WEIL-McLAIN

MODEL PFG

PFG

Gas-fired
Water boiler
Series 6

Boiler Manual

- Installation
- Service
- Operation
- Boiler Parts

For additional information, refer to . . .

Control Supplement

Read all instructions before installing

Installer Leave all instructions with boiler for future reference.
Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Owner Installation and service must be performed by qualified contractor.

Part No. 550-110-640/0703

Contents

Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

DANGER Indicates presence of hazards that will cause severe personal injury, death or substantial property damage.

WARNING Indicates presence of hazards that can cause severe personal injury, death or substantial property damage.

CAUTION Indicates presence of hazards that will or can cause minor personal injury or property damage.

NOTICE Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 13 of this manual. Failure to comply could result in severe personal injury.

WARNING Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to system components can result, causing substantial property damage.

WARNING Read all instructions before installing. Failure to follow all instructions in proper order can cause severe personal injury, death or substantial property damage.

NOTICE When calling or writing about the boiler— Please have the boiler model number from the boiler rating label and the CP number from the boiler jacket. You may list the CP number in the space provided on the **Installation and service certificate** found on page 11.

Section I: Installation

Codes

Installation must comply with all local codes, laws, regulations and ordinances. Also United States National Fuel Gas Code ANSI Z223.1-latest edition. When required, the installation must conform to Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1. Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler when the boiler underwent tests specified in ANSI Z21.13-latest edition.

Canadian installations must comply with CAN/CSA B149.1 or .2 Installation Codes. The equipment shall be installed in accordance with those installation regulations in force in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

Combustion air and ventilation openings

Combustion air and ventilation openings must comply with Section 5.3, Air for Combustion and Ventilation, of National Fuel Gas Code ANSI Z223.1-latest edition, or applicable local building codes. Canadian installations must comply with CAN/CSA B149.1 or .2 Installation Codes.

WARNING Provide adequate combustion and ventilation air to:
- Assure proper combustion
- Reduce risk or severe personal injury or death from flue gas spillage and carbon monoxide emissions.

WARNING Do not install an exhaust fan in the boiler room.

Boiler installation must assure sufficient openings in building and boiler room to provide adequate combustion air and ventilation. Consider construction tightness of building when deciding whether additional outside openings may be needed.

Older buildings with single-pane windows, minimal weather-stripping and no vapor barrier often provide enough natural infiltration and ventilation without dedicated openings.

New construction or remodeled buildings are most often built tighter. Windows and doors are weather stripped, vapor barriers are used and openings in walls are caulked. As a result, such tight construction is unlikely to allow proper natural air infiltration and ventilation.

Air from inside building (boiler in interior room):

- Tightly constructed buildings must be provided with openings to outside for combustion and ventilation air. These openings must be sized to handle all fuel burning appliances, exhaust and ventilation fans and fireplaces.
- When openings to boiler room are taken to interior spaces, provide two permanent openings: a combustion air opening within 12 inches of floor and a ventilation opening within 12 inches of ceiling. Each opening must provide a minimum free area of one square inch per 1,000 Btuh input of all appliances in room plus requirements for any exhaust fans in room. The interior space supplying combustion and ventilation air must have adequate infiltration from outside.

Air directly from outside to boiler room:

- Tightly constructed buildings must be provided with combustion air and ventilation openings to boiler room which are adequate to handle the boiler needs plus the needs of all other fuel-burning appliances, fireplaces and exhaust or ventilation fans.
- Combustion and ventilation openings connecting directly or by ducting to outside, or to attic or crawl spaces that freely connect with outside, must be sized as follows:
  1. Outside wall or vertical ducting - one square inch per 4,000 Btuh input of all appliances in room plus requirements for any exhaust fans or other appliances in room.
  2. Horizontal ducting - one square inch per 2,000 Btuh of all appliances in room plus requirements for any exhaust fans or other appliances in room.
  3. All ducting must be same size as permanent openings. Minimum area dimensions of ducting must be no less than 9 square inches.
  4. Other size ducting must comply with local codes.

Select the boiler location

- Consider all connections to boiler before selecting a location.
- Boiler must be installed so gas control system components are protected from dripping or spraying water or rain during operation or service.
- Non-combustible floor ONLY. See “Boiler foundation”, Page 4.

WARNING To avoid personal injury, death or property damage, keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

Installation clearances

Suggested minimum clearances for servicing

- 24 inches for cleaning and servicing, left side.
- 18 inches for access to controls and components, front.
- 48 inches from top for cleaning flueways.
- 6 inches on remaining sides.

Required minimum clearances to combustible material in alcove installations

PFG 5 thru 8:	Top 42"	R. Side 5"	Front: Alcove
	Rear 5"	L. Side 5"	
PFG 8:	Provide service clearances listed above and minimum 24" between jacket and any combustible wall(s) and ceiling. Install in space large in comparison to size of boiler.		

- Single wall vent pipe must be at least 6 inches from combustible material.
- Type "B" double wall metal vent pipe - refer to vent manufacturer's recommendation for clearances to combustible material.
- Hot water pipes must be at least ½" from combustible material.

Chimney or vent requirements

(also refer to Breaching erection, Page 9)

Venting must be installed according to Part 7, Venting of Equipment, of National Fuel Gas Code, ANSI Z223.1-latest edition and applicable building codes. Canadian installations must comply with CAN/CSA B149.1 or .2 Installation Codes.

Minimum chimney or vent sizes are on page 18. A chimney or vent without a listed cap should extend at least 3 feet above the highest point where it passes through a roof of a building and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet. A chimney or vent must not extend less than those distances stated above.

A lined chimney is preferred and must be used when required by federal, provincial, territorial, state or local building codes. Vitreous tile linings with joints which prevent the retention of moisture and linings made of noncorrosive materials are best. Advice for flue connections and chimney linings can usually be obtained from the local gas utility. Type "B" double wall metal vent pipe or single wall vent pipe may be used as a liner.

Cold masonry chimneys, also known as outside chimneys, typically have one or more walls exposed to outside air.

When any atmospheric gas-fired boiler with automatic vent damper is vented through this type of chimney, the potential exists for condensation to occur. Condensation can damage a masonry chimney.

Weil-McLain recommends the following to prevent possible damage:

1. Line chimney with corrosion-resistant metal liner such as AL29-4C® single wall stainless steel or B-vent. Size liner per National Fuel Code ANSI Z223.1-latest edition.
2. Provide drain trap to remove any condensate.

DANGER Inspect existing chimney or vent before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe injury or death.

DANGER Do not alter boiler draft hood or place any obstruction or non-approved damper in the breeching of vent system. AGA/CSA certification becomes void. Flue gas spillage and carbon monoxide emissions will occur causing severe personal injury or death.

Where two or more gas appliances vent into a common chimney or vent, equivalent area should be at least equal to the area of the vent outlet on the largest appliance plus 50 percent of the area of the vent outlet on the additional appliance.

When removing boiler from common venting system

CAUTION Failure to follow all instructions listed below can cause flue gas spillage and carbon monoxide emissions, resulting in severe personal injury, death or substantial property damage.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

a. Seal any unused openings in the common venting system.

b. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

c. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

e. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.

f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

g. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1-latest edition. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 in the National Fuel Gas Code, ANSI Z223.1-latest edition.

Canadian installations must comply with CAN/CSA B149.1 or .2 Installation Code.

