WEIL-McLAIN

CGi

US

Series 5
Sizes 25 - 8
Gas-Fired Water Boilers

Boiler Manual

- **Installation**
- **Startup**
- **Maintenance**
- **Parts**

Now featuring Unity-CI Control with Built-In Low Water Cut Off Functionality

⚠ WARNING

Installation and service of the boiler must be performed by a qualified installer or service technician. Read all instructions, including this manual and all other information shipped with the boiler, before installation or operation. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

Part Number 550-100-629/0126

Contents

Abbreviations

Table 1 Common abbreviations

Abbreviation	Description
AHD	Additional Heat Demand
AMP	Ampere or Amperage
ANSI	American National Standards Institute
BMS	Building Management System
BTUH	British Thermal Unit per Hour
CAD	Combustion Air Damper
CH	Comfort Heat
CP	Consumer Protection
CSA	Canadian Standards Association
DHW	Domestic Hot Water
LWCO	Low Water Cut-Off
MBH	Thousands of Btuh
NFPA	National Fire and Protection Agency
ODR	Outdoor Reset
ODT	Outdoor Temperature
P/T	Pressure and Temperature
VAC	Volts Alternating Current
VDC	Volts Direct Current
WWSD	Warm Weather Shut Down

Tools

Table 2 Tools

Tools Needed	Purpose
1/16" flat blade screwdriver	Wiring on terminal blocks
Flat blade screwdriver	Adjusting gas valve
5/16" socket	Burner access shield screws
Phillips head screwdriver	Jacket screws
Pipe wrenches	Gas train installation
Manometer (inclined or digital)	Measuring the gas pressure coming to the boiler

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Section 1
Safety

Hazard Definitions

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

Indicates presence of hazards that **will or can result minor** personal injury or property damage.

NOTICE

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

Glycol — potential fire hazard —

All glycol is flammable when exposed to high temperatures. If glycol is allowed to accumulate in or around the boiler or any other potential ignition source, a fire can develop. In order to prevent potential severe personal injury, death or substantial property damage from fire and/or structural damage:

- **Never store glycol of any kind near the boiler or any potential ignition source.**
- **Monitor and inspect the system and boiler regularly for leakage. Repair any leaks immediately to prevent possible accumulation of glycol.**
- **Never use automotive antifreeze or ethylene glycol in the system. Using these glycols can lead to hazardous leakage of glycol in the boiler system.**

1

Please Read Before Proceeding

⚠ WARNING

Installer— Read all instructions, including this manual and all other information shipped with the boiler, before installing. Perform steps in the order given to prevent personal injury or death.

User — This manual is for use only by a qualified heating installer/service technician. Refer to User's Information Manual for your reference.

User — Have this boiler serviced/inspected by a qualified service technician, at least annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE

Write in the Consumer Protection (CP) number in the space provided on the Installation certificate on **page 66** if not already shown.

When calling or writing about the boiler— Please have the boiler model number from the boiler rating label and the CP number from the boiler jacket.

Consider piping and installation when determining boiler location.

⚠ DANGER

If any part of a boiler, burner or its controls has been sprayed with or submerged under water, either partially or fully, DO NOT attempt to operate the boiler until the boiler has been either replaced or completely repaired, inspected, and you are sure that the boiler and all components are in good condition and fully reliable.

Otherwise, by operating this boiler, you will cause a fire or explosion hazard, and an electrical shock hazard, leading to serious injury, death, or substantial property damage. See the instructions at right.

Saltwater Damage — The exposure of boiler components to saltwater can have both immediate and long-term effects. While the immediate effects of saltwater damage are similar to those of freshwater (shorting out of electrical components, washing out of critical lubricants, etc.), the salt and other contaminants left behind can lead to longer term issues after the water is gone due to the conductive and corrosive nature of the salt residue. Therefore, Weil-McLain equipment contaminated with saltwater or polluted water will no longer be covered under warranty and should be replaced.

Electrical Damage — If any **electrical component** or **wiring** came into contact with water, or was suspected to have come into contact with water, replace the boiler with a new Weil-McLain boiler.

⚠ WARNING

Failure to adhere to the guidelines below can result in severe personal injury, death or substantial property damage.

When Servicing Boiler —

- To avoid electric shock, disconnect all electrical supplies to the boiler before performing maintenance.
- To avoid severe burns, allow boiler to cool before performing maintenance.
- This boiler contains ceramic fiber and fiberglass materials. Refer to the WARNING and instructions on **page 92**.

Carbon Monoxide Detector —

- The installer must verify that at least one carbon monoxide alarm has been installed and is operational within a residential living space or home following the alarm manufacturer's instructions and applicable local codes before putting the appliance into operation.

Boiler Operation —

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.

Combustion Air —

- DO NOT install combustion air intake where there is a risk of combustion air contamination.

