BOILER INSTALLATION, OPERATION INSTRUCTIONS

KAPPA R

Gas-Fired Natural Draft Hot Water Boilers

Please Read Instructions Carefully
Save for Future Reference

WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

— **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.**

— **WHAT TO DO IF YOU SMELL GAS**
- **Do not try to light any appliance.**
- **Do not touch any electric 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 can not reach your gas supplier call the fire department.**

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

— **These instructions must be affixed on or adjacent to the boiler.**

Manufactured by:
BIASI
Biasi S.p.A.
Verona, Italy

C US

Distributed By:
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Quincy Hydronic Technology Inc.
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Dear Customer:

Thank you for buying a Biasi KAPPA R Boiler System.

The Kappa R is an efficient floor standing gas fired boiler for central heat.

We realize that it is not possible to answer all questions about the KAPPA R boiler system in this manual. Reading this installation manual does not make the reader an expert in all aspects of installation and operation, and does not replace the need for a qualified, licensed heating contractor. We urge you to contact your installing contractor or distributor if you are in question about any aspect of your boiler's performance. Our main concern is that you are satisfied with your boiler and its performance. We require that your contractor complete efficiency tests using instruments.

The external controls and accessories listed in this manual (excluding those supplied inside the boiler) are intended to serve as guidelines rather than specific recommendations. We realize that other makes and models of such devices are available and can be used as successfully as those we specify. The installing contractor is the best judge of a system's specific requirements, as well as the local availability of certain makes and models of controls and accessories. The preceding does not apply, however, to the equipment that comes with every boiler, such as the overheat control and pressure relief valves. **The installation of the specific devices supplied with every boiler is absolutely necessary to the safe operation of the boiler and protection of the heating system**.

All BIASI KAPPA R boilers are built in accordance with the ASME boiler and pressure vessel code, and bear the "H" stamp. The Entire range of applications for the KAPPA R boiler has been tested to standard ANSI Z21.13/CSA4.9 and is CSA compliant.

This KAPPA R boiler has a 1 year warranty on parts and a limited lifetime warranty on the heat exchanger only.
Please be sure to return the warranty registration card as the warranty will be void without your boiler's serial numbers (located on label affixed to the boiler), date of installation and the name of your installer being on record in our files.

Thank you for purchasing our KAPPA R boiler. If you have questions or comments, please don't hesitate to contact us immediately. Our goal is 100% customer satisfaction.

QHT inc.

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WARNING

Boiler is certified as an indoor appliance. Do not install boiler outdoors or locate where it will be exposed to freezing temperatures.

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— **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.**

— **WHAT TO DO IF YOU SMELL GAS**
- **Do not try to light any appliance.**
- **Do not touch any electric 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 can not reach your gas supplier call the fire department.**

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

— **These instructions must be affixed on or adjacent to the boiler.**

DANGER

Caution: **Do not store or use flammable materials, chemicals or flammable liquids, especially gasoline, in the vicinity of this heating appliance.**

Caution: **Should overheating occur or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the appliance.**

Caution: **Do not use this boiler 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.**

WARNING

Any appliance that burns natural gas, propane gas, fuel oil, wood or coal is capable of producing carbon monoxide (CO). Carbon Monoxide (CO) is a gas which is odorless, colorless and tasteless but is very toxic. CO is lighter than air and thus may travel throughout the building.

BRIEF EXPOSURE TO HIGH CONCENTRATIONS OF CO, OR PROLONGED EXPOSURE TO LESSER AMOUNTS OF CO MAY RESULT IN CARBON MONOXIDE POISONING. EXPOSURE CAN BE FATAL AND EXPOSURE TO HIGH CONCENTRATIONS MAY RESULT IN THE SUDDEN ONSET OF SYMPTOMS INCLUDING UNCONSCIOUSNESS.

Symptoms of CO poisoning include the following:

dizziness	vision problems	shortness of breath
headache	loss of muscle control	unclear thinking
nausea	weakness	unconsciousness

The symptoms of CO poisoning are often confused with those of influenza, and the highest incidence of poisoning occurs at the onset of cold weather or during flu season.
A victim may not experience any symptoms, only one symptom, or a few symptoms.
Suspect the presence of carbon monoxide if symptoms tend to disappear when you leave your home.

The following signs may indicate the presence of carbon monoxide:

- Hot gasses from appliance, venting system pipes or chimney, escaping into the living space.
- Flames coming out around the appliance.
- Yellow colored flames in the appliance.
- Stale or smelly air.
- The presence of soot or carbon in or around the appliance.
- Very high unexplained humidity inside the building.

If any of the symptoms of CO occur, or if any of the signs of carbon monoxide are present, **VACATE THE PREMISES IMMEDIATELY AND CONTACT A QUALIFIED HEATING SERVICE COMPANY OR THE GAS COMPANY OR THE FIRE DEPARTMENT.**

ONLY QUALIFIED, LICENSED SERVICE CONTRACTORS SHOULD PERFORM WORK ON YOUR BIASI KAPPA R BOILER.

WARNINGS FOR THE HOMEOWNER

FOLLOW ALL INSTRUCTIONS and warnings printed in this manual and posted on the boiler.

INSPECT THE BOILER ANNUALLY. To keep your boiler safe and efficient, have a service technician follow the Service checklist near the end of this manual.

IF YOU ARE NOT QUALIFIED to install or service boilers, do not install or service this one.

THE BOILER MAY LEAK WATER at the end of its useful life. Be sure to protect walls, carpets, and valuables from water that could leak from the boiler.

PROTECT YOUR HOME IN FREEZING WEATHER. A power outage, safety lockout, or component failure will prevent your boiler from lighting. In winter, your pipes may freeze and cause extensive property damage. Do not leave the heating system unattended during cold weather unless alarms or other safeguards are in place to prevent such damage.

DO NOT BLOCK AIR FLOW into or around the boiler. Insufficient air may cause the boiler to produce carbon monoxide or start a fire.

KEEP FLAMMABLE LIQUIDS AWAY from the boiler, including paint, solvents, and gasoline. The boiler may ignite the vapors from the liquids causing explosion or fire.

KEEP CHILDREN AND PETS away from hot surfaces of the boiler, boiler piping, and vent pipe.

CARBON MONOXIDE (CO) is an odorless, deadly gas that may be introduced into your home by any malfunctioning fuel-burning product or vent system failure. Consider installing CO alarms near bedrooms in all levels of the building to warn you and your family of potential CO exposure.

WARNINGS FOR THE INSTALLER

READ THIS ENTIRE MANUAL before attempting installation, start-up, or service. Improper installation, adjustment, alteration, service, or maintenance may cause serious property damage, personal injury, or death.

DO NOT DISCONNECT PIPE FITTINGS on the boiler or in the heating system without first verifying that the system is cool and free of pressure and that your clothing will protect you from a release of hot water or steam. Do not rely solely on the boiler's temperature and pressure gage when making this judgment.

USE PROPER PERSONAL PROTECTION EQUIPMENT when servicing or working near the boiler. Materials of construction, flue products, and fuel contain alumina, silica, heavy metals, carbon monoxide, nitrogen oxides, and/or other toxic or harmful substances that can are hazardous to health and life and that are known to the State of California to cause cancer, birth defects, and other reproductive harm.

INSTALL ALL GUARDS, cover plates, and enclosures before operating the boiler.

SIZE THE BOILER PROPERLY relative to the design heat load or, if using domestic hot water priority, the peak hot water load, whichever is larger. A grossly oversized boiler will cycle excessively and this will lead to premature failure of the boiler and its components. Our warranty does not apply to damage from excessive cycling.

ADHERE TO ALL LOCAL CODE REQUIREMENTS. Contact your local code inspector prior to installation. In the absence of a local code, adhere to the *National Fuel Gas Code ANSI Z223.1/NFPA 54 or CAN/CSA B149.1, Natural Gas and Propane Installation Code*.

ALL WIRING must comply with the *National ElectrIcal Code ANSI/NFPA 70* (in the USA) or the *Canadian Electrical Code CSA C22.1* (in Canada) and any local regulations.

IMPORTANT INFORMATION

Please read this page carefully.

- **ALL BOILERS MUST BE INSTALLED IN ACCORDANCE WITH NATIONAL, STATE AND LOCAL PLUMBING, HEATING AND ELECTRICAL CODES AND ORDINANCES, AS WELL AS THE REGULATIONS OF THE SERVING ELECTRICAL, WATER AND GAS UTILITIES.**

- **All systems should be designed by competent contractors, and only persons knowledgeable in the layout and installation of heating systems should attempt the installation of any boiler. It is the responsibility of the installing contractor to see that all controls are correctly installed and operating properly when the installation is completed.**

- **This boiler is intended for use, only with propane or natural gas. All flammable liquids (especially gasoline), chemicals, rags, paper, wood scraps, debris, etc., should be kept away from the boiler at all times. Keep the boiler area clean and free of all fire hazards.**

- **Please read the literature and warranties supplied by the manufacturers of the various accessory equipment. This equipment is warranted by the respective manufacturers, not by Quincy Hydronic Technology, Inc. Each piece of equipment must be installed and used according to the recommendations of the manufacturer.**

Codes and Regulations:

Installation of the boiler and related equipment must conform to national, state and local regulating agencies and codes applicable to the installation of the equipment. In the absence of local requirements, the following codes apply:

A. ANSI/NFPA	-	#70 National Electric Code
B. ANSI/NFPA	-	#211 Chimneys and Vents
C. ANSI/NFPA	-	#Z223.1 National Fuel Gas Code
C. ANSI/NFPA	-	Domestic Gas Conversion Burner
D. CAN/CGA	-	B149 Installation Codes
E. ANSI/ASME	-	CSD-1

The above codes are available from:

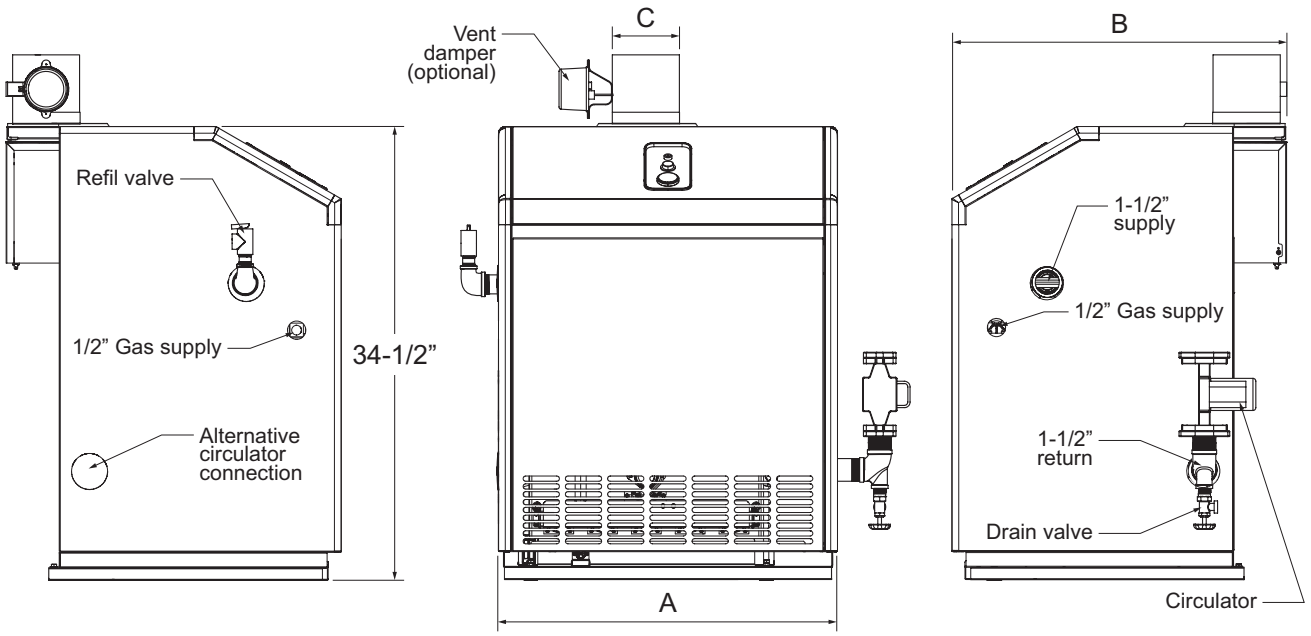
National Fire Protection Association (NFPA)
Battery March Park
Quincy, Massachusetts, 02269
http://www.nfpa.org

Canadian Standards Association Standards Division
5060 Spectrum Way, Suite 100
Mississauga, Ontario, L4W 5N6

1. Product Description

The KAPPA R series boiler is a cast iron gas fired water boiler designed for use in closed forced circulation heating systems.
This boiler is a Category I draft hood equipped appliance, which must be vented by natural draft using a lined masonry or listed metal chimney system. An adequate supply of air for combustion, ventilation and dilution of flue gases must be available in the boiler room.

2. Specifications



Left side view Front view Right side view

Figure 2.1 (General configuration)

BASIC BOILER MODEL	RATINGS	NATURAL GAS		PROPANE GAS			DIMENSIONS (inches)			weight (lbs)
	NUMBER OF SECTIONS	INPUT	HEATING CAPACITY	INPUT	HEATING CAPACITY	AFUE	A	B	C	
		MBH	MBH	MBH	MBH	%				
KAPPA 27R	4	106	91	94	80	85.0	19-3/4	25-3/4	5	**249**
KAPPA 35R	5	141	121	125	107	85.0	19-3/4	25-3/4	6	**308**
KAPPA 44R	6	177	151	157	134	85.0	25-3/4	25-3/4	6	**367**
KAPPA 53R	7	213	182	188	161	85.1	25-3/4	25-3/4	7	**427**

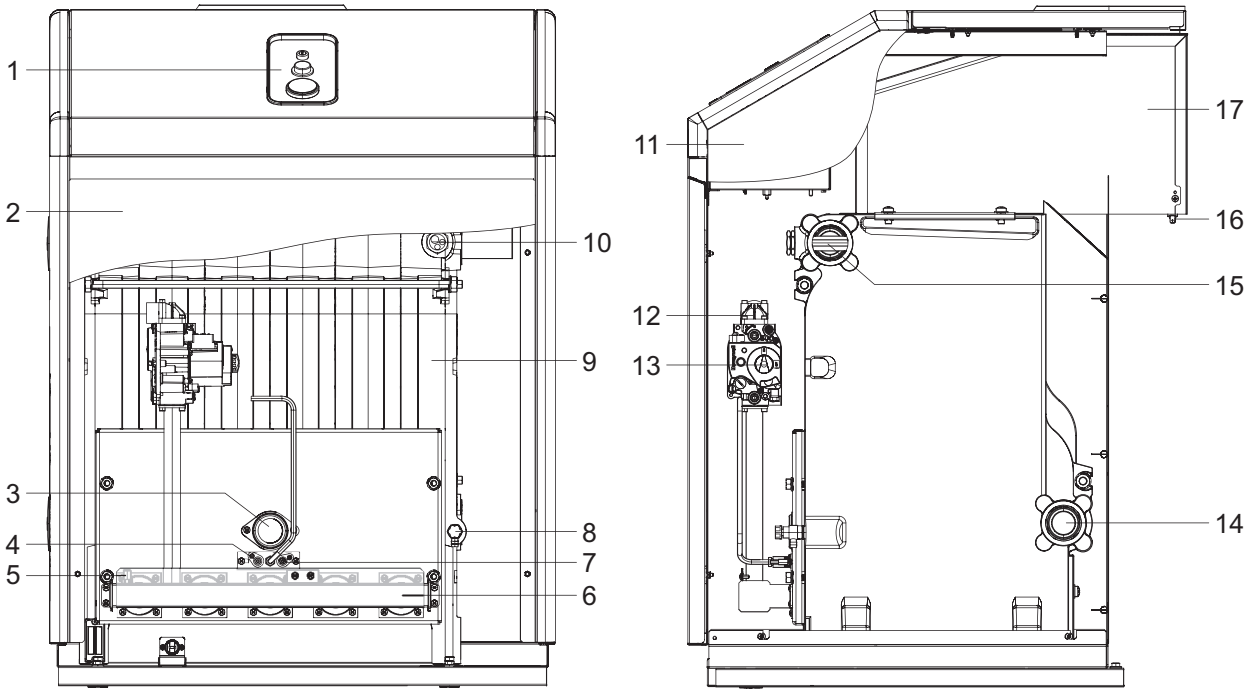
Table 2.1 (Specifications)

Note: The manufacturer should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc.

