Installation Instructions
Boiler Burner Unit

Models
PK 400, PK 440, PK 450
SPK 600, PK 750, K950, K1200
(For Hot Water Heating Systems)

Specifications

MODEL	NOZZLE SIZE GPH + TYPE	HEATING CAPACITY BTUH	NET OUTPUT BTUH	NET OUTPUT SQ. FT.	BECKETT BURNER	WATER CAPACITY GAL.	SMOKE OUTLET SIZE	CHIMNEY SIZE	SHIPPING WEIGHT POUNDS
PK400	.50-80S	61000	53000	350	AFG76XN	13	6	8x8x15	395
	.65-70S	79000	69000	460					
	.75-70S	91000	79000	525					
PK440	.85-70S	102000	8900	592	AFG76XN	12.5	6	8x8x15	435
	1.00-70S	120000	105000	697					
	1.10-70S	132000	115000	763					
PK450	.85-70S	104000	90000	600	AFG76XN	20	6	8x8x15	475
	1.00-70S	122000	106000	707					
	1.10-70S	134000	117000	780					
SPK600	1.25-80S	150000	131000	870	AFG76YB	22	6	8x8x15	575
	1.35-80S	163000	142000	945					
PK750T	1.35-70S	161000	140000	930	AFG76YB	24	7	8x8x15	640
K950T	1.75-70S	210000	182600	1220	AFG76XO	36	8	8x8x15	815
K1200T	2.25-70S	252000	219130	1460	AFG76XP	36	8	8x8x20	815

Installation Instructions

CAUTION:

1. *Installer must be a trained, experienced serviceman.*
2. *Inspect the boiler, jacket and all components to be sure damage has not occurred in shipment. If damage is evident you must file a claim with the freight carrier immediately.*
3. *Disconnect power supply before connecting wiring.*
4. *Refer to local installation codes for oil burning equipment, for recommended installation practice.*
5. *A complete heat loss calculation is necessary to choose the proper size unit to install. The boiler should be sized to within 25% of the actual heat loss of the structure.*
6. *Conduct thorough checkout when installation is complete.*

1) Place the boiler on a level non-combustible floor, preferably raised and as close to the chimney as possible. The following minimum clearances must be adhered to during installation and maintained thereafter to properly clean, inspect and service your boiler: sides and back - 6"; front - 24" and vent connector 18". Reduced clearance installations must

follow NFPA-31 guidelines. Be sure to allow clearance for removal of the turbulators. Turbulators are about 18" long.

2) For location of piping refer to the appropriate installation drawings in Figures 1, 2, 3, 4 and 5. The burner and aquastat are wired at the factory. The circulator is shipped loose. Wire the circulator as shown on the wiring diagrams in this manual. The circulator may be located on the return line as shown in the diagram or in the supply piping if desired. For piping and wiring of other system components see the manufacturer's installation manuals.

3) The tankless water heater may be piped as shown in Figure 4. A mixing valve, not supplied, must be used to reduce the water temperature at kitchen or bathroom taps. High temperature water for a dishwasher may be obtained by piping as shown in Figure 9. The nuts that secure the tankless coil flange should be tightened before the boiler is filled with water, after initial firing and once a year during the annual maintenance. DETERIORATION DUE TO COIL GASKET LEAKS WILL VOID THE WARRANTY.

4) The PK, SPK and K series boilers are equipped with an air eliminator feature that uses a dip tube construction on the boiler supply fitting. This feature allows quiet air free operation of your hot water system by assuring the removal of air pockets without the installation of Air Scoops to trap noisy air.

   The supply line or Riser tapping in the top of the boiler extends approximately 1" below the top or waterline of the boiler, thus allowing only air free water to enter the supply to the heating system. The air trapped in the top of the boiler is then purged through a 3/4" vent tapping to be released with an (1) automatic float vent (2) a manual vent or (3) piped into a conventional type expansion tank.

   Relief valve discharges and drain valve piping should be piped to a safe place of discharge. All plugs and water connections should be checked for leaks upon installation and annually.

5) Be certain the chimney is clean and free of obstructions. Connect boiler flue outlet to chimney using galvanized smoke pipe. The flue pipe should be pitched upward at least 1/4" per foot of run. Refer to Page 1 in this manual for proper size flue pipe for your model boiler. Use only elbows and straight sections. Tees may be used in a straight section in conjunction with a barometric draft regulator; however, they must not be used for a 90° turn. Each joint should be securely fastened with sheet metal screws. The flue pipe must not be inserted beyond the inside wall of the chimney. Install barometric draft regulator in the horizontal or vertical section of the flue pipe. The chimney should provide a minimum of .03 draft at the boiler flue outlet. A draft of .05 is ideal. The draft losses for PK, SPK and K Series Boilers are listed below.

MODEL	Firing Rate	Draft Loss
PK400	0.50GPH	.01
	0.65GPH	.02
	0.75GPH	.03
PK440	.85GPH	.010
	1.00GPH	.015
	1.10GPH	.025
PK450	.85GPH	.02
	1.00GPH	.025
	1.10GPH	.03
SPK600	1.25GPH	.020
	1.35GPH	.025
PK750	1.35GPH	.01
K950	1.75GPH	.02
K1200	2.25GPH	.025

6) The boiler room must be well ventilated to allow sufficient make-up air to support combustion. Lack of adequate combustion air may result in erratic operation of the burner, noisy combustion or fuel odors. Remember your need for outside air will be greatly increased if you have a vented dryer in the basement or other venting fans in the home. Boilers located in confined spaces shall be provided with two permanent openings, one near the top and one near the bottom of the enclosure. Each opening shall have a free

area of not less than one square inch per 1000 BTU per hour input rating of the boiler, freely communicating with interior areas having adequate infiltration from the outside.

7) Fill boiler and system with water. Be sure entire system has been purged of air and the desired pressure is obtained.

8) The boiler is shipped with a nozzle installed. Check the nozzle and change it if a different firing rate is desired. Connect burner to oil supply. Refer to fuel unit manufacturer literature for piping, connections, lift and tank installation.

9) Connect the electric supply to the boiler as indicated on the wiring diagrams. The wiring must be installed in accordance with the National Electrical Code and any other state and local codes.

