump may be required.

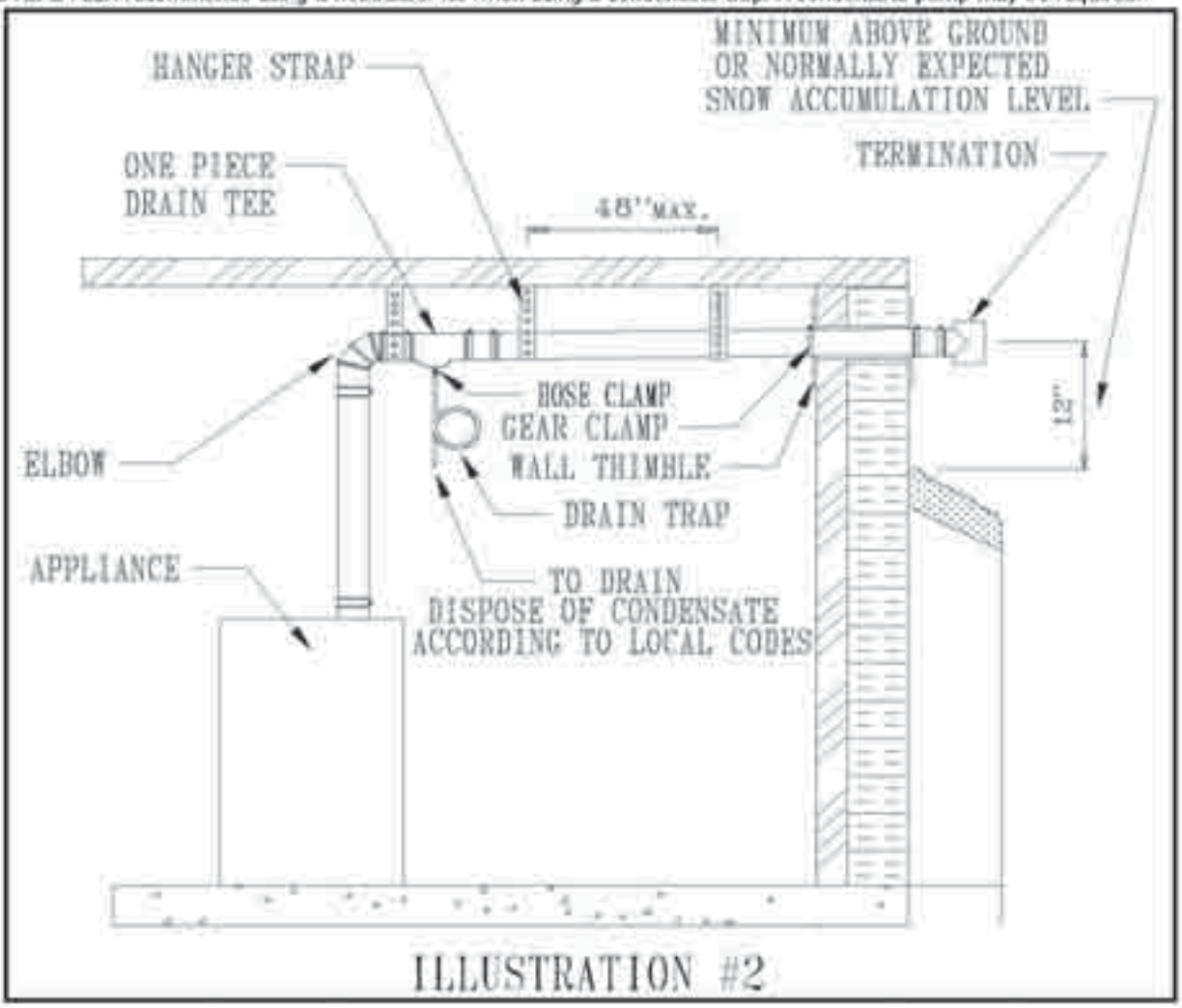

ILLUSTRATION #2

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VERTICAL VENTING

(see illustrations #3 & 4)

NOTE: The vent termination must be at least 3 ft. (1 m) to a maximum of 6ft. above the roof line and 2 ft. (.61 m) higher than any part of a structure within 10 ft. (3.1 m). The total vertical distance of the vent system from appliance flue collar to the rain cap termination and the maximum length of offsets shall not exceed that specified in the appliance manufacturer's installation instructions. No continuous vertical run shall be longer than sixty feet (18.3 m). All horizontal sections must observe the rules for **HORIZONTAL VENTING.** The clearance to combustibles inside a chase shall be no less than 4" (100 mm).