Boiler foundation

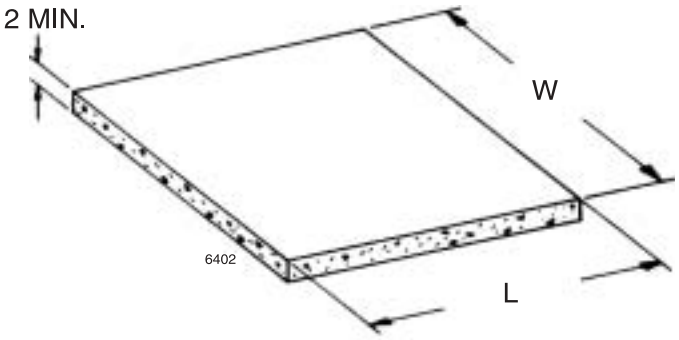
WARNING Never install boiler on combustible flooring or carpeting, even if a concrete or aerated foundation is used. Severe personal injury, death or substantial property damage can result.

1. See Figure 1. A level concrete or solid brick pad is required if:
   a) There is a possibility of the floor becoming flooded.
   b) Non-level conditions exist.

BOILER FOUNDATION SIZES

Boiler Size	Foundation L	Foundation W
5	20"	36½"
6	23"	36½"
7	26"	36½"
8	29"	36½"

Figure 1 Boiler foundation



2. An aerated boiler foundation is recommended if any of the following conditions exist:
   a) Electrical wiring or telephone cables buried in the concrete floor of the boiler room.
   b) Concrete floor is "green."
   c) There is a history of the floor becoming flooded.
   d) Water is channeled under the concrete.

Placing the boiler

1. Remove boiler from shipping pallet. Do not drop boiler or bump jacket on floor or pallet.
2. Level boiler so that air can be separated from the circulating water. Shim legs if necessary. Do not alter legs.
3. Remove front jacket door and burner access panel. Unscrew access panel screws, remove and discard shipping washers, and reinstall screws.
4. Check for proper orifice sizing from charts below.

DANGER Proper orifices must be used. Failure to do so will cause severe personal injury, death or substantial property damage.

ORIFICE SIZES		
Type of Gas	**Heating Value, BTU/cu. ft.**	**Orifice Size**
Natural	1000	#37 drill
Propane	2500	1.65 mm

ORIFICE SIZE – CANADA ONLY		
Elevation	**Natural**	**Propane**
0 – 2000 ft.	#37 drill	1.65 mm
2000 – 4500 ft.	#38 drill	#52 drill

5. Level and straighten the burners.

DANGER Burners must be seated properly in locating slots with their openings facing up. Gas orifices must inject down the center of the burner. Failure to properly seat burners will result in severe personal injury, death or substantial property damage.

6. Reinstall access panel.

Residential garage installation

Install boiler so burners are at least 18 inches above the floor.

Hydrostatic pressure test

Pressure test before attaching gas piping or electrical supply.

1. Plug any necessary boiler tappings or openings.
2. Connect water supply. Fill boiler and purge all air. Test at 45 psi for more than 10 minutes.

WARNING Do not leave boiler unattended. A cold water fill could expand and cause excessive pressure, resulting in severe personal injury, death or substantial property damage.

3. Check for maintained gauge pressure and leaks. Repair if found.

WARNING Leaks must be repaired at once. Failure to do so can cause boiler damage, resulting in substantial property damage.

DANGER Do not use petroleum-based sealing compounds in boiler system. Severe damage to boiler will result, causing substantial property damage.

4. Drain boiler and remove testing plugs.

Boiler piping connections to the heating system (refer to piping diagrams, Page 7)

CAUTION Failure to properly pipe the boiler may result in improper operation and damage to the boiler or building.

These boilers are provided with built-in air elimination systems.

1. Install relief valve vertically in top ¾" tapping in right end section.

WARNING Relief valve discharge piping must be piped near to the floor or to a floor drain to eliminate potential of severe burns. Do not pipe the relief valve discharge to any area where freezing could occur.

2. Install pressure-temperature gauge in tapping provided in left end section.
3. This boiler is for forced hot water circulation only. The circulator and expansion tank must be selected and sized according to the design requirements of the system.
   a) Size and install circulator. Can be installed on supply or return piping
   b) Size expansion tank to handle the volume of water in the system.
4. Expansion tank installations.
   a) Closed type expansion tanks - connect from the ¾" N.P.T. expansion tank tapping on the left end section (located just behind the supply outlet tapping) to the expansion tank using ¾" N.P.T. piping. Any horizontal expansion tank piping must pitch upward toward the tank at least 1 inch for each 5 feet of piping.
   b) Diaphragm type expansion tank - may be located anywhere in the system, preferably near the boiler.

NOTICE A manual or automatic type air vent must be installed in the ¾" N.P.T. tapping when a diaphragm type tank is used.

The most common cause of lime deposits in boilers is inadequate expansion tank volume. If the expansion tank is too small, system water is lost from the relief valve and make-up water is added through the fill valve. Eventual section failure will result.

5. Connect the system supply piping to the supply outlet tapping on the left end of the boiler. See Figure 2a for minimum pipe size.
6. Connect the system return piping to the return tapping on the right end of the boiler. See Figure 2a for minimum pipe size.
7. Install drain valve provided with boiler on left side. The installer must provide a drain cock to drain the right (return) side of the boiler and its connecting piping. The drain cock on the left side of the boiler will not fully drain the right side.
8. Low water cut off:
   a) Must be installed on any PFG boiler if the boiler is located above radiation level.
   b) Must be installed on all PFG-8 boilers to meet ASME specifications (low water cut-off not supplied by Weil-McLain).
   c) May be required by certain state, local or territorial codes or insurance companies.

   If a low water cut-off is required, use a control designed especially for water installations. An electrode probe type low water cut-off may be located in a tee in the supply line above the boiler.
9. If the system is to be ASME inspected and approved, an additional high temperature limit is needed. Purchase and install the control in the supply outlet piping to the boiler.
10. Connect the cold water fill supply piping close to the boiler.

Multiple zoning

1. Zone valves:
   a) Refer to zone valve manufacturer's literature for wiring and application. A separate transformer is required to power zone valves.
   b) Provide balancing valves to adjust the flow so it is about the same in each zone.
2. Circulators:
   a) Zoning with circulators requires a relay for each circuit.
   b) Install flow control valves to prevent gravity circulation.
   c) Provide balancing valves to adjust the flow so it is about the same in each zone.
   d) Size common return and supply piping for total flow of all circulators

Filling the system

1. Close manual air vents, drain cock, and automatic air vent, if used.
2. Fill to correct system pressure. Correct pressure will vary with each application. Residential systems are often designed for 12 pounds cold fill pressure.
3. Open automatic air vent one turn, if used.
4. Air must be vented for the system. Air in the system can interfere with water circulation and cause improper heat distribution.
   a) Open manual water feed valve.
   b) Starting on the lowest floor, open the air vents one at a time until water squirts out. Close vent.
   c) Repeat with remaining vents.
   d) Close manual water feed valve when correct boiler pressure is reached.
5. To purge air from system, install isolation valve in return piping.
   a) Connect a garden hose to the purge valve located above the isolation valve.
   b) Close isolation valve. Open purge valve.
   c) Open hand water feed valve and allow system to purge all air. If system has more than one circuit, purge each circuit separately by opening each balancing valve one at a time.
   d) Close purge valve.
   e) Open isolation valve.
   f) Fill the system to the correct pressure.
6. Keep the system filled by occasionally opening the air vents as in Step 4 above. Add water to make up system pressure.

Recommended boiler and system piping (forced hot water)

Figure 2a Minimum recommended pipe sizes

Boiler Size	Min. Pipe Size	
	Supply (A)	Return (B)
PFG-5	1½"	1½"
PFG-6	2"	2"
PFG-7	2"	2"
PFG-8	2"	2"

Supply and return sizes refer to minimum size of pipe connected to the boiler for 20°F temperature drop between supply and return.