DESCRIPTION	KAPPA				
	27R	35R	44R	53R	
Fuel	G20				
Destination country/countries	USA - CANADA				
Appliance category	I2H				
Type of appliance	B11BS				
Max rated heat input (MBH)	106	141	177	213	MBH
Max heat output (MBH)	90.5	120.5	151	182	MBH
Max rated heat input LP (MBH)	94	125	157	188	MBH
Max heat output LP (MBH)	80	107	134	161	MBH
Useful efficiency at Pn Max	85.5				%
Flue gas temperature (ΔT)	76 / 168	72 / 161	86 / 186	85 / 185	°C / °F
Required draught	0.02 ÷ 0.05 in W.C.				
CO2 (*)	5.4	5.2	6.2	5.6	%
CO (*)	< 10				p.p.m.
Maximum admissible temperature	110 / 230				°C / °F
Operating temperature (range)	32÷99 / 92÷210				°C / °F
Minimum return temperature	38 / 100				°C / °F
Maximum operating pressure "PMS"	50				psi
Power supply	120~60				Volt~Hz
Maximum power input (functioning)	125				W
Index of protection	X0D				IP
Classification	Low temperature				
Diameter of the stack fitting	5	6	6	7	inch
Water-side pressure drop (ΔT 18°C)	1.6	3.2	6.7	10.1	ft head
Water content in the boiler	3.25	3.90	4.55	5.20	Gal
Sections	4	5	6	7	n°

(*) Values achieved with G20 (natural gas) and with parameters referred to 0% residual O_2 in the products of combustion and with pressure 30 inHg.

Table 2.2 (Other specifications)



1. Control panel
2. Front panel
3. Flame inspection opening
4. Ignition electrode
5. Burner gas pressure test point
6. Burner
7. Flame detection sensor
8. Boiler drain cock
9. Boiler body
10. Immersion Well
11. Side panel
12. Gas supply
13. Gas valve
14. Central heating return inlet pipe
15. Central heating flow outlet pipe
16. Flue gas thermostat
17. Flue gas hood

Figure 2.2 (Primary components)

3. Before Installing

1) Safe, reliable operation of this boiler depends upon installation by a professional heating contractor in strict accordance with this manual and the requirements of the authority having jurisdiction.
   - In the absence of an authority having jurisdiction, installation must be in accordance with this manual and the *National Fuel Gas Code*, ANSI Z223.1-latest edition.
   - Where required by the authority having jurisdiction, this installation must conform to the *Standard for Controls and Safety Devices for Automatically Fired Boilers* (ANSI/ASME CSD-1)-latest edition.

2) Make sure that a properly sized chimney is available which is in good condition. Consult the authority having jurisdiction, Part VI of this manual, and the *National Fuel Gas Code* for additional information on venting requirements.

3) Make sure that the boiler is correctly sized:
   - For systems that incorporate other indirect water heaters, refer to the indirect water heater manufacturer's instructions for boiler output requirements.

4) Make sure that the boiler received is configured for the correct gas (natural or LP).

5) Boilers built for installations at altitudes above 2000 ft. require different main burner orifice. Make sure that the boiler is configured for use at the correct altitude.

6) When firing with Natural Gas, if 6 inwc of incoming pressure is not available, contact QHT Inc. for a low line pressure kit.

4. Locating the Boiler

WARNING

FAILURE TO OBSERVE THE FOLLOWING LOCATION REQUIREMENTS COULD RESULT IN A FIRE, EXPLOSION OR CARBON MONOXIDE (CO) HAZARD.

1) Clearances:
   - Observe minimum clearances shown below to avoid potential fire hazard. These clearances apply to all combustible construction as well as noncombustible walls, ceilings and doors. Also see Figures 4.1 and 4.2.

     Front - 18" (requires relocation of relief valve to right hand side of boiler)
     Right Side - 4"
     Rear - 6"
     Top - 24-1/2" Additional Height May Be Required To Maintain 6" Clearance From All Breeching Components

   - A 24" service clearance from the jacket is recommended on the left, right, and front of the boiler. These clearances may be reduced to those shown in Figures 4.1 & 4.2 , however servicing the boiler will become increasingly difficult as these service clearances are reduced.

   - Install only on a Non-Combustible Floor Only.

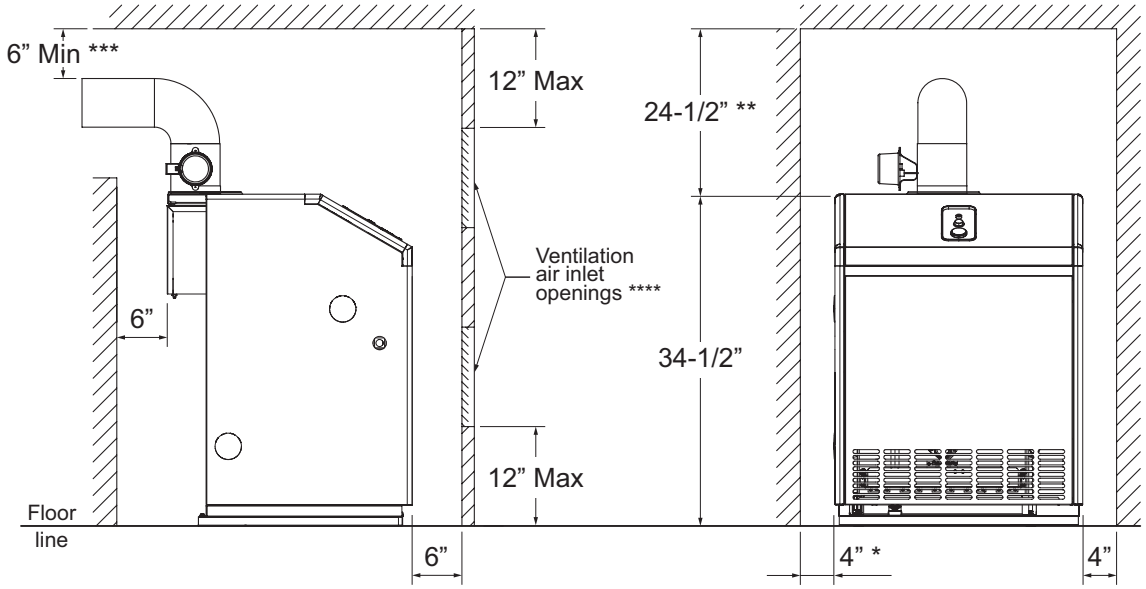


Figure 4.1 (Minimum clearance from boiler to all types of combustible construction and noncombustible ceilings, walls and doors (closet))

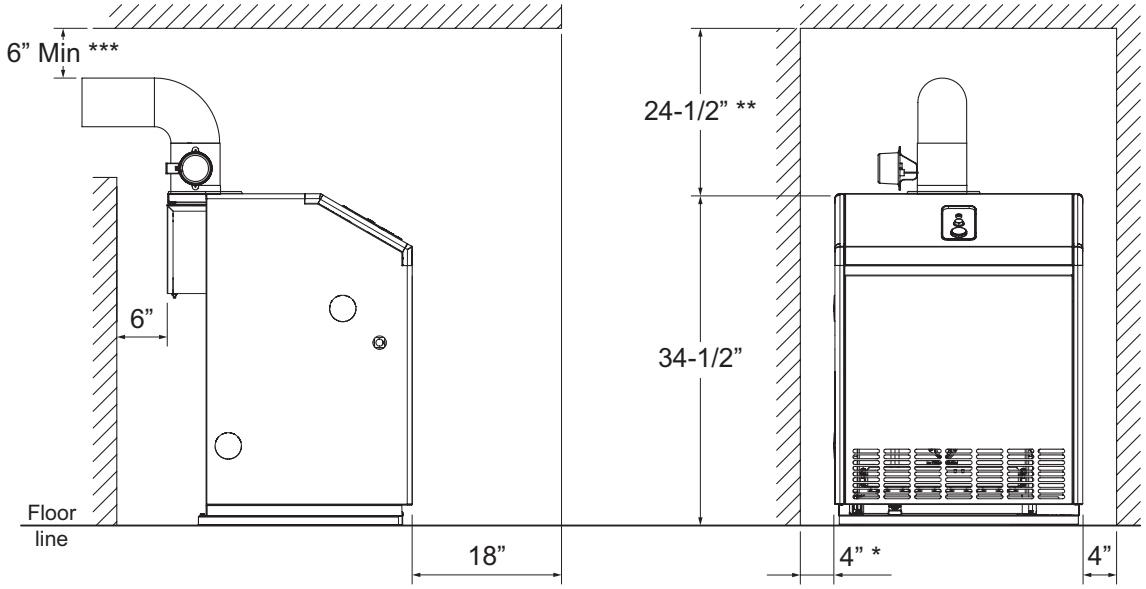


Figure 4.2 (Minimum clearance from boiler to all types of combustible construction and noncombustible ceilings and walls (alcove))

Notes:

* Left side clearance may be reduced to 1” if relief valve is relocate to supply piping next to right side of boiler.
** Additional height may be required to maintain required clearance from vent system.
*** Minimal radial distance from vent pipe to combustible construction.
**** Area of each opening to be 1 square inch for each 1000 BTUH input - with minimum of 100 square inch. Height of opening should be half the width.

4. Locating the Boiler (Cont.)

2) The boiler must be installed on a hard level surface. This surface may not be combustible.
3) Do not install this boiler in a location where gasoline or other flamable vapors or liquids will be stored or used.
4) Do not install this boiler in an area where large amounts of airborne dust will be present, such as a workshop.
5) The boiler should be located as close to the chimney as possible.
6) Do not install this boiler over carpeting. This may cause a fire.
7) Do not install this boiler directly on a surface that may get wet. Raise the boiler on a pad.
8) Protect ignition system components from sources of water that may spray, drip or rain on them during installation or service.
9) Level boiler using the boiler legs as necessary.

5. Air for Combustion and Ventilation

WARNING

INSUFFICIENT COMBUSTION AIR SUPPLY MAY RESULT IN THE PRODUCTION AND RELEASE OF DEADLY CARBON MONOXIDE (CO) INTO THE HOME WHICH CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

THIS BOILER IS NOT DESIGNED FOR USE IN A SPACE THAT IS DEPRESSURIZED RELATIVE TO THE OUTDOORS. OPERATING THIS BOILER IN A DEPRESSURIZED SPACE MAY CAUSE SEVERE PERSONAL INJURY OR DEATH.

Sufficient fresh air must be supplied for combustion, ventilation, and flue gas dilution. Provisions for an adequate fresh air supply must be made in accordance with local codes, or in the absence of such codes, the *National Fuel Gas Code* (NFPA 54/ ANSI Z223.1). In Canada, refer to the *Natural Gas and Propane Installation Code* (CAN/CSA 149.1).

The *National Fuel Gas Code* describes three basic ways to supply this boiler with adequate fresh air:

Indoor Combustion Air – Combustion air is drawn into the boiler room from other parts of the building and from the outdoors through natural infiltration (cracks under doors, etc). **This method can not be used in all cases – see discussion below.**

Outdoor Combustion Air – Combustion air is brought directly into the boiler room from outdoors through ducts or grills sized and installed specifically for this purpose.

Mechanical Combustion Air Supply – Combustion air is brought into the room from outdoors using a blower system that is engineered specifically for this purpose.

Each of the above methods is described in more detail in the following sections. The *National Fuel Gas Code* also describes some acceptable variations on these techniques that do not appear here.

Using the Indoor Combustion Air Method

1) Total the input of all appliances in the boiler room in thousands of BTU/hr.
2) Find the volume of the boiler room in cubic feet:

Volume (ft^3) = Length (ft) x Width (ft) x Height (ft)

If the boiler room adjoins another room and there is no door present between these two rooms, add the volumes of the rooms together. Repeat for any other connected rooms which do not have doors. **Do not add the volume of two rooms separated by a door even if that door is "always left open".**

3) Divide the volume obtained in Step 2 by the input calculated in Step 1.

4) If the result is at least 50 ft^3 per 1000 BTU/hr, and neither of the conditions described in (6) below are met, normal infiltration should provide adequate fresh air into the boiler room.

5) If the result is less than 50 ft^3 per 1000 BTU/hr, provide two openings into the boiler room, one near the floor and one near the ceiling. The top edge of the upper opening must be within 12” of the ceiling and the bottom edge of the lower opening must be within 12” of the floor (Figure 5.1):

   - Each opening must have a free area of 1 square inch per 1000 BTU/hr input of all gas burning appliances in the boiler room. The minimum opening dimension is 3 inches. Minimum opening free area is 100 square inches per opening.
   - If the total volume of both the boiler room and the room to which the openings connect is less than 50 cubic feet per 1000 BTU/hr of total appliance input, install a pair of identical openings into a third room. Connect additional rooms with openings until the total volume of all rooms is at least 50 cubic feet per 1000 BTU/hr of input.
   - The “free area” of an opening takes into account the blocking effect of mesh, grills, and louvers. Where screens are used, they must be no finer than ¼” (4 x 4) mesh.
   - If providing openings into adjacent rooms is undesirable, use the Outdoor Combustion Air Method.

6) Do not use the Indoor Combustion Air Method described above if either of the following are true:

   a. The indoor space is so tightly constructed that the number of air changes per hour is known to be 0.4 or less.
   b. The boiler room is depressurized relative to the outdoors. This depressurization is possible if the structure is tightly constructed and/or is equipped with exhaust fans.

Example:
An KAPPA 27R and a water heater are to be installed in a room measuring 6 ft - 3 in x 7 ft with an 8 ft ceiling. The water heater has an input of 30000 BTU/hr:

Total input in thousands of BTU/hr = (101000 BTU/hr + 30000 BTU/hr) ÷ 1000 = 131
Volume of room = 6.25 ft x 7 ft x 8 ft = 350 ft^3

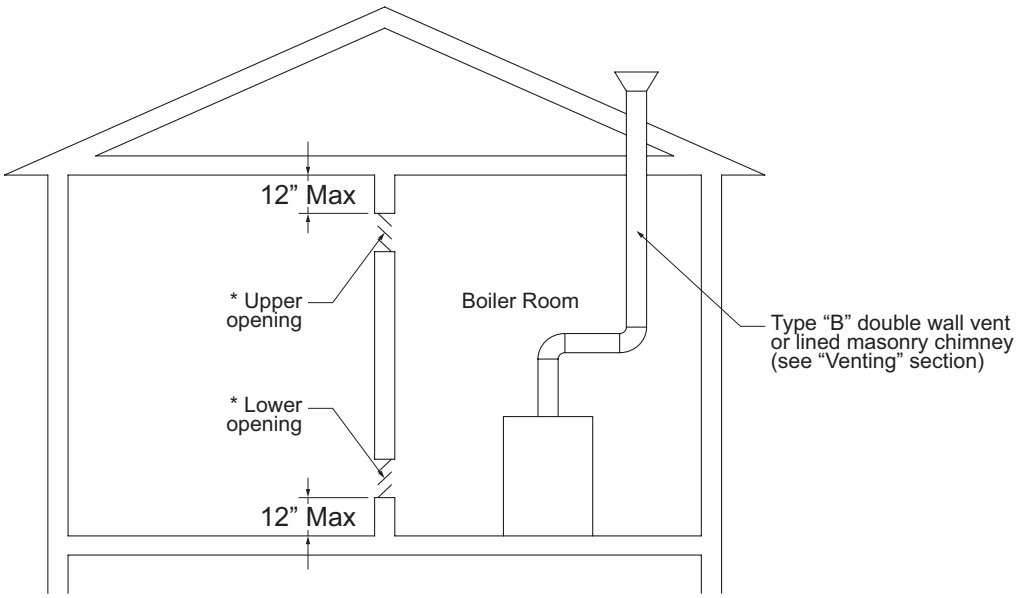


Figure 5.1 (Indoor combustion air method)

Note:

* See text for opening size.

350÷131 = 2.67. Since 2.67 is less than 50, there will be an inadequate fresh air supply in the boiler room unless openings are installed between the boiler room and at least one adjacent room. It turns out that the boiler room in this example is adjacent to a full basement which is 20 ft x 45 ft x 8 ft high. If two openings are installed into this basement that each have a free area of 135 in^2, the combined volume of the boiler room and basement will be:

350 ft^3 + 6400 ft^3 = 6750 ft^3 and:

6750÷131 = 52 ft^3 per 1000 BTU/hr.

In the absence of one of the conditions described in (6) above, this arrangement should provide an adequate fresh air supply to all the appliances in the boiler room.