1. Prior to beginning the installation loosely assemble all parts required to make sure all parts are present.

2. Locate position for venting system and proceed to cut holes for firestop support and firestop spacers. All vertical installations require the use of a support. Frame the opening of the floor using lumber, which is dimensionally consistent with the structural members. Insert the support from beneath the framed opening and secure with nails or screws as required.

3. Refer to **JOINT PROCEDURE** (illustration #1) before assembling system.

4. Install system joining pipe as required up through roof (illustration page 7). Tighten gear clamp on firestop spacer to hold vent system. NOTE: A firestop must be provided when a vent passes through a combustible floor or ceiling. The opening must be framed as for the support since the support also serves as a firestop.

5. The roof flashing can now be installed. Where the vent passes through the roof a flashing must be used to maintain the required clearances and to protect from the elements. The framed opening must be large enough to provide the necessary clearances to combustibles, taking into account the slope of the roof. The flashing can be used on slopes from flat to 6/12 pitch. Install the flashing while holding the pipe centered in the opening. Fasten the flashing to the roof under the roofing material upslope from the pipe and above the roofing material below the pipe. Seal as required using high temperature silicone.

6. Attach rain cap using. **JOINT PROCEDURE** (illustration #1)

7. The vertical section is connected by an elbow joined to the horizontal run and then through a drain tee (see page 5 for details) to the appliance. Elbows are joined to pipe using the **JOINT PROCEDURE** (illustratioon #1).

NOTE: If there is no solid anchor point in the system below the roof (ie Firestop Support etc.) then a Z-Vent Guy Band must be used below the roof as follows. (see illustration #6)

a. Attach the Guy Band at any point above an elbow or tee in the vertical section within 20 feet of the roof.

b. Fasten stainless steel or galvanized cable with a minimum capacity of 500 lbs. to each of the four anchor holes.

c. Anchor the cables to a rigid building member using an appropriate fastening method.