10) One pipe oil supply line installations must be absolutely air tight or loss of prime may result. Maximum lift on one pipe installations is about 8 feet. See burner literature for two pipe installations. Install a shutoff valve and oil filter in the oil supply line. Locate shutoff valve close to tank with oil filter between valve and burner.

Operational Sequence

1) Boilers with Tankless Coil - This boiler is equipped with a combination aquastat control which has high and low limits to be set at 180° and 160° respectively by the installer. When room temperature falls below thermostat setting, thermostat calls for heat starting the burner and circulating pump. The burner and pump continue to operate until room heating requirements are satisfied (thermostat setting is reached), or until boiler water temperature reaches the high limit control temperature setting. If the high limit control temperature setting is reached, the burner shuts off and the circulating pump continues to operate until the room heating requirements are satisfied. If the thermostat continues to call for heat after the boiler water temperature has dropped below the temperature setting of the high limit control, the oil burner will start again, while the circulating pump will continue to run. The boiler water temperature is normally maintained at 160°F around the tankless coil by the operating control so that an abundance of hot water is available. If the boiler water temperature should fall below the operating control setting (160°F) the oil burner will be started again by that control (and the circulating pump will be prevented from operating) until the operating control setting is satisfied. See control manufacturers literature included in the data package for detailed wiring, operating and safety instructions.

2) Boilers Less Tankless Coil and PK440. This boiler is equipped with a combination aquastat control which has high and low limits to be set at 180° and 120° respectively by the installer. The control acts exactly as described for a boiler with a tankless coil except that the low limit is set lower since the boiler does not need to be kept hot to provide heat to the domestic hot water coil. By maintaining the boiler at or above 120° the system will remain warm enough to avoid cycles of hot and cold that can produce condensation which can cause deterioration of the boiler heat exchanger.

3) A cadmium sulfide flame scanner (cad cell) and relay are provided with the oil burner. The cad cell will stop the oil burner within a predetermined number of seconds if the fuel fails to ignite or if the flame goes out during operation. The oil burner will remain off until the red reset button on the relay has been pushed. **RESET MUST NEVER BE PRESSED MORE THAN ONCE DURING A SINGLE FLAME FAILURE.**

Start-Up and Check-Out Procedure

CAUTION

Only a trained, experienced serviceman should attempt the checkout procedure outlined below. Read the burner manufacturers instructions for start-up for special instructions and special features of the burner and control.

1) Combustion test equipment required for proper burner adjustment:

   a) CO_2 Analyzer
   b) Draft Gauge
   c) Oil Pressure Gauge 0-200 PSI
   d) Stack Thermometer
   e) Smoke Test Gun
   f) Vacuum Gauge 0-30 in. of Hg

2) In order to take flue gas samples for combustion testing a 1/4" hole must be drilled in the flue pipe between the boiler and the barometric draft regulator.

3) Open all shut-off valves in the oil supply line to the burner.

4) Set thermostats substantially above room temperature.

5) Check electrode settings and readjust air setting if required. Electrode settings are shown in the burner manual provided along with this manual. Burner settings are listed on the Service Man's Label attached to the boiler and on the Burner Unit specifications provided along with this manual.

6) Install pressure gauge in the 1/8" gauge port of the oil pump.

7) Turn on switch to start burner. If burner does not start immediately, you may need to reset the burner control. See the burner manufacturers instructions for control and reset features.

8) On one pipe systems bleed the oil pump as soon as burner motor starts. To bleed, attach a length of 1/4" O.D. clear plastic tubing to the end of the bleed plug and then loosen plug while holding an empty container under the tubing to catch all of the expelled oil. Bleed for at least 15 seconds after the oil stream is free of all air. If air is still evident in the bleed line you must check the oil lines, all fittings, filters and any other connections for tightness. Kinks in the oil lines will create undue high vacuum therefore they must be eliminated. When you are sure all air has been eliminated then close the bleed valve. Ignition should be instantaneous following the closing of this valve. If it is not, proceed to the trouble shooting guide to determine why the oil did not ignite.

9) FINAL ADJUSTMENTS OF THE BURNER MUST BE MADE USING PROPER COMBUSTION TEST EQUIPMENT. The air supply should be adjusted by loosening the lock screw and moving the bulk air band or shutter so that the CO_2 measured in the stack ahead of the draft control should be a minimum of 10% and a maximum of 12%. At the same time the draft should be adjusted to negative .01"- negative .02" W.C. over the fire. Install a second barometric draft control if necessary to reduce excessive draft. The smoke should also be checked with a smoke gun and found to be zero.

10) Check operation of the cad cell relay by removing one cad cell wire from external terminal during the flame cycle. The relay should cut the burner off in approximately 15 seconds, depending on the control provided. See the burner manufacturers manual provided in the data pack.

Servicing the Boiler/Burner Unit

1) Burner Components: If replacement of burner parts is necessary, always use parts recommended by the manufacturer. Specify part number and description when ordering.

2) Electrode settings are important for reliable ignition of the oil. Check to be sure the settings are in accordance with the instructions provided in the burner manual.

3) Nozzles: The nozzle specifications listed in the manual are the result of years of exhaustive engineering testing. ANY NOZZLE REPLACEMENT SHOULD BE OF THE EXACT TYPE AS LISTED IN THE SPECIFICATIONS. Use extreme care in handling nozzles to avoid scratches or dirt that could cause leaks or affect the oil spray pattern.

4) Fan and blower housing should be kept clean of dirt and lint. If heating unit is located near an unvented dryer, special care must be taken so that lint does not clog the burner air inlets.

5) Replace the oil filter cartridge annually.

6) Cleaning the Boiler: Cleaning should be done only by a trained, experienced serviceman.
   1. Turn power off to the boiler.
   2. PK750, K900 and K1200. Remove rear jacket panel, rear hot head and turbulators. Disconnect flue pipe and remove flue collector.
   3. PK400, PK440, PK450 and SPK600. Remove front and rear crossover boxes and turbulators.
   4. Brush scale and soot from surfaces and vacuum.
   5. Clean flue pipe.

