

# ***APPENDIX "D"***

## ***PROPANE BOILER***

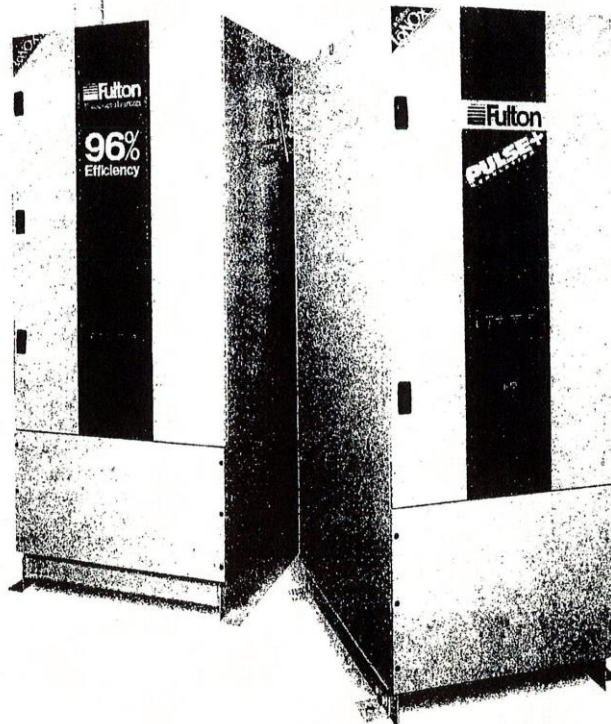
<p>This data and information in this appendix is provided for informational purposes only. The data and information is provided "as is" with no guarantee as to its accuracy.</p>
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## Installation, Operation And Maintenance Manual

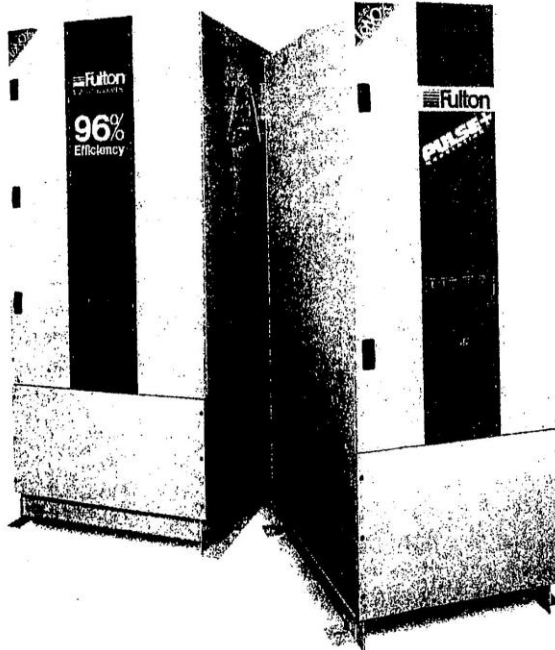
## Fulton Gas Pulse Combustion Commercial/Industrial Hydronic Heating Boilers

June 1999



PHW300  
PHW500  
PHW650+  
PHW750  
PHW950+  
PHW1000  
PHW1000P  
PHW1400+

## Fulton Pulse Combustion Hydronic Boilers. . . The Modern Approach to Commercial Heating



The application of the pulse combustion principle illustrates how fresh perceptions and changing needs can breathe new life into an old idea. The oldest patents related to this method of burning in a resonating system were issued before the end of the 19th century.

Today... advanced pulse technology has finally found and proven its way to the heating boiler industry. Fulton has brought pulse combustion applications out of the residential and light commercial application to larger commercial/industrial heating uses.

### Benefits of Gas Pulse Combustion:

#### Reliability

Flame sensing by pressure, no constant blower required.

#### Durability

These new boilers are constructed to ASME Code. The design compensates for expansion and contraction which cause other boilers to eventually leak or fail.

#### No Expensive Chimney Needed

The pulse combustion burner is self-venting through an AL29-4C stainless steel vent. Sidewall venting does not require a draft inducing fan.

#### Highest Efficiency Possible

Boiler efficiency is up to 98% depending on return water temperature.

#### Simple Reliable Spark Plug Ignition

No pilot or complex start sequence. Only a small assist starting fan is required. Following ignition this is shut off so there is no continuous electrical usage.

#### Gas and Pulse Combustion

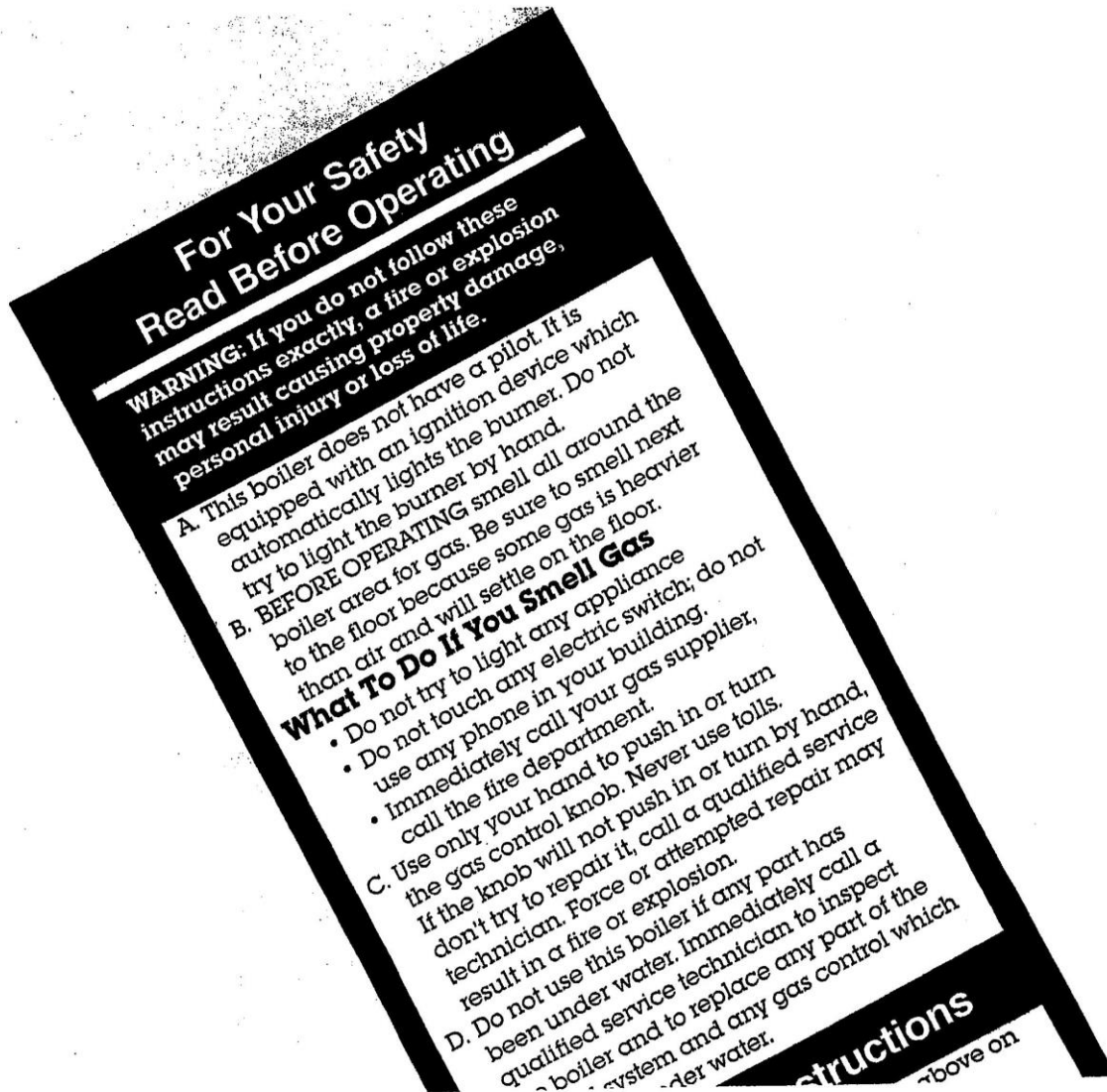
Our country's most abundant natural resource...gas... combined with modern-day pulse combustion is the cleanest most efficient combination for commercial/industrial applications today.

NOx (Nitrogen Oxides) commonly referred to as "smog" is a prime contributor to acid rain. Environmental control agencies are beginning to deal with this pollution problem. The Fulton self-venting pulse combustion hydronic heating boilers already meet or exceed most new emission standards being set.



Built & Stamped  
to ASME Code







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## For Your Safety

The following **WARNINGS, CAUTIONS, and NOTES** appear in various sections of this manual. They are repeated on these safety summary pages as an example and for emphasis.

**WARNINGS** must be observed to prevent serious injury, or death to personnel.

**CAUTIONS** must be observed to prevent damage or destruction of equipment or loss of operating effectiveness.

**NOTES** must be observed for essential and effective operating procedures, conditions, and as a statement to be highlighted.

It is the responsibility and duty of all personnel involved in the operating and maintenance of this equipment to fully understand the **WARNINGS, CAUTIONS, and NOTES** by which hazards are to be eliminated or reduced. Personnel must become familiar with all aspects of safety and equipment prior to operation or maintenance of the equipment.

### NOTE

The Fulton pulse combustion hydronic heating boiler is not designed for use in systems where water is replenished. Mineral buildup can occur on the heat transfer surfaces and result in over-heating and possible failure of the heat exchanger. Section 2.

### CAUTION

Do not install the boiler in an uncontrolled environment where the condensate will be subject to freezing temperatures. Section 2.

### NOTE

The boiler must not be installed on carpeting. Section 2.

### NOTE

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during boiler operation and service. Section 2.

### NOTE

All pulse combustion boilers must be installed with vibration isolators. No pulse combustion boiler shall be lagged directly to the concrete floor due to the transfer of vibration. In the box of trim shipped with each pulse boiler, Fulton supplies 4 elastomer coated fiberglass cubes used for vibration isolation. **For all non-critical installations these 3" x 3" x 2" cubes must be under each foot of the boiler.** Flex connectors must be installed on the water inlet and outlet lines. **For installations near "sensitive" areas such as offices, classrooms, or hospital rooms, spring mounts-which fit under the corner of each boiler-must be used instead of the cubes,** and flex connectors must be installed on the water inlet and outlet lines. Flex connectors may be installed on the gas inlet if necessary. Spring loaded pipe hangers may be used on the air inlet, water inlet and outlet, and the flue gas outlet pipes. Contact your Fulton Representative for vibration isolation packages designed specifically for your application. Section 2.

### CAUTION

The discharge from safety relief valve shall be so arranged that there will be no danger of scalding of personnel. Section 2.

### WARNING

No shutoff of any kind shall be placed between the safety relief valve and the boiler or on the discharge pipe between such valve and the atmosphere. Doing so can cause an accidental explosion from over-pressure. Section 2.

### NOTE

Intake PVC piping must be assembled using cement. This will ensure that the intake is air tight and will not allow contaminants from the boiler room into the boiler. Section 2.

### NOTE

The boiler, when used in conjunction with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler. If the boilers are connected to heating coils, located in air handling units where they may be exposed to refrigerated air circulation, such boiler piping systems shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle. Section 2.

### NOTE

See Figure 4, Page 13 for required pipe size, based on overall length of pipe from meter plus equivalent length of all fittings. Approximate sizing may be based on 1 cubic foot of natural gas per 1,000 BTU/Hr. input. Section 2.

### NOTE

Piping schematic consistent with the ANSI/ASME Boiler & Pressure Vessel Code Section IV. Section 2.

### CAUTION

Some soaps used for leak testing are corrosive to certain types of metals. Rinse all piping thoroughly with clean water after leak check has been completed. Section 2.

**Section**

**1**

**Safety Warnings  
and Precautions-3**

**WARNING**

Do not use matches, candles, flame or other sources of ignition to check for gas leaks. Section 2.

**NOTE**

The vent line connection on the gas pressure regulator and the low and high gas pressure switches must be piped to outdoor air by installer in accordance with the National Fuel Gas Code. Section 2.

**WARNING**

Do not attempt to start boiler to test wiring before filling and purging the boiler. A dry-fire will seriously damage the boiler and may result in property damage or personnel injury and is not covered by warranty. Section 2.

**NOTE**

Solvent cements for plastic pipe are flammable liquids and should be kept away from all sources of ignition. Proper ventilation should be maintained to reduce the hazard and to minimize breathing of solvent vapors. Avoid contact of cement with skin and eyes. Section 2.

**NOTE**

Time is critical at this stage. Do not allow primer to dry before applying cement. Section 2.

**NOTE**

Assembly should be completed within 20 seconds after last application of cement. Do not use hammer to insert pipe. Section 2.

**WARNING**

Do not attempt to start boiler before filling and purging boiler heating system. A dry fire will seriously damage the boiler and may result in property damage or personnel injury and is not covered by warranty. Section 2.

**NOTE**

The following purge procedure is applicable to the recommended piping configuration only. See Figure 15. Section 2.

**WARNING**

Never leave an opened manual air vent unattended. In the event an opened vent is left unattended, water damage could occur. Section 2.

**NOTE**

It is recommended that an authorized Fulton Pulse start up agent or your gas utility make any required gas input adjustments. Section 2.

**WARNING**

If you do not follow these instructions exactly a fire or explosion may result causing property damage, personnel injury, or loss of life. Section 3.

**NOTE**

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/or gas control(s) which have been under water. Section 3.

**NOTE**

Prior to starting, make sure the procedure for purging the heating system has been accomplished as detailed in section 2. Section 3.

**CAUTION**

Should overheating occur or the gas supply fail to shut off, shut off the gas supply at a location external to the boiler. Section 3.

**NOTE**

If for any reason, the air intake or exhaust vent piping is disassembled, re-assemble the piping in accordance with the installation procedure outlined in the installation section of this manual. Section 4.

**NOTE**

Your Fulton Pulse Combustion Hydronic Boiler has been designed for years of trouble-free performance. To ensure the continued safety and efficiency of the boiler, the schedule of maintenance outlined in this section should be adhered to. The boiler should be inspected annually. All service should be performed by a certified contractor. Section 4.

**WARNING**

Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids. Section 4.

The following are copies of safety labels and warnings which are affixed to the Fulton Pulse Combustion Hydronic Boilers. They are reproduced here as a further safety precaution and as a reminder to quickly identify them on the boiler.

### For Your Safety Read Before Operating

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

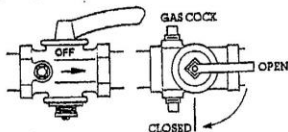
- A. This boiler does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the boiler area for gas. Be sure to smell next to the floor because some gas is heavier than air and will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

### 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 boiler.
4. This boiler is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Turn gas cock knob clockwise to OFF one quarter turn.
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.



7. Turn gas cock knob counterclockwise one quarter turn to ON.
8. Turn on all electric power to the boiler.
9. Set the thermostat to the desired setting.
10. If the boiler will not operate, follow the instructions "To Turn Off Gas To Boiler" and call your service technician or gas supplier.

### To Turn Off Gas To Boiler

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the boiler if service is to be performed.
3. Turn gas cock knob clockwise to OFF one quarter turn.

