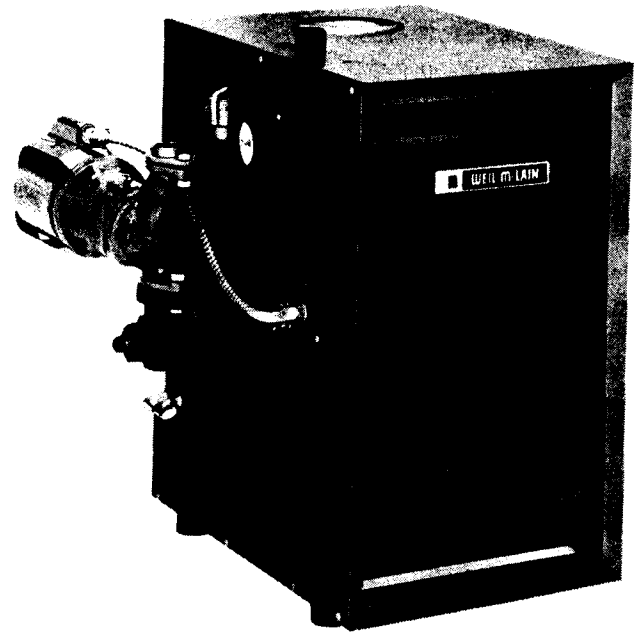


# WEIL-McLAIN

## MODELS CGM AND P-CG (Series 8) GAS-FIRED BOILERS

### Boiler Manual

- Installation
- Operation
- Service
- Parts



- To the owner:** Regular service on this boiler is recommended and should be performed by a qualified heating contractor.
- To the installer:** Installation is not complete until all instructions shipped with this boiler are returned to their envelope and displayed near the boiler.

**Read all instructions and warranty before starting**

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Part No. 550-141-324/1283WP

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**IMPORTANT: When calling or writing about the boiler, PLEASE GIVE THE MODEL, SERIES, AND C.P. NUMBERS located on the boiler rating nameplate.**

**Any reuse or reproduction of the artwork and copy in this manual is strictly prohibited without the written consent of Weil-McLain.**

# WEIL-McLAIN

Michigan City, Indiana 46360 ■ A Marley Company



In Canada: Wylain Canada LTD., L.TEE, 126 East Dr., Brampton, Ontario L6T 1C2



# Section I: Installation

The following 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. An explanation of each term is given below:

## DANGER

Danger is used to indicate the presence of a hazard which *will* cause *severe* personal injury, death or substantial property damage if the warning is ignored.

## CAUTION

Caution is used to indicate the presence of a hazard which *will* or *can* cause *minor* personal injury or property damage if the warning is ignored.

## WARNING

Warning is used to indicate the presence of a hazard which *can* cause *severe* personal injury, death or substantial property damage if the warning is ignored.

## NOTICE

Notice is used to notify of special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

Sec. I

## READ ALL INSTRUCTIONS BEFORE STARTING

FAILURE TO COMPLY WITH INSTALLATION INSTRUCTIONS CAN VOID WARRANTY

Installations must comply with all local codes, laws, regulations and ordinances. Also United States National Fuel Gas Code ANSI Z223.1-1980, obtain from: American Gas Association, 1515 Wilson Boulevard, Arlington (Rosslyn), Virginia 22209. When required, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. 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 the ANSI Z223.1-1980 standard.

In Canada the installation must comply with National Standard of Canada CAN 1-B149.1 or .2, Installation Code for Natural Gas Burning Appliances. The installation is exempt from compliance with clauses 6.13.1 and 6.13.5 of CAN 1-B149.1. Clause 6.14.3 of CAN 1B149.1 is supplemented by the following subsection: (c) or in accordance with the manufacturer's certified instructions. Refer to "Supplemental Instructions—CGM and P-CG Boilers for Canada" for application details.

### AIR SUPPLY FOR COMBUSTION

## WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion and prevent the possibility of flue gas spillage.

1. Conventional buildings—unconfined rooms.
  - a) Infiltration will normally provide enough air.
2. Unusually tight buildings—unconfined rooms.
  - a) Combustion air must be provided from outdoors or from spaces directly connected to the outdoors.
  - b) Openings must have a total area of at least one square inch per 5,000 Btuh boiler input.
3. Conventional buildings—confined rooms.
  - a) Two permanent unblocked openings must be provided.
    - 1) One opening must be less than 12 inches from the floor.
    - 2) One opening must be less than 12 inches from the ceiling.
  - b) Each opening must provide one square inch per 1,000 Btuh boiler input.
4. All outside air used—confined room.
  - a) Two permanent openings must be provided as specified in (3) above.
  - b) To supply combustion air, ducting to the outside or spaces like crawls or attics must be as follows:
    - 1) For vertical ducting or ducting through outside walls—one square inch per 4,000 Btuh boiler input.
    - 2) For horizontal ducting—one square inch per 2,000 Btuh boiler input.
    - 3) Ducting and its opening must be the same size. Rectangular ducts must be no smaller than 3 × 3 inches.

**SELECT THE BOILER LOCATION  
CONSIDER ALL CONNECTIONS TO THE BOILER  
BEFORE SELECTING A LOCATION.**

**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.

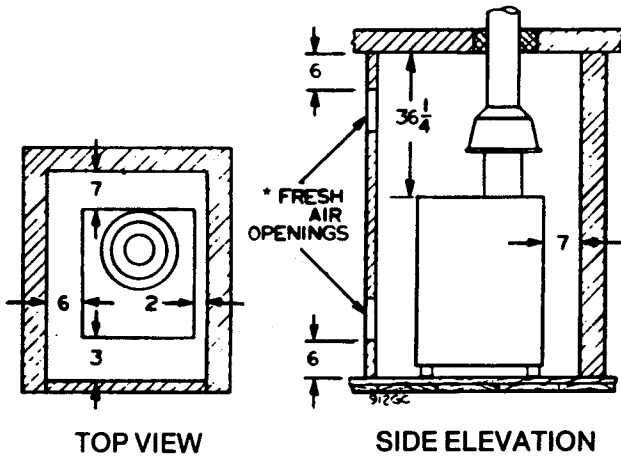
**INSTALLATION CLEARANCES**

**Suggested minimum clearances for servicing**  
24 inches for cleaning and servicing, left side.  
18 inches for access to controls and components, front.  
38 inches from top for cleaning flueways.  
7 inches on remaining sides.

**Required clearances in confined spaces**  
Refer to plate located on inner jacket panel for required minimum clearances. Also see Figures 1a and 1b.

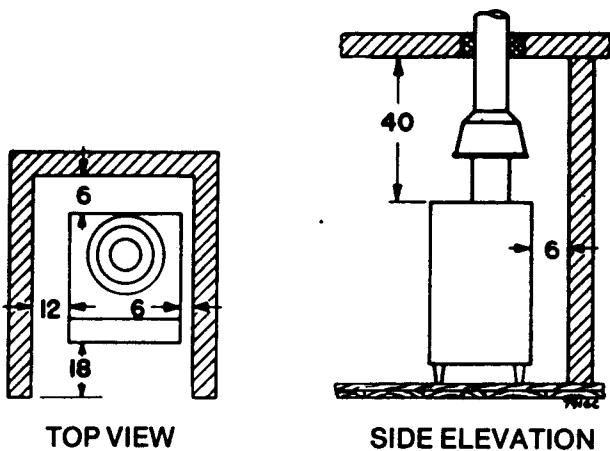
The vent pipe must be at least 6 inches from combustible material.