Boiler Water —

- Before connecting the boiler, thoroughly flush the system to remove sediment. Install a strainer or other sediment removal equipment if necessary. The cast iron heat exchanger can be damaged by build-up or corrosion due to sediment.
- Do not use petroleum-based cleaning or sealing compounds in boiler system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use "homemade cures" or "boiler patent medicines". Serious damage to boiler, personnel and/or property may result.
- Continual fresh makeup water will reduce boiler life. Mineral buildup in sections reduces heat transfer, overheats cast iron, and causes section failure. Addition of oxygen and other gases can cause internal corrosion. Leaks in boiler or piping must be repaired at once to prevent makeup water.
- Do not add cold water to a hot boiler. Thermal shock can cause heat exchanger to crack.

Freeze Protection Fluids —

- NEVER use automotive or standard glycol antifreeze. Use only freeze-protection fluids made for hydronic systems. Follow all guidelines given by the antifreeze manufacturer. Thoroughly clean and flush any replacement boiler system that has used glycol before installing the new boiler

⚠ CAUTION

Frozen Water Damage Hazard

Residences or buildings that are unattended in severely cold weather, boiler system components failures, power outages, or other electrical system failures could result in frozen plumbing and water damage in a matter of hours. For your protection, take preventative actions such as having a security system installed that operates during power outages, senses low temperature, and initiates an effective action. Consult with your boiler contractor or a home security agency.

Section 2
Installation

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Component Identification

1. Control Module

The control module responds to signals from the room thermostat, air pressure switch and boiler limit circuit to operate the boiler circulator, pilot burner, gas valve and inducer. When room thermostat calls for heat, the control module starts the system circulator and inducer.

The control module runs the inducer long enough to purge the boiler flue passages, then opens the pilot valve and activates pilot ignition spark.

The control module allows up to 15 seconds to establish pilot flame. If flame is not sensed within 15 seconds, the control module will turn off the gas valve and then enter a 15-second postpurge. The control module will then start a new cycle. This will continue indefinitely until pilot flame is established or power is interrupted. Once pilot flame is proven, the control module opens the gas valve to allow main burner flame.

When the room thermostat is satisfied, the control module turns off the gas valve, operates the inducer for a 15-second postpurge and waits for the next heat call.

2. Transformer

The control transformer reduces line voltage to 24 VAC for the gas valve and limit circuit.

3. Inducer

The inducer pulls flue gases through the boiler, causing air to be pulled in through the boiler air openings. The inducer pushes the flue gases through the vent pipe as well.

4. Air Pressure Switch

The air pressure switch monitors flue pressure for blockage and proper inducer operation.

- CGi-25, -3, -5 & -6: Single Air Pressure Switch
- CGi-4, -7 & -8: Dual Pressure Switch Assembly

5. Water Temperature/ LWCO Sensor

The water temperature/LWCO sensor provides a signal from a redundant thermistor temperature sensor to indicate the current water temperature at the boiler output. Additionally, there is a signal from the sensor's housing to indicate conductivity between the sensor housing and the boiler's casting. A low resistance reading indicates the presence of water making the connection from the sensor to the casting. In a low water condition with an active call for heat, the circulator will only run up to 15 minutes. Circulator operation will continue as normal once the low water condition is cleared.

6. Boiler Circulator

The boiler circulator circulates water through the external (system) piping. The circulator is shipped loose, and can be mounted on either the boiler supply or return piping. The factory-installed circulator wiring harness provides ample length for either location. **NOTE** — The control module provides a circulator exercising routine. If the boiler is not operated for 30 days, the control module will power the circulator for 30 seconds, then turn off.

