CROWN Boiler

DESIGNED TO LEAD

FW SERIES

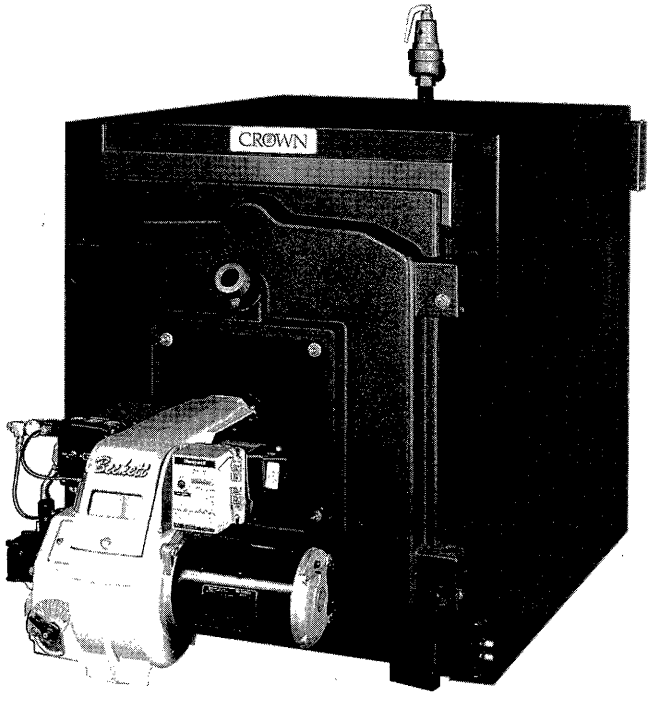
BOILER
BURNER UNITS

CAST IRON 3-PASS SCOTCH MARINE BOILER

INSTALLATION INSTRUCTIONS

These instructions must be affixed on or adjacent to the boiler

FOR LIGHT OIL
GAS-LIGHT OIL
AND GAS



CONSTRUCTED IN ACCORDANCE WITH ASME BOILER CODE

member gama

M.E.A. 205-88

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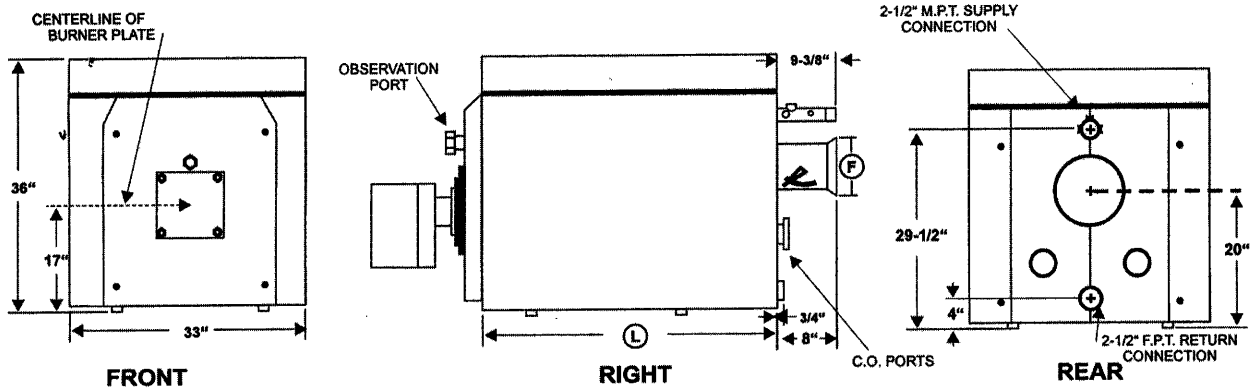
SPECIFICATIONS — DIMENSIONS TABLE 1



BOILER MODEL	I=B=R BURNER INPUT		I=B=R *GROSS OUTPUT		I=B=R **NET RATING WATER MBH	APPROX. DRY WEIGHT LBS.	VENT CONNECT. DIA. INCHES (F)	I=B=R VENT DIA. INCHES ***	DIM. INCHES (L)	WATER CONTENT GAL.	DRAFT LOSS IN. W.C.
	OIL GPH	GAS MBH	MBH	BHP							
FW-4	3.0	433	355	10.6	309	948	8	7	32	15.8	.16
FW-5	4.0	577	478	14.2	416	1124	8	7	37	19.0	.27
FW-6	5.0	722	600	17.9	522	1301	10	8	42	22.2	.39
FW-7	6.0	866	723	21.6	629	1477	10	9	47	25.4	.51
FW-8	7.5	1082	907	27.1	789	1654	10	10	52	28.5	.62
FW-9	9.0	1299	1091	32.6	949	1831	10	10	57	31.7	.75

Note: All dimensions are in inches

*Gross I=B=R rating has been determined under the I=B=R provisions governing forced draft conditions (0.10 inch W.C. positive pressure at the boiler flue gas outlet.

**Net ratings are based on piping and pickup allowance of 1.15.

*** I=B=R Vent Diameter size is the pipe size used from boiler vent connector (F) to Termination of stub stack: Max. Height 15' (For forced draft firing only).

For chimney venting consult National Fuel Gas Code.

INTRODUCTION

PRODUCT DESCRIPTION

The Crown "FW" Series boilers are three pass Scotch Marine design with fully water backed heat transfer surfaces. Boilers are designed for use in forced hot water heating systems up to 75 PSI water working pressure. They may be used with burners firing gas or oil. Boiler-Burner units operate with a positive pressure over fire and may be vented using a conventional chimney with balanced draft or pressurized vent systems.

The boiler block (heat exchanger) is factory assembled using cast iron push nipples. This heat exchanger has horizontal flue passages through which the products of combustion make three distinct passes to maximize the heat transfer process.

INSPECT SHIPMENT

Any claims for damage or shortage must be filed immediately against the carrier by the consignee. No claims for variances from, or shortage in orders, will be considered unless presented within 7 days after receipt of goods.

Boiler shipment comes on two separate pallets.

NOTE: Burner, when ordered, is shipped separately

1) Wood pallet with:
    (A) Boiler block with baffles installed in flue passages.

2) Wood pallet with shrink wrapped boxes:
    (A) Box of jacket parts.
    (B) Box marked #1 (Manifold Box)
        a) Supply and return manifold with gaskets, mounting studs, nuts and washers.
        b) Return diffuser and gaskets.
        c) (2) 3/4" Male x Female extension couplings for optional controls.
    (C) Box marked #2 (Control Box)
        a) L4008A Hi-Limit with 3/4" well and capalary clip.
        b) Tridicator Gauge
        c) Relief Valve
        d) Bag of refractory mix to insulate burner blast tube in front door.
        e) Instruction manual
        f) Boiler rating tag and A.S.M.E. Tag.
        g) Flame Sight Assembly
        h) (4) Spacers to secure back jacket panel.
    (D) Box marked #3
        a) Quadrant locking damper.

THINGS TO CONSIDER BEFORE INSTALLING BOILER

CODE REQUIREMENTS

Installation must comply with all state, local and utility codes. When required, installations must conform to A.S.M.E. safety code for controls and safety devices for automatically fired boilers No. CSD-1.

All electrical wiring must be done in accordance with the National Electrical codes latest edition and all state and local codes.

RULES FOR SAFE INSTALLATION AND OPERATION

1. Read this owner's manual and the rules for safe operation carefully. Failure to follow the rules for safe operation and the instructions could cause a malfunction of the boiler and result in death, serious bodily injury, and/or property damage.

2. Be certain burner is designed for type of fuel to be used. Overfiring will result in premature failure of the boiler sections and cause dangerous operation.

3. Locate the boiler as close to the chimney as practical. (See Fig. 1, 2, 3)
   Observe the minimum clearances outlined in (Fig. 1). Remember to allow room for the boiler door to open with the burner mounted.

4. Make sure that the surface on which the boiler is to be installed is capable of supporting the weight of the boiler, burner, and all other equipment supported by that surface.

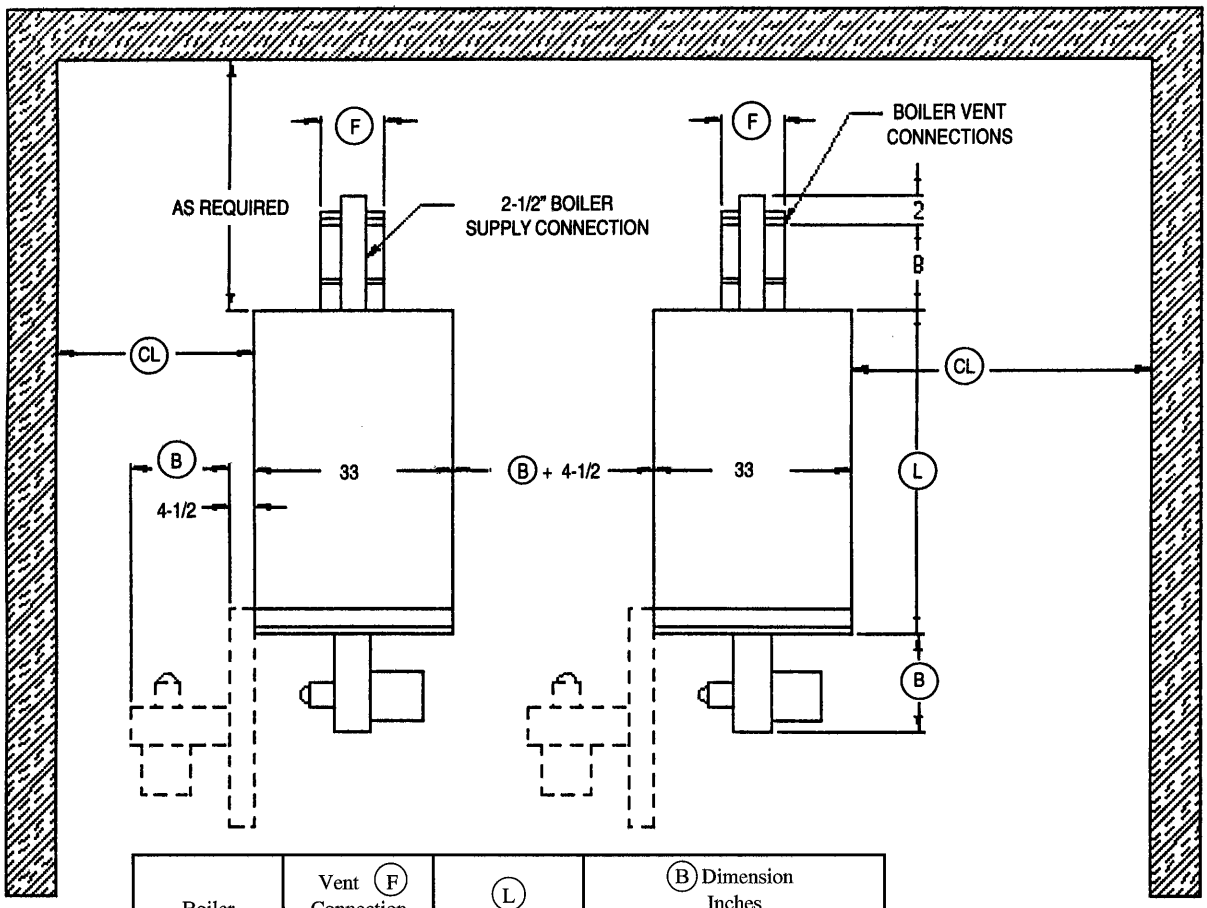
5. A boiler pad is strongly recommended (See Fig. 1). This pad is to be made of poured concrete. It should be at least 4 inches thick and should cover the entire area under the boiler (not just under the legs).