Sec. 1



\*Refer to Air Supply For Combustion for sizing required fresh air openings, Page 3.

(U.S.A. Installation)  
**FIGURE 1a**



(Canadian Installation)  
**FIGURE 1b**

**CHIMNEY OR VENT REQUIREMENTS  
(also refer to Breeching Erection, Page 8)**

Minimum chimney or vent sizes are on page 19 of these instructions. In most cases a chimney or vent extended at least 2

feet above the highest part of the roof or other structure within 30 feet will be sufficient to prevent downdrafts.

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. If a Type B or Type C vent is used, the instructions relative to the size and height contained in the National Fuel Gas Code should be followed. The chimney should be examined before the gas boiler is installed to be certain that it is properly built and is unobstructed.

The breeching connection must be above the bottom of the chimney to avoid blockage. The breeching must not enter the chimney far enough to cause obstruction. Use a thimble or slip joint where the breeching enters the chimney to allow removal for cleaning.

**WARNING**

Do not alter boiler draft hood or place any obstruction or non-approved damper in the breeching or vent system. Flue gas spillage can occur and A.G.A. design certification, C.G.A. approval, and the boiler warranty become void.

Where two or more gas appliances vent into a common chimney or vent, the 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.

**BOILER FOUNDATION**

**WARNING**

Fire hazard. Never install on carpeting, even if a concrete foundation is used.

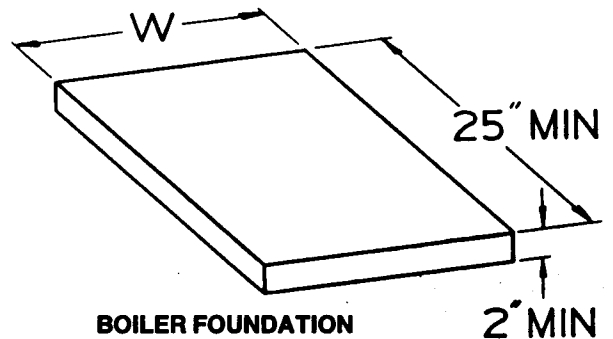
These boiler are approved for use on combustible flooring.

A level concrete or brick foundation is required if:

- a) There is a possibility of the floor becoming flooded.
- b) Non-level conditions exist.

See Figure 2 for construction.

BOILER FOUNDATION SIZES		
Number of Boiler Sections	Foundation Width	Foundation Length
3	12"	25 1/4"
4	15"	25 1/4"
5	18"	25 1/4"
6	21"	25 1/4"
7	24"	25 1/4"
8	27"	25 1/4"



**BOILER FOUNDATION  
FIGURE 2**

## RESIDENTIAL GARAGE INSTALLATION

### WARNING

Install boiler so burners are at least 18 inches above the floor. In Canada refer to CAN 1-B149 codes.

### LOCATING 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 OR REMOVE LEGS FROM THE BOILER.**
3. Remove front jacket door. Remove burner access panel. Unscrew access panel screws; remove and discard shipping washers; reinstall screws.
4. Check for proper orifice sizing from chart below.

ORIFICE DRILL SIZES		
Type of Gas	Heating Value, BTU/cu. ft.	Std. Orifice Drill Size
Natural	1000	46
Propane	2500	56

CANADA ONLY (HIGH ALTITUDE)		
Type of Gas	Heating Value, BTU/cu. ft.	Std. Orifice Drill Size
Natural	1000	48
Propane	2500	57

5. Level and straighten the burners.

### WARNING

Burners must be properly seated in their locating slots with their openings facing up. Gas orifices must inject down the center of the burner.

6. Reinstall access panel.

### HYDROSTATIC PRESSURE TEST

Pressure test before attaching gas piping or electrical supply.

### CAUTION

Leaks must be repaired at once or damage to the boiler can result. NEVER use petroleum based stop-leak compounds or leakage between the sections will occur.

1. Remove shipping nipple from the supply outlet tapping at top of the boiler. Plug any necessary boiler tappings or openings.
2. Plug  $\frac{1}{2}$ " N.P.T. compression tank tapping on top of left end section.
3. Fill boiler with water. Vent all air. **DO NOT EXCEED 30 PSIG.** Test for more than 10 but less than 30 minutes.
4. Make sure gauge pressure has been maintained.
5. Check for leaks. Repair, if found.
6. Drain boiler and remove plugs from any tappings that will be used for controls and accessories.
7. On initial start-up, check for leaks in the system piping. If found, repair at once.

## 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. For P-CG boilers, install the float type automatic air vent. No additional boiler air eliminating device will be required. For proper operation and venting of the float type automatic air vent, unscrew the vent cap one full turn. Refer to Figure 5.
2. a) CGM boilers used with closed type expansion tank—Connect from the  $\frac{1}{2}$ " N.P.T. compression tank tapping on left end section (located just behind supply outlet tapping) to the compression tank using  $\frac{1}{2}$ " N.P.T. piping. Any horizontal compression tank piping must pitch upward toward the tank at least 1 inch for each 5 feet of piping. Refer to Figure 6.  
b) CGM boilers with a closed diaphragm pre-pressurized type compression 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  $\frac{1}{2}$ " N.P.T. tapping when a closed diaphragm pre-pressurized tank is used. Refer to Figure 5.

3. **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.
4. Low water cut-off:
  - a) Must be installed on any P-CG or CGM boiler if the boiler is located above radiation level.
  - b) May be required by certain state, local or territorial codes or insurance companies.

If a low water cut-off is used, follow manufacturer's recommendations for installation. Use a control designed especially for water installations. An electrode probe type low water cut-off is recommended. Locate in a tee in the supply piping above the boiler.

5. Connect system supply piping to supply outlet tapping at left end of boiler.
6. Connect system return piping to circulator counter flange. Be sure not to overheat the gasket between the flanges when soldering fittings.
7. a. For Type CGM boilers, connect cold water fill supply piping close to boiler.  
b. For Type P-CG boilers, connect cold water fill supply piping to the union on the combination automatic fill valve and manual shut-off valve. **Before making this connection, refer to the separate instructions on the tag attached to the handle of the valve.**
8. For P-CG boilers, attach the Fill-Trol tank to the combination fill and manual shut-off valve.
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.

## EXPANSION TANK GUIDELINES

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. Make-up water is added through the fill valve. Eventual section failure can result.

**NOTE:** When additional expansion tank capacity is required for systems with high water content (i.e. gravity or radiant panel systems), do not replace the tank furnished with the boiler. Instead, any additional tank should be connected to a tee in the system piping adjacent to the boiler.

### P-CG EXPANSION TANK SIZING\*

Number of Boiler Sections	Standard P-W-Trol Tank—Adequate for Series Loop Piping Systems with Convactor Baseboard	Additional Ex-Trol Tank Required for One Pipe Systems with Convactor Baseboard	Additional Ex-Trol Tank(s) Required for Cast-Iron Radiators	Additional Ex-Trol Tank(s) Required for Cast-Iron Baseboard
3	No. 109	—	No. 15	No. 15
4	No. 109	No. 15	No. 15	No. 30
5	No. 109	No. 15	No. 15	No. 30
6	No. 110	—	No. 15	No. 30
7	No. 110	—	No. 30	No. 30
8	No. 110	No. 15	No. 30	No. 15 & 30

\* Tank selections based on 220°F. average system water temperature.