### Warning

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the user's information manual provided with this boiler. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

### This Boiler Must

Be installed in accordance with local codes, if any. If not, follow ANSI Z223.1 In Canada this boiler must be installed in accordance with CAN/CGA B149.1 and 2 and/or local codes.

### For Your Safety

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

### This Boiler Requires

A special venting system. See the installation instructions section in Installation Manual for roof, outside wall venting methods and necessary permits.

### This Unit Must

Be installed on a minimum clearance of 24 inches (610 mm) from any combustible wall or ceiling. Wall unit shall be installed in accordance with comparison chart for this boiler.

This Boiler is a Direct Vent Boiler for  
Installation on Non-Combustible Floors Only

## Fulton Gas Fired Pulse Combustion Boiler

Type of Gas: ☐ Natural ☐ Propane

Boiler Model No. \_\_\_\_\_

Boiler National Board No. \_\_\_\_\_

Year \_\_\_\_\_

BTU Input/Hr. \_\_\_\_\_

BTU Output/Hr. \_\_\_\_\_

Design Pressure \_\_\_\_\_

PSI \_\_\_\_\_

BTU/Hr. \_\_\_\_\_

Minimum Relief Valve Capacity: \_\_\_\_\_

Inches W.C. \_\_\_\_\_

Manifold Gas Pressure: \_\_\_\_\_

Maximum Gas Supply Pressure: 7 Inches W.C.

Minimum Permissible Gas Supply Pressure for Purpose of Input Adjustment: ☐ 7 Inches W.C.

☐ 11 Inches W.C.

Electrical Ratings: \_\_\_\_\_

120 Volts - 60 Hz

Less than 12 Amps

ANSI .13 Hot Water Boiler, ANSI Z21.13b/

Minimum Wall Thickness Through Which

Vent System May be Installed...3 1/4 Inches

Maximum Wall Thickness Through Which

Vent Systems May be Installed...20 Inches

Min. Clearance to Combustibles (front to rear)...24 Inches

Min. Clearance to Combustibles (side)...1 Inch

**Fulton**

Fulton Boiler Works, Inc.  
Fulton Thermal Corporation  
Pulaski, New York 13142



Section

**2**

**Installation - 7**



## Installation

### General specifications and information about Fulton Pulse Combustion Commercial/Industrial Hydronic Boilers:

Models	PHW300	PHW500	PHW650	PHW750	PHW950	PHW1000P	PHW1000	PHW1400
BTU/HR. Input	300,000	500,000	650,000	750,000	950,000	950,000	1,000,000	1,400,000
BTU/HR Output*	268,500	445,000	552,500	667,500	807,500	855,000	875,000	1,218,000
Fuel	NG/LPG	NG/LPG	NG/LPG	NG/LPG	NG/LPG	LPG only	NG only	NG/LPG
Approx. Dry Weight	1,320 lbs.	1,330 lbs.	2,200	2,250 lbs.	2,390	2250 lbs.	2,250 lbs.	3,380
Approx. Operating Weight	1620 lbs.	1,755 lbs.	2,485	3,150 lbs.	2,740	3,150 lbs.	3,150 lbs.	4,048
Floor Loading	230 lbs/ft <sup>2</sup>	250 lbs/ft <sup>2</sup>	346 lbs/ft <sup>2</sup>	275 lbs/ft <sup>2</sup>	381 lbs/ft <sup>2</sup>	275 lbs/ft <sup>2</sup>	275 lbs/ft <sup>2</sup>	346 lbs/ft <sup>2</sup>
Power Required	120/60/1	120/60/1	120/60/1	120/60/1	120/60/1	120/60/1	120/60/1	120/60/1
Max Required Gas Pressure	11" W.C. LPG 7" W.C. NG	11" W.C. LPG 7" W.C. NG	11" W.C. LPG 7" W.C. NG	11" W.C. LPG 7" W.C. NG	11" W.C. LPG 7" W.C. NG	11" W.C.	7" W.C.	11" W.C. LPG 7" W.C. NG
Max. Amp Draw (F.L.A.)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MAWP	60/100 PSI	60/100 PSI	60/160 PSI	60/160 PSI	60/160 PSI	60/160 PSI	60/160 PSI	60/160 PSI
Boiler Width	27.5 IN	27.5 IN	27.5 IN	33.675 IN	27.5 IN	33.675 IN	33.675 IN	33.675 IN
Boiler Height	59.75 IN	70.75 IN	66 IN	81 IN	76 IN	81 IN	81 IN	81 IN
Boiler Depth	37.75 IN	37.75 IN	37.75 IN	50 IN	37.75 IN	50 IN	50 IN	50 IN
Unit Size (Output) HP	8	13.3	16.5	20	24.1	25.5	26.1	36.4
KW	78.7	130.4	161.9	195.6	236.6	250.5	256.4	356.9

Note: \*Based on 120°F in -140°F out.

### Introduction

The Fulton pulse combustion hydronic boiler is an automatic gas fired, direct vent boiler. This boiler utilizes the pulse combustion principle. It requires no conventional burner controls, no pilot and no flue or chimney. The combustion components are of integral design with the heat exchanger. For combustion the boiler uses 100% outside air supplied through schedule 40 PVC pipe. The products of combustion are vented outdoors through non-corrosive venting materials which will withstand 480 degrees F (249C) temperatures. These pipes can be routed either through a roof or through the side wall of a building. Each boiler is built to ASME and CSD-1 Codes, hydrostatically tested, test fired, and shipped as a complete packaged unit. Gas, water, and electrical connections are similar to conventional boilers.

Safe ignition and other performance criteria were met with the gas manifold and control assembly provided on the boiler when the boiler underwent tests specified per AGA requirements 1991 and per ANSI Z2113a-1991 or latest edition.

All installations must be in accordance with the American National Standard "National Fuel Gas Code," latest edition, and with the requirements of local utilities or other authorities having jurisdiction. Such applicable requirements take precedence over the general instructions herein.

Since an external electrical source is utilized, the boiler, when installed, must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA 70-1987.

In some cases the approval authority may insist that the installation conform to the American Society of Mechanical Engineers ASME safety standard for controls and safety devices for automatically fired boilers, or CSD-1.

In Canada gas installations must be in accordance with the current CAN/CGA B149.1 and .2 and/or local codes. Electrical installations must be installed in accordance with the current CSA C22.1 Canadian Electrical Code and/or local codes.

### The following items are standard trim for Fulton pulse combustion hydronic boilers:

- Fully Insulated
- Microprocessor Based Control - 120 volt
- Low Water Cutoff (Probe Type)
- Control Panel Completely Wired with Diagram
- Operating Temperature Control
- Hi-Limit Temperature Control w/ Manual Reset
- Air Pressure Switch
- Spark Ignition
- Main Motorized Gas Valve
- Main Gas Pressure Regulator

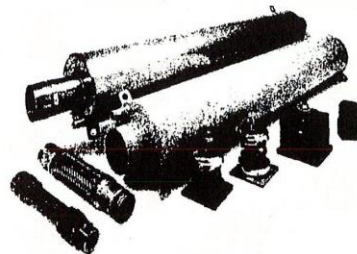
- Manual Lubricated Gas Cock
- Second Gas Valve (Solenoid)

### Included with and packaged separately with each boiler are the following components:

- ASME Pressure Relief Valve
- Pressure-Temperature Gauge
- Air Intake and Exhaust Pipe Adaptors
- Installation, Operation, and Maintenance Manual
- Elastomer Coated Fiberglass Cubes

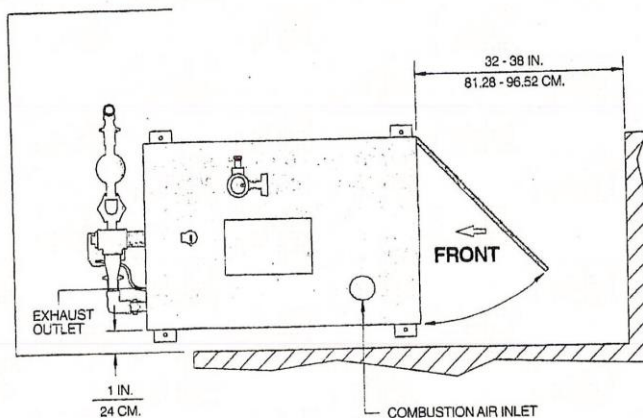
### Optional Accessories

Condensate Liquid Drainer  
Flex Connectors  
Spring Mounts  
Mufflers



## Installation

Figure 1



### TOP VIEW AIR INTAKE PIPING

Model No.	Type	Diameter/In.	Length/Ft.	Number of 90 Degree Elbows	Number of 90 Degree Termination Elbows
PHW300	PVC	3	10 Minimum	1	1
		3	35 Maximum	3	1
PHW500	PVC	3	10 Minimum	1	1
		3	35 Maximum	3	1
PHW650	PVC	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW750	PVC	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW950	PVC	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW1000P	PVC	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW1000	PVC	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW1400	PVC	4	10 Minimum	1	1
		4	35 Maximum	3	1

### EXHAUST VENT PIPING

Model No.	Type	Diameter/In.	Length/Ft.	Number of 90 Degree Elbows	Number of 90 Degree Termination Elbows
PHW300	Stainless Steel	3	10 Minimum	1	1
		3	35 Maximum	3	1
PHW500	Stainless Steel	3	10 Minimum	1	1
		3	35 Maximum	3	1
PHW650	Stainless Steel	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW750	Stainless Steel	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW950	Stainless Steel	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW1000P	Stainless Steel	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW1000	Stainless Steel	4	10 Minimum	1	1
		4	35 Maximum	3	1
PHW1400	Stainless Steel	4	10 Minimum	1	1
		4	35 Maximum	3	1



# Installation

## Locating The Boiler:

The boiler should be located so that the air supply and exhaust piping between the boiler and outside wall/roof are within the minimum and maximum lengths for horizontal or vertical venting. (Page 9) See Figure 1 for minimum clearances between the boiler and any combustible surfaces.

### NOTE

The Fulton pulse combustion hydronic heating boiler is not designed for use in systems where water is replenished. Mineral buildup can occur on the heat transfer surfaces and result in overheating and possible failure of the heat exchanger.

### CAUTION

Do not install the boiler in an uncontrolled environment where the condensate will be subject to freezing temperatures.

### NOTE

The boiler must not be installed on carpeting.

### NOTE

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during boiler operation and service.

### NOTE

All pulse combustion boilers **must** be installed with vibration isolators. No pulse combustion boiler shall be lagged directly to the concrete floor due to the transfer of vibration. In the box of trim shipped with each pulse boiler, Fulton supplies 4 elastomer coated fiberglass cubes used for vibration isolation. (Figure 2a) For all non-critical installations these 3" x 3" x 2" cubes must be under each foot of the boiler. White lines on blocks should be in "up" position. Flex connectors must be installed on the water inlet and outlet lines. For installations near "sensitive" areas such as offices, classrooms, or hospital rooms, spring mounts—which fit under the corner of each boiler—must be used instead of the cubes, and flex connectors must be

installed on the water inlet and outlet lines. Flex connectors may be installed on the gas inlet if necessary. Spring loaded pipe hangers may be used on the air inlet, water inlet and outlet, and the flue gas outlet pipes. Contact your Fulton Representative for vibration isolation packages designed specifically for your application.

## Installing Spring Isolation Mounts (Figure 2b)

1. Thread the leveling bolt into the top load plate of the spring until the head of the bolt is within 1/8" of the top load plate of the spring.
2. Coordinate the location of each isolator.
3. Remove the small cap screw and washer. Raise the boiler with jacks or similar tools (Do not attempt to raise the boiler via one (1) lifting point, but lift evenly around the perimeter of the boiler). Slide the spring isolator under the boiler or mounting bracket with the bolt head on the underside of the bracket.
4. Insert the small cap screw through the bracket and thread into the top of the leveling bolt and tighten finger tight.
5. Lower the boiler (evenly) onto the spring isolators. Do not overload any one isolator and take care not to push the boiler sideways.
6. Do not attempt to place all the weight on one spring, but distribute the load proportionately by adjusting each isolator in sequence.
7. Continue to adjust each leveling bolt (in sequence) until the boiler is at its height. When the boiler is filled with water, the springs will compress approximately 1-2".
8. Tighten the small cap screw, thus securing the spring isolator to the supported equipment and locking the leveling bolt against turning.
9. Do not attempt to move the boiler laterally while it is supported on the isolators. If it is necessary to move the boiler remove the weight from the isolators by raising the boiler before moving. Failure to follow this procedure could result in bent or broken leveling bolts or springs, or damage to the neoprene bottom

Figure 2a

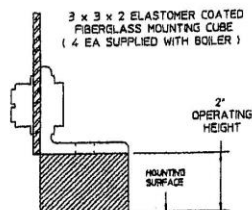
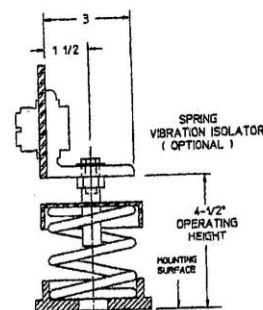


Figure 2b

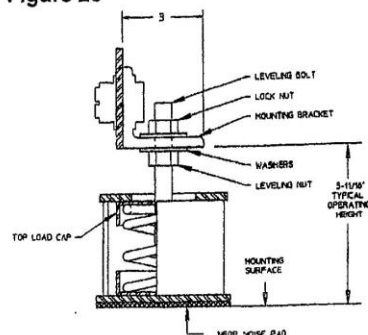


spring cap.

## Installing Seismic Spring Isolation Mounts (Figure 2c)

1. Thread the leveling bolt 1/2" into the top of the load cap.
2. Remove the lock nut and one washer from the top of the leveling bolt. Locate leveling nut as far down on leveling bolt as it will travel.
3. Coordinate the location of each isolator.
4. Place a one inch shim next to each bracket between the boiler and the housekeeping pad or structural floor. If an operating clearance of other than one inch is desired, use an appropriate size shim.
5. Raise the boiler and slide the spring isolator under the equipment mounting bracket. With the leveling nut and one washer on the under side of the bracket.
6. Lower the boiler onto the spring isolators taking care not to overload any one isolator and taking care not to push the boiler sideways.
7. Install second washer and lock nut one inch down from top of leveling bolt.
8. Grasp top of leveling bolt with vice grip and turn leveling nut in a counter-clockwise rotation until the boiler just touches the shim. The shim may now be removed. Proceed with adjustment

Figure 2c



## Installation

9. Tighten the lock nuts on the leveling bolts, thus bolting the spring to the boiler and locking the leveling bolt against turning.
10. Do not attempt to move the isolators laterally with the weight of the boiler on them. If it is necessary to move the boiler, remove the weight from the isolators by raising the equipment before moving.

### Installing Boiler Trim

1. Each boiler is supplied with a safety relief valve sized in accordance with ASME requirements. The safety relief valve shall be connected to the coupling located in the top of the boiler (Figure 3a). The safety relief valve must be installed with a 6" nipple between the boiler and the safety valve. The safety relief valve must always be installed in the vertical position. The discharge pipe shall be not less than the full area of the valve outlet. The discharge pipe shall be as short and straight as possible and so arranged as to avoid undue stress on the valve.