6. Make sure that the location chosen for the boiler will provide adequate air for combustion and ventilation (See Fig. 2). Also make sure that fuel and electrical requirements can be satisfied at the boiler location chosen.

7. For typical boiler/heating system piping which incorporates a blend pump, or for primary secondary pumped system See Fig. 4, 5, 6.

8. The heating system design shall not permit the boiler's return water temperature to be lower than 130°F for a significant period of time. This will prevent fire side corrosion and insure a long life expectancy for your boiler.

FIG. 1 TYPICAL BOILER ROOM LAYOUT



Boiler Model	Vent (F) Connection Diameter Inches	(L) Dimension Inches	(B) Dimension Inches	
			Beckett	Power Flame
FW-4	8	32	10	30
FW-5	8	37	10	30
FW-6	10	42	10	30
FW-7	10	47	21	30
FW-8	10	52	21	35
FW-9	10	57	21	35

Notes:

1.) (CL) Dimension as per job specs. and applicable codes.

2.) For (B) dimension of burners other than shown, consult Crown.

BOILER ROOM AIR REQUIREMENTS

WARNING

Failure to provide an adequate supply of fresh air for combustion will result in hazardous operating conditions. Do not use an exhaust fan in the boiler room.

1) To ensure safe, efficient operation, the boiler system must be supplied with sufficient air for combustion and ventilation. (See Fig. 2)

2) Unless properly controlled, avoid the use of forced ventilation, since it can create an undesirable pressure differential between boiler room and air source.

3) All boilers located in confined rooms should have free access to ventilation and combustion air from two permanent openings. One opening should terminate within 12" of the ceiling, the other within 12" of the floor. Each opening shall have at least 1 sq. inch free area per 1,000 btu/hr. of burner input. Openings should freely connect with areas having adequate infiltration of outside air.

When air comes directly from outdoors, again use two openings as explained above, except:

- Direct connection or vertical ducting allow 1 sq. inch per 4,000 btu/hr.
- Direct connection through horizontal ducting allow 1 sq. inch per 2,000 btu/hr.
- All ducting shall be the same size as opening but no less than 3 x 3 or 9 sq. inches.

Remember to compensate for louver blockage when calculating free air. Refer to the manufacturer's instructions or use the general guide:

WOOD LOUVERS allow 20-25% free air, METAL LOUVERS or GRILLES allow 60-70% free air. Any louver dampers should lock open or interlock with the burner to open automatically when the boiler operates.

FIG. 2 RECOMMENDED BOILER ROOM VENTILATION & COMBUSTION AIR

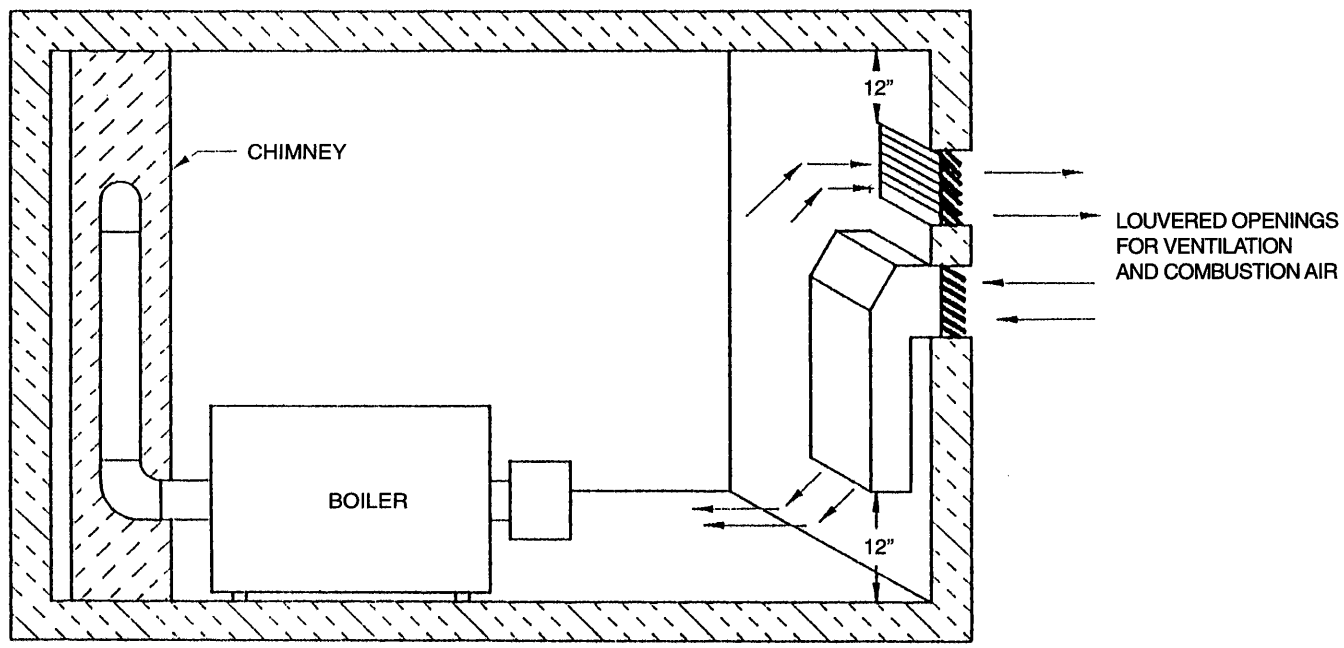
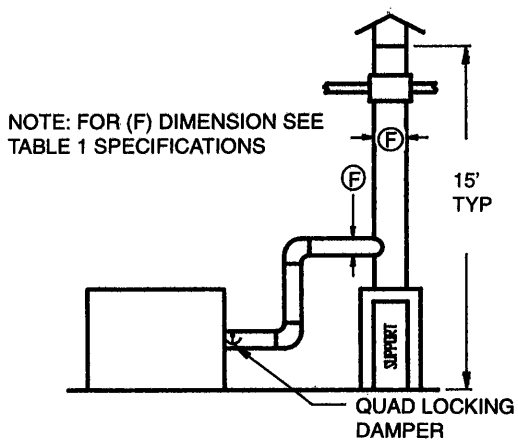


FIG. 3 CHIMNEY OR VENT SYSTEM

THE FW SERIES BOILER OPERATES WITH POSITIVE PRESSURE THROUGHOUT THE BOILER FURNACE AND FLUE PASSAGES. ADJUSTED TO PRODUCE .05 TO .10 W.C. POSITIVE PRESSURE AT THE OUTLET OF THE BOILER. THE OVER-FIRE PRESSURE WILL VARY ACCORDING TO BOILER SIZE. CONSULT LOCAL BUILDING CODES FOR PROPER INSTALLATION OF VENT SYSTEM RELATIVE TO THE FUEL BEING BURNED.

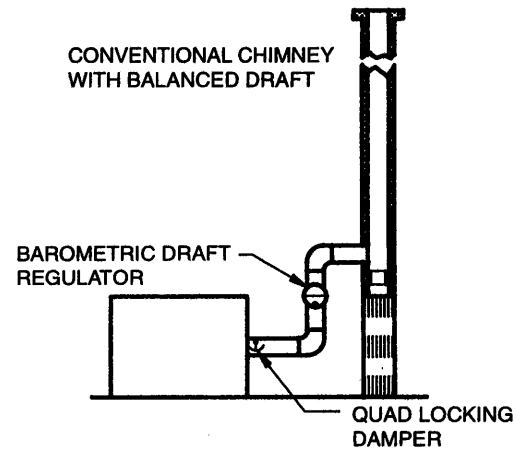
FORCED DRAFT

BOILER BREECH & STUB VENT OPERATE AT POSITIVE PRESSURE. ENTIRE SYSTEM MUST BE GAS TIGHT. STUB VENT HEIGHT MUST BE LIMITED TO PREVENT NEGATIVE DRAFT. SHOULD NEGATIVE DRAFT OCCUR INSTALL A BAROMETRIC DRAFT REGULATOR.