## MULTIPLE ZONING

### Single Circulator using Zone Valves:

Refer to zone valve manufacturer's literature for wiring and application. A separate transformer is required to power zone valves.

Provide balancing valves to adjust the flow so it is about the same in each zone.

### Multi-Circulators:

Zoning with circulators requires a relay for each circuit.

Install flow control valves to prevent gravity circulation. Provide balancing valves to adjust the flow so it is about the same in each zone.

## ADDITIONAL EQUIPMENT

### By-Pass Piping—Low Water Temperature Applications

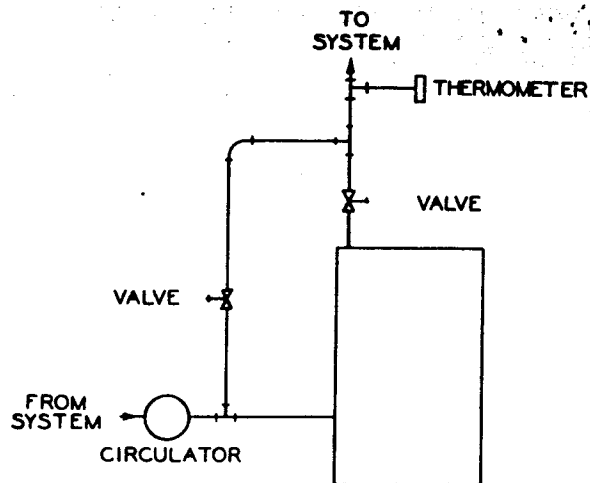
### NOTICE

Bypass piping should be used for low water temperature applications (i.e. radiant panel systems, converted gravity systems, etc.). Refer to Figure 3 for piping details.

Use same size bypass piping as supply and return piping. Connect as shown in Figure 3. Adjust the valves to maintain boiler temperature greater than 160°F.

### External Heat Exchangers

P-CG and CGM boilers 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.



BY-PASS PIPING  
FIGURE 3

## Freeze Protection

If antifreeze is used, hydrostatically pressure test the system with water before adding antifreeze. Drain system and refill with antifreeze/water solution.

Antifreeze especially formulated for hot water heating systems is recommended. DO NOT use automotive antifreeze.

The antifreeze products commonly used in hot water heating systems are inhibited propylene glycol or inhibited ethylene glycol.

Maximum freeze protection with either compound is achieved with 50% solution. Ethylene glycol at 50% solution provides freeze protection to -37°F; propylene glycol at 50% solution provides freeze protection to -28°F.

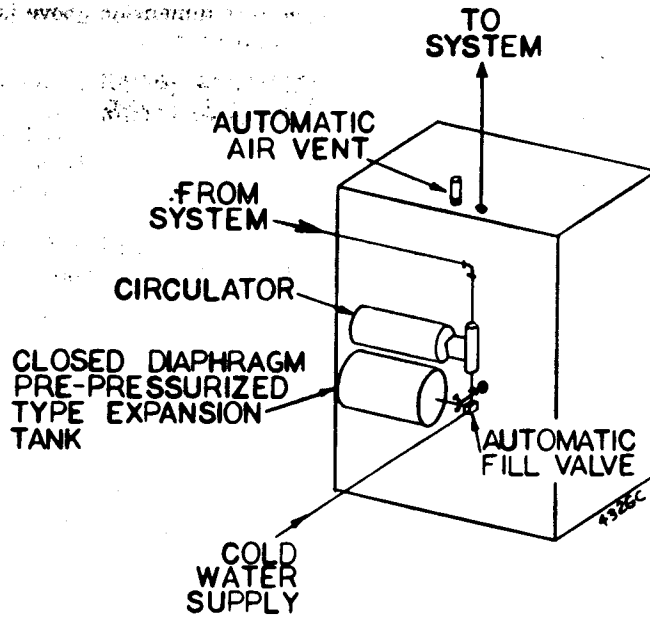
Ethylene glycol is toxic. Therefore, when used, the system solution must be isolated from the domestic water supply. Check with local code requirements to determine if systems containing these solutions must include a back-flow preventer or actual disconnection from the city water piping.

Antifreeze compounds are available from heating distributors. The system water content must be calculated to determine the quantity to purchase. Boiler water content is listed on page 19. Follow the manufacturer's instructions for application, toxicity, service, etc. **THE SIZING EFFECT ON HEAT DISTRIBUTING UNITS, CIRCULATOR, AND EXPANSION TANK MUST BE CONSIDERED IN ACCORDANCE WITH THE PERCENT OF SOLUTION SELECTED.**

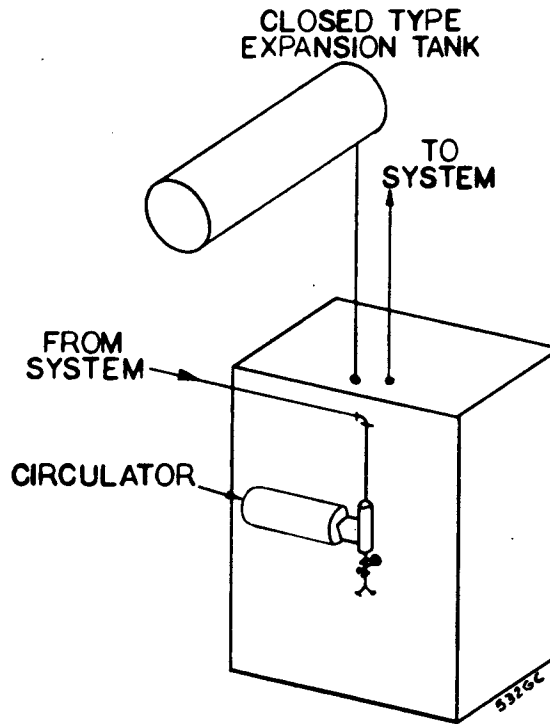
## Use With Refrigeration System

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 the 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.



PIPING—CLOSED DIAPHRAGM PREPRESSURIZED  
EXPANSION TANK  
FIGURE 5

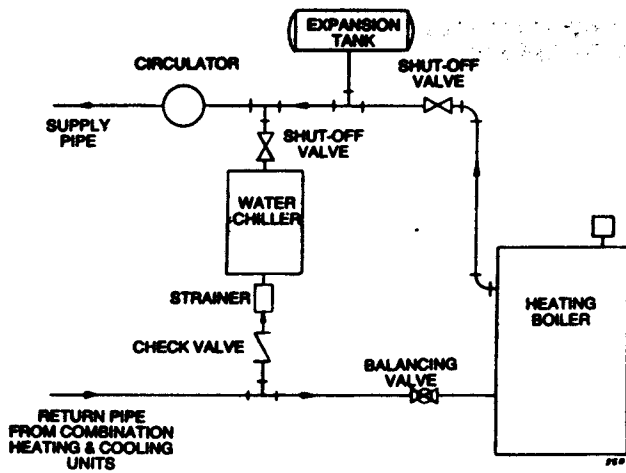


PIPING—CLOSED TYPE EXPANSION TANK  
FIGURE 6

NOTES:

1. Use balancing valves or zone valves in each circuit for multiple circuit applications.

2. **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.