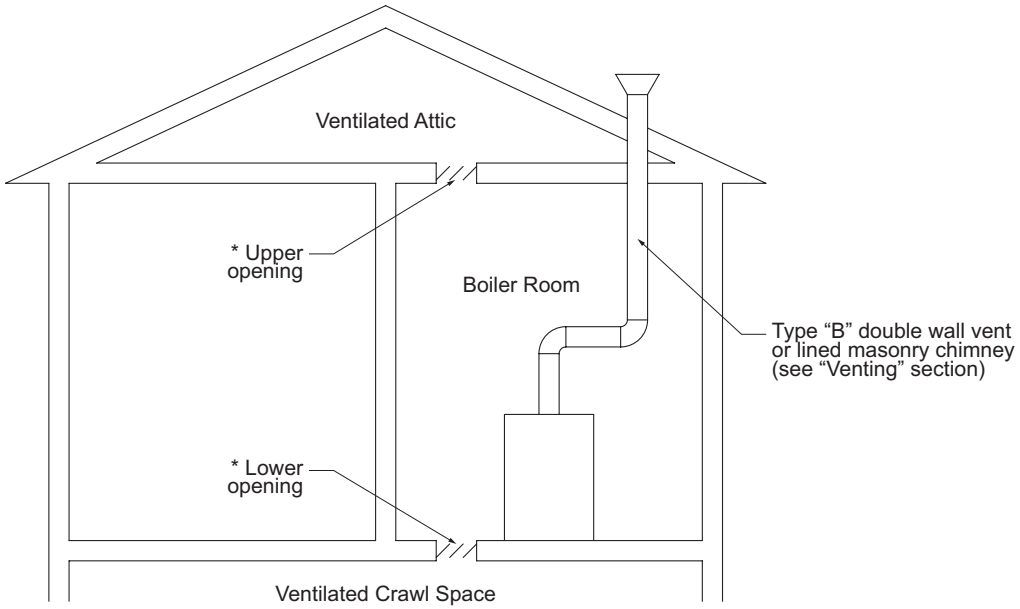


Figure 5.2 (All air from outdoors, ventilated crawl space and attic)

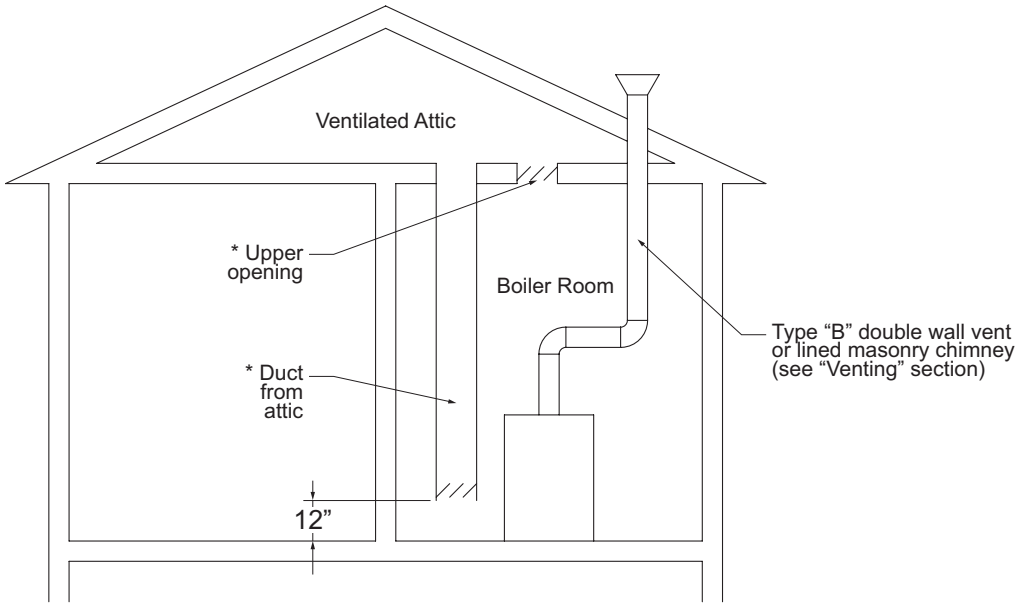


Figure 5.3 (All air from outdoors, via ventilated attic)

Note:

* See text for opening size.

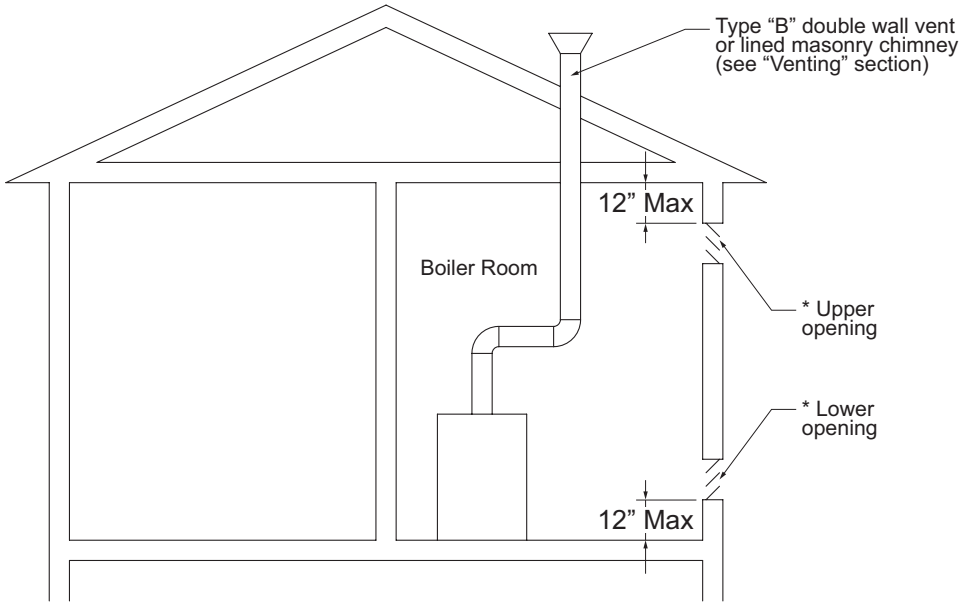


Figure 5.4 (Outdoor combustion air method: using openings into boiler room)

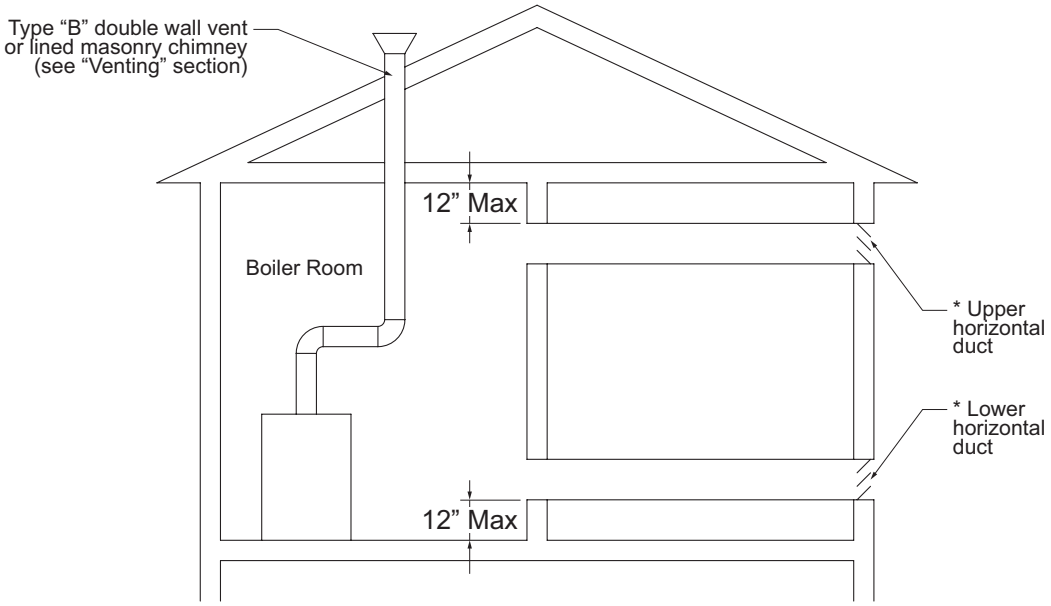


Figure 5.5 (Outdoor combustion air method: using horizontal ducts into boiler room)

Note:

* See text for opening size.

Using the Outdoor Combustion Air Method

1) Openings must be installed between the boiler room and the outdoors or a ventilated space, such as an attic or crawl space, which communicates directly with the outdoors.
2) Two openings are required. The top edge of the upper opening must be within 12 inches of the ceiling. The bottom edge of the lower opening must be within 12 inches of the floor.
3) Size openings and ducts as follows:

   - Vertical ducts or openings directly outdoors (Figure 5.2, Figure 5.3, and Figure 5.4) - Each opening must have a free cross sectional area of 1 square inch per 4000 BTU/hr of the total input of all gas-fired appliances in the boiler room. Minimum opening size is 3 inches.
   - Openings to outdoors via horizontal ducts (Figure 5.5) - Each opening must have a free cross sectional area of 1 square inch per 2000 BTU/hr of the total input of all gas fired appliances in the boiler room. Minimum opening size is 3 inches.

- The “free area” of an opening takes into account the blocking effect of mesh, grills, and louvers. Where screens are used, they must be no finer than ¼” (4 x 4) mesh.
- If motorized louvers are installed in the openings to the outdoors, they must be interlocked to prevent operation of the fuel burning appliances in the boiler room unless the louvers are open.

Mechanical Combustion Air Supply

A mechanical system may be used to bring all combustion air to the boiler which meets all of the following requirements:

1) The system must be manufactured specifically for this purpose.
2) Size the system to deliver combustion air at the rate prescribed by the system manufacturer’s instructions, but no less than 0.35 CFM for each 1000 BTU/hr of the combined input of all fuel burning appliances in the boiler room. If exhaust fans are present within the building, additional capacity may be required to prevent the boiler room from being depressurized.
3) The system must be interlocked to prevent operation of the fuel burning appliances in the boiler room if the system is not operating.

6. Venting

WARNING

IMPROPER VENTING MAY RESULT IN PROPERTY DAMAGE AND/OR THE RELEASE OF FLUE GASES, WHICH CONTAIN DEADLY CARBON MONOXIDE (CO), INTO THE HOME, WHICH CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

INSPECT EXISTING CHIMNEY BEFORE INSTALLING BOILER. FAILURE TO CLEAN OR REPLACE DAMAGED PIPE OR TILE LINING WILL CAUSE SEVERE INJURY OR DEATH.

The vent system installation must be in accordance with local codes, or in the absence of such codes, the *National Fuel Gas Code* (NFPA 54/ANSI Z223.1). In Canada, refer to the *Natural Gas and Propane Installation Code* (CAN/CSA 149.1).

A typical vent installation is illustrated by Figure 6.1. The components of vent installation are boiler draft diverter, vent damper, vent connector and chimney. The KAPPA R series boilers are equipped with a draft hood which is built into the boiler; do not attempt to install an external draft hood.

1) Acceptable Chimneys - The following chimneys may be used to vent KAPPA R series boilers:

   - Listed Type B or L gas vent - Install in accordance with the manufacturer’s instructions, the terms of its listing, and applicable codes.
   - Masonry Chimney - The masonry chimney must be constructed in accordance with local codes, or in the absence of any, the *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances* (NFPA 211). The chimney must be lined with listed lining system. Do not vent an KAPPA R series boiler into an unlined chimney.

2) Acceptable Vent Connectors - The following may be used for vent connectors:

   - Listed type B or L Gas Vent.
   - Single Wall Galvanized Pipe - Use 0.018” (26 gauge or heavier). The size and location of the chimney may not permit the use of a single wall connector in some cases. (see *the National Fuel Gas Code*). Do not use single wall pipe for vent connectors in attics.
   - Other Vent Connectors Permitted by the *National Fuel Gas Code*.

3) Chimney and Vent Connector Sizing - Size the chimney and vent connector in accordance with the *National Fuel Gas Code*.

4) Exterior Chimneys - An exterior chimney has one or more sides exposed to the outdoors below the roof line. The *National Fuel Gas Code* prescribes two conditions under which an exterior chimney may be used:

- In some very restrictive cases, the KAPPA R series boilers may be vented into an exterior ceramic lined masonry chimney. See the *National Fuel Gas Code* for information on when exterior chimneys may be used.
- An exterior masonry chimney may be used if it is lined with B vent or a listed chimney lining system.

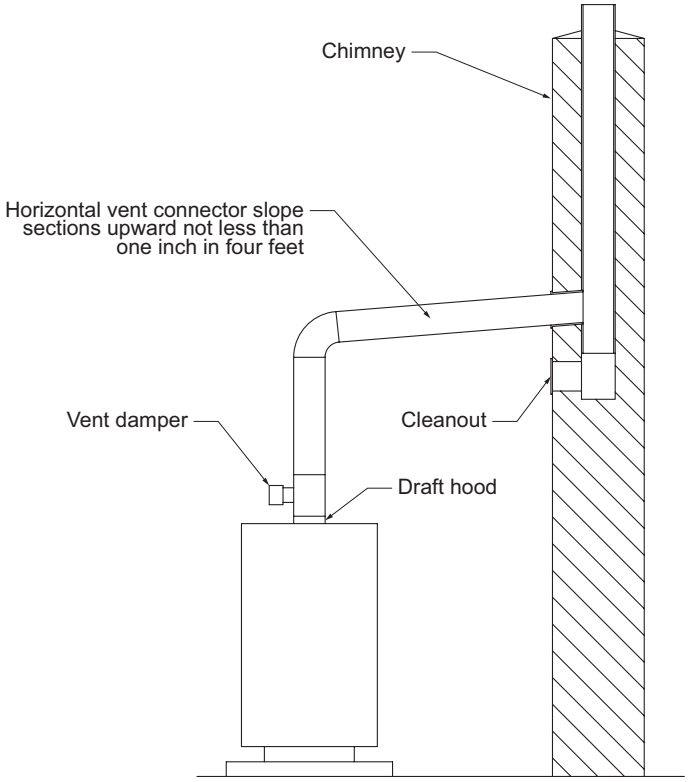


Figure 6.1 (Typical vent system installation and components)

5) This boiler may be vented using a listed power venter. The power venter must be in sized and installed in accordance with the power venter manufacturer's instructions, the terms of the power venter listing, and applicable codes. The boiler must be electrically interlocked with the power venter to prevent boiler operation if the power venter fails to operate. Before deciding to use a power venter, make certain that the flue gas exiting the power venter will not damage adjacent construction or other structures. Also make certain that the power venter terminal will not be subjected to winds which could affect power venter operation.

6) Do not connect the vent of this appliance into any portion of a mechanical vent system operating under positive pressure.

7) Do not connect the boiler into a chimney flue serving an open fireplace or other solid fuel appliance.

8) Prior to boiler installation, inspect chimney for obstructions or other defects and correct as required. Clean chimney as necessary.

9) Vent pipe should slope upward from draft diverter not less than one inch in four feet. No portion of vent pipe should run downward or have sags. Vent pipe must be securely supported.

10) The vertical section of vent pipe coming off the boiler should be as tall as possible, while still maintaining the proper clearance from the horizontal vent connector to combustibles and the proper pitch called for in (9) above.

11) Vent pipe should be installed above the bottom of the chimney to prevent blockage.

12) Vent pipe must be inserted flush with inside face of the chimney liner and the space between vent pipe and chimney sealed tight.

13) Do not install the vent damper in any portion of the vent system which is used by appliances other than the boiler being installed.

14) Vent damper installation is mandatory on all KAPPA R series boilers. Install vent damper (see Figure 6.2) as follows:
   a. Open vent damper carton and remove installation instructions. Read the instructions thoroughly before proceeding. Verify that vent damper is same size as draft diverter outlet (Figure 2.1). Unpack vent damper carefully. **Do not force closed damper blade.** Forcing vent damper closed may result in damaged gear train and void warranty.
   b. Vent damper is factory shipped having approximately ¾" diameter hole in the vent damper blade, which must be plugged on all KAPPA R boilers. Use the plug supplied with the damper.
   c. Mount the vent damper on the flue collar without modification to either and secure with sheet metal screws. Make sure screws do not interfere with damper blade operation. Vent damper blade position indicator must be visible to users.
   d. The damper wire harness is shipped pre-wired into the boiler. Plug the loose end of this harness into the damper and secure the flexible conduit to the damper using a connector nut provided. Provide the required 6" minimum clearance to combustible construction and servicing.
   e. Install vent connector pipe and vent fittings from vent damper outlet to chimney or gas vent. Secure with sheet metal screws and support as required.