BALANCED DRAFT

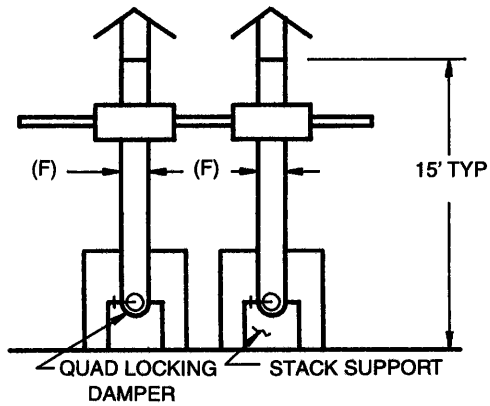
BOILER OPERATES WITH POSITIVE PRESSURE OVERFIRE. CHIMNEY PROVIDES NEGATIVE PRESSURE THAT IS BALANCED WITH A BAROMETRIC DRAFT CONTROL.



MULTIPLE BOILERS

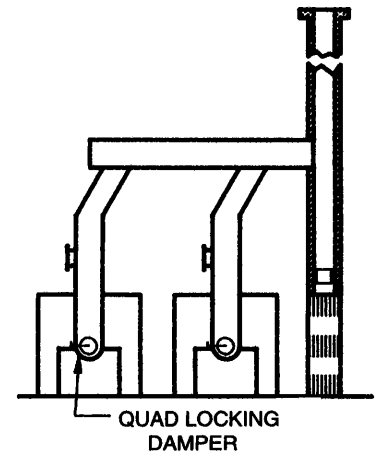
BOILER, BREECH & STUB VENT OPERATE AT POSITIVE PRESSURE: ENTIRE SYSTEM MUST BE GAS TIGHT: STUB VENT HEIGHT MUST BE LIMITED TO PREVENT NEGATIVE DRAFT: SHOULD NEGATIVE DRAFT OCCUR, INSTALL A BAROMETRIC DRAFT REGULATOR.

EACH BOILER MUST HAVE A STUB VENT.



MULTIPLE BOILERS

CONVENTIONAL CHIMNEY WITH MULTIPLE BOILER BALANCED DRAFT.



ATTENTION

Heating system design and burner operation must incorporate interlock to prevent burner from firing when boiler has no system water flow.

When burner is operating the water flow throughout the boiler shall be not less than 1.8 GPM for each 100,000 BTU/HR of gross boiler output. Size blend pump accordingly. See Table 2.

TABLE 2

Blend Pump		Primary/Secondary Pump	
Boiler Model	**GPM**	**Boiler Model**	**GPM**
FW-4	6.4	FW-4	30.9
FW-5	8.6	FW-5	41.6
FW-6	10.8	FW-6	52.2
FW-7	13.0	FW-7	62.9
FW-8	16.3	FW-8	78.9
FW-9	19.6	FW-9*	94.9
*Maximum water flow resistance for any FW boiler is 14" w.c.			

FIG. 4 SINGLE BOILER PIPING WITH BLEND PUMP

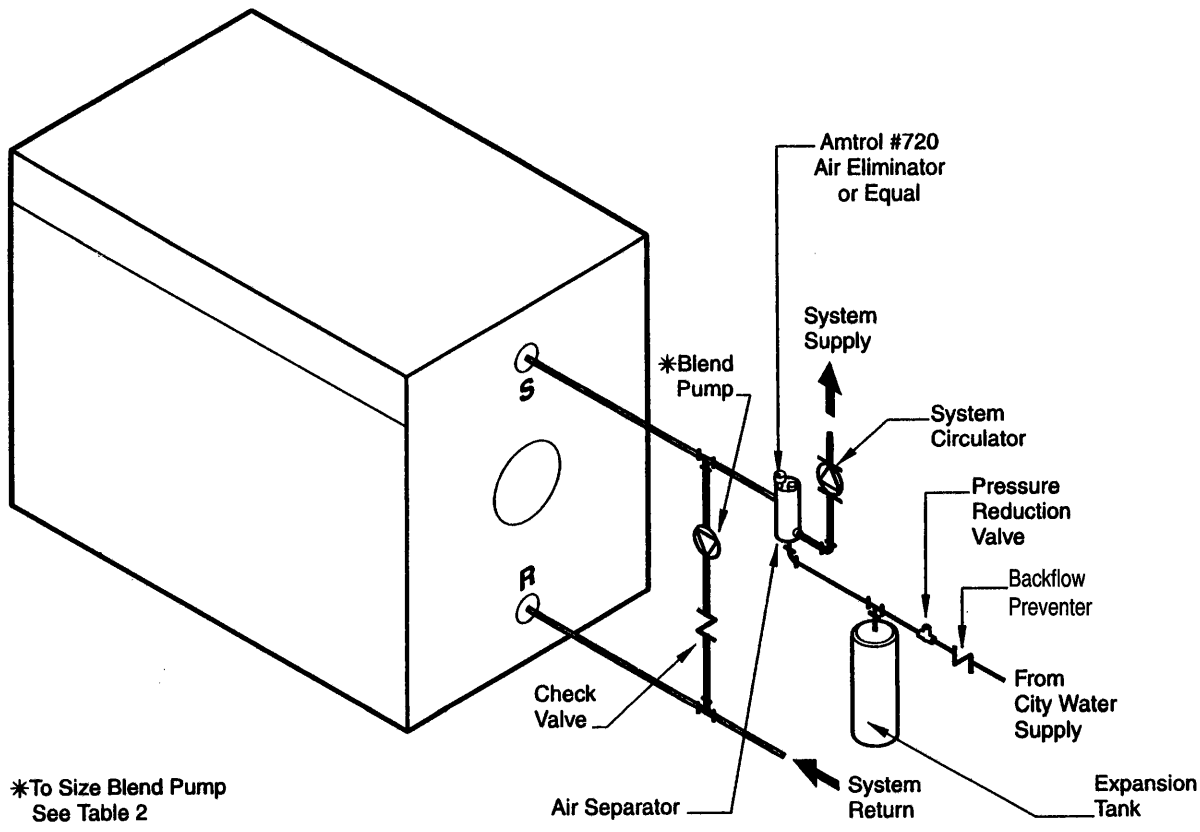


FIG. 5 SINGLE OR MULTIPLE BOILER PIPING FOR PRIMARY/SECONDARY PUMPING

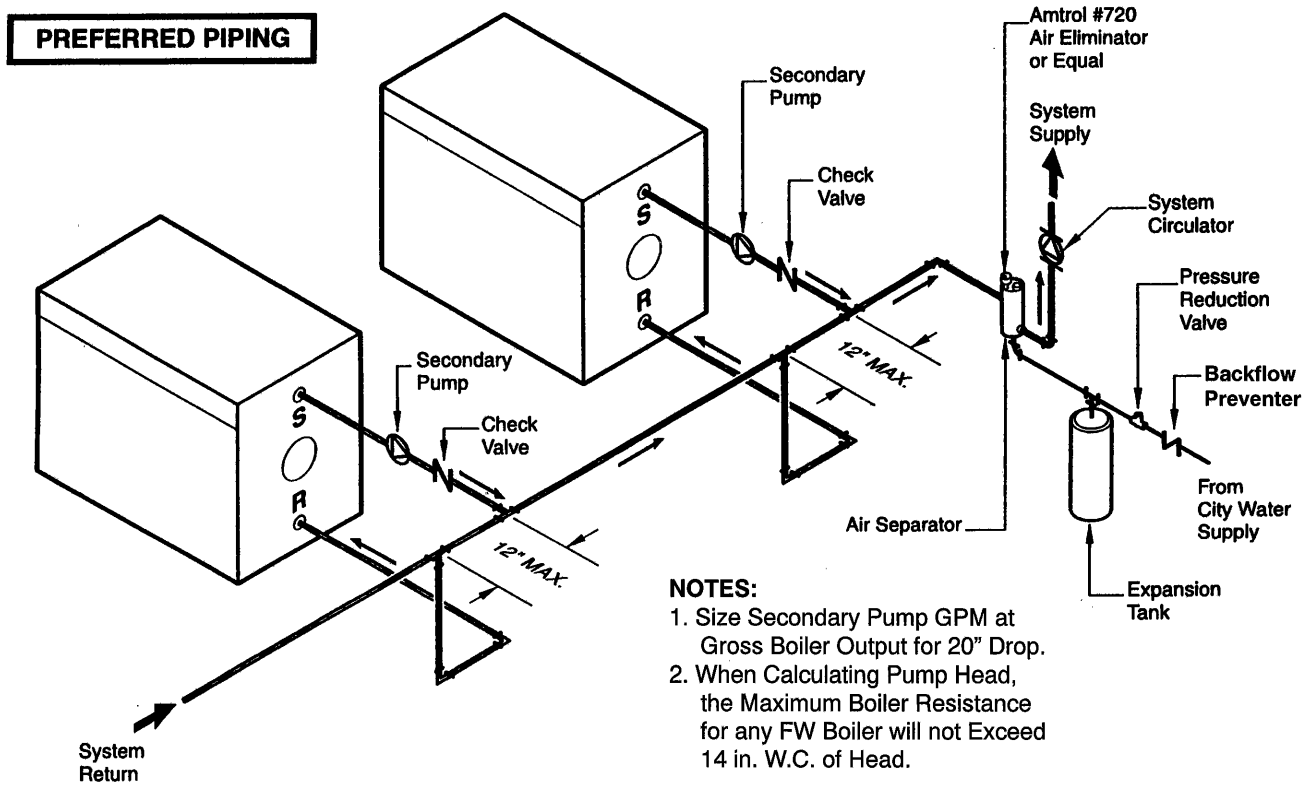
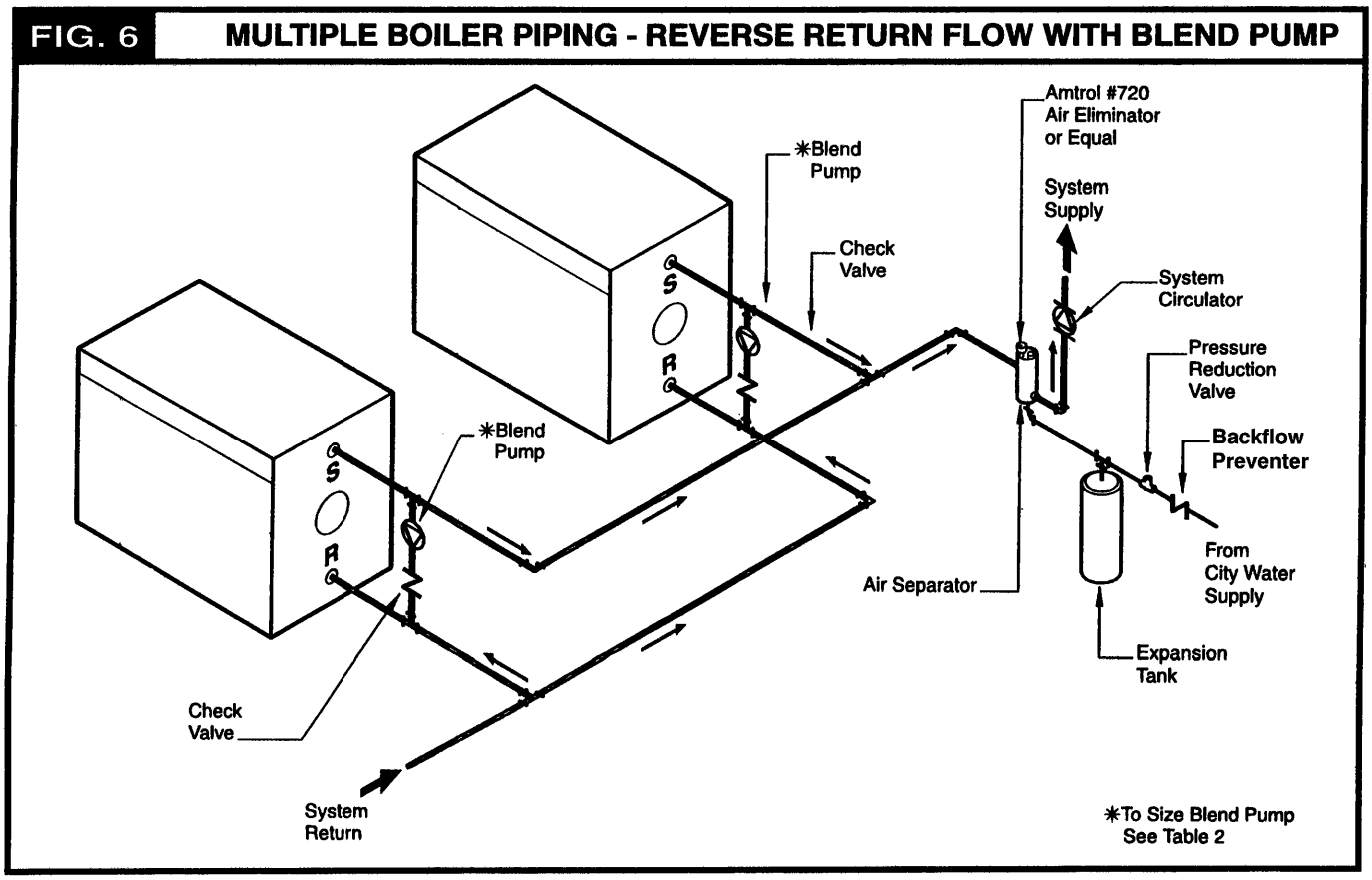