Figure 2b Piping – Closed type expansion tank

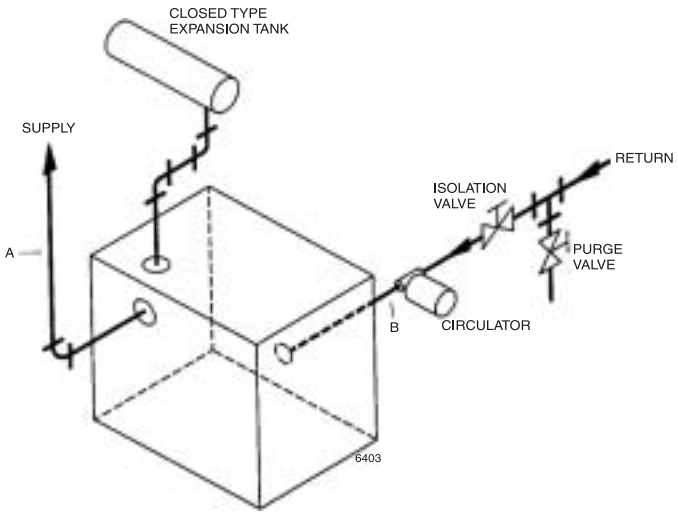
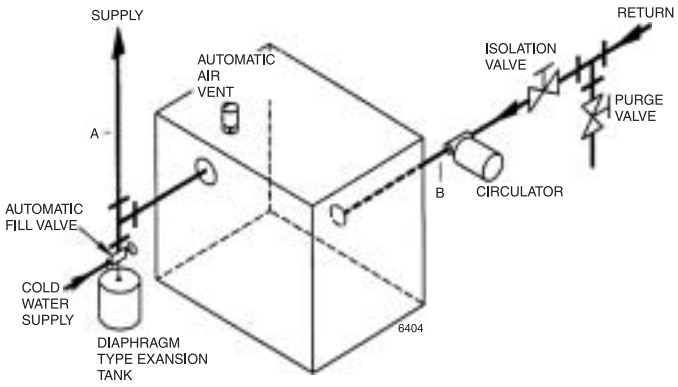


Figure 2c Piping – Closed diaphragm type expansion tank



Note: Use circulators or zone valves in each circuit for multiple circuit applications.

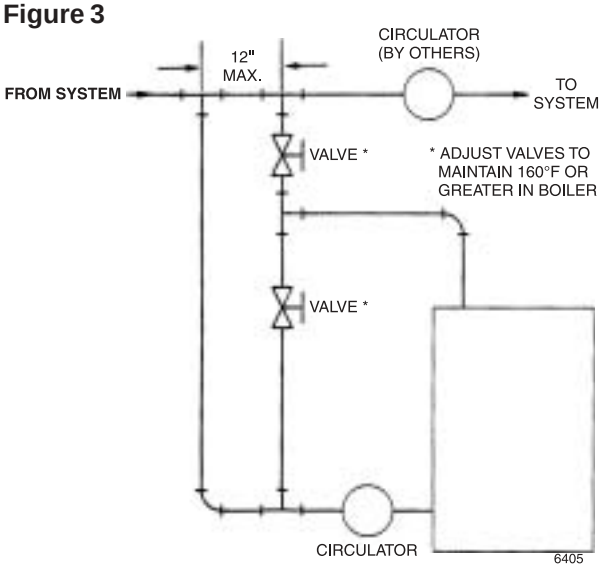
Bypass piping

BYPASS PIPING IS NOT NORMALLY REQUIRED ON ANY BASEBOARD SYSTEM

Bypass piping should be used for the following installations. Bypass, supply, and return piping should be same size.

1. To protect:
   - radiant panels, plaster, etc. from high temperature water supplied from boiler, or
   - boiler from condensation caused by low temperature water returned from system.
2. To protect boiler from condensation formed by low water temperature returned from large water content converted gravity systems, etc., see Figure 4.

Figure 3



External heat exchangers

The PFG boiler can be used with a storage tank/heat exchanger unit for domestic hot water. The boiler/tank combination should be installed and wired in accordance with the tank manufacturer's instructions, which will also show any additional components required. A zone valve or separate circulator must be installed to regulate the production of hot water.

Freeze protection

Use antifreeze especially made for hydronic systems. Inhibited propylene glycol is recommended.

WARNING Do not use automotive, ethylene glycol or undiluted antifreeze. Severe personal injury, death or substantial property damage can result.

50% solution provides protection to about -30°F

Local codes may require a back-flow preventer or actual disconnect from city water supply.

Determine quantity according to system water content. Boiler water content is listed on page 19.

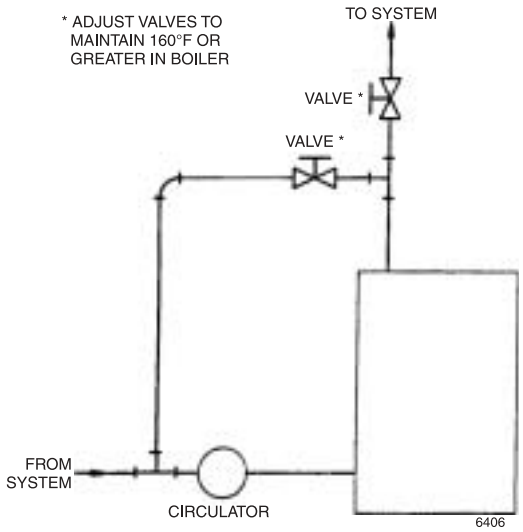
Follow antifreeze manufacturer's instructions.

Use with refrigeration system

The boiler must be installed so that chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the boiler. Consult I=B=R Installation and Piping Guides.

If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, gravity circulation during the cooling cycle must be prevented with flow control valves or other automatic means.

Figure 4



Size and install gas piping

In sizing the gas piping, the following factors should be considered.

a) Diameter and length of the gas supply piping.
b) Number of fittings.
c) Maximum gas consumption (including any possible future expansion).
d) Allowable loss in gas pressure from gas meter outlet to boiler. For pressure drops, see ANSI Z223-1 latest edition. Canadian installations must comply with CAN/CSA B149.1 or .2 Installation Codes.

1. Size natural gas piping from the following table. Piping must be sized to provide proper inlet gas pressure to the gas valve when boiler is operating at rated input. For natural gas, inlet gas pressure to gas valve should be a minimum of 5 inches water column and a maximum of 13 inches water column. If inlet natural gas pressure exceeds 13 inches water column, a 100 percent lock-up type gas pressure regulator of adequate size must be installed in gas supply piping and adjusted to prevent pressure in excess of 13 inches water column.

   To obtain cubic feet per hour, divide the input (Btu per hour) by the heating value (Btu per cubic foot).

Pipe delivery schedule

Length of Pipe In Feet	*CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR				
	½"	¾"	1"	1¼"	1½"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	890
40	63	130	245	500	760
50	56	115	215	440	670
75	45	93	175	360	545
100	38	79	150	305	460
150	31	64	120	250	380

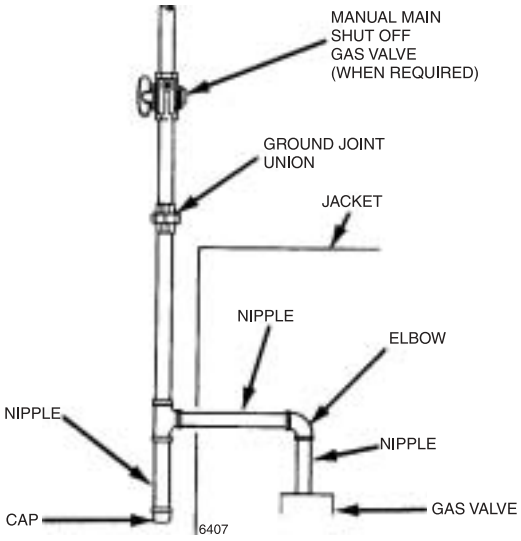
*0.60 Specific Gravity, 0.30 inches water column pressure drop. For additional schedules, see ANSI Z223.1. Canadian installations must comply with CAN/CSA B149.1 or .2 Installation Codes.