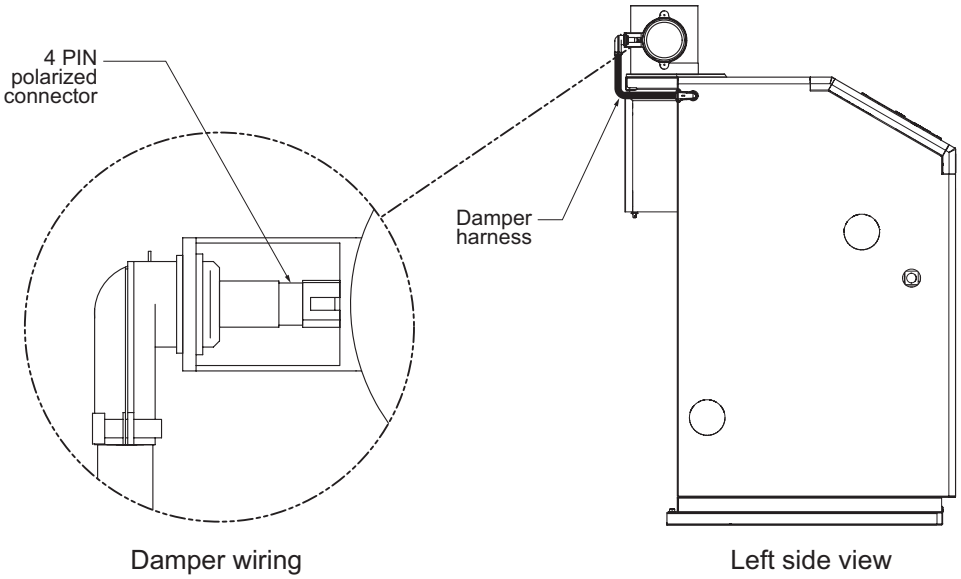


Figure 6.2 (Typical vent system installation and components)

Removing an Existing Boiler from a Common Chimney

In some cases, when an existing boiler is removed from a common chimney, the common venting system may be too large for the remaining appliances. At the time of removal of an existing boiler the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

   a. Seal any unused opening in the common venting system.
   b. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
   c. Insofar as practical, close all building doors and windows and all doors between the space in which all the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
   d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so the appliance will operate continuously.
   e. Test for spillage at the draft hood relief opening after five (5) minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
   f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliances to their previous condition of use.
   g. Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code*, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 10 of the *National Fuel Gas Code*, ANSI Z223.1.

7. Gas Piping

WARNING

SHUT OFF GAS SUPPLY BEFORE SERVICING THE BOILER.

ALL GAS PIPING MUST BE GAS TIGHT. USE GAS RATED THREAD COMPOUND ON ALL THREADED JOINTS TO AVOID LEAKS, WHICH MAY RESULT IN FIRE OR EXPLOSION.

SIZE GAS PIPING, REGULATORS, VALVES AND METERS SO AS TO PROVIDE AN ADEQUATE GAS FLOW AND PRESSURE TO THE BOILER DURING OPERATION. FAILURE TO DO SO MAY CAUSE POOR COMBUSTION, NOISE, INJURY OR DEATH.

Gas piping to the boiler must be sized to deliver adequate gas for the boiler to fire at the nameplate input at a line pressure between the minimum and maximum values shown on the rating plate. For more information on gas line sizing, consult the utility or the *National Fuel Gas Code*.

Figure 7.1 shows typical gas piping connection to the KAPPA R boiler. A sediment trap must be installed upstream of all gas controls. Install a manual shut-off valve outside the jacket and ground joint union as shown.

The boiler and its gas connection must be leak tested before placing the boiler in operation. When doing this, the boiler and its individual shut-off must be disconnected from the rest of the system during any pressure testing of that system at pressures in excess of 1/2 psi. When pressure testing the gas system at pressures of 1/2 psi or less, isolate the boiler from the gas supply system by closing its individual manual shut-off valve.

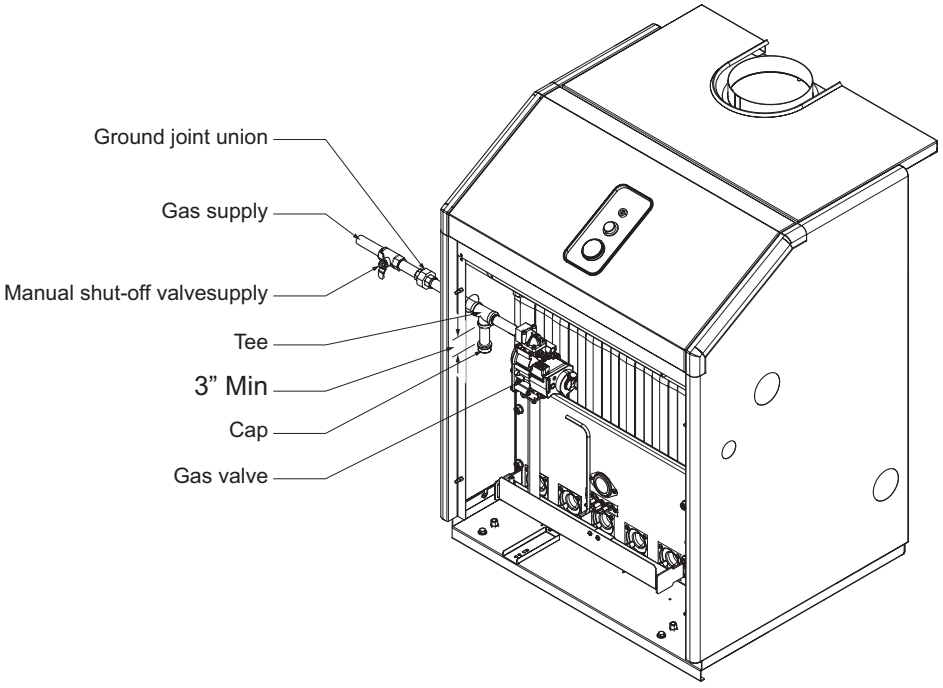


Figure 7.1 (Gas connection to boiler)

8. System Piping

WARNING

INSTALL BOILER SO THAT THE GAS IGNITION SYSTEM COMPONENTS ARE PROTECTED FROM WATER (DRIPPING, SPRAYING, RAIN, ETC.) DURING APPLIANCE OPERATION AND SERVICE (CIRCULATOR REPLACEMENT, ETC.).

OPERATION OF THIS BOILER WITH CONTINUOUS RETURN TEMPERATURES BELOW 120°F CAN CAUSE SEVERE HEAT EXCHANGER CORROSION DAMAGE.

OPERATION OF THIS BOILER IN A SYSTEM HAVING SIGNIFICANT AMOUNTS OF DISSOLVED OXYGEN CAN CAUSE SEVERE HEAT EXCHANGER CORROSION DAMAGE.

DO NOT USE TOXIC ADDITIVES, SUCH AS AUTOMOTIVE ANTIFREEZE, IN A HYDRONIC SYSTEM.

PIPE RELIEF VALVE DISCHARGE TO A SAFE LOCATION. THE RELIEF VALVE MAY DISCHARGE SCALDING HOT WATER.

DO NOT INSTALL A VALVE IN THE RELIEF VALVE DISCHARGE LINE.

DO NOT MOVE RELIEF VALVE FROM FACTORY LOCATION.

DO NOT PLUG RELIEF VALVE DISCHARGE. BLOCKING THE RELIEF VALVE MAY RESULT IN BOILER EXPLOSION.

Standard Piping

Figure 8.3 shows typical boiler system connections on a single zone system. Additional information on hydronic system design may be found in the *I=B=R* Guide RHH published by the Air-Conditioning, Heating and Refrigeration Institute (AHRI). The components in this system and their purposes are as follows:

1) Relief valve (Required) - Install the relief valve in the 1 1/4 x 1 1/4 x 3/4 inch tee provided on the supply piping immediately after leaving the boiler. No shutoffs may be installed between the relief valve and the boiler. The relief valve shipped with the boiler is set to open at 30 psi. This valve may be replaced with one having a pressure up to the “Maximum Allowable Working Pressure” shown on the rating plate. If the valve is replaced, the replacement must have a relief capacity in excess of the DOE heating capacity for the boiler.
   Pipe the discharge of the relief valve to a location where water or steam will not create a hazard or cause property damage if the valve opens. The end of the discharge pipe must terminate in an unthreaded pipe. If the relief valve discharge is not piped to a drain it must terminate at least 6 inches above the floor. Do not run relief valve discharge piping through an area that is prone to freezing. The termination of the relief valve discharge piping must be in an area where it is not likely to become plugged by debris.

2) Circulator (Required) - The circulator is shipped loose with the boiler. Fittings are provided to mount it on the boiler return as shown in Figure 8.3, however it can be installed on the boiler supply. If the circulator is moved to the supply it should be positioned just downstream of the expansion tank as shown in Figure 8.3.

3) Expansion Tank (Required) - If this boiler is replacing an existing boiler with no other changes in the system, the old expansion tank can generally be reused. If the expansion tank must be replaced, consult the expansion tank manufacturer’s literature for proper sizing.

4) Fill Valve (Required) - Either a manual or automatic fill valve may be used. The ideal location for the fill is at the expansion tank.

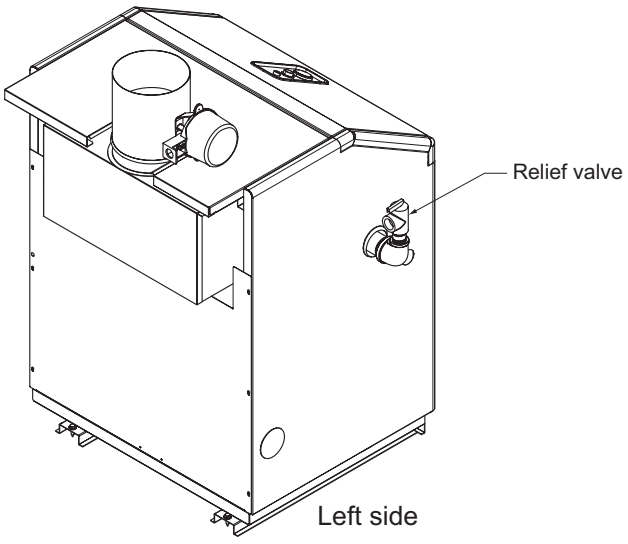


Figure 8.1 (Alternative relief valve position)

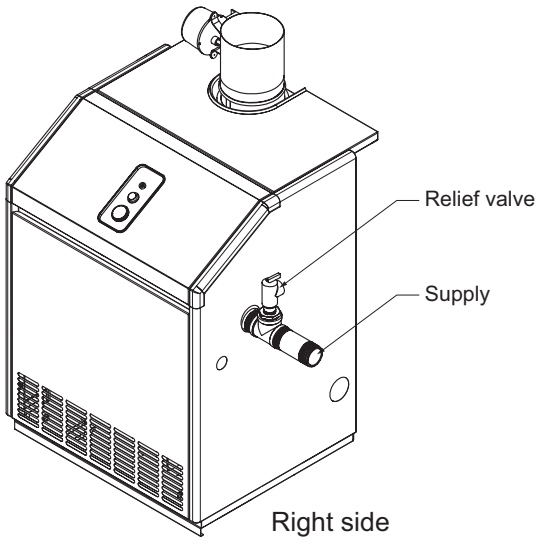


Figure 8.2 (Standard relief valve position)

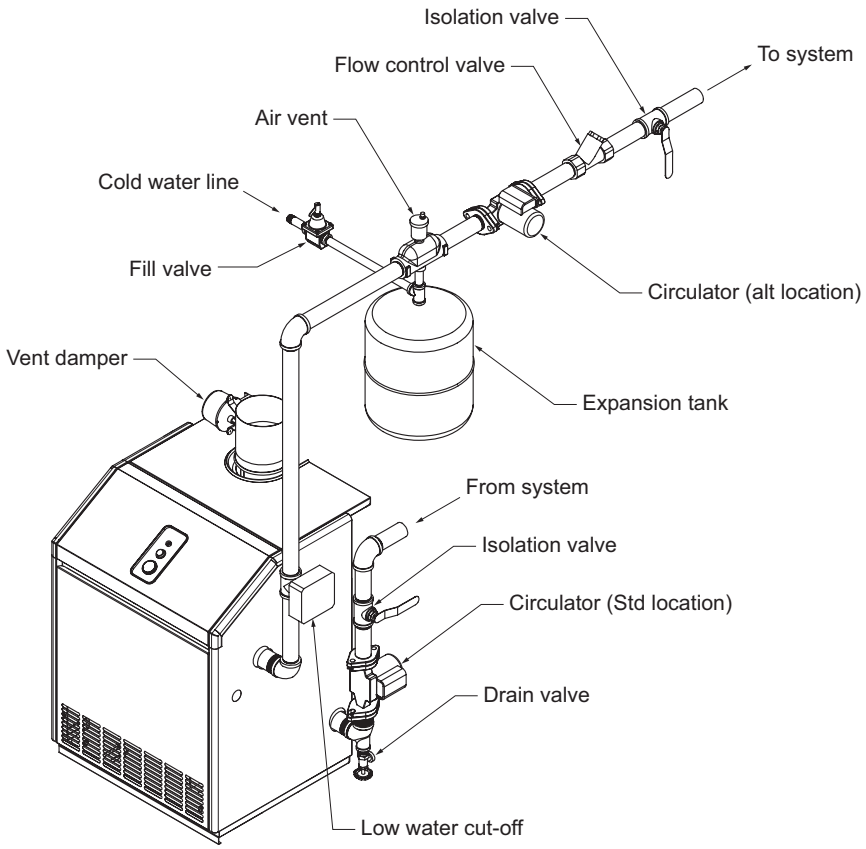


Figure 8.3 (Standard boiler piping)

5) Automatic Air Vent (Required) - At least one automatic air vent is required. Manual vents will usually be required in other parts of the system to remove air during initial fill.

6) Low Water Cut-Off (Required in some situations) - A low water cutoff (LWCO) is required when the boiler is installed above radiation. In addition, some codes such as ASME CSD-1 require low water cutoffs. Codes may also require that this low water cutoff have a manual reset function. The low water cutoff may be a float type or probe type, but must be designed for use in a hot-water system. The low water cutoff should be piped into the boiler supply just above the boiler with no intervening valves between it and the boiler.

7) Flow Control Valve (Required under some conditions) - The flow control valve prevents flow through the system unless the circulator is operating. A flow control valve may be necessary on converted gravity systems to prevent gravity circulation. Flow control valves are also used to prevent flow in circulator zone systems through zones that are not calling for heat.

8) Isolation Valves - Isolation valves are useful if the boiler must be drained, as they will eliminate having to drain and refill the entire system.

9) Drain Valve - The drain valve is shipped in the boiler parts bag. Install it in the tee under the circulator as shown in Figure 8.5.

Piping for Special Situations

Certain types of heating systems have additional requirements. Some of the more common variations follow:

1) "Left Piped" Boilers – If necessary, the supply and return may be connected to the left side of the boiler by moving the 1-1/4" plug and the relief valve fittings from the tappings in the left side of the boiler to the corresponding tappings on the right. Both the supply and return connections must be made on the same side of the boiler.

2) Indirect Water Heaters - Figure 8.4 shows typical indirect water heater piping. Boiler piping is the same as for any two zone system. Figure 8.4 shows circulator zoning, which is usually preferred for indirect water heaters. Size the circulator and indirect water heater piping to obtain the boiler water flow through the indirect water heater called for by the indirect water heater manufacturer.

3) Large Water Volume Systems - The piping shown in Figure 8.5 will minimize the amount of time that the boiler operates with return temperatures below 120°F on these systems. A bypass is installed as shown to divert some supply water directly into the return water. The bypass pipe should be the same size as the supply. The two throttling valves shown are adjusted so that the return temperature rises above 120°F during the first few minutes of operation. A three-way valve can be substituted for the two throttling valves shown. If the circulator is mounted on the supply, the bypass must be on the discharge side of the circulator.