### CAUTION

The discharge from safety relief valve shall be so arranged that there will be no danger of scalding of personnel. When the safety relief valve discharge is piped away from the boiler to the point of discharge, there shall be provisions made for properly draining the piping.

### WARNING

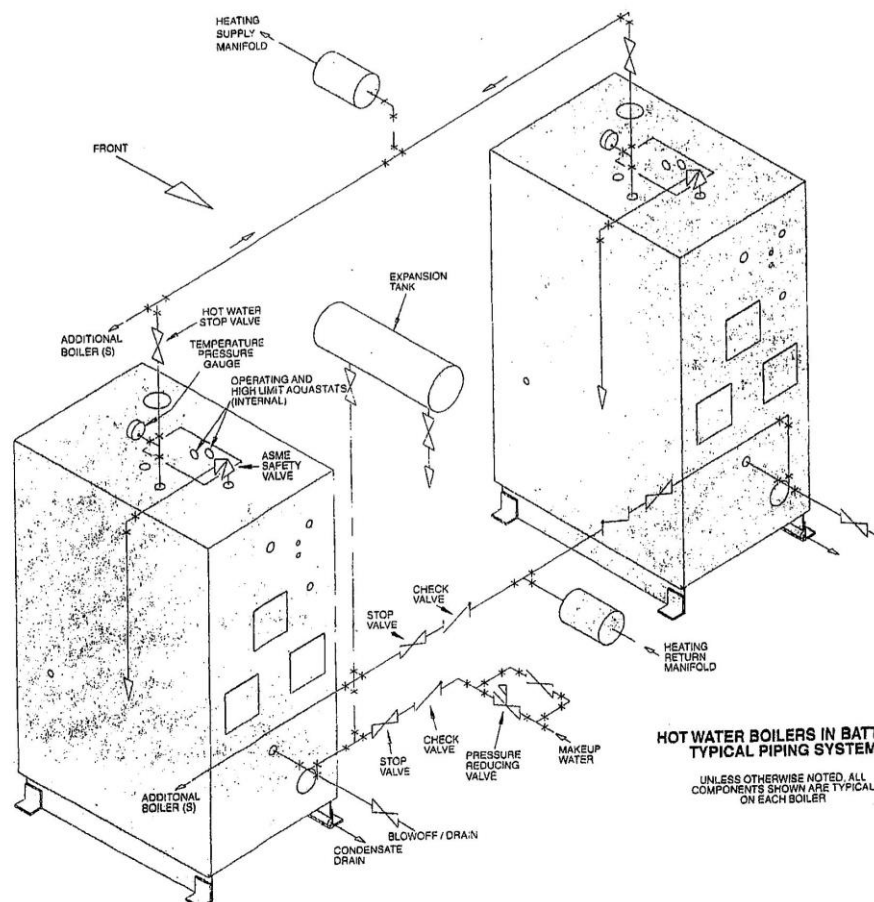
No shutoff of any kind shall be placed between the safety relief valve and the boiler or on the discharge pipe between such valve and the atmosphere. Doing so can cause an accidental explosion from overpressure.

2. Each boiler is supplied with a pressure-temperature gauge. A nipple is installed in the boiler water outlet. A tee is installed on the nipple. In the side port of the tee the temperature gauge is installed.

### Installing Water Piping

1. The bottom connection to the boiler is the INLET and must be used for the return from the system.
2. The top connection on the boiler is the OUTLET and must be connected as the supply to the system.
3. Connect hot water supply to heating system feed line.
4. Connect expansion tank.
5. Connect return water to boiler return water connection.
6. Install an air separator and air eliminator (air vent) which is necessary as there is no built in boiler air eliminating feature.
  - a. If a sealed diaphragm-type expansion tank is used, install air eliminator in hot water piping at air separator.
  - b. If an air cushion type expansion tank is used, pipe tank directly into boiler supply.
  - c. On multi zoned systems (or a system with both space and domestic water heating), air elimination must be provided either in the common piping or every loop.

Figure 3a



HOT WATER BOILERS IN BATTERY  
TYPICAL PIPING SYSTEM

UNLESS OTHERWISE NOTED, ALL  
COMPONENTS SHOWN ARE TYPICAL  
ON EACH BOILER

## Installation

d. When the boiler is installed at a higher level than baseboard radiation, air elimination must be provided directly above the unit.

7. Install hot water circulator, remote mounted from boiler. Do not attach directly to the boiler. Flexible connectors must be placed between the circulator and the boiler.

8. Install manual purging valves in all loops and zones. Install pressure reducing (automatic fill) valve in the cold water fill line to the boiler system.

9. Check that the proposed operation of zone valves, zone circulator(s) and diverting valves will not isolate air separator(s) and/or expansion tank(s) from the boiler.

### NOTE

The boiler, when used in conjunction with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler. If the boilers are connected to heating coils, located in air handling units where they may be exposed to refrigerated air circulation, such boiler piping systems shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

10. The boiler is furnished with a probe type low water cutoff. No field piping is required. If the probe does not sense water, the boiler will shut down and a red indicator will be illuminated on the control panel.

11. The boiler is not provided with external drain connections. A drain valve must be installed near the inlet connection to the boiler and piped to a suitable floor drain.

12. Before filling the boiler clean and flush the system to remove any debris. Clean and flush old piping thoroughly before installing the boiler. Consider installing a strainer ahead of the boiler.

### Installing Condensate Drain Piping Figure 3b

A condensate collecting tank and condensate pump will be required if an in the floor drain is not available to collect condensate (Collecting tank and pump are not supplied with the boiler). Complete condensate liquid drainer kits are available from Fulton.

1. All piping must be galvanized or stainless steel and should be free of leaks.
2. Make sure either elastomer coated fiberglass cubes or spring mounts have been installed under each leg of the boiler.

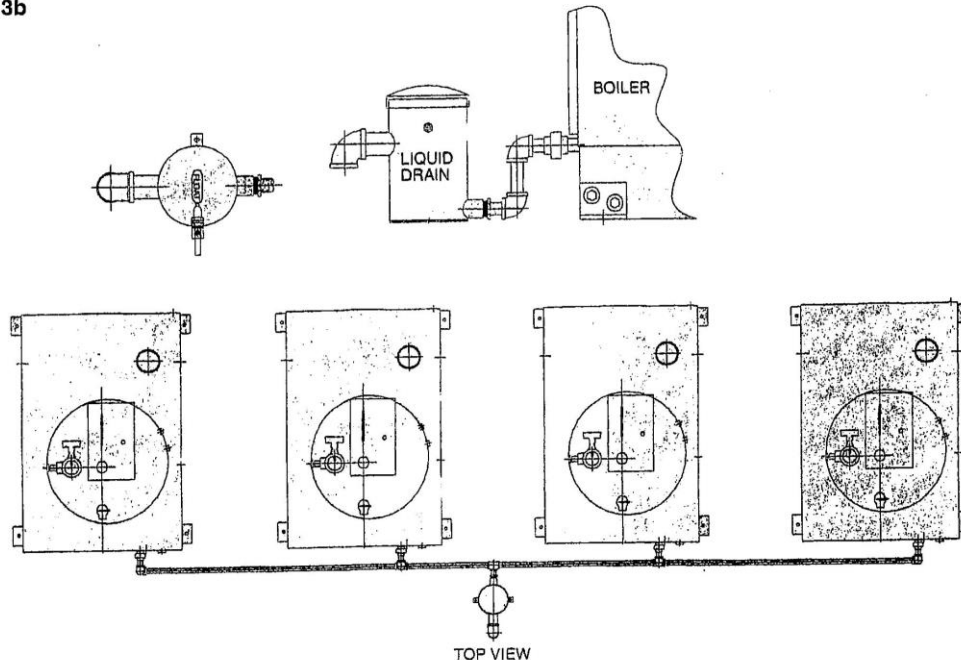
3. Install the condensate liquid drainer to the condensate drain in the lower right hand side of the boiler.

4. Connect 3/4" condensate drain(s), maximum of 8 boilers per drain kit, to the 1" inlet at the base of the drain tank. The bottom of the drain kit must be a minimum of 5 1/2" lower than the bottom of the exhaust decoupler.

5. Connect 1 1/2" drain outlet to an appropriate waste line following applicable codes. The 1 1/2" drain connection on the drainer must be the highest point prior to going to the drain. Failure to keep drain piping lower than this point will result in overflow of the drainer. Slope the drain pipe away at a minimum pitch of 1" for every 12 feet.

6. Attach a 1/4" water supply to the compression fitting on the float. The water line must be connected to an uninterrupted supply. Fulton recommends connecting it before the "Fast-Fill" valve to the boiler supply but after the back flow preventer to avoid contamination of a potable water supply. Maximum allowable water pressure to the compression fitting is 100 PSI.

Figure 3b



FOR MULTIPLE BOILER INSTALLATION, MAINTAIN A MINIMUM PIPE SIZE OF 1" FOR THE HEADER PIPING.  
(8 BOILERS MAXIMUM PER DRAIN KIT)

## Installation

### Pipe Capacity For Natural Gas

Nominal Iron Pipe Size Inches	Internal Diameter Inches	Equivalent Pipe Length 90° Elbow Feet	Tee Feet	Maximum Capacity in Cubic Feet of Natural Gas Per Hour Pressure Drop of 0.5" W.C. Equivalent Length of Pipe in Feet					
				20	40	60	80	100	150
1.25	1.38	3.50	6.90	950	—	—	—	—	—
1.50	1.61	4.00	8.00	1460	990	810	—	—	—
2.00	2.07	5.20	10.30	2750	1900	1520	1300	1150	950
2.50	2.47	6.20	12.30	4350	3000	2400	2050	1850	1500
3.00	3.07	7.70	15.30	7700	5300	4300	3700	3250	2650
4.00	4.03	10.10	20.20	15800	10900	8800	7500	6700	5500

### Installing Gas Piping

Figure 4

#### NOTE

See the above chart for required pipe size, based on overall length of pipe from meter plus equivalent length of all fittings. Approximate sizing may be based on 1 cubic foot of natural gas per 1,000 BTU/Hr. input.

1. Gas Piping should be installed in accordance with National Fuel Gas Code, ANSI Z223.1-1991 or latest addenda and any other local codes which may apply. In Canada gas installations must be in accordance with the current CAN/CGA B149.1 and .2 and/or local codes.

2. The pipe and the fittings used should be new and free of dirt or other deposits. Piping must be of the proper size to ensure adequate gas supply.

3. Gas pressure to inlet of gas train should be 7" WC. for natural gas and 11" WC. for propane. Connect gas supply line to the open end of the tee on which the drip leg is installed.

4. When making gas piping joints, use a sealing compound resistant to the action of liquefied petroleum gases. Do not use teflon tape on gas line threads.

5. After gas piping is completed and before wiring installation is started, carefully check all piping connections, (factory and field), for gas leaks. Use a soap and water solution.

#### CAUTION

Some soaps used for leak testing are corrosive to certain types of metals. Rinse all piping thoroughly with clean water after leak check has been completed.

6. The boiler must be disconnected at the boiler shut off valve from the gas supply piping system during any pressure testing of the system at pressure in excess of 1/2 psig (14" WC.).

7. Gas vents to outdoor air must be provided for the pressure regulator and gas pressure switches. Restricting orifices or bleed orifices should not be used at anytime.

#### WARNING

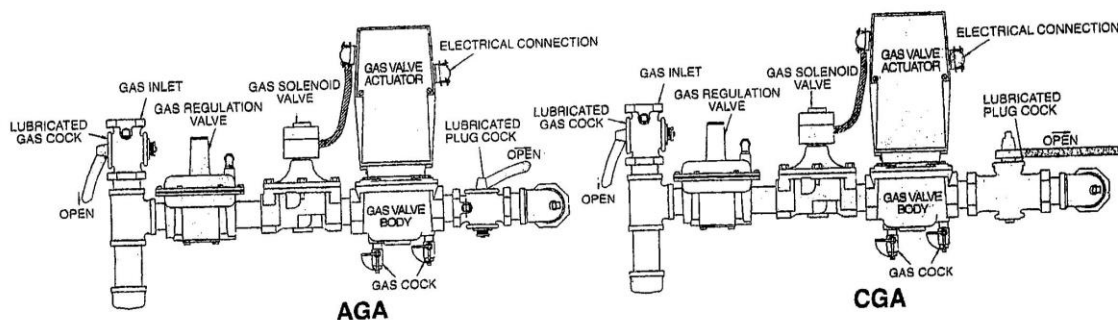
Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

#### NOTE

The vent line connection on the gas pressure regulator and the low and high gas pressure switches must be piped to outdoor air by installer in accordance with the National Fuel Gas Code, ANSI Z223.1-1991 or latest addenda.

In Canada gas installations must be in accordance with the current CAN/CGA B149.1 and .2 and/or local codes.

Figure 4



# Installation

## Installing Field Wiring Figure 4

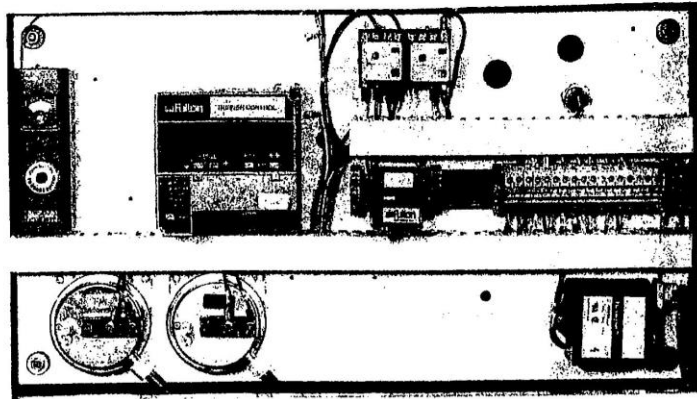
It is recommended that an independent power supply line be provided for the boiler. Connect one 120 volt (60Hz) fused powerline to terminal block as shown in Figure 5. Connect applicable wires to neutral and ground. Connect a ground wire to green colored ground lug in electrical control box.

### WARNING

Do not attempt to start boiler to test wiring before filling and purging the boiler. A dry fire will seriously damage the boiler and may result in property damage or personnel injury and is not covered by warranty.

### CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

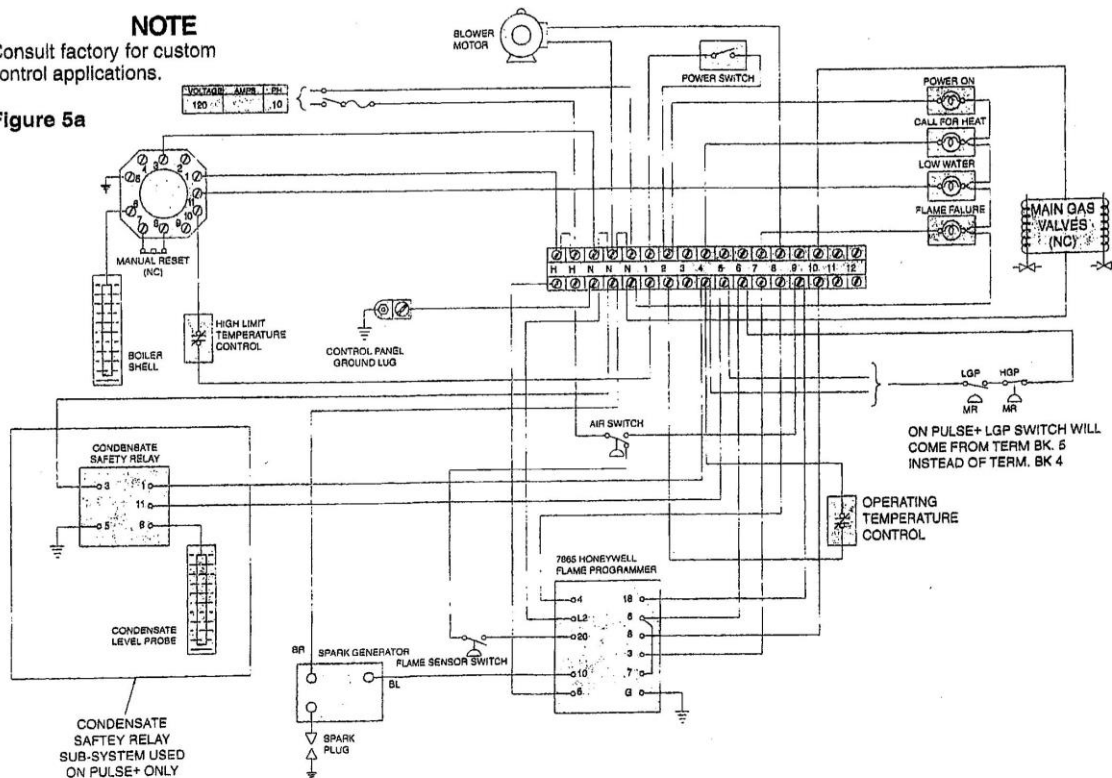


## Electrical Schematic

### NOTE

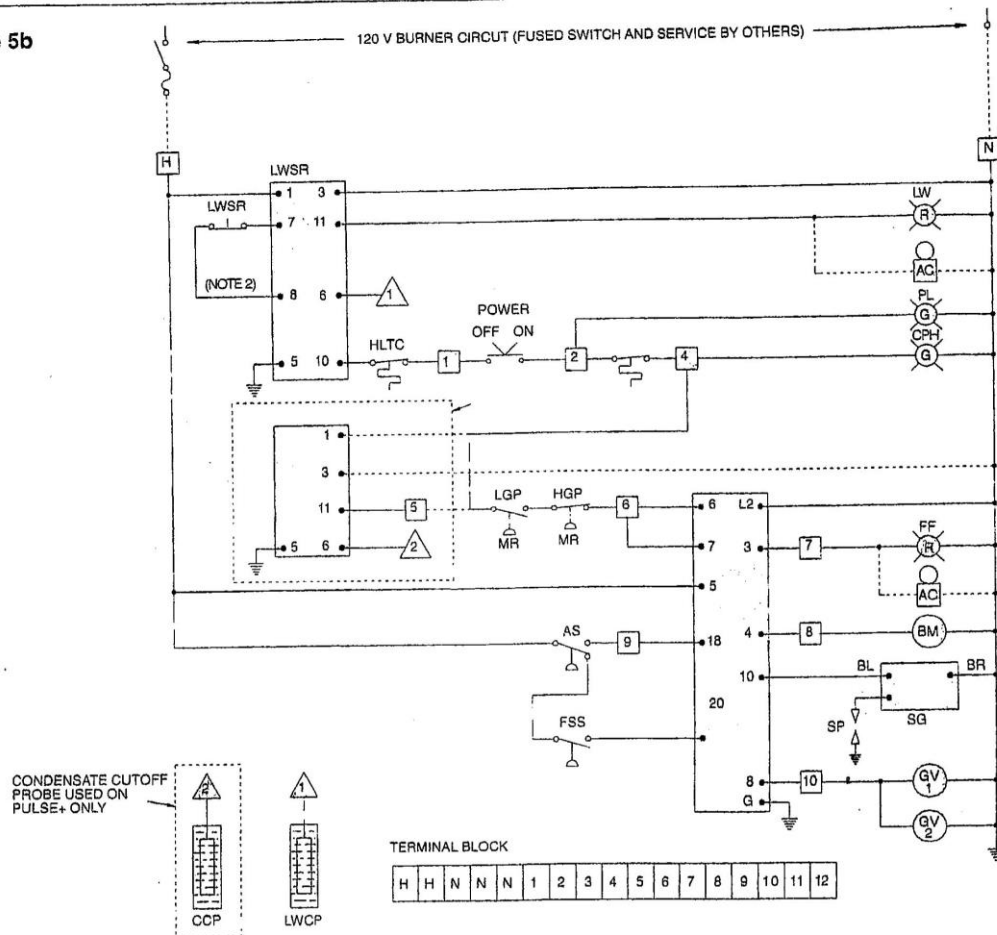
Consult factory for custom control applications.

Figure 5a



# Installation

Figure 5b



## Sequence of Operation

1. Turn on main breaker.
2. Low water safety relay (LWSR) is energized when the main breaker is turned on. (Red light on the boiler panel is lit and if the optional alarm is provided, alarm will go off. Current is not allowed to pass to the high limit temperature control until a) the probe in the boiler shell senses the water and b) the manual reset switch is reset. If a and b are both satisfied, the red light is turned off.
3. High limit temperature control allows current to pass to the next control if the temperature in the boiler water is not causing the control to open the circuit.
4. Burner switch is then closed to energize the operating temperature control. (Green light on the panel is lit).
5. Operating temperature control allows current to pass to the automatic control relay if the temperature of the boiler water is not causing the control to open the circuit.
6. 120V power is input to the automatic control relay (RM7865A).
7. Purge blower is energized for 35 seconds.
8. Purge fan switch is made, signaling the control to proceed.
9. Spark plug is energized.
10. Gas valve is energized.
11. Pressure sensing switch is made (proof of flame) allowing sequence to continue.
12. Pulse combustion will continue until one or more of the following things happen:
  - A. Operating temperature control is satisfied.
  - B. High limit temperature control is satisfied.
  - C. Low water safety relay loses water on probe.
  - D. Burner switch is turned off.
  - E. Main breaker is turned off.

## Glossary

- AC — Audible Alarm Control (Optional)
- ACR — Automatic Control Relay (7800 series)
- BM — Purge Fan Motor
- BS — Burner Switch
- CR — Control Relay
- HLTC — Hi Limit Temp. Control
- LW — Panel Light (Low Water Indicator)
- LWCP — Low Water Cutoff Probe
- LWRS — Low Water Reset Switch
- LWSR — Low Water Safety Relay
- GV — Main Gas Valve
- OTC — Operating Temp. Control
- PFS — Purge Fan Switch
- PL — Panel Light (Power On Green)
- PSS — Pressure Sensor Switch No. 2
- RC — Relay Coil
- SP — Spark Generator
- S.P. — Spark Plug
- TB-H — Terminal Block (Hot)
- TB-N — Terminal Block (Neutral)

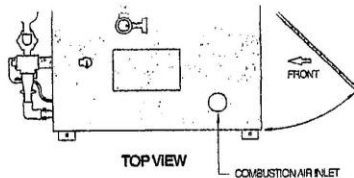


## Installation

### Air Intake Supply Piping Installation Preparation

The boiler is equipped with air intake supply and exhaust vent connections located at the top and rear of the boiler.

Figure 6

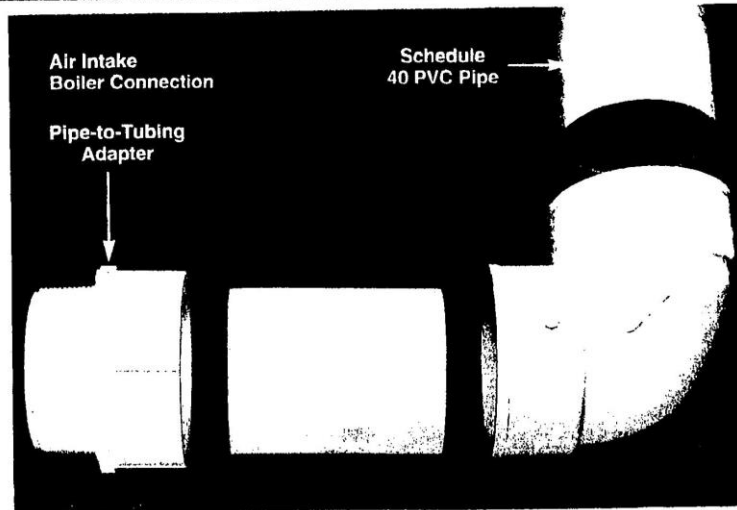


Air supply is on the top. See Figure 6. For Models PHW300 and PHW500 these connections are 3" NPT threaded female fittings and for Models PHW650, PHW750, PHW950, PHW1000P, PHW1000, and PHW1400 they are 4" NPT thread female fittings. These fittings will accept 3" and 4" male/female pipe to tubing adaptors respectively. This line must be sloped down toward the unit with a pitch of at least 1/4" per foot. Failure to do so can result in a condensate pocket which can result in an inoperative boiler. A high spot is acceptable, provided the pitch from the high spot is maintained back to the boiler and to the outside point of air intake.

The air intake must be piped out of the building. Air Intake pipes and fittings for all models shall be Schedule 40 PVC pipe. All Schedule 40 PVC pipe, fittings, primer and solvent cement must conform with American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM standards.)

#### NOTE

Intake PVC piping must be assembled using cement. This will ensure that the intake is air tight and will not allow contaminants from the boiler room into the boiler. The solvent shall be free flowing and contain no lumps, undissolved particles or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement shall not show gelation, stratification, or separation that cannot be removed by stirring.



#### WARNING

Solvent cements for plastic pipe are flammable liquids and should be kept away from all sources of ignition. Proper ventilation should be maintained to reduce the hazard and to minimize breathing of solvent vapors. Avoid contact of cement with skin and eyes.

The following procedure for cementing joints (per ASTM D2855) should be adhered to:

- Step 1  
Measure and cut PVC pipe to desired length.
- Step 2  
Chamfer end of pipe, removing any ridges or rough edges. If end is not chamfered, the edge of the pipe may remove cement from the fitting socket and result in a leaking joint.
- Step 3  
Clean and dry surfaces to be joined.
- Step 4  
Test fit joint and mark depth of fitting on pipe outside.
- Step 5  
Uniformly apply liberal coat of primer to inside socket surface of fitting and male end of pipe to depth of fitting socket.
- Step 6  
Promptly apply solvent cement to end of pipe and inside socket surface of fitting. Cement should be applied lightly—but uniformly—to inside of socket. Take care to keep excess cement out of socket. Apply second coat to pipe end.

#### NOTE

Time is critical at this stage. Do not allow primer to dry before applying cement.

Step 7  
Immediately after applying last coat of cement to pipe, while inside socket surface and end of pipe are wet with cement, insert end of pipe into socket, turn pipe 1/4 turn to distribute cement evenly, continue to insert pipe until it bottoms out.

#### NOTE

Assembly should be completed within 20 seconds after last application of cement. Do not use hammer to insert pipe.

Step 8  
After assembly, wipe excess cement from pipe at end of fitting socket. A properly made joint will show a bead around its entire perimeter. Any gaps may indicate a defective assembly due to insufficient cement.

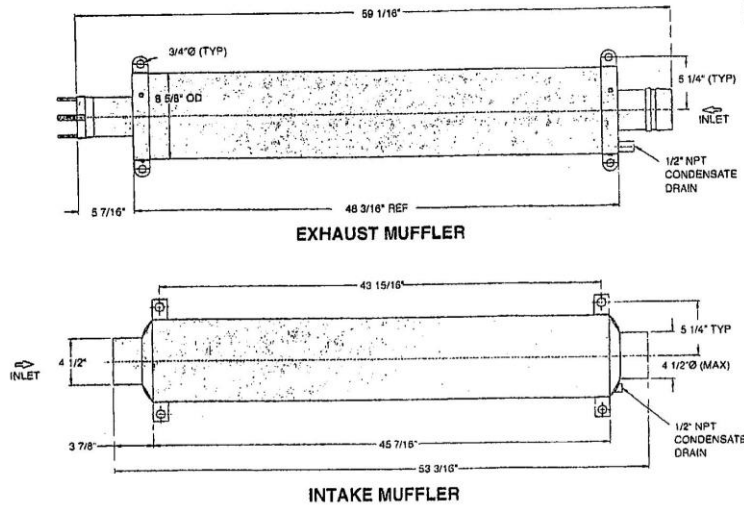
Step 9  
Handle joints carefully until completely set.

### Intake Muffler Installation - Figure 7

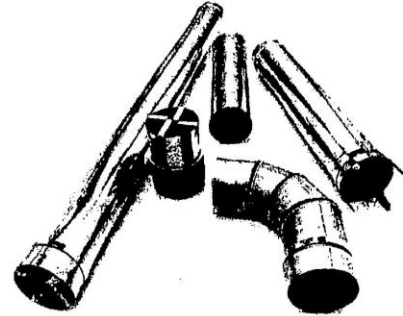
Follow steps 1-9 above for cementing joints. For best noise attenuation, the muffler should be installed as close to the boiler as possible.

# Installation

Figure 7



Exhaust vent piping shall be stainless steel



## Exhaust Vent Piping Installation Preparation

The boiler is equipped with an exhaust vent connection located at the rear of the boiler. (Figure 6) For models PHW300 and PHW500 the connections are 3" NPT threaded female fittings. For Models PHW650, PHW750, PHW950, PHW1000P, PHW1000, and PHW1400 they are 4" NPT threaded female fittings. **The exhaust line must be sloped down toward the unit with a pitch of at least 1/4" per foot.** Failure to do so can result in a condensate pocket which can result in an inoperative boiler. There must be no low spots in the exhaust pipe, as this can also result in a condensate pocket. A high spot is acceptable, provided the pitch from the high spot is maintained back to the boiler to the outside point of the exhaust. **In supporting piping, or routing it through a rafter or wall, always use vibration eliminating hangers** around the piping to prevent transmission of pulsations. Always avoid rigid connections between piping and structural members of the building. Flue exhaust pipes and fittings for All models shall be stainless steel. The stainless steel shall be UL temperature rated at minimum air clearance to combustibles. At 480 degrees F temperature rating, a 5" minimum air space clearance to combustibles is required. Fulton pulse combustion hydronic heating

boilers require a special venting system. Applicable Federal Codes are NFPA 54/ANSI Z223.1 National Fuel Gas Code and NFPA/ANSI 211 Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances. In Canada refer to the venting section of CAN/CGA B149.1 and .2. These codes contain information on special gas vents. The gas vent installer should be familiar with these Federal Codes as well as local codes and regulations.