**RECOMMENDED PIPING FOR COMBINATION HEATING & COOLING (REFRIGERATION) SYSTEMS**  
**FIGURE 4**

**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. Heat to approximately 210°F for 15 minutes to drive off dissolved gases. The high limit should be set above 210°F.
5. Check system piping for leaks. If found, repair immediately. **DO NOT** use petroleum based stop-leak compounds or damage to the boiler will occur.
6. Air must be vented from 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.
7. Keep the system filled by occasionally opening the air vents as in Step 6 above. Add water to make up system pressure.
8. If purge valve is used—located in the return piping:
  - a) Connect a garden hose to the drain valve located above the purge valve.
  - b) Close 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 drain cock.
  - e) Open purge valve.
  - f) Fill system to correct pressure.

**DRAFT DIVERTER INSTALLATION**

Secure draft diverter to outlet at top of boiler with sheet metal screws. Bottom of draft diverter or "skirt" must have the

clearance dimension above jacket top panel as indicated on draft diverter.

**WARNING**

Do not alter the draft diverter—flue gas spillage can occur. If draft diverter is altered, the A.G.A. design certification, C.G.A. approval and boiler warranty become void.

**BREECHING ERECTION**

(Also Refer to Chimney or Vent Requirements, Page 4)

Connect from draft diverter outlet to chimney or vent with full-sized (same diameter as draft diverter outlet) breeching. Where possible, vertical venting to the outside from the draft diverter outlet will give best performance at lowest total cost. Where horizontal breeching is used, it should slope upward at least 1/4 inch per lineal foot toward the chimney or vent.

**WARNING**

A vertical height of 3 feet to 5 feet of breeching before any elbow or horizontal breeching is recommended to reduce chances of flue gas spillage at the draft diverter. Long horizontal breechings, excessive numbers of elbows or tees, or other obstructions which restrict the flow of combustion gases should be avoided.

**SIZE AND INSTALL GAS PIPING**

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

- a. Diameter and length of 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. This is specified as three-tenths of an inch water column.

1. Size natural gas piping from the following tables. Piping must be sized to provide proper inlet gas pressure to gas valve when boiler is operating at rated input. For natural gas, inlet gas pressure to the gas valve should be a minimum of 5 inches water column and a maximum of 14 inches water column. If inlet natural gas pressure to the gas valve exceeds 14 inches water column, a 100 percent lock-up type gas pressure regulator of adequate size must be installed in the gas supply piping to the boiler and adjusted to prevent pressure in excess of 14 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				
	1/2"	3/4"	1"	1 1/4"	1 1/2"
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

\* Flow determined by Dr. Pole's Formula—0.60 Specific Gravity, 0.30 inches water column pressure drop.



**ADDITIONAL LENGTH OF PIPE TO BE ADDED FOR EACH ELBOW OR TEE BEND IN THE LINE**

Pipe Size, inches	Additional Length, Feet
1/2	1.3
3/4	1.7
1	2.2
1 1/4	2.9
1 1/2	3.3

**CAUTION**

- a) DO NOT check for gas leaks with an open flame—BUBBLE TEST.
- b) Close manual main shut-off valve during any pressure testing at less than 14.0 inches water column.
- c) The boiler and gas valve must be disconnected from gas supply piping during any pressure test greater than 14.0 inches water column.

**WIRING**

**WARNING**

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

2. For propane gas, the inlet gas pressure to the gas valve should be 10 to 13 inches water column. The gas pressure regulator (furnished by the gas supplier) must be adjusted to provide lock-up pressures not exceeding 14 inches water column. Select the pipe size, tanks and regulators as required.
3. Remove jacket door and refer to Figure 7 for gas piping.
4. Follow good piping practices.
5. Pipe joint compound (pipe dope) must be resistant to the corrosive action of liquified 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 7).
8. Install manual shut-off valve outside boiler jacket as shown in Figure 7 when required by local codes.
9. Piping must be supported by hangers, not by the boiler or its accessories.
10. Purge all air from supply piping.
11. Check all connections for leaks—BUBBLE TEST. Check factory installed piping and field installed piping.

All wiring must be installed in accordance with the requirements of the National Electrical Code and any additional national, state, or local code requirements having jurisdiction. All safety circuit wiring must be N.E.C. Class 1.

The boiler must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA No. 70-1981. Use 90°C Thermoplastic Wire, or equivalent, if any original wire must be replaced.

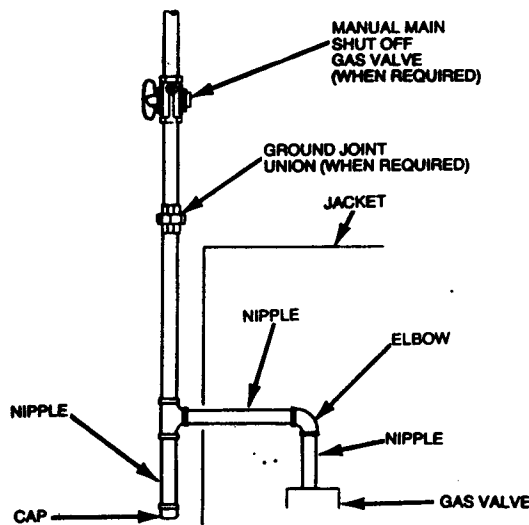
In Canada the installation must conform to Canadian Electrical Code, Part 1, C22.1, Safety Standard for Electrical Installations, and any local codes. Refer to wiring diagrams in "Supplemental Instructions—CGM and P-CG Boilers for Canada." The control circuit fuse provides ground fault protection of the safety control circuit.

The boiler is shipped with the control components completely wired.

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

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

For boilers equipped with PI or PID systems, refer to separate instructions for application data.



**GAS SUPPLY PIPING  
FIGURE 7**

**INSTALL ROOM THERMOSTAT**

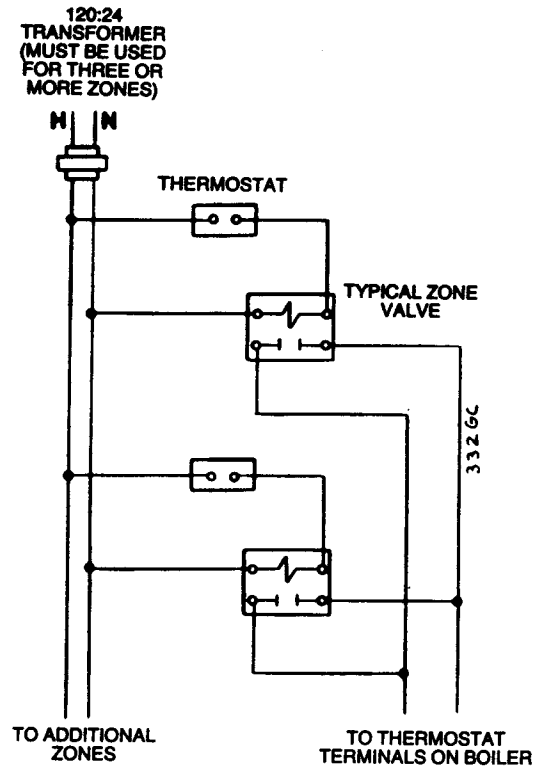
Install room thermostat on an inside wall. Never install where it will be influenced by drafts, hot or cold water pipes, lighting fixtures, television, rays of the sun or near a fireplace.

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.

Sec. I

### 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.



**TYPICAL WIRING—ZONING  
WITH ZONE VALVES  
FIGURE 8**

## CHECK-OUT PROCEDURE

Check-off steps as completed.