6. Re-insert turbulators.
7. The crossover boxes are insulated with a molded high temperature ceramic fiber liner. This material is the same as used in the combustion chamber. The operating temperature rating is 2300°F. The condition of the liners must be checked during the annual cleaning and service check. Replace if they do not provide a proper gas seal or show some deterioration. Be particularly careful in checking the rear box line on models PK 400, 440, 450 and SPK600, that the gas pass dividing wall on this liner is sound and provides a good gas seal. If gases get around the divider, the first gas pass through the lower bank of flue tubes will exit directly out the stack.

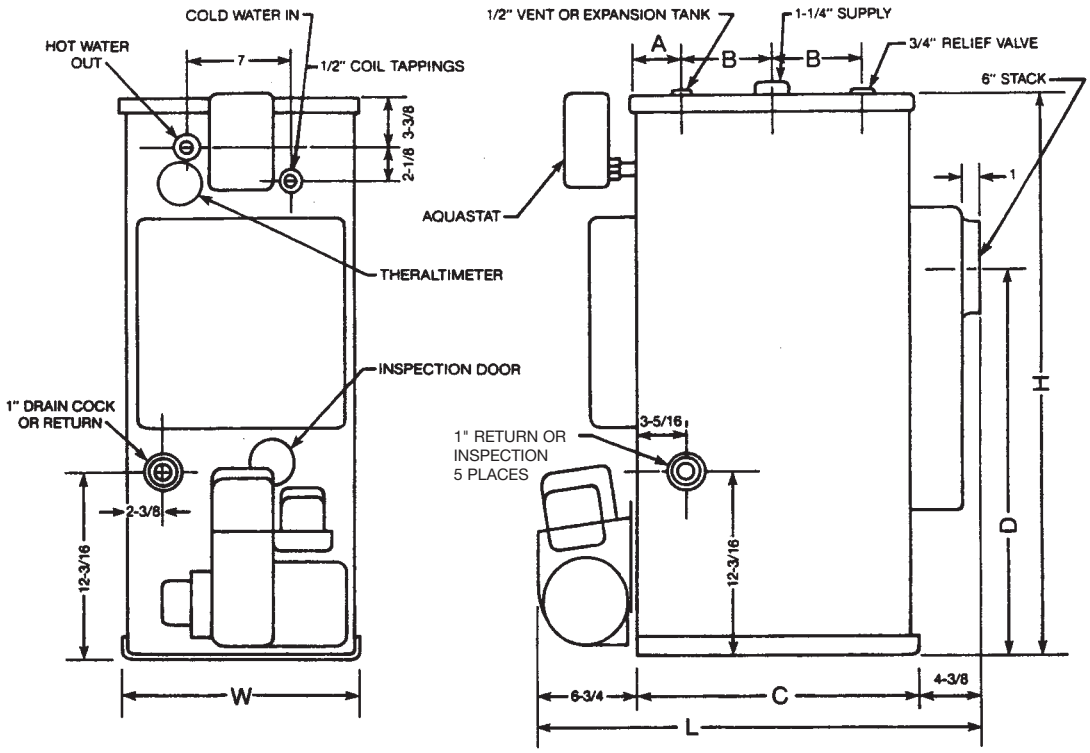
CAUTION

Since this unit utilizes a fiber combustion chamber, be especially careful when cleaning the chamber with a vacuum cleaner.

Instructing the Homeowner

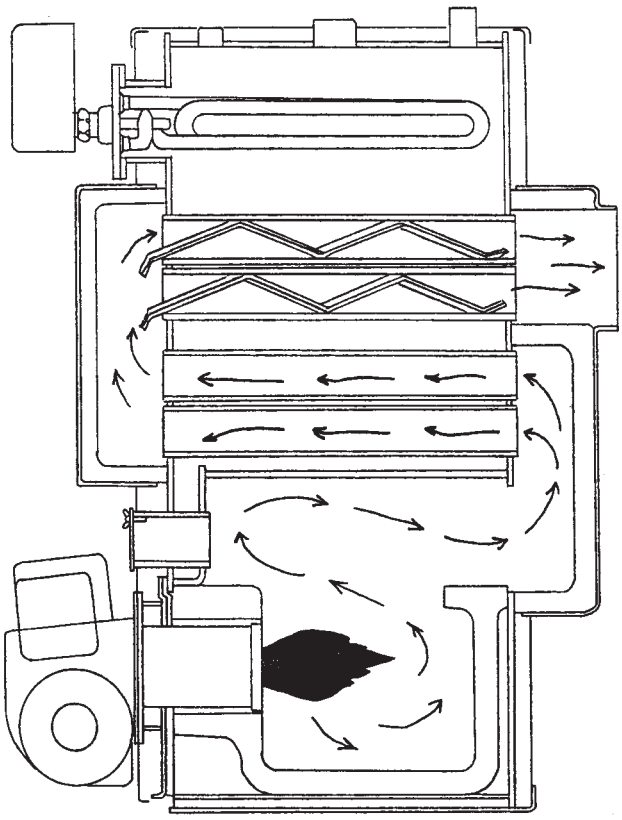
The operation and care of the heating system should be explained to the homeowner, including the simple checks to make before calling for service if the burner fails to operate automatically.