FIG. 6 MULTIPLE BOILER PIPING - REVERSE RETURN FLOW WITH BLEND PUMP



OIL SUPPLY PIPING

Oil burners are designed for use with light grade fuel oils - commercial standard grades #2 or #1.

It is recommended that prior to installation all national, local and other applicable codes be reviewed to ensure total compliance.

A two pipe (separate suction and return line) system is usually required, consult burner Manufacturer's Instruction Manual. Most burner fuel pumps are preset at the factory for use only with a two pipe system. Check Burner Manufacturer's Instruction Manual. Rigid pipe connected directly to the pump may cause excessive vibration. It is recommended that the connection to the pump be of copper tubing, complete with a vibration dampening loop, on both suction and return lines. The pump warranty will be voided if Teflon tape is used.

Do not install manual valves in the return line between the pump and the tank unless required by a specific code. If a manual valve is required, an automatic relief valve must be installed across the manual valve to ensure that oil will bypass directly back to the tank in the event the manual valve is inadvertently left in the closed position.

Use copper tubing with flare fittings or iron pipe on all installations. All units must utilize the proper size suction and return oil lines (See figure 7 and 8).

If the oil storage system has been used with fuel heavier than #2 fuel oil, the entire system should be thoroughly cleaned and flushed before starting up the new system. Utilize fusible link and/or overhead anti-siphon valves as applicable (when oil tank is above the burner).

If iron pipe oil lines are used on underground tanks, swing joints utilizing nipples and elbows must be used and joined together, making certain the piping connections are tightened as the tank settles. Keep swing joints in the suction and return lines as close to the tank as possible. Underground tanks should be pitched away from the suction line end of the tank to prevent sediment from accumulating at the suction line entrance. The suction line should be a minimum of 3" from the tank bottom.

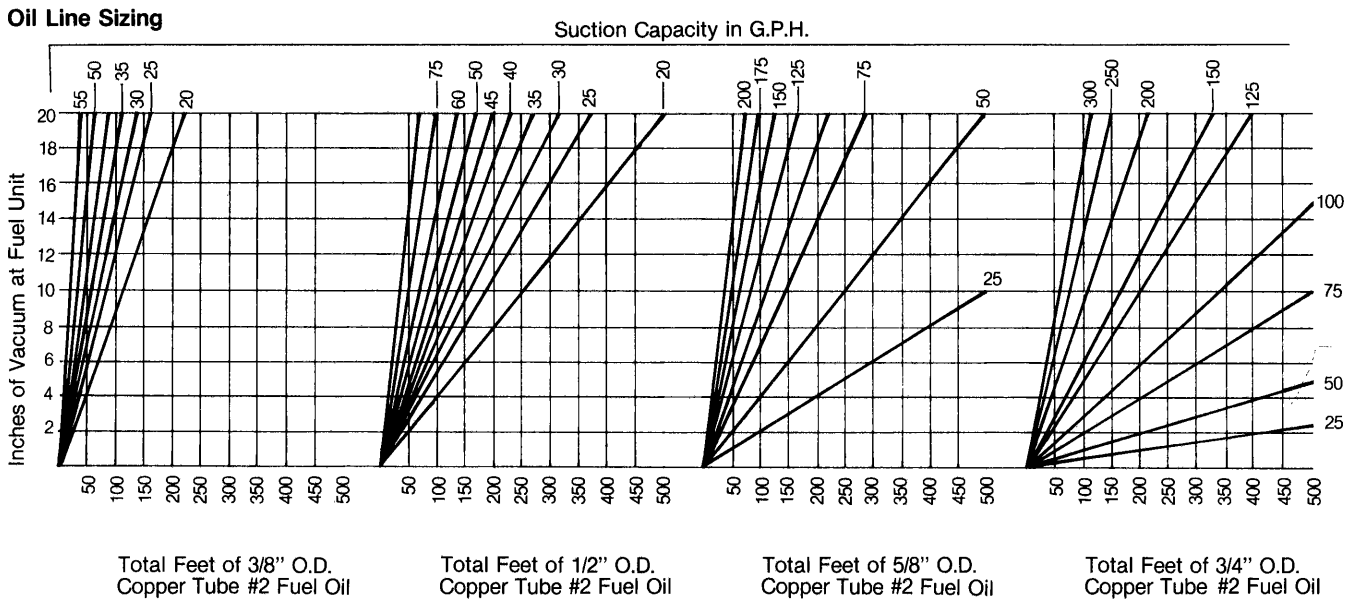
Before starting up the system, all appropriate air and oil leak tests should be performed. Make certain that the tank atmospheric vent line is unobstructed.

Refer to fuel pump oil piping connection information. Further information relating to burner oil piping can be found in the Burner Instruction Manual.

CAUTION:

A foot valve at the end of the suction line in the tank is not recommended

FIG. 7

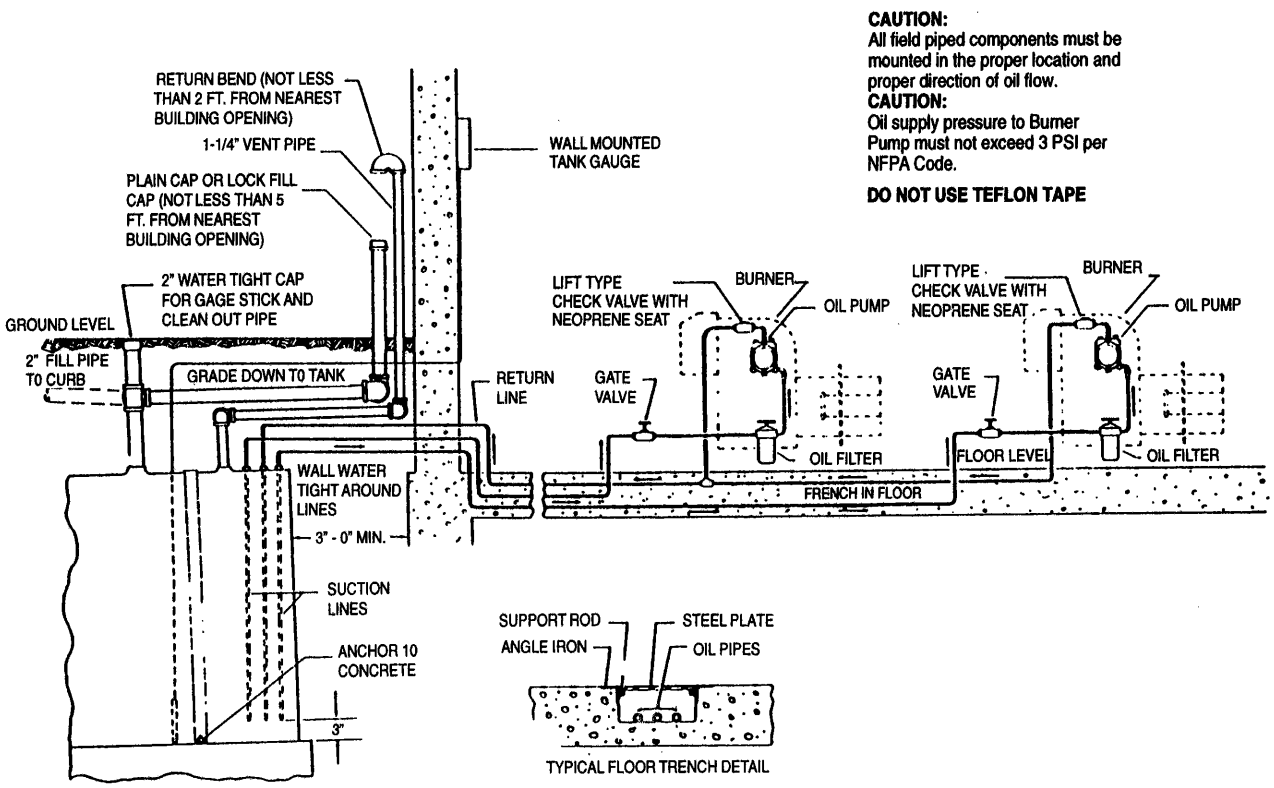


1. Check oil pump Suction Capacity.
2. Measure total suction line length (horizontal and vertical) from the end of the line in the tank, to the connection at the oil pump.
3. Choose the appropriate graph above, based on the tubing size. Read up from horizontal line "total feet of copper tube" to "Suction Capacity" in GPH.
4. Read left to the vertical line "Inches of Vacuum at Fuel-Unit." (This is the vacuum required to draw oil through the length of tubing selected.)
5. If installation has lift ("Lift" is defined as the vertical distance the fuel unit is above the oil level in the tank,) add 1" of vacuum for every foot of lift.
6. Add the vacuum determined from items 4 and 5 together to determine total inches of vacuum.
7. If total is over 10", move to next larger tubing size chart and re-calculate total inches of vacuum.
8. The instructions above do not allow for any added restrictions, such as line filter, elbows, sharp bends check valves, etc. Suction line vacuum values for such components vary from one manufacturer to another.

   A Rule of Thumb to determine total vacuum for suction line sizing is to add 10% to vacuum determined from calculations.
9. It is always safe to size the return line from pump to tank at the same size as the selected suction line.
10. Install oil filter of proper size and capacity.
11. See Burner Manufacturer's Instruction Manual.

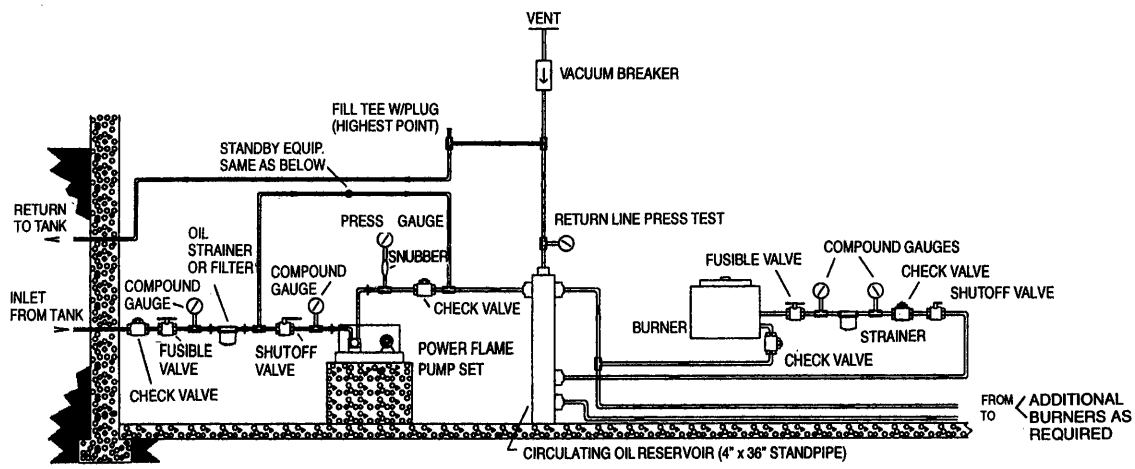
FIG. 8 TYPICAL OIL BURNER PIPING DIAGRAMS

TYPICAL OIL PIPING INSTALLATION FOR SINGLE OR MULTIPLE BURNER



Notes:
Also see burner installation and instruction manual which takes precedent over Fig 8

MULTIPLE BURNER SYSTEM OIL PIPING SCHEMATIC (Flooded Suction)



GAS SUPPLY PIPING

ATTENTION

Before you install any gas piping contact the local gas utility relative to available supply pressures, limitations on allowable pressures in the building, general piping requirements and applicable codes, restrictions and regulations.

Considerations of these regulations as well as written permits and other state, city and local codes, should be discussed with and approved by the appropriate governing bodies.

In addition install main gas piping in accordance with the National Gas Code NFPA 54 and ANSI Z223-1 (latest edition).

Gas piping should be sized to provide required pressure at the burner train inlet manual shutoff cock, when operating at the maximum desired fuel input.

All gas piping should be appropriately pressure tested to ensure leak free operation. It is recommended that a dirt pocket or trap be piped into the gas supply system just ahead of the burner train inlet manual shutoff cock.

When testing with pressures higher than the maximum pressure ratings of the gas train components, be sure to isolate these components and test their piping for gas leaks with correct pressures only. On some burners, the maximum main gas train and/or pilot gas train components pressure is 1/2 psig. (14" W.C.)

Refer to Table 3 for information relating to the sizing of gas supply piping. These charts are based on the general flow characteristics of commercially produced black wrought iron pipe. If in doubt regarding flow capabilities of a chosen line size, the next largest size is recommended.

See Fig. 9 for typical gas burner piping schematics, also refer to respective Burner Instruction Manual.

TABLE 3 CAPACITY OF PIPE

Capacity of Pipe - Natural Gas (CFH)
With Pressure Drop of 0.3" w.c. and Specific Gravity of 0.60

Pipe Length in Feet	Pipe Size - Inches (IPS) 1	1 1/4	1 1/2	2	2 1/2	3	4
10	520	1050	1600	3050	4800	8500	17500
20	350	730	1100	2100	3300	5900	12000
30	285	590	890	1650	2700	4700	9700
40	245	500	760	1450	2300	4100	8300
50	215	440	670	1270	2000	3600	7400
60	195	400	610	1150	1850	3250	6800
70	180	370	560	1050	1700	3000	6200
80	170	350	530	990	1600	2800	5800
90	160	320	490	930	1500	2600	5400
100	150	305	460	870	1400	2500	5100
125	130	275	410	780	1250	2200	4500
150	120	250	380	710	1130	2000	4100
175	110	225	350	650	1050	1850	3800
200	100	210	320	610	980	1700	3500

Correction Factors

Specific Gravity Other Than 0.60		Pressure Drop Other Than 0.3	
0.50	1.10	0.1	0.577
0.60	1.00	0.2	0.815
0.70	0.926	0.3	1.00
0.80	0.867	0.4	1.16
0.90	0.817	0.6	1.42
1.00	0.775	0.8	1.64
Propane	Air	1.0	1.83
1.10	0.740	2.0	2.58
Propane		3.0	3.16
1.55	0.622	4.0	3.65
Butane		6.0	4.47
2.00	0.547	8.0	5.15

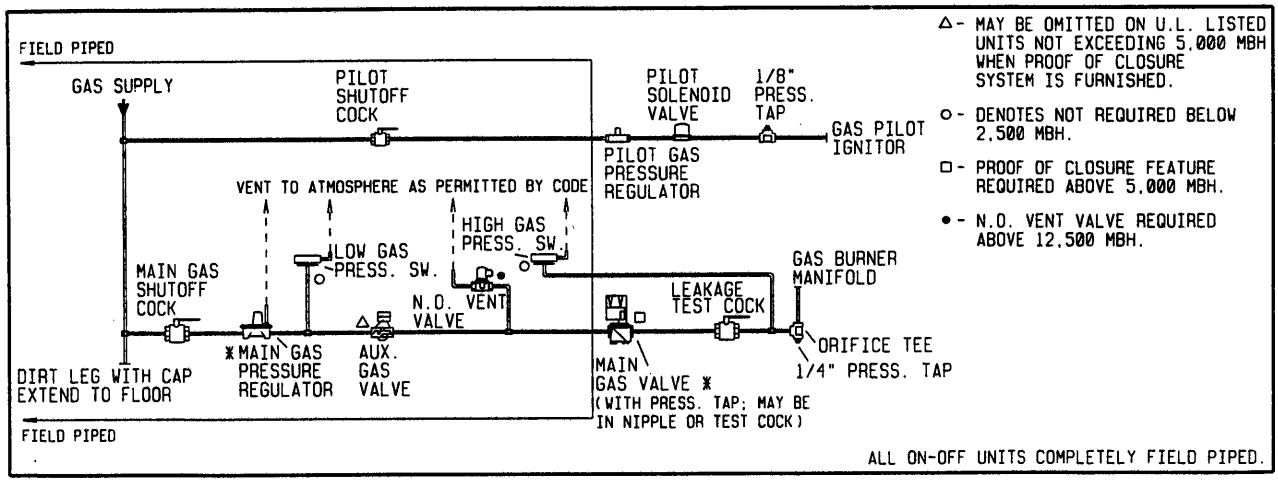
Note: Use multiplier at right for other specific gravities and pressure drops.