- 1. Boiler and heat distribution units filled with water?
- 2. Automatic air vent, if used, open one turn?
- 3. Air purged from system?
- 4. Air purged from gas piping? Piping checked for leaks?
- 5. Follow operating instruction label on boiler for proper start-up. Also refer to "To Place in Operation", page 13.  
For boilers with spark ignition: Electronic control will light pilot burner (if vent damper is installed, the damper must first be fully open). When pilot flame is proven, main gas valve will open and main burners will ignite. NOTE: If pilot flame isn't proven, main gas valve will not open and boiler will not operate until properly serviced.
- 6. Proper burner flame? Refer to "Check Main Burner Flames" and "Check Pilot Burner Flame", page 14.
- 7. Test safety controls: If boiler is equipped with a low water cut-off or additional safety controls, test for operation as outlined by the manufacturer. Burners should be operating and should go off when controls are tested. When safety devices are restored, burners should reignite.
- 8. Test limit control: While burners are operating, move the indicator of the high limit control below actual boiler water temperature. Burners should go off while circulator continues to operate. Raise limit control above the boiler water temperature and burners should reignite.
- 9. For boilers with electronic ignition systems—To test ignition system safety shut-off device: Connect a manometer to outlet side of gas valve. Start the 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. Immediately open manual main shut-off gas valve. The manometer should confirm there is no gas flow until the flame sensing element has sufficient time to cool. Only after this delay should the boiler cycle and the main burners reignite.
- 10. High limit control set to design temperature requirements of the system? Maximum high limit setting—240°F.
- 11. For multiple zones, flow adjusted so it is about the same in each zone?
- 12. Thermostat heat anticipator is set properly? Refer to "Room Thermostat", page 10, and wiring diagram on jacket door.
- 13. 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.
- 14. Measure gas input (natural gas only):
  - a. Allow boiler to operate at least 10 minutes.
  - b. Turn off all other appliances served by the gas meter, including gas stove, pilot lights and gas yard lights.
  - c. At the natural gas meter, with stopwatch, measure the time (in seconds) required to use one cubic foot of gas.
  - d. Divide the number of seconds into 3,600 to get number of cubic feet boiler would use in one hour.
  - e. Multiply cubic feet per hour by heating value of the gas to obtain Btu per hour input capacity. Result will be actual input capacity.  
  
Note: The average heating value of natural gas is 1,000 Btu per cubic foot. Adjust formula according to heating value of gas furnished by the local utility.
  - f. Result obtained in Step e should correspond to published input on rating plate or page 18. If it does not correspond, adjust the gas pressure regulator to obtain required gas flow. Gas pressure regulator is located on main gas valve body. To adjust, remove the regulator adjustment screw cap. Turn adjustment screw clockwise to increase or counter-clockwise to decrease gas flow.  
  
If actual input is more than 5 percent off rated boiler input, change orifice sizes.
- 15. Check manifold gas pressure by connecting a manometer to the downstream test tapping on the main gas valve. Manifold gas pressure for natural gas should be 3½ inches water column and for propane gas should be 10 inches water column.
- 16. Several operating cycles observed for proper operation?
- 17. Room thermostat set to desired temperature?
- 18. Installation and Service Certificate on this page completed?
- 19. 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 \_\_\_\_\_

BTU 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 person.

Installer \_\_\_\_\_  
(Company) (Address) (Phone) (Installer's Signature)

## Section II: Maintenance Instructions

**Also Refer to Additional Instructions Shipped With The Boiler For Specific Control Operation and Troubleshooting.**

### 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, 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 the boiler. Incomplete combustion and flue gas spillage can occur.

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.

### WARNING

**TO AVOID PERSONAL INJURY, BEFORE SERVICING:**

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

## Suggested Minimum Maintenance Schedule

### 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 "Cleaning Main Burners", page 14.
3. Follow procedure "To Place in Operation", page 13.
4. Visually inspect pilot and burner flames. Reference "Check Main Burner Flames" and "Check Pilot Burner Flame", page 14.
5. Visually inspect venting system for proper function, deterioration or leakage. Reference "Inspect Venting System", page 14.
6. Visually inspect base insulation. Reference "Inspect Base Insulation," page 13.
7. Check operation of low-water cut-off, if used, and additional safety devices. Refer to manufacturer's instructions.
8. Check that boiler area is free from combustible materials, gasoline and other flammable vapors and liquids.
9. Check for and remove any obstruction to the flow of combustion or ventilation air to the boiler.
10. Follow instructions on circulator to oil, if oil lubricated. Overoiling 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 safety 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. DO NOT use petroleum based stop-leak compounds—leakage between the sections will occur.

### CAUTION

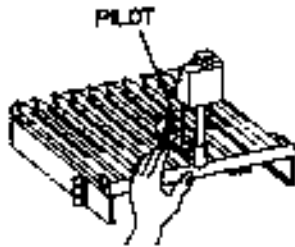
Continuous use of make-up water can damage boiler sections due to the addition of minerals to the boiler.

2. Check any gaskets for leakage. Tighten or replace, if needed. DO NOT overtighten bolts—damage to the gasket can occur.
3. Visually inspect pilot and burner flames. Reference "Check Main Burner Flames" and "Check Pilot Burner Flame," page 14.
4. Visually inspect venting system for proper function, 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.

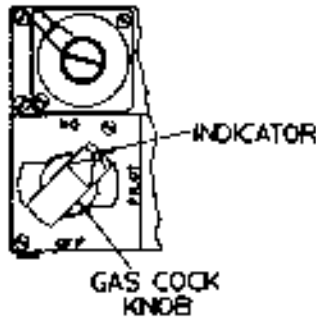
### End of each heating season:

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

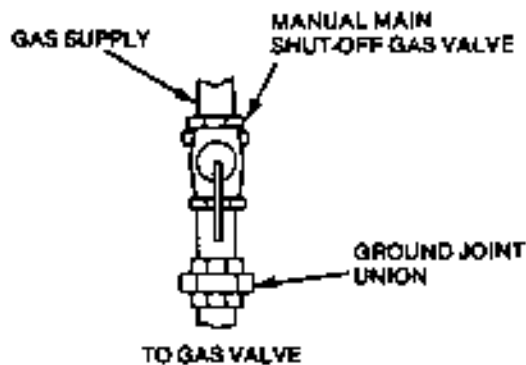
## Detailed Maintenance Instructions



TYPICAL BURNER BASE ASSEMBLY  
FIGURE 9



TYPICAL GAS COCK DIAL  
FIGURE 10



MANUAL MAIN SHUT-OFF GAS VALVE  
FIGURE 11

### Inspect Base Insulation

Make sure base insulation is secure against all four sides of base.

#### WARNING

If base insulation material is damaged or displaced, call serviceman immediately. DO NOT operate boiler.

### To place in operation:

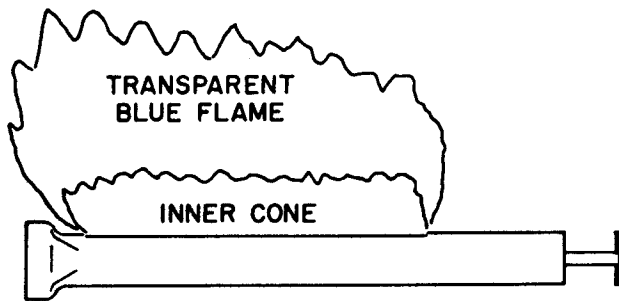
#### CAUTION

The manual gas cock knob and manual main shut-off gas valve (when used) must be closed for at least five (5) minutes before lighting.