INSTALLATION DIMENSIONS

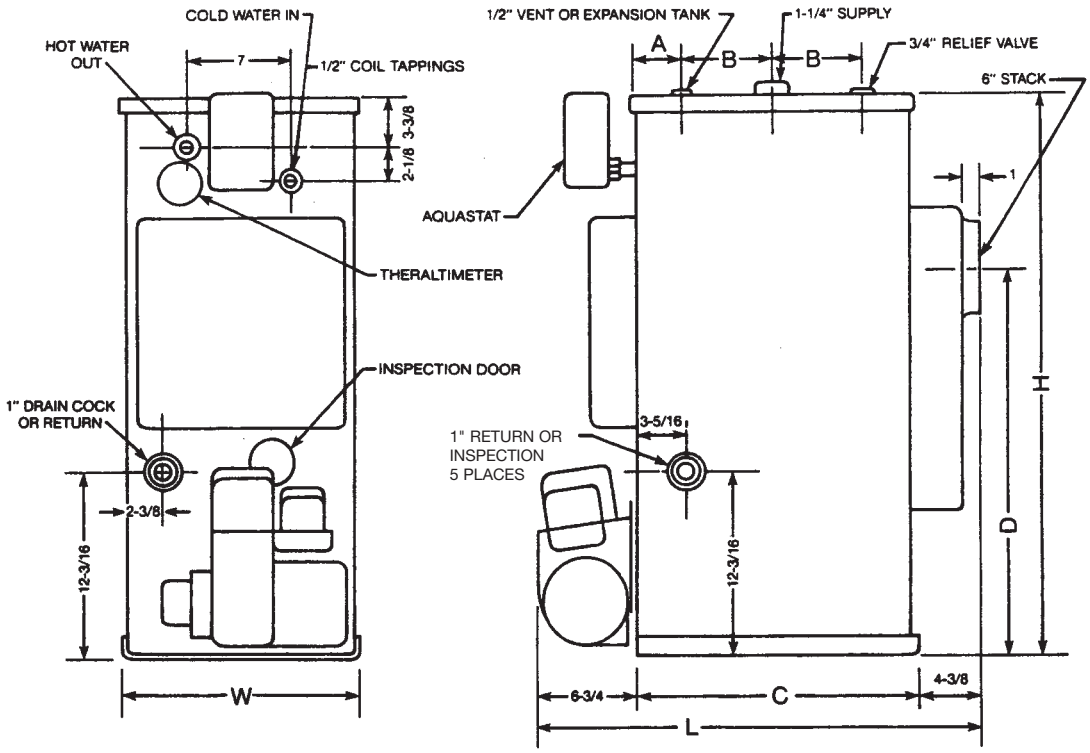


MODEL	A	B	C	D	H	L	W
PK400	2-7/8	6	18-5/16	25-1/2	37	29-7/16	15-7/16
PK450	3-9/16	7	20-9/16	27-3/16	38-3/4	31-11/16	18-7/16