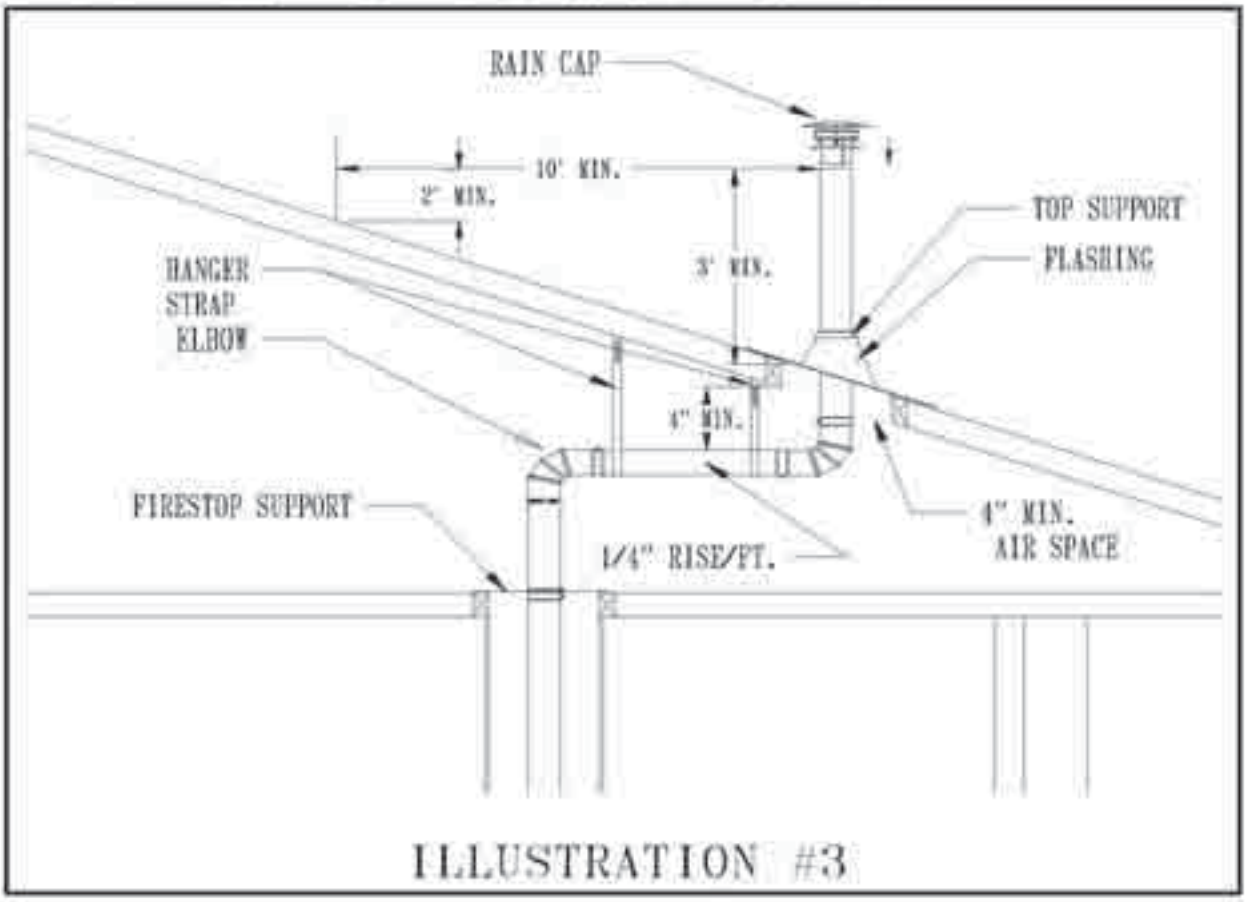

ILLUSTRATION #3