### The procedure for adhesive joining stainless steel pipe and fittings follows:

- Step 1  
Do not mix stainless steel pipe with galvanized or other alternatives for the entire length of the system.
- Step 2  
All joints between sections of the vent connector and the vertical conduit must be sealed with a high temperature sealant to prevent any possible leakage of flue gas.
- Step 3  
Apply a bead of sealant, about 1/4 inch in diameter, completely around the male (without tabs) end of each conduit section or elbow, between 1/4 and 3/8 inch from the end of the section. Also run a similar sized bead down the seam weld of each section, from the edge of the pipe to the top of the bulge.
- Step 4  
Fully insert the male end of the section

into the female fitting of the section below. Spread any sealant that squeezes out around the circumference of the joint. Attach the sections together with the locking ring and tabs. Again spread any extruded sealant around the joint. Inspect the joint to ensure that flue gases will not escape. If necessary, apply additional sealant to any voids. Allow the sealant 24 hours to cure before operating the boiler.

Step 5  
All pipes, elbows, and fittings used in condensate piping from liquid drain to floor drain shall be high temperature plastic or stainless steel.

**Alternate exhaust vent piping would be stainless steel 316L, minimum schedule 10.** This piping and fittings should be connected using standardly accepted stainless steel welding procedures.

## Exhaust Muffler Installation Figure 7

Follow steps 1-5 above to join the fittings.  
**For muffler drain installation:**  
1. For mufflers installed in the vertical configuration the drain can be plugged.  
2. For mufflers installed in the horizontal configuration, the drain should be piped to the drain line between the boiler and the liquid drainer.  
For best noise attenuation, the muffler should be installed as close to the boiler as possible.



## Installation

### Air Intake Supply and Exhaust Vent Installation

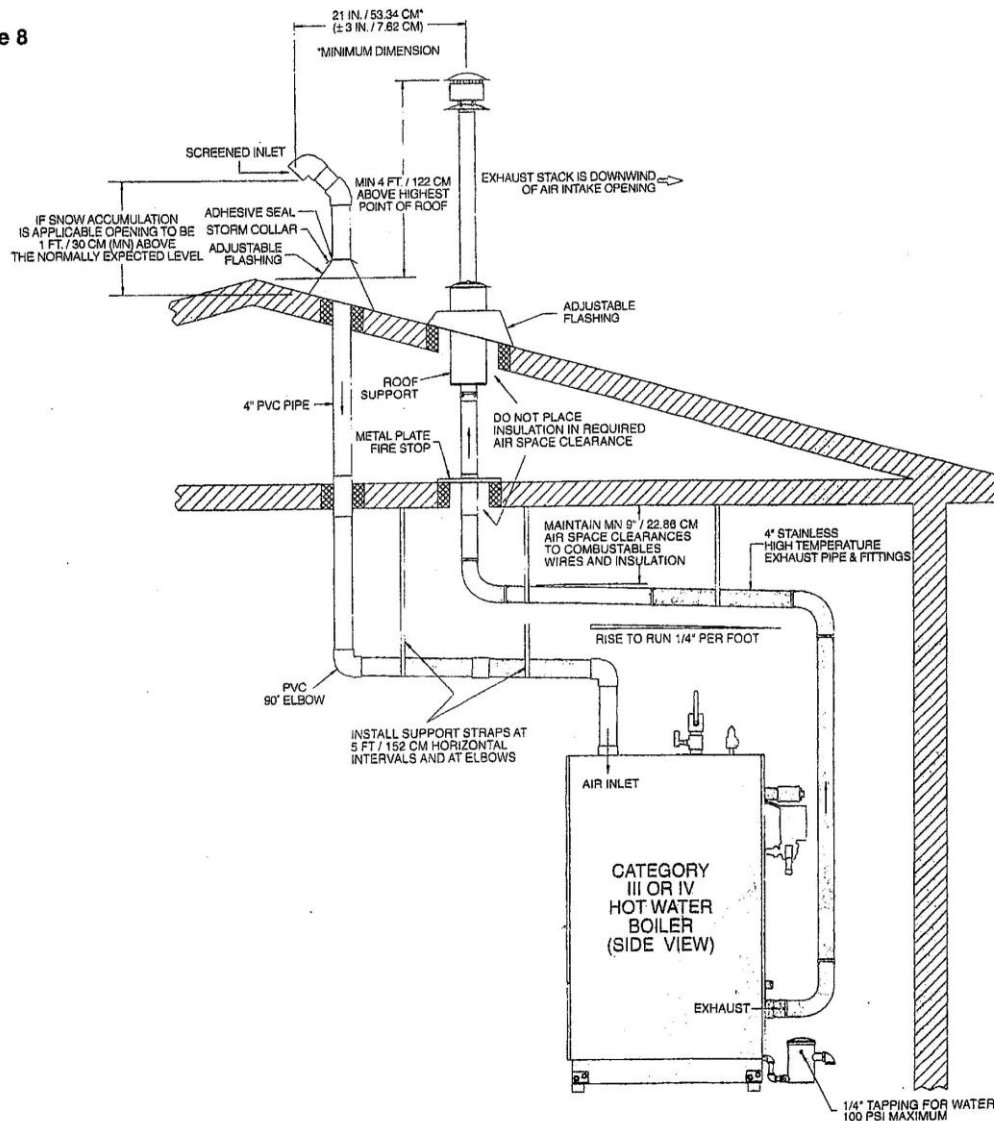
Air intake supply and exhaust vent pipes and fittings are suitable for vertical, through-the-roof or horizontal through-the-wall installation. The vent system must be installed in accordance with the manufacturer's instructions.

All vent pipes and fittings must be

installed with appropriate air space clearances to combustibles. These air space clearances apply to indoor or outdoor vents—whether they are open, enclosed, horizontal or vertical or pass through floors, walls, roofs, or framed spaces. See Figure 8. The air space clearances should be observed to joists, studs, subfloors, plywood, drywall or plaster enclosures, insulating sheathing, rafters, roofing, and any other material classed as combustible.

The required minimum air space clearances also apply to electrical wires and any kind of building insulation away from gas vent and out of the required air space clearance.

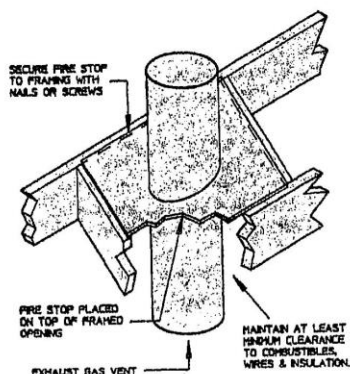
Figure 8



Typical Ceiling and Roof Penetration Detail

## Installation

**Figure 9**  
**Fire Stopping Required For All Ceiling/Floor Penetrations**



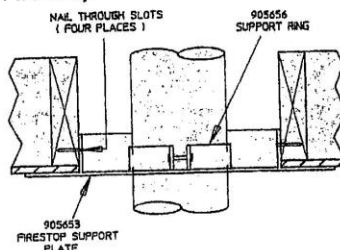
Vertical runs or vent pipes and fittings passing through floors, ceilings, or in framed walls must be fire stopped at floors and ceilings. The fire stop must close in the area between the outside of the vent and the opening in the structure. Figure 9. When passing through a floor or ceiling, frame in an opening providing 5" or 9" air space clearance to vent pipe as applicable. The fire stop fits to the bottom of a framed opening 13 1/4" square. Nail into the inside of the framed opening through the four holes in the ring. The fire stop is placed on top of a framed opening 14 1/4" square with the dished position down. Nail the flange to the top of the framing.

Pass the vent pipe through the opening in the fire stop. If used as a support, install the support ring around the vent pipe above the fire stop. Slide the support ring down to the top of the fire stop and tighten it securely to the vent pipe. Firestop supports can support up to 10 feet of vent pipes and are recommended at all floor and ceiling penetrations. Figure 10. Air intake supply and exhaust vent pipes and fittings must be securely supported.

Horizontal sections require supports every 5 feet and at elbows. From the boiler, all horizontal sections must rise at least 1/4" per foot, and there must be no sags or dips where condensate could collect. The upward pitch is required so condensate will run back to the boiler for collection and disposal.

For vertical through the roof installations all gas vents extending above the roof by more than 2-1/2 feet must be securely guyed or braced—inside and outside wall—2 clamps. Use a support ring to attach guys or braces to the vent pipe.

**Figure 10**  
**Fire Stop**



### Vertical Vent Flashing and Installation:

The roof opening should be located and sized such that the vent is vertical and has the required air space clearance. The roof flashing is positioned with the lower portion of the base flange over roofing material. Figure 11.

Nail through the upper portion and sides of the base flange. Use nail with neoprene washers or cover the nail heads with a neoprene plastic.

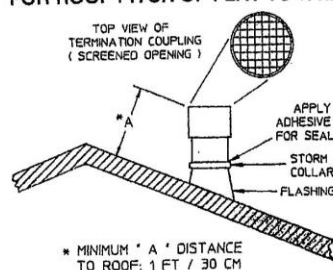
### Vertical Vent Termination:

The vent pipe must extend through the flashing to a height above the roof as required in Figure 11.

A storm collar is installed on the vent pipe over the opening between pipe and flashing. Adhesive material is used over the joint between the vent pipe and the storm collar. Figure 10. The vent termination is joined to the end of the vent pipe.

**Figure 12**

**FOR ROOF PITCH OF FLAT TO 7/12**

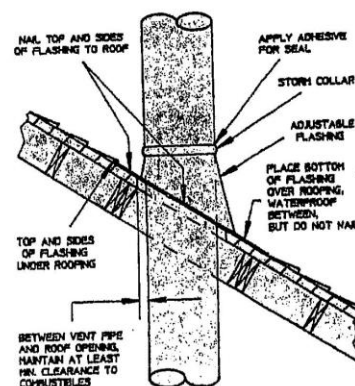


\* MINIMUM \* A \* DISTANCE TO ROOF: 1 FT / 30 CM

ROOF PITCH (RISE OVER RUN)	HEIGHT ABOVE ROOF	
	FT	CM
FLAT TO 7/12	1.0	30
OVER 7/12 TO 8/12	1.5	45
OVER 8/12 TO 9/12	2.0	60
OVER 9/12 TO 10/12	2.5	75
OVER 10/12 TO 11/12	3.25 [1]	100 [1]
OVER 11/12 TO 12/12	4.0	120

[1] BRACE TO ROOF AT TOP

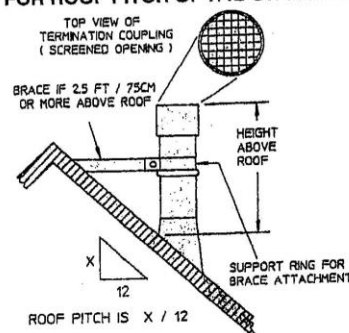
**Figure 11**  
**Elements For Correct Roof Flashing Installation**



Finish roofing around that flashing, covering the sides and upper flange with roofing material.

Termination height for the vent pipe must be such that no discharge opening is less than 2 feet horizontally from the roof surface, and the lowest discharge opening shall be no lower than the minimum height specified in Fig 12. These minimum heights may be used provided the vent is not less than 8 feet from any vertical wall.

**FOR ROOF PITCH OF 7/12 OR MORE**



ROOF PITCH IS X / 12

ROOF PITCH (RISE OVER RUN)	HEIGHT ABOVE ROOF	
	FT	CM
OVER 12/12 TO 14/12	5.0	150
OVER 14/12 TO 16/12	6.0	180
OVER 16/12 TO 18/12	7.0 [2]	210 [2]
OVER 18/12 TO 20/12	7.5	225
OVER 20/12 TO 21/12	8.0	240

[2] BRACE TO ROOF AT TOP AND MID POINT

# Installation

## Horizontal Installation Wall Penetrations

Figure 13

Select the point of penetration where a minimum of 4" per foot upward pitch can be maintained.

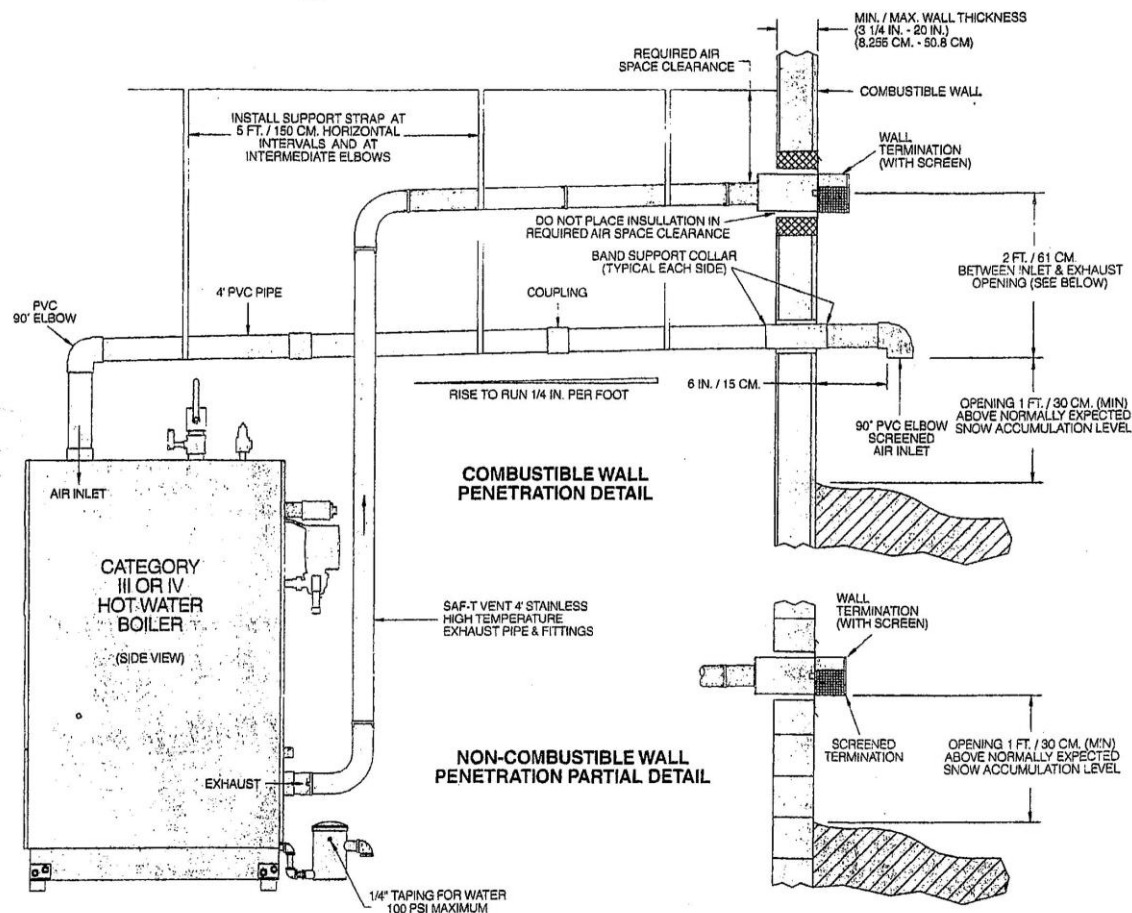
When penetrating a non-combustible wall, the hole through the wall must be large enough to maintain the pitch of the vent and provide sealing.

Use adhesive material to seal around the vent on both sides of the wall.  
When penetrating a combustible wall, a wall thimble must be used. See next page Figure 14 for installation instructions.