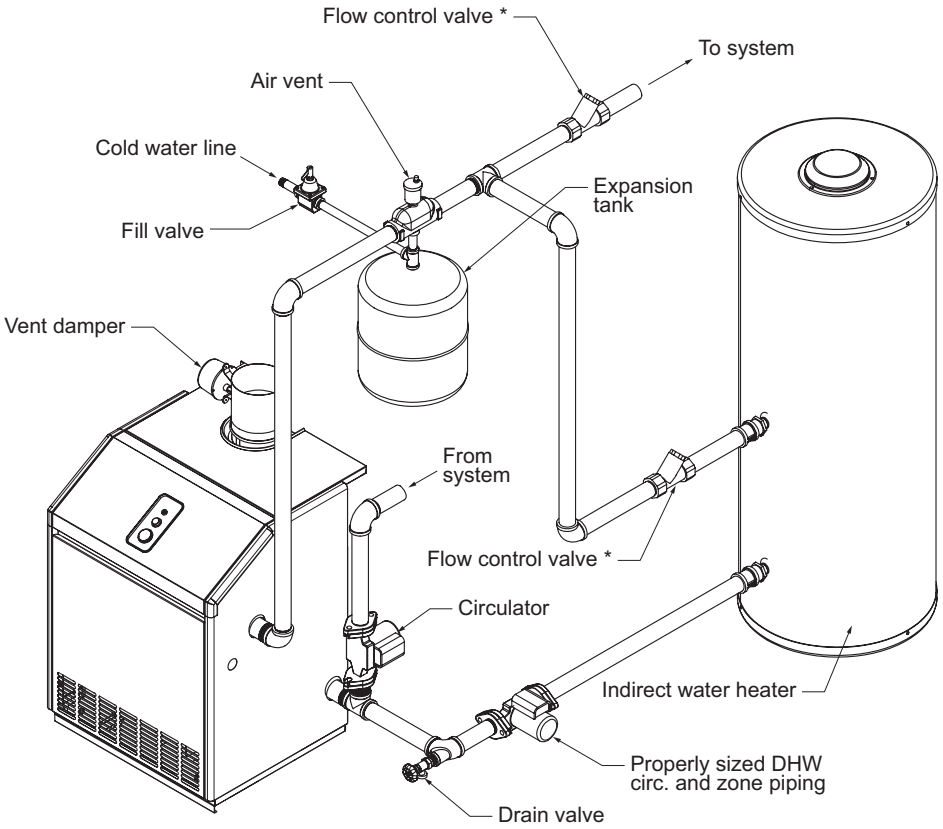


Figure 8.4 (Indirect water heater boiler side piping)

Note: * Flow control valves required in circ. zone system.

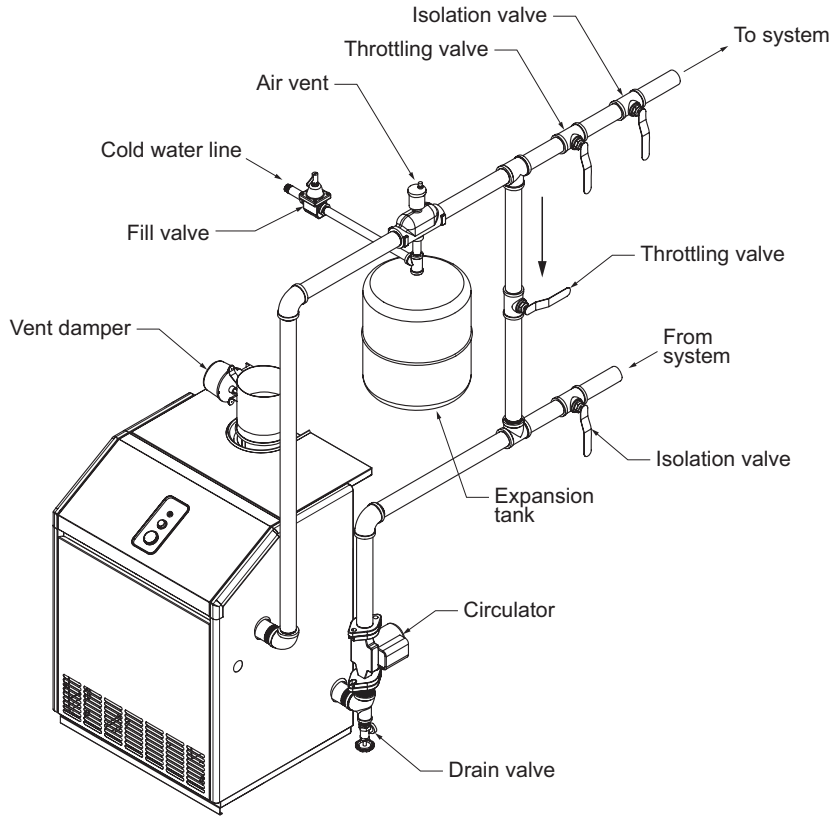


Figure 8.5 (Boiler bypass piping)

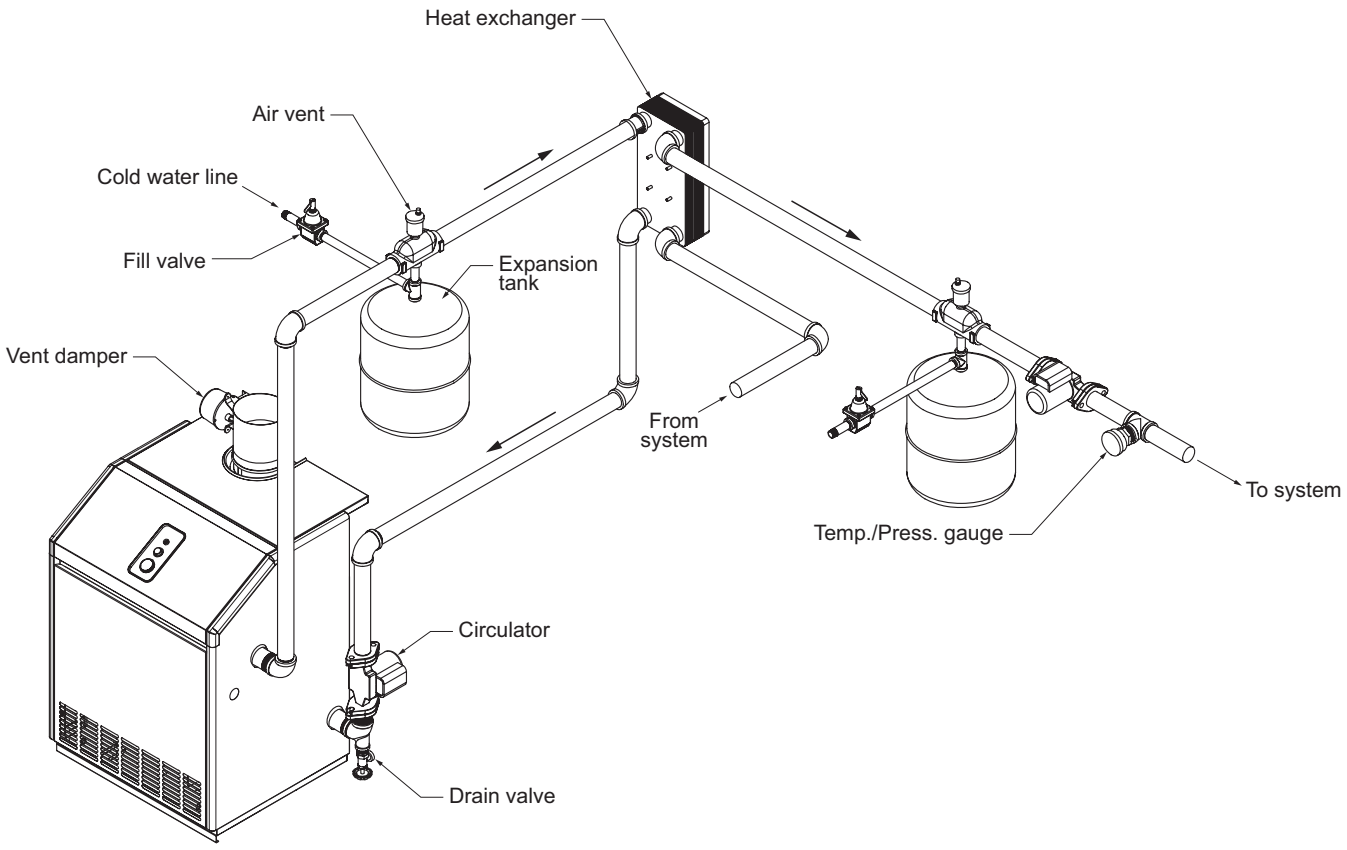


Figure 8.6 (Isolation of boiler from system with a heat exchanger)

4) Low Temperature Systems - Some systems, such as radiant tubing systems, require the system water temperature to be limited to a value below the temperature of the water leaving the KAPPA R. These systems also typically have return temperatures well below the 120°F minimum.
Figure 8.6 illustrates the use of a heat exchanger to connect the KAPPA R boiler to this type of system. The heat exchanger will permit the transfer of heat from the boiler water to the low temperature system while holding

the system supply and boiler return temperatures within their limits. For this system to work properly the heat exchanger must be properly sized and the correct flow rates are required on either side of the heat exchanger. Consult the heat exchanger manufacturer for sizing information. The water in the boiler is completely isolated from the water in the system. This means that separate fill and expansion tanks are required for the heating system loop.
There are several other ways to connect low temperature systems to the non-condensing boilers like the KAPPA R such as four way mixing valve and variable speed injection Circulatoring systems.

5) Systems containing oxygen - Many hydronic systems contain enough dissolved oxygen to cause severe corrosion damage to a cast iron boiler such as the KAPPA R. Some examples include:
   - Radiant systems that employ tubing without an oxygen barrier.
   - Systems with routine additions of fresh water.
   - Systems which are open to the atmosphere.

   If the boiler is to be used in such a system, it must be separated from the oxygenated water being heated with a heat exchanger as shown in Figure 8.6.
   Consult the heat exchanger manufacturer for proper heat exchanger sizing as well as flow and temperature requirements.
   All components on the oxygenated side of the heat exchanger, such as the Circulator and expansion tank, must be designed for use in oxygenated water.

6) Piping with a Chiller - If the boiler is used in conjunction with a chiller, pipe the boiler and chiller in parallel as shown in Figure 8.7. Use isolation valves to prevent chilled water from entering the boiler.

7) Air Handlers - Where the boiler is connected to air handlers through which refrigerated air passes, use flow control valves in the boiler piping or other automatic means to prevent gravity circulation during the cooling cycle.

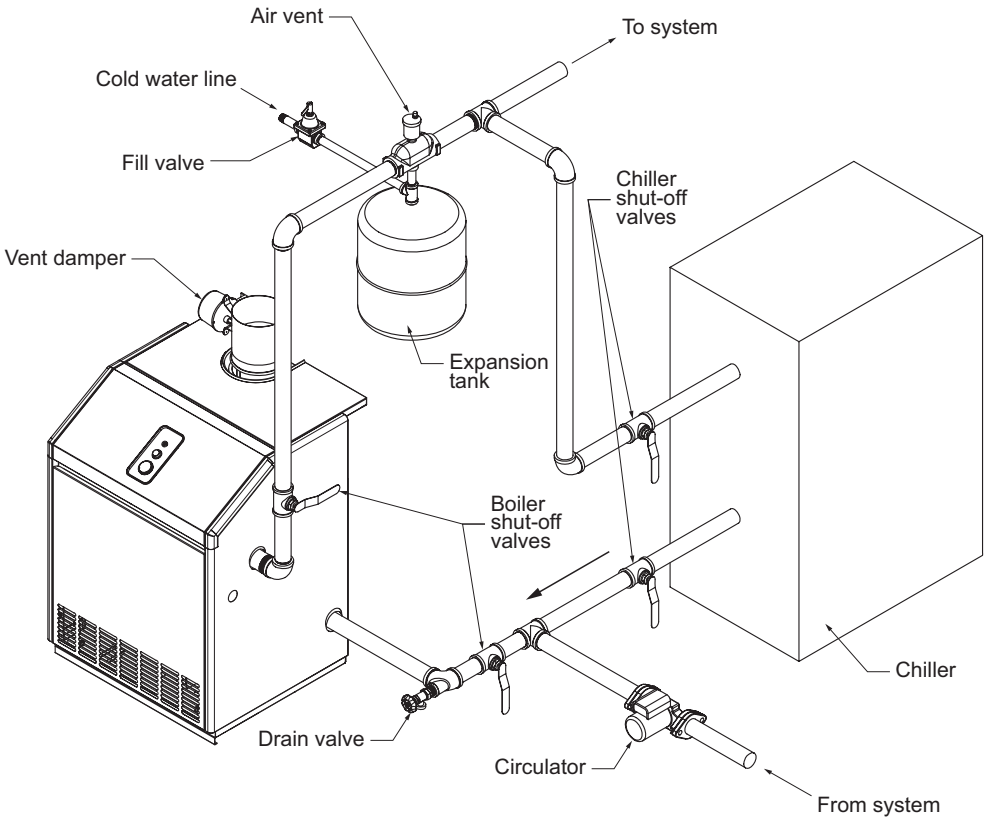


Figure 8.7 (Boiler piping with chiller)

9. Wiring

WARNING

IF AN EXTERNAL ELECTRICAL SOURCE IS UTILIZED, THE BOILER, WHEN INSTALLED, MUST BE ELECTRICALLY BONDED TO GROUND IN ACCOURDANCE WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION OR, IN THE ABSENCE OF SUCH REQUIREMENTS, WITH THE NATIONAL ELECTRICAL CODE, ANSI/NFPA70 AND/OR THE CANADIAN ELECTRICAL CODE PART I, CSA C22.1, ELECTRICAL CODE.

DISCONNECT ELECTRICAL POWER TO THE BOILER AND HEATING SYSTEM BEFORE SERVICING. POSITIVELY ASSURE THAT NO VOLTAGE IS PRESENT. LOCK ELECTRICAL BOXES TO PREVENT SOMEONE FROM INADVERTENTLY RESTORING POWER BEFORE THE HEATING SYSTEM IS SAFE TO OPERATE.

NEVER DEFEAT OR JUMP OUT SAFETY DEVICES.

PROTECT EACH BOILER CIRCUIT WITH A PROPERLY SIZED OVER-CURRENT PROTECTION DEVICE.

MAKE ELECTRICAL CONNECTIONS CAREFULLY ACCORDING TO THE BOILER'S WIRING DIAGRAM AND INSTRUCTIONS.

WIRE ADDITIONAL FIELD SUPPLIED SAFETY LIMITS, SUCH AS LOW WATER CUTOFFS AND TEMPERATURE LIMIT DEVICES, IN SERIES WITH THE 120V CIRCUIT USED TO POWER THE BOILER. DO NOT ALTER THE BOILER'S FACTORY WIRING WHEN ADDING AN ADDITIONAL LIMIT DEVICE.

1) Line Voltage (120 VAC) Field Connections – See Figure 10.1 for line voltage connections. Provide a dedicated circuit for the boiler of 15A or greater. A service switch is recommended and is required by many local codes. Locate this switch in accordance with local codes or, in the absence of any, in a location where it can be safely accessed in an emergency involving the boiler. All 120VAC connections to the boiler itself are made inside the junction box on the right side of the boiler (accessible through the cover plate on the right side jacket panel). 120VAC connections are:

   - Ground
   - 120VAC Hot (Black)
   - 120VAC Neutral (White)
   - Heating Circulator Hot (Red)
   - Heating Circulator Neutral (White)

The use of the Circulator outputs are as follows (also refer to the Piping Section)

   a. Heating Circulator - Pumps water upon a call for heat (CH) from the thermostat terminals T-T shown in Figure 10.1 or from an EnviraCom (ECOM) thermostat. This output is factory wired to the "circulator whip" mounted on the boiler.

Maximum circulator current draw is 5.0 FLA.

2) Low Voltage Connections – Low voltage field connections are located as shown in Figure 10.1 and are as follows:

   a. Heating Thermostat - Connect to a 24 volt thermostat or other "dry contacts" (such as a zone panel end switch) that close upon a call for heat. Follow thermostat manufacturer's instructions. To insure proper thermostat operation, avoid installation in areas of poor air circulation, hot spots (near any heat source or in direct sunlight), cold spots (outside walls, walls adjacent to unheated areas, locations subject to drafts). Provide Class II circuit between thermostat (or zone controls) and boiler.

CAUTION

When making low voltage connections, make sure that no external power source is present in the thermostat circuits. If such a power source is present, it could destroy the boiler's control. One example of an external power source that could be inadvertently connected to the low voltage connections is a transformer in old thermostat wiring.

Do not use the transformer provided on the boiler to power external devices such as zone valves. Doing so may cause damage to the transformer.