2. PFG 6 thru 8 only (and no damper on PI boilers) - for propane gas, inlet gas pressure to gas valve should be 11 to 13 inches water column. The gas pressure regulator (furnished by the gas supplier) must be adjusted to provide lock-up pressures not exceeding 13 inches water column. Select the pipe size, tanks and regulators as required.

DANGER If boiler is to be propane fired, a conversion kit must be used. Failure to use kit, properly install kit or use kit on boiler with damper will result in severe personal injury, death or substantial property damage.

3. Remove jacket door and connect from gas valve to gas meter. Use a street elbow or an elbow and close nipple at the inlet connection of the gas valve to run gas piping through opening in jacket side panel.
4. Follow good piping practices.
5. Pipe joint compound (pipe dope) must be resistant to corrosive action of liquefied petroleum gases and applied sparingly only to male threads of pipe joints.
6. A drip leg must be installed at inlet of gas connection to boiler. Where local utility requires drip leg be extended to the floor, use an appropriate length of pipe between the cap and tee.
7. A ground joint union must be installed in the piping to provide for servicing (see Figure 5).
8. Install manual shut-off valve outside boiler jacket as shown in Figure 5 when required by local codes.
9. Piping must be supported by hangers, not by the boiler or its accessories.
10. In Canada only - when manual main shut off valve is used, it must be identified by installer.
11. Purge all air from the supply piping.

Figure 5 Gas supply piping



12. Before placing boiler in operation, check boiler and its gas connection for leaks.

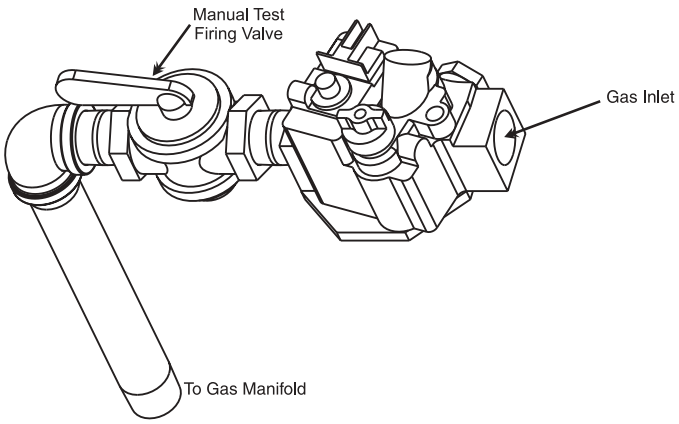
WARNING Do not check for gas leaks with an open flame - use bubble test. Failure to do so can cause severe personal injury, death or substantial property damage.

a) If test pressure is less than 13.0 inches water column then close manual main shut-off valve.

b) If test pressure is greater than 13.0 inches water column then boiler and gas valve must be disconnected from gas supply piping.

PFG-8, as requiried by ANSI Z21.13/CSA 4.9, is equipped with a manual test valve as shown in Figure 5a. Close this valve to test boiler gas valve without supplying gas to the manifold.

Figure 5a Leak test valve (model PFG-8 ONLY)



Draft hood installation

Secure the draft hood to the outlet at the top of the boiler with sheet metal screws. The bottom of the draft hood or "skirt" must have the clearance dimension above the jacket top panel as indicated on the draft hood.

DANGER Do not alter draft hood. A.G.A./CSA design certification becomes void. If draft hood is altered, severe personal injury or death will occur, resulting from flue gas spillage or carbon monoxide emissions.

Spill switch installation (PFG-5 ONLY)

Fasten spill switch to draft hood as shown on page 16. Connect wires as shown on wiring diagram label located inside boiler door.

Damper installation

If damper will be installed, see Control Supplement for information.

Breeching erection

(also refer to chimney or vent requirements, Page 4)

Connect from draft hood or damper outlet to chimney or vent with same size as breeching. Where possible, vertical venting to the outside from the draft hood or damper outlet will offer best performance. Where horizontal breeching is used, slope upward at least ¼ inch per lineal foot toward the chimney or vent and support with hangers to prevent sagging.

WARNING A minimum vertical height of 3 feet of breeching before any elbow or horizontal breeching is recommended to reduce chances of flue gas spillage at the draft hood. Long horizontal breechings, excessive numbers of elbows or tees, or other obstructions that restrict the flow of combustion gas should be avoided.

Breeching must not be connected to any portion of a mechanical draft system that can operate under positive pressure.

Wiring

WARNING For your safety, turn off the electrical power supply at the service entrance panel before making any electrical connections to avoid possible electrical shock hazard.

All wiring must be installed in accordance with requirements of the National Electrical Code and any additional national, state or local code requirements having jurisdiction. All wiring must be N.E.C. Class 1. The boiler must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA No. 70-latest edition.

In Canada, all wiring must be done in accordance with the CSA C22.1 Canadian Electrical Code Part 1.

If original rollout thermal fuse element wire as supplied with PFG-5 boiler must be replaced, type 200°C wire or equivalent must be used. If other original wire as supplied with any PFG boiler must be replaced, type 105°C wire or equivalent must be used.

The boiler is shipped with control components completely wired except for spill switch and damper (if provided).

A separate electrical circuit should be used for the boiler with a fused disconnect switch (15 amp. recommended).

Refer to wiring diagram label affixed to the inside of the jacket door. Bring electrical supply through proper opening in the jacket left end panel and into the electrical junction box. Wire electrical supply, circulator and thermostat as shown on the wiring diagram.

For boilers equipped with control systems other than constant burner pilot, refer to separate instructions for application data.

Wiring multiple zones

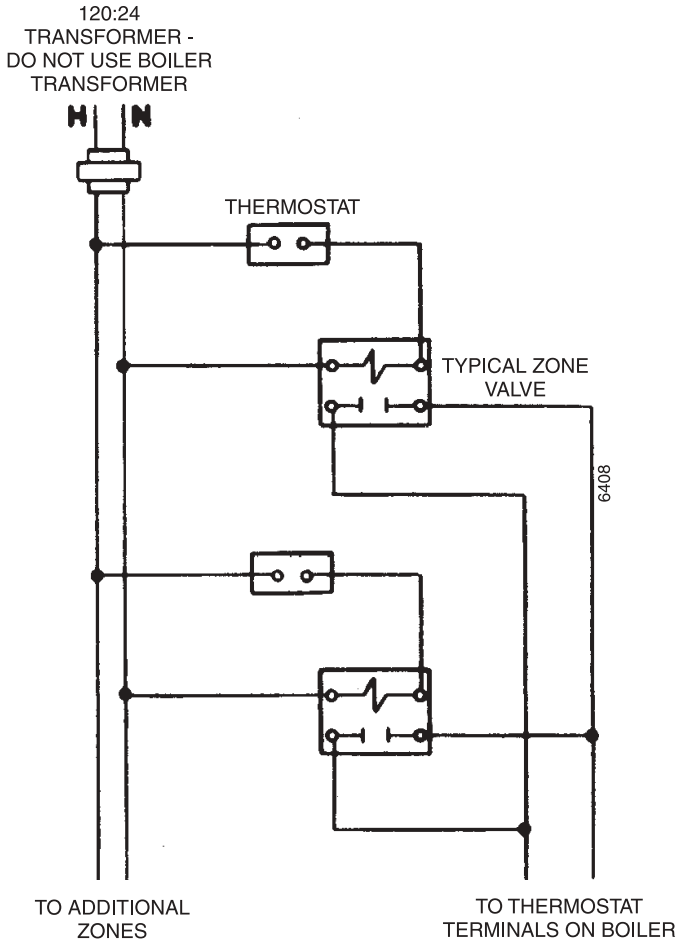
Refer to zone valve manufacturer's literature for wiring and application. A separate transformer is required to power zone valves. Zoning with circulators requires a relay for each circuit.