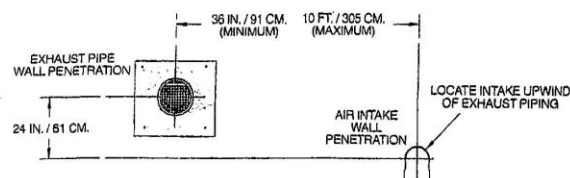
Minimum wall thickness through which vent system may be installed is 3 1/4".  
Maximum wall thickness through which vent system may be installed is 20 inches.

Figure 13

## Typical Combustible Wall Penetration Detail



## AIR INTAKE & EXHAUST PIPES WALL PENETRATION CLEARANCES

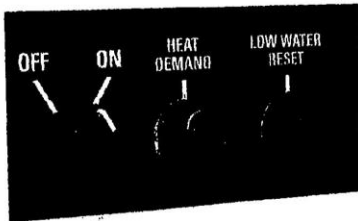


# Installation

## Installation Checkpoints

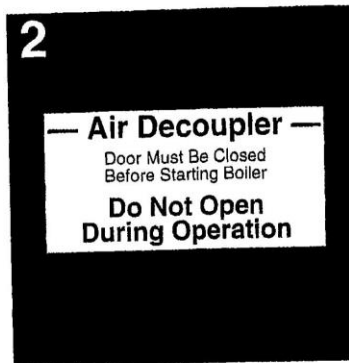
1. Before Starting The Boiler: Do not turn on the boiler unless it is filled with water as shown by indicating light on panel box.

1



2. Check that the front door of the air decoupler box is closed.

2

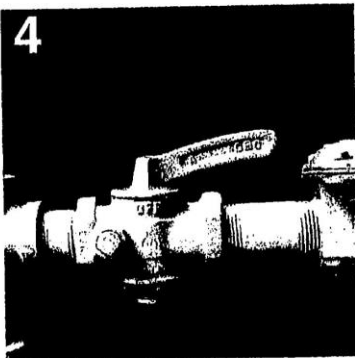


3. Set the thermostat to the desired setting.

3

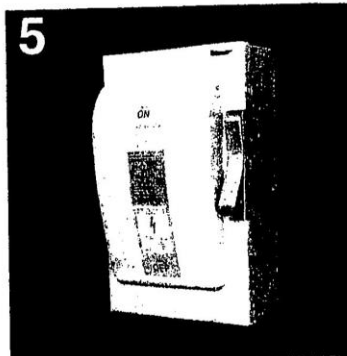


4



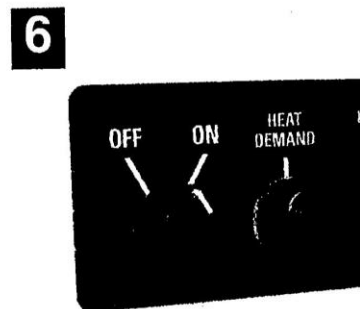
4. Open the manual shut off gas valve

5



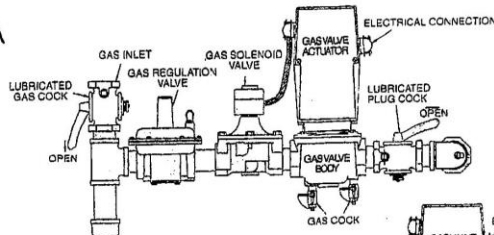
5. Close the circuit breaker or the fuse disconnect.

6

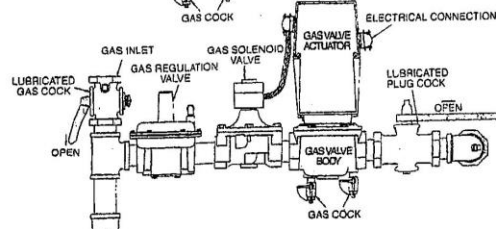


6. Turn the on-off switch to "ON"

AGA



CGA



### Rating The Boiler

After the boiler has been operating for about 15 minutes check gas input rate to be sure boiler is operating at design capacity

Measure Gas Flow Rate:  
Turn off the boiler and the manual gas shutoff valve. Remove manifold (downstream) pressure test plug from the 90 degree elbow.



Figure 16

## Installation

### After Installation/Prior to Start-Up (continued)

At this point, the system has been initially filled. However, air pockets may still remain at high points in the system and in heating loops above the level of the combination shut-off/purge valve. It is quite possible, depending on the particular system that all piping above the combination shut-off/purge valve still contains nothing but air. If manual vents are installed on the system high points, these should be opened to vent these locations. When only water is discharged from all vents, the initial purging is complete.

f. Open the combination shut-off/purge valve (keep the vent closed). With the gas shutoff valve closed, turn on power to the boiler and operate the circulator. Circulate the system water for approximately 30 minutes to move all air to the automatic air

separation point.

g. Again, open manual air vents at high points of heating loop until a constant stream of water is discharged from the vent. Close the vent and make sure it's watertight. Repeat procedure for all high points and for every zone.

### WARNING

Never leave an opened manual air vent unattended. In the event an opened vent is left unattended, water damage could occur.

h. Check temperature/pressure indicator reading, which should equal the pressure reducing (fill) valve set pressure. No more water should be entering the system. Close the shutoff valve on the cold water fill line.

i. Visually inspect all pipe joints and equipment connections for leaks. If necessary, drain system, repair leaks and refill/purge the system. If no pressure drop is detected for a period of two hours under pressure, the system may be considered water tight.

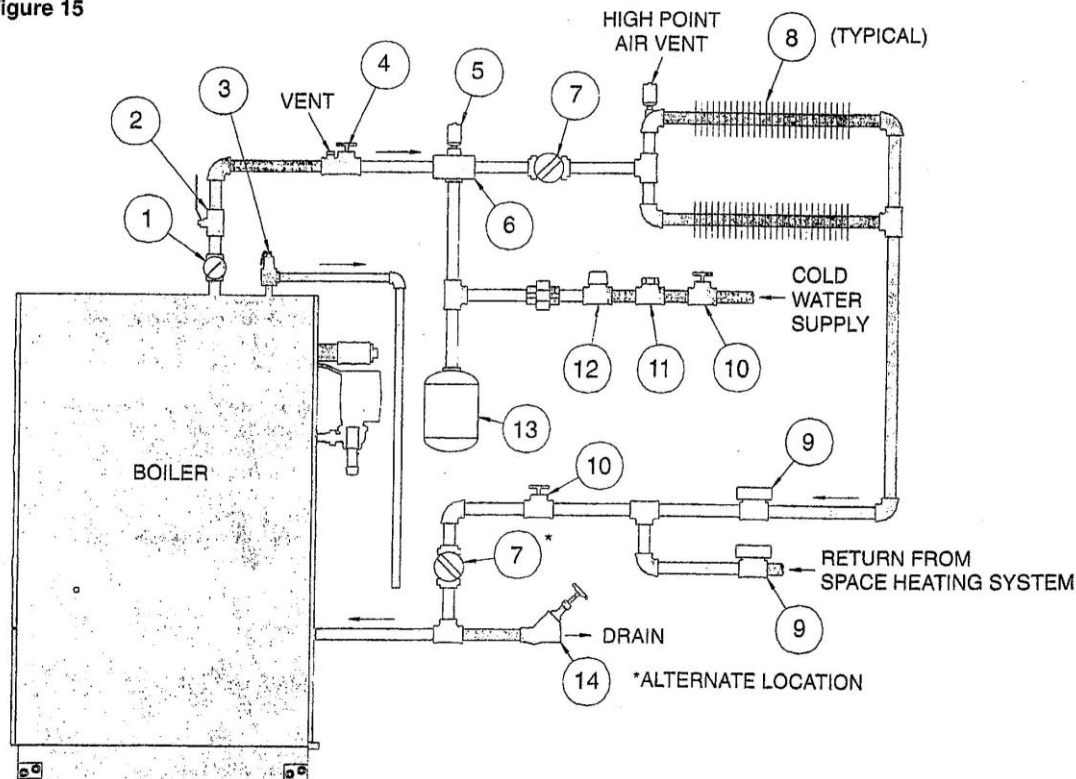
j. When purging is completed, make sure the following are open—combination shut-off/purge valve, shutoff valve to pressure reducing (fill valve), shutoff valve in cold water fill line, and shutoff valve in return line.

k. Make sure the following are closed—all drain cocks, the vent on the combination shut-off-purge valve, and all manual vents. Reset zone valves to normal mode of operation and turn off power to boiler.

2. Open gas shutoff valve, allowing gas to flow to boiler.

Piping Configuration for System Purge (represents any heating load)

Figure 15



### Glossary

1. Temperature/Pressure Indicator
2. Hot Water Outlet Stop Valve
3. Safety Valve
4. Combination Shut-off-Purge Valve
5. Automatic Air Vent

6. Air Scoop
7. Circulator
8. Heat User
9. Zone Valve
10. Stop Valve

11. Check Valve
12. Pressure Reducing Valve
13. Diaphragm Expansion Tank
14. Drain Valve

**Section**

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**3**

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**Operation-25**

## Installation

Figure 16. Replace the plug with a 1/4 N.P.T. to 1/4" compression (or flare) adaptor and a short piece of tubing. Connect one piece of rubber hose from tubing to a manometer. Open the gas shutoff valve (gas cock) and turn on boiler. The following pressures are for reference only. Depending on the calorific value of the gas, and length of intake and vent piping, the actual pressure can be significantly higher or lower.

**Pressure for Natural gas** should measure 1 to 3" WC at the last elbow on the gas train at high fire, or full rate on on/off units. For more specific information, consult the test fire report which is included in the User Manual. There should be 7" WC at the inlet of the train. **Pressure for propane** should be 11" WC at inlet to the gas train.

### To Correct Input—Adjust Gas Pressure Regulator

Turn boiler off and remove cap from regulator. Figure 17 Turn adjusting

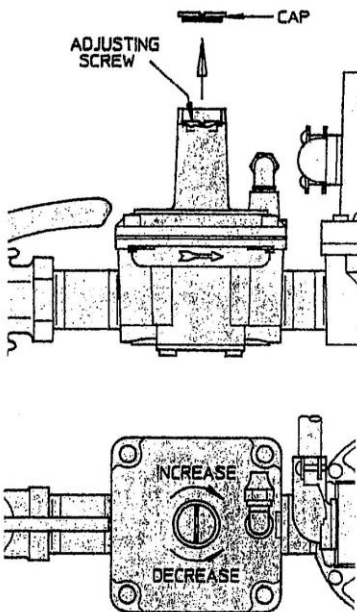


Figure 17

### NOTE

It is recommended that an authorized Fulton Pulse start up agent or your gas utility make any required gas input adjustments.

screw clockwise to increase gas flow. Turn adjusting screw counter clockwise to decrease gas flow. Always replace cap before turning on boiler. Vent must terminate outdoors. A flow restricting bleed valve shall not be used.

### For High Gas Pressure Installations

In high gas pressure areas, it is good practice to step the pressure down as described below.

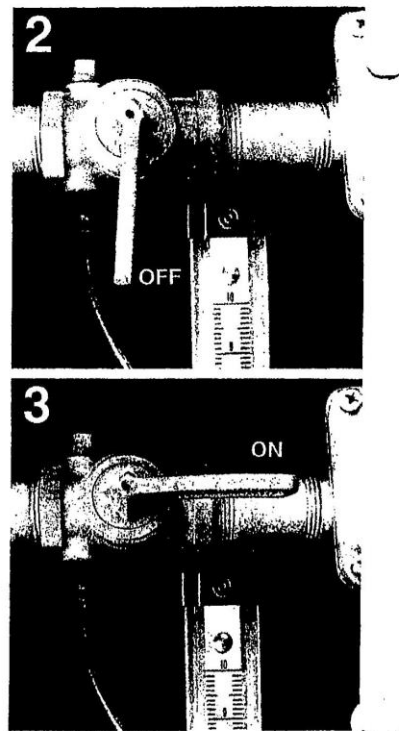
1. Locate the stepdown regulator as far away from the pulse boiler as possible.
2. When stepping down from more than 2 psig to 7" WC, the stepdown should be done in two steps:
  - a) Reduce the pressure to 2 psig.
  - b) Reduce the pressure from 2 psig to 7" WC
3. The preferred regulator for this application is the Fisher S Series with lock up capability.
4. Consult your Authorized Fulton Representative for selection.

This recommendation is made to avoid the regulators chattering. It is also recommended to avoid high lockup pressures which can cause light off reliability problems.

Regulators, other than specified, may be acceptable, but it has been our experience that the above listed regulators operate the most satisfactorily.

### To Check for High Gas Pressure

1. The boiler and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.5 kPa).
2. Turn off boiler and turn off gas supply to manual gas shutoff valve. Remove the pressure test plug on manual shutoff gas valve. Replace with a 1/4" NPT to 1/4" compression (or flare) adaptor and a short piece



of tubing. Connect a piece of rubber hose from tubing to one side of manometer.

3. Open gas supply to manual gas shutoff valve and turn on boiler. After combustion starts, manometer should read 7" WC (178mm).
4. If reading exceeds 7.0" WC. (178mm) install regulator upstream of gas valve to reduce pressure. If pressure is less than 6" WC, consult your gas company for adjustment 7 to the supply pressure.

### Before Leaving The Installation

Check all controls to insure they are operating properly. Cycle boiler several times by raising and lowering operating temperature on the thermostat.

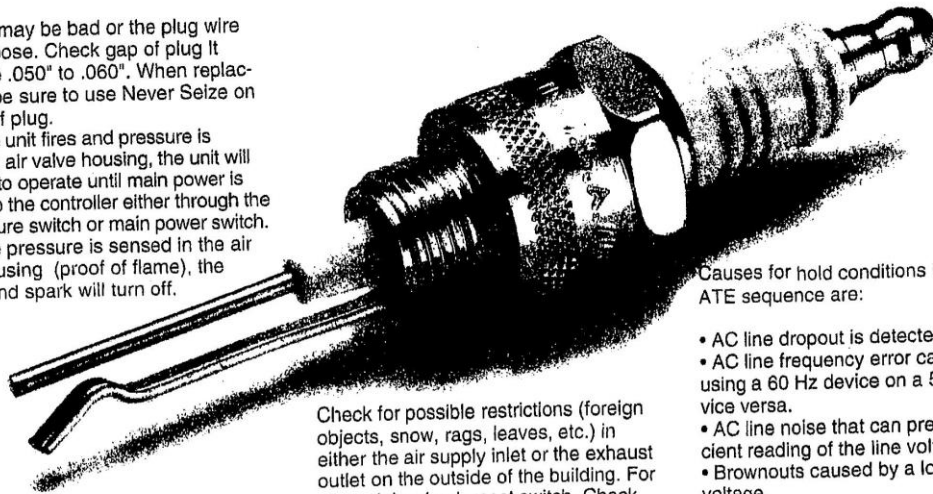
Make sure installation complies with all applicable codes.



## Operation

The plug may be bad or the plug wire may be loose. Check gap of plug it should be .050" to .060". When replacing plug be sure to use Never Seize on threads of plug.

When the unit fires and pressure is sensed in air valve housing, the unit will continue to operate until main power is shut off to the controller either through the temperature switch or main power switch. Once the pressure is sensed in the air valve housing (proof of flame), the blower and spark will turn off.



