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WEIL-McLAIN



Boiler Manual CGM AND P-CG (Series 9) Gas-Fired



- Includes:**
- Installation
 - Start-up
 - Service
 - Parts

**Refer to Control Supplement
for additional information**

For Natural or Propane Gas

BOILER MANUAL FOR USE BY A QUALIFIED CONTRACTOR

- To the owner: Regular service on this boiler is recommended and should be performed by a qualified contractor.
- To the installer: 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.



Table of Contents

Section I: Pre-Installation

Air Supply for Combustion	3
Chimney or Vent Requirements	4
Minimum Service Clearances	4
Boiler Foundation	4

Section II: Boiler Set-Up

Placement	5
Draft Diverter	5
Breeching	5
Hydrostatic Pressure Test	5

Section III: Piping

Supply and Return	6
Expansion Tank Sizing	6
Multiple Zoning with Circulators	7
Bypass Piping	8
Use with Refrigeration System	8

Section IV: Gas Piping 9

Section V: Wiring 10

Section VI: Final Adjustments

Water Treatment	11
Filling the System	11
Inspect Base Insulation	11
To Place in Operation	11
Check Burner Flames	12
Inspect Venting System	12

Section VII: Check-Out Procedure ... 12-13

Section VIII: Maintenance

Suggested Minimum Maintenance	14-15
Common Problems/Possible Solutions	16

Section IX: Replacement Parts 17-21

Ratings & Dimensions 22-23

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

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WARNING

DO NOT USE PETROLEUM-BASED CLEANING OR SEALING COMPOUNDS IN BOILER SYSTEM. SEVERE DAMAGE TO THE BOILER WILL OCCUR.

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 a hazard which *will* cause *severe* personal injury, death or substantial property damage if ignored.

CAUTION

indicates presence of a hazard which *will* or *can* cause minor personal injury or property damage if ignored.

WARNING

indicates presence of a hazard which *can* cause *severe* personal injury, death or substantial property damage if ignored.

NOTICE

indicates special instructions on installations, operation, or maintenance which are important but not related to personal injury hazards.

WARNING

FAILURE TO FOLLOW ALL INSTRUCTIONS IN PROPER ORDER CAN CAUSE PERSONAL INJURY OR DEATH. READ ALL INSTRUCTIONS BEFORE INSTALLING.

Section I: Pre-Installation

CODES

Installations must comply with all local codes, laws, regulations and ordinances, also United States National Fuel Gas Code ANSI Z223.1-1984. When required, installations 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 boiler when boiler underwent tests specified in ANSI Z21.13a-1983 standard.

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. In buildings of conventional frame, masonry or metal construction, infiltration is normally adequate to provide combustion air for boilers in unconfined rooms.

2. If the space is in a building of unusually tight construction, air should be obtained from outdoors or from spaces which freely connect with outdoors (see #4 below).
3. For boilers in confined rooms, two permanent openings shall be provided: one within 12 inches from the ceiling and one within 12 inches from the floor of the room. Each opening shall be at least one square inch per 1,000 BTUH boiler input, but must not be less than 100 sq. inches. These openings shall freely connect with areas having adequate infiltration from outside.
4. When all air is provided from outdoors the confined space shall be provided with two openings as outlined in #3 above. These openings shall connect directly or by ducts with outdoors or spaces (crawl or attic) that freely connect with the outdoors and shall be of the size listed below for that particular arrangement:
 - (a) One square inch per 4,000 BTUH of boiler input for direct outdoor air supply through an outside wall or through vertical ducting directly to outside.
 - (b) One square inch per 2,000 BTUH of boiler input for direct outdoor air through horizontal ducting.
 - (c) All ducting shall be of the same size as the opening to which it is connected with minimum dimensions of no less than 3 × 3 inches or 9 total square inches of area.
 - (d) Other size ducting must comply with local codes.



CHIMNEY OR VENT REQUIREMENTS

Minimum chimney or vent sizes are on page 23 of these instructions. In most cases a chimney or vent extended at least 2 feet above highest part of 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 that prevent retention of moisture and linings made of noncorrosive materials are best. Advice for flue connections and chimney linings can be obtained from local gas utility.

DANGER

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

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. A.G.A. certification will 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.

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.

MINIMUM SERVICE CLEARANCES

Suggested for easy servicing:

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

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

Clearance from hot water piping to combustible material—1 inch.

Screwdriver clearance for removal of jacket screws should be provided. If not, unions and shut-off valves should be installed in system so boiler can be moved for servicing.

Required clearances in confined spaces

Refer to plate located on inner jacket panel for required minimum clearances. Also see Figure 1.

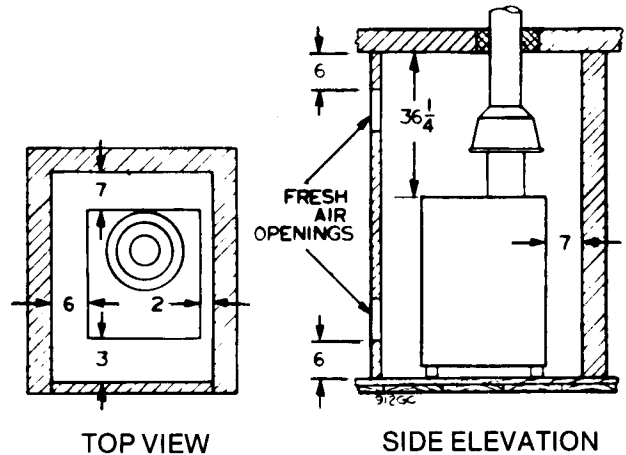


FIGURE 1

RESIDENTIAL GARAGE INSTALLATION (ANSI Z223.1)

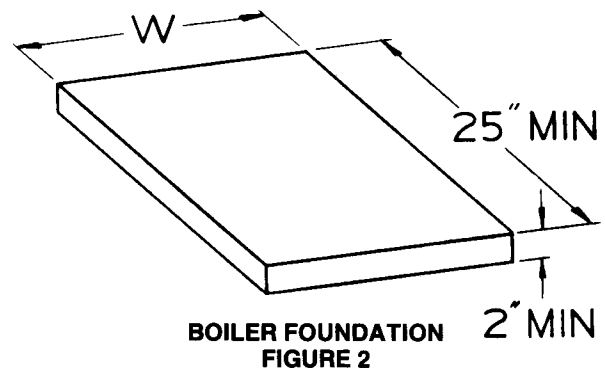
Install boiler so burners are at least 18 inches above the floor.

BOILER FOUNDATION

Boilers are approved for use on combustible flooring but **MUST NOT BE INSTALLED ON CARPETING.**

1. Level concrete or solid brick pad foundation is required if:
 - a) Water could flood area.
 - b) Non-level conditions exist.

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

Section II: Boiler Set-up

PLACING THE BOILER

Leave boiler in crate and on pallet until installation site is ready.

1. Move entire crate and pallet next to selected location.
2. Remove crate.
3. Remove boiler from pallet as follows:
 - a. Tilt left side of boiler up and place a board under left legs.
 - b. Tilt boiler the other way and place a board under right legs.
 - c. Slide boiler backward off pallet and into position.

DO NOT DROP BOILER OR BUMP JACKET ON FLOOR OR PALLET.

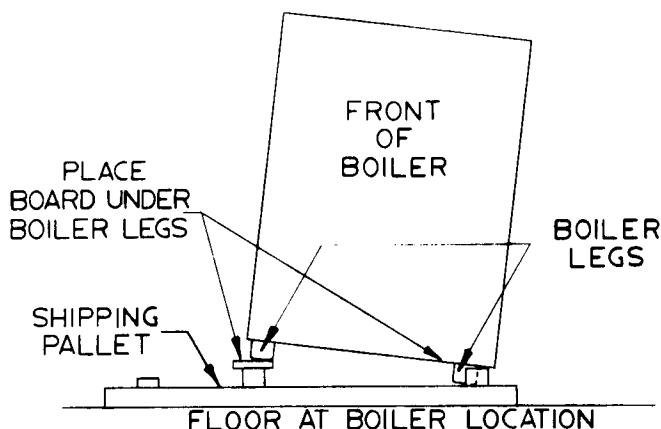


FIGURE 3

4. Check level. Shim legs, if needed. Do not alter the legs.
5. Remove front jacket door. Remove burner access panel. Unscrew access panel screws; remove and discard shipping washers; reinstall screws.
6. 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

7. 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.