Equivalent Length of Fitting in Feet

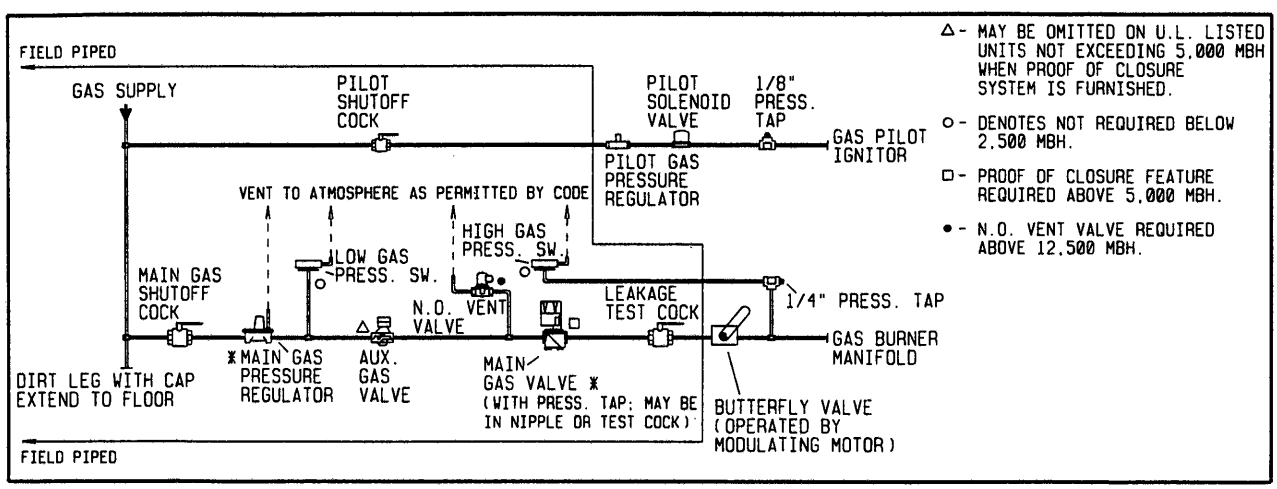
Pipe Size (IPS)	1	1.25	1.5	2	2.5	3	4
Std. Tee through Side	5.5	7.5	9.0	12.0	14.0	17.0	22.0
Std. E11	2.62	3.45	4.02	5.17	6.16	7.67	10.1
45° E11	1.2	1.6	2.0	2.5	3.0	3.7	5.0
Plug Cock	3.0	4.0	5.5	7.5	.0	12.0	16.0

FIG. 9 GAS BURNER PIPING DIAGRAMS

Typical Schematic Gas Piping for Gas Burner, Low-High-Off and Low-High-Low System



Typical Schematic Gas Piping for Gas Burner, Modulating System



* On some burner models at inputs below 2,500 MBH a combination pressure regulator/automatic gas valve may be used in place of the separate main gas pressure regulator and main gas shutoff valve shown in Figure 9 above. For specifics on your burner refer to the gas piping diagram supplied with the burner.

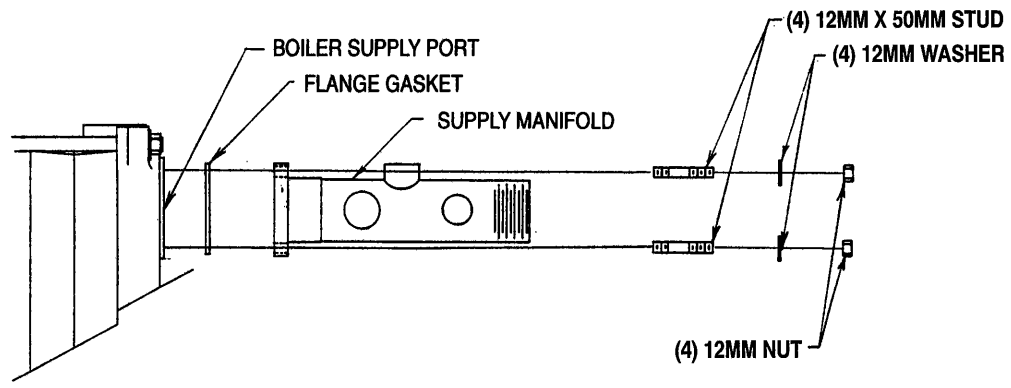
NOTE: Also consult Burner Manufacturer's Instruction Manual which takes precedence over Figure 9.

BOILER ASSEMBLY & INSTALLATION

All FW Series boilers are shipped with the boiler sections assembled and hydrostatically tested at the factory.

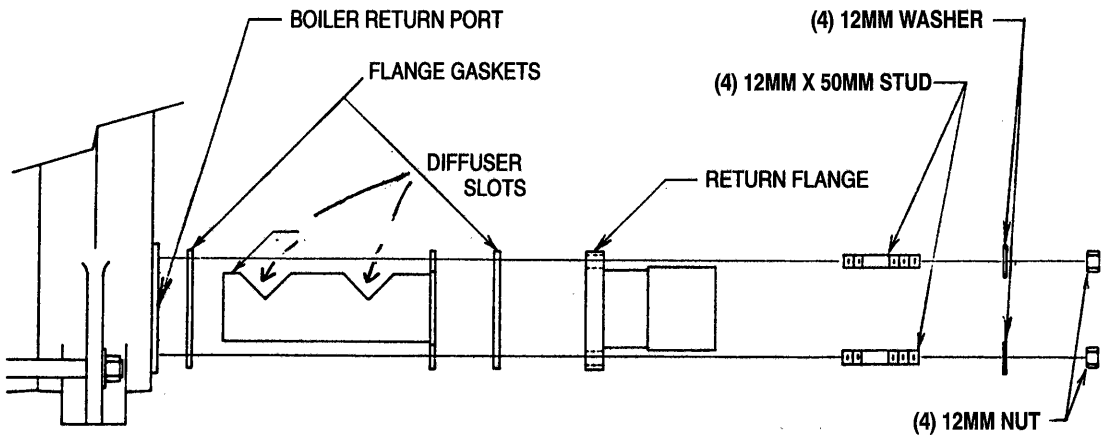
1. Position boiler on proper load bearing concrete pad or floor.
2. Attach supply manifold as shown in Figure 10.

FIG. 10 SUPPLY MANIFOLD ASSEMBLY



3. Install return port diffuser and attach return flange as shown in Fig. 11. Make sure diffuser SLOTS face upward.

FIG. 11 RETURN DIFFUSER INSTALLATION



Note:
Should any of these parts be missing contact your Crown dealer for replacements. Note that screw threading used on these parts is metric.

THERE IS NO ENGLISH THREAD EQUIVALENT TO THE NUTS OR STUDS SUPPLIED. ATTEMPTS TO USE ANY ENGLISH THREADED STUD IN PLACE OF THOSE SUPPLIED WILL DAMAGE THE BOILER BLOCK.

JACKET ATTACHMENT

ATTENTION

DO NOT INSTALL THE JACKET WITHOUT FIRST BOLTING-UP THE SUPPLY AND RETURN FLANGES.

INSTALL BOILER JACKET: REFER TO FIG 12 FOR ASSEMBLY (Also see Parts List Pages 22 and 23)

(1) Screw the (4) extension setscrews (043) into the four outer holes in the corners of the rear sections. Securely tighten the setscrews and other fastening bolts of the flue outlet cover (022).

(2) Place the large wraparound insulation mat (040) over boiler block (aluminum foil side facing out).

(3) Place smaller piece of insulation on top of wraparound insulation. This will provide double thick insulation on top of the boiler block.

(4) Remove flue collector clean-out covers (062).

(5) Push the two smaller pieces of insulation (060) onto the flue collector (022) so that the four extension setscrews (043) protrude through the insulation.

(6) Attach rear jacket panels (036) and (038) to the (2) extension screws (043) using the M6x10 pan head screws. Screw the rear panels together in the center using sheet metal screws provided. Reattach the clean-out covers.

(7) Place right and left side panels (093) (094) into the factory mounted hinge bracket (018) and hook into the rear panels (036) and (038).

(8) Hook center panel (033) with flange edge down between side panels (093) and (094).

(9) Attach the upper front trim panel (041) between the right and left side panels over the front door.