Causes for hold conditions in the INITIATE sequence are:

- AC line dropout is detected.
- AC line frequency error caused by using a 60 Hz device on a 50 Hz line or vice versa.
- AC line noise that can prevent a sufficient reading of the line voltage inputs
- Brownouts caused by a low line voltage.

The INITIATE sequence will be initiated if the operating control input is de-energized during PREPURGE.

### STANDBY

The RM7865 is ready to start an operating sequence when the operating control input determines a call for heat. The burner switch, limits, operating control, inter-locks, critical loads and all microcomputer monitored circuits must be in the correct state for the RM7865 to continue into the PREPURGE sequence.

### NORMAL START-UP PREPURGE

The RM7865 provides a PREPURGE timing of 35 seconds with power applied and the RM7865 operating control indicating a call for heat.

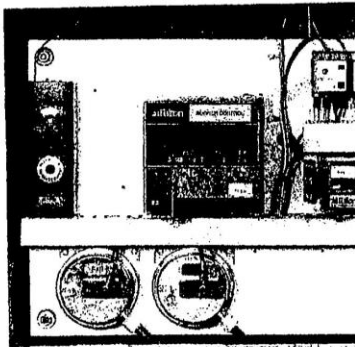
- a. Combustion pressure switch, purge fan switch ILK, burner switch, limits, operating control and all microcomputer monitored circuits must be in the correct operating state.
- b. The fan motor output, terminal 5, is powered to start the PREPURGE sequence.
- c. The purge fan switch ILK input must close within three seconds to start the 35 second PRE-PURGE; otherwise, lockout occurs.

### IGNITION TRIALS

- a. Combustion Pressure Establishing Period (CPEP):

1. The ignition transformer, terminal 10, is energized two seconds prior to opening of the main fuel valve.

### Do Not Change Pressure Switch Settings.



Check for possible restrictions (foreign objects, snow, rags, leaves, etc.) in either the air supply inlet or the exhaust outlet on the outside of the building. For all models, check reset switch. Check for proper water level in the boiler (low water cutoff).

**If the boiler still does not operate, follow these instructions to shut off the gas and call your service technician and/or gas supplier:**  
Set the thermostat to the lowest setting. Turn off all electric power to the boiler if service is required. Turn gas cock knob clockwise to "OFF" a quarter of a turn. Figure 18, Page 26.

### Emergency Shut Down

1. Shut off electric power to the boiler.
2. Shut off the main gas valve.

## Sequence of Operation

### Wiring Diagram Figure 20 INITIATE

The RM7865 enters the five second INITIATE sequence when the Relay Module is powered. The RM7865 can also enter the INITIATE sequence if the Relay Module verifies voltage fluctuations of +/-10-15% or frequency fluctuations of +/-10% during any part of the operating sequence. The INITIATE sequence lasts for five seconds unless the voltage or frequency tolerances are not met. When the tolerances are not met, a hold condition will be initiated and will be displayed on the optional display module for at least five seconds. When the tolerances are met, the INITIATE sequence will restart. If the condition is not corrected and the hold condition exists for four minutes, the RM7865 will lockout.

### CAUTION

Should overheating occur or the gas supply fail to shut off, shut off the gas supply at a location external to the boiler.

### If The Boiler Does Not Start

Check that the temperature control is set higher than water temperature in the boiler. Check for tripped circuit breaker or blown fuse.



## Operation

Post these instructions in an appropriate place near the boiler and maintain in good legible condition.

### WARNING

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

The Fulton pulse combustion boilers do not have a pilot. They are equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand. BEFORE OPERATING smell all around the boiler area for gas. Be sure to smell next to the floor as some gas is heavier than air and will settle. IF YOU SMELL GAS: Do not 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, and then follow your gas supplier's instructions. If you cannot reach your gas supplier, call the fire department. Use only your hand to turn the gas cock knob. Never use tools. If the knob will not turn by hand, don't try to repair it. Call a qualified service technician. FORCE OR ATTEMPTED REPAIR MAY RESULT IN A FIRE OR EXPLOSION.

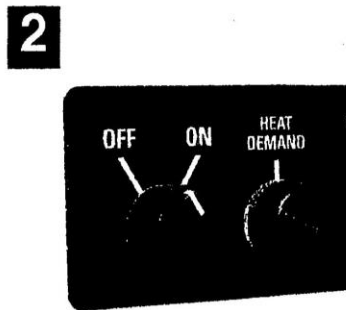
### NOTE

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/or gas control(s) which has been under water.

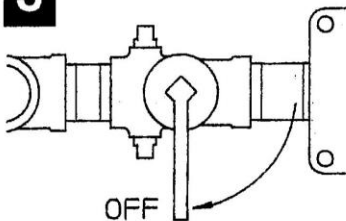
### Before operating your Fulton Pulse Combustion Hydronic Heating Boiler:

**STOP! Make sure you have read and followed all previous safety information.**

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the boiler.
3. Turn gas cock knob clockwise to "OFF". Figure 18. (This gas cock knob is also the emergency shut-off device.)



3 Figure 18



This boiler is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow safety information. If you don't smell gas, go to next step.

## Starting the Fulton Pulse Combustion Hydronic Heating Boiler

### NOTE

Prior to starting, make sure the procedure for purging the heating system has been accomplished as detailed in Section 2.

Open the main gas cock knob counter-clockwise 1/4 turn to "ON",

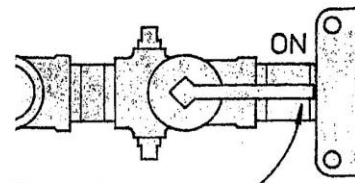
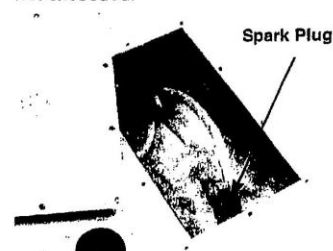


Figure 19.

Turn on all electric power to the boiler. Set thermostat to desired position. Turn operating switch on boiler to "ON" position. The boiler is energized and 35 second prepurge begins. After 35 seconds the spark ignitor and gas valve (2 seconds later) are ener-



gized. If pressure is not sensed in air valve housing within 4 seconds, gas and spark are de-energized. The control will recycle to prepurge, only if the selected number of retry attempts is not exceeded.



If after 37 seconds the gas valve opens but the boiler does not start, check the spark plug to be sure it is working properly.

Continued

## Operation

2. The main fuel valve, terminal 8, is energized for four seconds. Combustion pressure must be proven by the end of the six seconds of CPEP

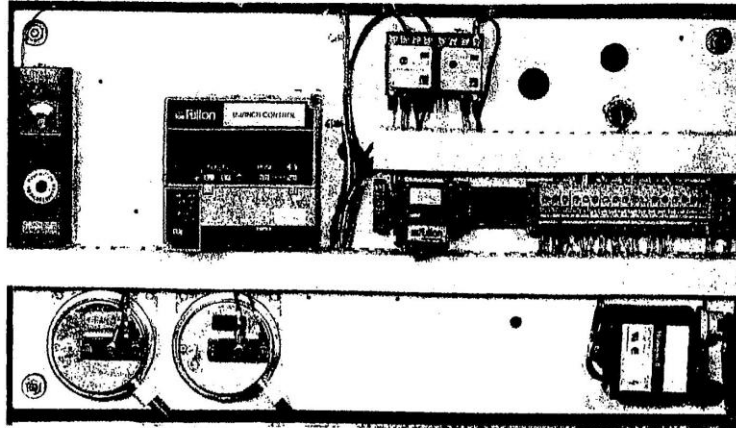
allow the sequence to continue to the Combustion Pressure Stabilization Period (CPSP). If combustion pressure is not proven by the end of CPEP, the RM7865 will recycle to PREPURGE.

b. Combustion Pressure Stabilization Period (CPSP):

1. If the combustion pressure switch is energized at the end of CPEP, the RM7865 enters an eight second Combustion Pressure Stabilization Period. If the combustion pressure switch ILK opens, the RM7865 will recycle to PREPURGE only if the selected number of retry attempts is not exceeded. After the eight seconds, the RM7865 will enter the RUN period.

### RUN

1. After the CPSP, the RM7865 will enter into the RUN sequence. The RM7865 will remain in RUN until the controller input, terminal 6, opens, indicating that the demand is satisfied or a limit has opened. If the combustion pressure switch ILK opens, the RM7865 will enter the PREPURGE period. The fan motor is de-energized during RUN.



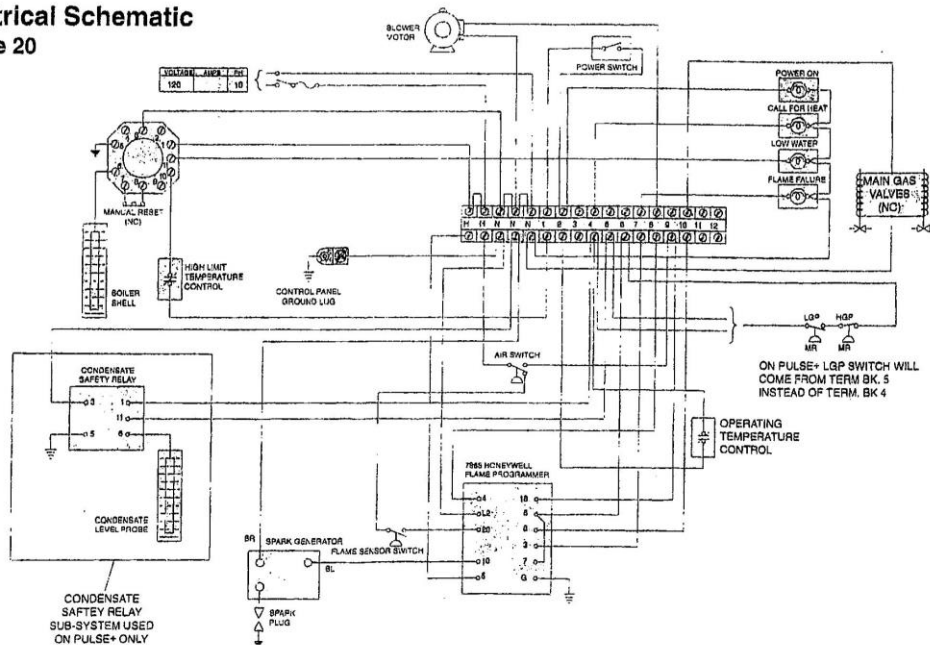
### POSTPURGE

The RM7865 provides a 35 second POSTPURGE following the completion of the RUN period; and the fan motor output is powered to drive all products of combustion and any unburned fuel from the combustion chamber. The RM7865 will also enter POSTPURGE if the operating control input is de-energized during CPEP, CPSP or RUN.

1. The main fuel valve and ignition, terminals 8 and 10, are de-energized. The purge fan switch is energized and the POSTPURGE period begins.

2. After the 35 second POSTPURGE period is completed, the RM7865 returns to STANDBY.

Electrical Schematic  
Figure 20



Section

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**4**

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Maintenance-29

# Maintenance

## NOTE

Your Fulton Pulse Combustion Hydronic Boiler has been designed for years of trouble-free performance. To ensure the continued safety and efficiency of the boiler, the schedule of maintenance outlined in this section should be adhered to. **The boiler should be inspected annually. All service should be performed by a certified contractor.**

## Cleaning of Flue Gas Passageways and Exhaust

It is extremely rare for a Fulton Pulse Boiler to require cleaning of flue gas passageways. If the boiler appears sootied, contact your local Fulton Pulse Boiler representative.

## Before Each Heating Season

Check air intake and exhaust vent outlet for any blockage or restrictions.  
Check for any leaks in the heating system or boiler piping.  
Check the air intake and exhaust vent piping for sagging.  
Follow purge procedure outlined in Section 2 of this manual.  
Follow start up procedure outlined in Section 3 of this manual.  
With the boiler running, check for visible cracks at fittings and joints.

## WARNING

Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

## Recommended Daily Maintenance

Make an inspection of the boiler and system for leaks or any unusual condition in the operation of the controls and circulating pump.

## Recommended Monthly Maintenance

Clean water traps and strainers in gas lines.

## Recommended Quarterly Maintenance

Inspect the air intake and exhaust vent pipes for broken seals at the joints. Inspect the screens on the air intake and exhaust vent terminal and make sure they are free of dirt or any foreign matter which may block the terminals.

## Recommended Six Month Maintenance

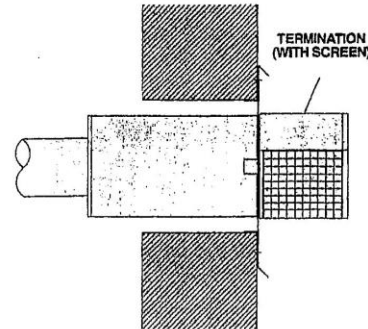
Clean probe on top of boiler shell. Make sure there is no pressure on boiler during the removal of the probe. Remove the probe, clean with very fine emery cloth and replace it.

## Recommended Annual Maintenance

Change the spark plug.  
Clean flapper valves.  
Perform flue gas analysis.

## NOTE

If for any reason, the air intake or exhaust vent piping is disassembled, reassemble the piping in accordance with the installation procedure outlined in the installation section of this manual.



## Maintenance

### Troubleshooting

This troubleshooting guide will assist in the diagnosis and correction of minor field problems. It should be used in conjunction with the unit wiring diagram. In any case requiring additional assistance, the Fulton Service Department should be contacted.

Problem	Cause	Check
<b>Starting or Purge Failure</b>	Power Supply	Check fuse or circuit breaker. Reset or replace, as necessary.
	On/Off Switch	For all models check to see if on/off switch is illuminated.
	Bad Air Switch	Try adjusting sensitivity of switch or replace.
	Bad Fan	Check fan for operation. Replace if necessary.
	Main Control	Check for bad ground, or bad control. Replace control.
	Plugged Air Inlet	Check for blockage of air inlet line and remove.
	Spark Plug	Check for carbon build up, moisture, cracks in porcelain. Check for proper gap (.050" to .060" for Champion sparkplug). Clean or replace as necessary.
	Loose Wire Connection	Check connections to all components.
	Temperature Control	Check that the operating temperature control is set higher than temperature of the boiler water.
	Loose Tubing	Check to see if the copper tubing on the air valve housing is securely connected.
<b>Flame Failure</b>	Power Supply	Check fuse or circuit breaker. Reset or replace as necessary.
	Main Control	Check for bad ground or bad control. Replace if necessary.
	Proof of Flame Switch	Check adjustment of pressure switch No. 2. It should be set at 1.5" W.C. Replace if necessary.
	Loose Wire Connection	Check connections to all components.
	Air Flappers	Check to see if the flappers on the air valve plate are placed correctly (covering the holes).
	Gas Flappers	Check to see if the flappers on the gas valve plate are placed correctly (covering the holes).
	Plugged Exhaust Line	Check for a blockage of the exhaust piping and remove.
<b>In All Cases:</b>		<b>Reset main control in panel box on flame failure.</b>
<b>Poor Combustion</b>	Air Flappers	Check to see if the flappers on the air valve plate are placed correctly (covering the holes).
	Gas Flappers	Check to see if the flappers on the gas valve plate are placed correctly (covering the holes).
	Plugged Air Inlet	Check for blockage of air inlet line and remove.