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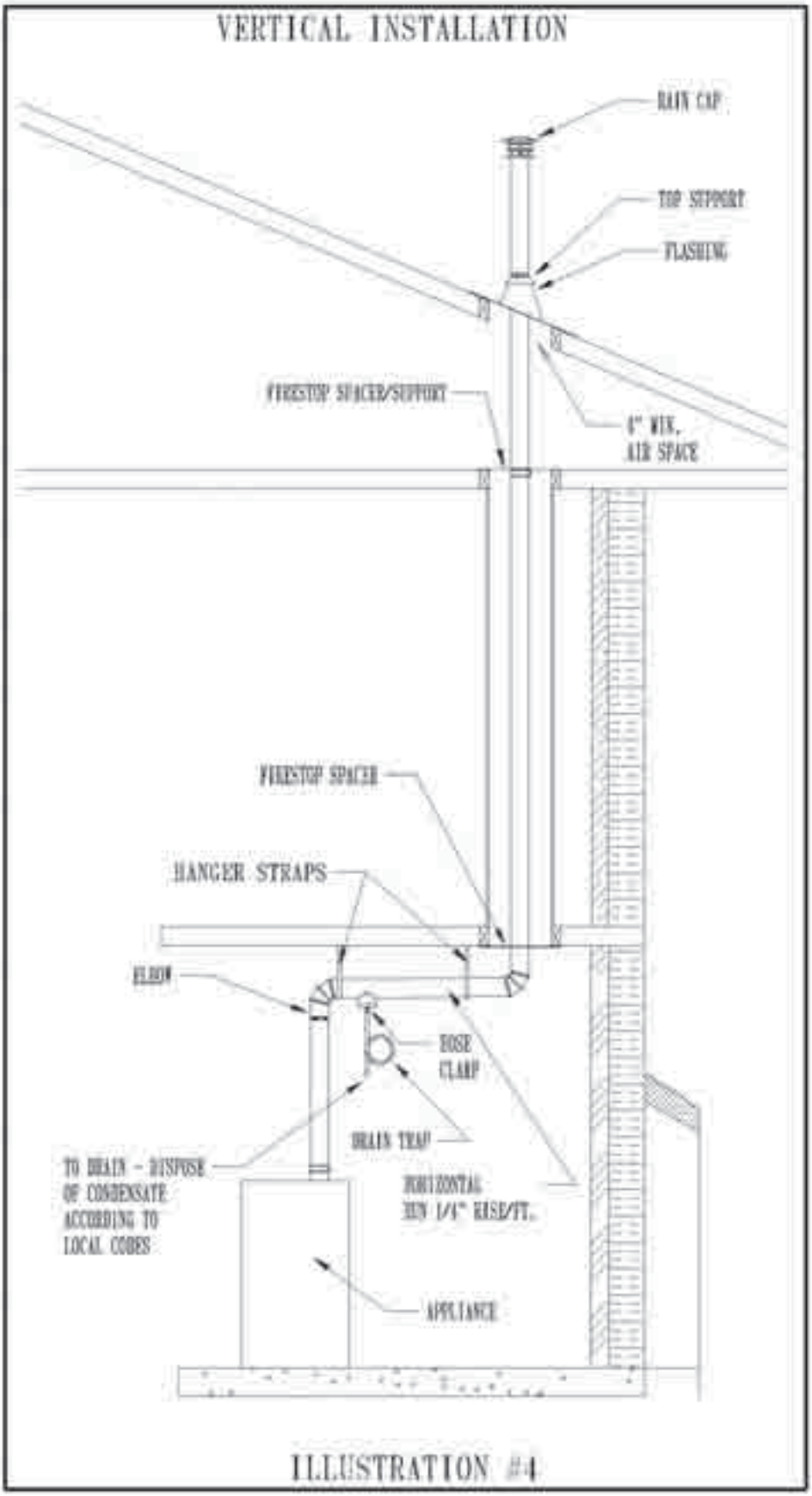