8. Reinstall access panel.

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, A.G.A. design certification becomes void.

BREECHING ERECTION

Connect from draft diverter outlet to chimney or vent with same size breeching. Where possible, vertical venting to the outside from the draft diverter outlet will offer best performance at lowest total cost. Where horizontal breeching is used, slope upward at least 1/4 inch per lineal foot toward chimney or vent.

NOTICE

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.

HYDROSTATIC PRESSURE TEST

Pressure test before attaching 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 supply outlet. Plug tapings, including compression tank tapping.
2. Connect water supply. Fill boiler and purge all air. TEST AT 45 PSIG for more than 10 minutes.

WARNING

Do not leave the boiler unattended. A cold water fill could expand and cause excessive pressure.

3. Make sure gauge pressure has been maintained.
4. Check for leaks. Repair, if found.
5. Drain boiler and remove testing plugs.
6. On initial start-up, check for leaks in system piping. If found, repair at once.



Section III: Piping

CAUTION

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

1. Pipe as shown in Figures 4 or 5.

a. For P-CG boilers—

1) Pre-pressurized expansion tank is provided. Ensure tank pressure and size will handle system fill and water volume.

a) Fill pressure may be adjusted at tank for design conditions. Follow manufacturer's instructions.

b) Additional tanks may be connected to tees in system near boiler. See Table I.

2) Install provided air vent.

b. For CGM boilers—

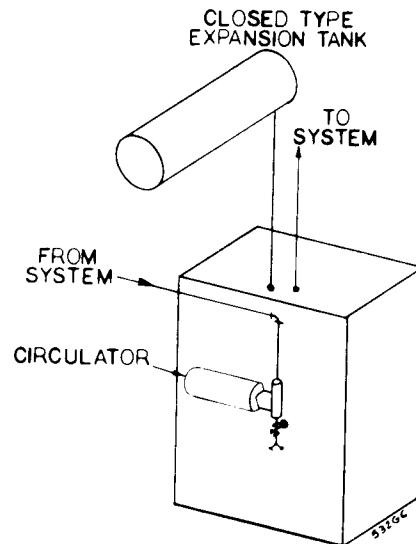
1) Size tank to system requirements. Refer to tank manufacturer's instructions and Table I.

2) Closed diaphragm pre-pressurized expansion tank—locate near boiler.

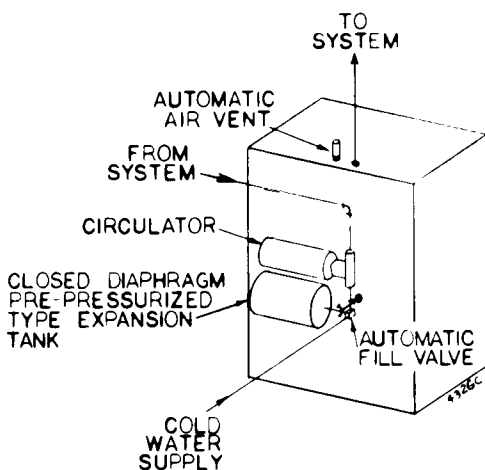
NOTICE

Install manual or automatic air vent in 1/2" tapping as shown in Figure 4 when using closed diaphragm pre-pressurized tank.

3) Closed type expansion tank—connection from 1/2" N.P.T. tapping (located behind supply outlet) to expansion tank. Use 1/2" piping. Any horizontal piping must pitch up towards tank 1" per 5 feet of piping. Built-in air elimination system is provided. No additional device is needed if tank is piped as shown in Figure 5.



**CLOSED TYPE EXPANSION TANK PIPING
 FIGURE 5**



**CLOSED DIAPHRAGM PREPRESSURIZED
 EXPANSION TANK PIPING
 FIGURE 4**

TABLE I—EXPANSION TANK SIZING*

Number of Boiler Sections	Standard Fill-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.

• Standard equipment for P-CG boilers.

** Systems with unusually large volumes of water may require additional expansion capacity.

2. Use low water cut-off when:

- a. boiler is located above radiation level.
- b. required by certain state, local, or territorial codes or insurance companies.

Use low water cut-off designed for water installations. Electrode probe type is recommended. Install in tee in supply piping.

3. If the system is to comply with ASME codes, an additional high temperature limit is needed. Purchase and install in supply piping from the boiler.

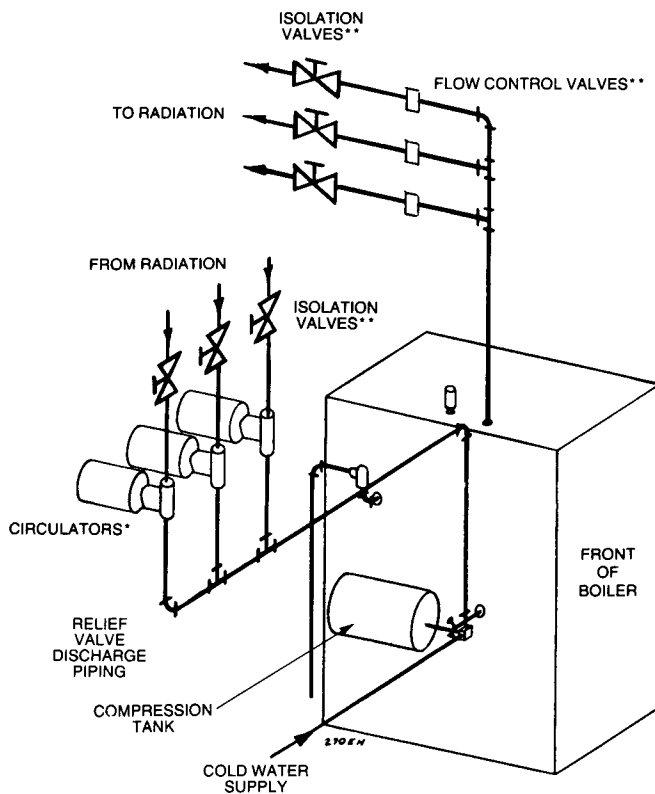
WARNING

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

5. Connect supply, return, and cold water fill piping.

MULTIPLE ZONING WITH CIRCULATORS

1. If multiple zoning with circulators, boiler must be repiped. See Figure 6.
 - a) Remove provided circulator.
 - b) Determine if by-pass piping will be needed. See page 8.
 - c) Mount circulators as shown.
 - d) Install flow control valves.
 - e) Follow remaining piping instructions



*DO NOT USE DRAIN COCK TAPPING
**MAY BE INSTALLED IN ALTERNATE LOCATIONS

MULTIPLE ZONING WITH CIRCULATORS
FIGURE 6

BYPASS PIPING

BYPASS PIPING IS NOT NORMALLY REQUIRED ON TYPICAL BASEBOARD SYSTEM.

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

1. When return water temperature is 130°F or greater: to protect system radiant panels, plaster, etc. from high temperature water supplied from boiler, see Figure 7.

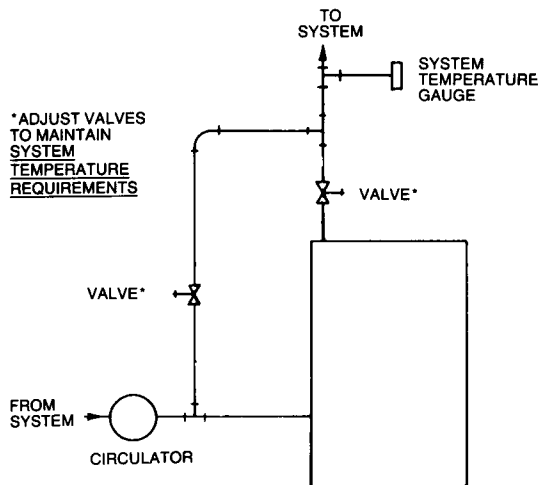


FIGURE 7

2. To protect boiler from condensation formed by low water temperature returned from large water content converted gravity systems, etc., see Figure 8.