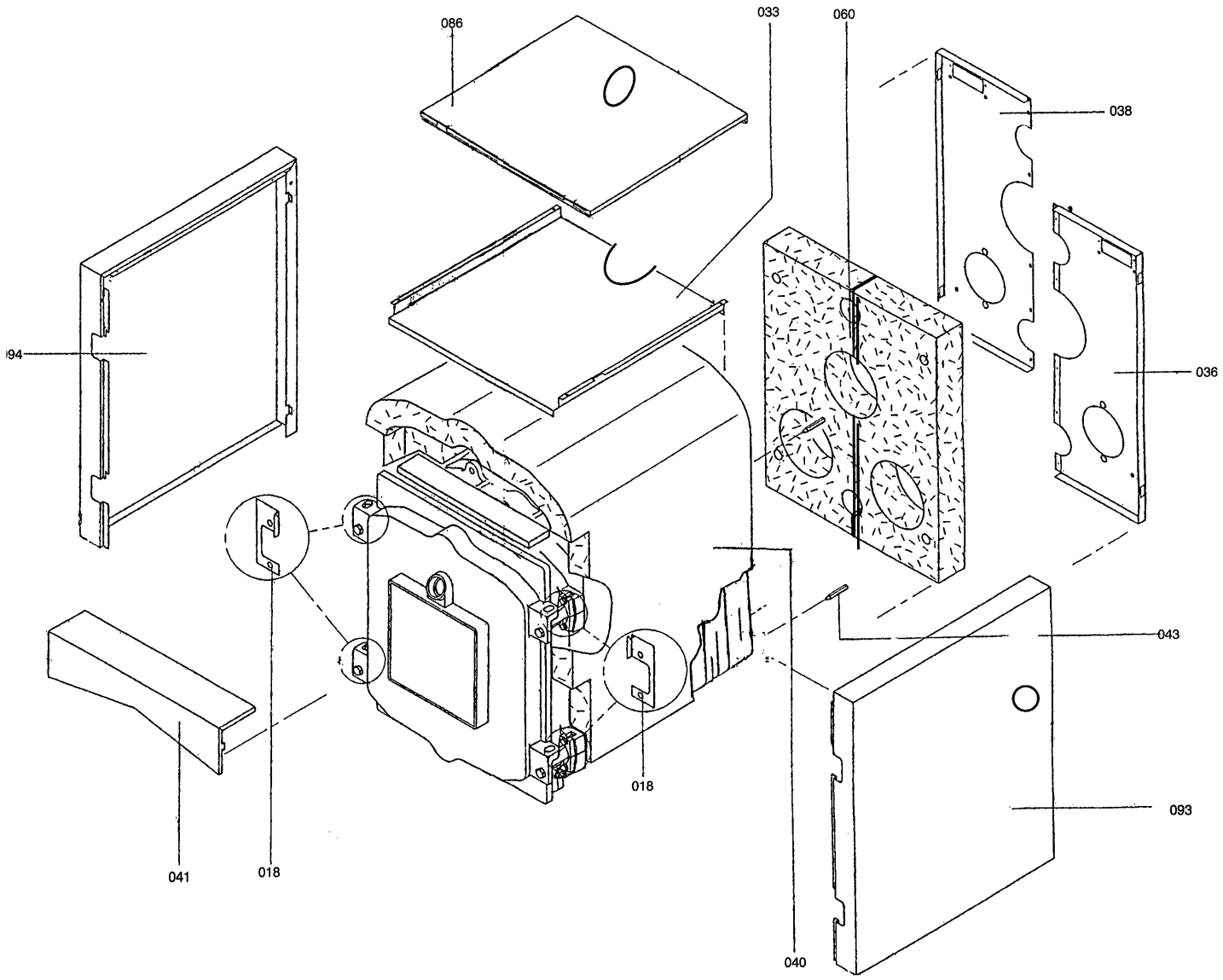
(10) Place the top panel (086) in position. Hook to the side panels.

(11) Remove sight glass plug in front door and install sight glass assembly (023, 025, 026, 048).

(12) Attach CROWN nametag at front/center of top jacket panel.

(13) Attach ASME tag and boiler rating tag at top left of rear jacket panel.

FIG. 12



Parts List

018 Hinge Bracket (Factory Mounting on Boiler)

033 Center panel

036 Right rear panel

038 Left rear panel

040 Insulating mat for boiler shell

041 Upper front trim panel

043 Setscrew AF 17 rear jacket panel, spacer piece

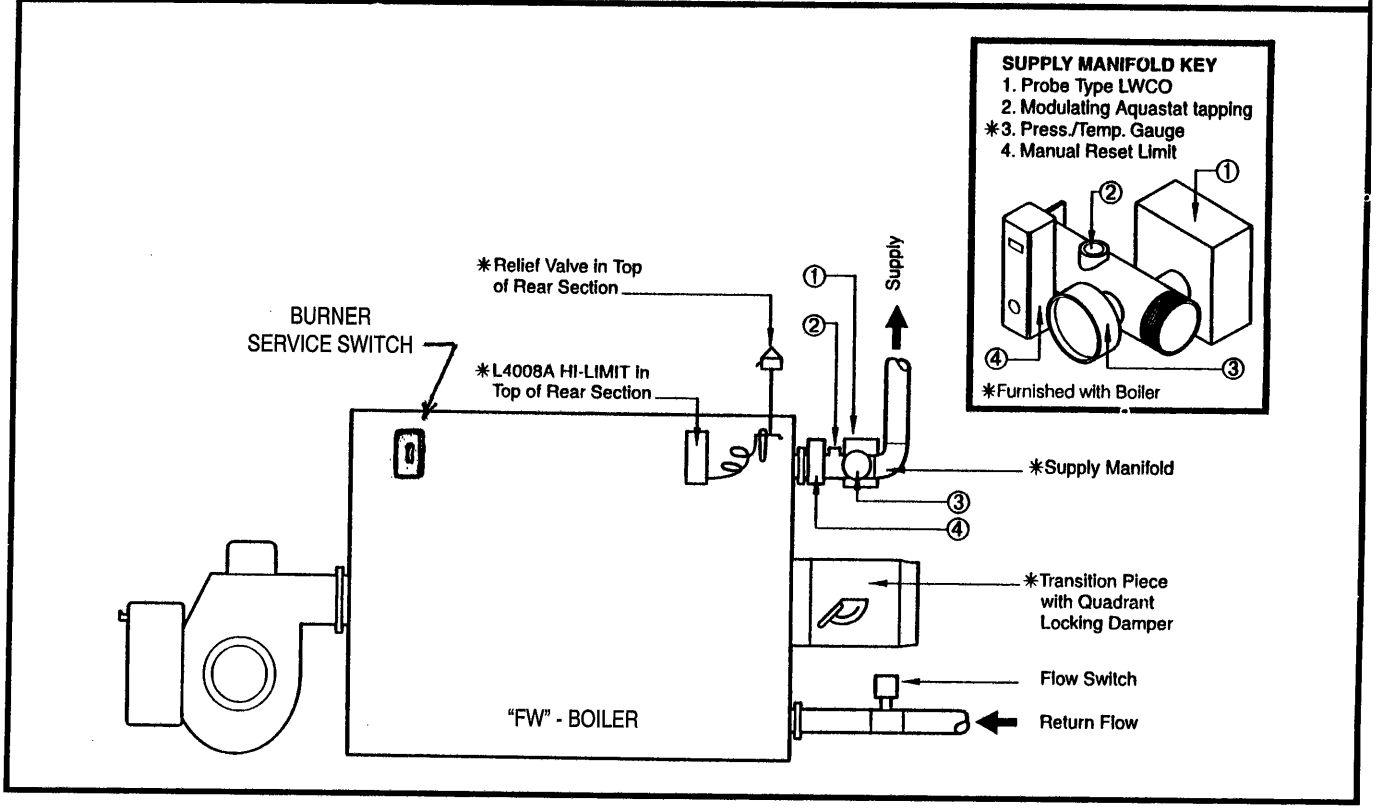
060 Rear insulating mat

086 Top Panel

093 Right side panel

094 Left side panel

FIG. 13 BOILER CONTROLS AND ACCESSORY LOCATION



1). Install relief valve, tridicator and L4008A operating high limit as shown in Fig. 13.

2). Connect feed water and piping system to boiler. Perform appropriate Hydrostatic test in accordance with A.S.M.E. code and authorities having jurisdiction.

3). Attach quadrant locking damper and seal with High Temperature silicone sealant.

OIL OR GAS BURNER PIPING

1). See Burner Manufacturer's installation instructions for near burner piping (See Fig. 8,9)

WIRING

ATTENTION

Disconnect power source before installing burner or servicing. Electric shock can cause severe injury or death.

All wiring should be done in accordance with rules of the National Electrical Code ANSI/NFPA-70 latest edition and any State or Local codes having jurisdiction.

1). **BEFORE ANY WIRING IS DONE**
Check burner voltage/cycle/phase. It must be compatible with the electricity furnished at job site.

2). Wiring diagram is found in burner instruction manual. Follow diagram for proper wiring of burner and controls.

3). Where burner motor voltage differs from control voltage, supply proper voltage to each.

4). Use properly sized fused disconnect and conductors for burner motor and control circuit.

BURNER MOUNTING

The FW series boilers are I=B=R tested and certified with burners as shown in Table 4.

TABLE 4

CROWN BOILER MODEL	BURNER MOTOR			BURNER MODEL LIGHT OIL	BURNER MODEL GAS	BURNER MODEL GAS/OIL COMB.	GAS TRAIN SIZE	MIN. GAS PRESS. REQ. at BURNER IN W.C.
	MFG.	HP	VOLTAGE					
FW-4	BECKETT	1/3	120-1	CF-500	-	-	-	-
	POWER FLAME	1/3	120-1	C1-0	C1-G-10	C1-GO-10	1-1/4	5.5
FW-5	BECKETT	1/3	120-1	CF-800	-	-	-	-
	POWER FLAME	1/3	120-1	C1-0	C1-G-10	C1-GO-10	1-1/4	5.5
FW-6	BECKETT	1/3	120-1	CF-800	-	-	-	-
	POWER FLAME	1/3	120-1	C1-0	C1-G-10	C1-GO-10	1-1/4	5.5
FW-7	BECKETT	1/2	120-1	CF-1400	-	-	-	
	POWER FLAME	1/3	120-1	C1-0	C-G-10	C1-GO-10	1-1/4	5.5
FW-8	BECKETT	1/2	120-1	CF-1400	-	-	-	
	POWER FLAME	3/4	230-1	C2-OA	C2-G-15	C2-GO-15	1-1/2	7.0
FW-9	BECKETT	1/2	120-1	CF-2300	-	-	-	-
	POWER FLAME	3/4	230-1	C2-OA	C2-G-15	C2-GO-15	1-1/2	7.0

NOTES: 1) All burners are LO-HI-OFF except Beckett CF-500 and CF-800 which are ON-OFF
2) Standard burner certification is U.L. special high risk insurance package. Available IRI, FIA, FM.
3) Burners are shipped in a separate crate. (When ordered)
4) Burner Blast Tube Insertion 4 3/4"

1). When mounting burners note as follows:
A) Beckett burners are furnished with a flange gasket
B) Power Flame burners are furnished with a sealing rope to be wrapped around the burner blast tube between the burner flange and the boiler/burner plate when used.

2) Slide burner through front door and bolt-up. Power Flame burners must be supported from underneath the burner housing.