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EXISTING MASONRY CHIMNEY

(see illustration #5)

NOTE: A masonry chimney flue may be used to route **Z-VENT** if no other appliance vents directly into the same flue without a liner. Prior to beginning the installation, be sure that the existing chimney meets all national and local building codes. The chimney must be cleaned, removing all soot, debris and creosote before installing **Z-VENT.**

1. Using the **JOINT PROCEDURE**, (illustration #1) join pipe lengths as they are lowered down the chimney until bottom end lines up with opening in chimney. (A rope may be used to facilitate lowering of liner).

2. Install flashing over last pipe length and attach top support to pipe. Leave 6" (150 mm) of pipe protruding from flashing so that rain cap may be installed and to allow for any adjustment to line up base tee properly.

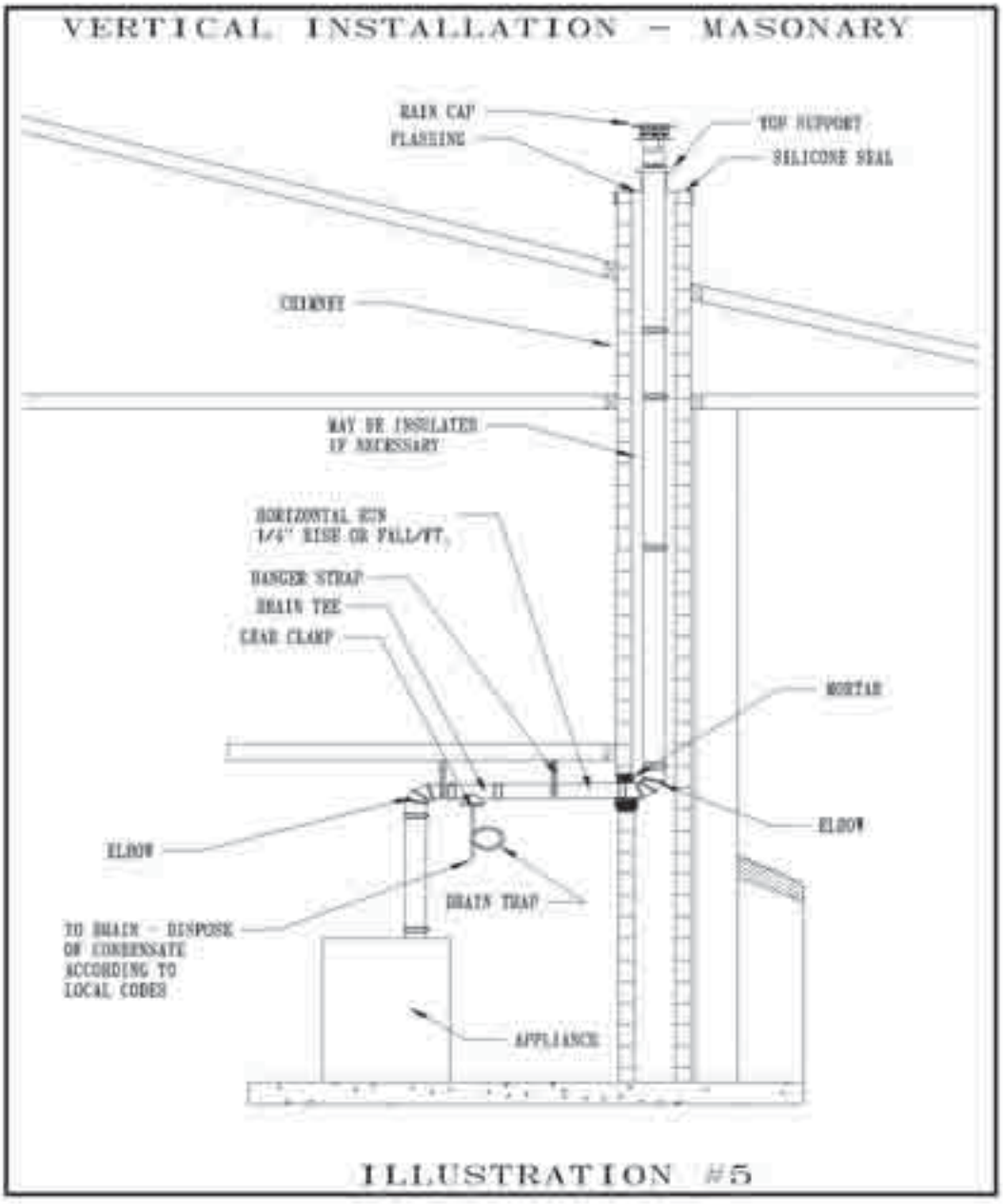
3. Fasten flashing to chimney top using caulking and/or screws. If the top clay tile is still in place, the corners of the flashing must be notched and flashing plate formed down around clay tile.