Install room thermostat

Install room thermostat on an inside wall. Never install where it will be influenced by drafts, hot or cold water pipes, lighting fixtures, television, rays of the sun or near a fireplace.

Heat anticipator in thermostat must be set to match the power requirements of the primary control to which it is connected. Refer to wiring diagram on jacket door for recommended heat anticipator setting with standard equipment. Wire the thermostat as shown.

Figure 6 Typical wiring – zoning with zone valves



Check-out procedure

Check off steps as completed.

❑ 1. Check to make sure base insulation is secure. See "Inspect Base Insulation," page 15.

❑ 2. Boiler and heat distribution units filled with water?

❑ 3. Automatic air vent, if used, open one turn?

❑ 4. Air purged from system?

❑ 5. Air purged from gas piping? Piping checked for leaks?

❑ 6. Follow operating/lighting instruction label on boiler for proper start-up. Also refer to “To Place in Operation,” page 13.

❑ 7. Are proper orifices installed? See page 5 for proper orifice size.

DANGER Proper orifices must be used. Failure to do so will cause severe personal injury, death or substantial property damage.

❑ 8. Proper burner flame? Refer to "Check Main Burner Flames" and "Check Pilot Burner Flame," page 13.

❑ 9. Test limit control: While burners are operating, move the indicator of the high limit control below actual boiler water temperature. The burners should go off while the circulator continues to operate. Raise the limit control above the boiler water temperature and the burners should reignite.

❑ 10. Test any additional field-installed controls: If boiler has low water cut-off, additional high limit or other controls, test for operation as outlined by manufacturer. Burners should be operating and should go off when controls are tested. When controls are restored, burners should reignite.

❑ 11. To test ignition system shut-off device:

a. For PI systems: Connect a manometer to outlet side of gas valve. Start boiler, allowing for normal start-up cycle to occur and main burners to ignite. With main burners on, manually shut off gas supply at manual main shut-off gas valve. Burners should go off. Open manual main shut-off gas valve. The manometer should confirm there is no gas flow. Pilot will relight, flame sensing element will sense pilot flame and the main burners reignite.

b. For standing pilot systems: Turn gas knob to PILOT position and extinguish pilot flame - Pilot gas flow should stop in less than 3 minutes. Put system back into operation, see page 13.

❑ 12. High limit control set to design temperature requirements of the system? Maximum high limit setting - 240 °F.

❑ 13. For multiple zones, flow adjusted so it is about the same in each zone?

❑ 14. Thermostat heat anticipator is set properly? Refer to "Install Room Thermostat," page 10, and wiring diagram on jacket door.

❑ 15. Boiler cycled with the thermostat? Raise to highest setting. Boiler should go through normal start-up cycle. Lower to lowest setting. Boiler should go off.

❑ 16. Measure gas input (natural gas only):

a. Operate boiler 10 minutes.

b. Turn off all other appliances served by the gas meter, including gas stove, pilot lights and gas yard lights.

c. At natural gas meter measure time (in seconds) required to use on cubic foot of gas.

d. Calculate gas input:

$$\frac{3600 \times 1000}{\text{number of seconds from step C}} = \text{Btuh}$$

e. Btuh calculated should approximate input rating on rating label.

❑ 17. Check manifold gas pressure by connecting manometer to downstream test tapping on main gas valve. Manifold gas pressure for natural gas should be 3 1/2 inches water column and for propane gas should be 10 inches water column.

❑ 18. Several operating cycles observed for proper operation? If damper is provided, see Control Suppelement for check-out procedure.

❑ 19. Room thermostat set to desired temperature?

❑ 20. Installation and Service Certificate on this page completed?

❑ 21. All instructions shipped with this boiler reviewed with owner or maintenance person, returned to envelope and given to owner or displayed near boiler?

Installation and Service Certificate

Boiler model _____ Series _____ CP number _____ Date installed _____

Measured Btuh input _____

☐ Installation instructions have been followed.
☐ Check-out sequence has been performed.
☐ Above information is certified to be correct.
☐ Information received and left with owner/maintenance ☐

Installer _____ _____ _____
(company) (address) (phone)

_____
(installer’s signature)

Section II: Service

Also Refer to Additional Instructions Shipped With The Boiler For Specific Control Operation and Troubleshooting.
Verify Proper Operation After Servicing.

NOTICE Your boiler should be inspected, cleaned and, if necessary, adjusted once a year. A qualified service agency should be called.

WARNING To avoid personal injury, before servicing:

1. Disconnect electrical supply.
2. Shut-off gas supply.
3. Allow boiler to cool.

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

WARNING To avoid personal injury, death or property damage, keep the boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

Do not block flow of air to boiler. Incomplete combustion and carbon monoxide emissions can cause severe personal injury, death or substantial property damage.

Do not store sources of hydrocarbons (i.e., bleaches, cleaners, chemicals, sprays, paint removers, fabric softeners, etc.) in boiler area. This can contribute to shortened boiler/vent system life.

Suggested Minimum Service Schedule for Qualified Service Technician Only

Beginning of each heating season:

1. Annual service call by a qualified service agency.
2. Check burners and flueways and clean if necessary. Reference "Clean Boiler Heating Surfaces" and "Clean Main Burners," page 14.
3. Visually inspect base insulation. Reference "Inspect Base Insulation," page 13.
4. Follow procedure "To Place in Operation," page 13.
5. Visually inspect main burner flames. Refer to "Check Main Burner Flames," page 13.
6. Check pilot flame. Refer to page 13.
7. Visually inspect venting system for blockage, deterioration or leakage. Reference "Inspect Venting System," page 14.
8. Check operation of low water cut-off, if used, and additional safety devices. Refer to manufacturer's instructions.
9. Check that boiler area is free from combustible materials, gasoline and other flammable vapors and liquids.
10. Check for and remove any obstruction to the flow of combustion or ventilation air to the boiler.
11. Follow instructions on circulator to oil, if oil lubricated. Over oiling will damage the circulator. Water lubricated circulators do not need oiling.

Daily during heating season:

1. Check that boiler area is free from combustible materials, gasoline and other flammable vapors and liquids.
2. Check for and remove any obstruction to the flow of combustion or ventilation air to the boiler.

Periodically during heating season:

1. Check relief valve. Reference manufacturer's instructions on relief valve tag.
2. Test low water cut-off, if used. Blowdown if low water cut-off is float type. Reference manufacturer's instructions.

Monthly during heating season:

1. Check for leaks in the boiler and piping. If found, repair at once.

WARNING Leaks must be repaired at once. Failure to do so can cause boiler damage, resulting in substantial property damage.

DANGER Do not use petroleum-based sealing compounds in boiler system. Severe damage to boiler will result, causing substantial property damage.

2. Visually inspect main burner flames. Reference "Check Main Burner Flames."
3. Check pilot flame. Refer to page 13.
4. Visually inspect venting system for blockage, deterioration or leakage. Reference "Inspect Venting System," page 14.
5. Check automatic air vent for leakage. If leaking, remove vent cap and push valve core in to wash off sediment that may have accumulated on the valve seat. Release valve, replace cap, and open one turn.

End of each heating season:

1. Follow "Annual Shutdown Procedure," page 14.

Handling ceramic fiber and fiberglass materials

WARNING This product contains fiberglass jacket insulation and ceramic fiber materials in combustion chamber lining or base panels in gas fired products. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation. The combustion chamber lining or base insulation panels in this product contain ceramic fiber materials. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).":

Suppliers of fiberglass wool products recommend the following precautions be taken when handling these materials:

Precautionary measures

- Avoid breathing fiberglass dust and contact with skin or eyes.
- Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
- Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining or base insulation to prevent airborne dust.
- Remove combustion chamber lining or base insulation from the boiler and place it in a plastic bag for disposal.
- Operations such as sawing, blowing, tear out and spraying may generate airborne fiber concentration requiring additional protection. Bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

•Eye: Irrigate immediately

•Breathing: Fresh air.