10. Electric Diagrams

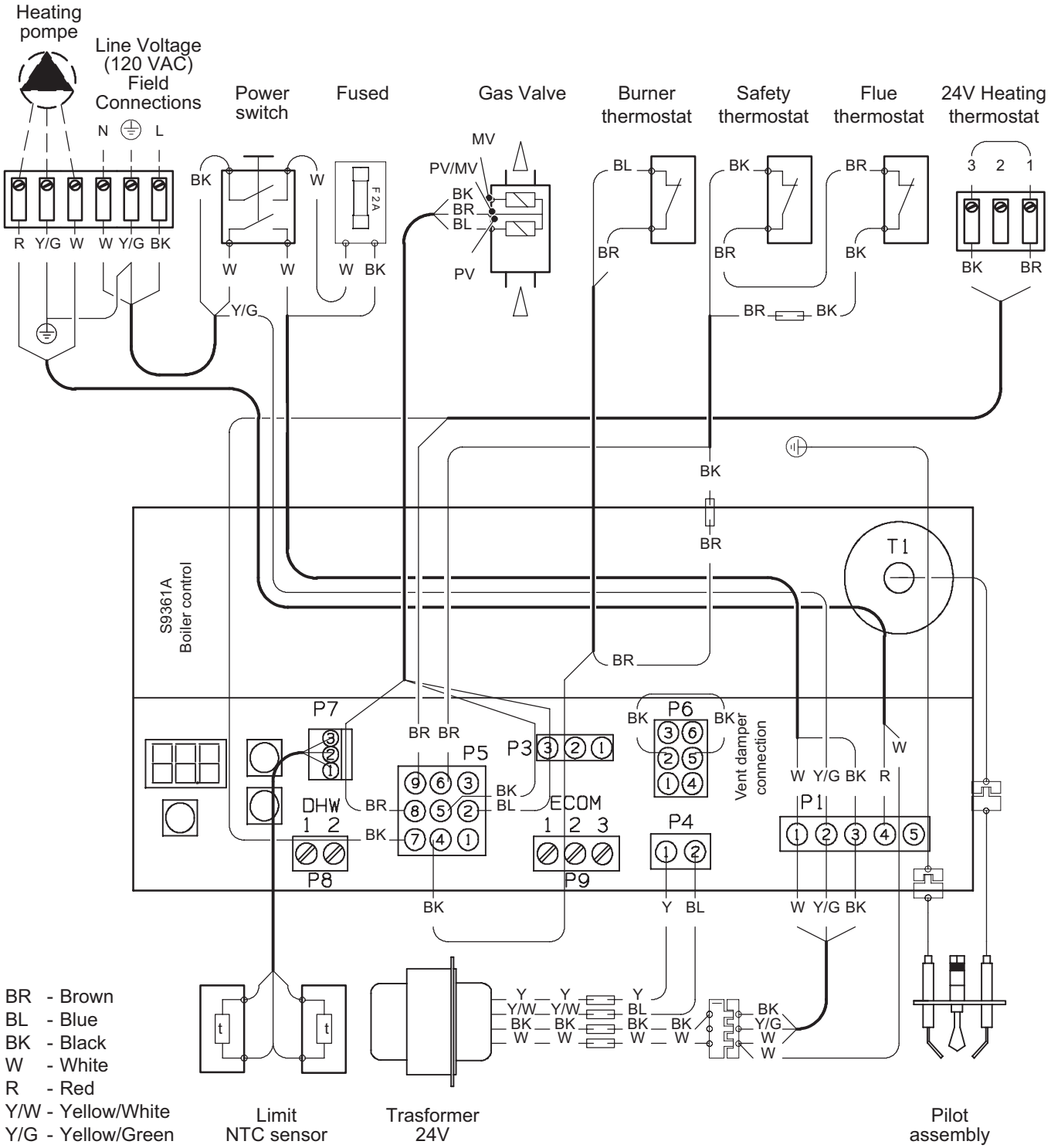


Figure 10.1 (Field connections)

11. Start-up and Checkout

WARNING

DO NOT LEAVE THE BOILER IN SERVICE IF IT FAILS ANY OF THE FOLLOWING START-UP CHECKS. DOING SO MAY RESULT IN FIRE, EXPLOSION, OR CARBON MONOXOIDE (CO) POISONING.

GAS LEAKS MAY RESULT IN FIRE OR EXPLOSION.

NEVER USE A FLAME TO CHECK FOR GAS LEAKS.

MAKE SURE THAT THE AREA AROUND THE BOILER IS CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

WATER LEAKS MAY CAUSE EXTENSIVE PROPERTY DAMAGE.

Note:

Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler when the boiler underwent the tests specified in Z21.13.

Use the following procedure for initial start-up of the boiler:

1) Make sure that the boiler and system are filled with water.

2) Check all gas piping for leaks and purge piping sections that are filled with air. See of the *National Fuel Gas Code* for additional information on testing and purging gas lines.

3) Verify that vent system is complete and free of obstructions before attempting to fire boiler.

4) Inspect all wiring for loose or uninsulated connections.

5) Make sure the main burners are seated properly in the rear of burner tray and on orifices.

6) Adjust thermostat to the highest setting.

7) Start the boiler using the operating instructions on page 32. The red LED display on boiler control should illuminate as soon as power is applied to the boiler, but it will take approximately 1 minute from the time power is applied to the boiler, and the thermostat is closed, until the first trial for ignition. For additional information on boiler operation, see Section 12.

8) Upon initial start-up, the gas train will be filled with air. Even if the gas line has been completely purged of air, it may take several tries for ignition before a flame is established. Once a flame has been established for the first time, subsequent calls for burner operation should result in a flame on the first try.

9) Inspect the pilot burner flame. The pilot burner produces three flames. The center one should be a steady medium blue flame covering around 3/8” to 1/2” of spark electrode/flame rod. (Figure 11.1)

10) Make sure vent damper is in open position when main burners are firing.

11) Inspect the main burner flames visible through the observation port in burner access panel. The flame should be stable and mostly blue (see Figure 11.2). No yellow tipping should be present; however, intermittent flecks of yellow and orange in the flame are normal.

12) Check entire gas train for leaks using soap and water or other approved leak detection method while boiler is firing. Fix any leaks found immediately.

FOR YOUR SAFETY READ BEFORE LIGHTING

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

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do NOT try to light the pilot by hand.

B. BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

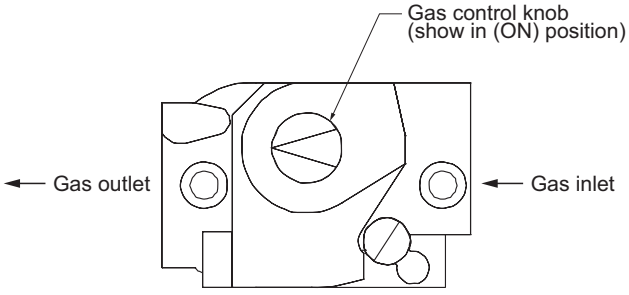
- **Do not try to light any appliance.**
- **Do not touch any electric switch; do not use any phone in your building.**
- **Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

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

OPERATING INSTRUCTIONS

1. **STOP! Read the safety information above on this label.**
2. **Set the thermostat to lowest setting.**
3. **Turn off all electric power to the appliance.**
4. **This appliance is equipped with an ignition device which automatically lights the pilot. Do NOT try to light the pilot by hand.**
5. **Remove front access panel.**
6. **Rotate the gas control knob clockwise ↷ to OFF.**
7. **Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas go to the next step.**
8. **Rotate the gas control knob counter clockwise ↶ to "ON".**
9. **Replace front access panel.**
10. **Turn on all electric power to the appliance.**
11. **Set thermostat to desired setting.**
12. **If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.**



GAS VALVE - TOP VIEW

TO TURN OFF GAS TO APPLIANCE

1. **Set the thermostat to lowest setting.**
2. **Turn off all electric power to the appliance if service is to be performed.**
3. **Push in gas control knob slightly and turn clockwise ↷ to "OFF". Do not Force.**

13) Run gas valve safety shutdown test. With main burners firing, disconnect ignition cable from ignition module. Both pilot burner and main burners should stop firing.

14) Check the manifold pressure and adjust if necessary. To do this, use the following procedure:
    a. Connect a manometer to the inlet pressure tap on the gas valve (see Figure 11.3).
    b. Check the line pressure with all gas appliances on and off. The line pressure at the boiler must be within the following limits regardless of what combination of appliances is firing:

Line Press (inches w.c.)	Natural Gas	LP Gas
Min.	6.0	11.0
Max.	14.0	13.0

    If the line pressure falls outside of these limits, find and correct the cause of the problem before proceeding further.
    c. Connect a manometer to the manifold (outlet) pressure tap on the gas valve (see Figure 11.3).
    d. Read the manifold pressure. It should be set at 5 in w.c. for natural gas and 10.0 in w.c. for LP.
    e. If a manifold pressure adjustment is needed, make the adjustment by turning the regulator (see Figure 11.3) screw clockwise to raise the pressure and counter clockwise to reduce the pressure. If a manifold pressure adjustment is made, recheck the line pressure to be certain that it is still within acceptable limits. Replace the cover screw on the regulator.

15) Test thermostat operation while the boiler is running. Turn the thermostat to the lowest setting. Circulator should stop running and both pilot burner and main burners should stop firing. Raise the thermostat back to the highest setting. Circulator should restart. The pilot burner and main burners should relight.

16) Verify high limit operation. Allow the boiler water temperature to increase to high limit setting (factory set to 180F). Circulator should continue running. Both pilot burner and main burners should stop firing when the gauge reading is within 15F of the high limit setting.

17) Allow the boiler water temperature to drop below high limit setting. The pilot burner and main burners should relight.

18) After the boiler has operated for approximately 30 minutes, check the boiler and heating system piping for leaks. Repair any leaks found at once.

19) Inspect the vent system for flue gas leaks and for proper operation. To do this:
    a. Insofar as practical, close all building doors and windows and all doors between the space in which all the boiler is located and other spaces of the building. Turn on clothes dryers and any other appliance not connected to the same vent system as the boiler. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Close fireplace dampers.
    b. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so the appliance will operate continuously.
    c. Test for spillage at the draft hood relief opening after five (5) minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, pipe, etc.
    d. Repeat (c) for any other appliances connected to the same vent system as the boiler. No spillage should be present with any combination of appliances in operation.
    e. After it has been determined that the vent system operates properly when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliances to their previous condition of use.
    f. Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code*, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in *Part 10 of the National Fuel Gas Code*, ANSI Z223.1.

20) Use a combustion analyzer to confirm normal combustion performance. To do this, insert the probe of the combustion analyzer through the draft hood opening and into the area above the block. Slowly wave the probe around in this area to obtain an average sample of the flue products upstream of the draft diverter. Readings obtained should have a CO of less than 400 ppm air free.

21) Verify proper operation of any field installed safety devices, such as low water cut-offs.

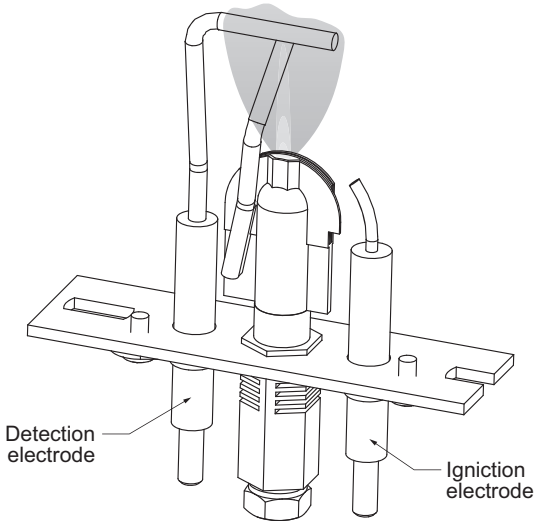


Figure 11.1 (Pilot burner flame)

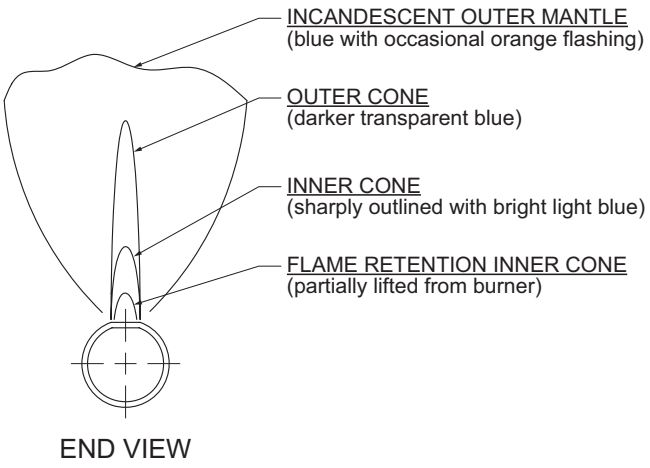


Figure 11.2 (Main burner flame)

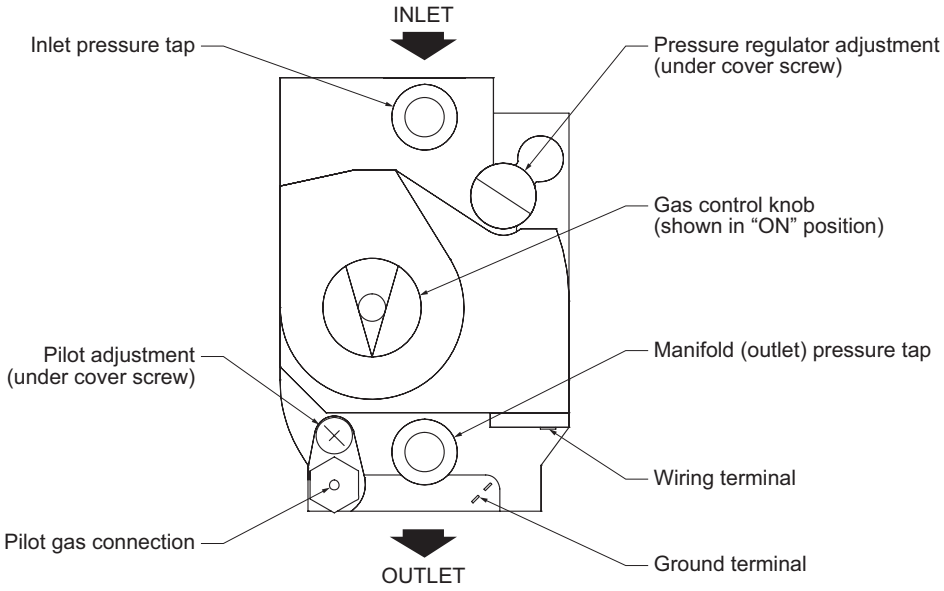


Figure 11.3 (Gas valve detail)

12. Operation

A. General Information

This boiler uses a proprietary version of the Honeywell S9361A “integrated boiler control” to manage all boiler functions including flame supervision, temperature control, and Circulator operation. This control can operate one or two circulator zones without the use of additional relays.

In accordance with the 2007 Energy and Independence Security Act, this control first attempts to use residual heat in the boiler to satisfy a space heating demand before firing the burner. In this manual, this function is referred to as a “thermal purge”. For additional information see Part C of this section.

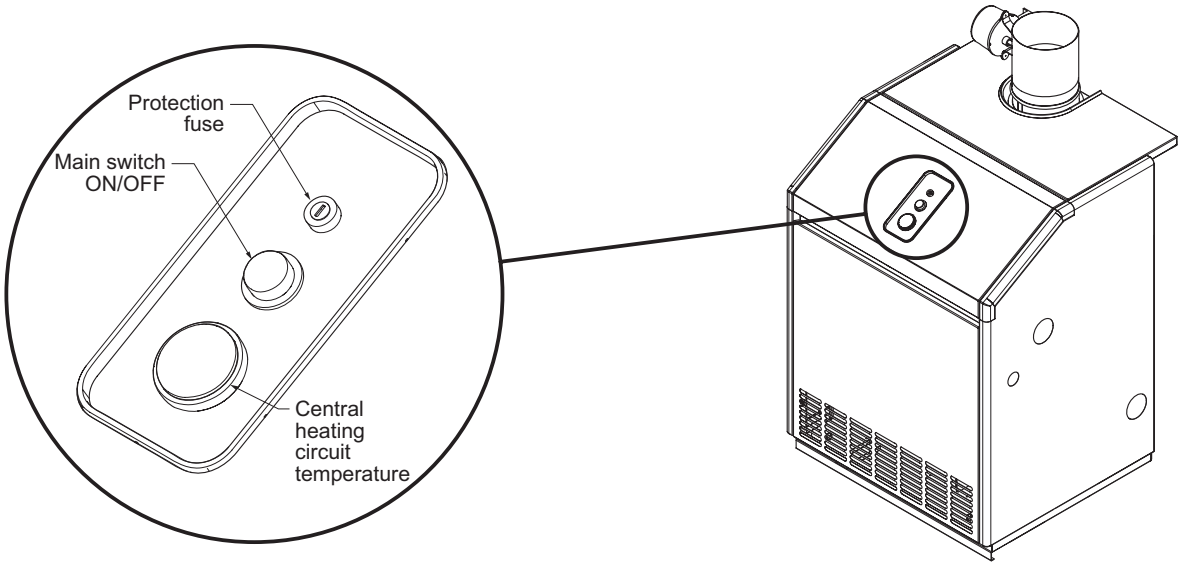


Figure 12.1

B. Reading Status and Using Menu

The boiler’s status, as well as all parameters, are viewed and adjusted using the 3 digit LED and three buttons shown in Figure 12.2. The S9361A has four basic modes of operation (also see Figure 12.1):

1) Status Mode - This is the default mode of operation for the control. In it, the display alternates between `5tA` and a number indicating the current status of the boiler. A list and description of these status numbers is shown in Table 12.1 and is also shown on the face of the control itself.