1. Turn thermostat or operating control to OFF position or lowest position on the dial. Be sure boiler has been correctly filled with water.
2. Turn OFF electric power.
3. For boilers with electronic spark ignition systems:
  - a) Open manual gas cock knob.
  - b) Open manual main gas valve, when used.
  - c) Go to Step 5.
4. For boilers with constant burning pilots:
  - a) Remove front access panel.
  - b) Open manual pilot gas valve, when used.
  - c) Open manual main gas valve, when used.
  - d) Place lighted match next to pilot burner.
  - e) Turn gas cock knob to pilot and depress. Pilot should ignite. Hold in for 60 seconds.
  - f) Release knob after 60 seconds. Pilot should continue burning.
  - g) Turn knob to ON position.
5. Move thermostat or operating control to call for heat.
6. Turn ON electric power.
7. If boiler starts, go to Step 9.  
If boiler fails to start, go to Step 8.
8. If boiler fails to start, check:
  - a) Loose connection or blown fuse?
  - b) High limit setting above boiler water temperature?
  - c) Thermostat above room temperature?
  - d) Gas turned on at meter?
  - e) Gas turned on at boiler?
  - f) If above fails to eliminate the trouble, call a trained serviceman.
9. Make sure boiler goes through several normal operating cycles.
10. Turn thermostat or operating control to desired setting.

### Check main burner flames:

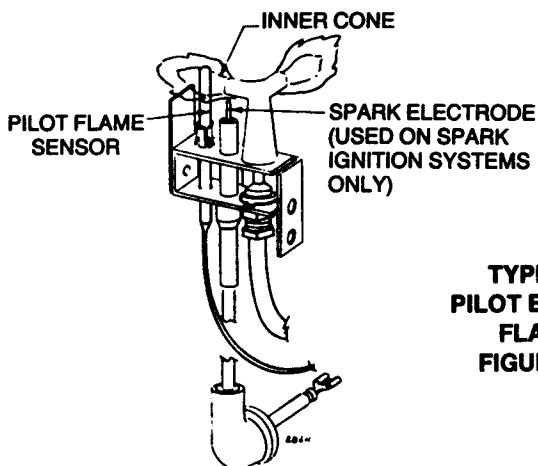
1. Check main burner flames at least once a month during the heating season.
2. Proper burner flame:
  - a) Upper cone transparent blue.
  - b) Yellow-orange streaks may appear—caused by dust.
  - c) Inner cone— $\frac{1}{2}$  to  $\frac{5}{8}$  inches high.
3. Improper flame:
  - a) Overfired—Flames large.
  - b) Underfired—Flames small.
  - c) Lack of primary air—Yellow tipping on flames; sooting will occur.
4. If improper burner flames are suspected, contact a trained serviceman or local gas utility.



TYPICAL MAIN BURNER FLAME  
FIGURE 12

### Check pilot burner flames:

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.
3. If improper pilot flames are suspected, contact a trained serviceman or local gas utility to inspect the condition.



TYPICAL  
PILOT BURNER  
FLAME  
FIGURE 13

### Inspect venting system:

1. Check the venting system at least once a month during the heating season. With boiler firing, hold a candle or match below lower edge of the draft hood "skirt". If flame does not blow out, but burns undisturbed, vent system is functioning properly. If flame blows out or flickers drastically, vent system must be checked for obstructions or other causes of improper venting.
2. Inspect all parts of the venting systems for deterioration from corrosion, physical damage, sagging, etc. Correct all conditions found.

### Clean boiler heating surfaces:

1. Follow shut-down procedure.
2. Remove upper rear jacket 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 that hang between sections.
5. Remove burners from base of boiler. Follow "Cleaning main burners," page 14, to thoroughly clean burners.
6. Place newspaper in base of boiler to collect soot that will fall.
7. With a wire flue brush, clean between the sections.
8. Remove paper and soot. Vacuum or brush base and surrounding area.
9. Replace radiation plates.
10. Replace collector hood. Seal with boiler cement.
11. Replace insulation and jacket panel.
12. Replace main burners.

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

### Cleaning main burners:

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

### CAUTION

When replacing, burner tubes must be seated in the slots in the back with the openings facing up.

### Annual shut-down procedure:

1. Close manual shut-off valve (when used) and gas cock on gas valve. Close pilot valve, when used.
2. Disconnect electric power supply.
3. Move thermostat indicator to low setting.
4. DO NOT drain the system unless exposure to freezing temperatures will occur. If antifreeze is used with system, do not drain.
5. Open boiler drain cock to remove impurities that may have settled in the boiler (about a quart is all that is necessary to drain out). Refill to correct pressure.

## COMMON PROBLEMS AND POSSIBLE SOLUTIONS

COMMON SYMPTOMS	COMMON CAUSES	POSSIBLE CORRECTIONS
Rapid cycling—burners turn on and off frequently.	Unlevel thermostat.	Level thermostat. Refer to instructions with thermostat.
	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 (water boilers).	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.
	Leaking gasket.	Evenly tighten gasket. Do not overtighten.
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 constant make-up water.
	Incorrect pH of boiler water	pH should be maintained at 7.5 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 (water boilers)	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 too low.	Adjust high limit to a higher setting.

## Section III: Replacement Parts

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.

Weil-McLain will attempt to stock major boiler replacement parts for at least 20 years. Items manufactured by others will normally have an equivalent part available for at least the same time period. Do not order replacement parts directly from Weil-McLain. Your serviceman must provide our distributor with the type of fuel, boiler size, type and series for proper parts replacement.

Those replacement parts likely to be available locally from your installer, serviceman or local heating supply store are identified in Figure 14 as items: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 18, 19, 20, and 21.

Those replacement parts which may have to be ordered by your installer or serviceman from Weil-McLain will be items: 7, 11, 12, 15, 16, and 17.

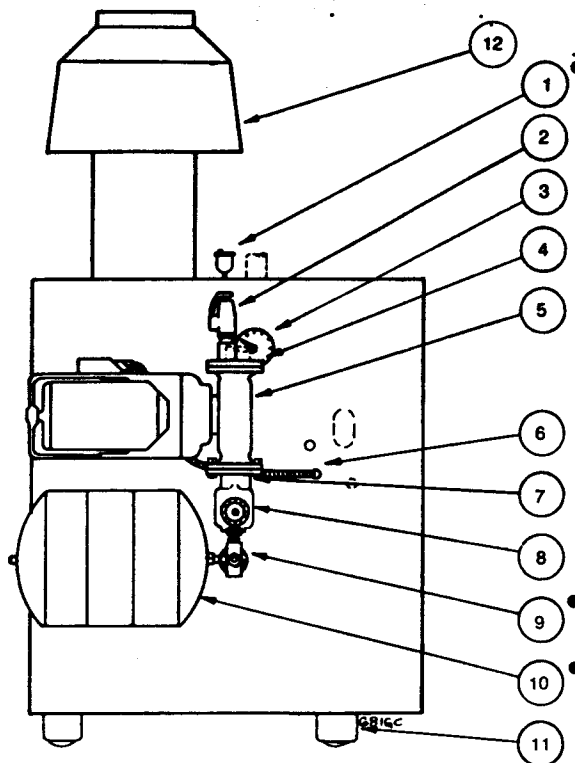
### PARTS IDENTIFICATION

- \*1. Float Type Automatic Air Vent
- 2. ASME Pressure Relief Valve
- 3. Combination Pressure-Temperature Gauge
- 4. Circulator Counter Flange
- 5. Circulator
- 6. Circulator Wiring Harness
- 7. Angle Circulator Flange  
(Not used on P-CG-25 or CGM-25)
- 8. Drain Cock
- \*9. Combination Automatic Fill Valve and Manual Shut-Off Valve
- \*10. Air Cushion Tank (closed diaphragm type)
- 11. Boiler Leg (four used)
- 12. Draft Hood
- 13. High Limit Control
- \*14. Combination Manual Main Shut-Off Gas Valve, Main Automatic Gas Valve, Redundant Gas Valve (except self-generating) and Pressure Regulator
- 15. Gas Manifold
- 16. Access Panel
- 17. Main Burners
- 18. Safety Pilot Burner Gas Supply Tubing
- 19. Thermocouple
- 20. Wiring Junction Box
- 21. Combination Relay with 40VA Transformer