Inspect base insulation:

WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials. See WARNING above. Failure to comply could result in severe personal injury.

Make sure base insulation is secure against base front and back panels. If base insulation is damaged or displaced, do not operate boiler. Replace or reposition insulation.

WARNING Failure to replace damaged insulation or reposition insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

To place in operation:

1. Make sure boiler is filled with water.
2. Follow lighting/operating instructions on boiler.

For propane boilers only:

WARNING Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor.

Propane gas can accumulate at floor level. Smell near the floor for the gas odorant or any unusual odor. If you suspect a leak, do not attempt to light the pilot.

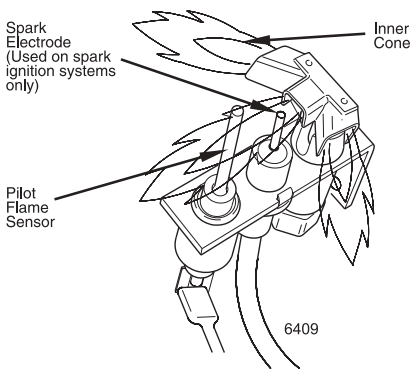
- Use caution when attempting to light a propane pilot. This should be done by a qualified service technician, particularly if pilot outages are common.
- Periodically check the odorant level of your gas.
- Inspect boiler and system at least yearly to make sure all gas piping is leak-tight.
- Consult your propane supplier regarding installation of a gas leak detector. There are some products on the market intended for this purpose. Your supplier may be able to suggest an appropriate device.

3. If boiler starts, go to Step 5. If boiler fails to start, go to Step 4.
4. If boiler fails to start, check for following conditions:
   a) Loose connection or blown fuse?
   b) High limit setting below boiler water temperature?
   c) Thermostat setting below room temperature?
   d) Gas not turned on at meter?
   e) Gas not turned on at boiler?
   f) If above fails to eliminate the trouble, refer to Control Supplement.
5. Make sure boiler goes through several normal operating cycles.
6. Turn thermostat or operating control to desired setting.

Check pilot burner flame:

1. Proper pilot flame
   a) Blue flame.
   b) Inner cone engulfing pilot flame sensor.
   c) Pilot flame sensor glows cherry red.
2. Improper pilot flame
   a) Overfired - flames large and lifting or blowing past pilot flame sensor.
   b) Underfired - flame small; pilot flame sensor not engulfed by inner cone.
   c) Lack of primary air - flame tip yellow.
   d) Pilot flame sensor not heated properly.

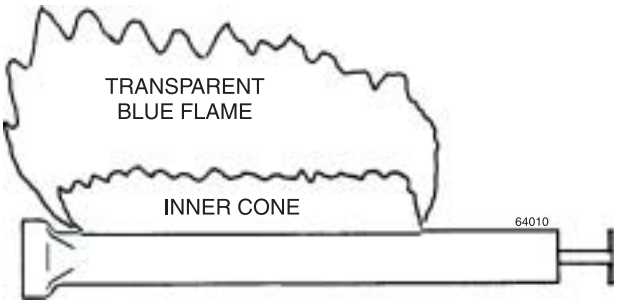
Figure 7 Typical pilot burner flame



Check main burner flames:

1. Proper burner flame - Yellow-orange streaks may appear - caused by dust.
2. Improper flame
   a) Overfired - Flames large.
   b) Underfired - Flames small.
   c) Lack of primary air - Yellow tipping on flames; sooting will occur.

Figure 8 Typical main burner flame



Inspect venting system:

1. Check venting system at least once a month during heating season. With boiler in operation (at least 5 minutes), hold a candle or match below lower edge of draft hood "skirt." If flame is undisturbed or leans under skirt, vent system is functioning properly. If flame is extinguished, flickers, or reduced while flame is pushed out side skirt, the vent system must be checked for obstructions or other causes of improper venting.
2. Inspect all parts of venting systems for deterioration from corrosion, physical damage, sagging, etc. Correct all conditions found.
3. Verify damper, if used, is open when burner ignites. For additional information, see Control Supplement.

Clean boiler heating surfaces

WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 13 of this manual. Failure to comply could result in severe personal injury.

1. Follow shut-down procedure.
2. Remove breeching, draft hood and damper (when used).
   Remove jacket top panel. Turn back jacket insulation to expose collector hood.
3. Remove collector hood. Clean excess boiler cement from collector hood and cast iron sections.
4. Remove radiation plates.
5. Remove burners from base of boiler. Follow "Clean Main Burners," page 14, to thoroughly clean burners.
6. Place newspaper in base of the boiler to collect soot that will fall.
7. With a wire flue brush, clean between the sections.
8. Remove newspaper and soot. Vacuum or brush base and surrounding area to remove soot.
9. Reinstall radiation plates.
10. Reinstall collector hood. Seal with boiler cement.
11. Reinstall insulation and jacket panel.
12. Reinstall burners.

DANGER When reinstalling, burner tubes must be seated in their locating slots with the openings facing up. Gas orifices must inject down center of burner. Failure to properly seat burner will result in severe personal injury, death or substantial property damage.

13. Reinstall draft hood, damper (when used), and breeching.
14. Follow "To Place in Operation" procedure.

NOTE: Excessive sooting indicates improper combustion of the gas. Call a qualified service agency or your local gas utility to check for proper combustion and make any necessary adjustments.

Clean main burners:

1. Vacuum or brush burners to remove dust and lint.

DANGER When reinstalling, burner tubes must be seated in their locating slots with the openings facing up. Gas orifices must inject down center of burner. Failure to properly seat burner will result in severe personal injury, death or substantial property damage.

Annual shut-down procedure:

1. Follow lighting/operating instructions label on boiler.
2. DO NOT drain the system unless exposure to freezing temperatures will occur. If antifreeze is used with system, do not drain.
3. If the complete boiler and piping system must be drained to avoid freezing, then a means must be provided for draining water from BOTH ends of the boiler at or below the level of the return tapping. A boiler drain cock is provided by Weil-McLain on the left side of the boiler only.

Special servicing instructions

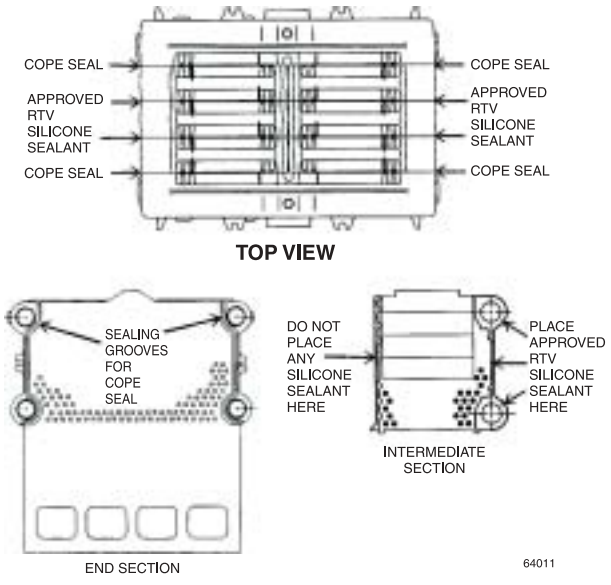
WARNING Failure to use PFG Series 6 intermediates or to properly seal sections per Figure 9 can cause flue gas spillage or carbon monoxide emissions, resulting in severe personal injury, death or substantial property damage.