**Section**

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**5**

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**Parts and Warranty-33**



## Replacement Parts (available from authorized Fulton Representatives)

Part Number	Description	Models PHW					Models PHW+		
		300	500	750	1000	1000P	650	950	1400
2-30-000232	Air switch-purge fan	x	x	x	x	x	x	x	x
2-30-001350	Air switch-proof of flame	x	x	x	x	x			
2-30-001334	Air switch-proof of flame						x	x	x
2-12-000551	Air flapper gaskets	x	x	x	x	x	x	x	x
<b>Air Flapper Spacers and Valve Assemblies*</b>									
2-22-000181	Air flapper spacer-.030								
2-22-000182	Air flapper spacer-.050								
2-22-000183	Air flapper spacer-.040								
7-37-000120	Air flapper valve assy								
7-37-000150	Air flapper valve assy								
7-37-000124	Air flapper valve assy								
7-37-000123	Air flapper valve assy								
2-40-000251	Aquastat-operating temp.	x	x	x	x	x	x	x	x
2-40-000250	Aquastat-high limit-m/r	x	x	x	x	x	x	x	x
2-40-000220	Gas valve actuator w/P.O.C.(IRI)	x	x	x	x	x	x	x	x
2-40-000214	Gas valve actuator (CSD-1)	x	x	x	x	x	x	x	x
2-30-000310	Gas valve—1" body	x	x	x			x		
2-30-000311	Gas valve—1-1/4" body				x	x		x	
2-40-000253	Gas valve—1-1/2" body								x
2-30-000306	Gas solenoid valve-1"	x	x	x			x		
2-30-000307	Gas solenoid valve- 1-1/4"				x	x		x	
2-30-000308	Gas solenoid valve- 1-1/2"								x
2-30-000750	Gas pressure regulator-1RV61	x	x	x			x		
2-30-000105	Gas pressure regulator-1-1/4"RV61				x	x		x	
2-30-000107	Gas pressure regulator-1-1/2"RV81								x
7-37-000210	Gas flapper valve assy	x	x				x		
7-37-000215	Gas flapper valve assy			x				x	
7-37-000220	Gas flapper valve assy				x	x			
2-12-000552	Gas flapper gaskets	x	x	x	x	x	x	x	x
7-57-000110	Gas decoupler	x	x				x	x	
7-57-000112	Gas decoupler			x					
7-57-000115	Gas decoupler				x	x			x
2-35-000687	Gas decoupler compression ell	x	x	x	x	x	x	x	x
<b>Gas Orifices*</b>									
2-20-000131	Gas orifice .500								
2-20-000201	Gas orifice .525								
2-20-000212	Gas orifice .570								
2-20-000202	Gas orifice .593								
2-20-000214	Gas orifice .651								
2-20-000132	Gas orifice .690								
2-20-000203	Gas orifice .718								
2-20-000204	Gas orifice .735								
2-30-000201	Pres.Temp.Gauge 0-320 0F 0-75PSIG	x	x	x	x	x	x	x	x
2-30-000203	Pres.Temp.Gauge 0-3200F 0-200PSIG	x	x	x	x	x	x	x	x
2-30-000445	Purge blower motor/fan	x	x	x	x	x	x	x	x
2-40-000271	RM7865 Programmer	x	x	x	x	x	x	x	x
2-40-000270	Base for RM7865	x	x	x	x	x	x	x	x



## Replacement Parts (available from authorized Fulton Representatives)

Part Number	Description	Models PHW					Models PHW+		
		300	500	750	1000	1000P	650	950	1400
2-40-000272	Display Module for 7865	x	x	x	x	x	x	x	x
2-30-000120	Safety valve 3/4" x 1" 30#	x	x	x	x	x	x	x	
2-30-000121	Safety valve 3/4" x 1" 60#	x	x	x	x	x	x	x	x
2-30-000145	Safety valve 3/4" x 1" 100#	x	x	x	x	x	x	x	x
2-30-000166	Safety valve 3/4" x 1" 160#	x	x	x	x	x	x	x	x
2-30-000851	Safety valve 1" x 1" 30#								x
2-20-000090	Spark plug	x	x	x	x	x	x	x	
2-40-000980	Spark plug wire	x	x	x	x	x	x	x	x
2-45-000026	Spark plug connector	x	x	x	x	x	x	x	x
5-11-400090	Spark plug bushing	x	x	x	x	x	x	x	x
2-40-000185	Spark generator	x	x	x	x	x	x	x	x
2-45-000101	Terminal block	x	x	x	x	x	x	x	x
2-40-000131	Ice cube relay	x	x	x	x	x	x	x	x
2-40-000096	Base for ice cube relay	x	x	x	x	x	x	x	x
2-40-000421	Low water safety relay	x	x	x	x	x	x	x	x
2-40-000423	Base for LWCO relay	x	x	x	x	x	x	x	x
2-40-0002000	Motor starter relay - 20 amp								
2-12-000090	Retainer spring for LWCO relay	x	x	x	x	x	x	x	x
2-45-000304	Remote/off/local switch light 3 position	x	x	x	x	x	x	x	x
2-45-000307	On/off switch light - green	x	x	x	x	x	x	x	x
2-45-000305	Low water reset push button light - red	x	x	x	x	x	x	x	x
2-45-000411	Flame failure light-red	x	x	x	x	x	x	x	x
2-45-000412	Call for heat light - green	x	x	x	x	x	x	x	x
2-45-000203	Light bulb only	x	x	x	x	x	x	x	x
2-45-000306	Flame failure light	x	x	x	x	x	x	x	x
<b>Accessories</b>									
2-45-000212	H-O-A Switch	x	x	x	x	x	x	x	x
5-60-000130	Instruction Manual	x	x	x	x	x	x	x	x
4-57-000440	Condensate drain kit	x	x	x	x	x	x	x	x
2-10-000168	Condensate drain float assembly	x	x	x	x	x	x	x	x
2-35-000863	Isolation cube	x	x	x	x	x	x	x	x
2-35-000864	Isolation spring-green	x	x				x		
2-35-000865	Isolation spring-grey			x	x	x		x	x
2-35-000612	Seismic iso spring	x	x				x		
2-35-000611	Seismic iso spring			x	x	x		x	x
2-35-000861	2" x 14" flex cont.-water	x	x				x	x	
2-35-000862	2-1/2" x 16" flex cont.			x	x	x			x
2-35-000531	1" gas flex cont.	x	x	x			x		
2-35-000532	1-1/4" gas flex cont.				x	x		x	x
2-30-000498	FS 43 MM Flow switch	x	x	x	x	x	x	x	x
2-45-000040	Knockout cover	x	x	x	x	x	x	x	x
4-57-000500	Air spacer kit (old style)	x	x	x	x	x			
2-23-000170	Paint-Tech Tan spray-4 oz.	x	x	x	x	x	x	x	x
4-23-000016	Paint-Tech Tan -quart	x	x	x	x	x	x	x	x
2-35-000798	PVC Air-intake adaptor - 3"	x	x						
2-35-000799	PVC Air-intake adaptor - 4"			x	x	x	x	x	x
2-30-000831	4" S.S. muffler-intake	x	x	x	x	x	x	x	x
2-30-000833	4" S.S. muffler-exhaust	x	x	x	x	x	x	x	x
2-35-000033	3" flex connector-intake	x	x						
2-35-000061	4" x 3" flex connector-intake	x	x						

\*Air flapper spacers, air flapper valve assemblies, and gas orifices must be requested by contacting your authorized Fulton representative.  
Please advise serial number on purchase order or quote request.



## Replacement Parts (available from authorized Fulton Representatives)

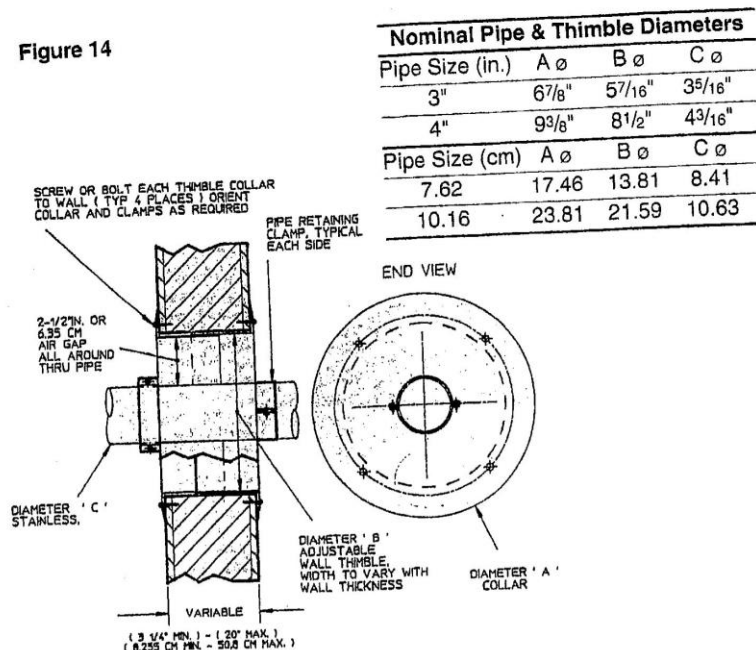
Part Number	Description	Models PHW					Models PHW+		
		300	500	750	1000	1000P	650	950	1400
2-35-000059	4" flex connector-intake	x	x	x	x	x	x	x	x
4-57-000162	3" PVC term. w/screen-coupling	x	x						
4-57-000160	3" PVC term. w/screen-45 deg. elbow	x	x						
4-57-000166	3" PVC term. w/screen 90 deg. elbow	x	x						
4-57-000168	4" PVC term. w/screen-coupling	x	x	x	x	x	x	x	x
4-57-000164	4" PVC term. w/screen 45 deg. elbow	x	x	x	x	x	x	x	x
4-57-000170	4" PVC term. w/screen-90 deg. elbow	x	x	x	x	x	x	x	x
4-57-000510	Panel retrofit isolation kit	x	x	x	x	x			

### Vent Material - 4" Single Wall Stainless Steel

2-35-000987	Roof sup/jack assy-5480C1
2-35-000812	Vent termination-5490C1
2-35-000571	4" Pulse adapter-7401FUL
2-35-000810	3" x 4" increaser-7374GC
2-35-000583	4" x 3" decreaser-7473
2-35-000983	Rain cap-7400GC
2-35-000980	4" x 6" vent-7401GC
2-35-000981	4" x 12" vent-7402GC
2-35-000582	4" x 18" vent-7404GC
2-35-000573	4" x 24" vent-7405GC
2-35-000982	4" x 36" vent-7407GC
2-35-000574	4" x 48" vent-7408GC
2-35-000575	4" 45° elbow-7411GC
2-35-000576	4" 90° elbow-7414GC
2-35-000577	4" vent tee-7416GCD
2-35-000962	4" boot-tee-7416GCB
2-35-000960	4" drain cover-7417GCD
2-35-000985	4" support clamp-7423GC
2-35-000572	4" x 18" adjustable-7424GC
2-35-000984	4" strm/spt collar-7426GC
2-35-000961	4" boot tee w/3" take-off-7443GCB
2-35-000813	4" horizontal termination-7490GC
2-35-000986	16" x 16" cover plate-7473GC
2-35-000971	3" Rain cap-7300GC
2-35-000811	3" Pulse adapter-7301FUL
2-35-000972	3" x 6" vent-7301GC
2-35-000973	3" x 12" vent-7302GC
2-35-000974	3" x 18" vent-7304GC
2-35-000975	3" x 24" vent-7305GC
2-35-000976	3" x 36" vent-7307GC
2-35-000977	3" x 48" vent-7308GC
2-35-000991	3" 45 deg. elbow-7311GC
2-35-000992	3" 90 deg. elbow-7314GC
2-35-000993	3" vent tee-7316GC
2-35-000994	3" vent boot tee-7316GCB
2-35-000995	3" vent tee cover w/drain 7317GCD
2-35-000997	3" x 18" adjustable-7324GC
2-35-000998	3" horizontal termination-7390GC
2-35-000996	3" horizontal support-7323GC
2-60-000114	Hi temp. sealant-10 oz.
2-Misc	7000RTV Sealant-5 oz.
2-Misc	7000RTVL Sealant-10 oz.

## Installation

Figure 14



### Wall Thimble Installation

A 9" diameter thimble is inserted through the wall from the outside. Secure the outside flange to the wall with nails or screws, and seal with adhesive material. Install the inside flange to the inside wall, secure with nails or screws, and seal with adhesive material. Pass the vent pipe through the thimble from the outside and join to the rest of the vent system. Seal the pipe to the thimble flange with adhesive material. Figure 14. Install two pipe retaining clamps around the intake as well as vent pipes on both ends of the wall thimble (on the inside and outside of the wall) through which intake and vent pipes are passed when tightened securely. They will prevent the intake and vent pipes from being pushed or pulled.

### Horizontal Vent Termination

The vent termination is joined to the vent pipe outside the wall. Use the same joining procedures for vent pipe and fittings. The termination of the vent system must be at least 12" above the finished grade, or at least 12" above normal snow accumulation level (for applicable geographical areas). Refer back to previous page Figure 13. The termination of the vent system shall not be located in traffic areas such as walk-ways, adjacent buildings, openable windows and building openings unless the venting system is at least 7 feet above finished grade, (National Fuel Gas Code, ANSI Z223.1). The vent termination must be at least 4 feet (1.22m) horizontally from, and in no case above or below, unless a 4-foot (1.22m) horizontal distance is maintained from electric meters, gas meters, regulators, and relief equipment. The air supply inlet and exhaust outlet must be separated from 3ft. minimum to 10ft. maximum on the same wall. The exhaust outlet must be installed 2ft. minimum above and downwind from air supply inlet to prevent exhaust recirculation. Under certain wind conditions, some building materials may be affected by flue products expelled in close proximity to unprotected surfaces. Sealing or shielding of the exposed surfaces with a corrosion resistant material (such as aluminum sheet) may be required to prevent staining or deterioration.

Do not locate the vent termination too close to shrubbery as flue products may stunt or kill them.

### After Installation/Prior to Start-Up

#### WARNING

Do not attempt to start boiler before filling and purging boiler heating system. A dry fire will seriously damage the boiler and may result in property damage or personnel injury and is not covered by warranty.

1. Completely fill and purge the heating system using the following sample procedure.

#### NOTE

The following purge procedure is applicable to the piping configuration as shown in Figure 15 on the following page.

- a. Close combination shutoff/purge valve in supply, all drain cocks, the shutoff valve for the pressure reducing (fill) valve, and all manual air vents.
- b. Open all other system shutoff valves one of the zone valves, the vent on the combination shutoff / purge valve, and the shutoff valve to the pressure reducing (fill) valve.
- c. Water will now begin to fill the system. Air will escape through the vent on the combination shutoff/ purge valve. Continue filling until a constant stream of water (no bubbling) is discharged from the vent.
- d. Close the zone valve on the purged loop, and open the zone valve on the next loop to be purged. When all air has escaped and only water is discharged, close the zone valve. When all zones have been purged. (one at a time), close the vent on the combination shutoff/ purge valve.