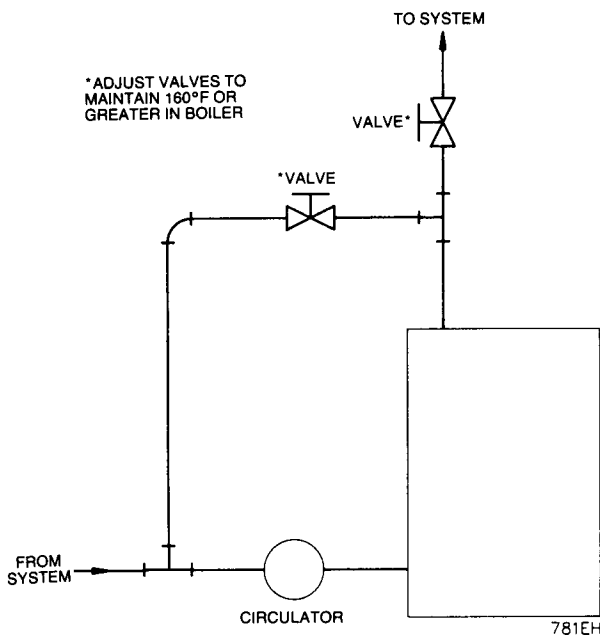


FIGURE 8

3. When return water temperature is below 130°F: to protect boiler from condensation while protecting system from high water temperatures, as in large water content radiant ceiling panels, see Figure 9.

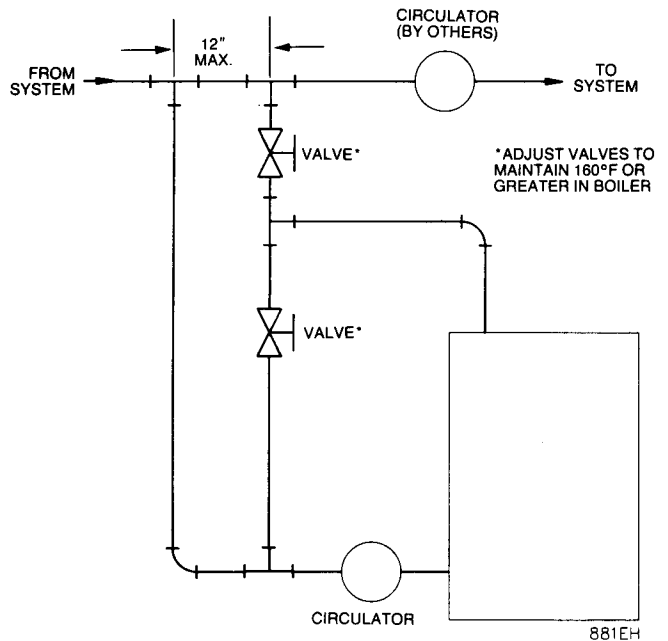
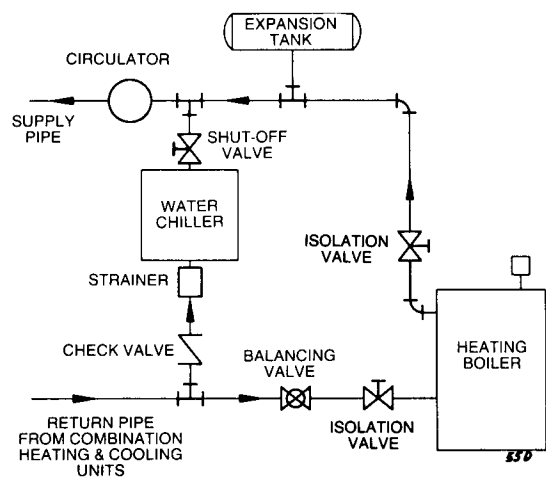


FIGURE 9

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.

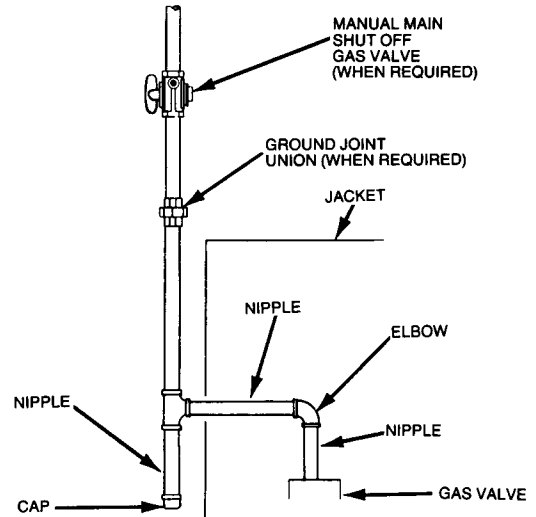


RECOMMENDED PIPING FOR COMBINATION HEATING & COOLING (REFRIGERATION) SYSTEMS
 FIGURE 10

Section IV: Gas Piping

Size gas piping considering:

- 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. For additional pressure drops, see ANSI Z223.1.
1. For natural gas:
 - a) Refer to following tables. To obtain cubic feet per hour, divide the input by 1000.
 - b) Size for rated boiler input.
 - c) Inlet gas pressure: 5" W.C. minimum
13" W.C. maximum
 - d) Manifold gas pressure: 3½" W.C.
 - e) Install 100% lock-up gas pressure regulator in supply line if inlet pressure exceeds 13" W.C. Adjust for 13" W.C. maximum.



**GAS SUPPLY PIPING
 FIGURE 11**

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

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

NOTE: For additional piping schedules, see ANSI Z223.1.

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

Pipe Size, Inches	Additional Length, Feet
½	1.3
¾	1.7
1	2.2
1¼	2.9
1½	3.3

2. For propane gas:
 - a) Inlet gas pressure: 11" W.C. minimum
13" W.C. maximum
 - b) Manifold gas pressure: 10" W.C.
 - c) Gas pressure regulator provided by gas supplier must be adjusted for maximum pressure of 13" W.C.
 - d) Contact gas supplier to size pipes, tanks and regulator.
3. Remove jacket door and refer to Figure 11 for gas piping.

4. Follow good piping practices.
5. Pipe joint compound (pipe dope) must be resistant to corrosive action of liquified petroleum gases and applied sparingly only to male threads of pipe joints.
6. Install drip leg 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. Install ground union to provide for servicing, when required.
8. Install manual shut-off valve in gas supply piping outside boiler jacket when required by local codes or utility requirements.
9. Support piping by hangers, not by the boiler or its accessories.
10. Purge all air from supply piping.
11. Check factory installed piping and field installed piping for leaks—BUBBLE TEST.

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 13 inches water column.
- c) Disconnect boiler and gas valve from gas supply piping during any pressure test greater than 13 inches water column.



Section V: Wiring

Refer to wiring diagram label on jacket door and Control Supplement for specific wiring details.

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.

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 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. 70-1984. Use 90°C Thermoplastic Wire, or equivalent, if any original wire must be replaced.

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). 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.

INSTALL ROOM THERMOSTAT

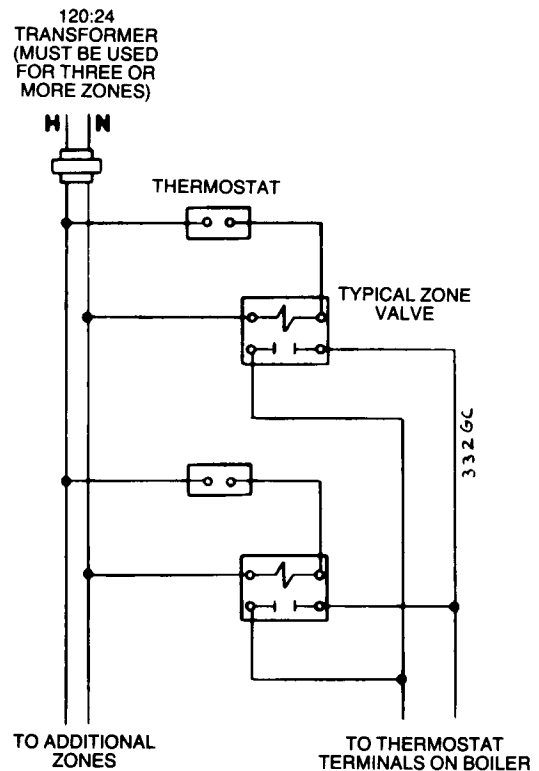
Install room thermostat on an inside wall. Never install where it will be influenced by drafts, hot or cold water pipes, lighting fixtures, television, sun rays or near a fireplace.