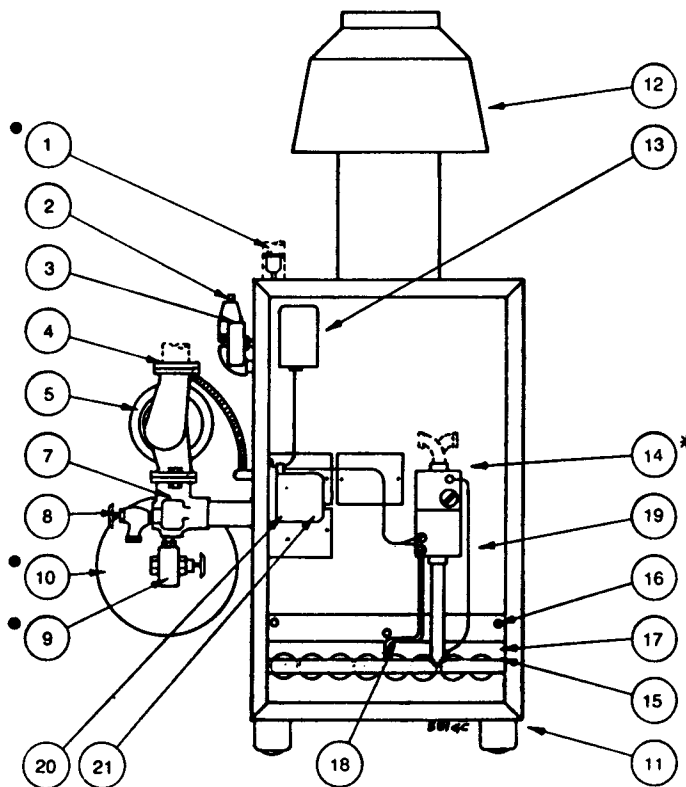
\* Not furnished with Model CGM boilers.

\* The gas supply piping may be located at the left side or right side of the boiler. If an additional manual main shut-off gas valve is required, it should be located in the gas supply piping according to the local utility requirements.





LEFT SIDE



FRONT



Design  
Certified by  
American Gas  
Association

DOE



Net ratings approved by  
Hydronics Institute



Built to  
ASME  
Specifications

## RATINGS—DIMENSIONS

Boiler Number	Input BTU/Hr.	D.O.E. Heating Capacity‡	NET I-B-R Ratings BTU/Hr.*	Dimensions						D.O.E. Seasonal Efficiency (A.F.V.E.)‡		
				A	B††	C	D	E	W	Standing Pilot	PI	PID
†CGM-25	52,000	43,000	37,400	15"	43 <sup>3</sup> / <sub>8</sub> "	18 <sup>1</sup> / <sub>4</sub> "	4"	1 <sup>1</sup> / <sub>2</sub> "	10"	66.3	70.2	80.6
†CGM-3	70,000	55,000	47,800	15"	43 <sup>3</sup> / <sub>8</sub> "	18 <sup>1</sup> / <sub>4</sub> "	4"	1 <sup>1</sup> / <sub>2</sub> "	10"	65.0	68.4	77.8
†CGM-4	105,000	83,000	72,200	17 <sup>7</sup> / <sub>8</sub> "	46 <sup>1</sup> / <sub>4</sub> "	21 <sup>1</sup> / <sub>4</sub> "	5"	1 <sup>1</sup> / <sub>2</sub> "	13"	65.5	68.4	77.9
†CGM-5	140,000	110,000	95,700	21 <sup>1</sup> / <sub>4</sub> "	49 <sup>3</sup> / <sub>8</sub> "	24 <sup>1</sup> / <sub>4</sub> "	6"	1 <sup>1</sup> / <sub>2</sub> "	16"	65.9	68.5	77.9
†CGM-6	175,000	138,000	120,000	25 <sup>1</sup> / <sub>4</sub> "	53 <sup>3</sup> / <sub>8</sub> "	30 <sup>7</sup> / <sub>8</sub> "	8"	4"	19"	66.3	68.5	77.9
CGM-7	210,000	165,000	143,500	25 <sup>1</sup> / <sub>4</sub> "	53 <sup>3</sup> / <sub>8</sub> "	33 <sup>7</sup> / <sub>8</sub> "	7"	4"	22"	66.8	68.6	78.0
CGM-8	245,000	192,000	167,000	30 <sup>1</sup> / <sub>4</sub> "	58 <sup>3</sup> / <sub>8</sub> "	38 <sup>7</sup> / <sub>8</sub> "	7"	4"	25"	67.2	68.6	78.0

NOTES: Fill Trol Expansion tank not furnished with CGM boilers.

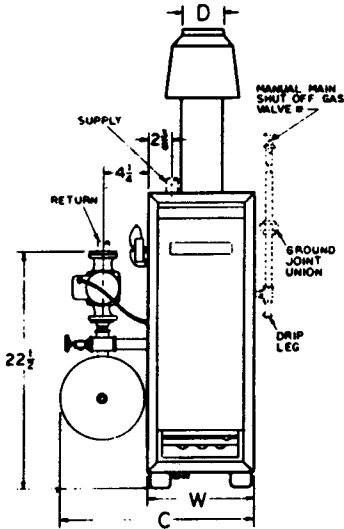
†† Add "P" to designator for package unit without Fill-Trol (example P-CG-3). Add "PI" to designator for intermittent electronic ignition system; add "PID" to designator for intermittent electronic ignition system with automatic vent damper (example: CGM-3-PID).

\* Net I-B-R Water 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 pick-up. Ratings are computed on an allowance for factor of 1.15. For usual piping and pick-up loads, consult Weil-McLain Application Engineering Department.

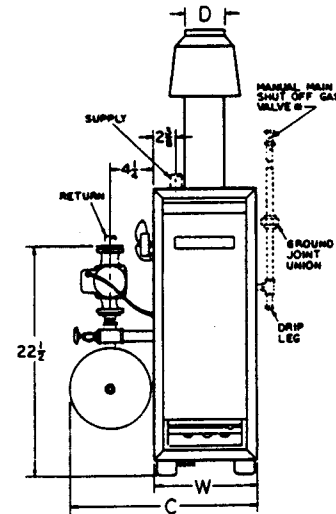
† Add 4<sup>1</sup>/<sub>2</sub>" when automatic vent damper is used.

‡ Includes boiler water volume. For piping systems which have a higher water content, additional compression tank capacity must be provided (see table, Page 6).

‡ Based upon standard test procedures prescribed by the United States Department of Energy.