2) Operating Mode - Provides additional information about the current status of the boiler. Operating mode is entered by pressing the **I** button shown in Figure 12.2. When this button is first pressed in Status mode, the display will alternately display `bt` and the current boiler water temperature as shown in Figure 12.2. Pressing the **I** button again will display the next line item shown in Table 12.2. In the same manner it is possible to advance through all of the “parameters” shown in Table 12.2. To return to Status mode, press **I** repeatedly until `5tA` once again appears on the display. Alternatively, the control will return to Status mode if no key is touched for 30 minutes.

3) Error Mode - In Error mode, the control alternately displays `Err` and an error code. A list of these error codes is found on the front of the control, as well as in Section 14 of this manual (along with suggested corrective actions).

4) Adjustment Mode - Used to change parameters, such as high limit setting. See Part C for using Adjustment Mode.

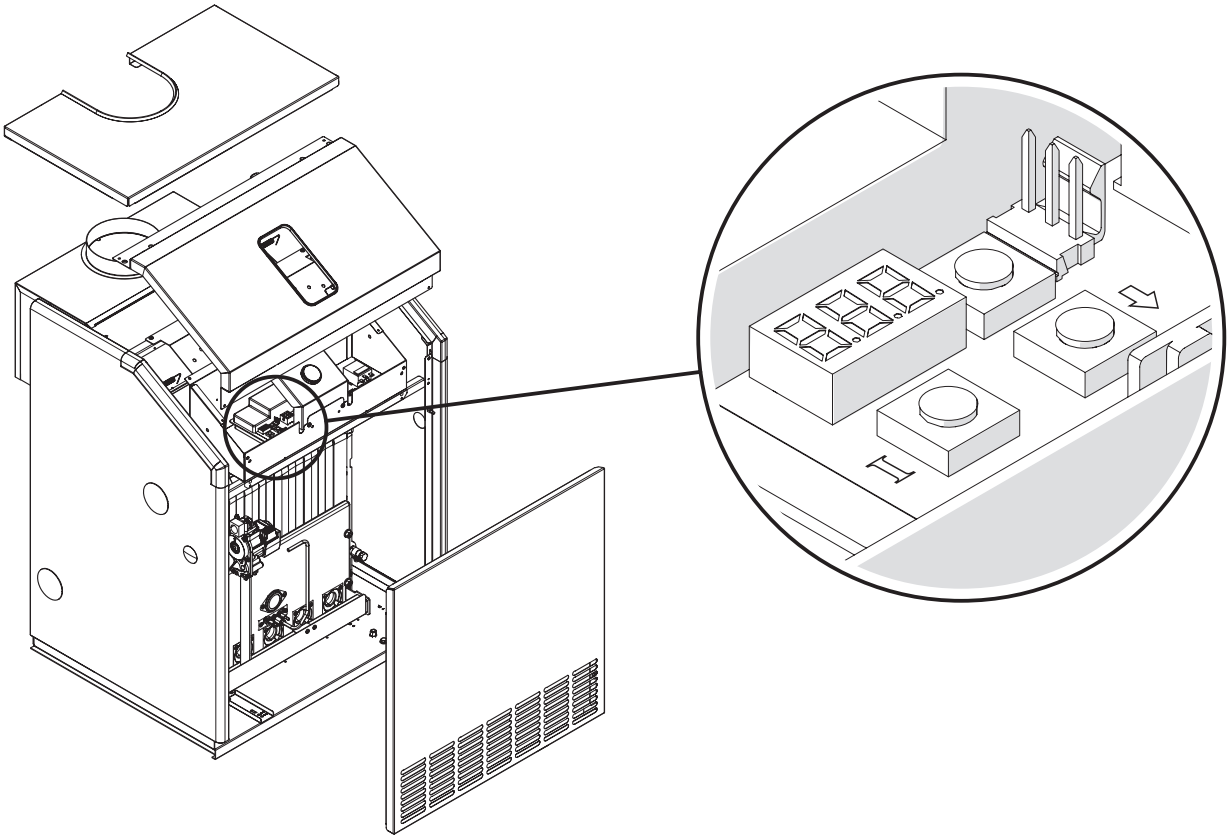
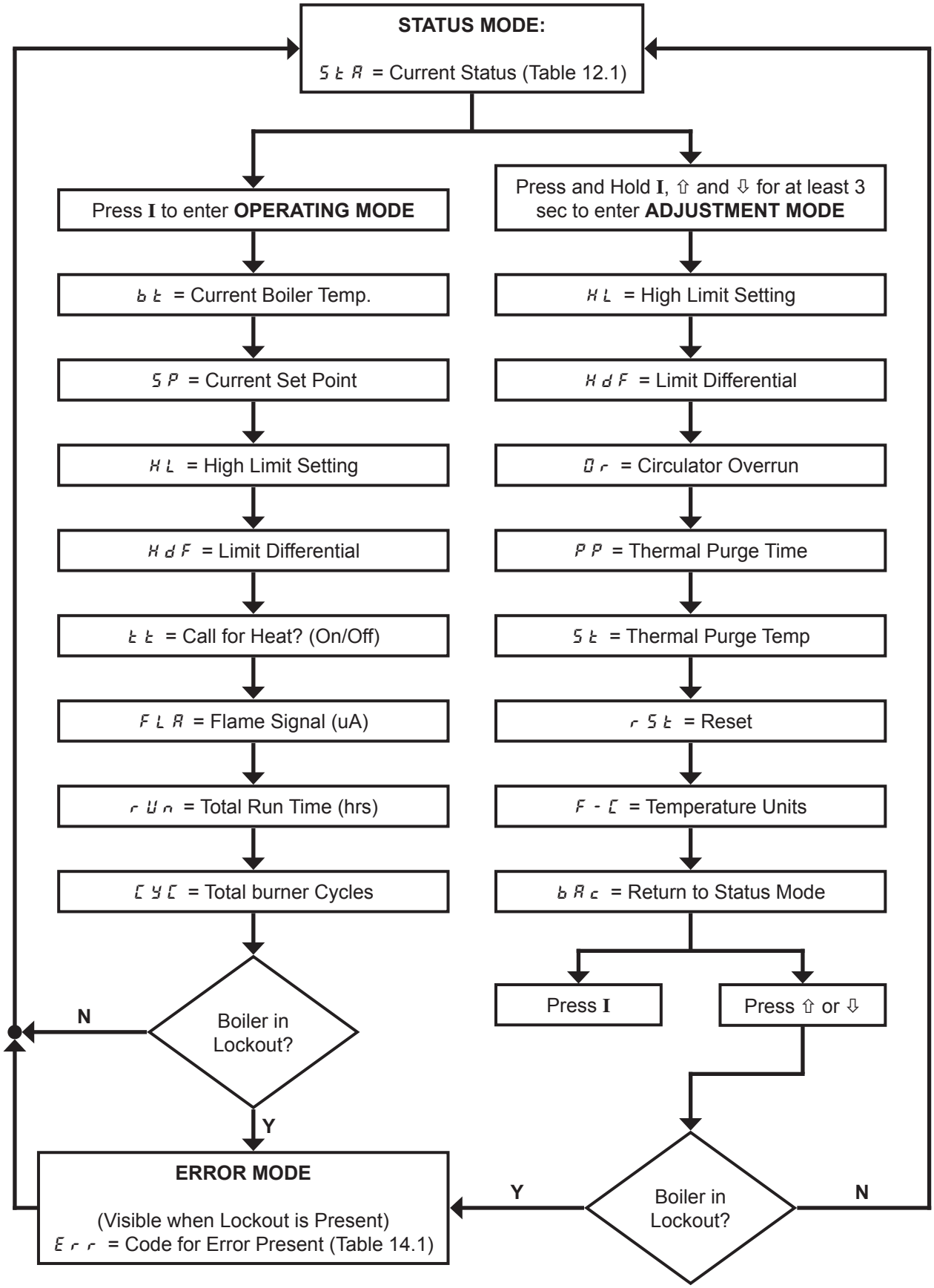


Figure 12.2 (Location/appearance of led, buttons)



- Except as shown above, press I to navigate through menu.
- Use ⇧, ⇩ to change parameters in Adjustment Mode.

Figure 12.3 (Boiler control menu)

Status #	Description	Meaning
1	Standby	No call for heat. OR Call for heat present, but boiler is in thermal purge (See PP on page 29). OR Call for heat present but boiler temperature is above set point (SP) setting.
4	Prepurge	Damper has opened and control is briefly waiting before starting trial for ignition (pre-purge time is 1.7s).
6	Spark	Control is attempting to light pilot.
7	Flame proving	Control is verifying that the pilot flame is on and stable.
8	Running	Main burner is on.
10	Retry/Recycle Delay	Control was unable to establish pilot and is waiting 5 minutes before trying again. OR Proof of pilot was lost after pilot was established and control is waiting 10 seconds before attempting to relight.
13	Soft Lockout	A fault is preventing the boiler from firing. Boiler will be allowed to fire after problem clears itself AND a forced delay period has passed.
14	Hard Lockout	A fault has occurred which requires manual intervention before the boiler will again operate. This intervention can be in the form of interruption of the power supply to the boiler or resetting the control in Adjustment mode.
15	Waiting for limit to close	A call for heat is present, but there is an open safety device, such as a blocked vent switch, that is preventing the boiler from operating.
16	Flame Present out of Sequence	A flame was detected when none should have been present.
17	Self test	Boiler was just energized and control is running a self check.
18	Waiting for Damper to open	Control is waiting for vent damper to prove open.
20	Damper failed to open	Damper failed to prove open 60 seconds after being called to open.

Table 12.1 (Status codes)

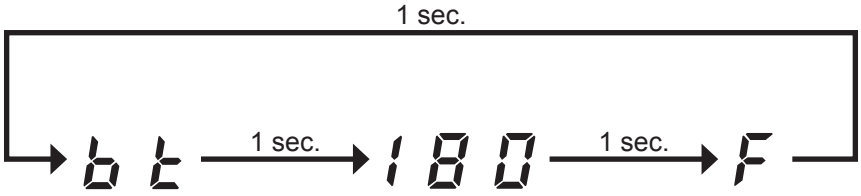


Figure 12.4 (Typical operating mode display (boiler temp shown))

Note: In operating mode, holding either the ⇧ or ⇩ button while viewing a given parameter will keep the display on the actual reading. For example, pressing ⇧ while reading boiler temperature as shown in Figure 12.2 will keep the display on 180 for as long as this button is held. This makes it easier to view readings “live” if they are changing rapidly

Parameter #	Description	Meaning
bt	Boiler Temperature	Current boiler water temperature measured by the control's sensor.
SP	Boiler water set point	Current target temperature.
HL	High Limit Set point	Boiler will stop firing if boiler water temperature exceeds this value (Circulator/s will continue to operate).
HdF	High Limit Differential	If high limit setting is reached, boiler water temperature will need to drop by this amount before boiler will again fire during the same call for heat.
tt	Heat Request Status	Shown as either ON or OFF. Indicates whether there is a call for heat.
FLA	Flame Current	Flame rectification signal (uA).
run	Run Time Hours	Total amount of time gas valve has been open (burner firing) since control was new (hours, starting from 1).
CYC	Boiler Cycles	Total number of burner cycles on the control.
Err	Error Number	Present only if the control has detected a problem. See Table 14.1 for a list of error codes and suggested corrections.

Table 12.2 (Operating mode parameters)

Status #	Description	Factory Setting	Permissible Range
HL	High Limit Set point	180F	140-220F
dF	High Limit Differential	15F	10-30F
Or	Circulator overrun	0 min	0-10 minutes
PP	Thermal Purge time	2 min	2-20 minutes
St	Thermal Purge Start Temp	140F	140-180F
rSt	Reset	N/A	OFF or Momentary ON
F - C	Temperature Units	F	F or C
bAc	Exit Adj. mode	N/A	N/A

Table 12.3 (Adjustment mode parameters)

C. Using Adjustment Mode

WARNING

IMPROPER ADJUSTMENTS TO CONTROL PARAMETERS COULD RESULT IN UNRELIABLE BOILER OPERATION, PROPERTY DAMAGE, PERSONAL INJURY, OR LOSS OF LIFE. ADJUSTMENTS SHOULD ONLY BE MADE BY A QUALIFIED HEATING TECHNICIAN.

A list of parameters which can be changed on this control are shown in Table 12.2. To enter Adjustment mode and change parameters:

1) Press and hold **I**, ⇧, ⇩ together for at least 3 seconds.
2) Use **I** to advance to the parameter which is to be changed.
3) Use the ⇧ or ⇩ buttons to change the setting or select from possible choices. See below for additional information on the use of these parameters.
4) If other parameters are to be changed, use the **I** button to advance to the next parameter needing adjustment and change it in the same way.
5) After all parameters have been changed, use the **I** button to advance until bAc is shown on the display.
6) Press either the ⇧ or ⇩ key to return to Status mode. Alternatively, the control will return to Status mode if no key is touched for 5 minutes.

HL (High limit Set point) - Burners shut down if the boiler water temperature exceeds this setting. The circulator will continue to run.

dF (High limit differential) - If the boiler shuts off on high limit, the water temperature must fall by an amount equal to the differential during the same call for heat before the burners will again start. For example, with HL =180 and dF =15, the burners will shut off if the water temperature exceeds 180F and stay off until the temperature falls to

165F (180 - 15). Note that if all calls for heat end while the burners are off on high limit, the burner will not restart during the next call for heat until the thermal purge requirements described below are met.

Or (Circulator Overrun) - Determines how long the Heating Circulator will operate after the call for heat ends. In some cases, this can help reduce energy consumption by sending heat stored in the boiler out into the system. At the same time, caution should be exercised before setting this value to something other than zero. Before doing so, verify that the system will permit flow (e.g. flow is not completely cut-off by closed zone valves) and that the overrun will not cause overheating problems.

PP (Thermal Purge Time) - Upon a call for heat, the boiler will prevent burner operation until either:

- The water temperature drops below the Thermal Purge start temperature (St) OR:
- The thermal purge time has passed

Thermal purge is only invoked when a call for heat first appears and the boiler is not already firing. For this reason, if the boiler is already firing in response to an call for heat, and a call for heat appears at the second zone, the boiler will continue to fire.

St (Thermal Purge Start Temperature) - See description for Thermal Purge Time above.

Example #	Call for Heat From	Use of DHW Zone	Thermal Purge Settings		Boiler Temp at Begin Call	Boiler Behavior
			Time (Pt)	Start Temp (St)		
1	T-T	N/A	2 min.	140F	130	• Heating Circulator starts immediately • Burner fires immediately
2	T-T	N/A	2 min.	140F	150	• Heating Circulator starts immediately • Burner fires when either: 2 minutes have passed OR Temperature falls below 140
5	T-T	N/A	2 min.	145F	150	• Heating Circulator starts immediately • Burner fires when either: 2 minutes have passed OR Temperature falls below 145
6	T-T	N/A	3 min.	140F	150	• Heating Circulator starts immediately • Burner fires when either: 3 minutes have passed OR Temperature falls below 140

Table 12.4 (Examples of thermal purge operation)

rSt (Reset) - Used to reset the boiler from a hard lockout (as an alternative to momentarily interrupting power to the control). Pressing the up key will turn rSt momentarily to on. When it goes back off (typically within one or two seconds), the control is reset.

F - C (Temperature Units) - Determines whether temperature units on the S9361A are displayed in F or C. Note that this selection only applies to the temperature displayed on the LED shown in Figure 12.2. Temperature units must be selected independently on the displays of any control options plugged into Option Plugs 1 or 2.

bAc (Return to Status mode) - Exits adjustment mode. Any changes made to the parameters described above are saved, and become effective, as soon as they are made; bAc only exits adjustment mode.