Heat anticipator in thermostat must be set to match power requirements of primary control to which it is connected.

Refer to wiring diagram on jacket door or in Control Supplement for recommended heat anticipator setting with standard equipment. Wire thermostat as shown.

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 circulator.



TYPICAL WIRING—ZONING WITH ZONE VALVES
FIGURE 12

Section VI: Final Adjustments

WATER TREATMENT

Never use petroleum based stop-leak compounds. Water seal deterioration will occur, resulting in leakage between sections.

Continual make-up water will reduce boiler life. Minerals can build up in the sections, reducing heat transfer, overheating the cast iron, and causing section failure.

For unusually hard water areas or low pH conditions (less than 7.0) consult local water treatment company.

Freeze protection (when used):

Use antifreeze especially made for hydronic systems. Inhibited propylene glycol is recommended. DO NOT use undiluted or automotive type antifreeze.

50% solution provides maximum 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 23.

Follow antifreeze manufacturer's instructions.

FILLING 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 of cold fill pressure.
3. Open automatic air vent two turns, if used.
4. Open manual water feed valve.
5. a) Starting on the lowest floor, open air vents one at a time until water squirts out. Close vent.
b) Repeat with remaining vents.
6. Close manual water feed valve when correct boiler pressure is reached.

INSPECT BASE INSULATION

Check to make sure refractory is secure against all four sides of the base.

WARNING

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

CAUTION

Ceramic fiber material used in boiler base insulation and gaskets can cause temporary skin, eye, and upper respiratory irritation.

Use NIOSH or MSHA approved protection when installing or removing this material.

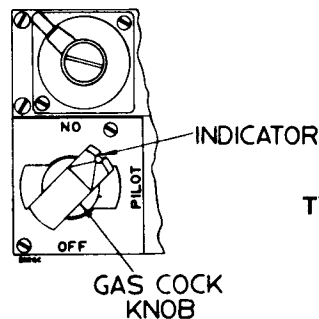
TO PLACE IN OPERATION

CAUTION

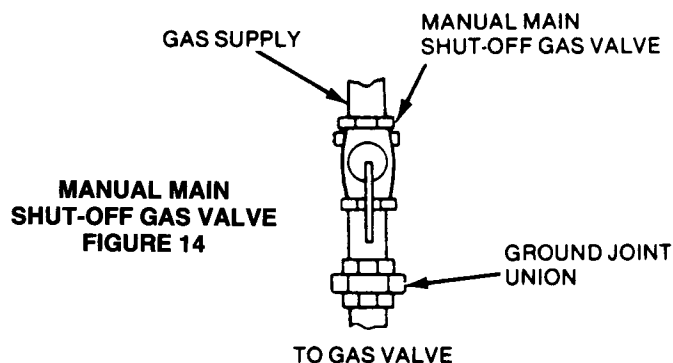
The manual gas cock knob and manual main shut-off gas valve (when used) must be closed for at least five (5) minutes before lighting.

1. Turn thermostat or operating control to OFF position or lowest position on dial. Be sure boiler has been correctly filled with water.

2. Turn OFF electric power.
3. For boiler 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 for following conditions:
 - a) Loose connection or blown fuse?
 - b) Limit setting below boiler water temperature or pressure?
 - c) Thermostat set below room temperature?
 - d) Gas not turned on at meter and boiler?
 - e) Incoming natural gas pressure less than 5" W.C. or propane less than 10" W.C.?
 - f) Access panel not secured in place?
 - g) 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.



TYPICAL GAS COCK DIAL
FIGURE 13



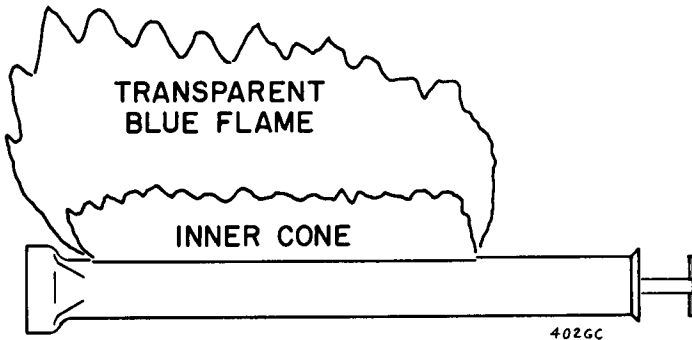
MANUAL MAIN
SHUT-OFF GAS VALVE
FIGURE 14



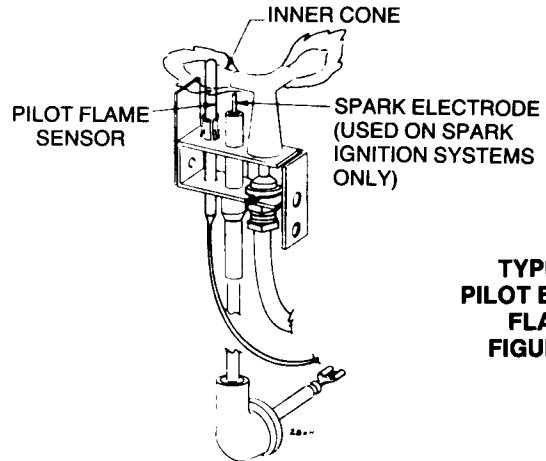
CHECK BURNER FLAMES

1. Proper burner flame, see Figure 15. 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.
3. If improper burner flames are suspected, contact a trained serviceman or local gas utility.

- 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 flames are suspected, contact a trained serviceman or local gas utility to inspect the condition.



TYPICAL MAIN BURNER FLAME
FIGURE 15



TYPICAL PILOT BURNER FLAME
FIGURE 16

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—flame is large and lifting or blowing past pilot flame sensor.

INSPECT VENTING SYSTEM

1. Check venting system at least once a month during heating season. With boiler firing, hold a candle or match below lower edge of draft hood "skirt". If the flame does not blow out, but burns undisturbed, the 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 venting systems for deterioration from corrosion, physical damage, sagging, etc. Correct all conditions found.

Section VII: 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 11.

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 12.
- 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 the circulator continues to operate. Raise limit control above the boiler water temperature and burners should reignite.

- 9. Test ignition system safety shut-off device:
 - a. For 24V and MV standing pilot—Turn gas cock knob to PILOT position and extinguish pilot flame. Pilot gas flow should stop in less than 2 minutes. Put system back into operation (see page 11).
 - b. For intermittent ignition systems—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 the 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. Operate boiler 10 minutes.
 - b. Turn off other appliances.
 - c. At natural gas meter, measure time (in seconds) required to use one cubic foot of gas.
 - d. Calculate gas input:

$$\frac{3600 \times 1000}{\text{number seconds from step C}} = \text{Btuh}$$
 - e. Btuh calculated should approximate input rating on rating plate.
- 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 room 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 VIII: Maintenance

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, BEFORE SERVICING:

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

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.

Do not block flow of air to 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.

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 15.
3. Follow procedure "To Place in Operation", page 11.
4. Visually inspect pilot and burner flames. Reference "Check Main Burner Flames" and "Check Pilot Burner Flame", page 12.
5. Visually inspect venting system for proper function, deterioration or leakage. Reference "Inspect Venting System", page 12.
6. Visually inspect base insulation. Reference "Inspect Base Insulation," page 11.
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 flow of combustion or ventilation air.
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.

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.

CAUTION

Continuous use of make-up water can damage boiler sections due to addition of minerals. DO NOT use petroleum based stop-leak compounds—leakage between the sections will occur.

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 12.
4. Visually inspect venting system for proper function, deterioration or leakage. Reference "Inspect Venting System", page 12.
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 15.