CROSS SECTION OF UNIT

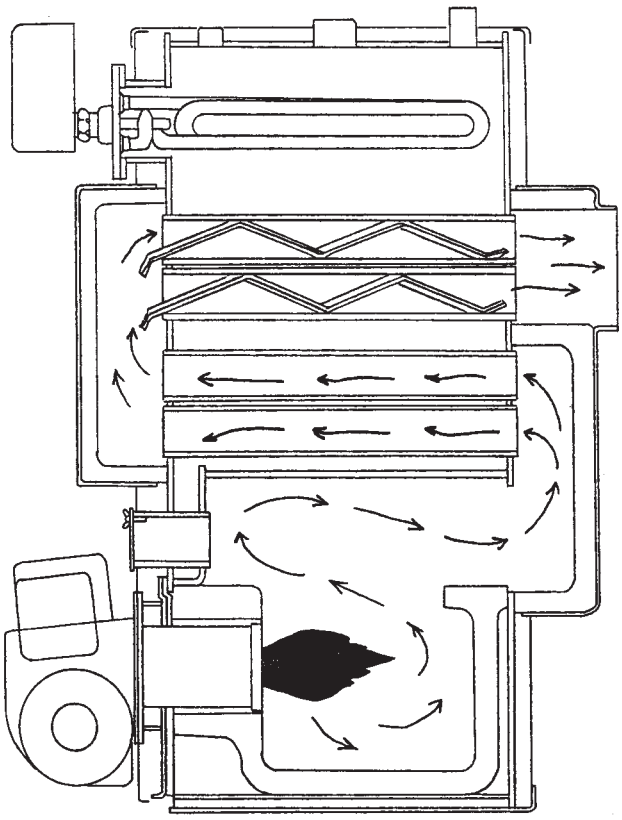


INSTALLATION DIMENSIONS

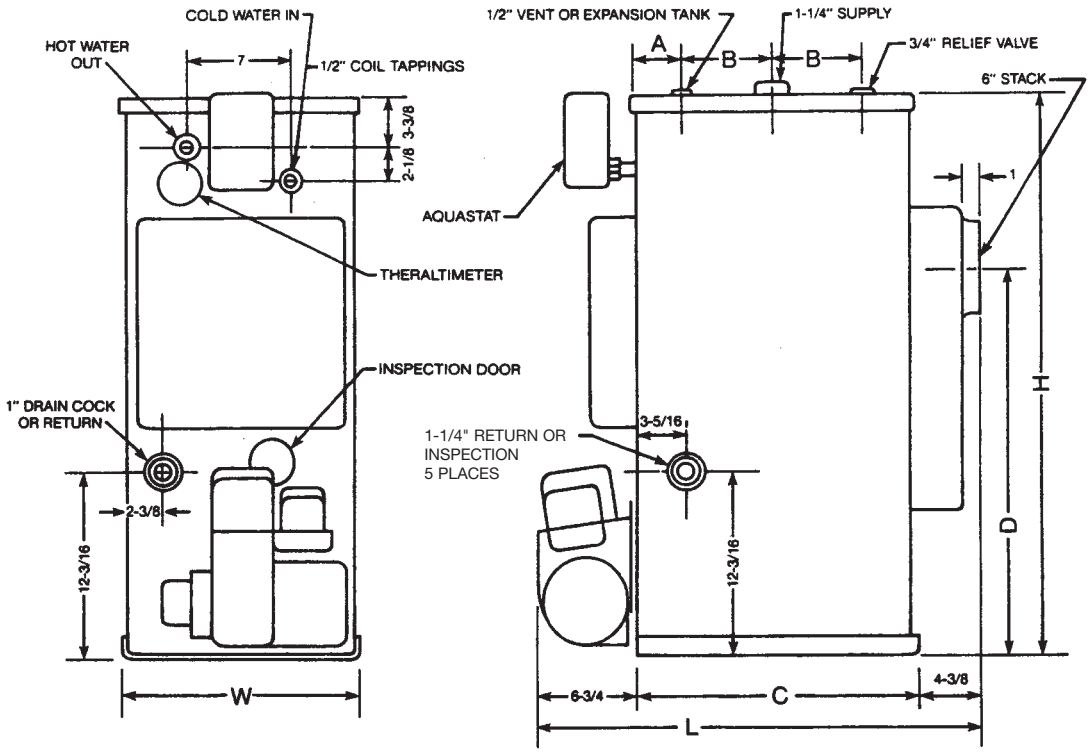


MODEL	A	B	C	D	H	L	W
PK440	3-7/17	4-1/2	20-9/16	27-3/16	33-1/4	31-11/16	18-7/16

CROSS SECTION OF UNIT

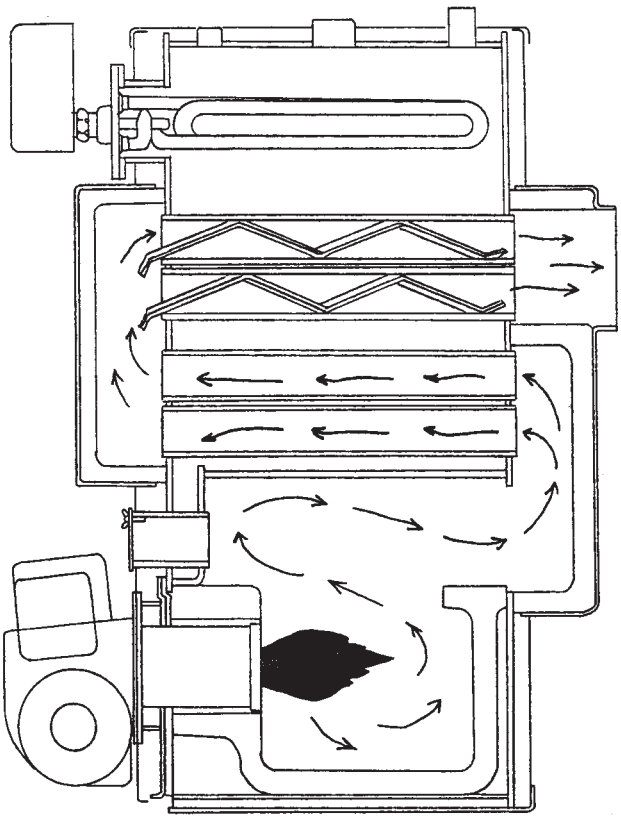


INSTALLATION DIMENSIONS

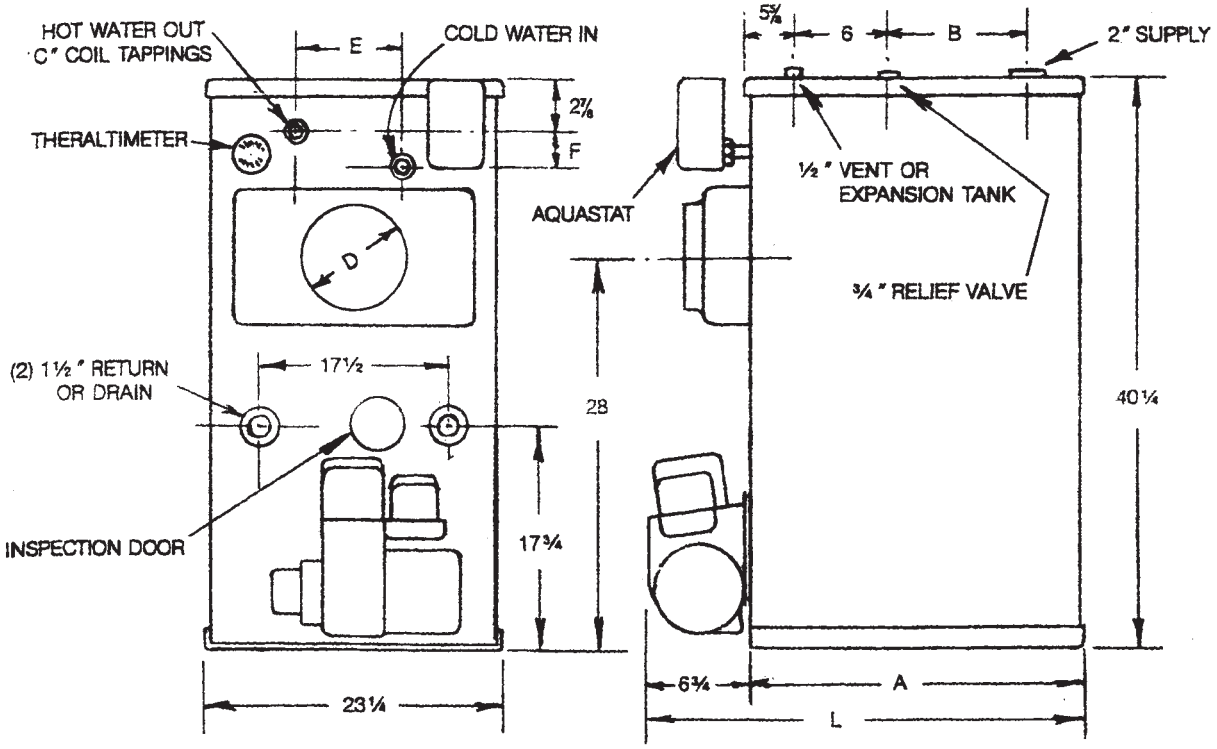


MODEL	A	B	C	D	H	L	W