D. Sequence of Operation

(Refer to Figure 10.1 for Connection)

1) When the boiler is energized, 24 volts is immediately applied to terminals 1 (blue) and 4 (yellow) on the vent damper. Assuming that there is no call for heat, and that the damper switch is in the “automatic” position, the damper will close.
2) A call for heat from the thermostat connected to T-T energizes the Heating Circulator (connected to red and white leads in J-box).
3) Depending on the boiler water temperature at the time of the call for heat, the control will do one of two things:

   - If the water temperature is below the thermal purge start temperature (SE), the control will continue the ignition sequence.
   - If the boiler water temperature is above the thermal purge start temperature, the boiler will wait until either of the following conditions are met before continuing the ignition sequence:

     a. The boiler water temperature falls below the thermal purge start temperature (SE) Factory default is 140F.
     b. The thermal purge time elapses (PP). Factory default is 2 minutes.

4) If the blocked vent switch, flame roll-out switch, and any external limits connected to Option Plug #1 are made, 24 VAC will be applied across pin terminal 2 (orange) and 4 (yellow) at the vent damper and the damper will open.
5) Once the vent damper is fully open, an end switch inside the damper will make, energizing pin 3 (red) at the damper. The control reads 24VAC between this pin and pin 4 (yellow) as proof that the damper has opened.
6) The control waits for a 1.7s “prepurge period” to pass before attempting to light the pilot.
7) The control starts an ignition spark at the pilot and applies 24 volts across the pilot valve (terminals PV and MV/PV on the gas valve).
8) Once the pilot is established, the pilot flame will act as a diode, converting the AC current at the electrode to a half wave DC current at the pilot’s ground strap. This DC current flows through the boiler to the ground connection on the S9361A. For the ignition module to recognize that a pilot flame is present, the DC current flowing into this terminal must be in excess of approximately 1.0 uA.
9) If the pilot is not proven within 90 seconds of the beginning of the trial for ignition, the pilot valve will close and wait 5 minutes before the ignition sequence is retried.
10) Once the ignition module detects the presence of a pilot flame, voltage is applied across the main valve (terminals MV and MV/PV on the valve), opening the valve and establishing main flame.
11) If the water temperature climbs above the high limit setting during the call for heat, the burner will shut down, and the vent damper close, while the Heating Circulator continues to operate. The ignition sequence will restart (from Step 4) when the water temperature falls to the high limit setting (HL) minus the high limit differential (Hd F).

C. Safety Control Operation

Blocked Vent Switch - Automatically interrupts main burner operation in the event that a blocked vent causes flue gas to spill from the draft diverter opening. This switch is equipped with a reset button which must be pressed to restore normal burner operation. An open blocked vent switch is indicative of a problem with the vent system and/or the combustion air supply. If the blocked vent switch opens, the cause of this problem must be found and corrected by a qualified gas service technician before the blocked vent switch is reset.

Flame Roll-out Switch - Automatically interrupts boiler operation when flames or excessive heat are present in vestibule. The flame roll-out switch is a single use device which must be replaced by an identical switch in order to restore normal operation. An open flame roll-out switch is usually indicative of a plugged heat exchanger. The cause of the flame roll-out must be found and corrected by a qualified gas service technician, and the switch replaced with an identical one, before the boiler is returned to operation.

13. Service and Maintenance

WARNING

THE BOILER CONTAINS REFRACTORY CERAMIC FIBER, A POSSIBLE HUMAN CARCINOGEN. USE A NIOSH APPROVED RESPIRATOR WHEN SERVICING HIGH-TEMPERATURE INSULATION AND GASKET MATERIALS. WASH EXPOSED SKIN GENTLY WITH SOAP AND WATER AFTER CONTACT. WASH EXPOSED CLOTHING SEPARATE FROM NORMAL LAUNDRY.

LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. VERIFY PROPER OPERATION AFTER SERVICING.

FAILURE TO MAINTAIN THE BOILER IN PROPER WORKING CONDITION MAY LEAD TO FIRE, EXPLOSION, PERSONAL INJURY OR DEATH AND EXTENSIVE PROPERTY DAMAGE.

TURN OFF ALL GAS AND ELECTRIC POWER SUPPLIES TO THE BOILER BEFORE SERVICING. CONTACT WITH OR RELEASE OF DANGEROUS FLAMMABLE GAS, ELECTRICAL VOLTAGE, MOVING PARTS AND VERY HOT WATER UNDER PRESSURE MAY CAUSE SERIOUS PERSONAL INJURY, PROPERTY DAMAGE OR DEATH.

LOCK ELECTRICAL BOXES AND GAS VALVES CLOSED TO PREVENT SOMEONE FROM INADVERTENTLY RESTORING POWER OF GAS BEFORE THE HEATING SYSTEM IS SAFE TO OPERATE.

WATER LEAKS CAN CAUSE SEVERE CORROSION DAMAGE TO THE BOILER OR OTHER SYSTEM COMPONENTS. REPAIR ANY LEAKS FOUND IMMEDIATELY.

The following routine maintenance should be performed on an annual basis:

1) Turn off electrical power and gas supply to the boiler
2) Inspect the flue passages for signs of blockage. If there is any carbon in the combustion chamber or the flue passages, clean the heat exchanger before proceeding further. See the cleaning procedure below.
3) Remove all burners, noting the location of the pilot main burner. If burners show signs of deterioration, they should be replaced (some discoloration around the burner ports is normal). Clean the burners by first brushing the ports with a soft bristle brush and then vacuuming out any debris through the venturi opening.
4) Remove any debris found in the combustion chamber, being careful not to disturb combustion chamber insulation.
5) Inspect the pilot assembly. Clean any deposits found on the electrode and grounding strap. The ideal gap between the electrode and the ground strap is 1/8”. Inspect the porcelain for cracks or other deterioration. Replace pilot assembly if deterioration is found.
6) Inspect the combustion chamber insulation for deterioration.
7) Inspect the ignition cable insulation for cracks or other deterioration. If deterioration is found, replace cable.
8) Reinstall burners, being careful to put the pilot main burner in its original location.
9) Inspect all boiler wiring for loose connections or deterioration.
10) Inspect the vent system:

    - Make sure that the vent system is free of obstructions.
    - Make sure that all vent system supports are intact.
    - Inspect joints for signs of condensate or flue gas leakage.
    - Inspect venting components for corrosion or other deterioration. Replace any defective vent components.

11) Inspect the boiler and hydronic system for leaks.
12) Place the boiler back in operation using the procedure outlined in “Start-up”. Check the pilot line and any other gas piping disturbed during the inspection process for leaks.

Heat Exchanger Cleaning Procedure

WARNING

SOOT DEPOSITS IN THE FLUE PASSAGES ARE A SIGN THAT THE BOILER MAY BE OPERATING AT HIGH CARBON MONOXIDE (CO) LEVELS. AFTER CLEANING THE BOILER OF SOOT DEPOSITS, CHECK THE CO LEVEL IN THE FLUE GAS TO INSURE THAT THE BOILER IS OPERATING PROPERLY.

If it is necessary to check CO, use a combustion analyzer, or other instrument which is designed to measure CO in flue gas. A CO “sniffer” designed for testing CO levels in ambient air cannot be used to check boiler combustion. Take a flue gas sample by inserting a sample probe through the draft diverter opening and into the flue collector so that the sample is taken in the area directly over the heat exchanger. Do not take a sample until the boiler has been firing for at least five minutes. A normal CO reading for an KAPPA R series boiler is less than 50 ppm (0.005%). A reading of more than 100 ppm (0.01%) is indicative of a combustion problem.

Some causes of excessive CO include:

- Incorrectly sized main burner orifice for the altitude at which boiler is installed
- Crooked or out-of-round orifice holes (never attempt to drill orifice for this boiler in the field)
- Partially plugged flue passages
- Improper manifold pressure
- Foreign material in burner venturis or burner ports
- Leak in seal between flue collector and heat exchanger
- Inadequate supply of combustion air

1) Turn off electrical power and gas supply to the boiler.
2) Disconnect the damper and vent connector from the boiler.
3) Remove the top jacket panel. If possible, remove the rear and left side jacket panels.
4) Remove the burners.
5) Disconnect the wiring at the blocked vent switch.
6) Remove the four #10 sheet metal screws holding the flue collector onto the block. Also remove the two #10 sheet metal screws securing the flue collector to the rear jacket panel.
7) Remove the flue collector from the heat exchanger.
8) Carefully remove the flue collector gasket strips and set them aside.
9) Clean the flue passageways using a stiff bristle brush. Be certain that all foreign material is removed from the gaps between the pins.
10) Clean the bottom surfaces of the heat exchanger.
11) Put a light in the combustion chamber and look through the flue passages from the top to verify that they have been thoroughly cleaned.
12) Replace the flue collector gasket strips. If desired, RTV-732 silicone sealant with a 500F intermittent duty temperature rating may be substituted for this rope gasket. The flue collector must be thoroughly sealed to the heat exchanger.
13) Reattach the flue collector.
14) Reattach all the jacket components.
15) Reinstall burners, being careful to put the pilot main burner in its original location.
16) Replace the blocked vent switch.
17) Reconnect the damper and vent system.

14. Troubleshooting

A. Before Troubleshooting

The following pages contain trouble shooting tables for use in diagnosing control problems. When using these tables the following should be kept in mind:

1) This information is only meant to be used by a professional heating technician as an aid in diagnosing boiler problems.

2) Where applicable, follow all precautions outlined in the Section 11 (Start-up and Checkout).

3) In general, these tables assume that there are no loose or miswired electrical connections. Before using these tables inspect all electrical connections on the boiler to make sure that they are tight. Also, check the wiring on the boiler against the wiring diagram in Figures 10.1. Ensure that incoming 120VAC power polarity is correct and that the boiler is properly grounded. Further, ensure that the control power supply is 24VAC (minimum 18VAC to maximum 30VAC).

4) All controls on the boiler are tested at least once in the manufacturing process and a defective control or component is generally the least likely cause. Before replacing a component, try to rule out all other possible causes.

5) When checking voltage across at wiring connectors (such as at the vent damper harness plug) be careful not to insert the meter probes into the metal sockets. Doing so may damage the socket, resulting in a loose connection when the harness is reconnected.

B. If Display is Blank

1) Check for 24VAC on transformer secondary connections (screws to which blue and yellow leads are connected). If voltage across these screws is between 18 and 30VAC, possible causes include:

   - Loose connection at either plug or transformer end of transformer harness (blue/yellow harness).
   - Defective transformer harness.
   - Defective boiler control.

2) If voltage is less than 18VAC at transfer secondary, possible causes include:

   - Service switch off
   - Trip 120VAC breaker
   - Miswired or loose connection in 120VAC boiler circuit.
   - Loose connection inside J-box between transformer primary and 120VAC line.
   - Defective transformer (possibly caused by short circuit in 24VAC wiring or additional loads connected to the transformer in the field).

C. If Control Shows Err Code

Use Table 14.1 to help identify and correct the cause of the problem.

D. If Control Shows SLA Code, but Other Problem Present

If no Err Code is observed (even after repeatedly pressing **I** to cycle through Operation Mode), use Table 14.2 to help identify and correct the cause of the problem.

Error Code	Meaning	Possible Cause
4	Low Flame Signal.	• Low gas pressure at gas valve inlet. • Partially plugged pilot tubing or pilot orifice. • Loose connection in ignition cable or ground wiring. • Dirty pilot electrode/ground strap. • Pilot electrode porcelain cracked. • Damaged pilot hood/ assembly. • Defective control.
6	Pilot Flame detected when no flame should be present.	• Defective gas valve. • High gas pressure. • Defective control.
18	Internal electronics failure.	• Possible internal problem with boiler control. Cycle power to the boiler and replace control if problem persists.
23	Flame sensed during 1.7s pre-purge (before pilot valve opened).	• Defective gas valve. • High gas pressure. • Defective control.
32	Boiler water temperature sensor failure.	• Loose sensor connection at control. • Defective Sensor. • Defective control.
35	Duplicate Zone.	Error code reserved for future use.
55	Damper failed to open after 60s.	• Loose or defective damper harness. • Obstruction in path of damper blade. • Defective damper. • Defective control.
56	Power at end of limit string when it shouldn't be.	• Control, vent damper, or damper harness is defective. With Error 56 present, and no call for heat, unplug damper harness from control and check for 24VAC between terminal P6-5 on control (see Figure 10.1 for location) and ground. If voltage is present, replace control. If not, inspect the damper harness for shorts or miswired connections. If no harness defect is found, replace vent damper.
57	Grounded pilot electrode.	• Condensate or foreign material is shorting pilot electrode to ground. • Ignition cable insulation is damaged and touching ground. • Pilot is damaged.
58	AC Power Frequency Error.	• 120VAC power supply frequency is incorrect (Should be 60Hz). • 120VAC power supply is dirty (consult electrician and/or Utility). • Boiler water temperature sensor common (center wire) is damaged and shorted to ground.
59	Line voltage error (Supply voltage too high or low).	• Power supply voltage is incorrect (should be 120VAC nominal). • Defective or incorrect 24VAC transformer. • Loose 120VAC connection or 24VAC connection between transformer and control.
60	Thermostat input higher than threshold.	• External voltage is applied to thermostat connections (most common cause is external transformer in old thermostat wiring.
61	Line Voltage Unstable.	• 120VAC power supply is dirty (consult electrician and/or Utility). • Loose 120VAC connection or 24VAC connection between transformer and control. • Large electrical loads elsewhere on the installation are switching on and off, causing incoming voltage to swing excessively at boiler.
63	Maximum recycles exceeded.	• See Error Code 4 above (boiler lost proof of pilot 6 times in a row).
64	Internal failure.	• Loose or defective damper harness. • Obstruction in path of damper blade. • Defective damper • Improper pilot operation. • If problem persists, replace control.
89	EnviraCom communication lost.	Communication lost between boiler control and certain QHT control options. Consult QHT control option manual.

Table 14.1 (Error codes)

Displayed Codes	Problem	Possible Cause
StA 1 tt OFF dh OFF	Burners and Circulator Off.	• Thermostat/s not calling for heat. • Loose connection in thermostat, zone valve end switch, or zone panel wiring. • Thermostat, zone valve, or zone panel miswired. • Defective thermostat, zone valve, or zone panel.
StA 1 tt On	Burners Off Circulator On Boiler Warm.	• Boiler off on high limit (normal operation). • Boiler off on thermal purge (normal operation - See Table 12.3).
StA 15	Burners Off and Damper is closed.	• Blocked vent switch (BVS) open due to problem with vent system, such as a blocked chimney, or a combustion air supply problem. Correct and press reset button on BVS. • Flame roll-out switch (FRS) open due to blocked heat exchanger. Correct problem and replace FRS with exact replacement (see parts list).
StA 6	No spark at pilot.	• Loose connection in ignition cable or pilot ground. • Damaged electrode porcelain or ignition wire insulation (replace pilot). • Pilot electrode or Ground strap damaged (replace pilot). • If you cannot hear spark at all, replace control.
StA 6	Spark, but no pilot flame.	• Low inlet gas pressure. • Plugged, kinked, or leaking pilot tubing. • Plugged pilot orifice. • Gas line not purged of air. • Defective pilot assembly. • Defective gas valve (before replacing, confirm that there is 24VAC between PV and MV/PV. If there is not, control harness is loose or the control itself is defective). • Loose connection in harness between control and gas valve.
StA 6	Pilot flame present, but spark does not shut off.	• Low inlet gas pressure. • Partially plugged, kinked, or leaking pilot tubing. • Partially plugged pilot orifice. • Loose connection in ignition cable or pilot ground. • Damaged electrode porcelain or ignition wire insulation (replace pilot). • Pilot electrode or Ground strap damaged (replace pilot). • Defective Control.
StA 8	Pilot flame present, spark off, but Main Burner does not light at all.	• Loose connection in harness between control and gas valve. • Defective gas valve (before replacing, confirm that there is 24VAC between MV and MV/PV. If there is not either there is a loose connection in the control harness or the control itself is defective).
StA 10	Main burner lights, but shuts off immediately.	• Low inlet gas pressure. • Partially plugged, kinked, or leaking pilot tubing. • Partially plugged pilot orifice.
StA 10 or StA 13	No spark or pilot.	• Pilot was either never established or proof of pilot was lost after it was lit. Cycle power to the boiler and look for symptoms above.

Table 14.2 (Faults without error code present)

17962.3039.0 2717 44A4 USA

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