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 collection 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 15.
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.

WARNING

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 main 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 system unless exposure to freezing temperatures will occur. If antifreeze is used in the 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.	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. 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.
	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 7.0 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 too 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 IX: Replacement Parts

Parts Lists
Component-Assemblies Replacement
(Refer to Control Supplement for control replacement)

Section Assembly 18
Base Assembly 19
Jacket Assembly 20
Boiler Trim Assembly 21

COMPONENT REPLACEMENT INSTRUCTIONS

Before replacing any parts on the boiler:

- 1. Turn off power
- 2. Shut off gas supply

Refer to the appropriate exploded diagram for parts replacement.

Replacement parts can be ordered or purchased through a local Weil-McLain distributor. When ordering, specify boiler model and series and include description and number of replacement part. Some parts are stock items and can be purchased from a local supply house.

Section Assembly CGM and P-CG Series 9

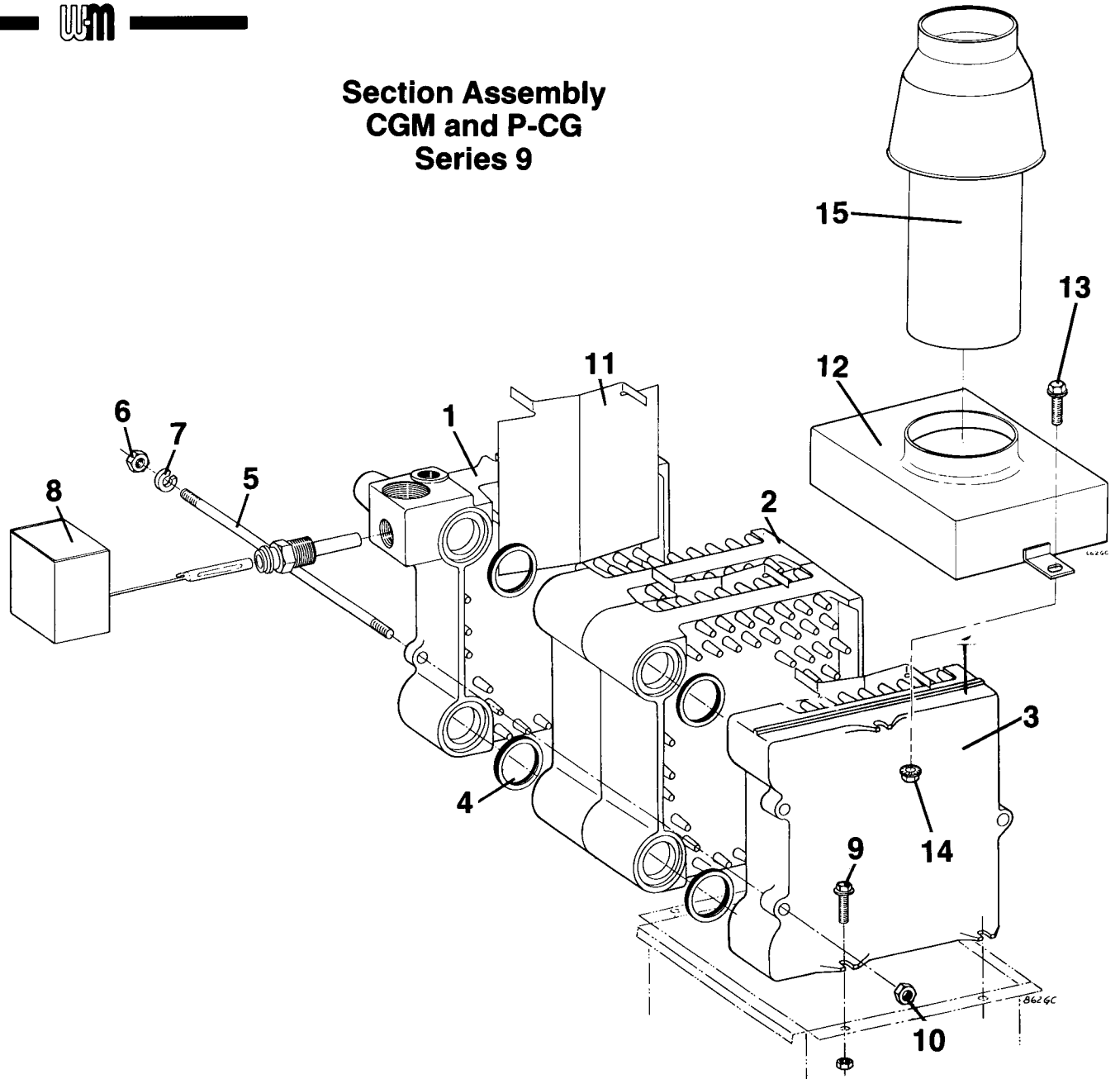


FIG. NO.	DESCRIPTION	VENDOR/PART NUMBER	W-M PART NUMBER
1	Left End Section 51124	W-M	311-103-815
2	Intermediate Section 51125	W-M	311-103-818
3	Right End Section 51128	W-M	311-103-821
4	Square Cut Seal, 2"	W-M	592-800-011
5	Tie Rod—CG25/CG-3 7/16×9		560-234-500
	CG4 7/16×12		560-234-501
	CG5 7/16×15		560-234-502
	CG6 7/16×18		560-234-503
	CG7 7/16×21		560-234-504
	CG8 7/16×24		560-234-505
6	Nut, 7/16-14 Reg. Hex		■
7	Washer, 7/16 Reg. Helical Spring Lock		■
8	Limit Control—24V —MV	W-R 11881-3 W-R 11881-703	510-310-253 510-310-140

FIG. NO.	DESCRIPTION	VENDOR/PART NUMBER	W-M PART NUMBER
9	Screw, 5/16-18×1 Whiz-Lock		■
10	Nut, 5/16-18 2-way Lock		■
11	Radiation Plate	W-M	460-003-695
12	Flue Collector Hood—CG-25	W-M	450-020-493
	—CG-3	W-M	450-020-487
	—CG-4	W-M	450-020-488
	—CG-5	W-M	450-020-489
	—CG-6	W-M	450-020-490
	—CG-7	W-M	450-020-491
	—CG-8	W-M	450-020-492
13	Screw, 1/4-20×1/4 Whiz-Lock Nut, 1/4-20 Whiz-Lock		■ ■
15	Draft Hood—CG-25	W-M	450-021-222
	—CG-3	W-M	450-021-223
	—CG-4	W-M	450-021-224
	—CG-5	W-M	450-021-225
	—CG-6	W-M	450-021-226
	—CG-7	W-M	450-021-227
	—CG-8	W-M	450-021-228

■ LISTED PART OR EQUIVALENT CAN BE PURCHASED AT LOCAL SUPPLY HOUSE.