4. The rain cap may now be installed using the **JOINT PROCEDURE** (illustration #1).

5. Where required a drain tee should be installed to a pipe as per **JOINT PROCEDURE** (illustration #5).

6. The remainder of the horizontal installation to the appliance can be done the same as for side wall venting on page 5 observing rules for **HORIZONTAL VENTING.**

7. Final adjustment may be made to the top support if necessary.



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ABOVE THE ROOF

(see illustration #6)

NOTE: When Z-Vent must be extended above the roof line more than six (6) feet the Guy Band must be used to support the system.

1. Install the Guy Band below the Rain Cap using the 10-24 screw and nut provided.
2. Attach stainless steel or galvanized cable with a minimum rated capacity of 500lbs. to each of the four anchor holes.
3. Anchor the cables to a rigid building member using an appropriate fastening method

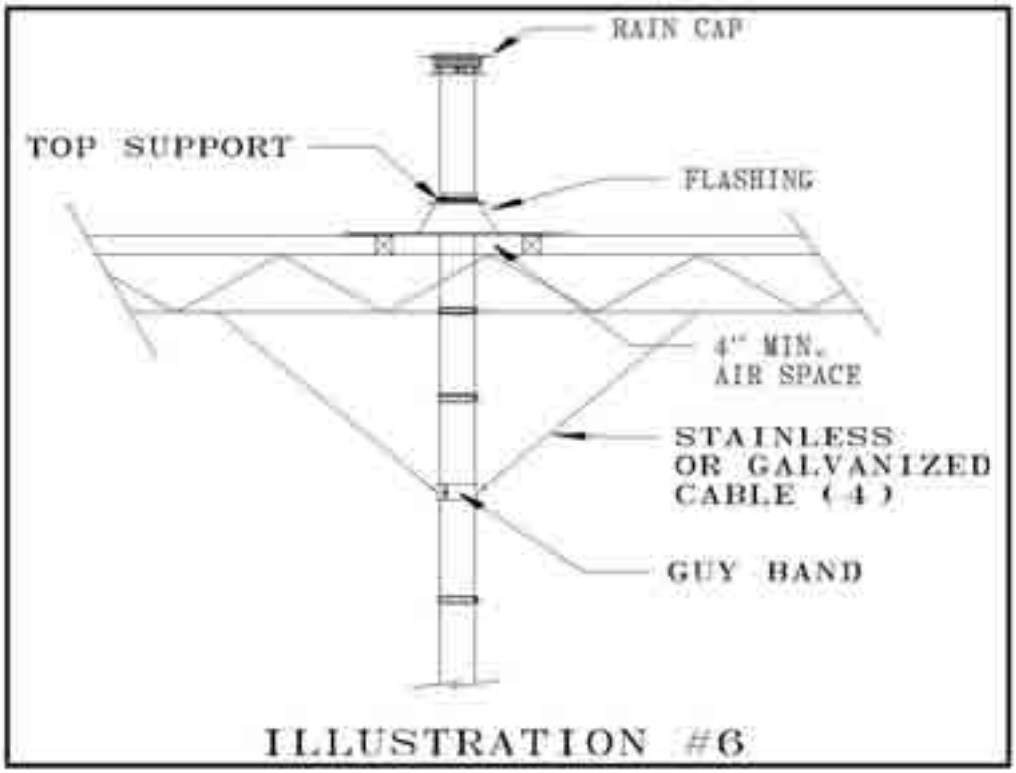

ILLUSTRATION #6

APPLIANCE CONNECTION

Refer to the appliance manufacturer's installation manual for proper method of joining **Z-VENT** to the appliance collar. An appliance adapter to suit specific requirements may be obtained from Z-FLEX.

IMPORTANT NOTICE

When any of the previous installation procedures are completed, be sure to go over the entire system to make sure all joints are secure and sealed correctly. The seams and joints must be checked for tightness prior to using the venting system.

A qualified inspector must check the entire system at least once annually following initial installation to maintain the **Z-FLEX** warranty.

The installation must conform to the requirements of the appliance manufacturers' instructions, The National Fuel Gas Code and local codes and regulations.

IMPORTANT: The Z-Vent is designed for use with Category II, III and IV furnace and boiler venting and should not be used with any other type of furnace and boiler venting. Use of the Z-Vent with any other type of furnace and boiler venting other than those recommended by Seller for use with its Z-Vent will void the warranty.

WARNING: CONDENSATION WITH HIGH ACID CONTENT MAY BE PRODUCED DUE TO UNFORESEEN CONDITIONS. YOUR HEATING APPLIANCE AND VENTING SYSTEM SHOULD BE INSPECTED BY A LICENSED CONTRACTOR ON AN ANNUAL BASIS FOR POSSIBLE SIGNS OF DETERIORATION DUE TO RUSTING OR PIN HOLES. CONDENSATION WITH HIGH ACID CONTENT MAY CAUSE LEAKAGE OF HARMFUL GASES WHICH CAN CAUSE NAUSEA, FAINTING OR DEATH. IF DETERIORATION IS DETECTED CEASE USE OF HEATING SYSTEM AND CALL FURNACE/BOILER INSTALLER FOR REMEDIAL ACTION.

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6.2 Appendix B - Vent Terminations

THROUGH THE WALL VENT TERMINATIONS (excerpted from NFPA - National Fuel Gas Code - See illustration below) See Appendix C

A mechanical draft venting system shall terminate at least 3 ft (0.9 m) above any forced air inlet located within 10 ft (3.0 m).

Exception No. 1: This provision shall not apply to the combustion air intake of a direct-vent appliance.