S-PK600	3-9/16	7	20-9/16	28-11/16	40-1/4	32-3/16	21-7/16

CROSS SECTION OF UNIT

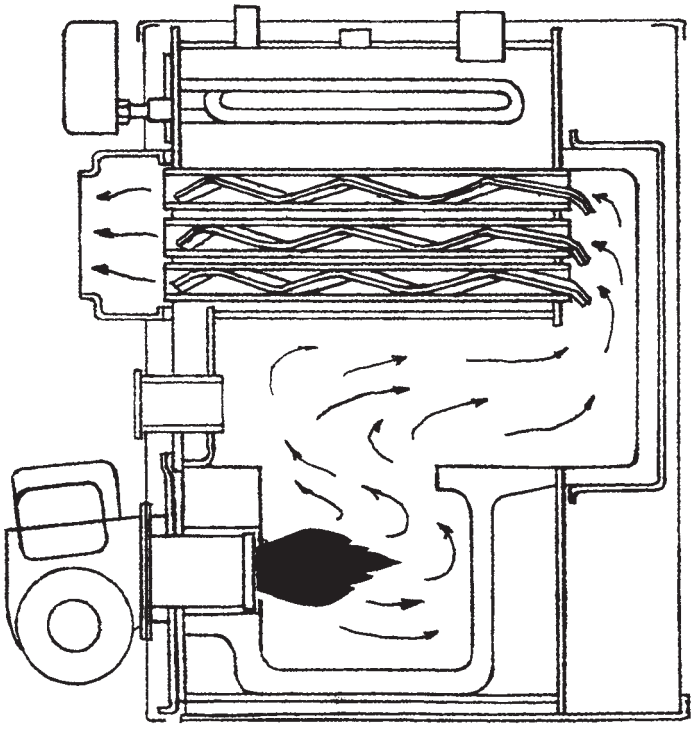


INSTALLATION DIMENSIONS



MODEL	A	B	C	D	E	F	L
PK750	29	7	1/2	7	7	2-1/8	35-3/4
K950-1200	41	19	3/4	8	6-7/8	2	47-3/4

CROSS SECTION OF UNIT



PIPING DIAGRAMS
SINGLE ZONE

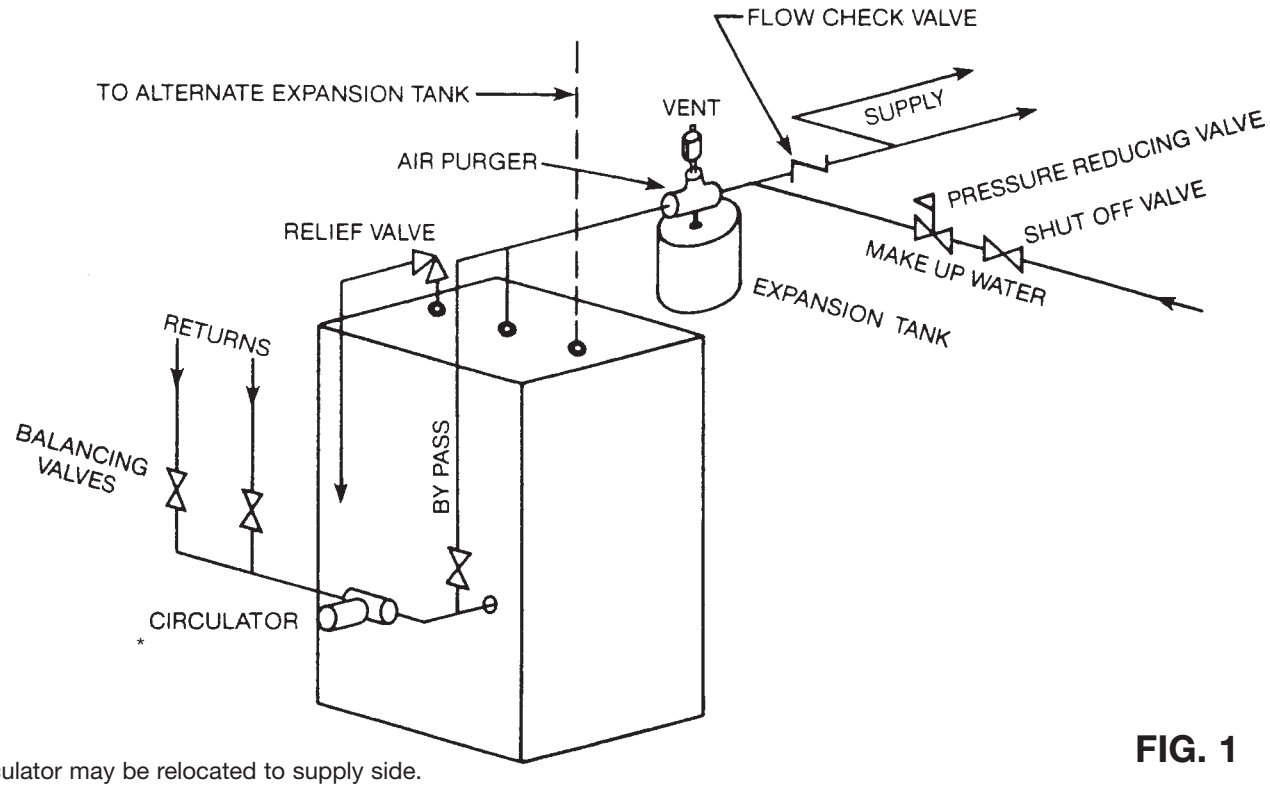


FIG. 1

*Circulator may be relocated to supply side.