PFG Series 6 intermediate sections have smooth ground sealing surfaces. These sections must be used if replacing intermediate sections. End sections have rope groove in place of smooth ground sealing surface.

If replacing any section (see Figure 9):

- Approved RTV silicone sealant (Dow Corning 700 or 732 or G.E. 808 or 108) must be used to seal between intermediates.
- Cope seal must be used to seal between intermediates and end sections.

Figure 9 Section assembly



Common problems and possible solutions

COMMON SYMPTOMS	COMMON CAUSES	POSSIBLE CORRECTIONS
Rapid cycling – burners turn on and off frequently.	Thermostat installed where drafts or heat affect reading.	Locate thermostat on inner wall away from heat sources or cool drafts.
	Heat anticipator in thermostat adjusted incorrectly.	Adjust heat anticipator to match current draw. Refer to boiler wiring diagram.
	Incorrect limit setting.	Set limit according to system design. Maximum setting is 240°F. for water boilers. Increase limit setting to decrease cycling.
Frequent release of water through the relief valve.	Insufficient expansion tank size.	Call installer to check expansion tank operation.
	Flooded expansion tank.	Call installer to check expansion tank operation.
Need to frequently add make-up water.	Leaks in boiler or piping.	Have installer repair leaks at once to avoid constant use of make-up water. Make-up water can cause mineral deposits which, in turn, can cause boiler section failure. Do not use petroleum based stop-leak chemicals.
Popping or percolating noise heard in boiler.	Mineral deposits in the sections due to the constant use of make-up water.	Call installer to delime the boiler, if necessary. In some cases the deposits will be too heavy to remove with deliming.
		Have installer repair leaks to eliminate the need for contstant make-up water.
	Incorrect pH of boiler water.	pH should be maintained at 7.0 to 8.5.
Metal flakes found in boiler base – flueway corrosion.	Halogenated hydrocarbons from environment contaminating the combustion air.	Locate and remove sources of hydrocarbons (i.e., bleaches, cleaners, chemicals, sprays, fabric softeners, paint remover, etc.).
	Condensation of combustion gases.	Raise high limit setting. If problem continues, call installer for assistance.
Isolated radiation does not heat.	Air in system.	Bleed air from system through vents in radiation.
	Low system pressure.	Fill to correct pressure.
		Check for leaks in boiler or piping. Have installer repair at once.
	High limit set to low.	Adjust high limit to a higher setting.
Black Water Condition.	Oxygen corrosion due to leaks in piping.	Check for leaks in piping. Have installer repair at once. Maintain pH between 7.0 – 8.5.

Section III: Replacement Parts

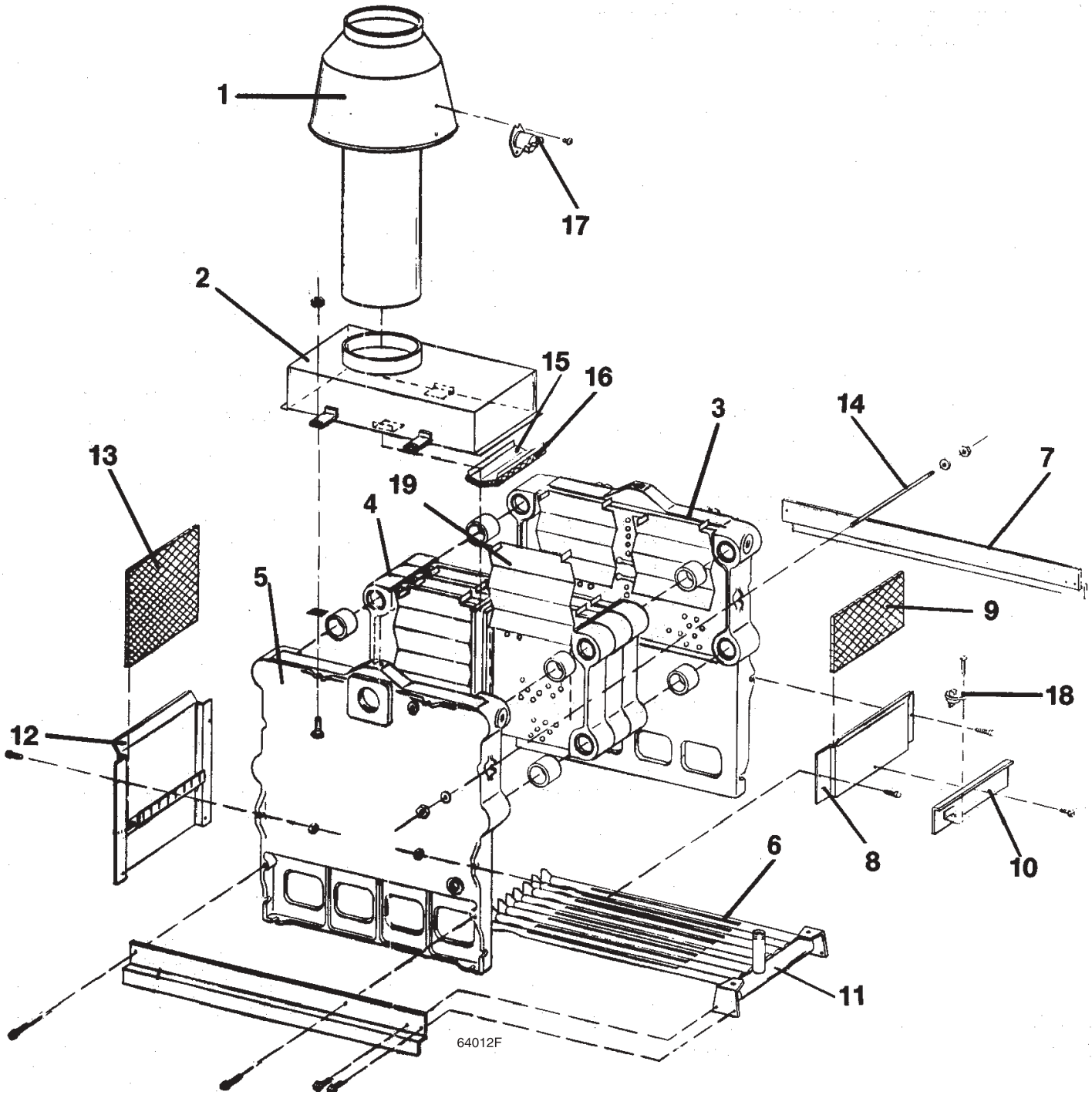
WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 13 of this manual. Failure to comply could result in severe personal injury.

WARNING To avoid personal injury, before replacing any parts on the boiler:

1. Turn off power.
2. Shut off gas supply.
3. Allow boiler to cool.

Item	Description	Part Number
1	Draft Hood: PFG-5 PFG-6 PFG-7 PFG-8	450-021-200 450-021-201 450-021-202 450-021-205
2	Collector Hood: PFG-5 PFG-6 PFG-7 PFG-8	450-014-819 450-014-820 450-014-821 450-014-822
3	Right Hand End Section, 5117	312-804-410
4	Intermediate Section, 51125	312-103-420
5	Left Hand End Section, 5113	312-804-400
Not Shown	Section Replacement Kit (one per joint)	382-800-281
6	Burner, Main	512-200-022
6a Not Shown	Burner, Main w/Pilot Bracket	512-200-023
7	Right Hand/Left Hand Base Rail	452-800-655
8	Base Front Panel: PFG-5 PFG-6 PFG-7 PFG-8	452-800-500 452-800-501 452-800-502 452-800-503
9	Front Base Insulation: PFG-5 PFG-6 PFG-7 PFG-8	591-220-020 591-220-021 591-220-022 591-220-023
10	Base Access Panel: PFG-5 PFG-6 PFG-7 PFG-8	452-800-540 452-800-541 452-800-542 452-800-543
11	Manifold: PFG-5 PFG-6 PFG-7 PFG-8	591-125-820 591-125-821 591-125-822 591-125-823
12	Base Back Panel: PFG-5 PFG-6 PFG-7 PFG-8	452-800-580 452-800-581 452-800-582 452-800-583
13	Back Base Insulation: PFG-5 PFG-6 PFG-7 PFG-8	591-220-030 591-220-031 591-220-032 591-220-033
14	Tie Rod w/o Nut (2 per boiler): PFG-5, ⅜"X15" PFG-6, ⅜"X18" PFG-7, ⅜"X21" PFG-8, ⅜"X24"	560-234-422 560-234-433 560-234-437 560-234-443
15	Flue Baffle: PFG-5 PFG-6 PFG-7 PFG-8	452-800-449 452-800-450 452-800-451 452-800-452
16	Flue Baffle Insulation: PFG-5 PFG-6 PFG-7 PFG-8	591-222-095 591-222-096 591-222-097 591-222-098
17	Spill Switch, PFG-5 only	510-350-105
18	Rollout Thermal Fuse Element, PFG-5 only	512-050-230
19	Radiation Shield (2 per joint)	460-003-700
Not Shown	Main Burner Orifice (Natural Gas) No. 37 Drill Main Burner Orifice (Propane Gas) 1.65 mm	560-529-055 560-529-056

Replacement Parts



Section IV: Ratings and dimensions

Ratings

DOE

Water Boiler Number	C.S.A. (United States) 0–2,000 ft. Input (MBH)	C.S.A. (United States) 0–2,000 ft. Output (MBH)	C.S.A. (Canada) 0–2,000 ft. Input (Btuh)	C.S.A. (Canada) 0–2,000 ft. Output (Btuh)	C.S.A. (Canada) 2,000–4,500 ft. Input (Btuh)	C.S.A. (Canada) 2,000–4,500 ft. Output (Btuh)	Net I=B=R ratings (MBH) (Note 2)	Boiler H.P.	Chimney size	Dimensions (inches) A	B	D	W
PFG-5 (Note 1)	244	199*	244,000	199,000	219,600	179,100	173	5.9	7" I.D. x 20'	15	23¾	7	17 1/16
PFG-6	305	247	305,000	247,000	274,500	222,300	215	7.4	8" I.D. x 20'	17¼	27 1/16	8	20 1/16
PFG-7	366	296	366,000	296,000	329,400	266,400	257	8.8	9" I.D. x 20'	19½	30⅜	9	23 1/16
PFG-8R	400	324	- -	- -	- -	- -	282	10.3	9" I.D. x 20'	25	35⅞	9	26 1/16
PFG-8	427	346	427,000	(Note 3)	(Note 4)	(Note 4)	301	10.3	9" I.D. x 20'	25	35⅞	9	26 1/16

Notes
1. AFUE = 81.0%
2. Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads. Contact Weil-McLain area sales office. Ratings shown are for elevations up to 2,000 feet. For elevations above 2,000 feet, ratings should be reduced at the rate of 4 percent for each 1,000 feet above sea level.
3. 62.56 square feet heating surface.
4. PFG-8 may be installed at altitudes of 2,000-4,500 feet subject to acceptance by Provincial Inspection Authority based on field tests of individual installations.
5. Boilers tested for 50 P.S.I. working pressure.

* DOE Heating Capacity in BTU/Hr. based on standard test procedures prescribed by the United States Department of Energy.

Standard equipment

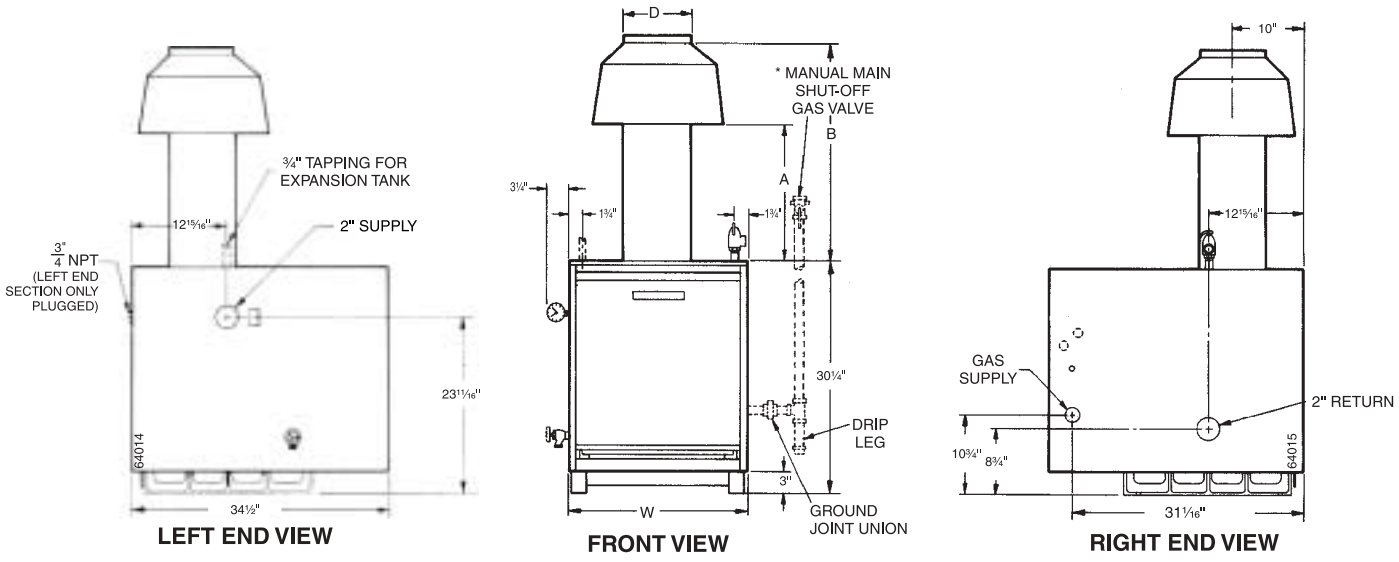
Factory Fire Tested
Insulated Extended Jacket
Built-In Air Separator
Draft Hood (Shipped in separate carton)
Combination Gas Valve
Non-Linting Pilot Burner
Aluminized Steel Burners
Combination Relay Receptacle and 40 VA Transformer
Relay
High Limit Control
Spill Switch (PFG-5 only)
Rollout Thermal Fuse Element (PFG-5 only)
30 P.S.I. Relief Valve (shipped in separate carton)
(boiler sections tested for 50 P.S.I. water working pressure)
Combination Pressure-Temperature Gauge
(shipped in separate carton)
Drain Valve (shipped in separate carton)

PIDN
Intermittent Electronic Ignition System
Automatic Vent Damper

PIN
Intermittent Electronic Ignition System

SPN
Constant Burning Thermally Supervised Pilot System
Thermocouple

Dimensions



* Locate manual main Shut-Off Gas Valve (where required) according to local utility requirements.

Water Boiler Number	No. & Size of		Gas Connection Size Natural and Propane	Draft Hood Outlet Size	Dimensions of Crate (Outside Dimensions)			Approximate Shipping Weight (lbs.)	Boiler Water Content (gal.)
	Supply	Return			Length	Width	Height		
PFG-5	1 – 2"	1 – 2"	¾"	7"	38⅜"	25"	33½"	507	8.76
PFG-6	1 – 2"	1 – 2"	¾"	8"	38⅜"	25"	33½"	575	9.60
PFG-7	1 – 2"	1 – 2"	¾"	9"	38⅜"	31"	33½"	635	10.44
PFG-8	1 – 2"	1 – 2"	¾"	9"	38⅜"	31"	33½"	695	11.28

WEIL-McLAIN

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