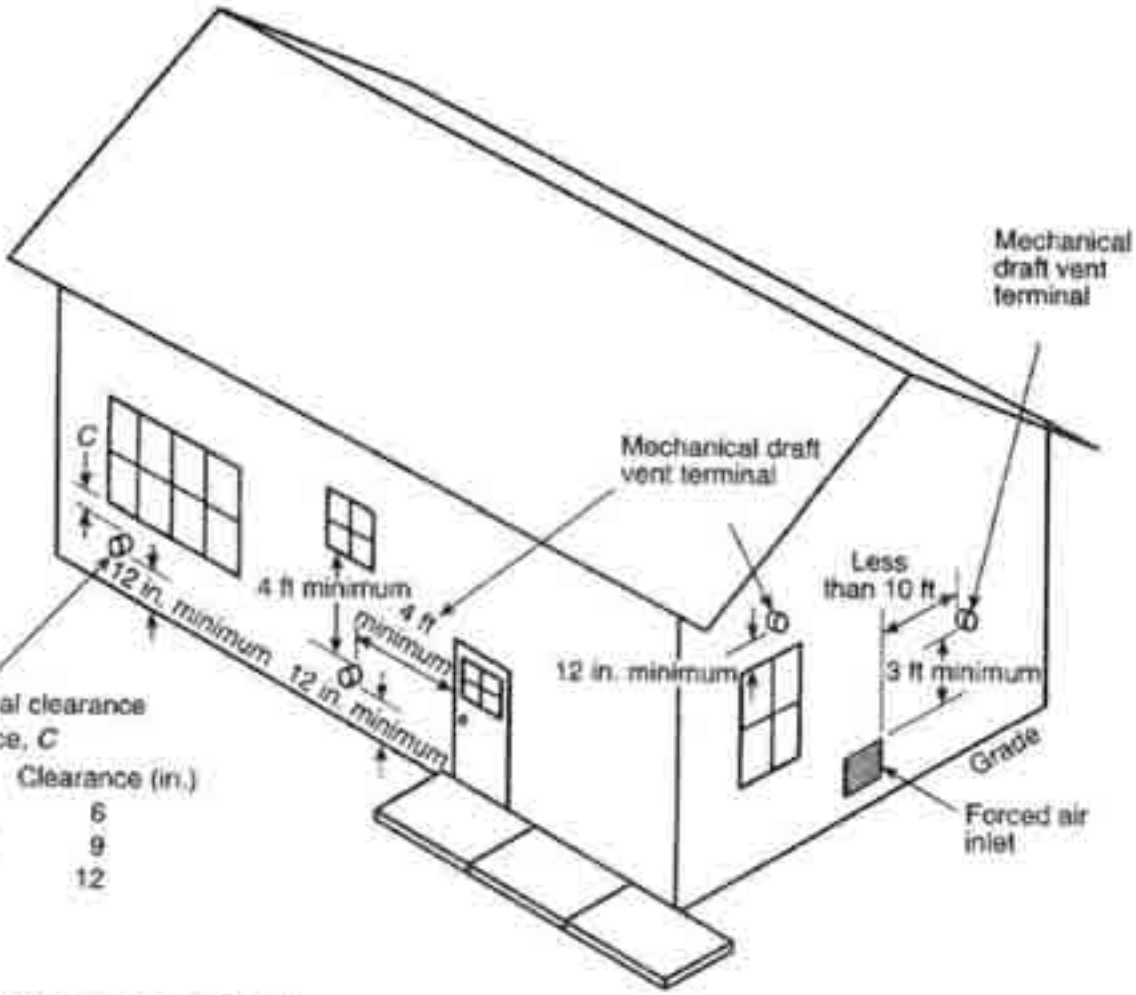
Exception No. 2: This provision shall not apply to the separation of the integral outdoor air inlet and flue gas discharge of listed outdoor appliances.

A mechanical draft venting system of other than direct-vent type shall terminate at least 4 ft (1.2 m) below, 4 ft (1.2 m) horizontally from, or 1 ft (300 mm) above any door, operable window, or gravity air inlet into any building. The bottom of the vent terminal shall be located at least 12 in. (300 mm) above grade.

The vent terminal of a direct-vent appliance with an input of 10,000 Btu/hr (3 kW) or less shall be located at least 6 in. (150 mm) from any air opening into a building and such an appliance with an input over 10,000 Btu/br (3 kW) but not over 50,000 Btu/hr (14.7 kW) shall be installed with a 9 in. (230 mm) vent termination clearance, and an appliance with an input over 50,000 Btu/hr (14.7 kW) shall be at least a 12 in. (300 mm) vent termination clearance. The bottom of the vent terminal and the air intake shall be located at least 12 in. (300 mm) above grade.

Through-the-wall vents for Category II and Category IV appliances and noncategorized condensing appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment. Where local experience indicates that condensate is a problem with Category I and Category III appliances, this provision shall also apply.

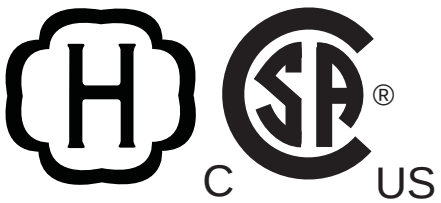
Exit terminals of mechanical draft and direct-vent venting systems.



Direct vent terminal clearance
Minimum clearance, *C*

Input (Btu/hr)	Clearance (in.)
10,000 or less	6
10,001 to 50,000	9
Over 50,000	12

For SI units: 1 ft = 0.305 m; 1 in. = 25.4 mm; 1 Btu/hr = 0.293 W



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