PIPING DIAGRAMS
MULTI-ZONE WITH CIRCULATORS

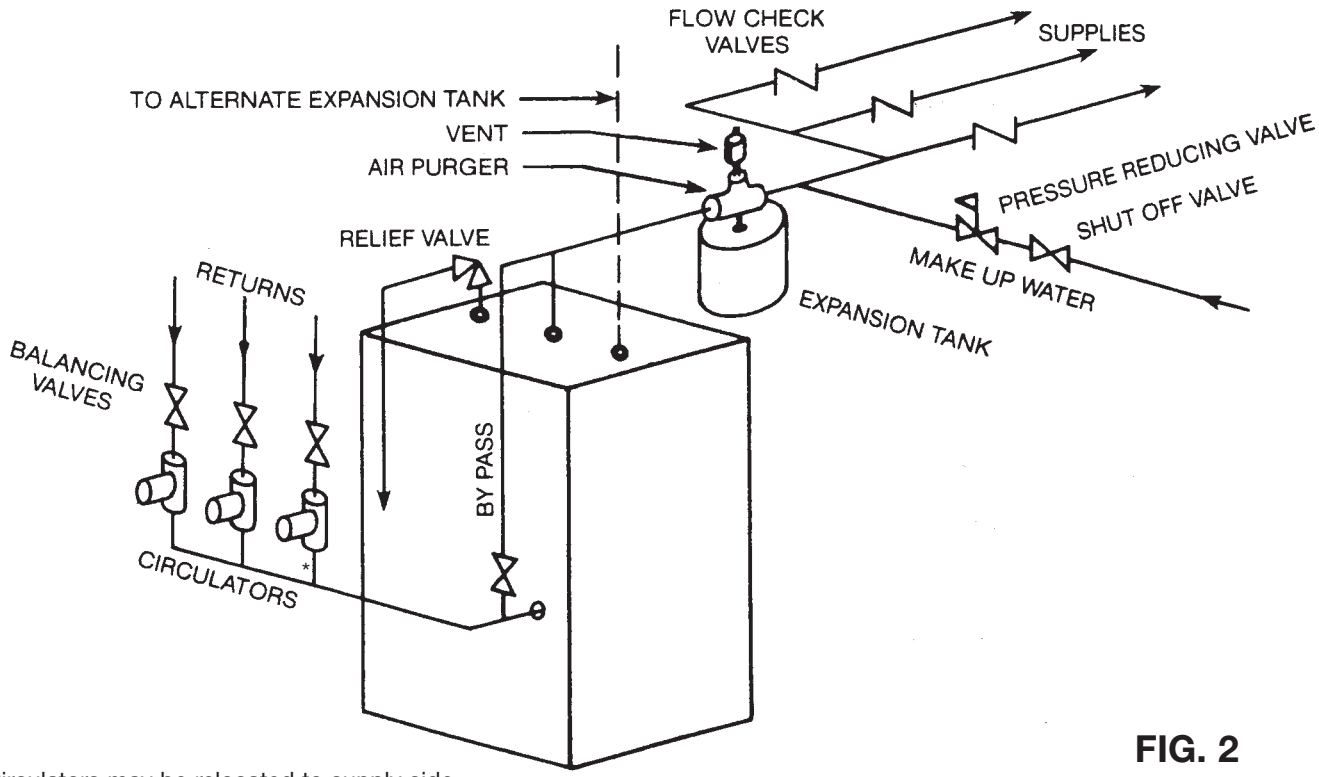
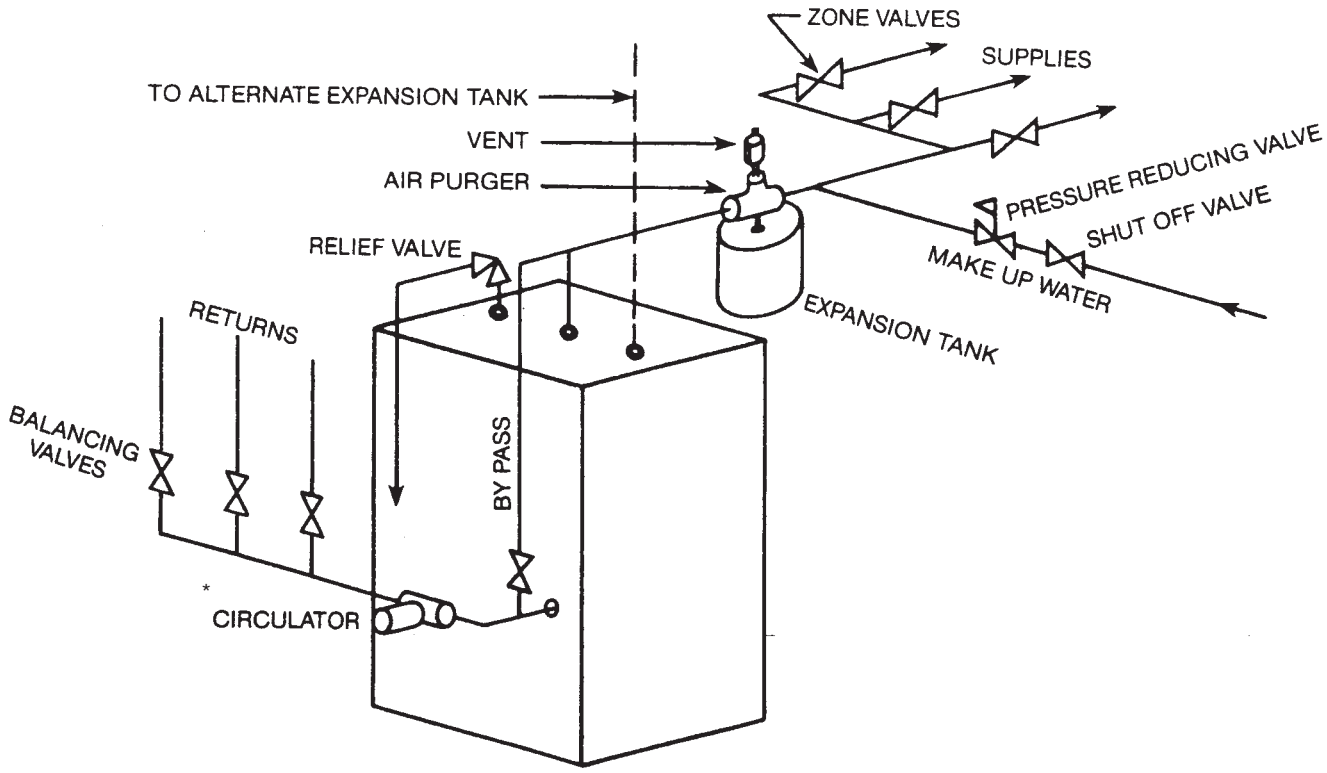


FIG. 2

*Circulators may be relocated to supply side.

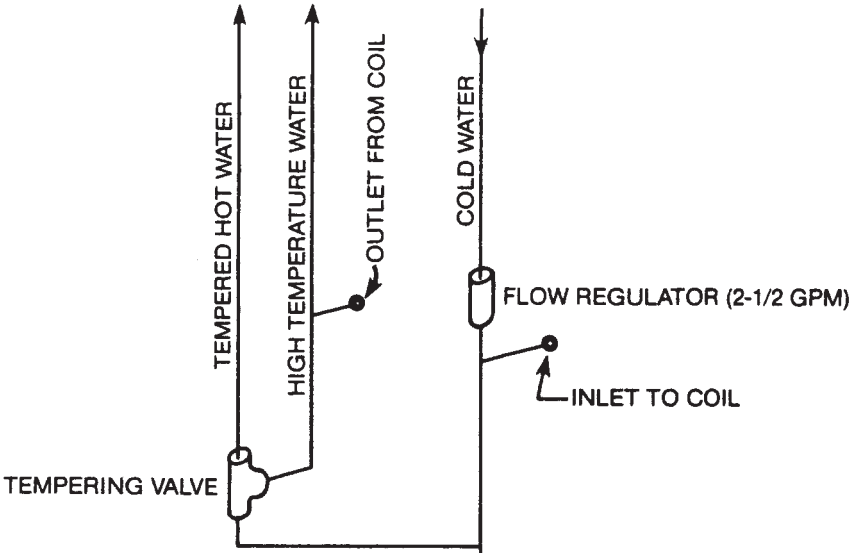
PIPING DIAGRAMS
MULTI-ZONE WITH ZONE VALVES



*Circulator may be relocated to supply side.