Base Assembly CGM and P-CG Series 9

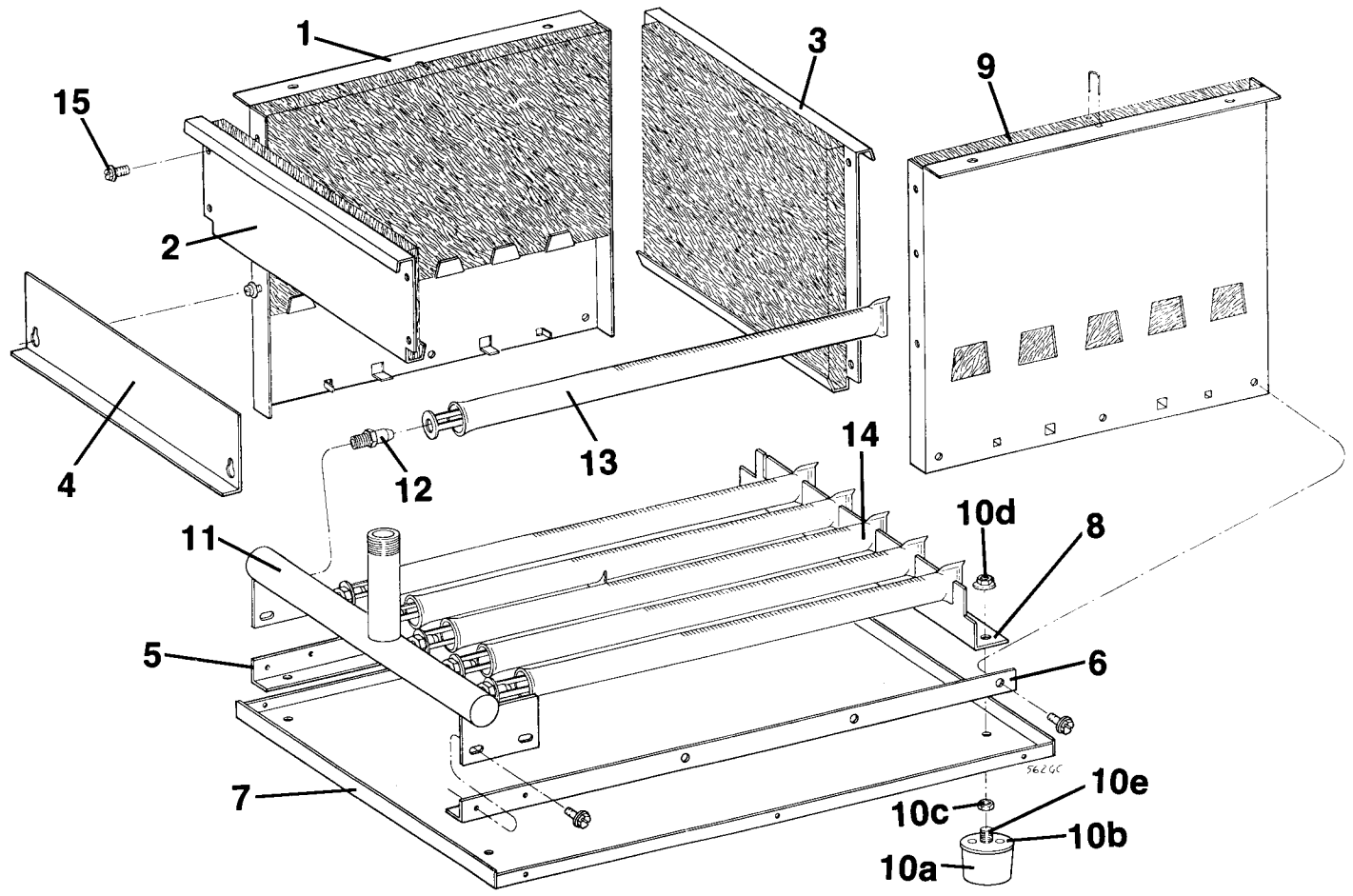


FIG. NO.	DESCRIPTION	VENDOR/ PART NUMBER	W-M PART NUMBER
1	Base Side Panel	W-M	460-003-710
2	Base Front Cross Tie— CG-25/CG-3 CG-4 CG-5 CG-6 CG-7 CG-8	W-M W-M W-M W-M W-M W-M	460-003-777 460-003-778 460-003-779 460-003-780 460-003-781 460-003-782
3	Base Back Cross Tie— CG-25/CG-3 CG-4 CG-5 CG-6 CG-7 CG-8	W-M W-M W-M W-M W-M W-M	460-003-701 460-003-702 460-003-703 460-003-704 460-003-705 460-003-706
4	Base Access Panel— CG-25/CG-3 CG-4 CG-5 CG-6 CG-7 CG-8	W-M W-M W-M W-M W-M W-M	460-003-741 460-003-742 460-003-743 460-003-744 460-003-745 460-003-746
5	Base Pan Angle—L.H.	W-M	450-030-475
6	Base Pan Angle—R.H.	W-M	450-030-474
7	Base Pan—CG-25/CG-3 CG-4 CG-5 CG-6 CG-7 CG-8	W-M W-M W-M W-M W-M W-M	450-003-730 450-003-731 450-003-732 450-003-733 450-003-734 450-003-735
8	Burner Rest—CG-25 —CG-3 —CG-4 —CG-5 —CG-6 —CG-7 —CG-8	W-M W-M W-M W-M W-M W-M W-M	450-030-742 450-030-736 450-030-737 450-030-738 450-030-739 450-030-740 450-030-741

FIG. NO.	DESCRIPTION	VENDOR/ PART NUMBER	W-M PART NUMBER
9	Base Insulation Set— CG-25/CG3 CG-4 CG-5 CG-6 CG-7 CG-8 Staple, 13/4" for base insulation	W-M W-M W-M W-M W-M W-M W-M	591-222-040 591-222-041 591-222-042 591-222-043 591-222-044 591-222-045 ■
10	Leg, Screw-on Assembly*	W-M	590-424-252
10a	Leg	—	—
10b	Washer, 3/8" Hole	—	—
10c	Nut, 5/16-18 Jam	—	—
10d	Nut, 5/16-18 Whiz-Lock	—	—
10e	Screw, 5/16-18 x 2 1/4 Mach. Fl. Hd. Phil.	—	—
11	Manifold—CG-25 CG-3 CG-4 CG-5 CG-6 CG-7 CG-8	W-M W-M W-M W-M W-M W-M W-M	591-126-549 591-126-550 591-126-551 591-126-552 591-126-553 591-126-554 591-126-555
12	Orifice, Main Burner— Natural, #46 Drill Propane, #56 Drill	W-M W-M	560-528-997 560-528-998
13	Burner, Steel	W-M	512-200-060
14	Burner, Steel w/Pilot Brkt.	W-M	512-200-065
15	Screw, 10-32 x 3/8 STP Type D Hex Wash. Hd. Slot ZP	—	■