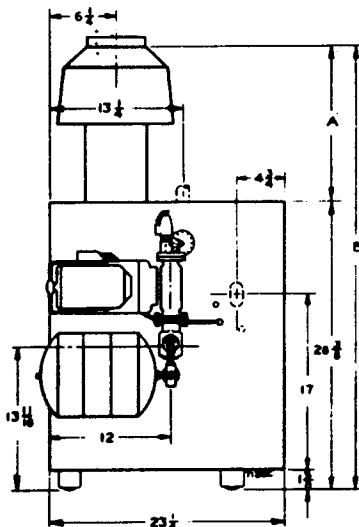


FRONT  
CGM-3 THRU 8 AND P-CG-3 THRU 6

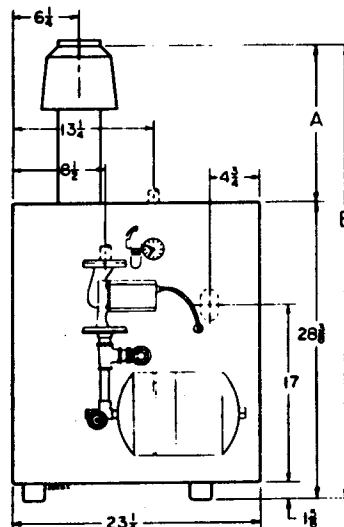


FRONT  
CGM-25 AND P-CG-25 ONLY

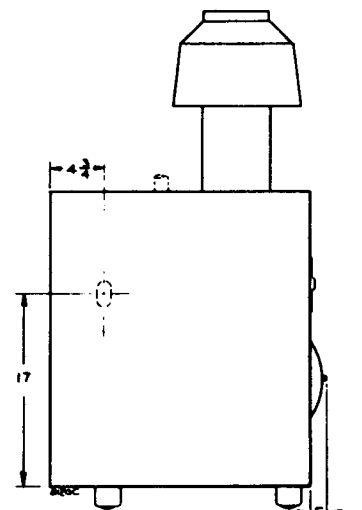
\* Locate manual main shut-off gas valve (where required) according to local utility requirements. Gas supply piping may be located at the left side or right side of the boiler.



LEFT SIDE  
CGM-3 THRU 8 AND P-CG-3 THRU 6



LEFT SIDE  
CGM-25 AND P-CG-25 ONLY



RIGHT SIDE  
ALL CGM AND P-CG BOILERS



Design  
Certified by  
American Gas  
Association

DOE



Net ratings approved by  
Hydronics Institute



Built to  
A.S.M.E.  
Specifications

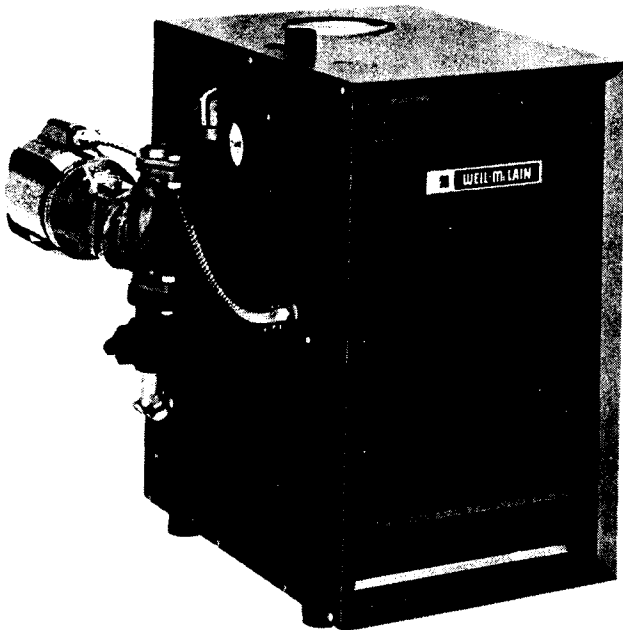
## ENGINEERING DATA

Boiler Number	Supply Outlet		Return Inlet		Boiler Water Content Gallons	Maximum Allowable System Water Content in Gallons with Standard Fill-Trol	Gas Connection Pipe Size		Gas Manifold Pipe Size All Gases	Chimney and Breeching Size**
	No.	Pipe Size	No.	Pipe Size			Natural Gas	Propane Gas		
†CGM-25	1	¾"	1	¾"	1.54	18	½"	½"	½"	4" I.D. x 20'
†CGM-3	1	1¼"	1	1"	1.54	18	½"	½"	½"	4" I.D. x 20'
†CGM-4	1	1¼"	1	1"	2.11	18	½"	½"	½"	5" I.D. x 20'
†CGM-5	1	1¼"	1	1"	2.69	18	½"	½"	½"	6" I.D. x 20'
†CGM-6	1	1¼"	1	1¼"	3.26	44	½"	½"	½"	6" I.D. x 20'
CGM-7	1	1¼"	1	1¼"	3.84	44	½"	½"	¾"	7" I.D. x 20'
CGM-8	1	1½"	1	1½"	4.42	44	¾"	¾"	¾"	7" I.D. x 20'

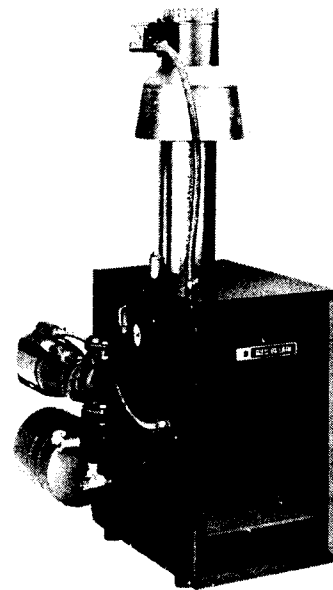
† Add "P" to designator for package unit without Fill-Trol (example P-CG-3). Add "PI" to designator for intermittent electronic ignition system; add "PID" to designator for intermittent electronic ignition system with automatic vent damper (example: CGM-3-PID).

► Includes boiler water volume. For piping systems which have a higher water content, additional compression tank capacity must be provided (see table, Page 6).

\*\* In special cases where surrounding conditions permit, chimney height may be 10 ft.



TYPE CGM



TYPE P-CG

## Standard Equipment

**ASSEMBLED ON THE BOILER** • Insulated Extended Jacket • Vertical Draft Hood (packed in carton) • Aluminized Steel Burners • Stainless Steel Radiation Plates • Combination Gas Valve (with redundant seats) for 24 Volt • 100% Shutoff • Thermocouple • Built-in Air Eliminator • Non-Linting Pilot Burner • ASME Safety Relief Valve • Automatic Air Vent (not mounted—P-CG only) • Combination Pressure-Temperature Gauge • Combination Relay Receptacle and 40VA Transformer • Plug-in Circulator Relay • High-Limit Control • Electrical Junction Box • Wiring Harness and Safety Control Wire • Circulator—¾", CGM and P-CG-25; 1", CGM and P-CG-3 thru 5; 1¼", CGM and P-CG-6 and CGM-7; 1½", CGM-8 • Fill-Trol (compression tank—not mounted—with fill and check valve, P-CG only) • Boiler Drain Cock

**OPTIONAL EQUIPMENT** • Fill-Trol Package for CGM (No. 109 or 110 compression tank, fill and check valve, automatic air vent and fittings) • Self-Generating Controls with 100% Shutoff (dual limit control furnished in place of gas valve with redundant seats) • Intermittent Electronic Ignition System (mounted and wired) • Intermittent Electronic Ignition System with Automatic Vent Damper

In the interest of continual improvement in products and performance, Well-McLain reserves the right to change specifications without notice.

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