FIG. 3

PIPING DIAGRAMS
DOMESTIC HOT WATER



(Note: Does not apply to PK440.)

FIG. 4

PIPING DIAGRAM
LOW WATER CUT-OFF

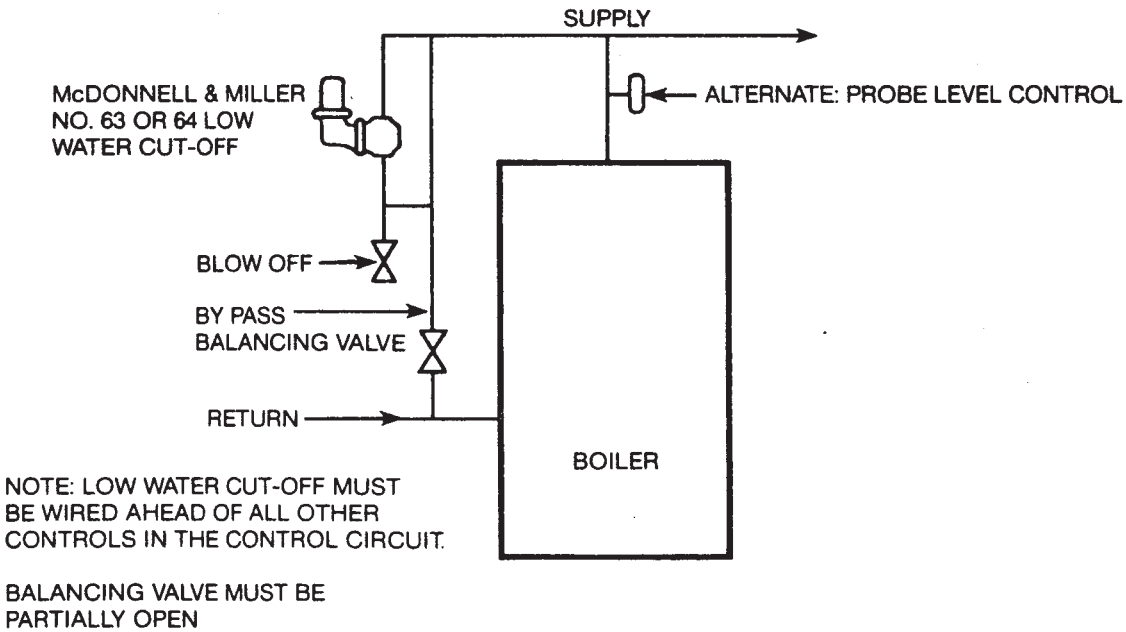


FIG. 5

SERVICEMAN LABELS

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PK SERIES

S/N:

MODEL:	PK 450		
Firing Rate G.P.H.:	0.85	1.00	1.10
Input BTU/HR:	119,000	140,000	154,000
DOE Cap. BTU/HR:	104,000	122,000	134,000
Net Rate BTU/HR:	90,000	106,000	117,000
Val. Cap. Lbs/HR:	270	270	270
Max W.P. Water PSI:	30	30	30

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"

e·f·m·
PK SERIES

S/N:

MODEL:	SPK 600		
Firing Rate G.P.H.:		1.25	1.35
Input BTU/HR:		175,000	189,000
DOE Cap. BTU/HR:		151,000	163,000
Net Rate BTU/HR:		131,000	142,000
Val. Cap. Lbs/HR:		325	325
Max W.P. Water PSI:		30	30

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"

e·f·m·
PK SERIES

S/N:

MODEL:	PK 440		
Firing Rate G.P.H.:	0.85	1.00	1.10
Input BTU/HR:	119,000	140,000	154,000
DOE Cap. BTU/HR:	102,000	120,000	132,500
Net Rate BTU/HR:	89,000	105,000	115,000
Val. Cap. Lbs/HR:	270	270	270
Max W.P. Water PSI:	30	30	30

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"

e·f·m·
PK SERIES

S/N:

MODEL:	K 1200		
Firing Rate G.P.H.:	2.25		
Input BTU/HR:	315,000		
DOE Cap. BTU/HR:	252,000		
Net Rate BTU/HR:	219,130		
Val. Cap. Lbs/HR:	299		
Max W.P. Water PSI:	30		

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"

SERVICEMAN LABELS

e·f·m·
PK SERIES

S/N:

MODEL:	PK 400		
Firing Rate G.P.H.:	0.50	0.65	0.75
Input BTU/HR:	70,000	91,000	105,000
DOE Cap. BTU/HR:	60,000	78,000	90,000
Net Rate BTU/HR:	52,000	68,000	78,000
Val. Cap. Lbs/HR:	185	185	185
Max W.P. Water PSI:	30	30	30

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"

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PK SERIES

S/N:

MODEL:	K 950		
Firing Rate G.P.H.:	1.75		
Input BTU/HR:	245,000		
DOE Cap. BTU/HR:	210,000		
Net Rate BTU/HR:	182,000		
Val. Cap. Lbs/HR:	299		
Max W.P. Water PSI:	30		

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"

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PK SERIES

S/N:

MODEL:	PK 750		
Firing Rate G.P.H.:	1.35		
Input BTU/HR:	186,000		
DOE Cap. BTU/HR:	161,500		
Net Rate BTU/HR:	140,000		
Val. Cap. Lbs/HR:	315		
Max W.P. Water PSI:	30		

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	6"
Chimney Connector	18"