■ LISTED PART OR EQUIVALENT CAN BE PURCHASED AT LOCAL SUPPLY HOUSE.
 * SOLD AS ASSEMBLY ONLY

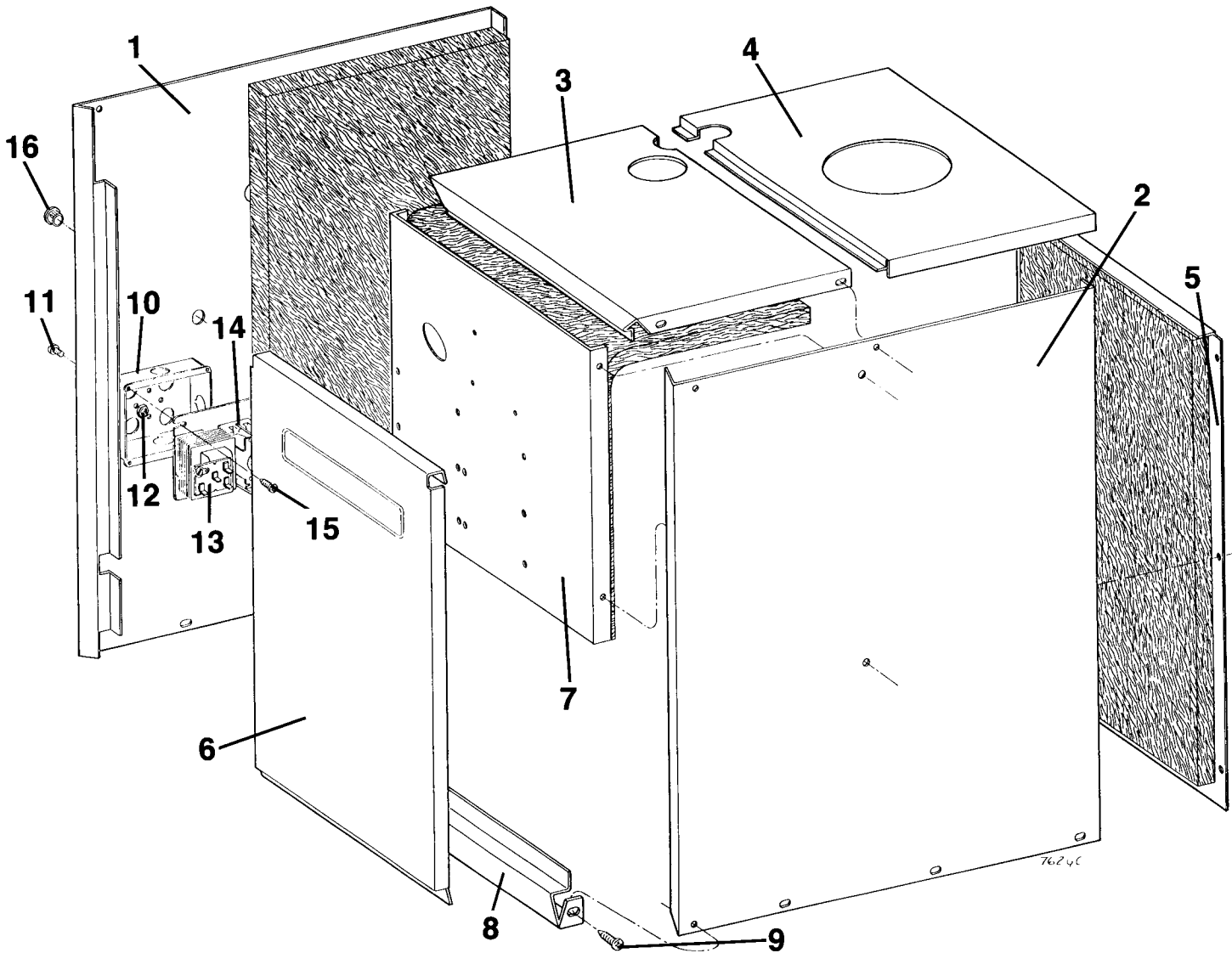


FIG. NO.	DESCRIPTION	VENDOR/PART NUMBER	W-M PART NUMBER
1	Side Panel, L.H.	W-M	421-208-159
2	Side Panel, R.H.	W-M	421-208-160
3	Top Panel, Removable—		
	CG-25	W-M	431-203-112
	CG-3	W-M	431-203-127
	CG-4	W-M	431-203-128
	CG-5	W-M	431-203-129
	CG-6	W-M	431-203-130
	CG-7	W-M	431-203-131
	CG-8	W-M	431-203-132
4	Top Panel—CG-25/CG-3	W-M	421-203-120
	CG-4	W-M	421-203-121
	CG-5	W-M	421-203-122
	CG-6	W-M	421-203-123
	CG-7	W-M	421-203-124
	CG-8	W-M	421-203-125
5	Rear Panel—CG-25/CG-3	W-M	431-202-139
	CG-4	W-M	431-202-140
	CG-5	W-M	431-202-141
	CG-6	W-M	431-202-142
	CG-7	W-M	431-202-143
	CG-8	W-M	431-202-144
6	Door—CG-25/CG-3	W-M	421-208-150
	CG-4	W-M	421-208-151
	CG-5	W-M	421-208-152
	CG-6	W-M	421-208-153
	CG-7	W-M	421-208-154
	CG-8	W-M	421-208-155

FIG. NO.	DESCRIPTION	VENDOR/PART NUMBER	W-M PART NUMBER
7	Interior Panel—		
	CG-25/CG-3	W-M	431-223-130
	CG-4	W-M	431-223-131
	CG-5	W-M	431-223-132
	CG-6	W-M	431-223-133
	CG-7	W-M	431-223-134
	CG-8	W-M	431-223-135
8	Front Bottom Cross Tie		
	CG-25/CG-3	W-M	431-214-124
	CG-4	W-M	431-214-125
	CG-5	W-M	431-214-126
	CG-6	W-M	431-214-127
	CG-7	W-M	431-214-128
	CG-8	W-M	431-214-129
9	Screw, #10×1/2 Sht. Mtl. Type A Pan Hd. Phil.		■
10	Junction Box, 4×4×1/2		■
11	Screw, 10-32×1/2 Mach. Pan Hd. Phil.		■
12	Nut, 10-32 Hex Green-plated		■
13	Transformer w/Plug-in Recp. and Bale Wire, 24V Transformer Relay, MV		■
14	Relay, 24V		■
15	Screw, #8×1/2 Sht. Mtl. Pan Hd. Phil.		■
16	Bushing, Thermostat Wire		■

■ LISTED PART OR EQUIVALENT CAN BE PURCHASED AT LOCAL SUPPLY HOUSE.

Boiler Trim Assembly CGM and P-CG Series 9

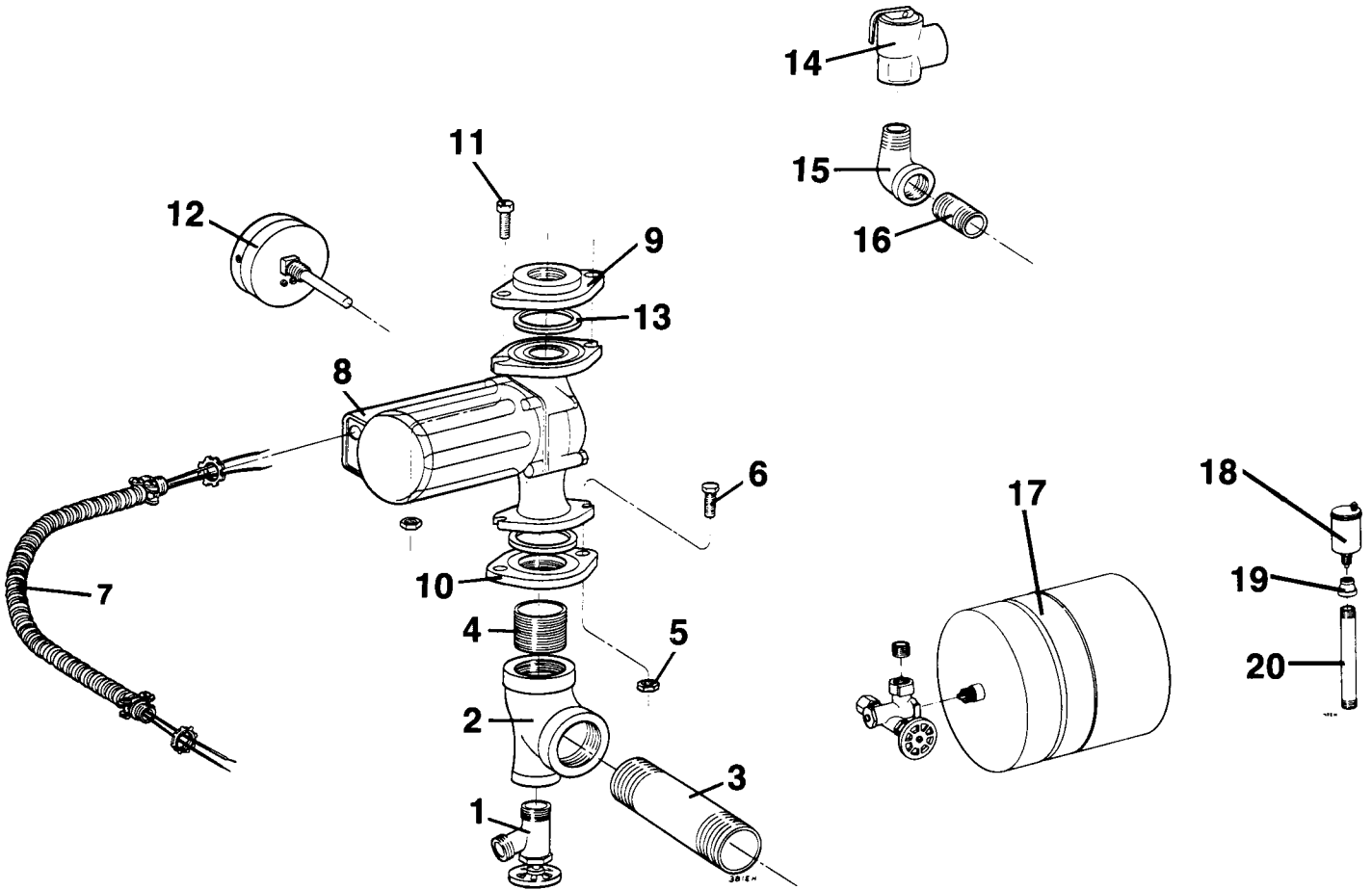
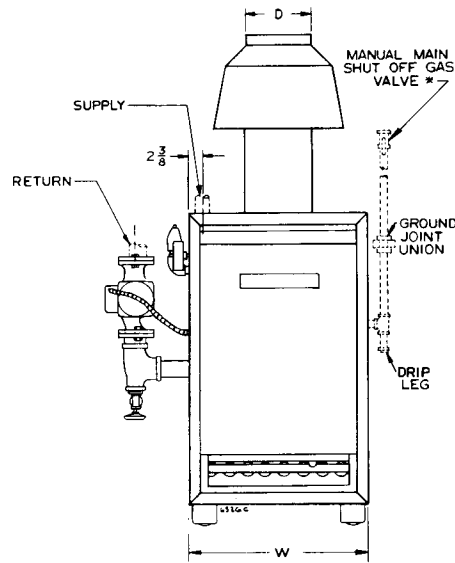