3) Open boiler front door. Mix up a slurry of insulating cement. Fill void between burner blast tube and door refractory with flair cement as needed to have uniform relief from end of blast tube outward.

4) Let insulating cement cure approximately 24 hours prior to firing boiler.

FILLING BOILER

1). Fill boiler and system in accordance with job specification. System pressure should be set to have 5 PSI pressure at the highest point in the heating system. Boiler pressure gauge will indicate pressure relative to the height of water column from the boiler to the highest point, plus the additional 5 PSI.

Example: To calculate cold fill pressure:

Highest point in system above boiler is 40'; 40 ÷ 2.31 = 17.32 (1 PSI = 2.31 Ft. W.C.)
Add 5 PSI to 17.32 = 22.32 PSI; boiler pressure gauge will indicate 22.32 PSI (cold fill pressure).

WARNING

The expansion tank must be properly sized to system requirements. An under-sized expansion tank will cause system water to be lost through the relief valve and make-up water to be introduced through the fill valve. Continual introduction of fresh water into the system will cause mineral build-up in the boiler sections and eventual section failure.

2). Purge air from boiler and system.

WARNING

Never purge system while boiler is in operation, also never run cold water into a hot/empty boiler.

BURNER START UP - ALL FUELS

WARNING

DO NOT start or operate burner unless boiler and heating system pumps are ON and boiler has a minimum system water flow of 1.8 GPM for each 100,000 BTU/HR. of Gross boiler output. Refer to Table 2.

Consult Burner Manufacturer's Instruction Manual for proper start-up procedure

All Fuels - General Start Up

A thoroughly qualified burner technician should be employed to provide the initial burner start up, as well as any subsequent servicing.

A representative of the owner and/or the person or persons responsible for operating and maintaining the unit should be present during the initial start up. A service representative may also be required by the local utility on gas fired equipment. Instructions regarding the proper care and maintenance of the unit should be outlined with these people present.

1). Lock open boiler smoke outlet damper.
2). Start burner.
3). Heat up system.
4). Drill hole in smoke outlet transition piece between boiler and damper blade and run combustion tests.
5). Adjust burner using combustion test equipment. Adjust burner for:
   a). Oil - 12.5% CO_2; and 0 to trace smoke
   b). Gas - 9 - 10% CO_2 Natural gas and 100 PPM (0.01%) CO in flue gas
6). Adjust quadrant locking outlet damper to have .05" to .1" W.C. positive pressure at the smoke outlet.
7). Secure damper.
8). Seal combustion sample hole and smoke outlet connections using high temperature silicone sealant. Also seal the breeching smoke pipe joints and seams and connection to chimney.
9). After burner has been adjusted and while it is operating, check front door for leakage of flue gas. Should leakage occur, tighten door closure bolts. Also adjust door hinge bolts.

MAINTENANCE

Periodic observation of the Heating Plant is advised to insure safe efficient operation.

1). Check control operation and settings.
2). Check for odors or soot deposit marks. Door seal may need adjusting or vent connections may require additional sealing.
3). Observe burner operation for excessive noise or vibration.
4). Check for water leaks.

BOILER CLEANING

Boilers which operate only for heating, need only be cleaned at the end of each heating season. Boilers which operate year round should be cleaned Bi-annually.

It is important that the boiler be cleaned immediately after shut-down and while the cast iron is still warm, firstly because the deposits are more readily removed and, secondly, hardened deposits will absorb moisture and will cause corrosion.

ATTENTION

Before starting to clean the boiler: shut off all power to burner and boiler.
Shut off the fuel supply to burner in accordance with Burner Manufacturer's Instruction Manual.

To clean boiler:

1). Remove smoke pipe and flue collector at back of boiler.

2). Disconnect burner fuel lines as needed to open front door.

3). Remove all flue baffles.

4). Using the cleaning brush, scrub all fireside surfaces in combustion chamber, flue passages and flue collector area.

5). Remove residue and vacuum clean.

6). Check condition of flue baffles and replace as needed.

7). Check front door and flue collector rope seals, replace as needed.

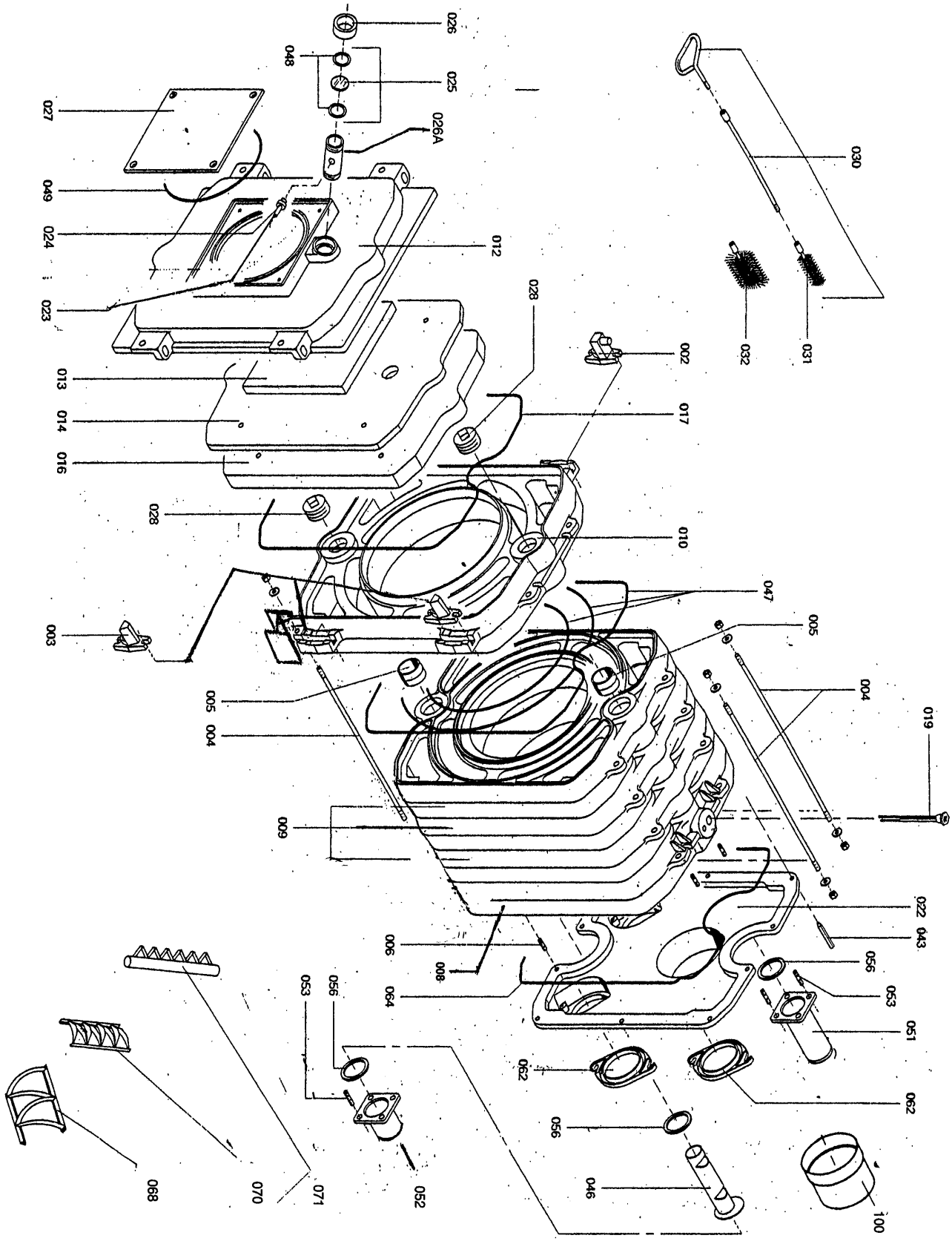
8). Re-assemble and put boiler into operation as needed.

NOTE:

When the boiler is to be "layed-up" at the end of the heating season or out of service for a prolonged period of time:

A) Make sure all surfaces are clean and dry.
B) Open boiler front door and place a tray of calcium chloride in the center of the furnace. This will absorb moisture and keep the heat transfer surfaces dry. When calcium chloride becomes mushy, replace with new.
C) Block door approximately 1/4 open.

Fig. 14 Parts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052

List of Parts

002 Hinge Pin
003 Adjusting Pin
004 Anchor Rod
005 Nipple
006 Bolt M 10 x 40

008 Rear Section
009 Middle Section
010 Front Section
012 Boiler door, complete (with item 013, 014, 016, 017 and 049)
013 Insulation mat for boiler door 344 x 344

014 Insulation mat for boiler door 583 x 745
016 Insulation block for boiler door
017 Packing 20 x 15
019 Aquastat well
022 Flue gas cover with flue connection

023 Hose coupling nipple 1/4"
025 Sight glass with seal
026 Sight glass and measuring tube cap
026A Sight glass nipple 1-1/4"
027 Burner plate

028 Stopper 2"
030 Cleaning tools, complete (with items 031 and 032)
043 Jacket spacer complete with set/screw and washer
046 Distributor pipe
047 Packing cord 7 mm dia. (6 m long)

048 Gasket for sight glass
049 Packing cord 8 mm dia. (0.94 m long)
051 Connecting pipe for boiler flow
052 Connecting pipe for boiler return
053 Bolt M 12 x 50

056 Seal 94 x 65 x 2 (flange gasket)
062 Clean-out cover
064 Packing cord 8 mm dia. (2.6 m long)
068 Retarder 2nd pass (bladetype)
070 Retarder 3rd pass (bladetype) FW-4, FW-5

071 Retarder 3rd pass (tubetype) FW-6 to FW-9
100 Smoke collar transition with quad locking damper

CROWN
Boiler

Manufacturer of Hydronic Heating Products

P.O. Box 14818 • 3633 I Street
Philadelphia, PA 19134

PN 98-052 FW 07/00 2.5M