FIG. NO.	DESCRIPTION	VENDOR/ PART NUMBER	W-M PART NUMBER
1	Drain Valve, 3/4"		■
2	Tee, Reducer Black 1 1/4 x 3/4 x 1 1/4		■
3	Nipple, Black— Taco 007 1-1 1/4 x 5 1/2 B&G LR20 1-1/4 x 6 B&G100/Taco 110 1-1/4 x 5		■ ■ ■
4	Nipple, Close 1 1/4		■
5	Nut, Hex 7/16-14		■
6,11	Screw, Cap Hex Hd. 7/16-14 x 1 1/4—SMALL PUMPS Screw, Cap Hex Hd. 7/16-14 x 1 1/2—LARGE PUMPS		■ ■
7	Wiring Harness, Box to Pump		■
8	Circulator, SMALL Circulator, LARGE	Taco 007 or B&G LR20 Taco 110 or B&G 100	■ ■ ■
9	Pump Flange— CG-25—3/4 NPT CG-3-5—1 NPT CG-6-7—1 1/4 NPT CG-8—1 1/2 NPT	B&G or Taco B&G or Taco B&G or Taco B&G or Taco	■ ■ ■ ■

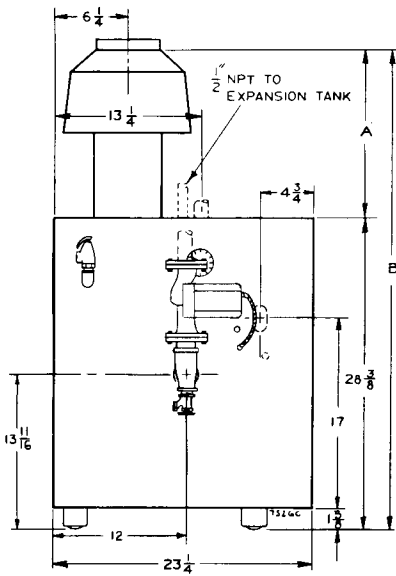
FIG. NO.	DESCRIPTION	VENDOR/ PART NUMBER	W-M PART NUMBER
10	Pump Flange— CG-25—3/4 NPT CG-3-8—1 1/4 NPT	B&G or Taco B&G or Taco	■ ■
12	Pressure-Temperature Gauge	Ametek Spec #135392 Short Shank	■
13	Gasket	Taco—SMALL & LARGE PUMPS B&G LR 20 B&G 100	■ ■ ■
14	Relief Valve, 30# Male or Female		■
15	Street Ell, 3/4 Black for Female Ell, 3/4 Black for Male		■
16	Nipple, 3/4 x 2 Black		■
17	Expansion Tank— (P-CG-25-5) (P-CG-6)	Fill-Trol System #109 Fill-Trol System #110	■ ■
18	Auto Air Vent (P-CG only)	Maid O'Mist #68	■
19	Reducer 1/2 NPT x 1/4 NPT (P-CG only)		■
20	Nipple 1/2 x 6 (P-CG only)		■
***	Silicone Sealant—400°F	Dow 732 RTV	■
***	Retort Cement		■

■ LISTED PART OR EQUIVALENT CAN BE PURCHASED AT LOCAL SUPPLY HOUSE.
*** NOT SHOWN

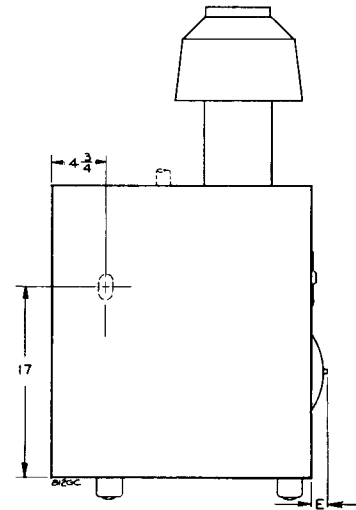
DIMENSIONS



FRONT



LEFT SIDE



RIGHT SIDE

Boiler Number	Supply Outlet		Return Inlet		Gas Connection Pipe Size			Gas Manifold Pipe Size All Gases	Dimensions					
	No.	Pipe Size	No.	Pipe Size	Natural Gas	Propane Gas	A		B††	C	D	E	W	
†CGM-25	1	3/4"	1	3/4"	1/2"	1/2"	1/2"	11"	39 3/8"	18 1/4"	4"	1 1/2"	10"	
†CGM-3	1	1 1/4"	1	1"	1/2"	1/2"	1/2"	18 1/2"	46 7/8"	18 1/4"	4"	1 1/2"	10"	
†CGM-4	1	1 1/4"	1	1"	1/2"	1/2"	1/2"	20"	48 3/8"	21 1/4"	5"	1 1/2"	13"	
†CGM-5	1	1 1/4"	1	1"	1/2"	1/2"	1/2"	23"	51 3/8"	24 1/4"	6"	1 1/2"	16"	
†CGM-6	1	1 1/4"	1	1 1/4"	1/2"	1/2"	1/2"	26"	54 3/8"	30 7/8"	6"	4"	19"	
†CGM-7	1	1 1/4"	1	1 1/4"	3/4"	3/4"	3/4"	24 3/4"	53 1/8"	33 7/8"	7"	4"	22"	
†CGM-8	1	1 1/2"	1	1 1/2"	3/4"	3/4"	3/4"	27 1/2"	55 7/8"	36 7/8"	7"	4"	25"	

†† Add 4 1/2" when automatic vent damper is used.



RATINGS



Boiler Number	Input BTU/Hr.	D.O.E. Heating Capacity‡	NET I-B-R Ratings BTU/Hr.*	Boiler Water Content Gallons	Maximum Allowable System Water Content in Gallons with Standard Fill-Trol▶	D.O.E. Seasonal Efficiency (A.F.U.E.)‡			Chimney and Breeching Size**
						Standing Pilot	PI	PI w/ damper	
†CGM-25	52,000	44,000	38,000	1.54	18	69.5	74.3	82.7	4" I.D. x 20'
†CGM-3	70,000	58,000	50,000	1.54	18	70.3	73.7	81.8	4" I.D. x 20'
†CGM-4	105,000	86,000	75,000	2.11	18	70.3	73.7	81.7	5" I.D. x 20'
†CGM-5	140,000	115,000	100,000	2.69	18	70.3	72.9	81.5	6" I.D. x 20'
†CGM-6	175,000	143,000	124,000	3.26	44	70.4	72.5	81.4	6" I.D. x 20'
†CGM-7	210,000	172,000	150,000	3.84	44	70.4	72.0	81.2	7" I.D. x 20'
†CGM-8	245,000	200,000	174,000	4.42	44	70.4	71.6	81.1	7" I.D. x 20'

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 "PI w/damper" to designator for intermittent electronic ignition system with automatic vent damper (example: CGM-3-PI w/damper).
- ▶ 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.
- * 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 pick-up. Ratings are computed on an allowance for factor of 1.15. For unusual piping and pick-up loads, consult your Weil-McLain representative.
- ‡ Based upon standard test procedures prescribed by the United States Department of Energy.

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—³/₄" , CGM and P-CG-25; 1" CGM and P-CG-3 thru 5; 1¹/₄" , CGM and P-CG-6 and CGM-7; 1¹/₂" , 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, Weil-McLain reserves the right to change specifications without notice.