7. Supply to system

8. Return from system

9. Stainless steel burners

10. Flue outlet

11. Gas valve

12. Pressure/temperature gauge

13. Relief valve

14. Air vent connection

15. Flame rollout thermal fuse element (TFE)

16. Burner shield

17. Pilot burner and bracket

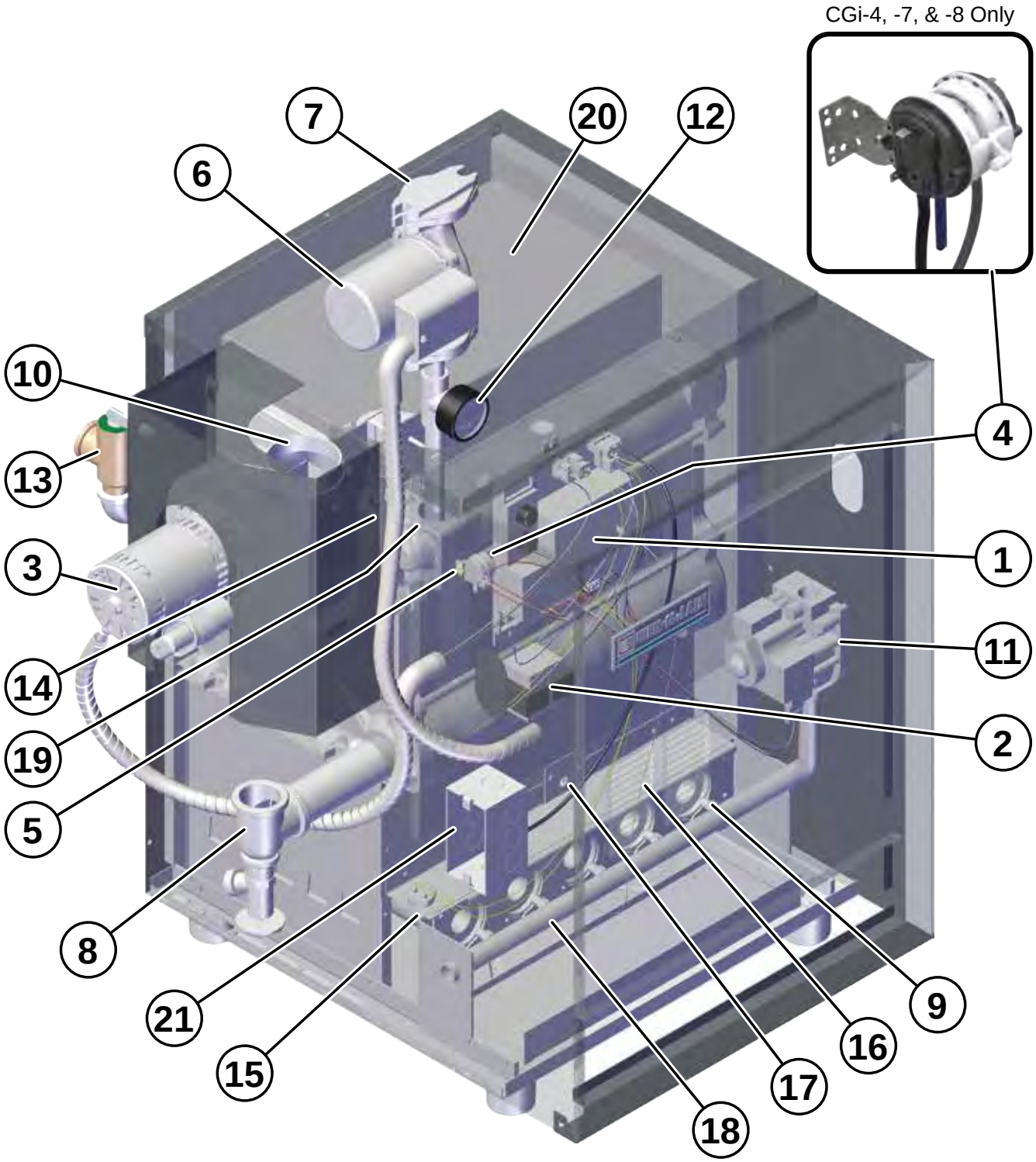
18. Gas manifold

19. Cast iron boiler sections

20. Flue collector

21. Junction box

CGi Series 5 Gas-Fired Water Boiler



Preparation

Boiler Location — Codes & Checklist

Installations must Follow These Codes:

- Local, state, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition.
- Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1 — latest edition.
- National Electrical Code, ANSI /NFPA 70 – latest edition.

Certification:

Commonwealth of Massachusetts

When the boiler is installed within the Commonwealth of Massachusetts:

- This product must be installed by a licensed plumber.
- If antifreeze is used, a reduced pressure back-flow preventer device shall be used.

NOTICE

The CGi boiler gas manifold and controls meet safe operating and other performance criteria when boiler underwent tests specified in ANSI Z21.13 – latest edition.

Before Locating the Boiler, Check the Following:

- Check for nearby connection to:
  - System water piping
  - Venting connections
  - Gas supply piping
  - Electrical power
- Check area around boiler. **Remove any combustible materials, gasoline and other flammable liquids, or other contaminants.**

⚠ WARNING

Failure to keep boiler area clear and free of **combustible materials, gasoline and other flammable liquids and vapors** can result in severe personal injury, death or substantial property damage.

- Boiler must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
- If new boiler will replace existing boiler, check for and correct system problems, such as:
  1. System leaks causing oxygen corrosion or section cracks from hard water deposits.
  2. Incorrectly-sized expansion tank.
  3. Lack of antifreeze in boiler water causing system and boiler to freeze and leak.

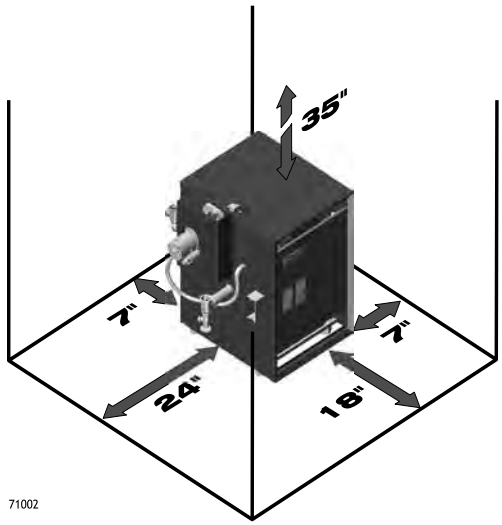
Preparation (continued)

Boiler Location — Clearances

Recommended SERVICE Clearances (Fig. 1a)

1. Provide clearances for cleaning and servicing the boiler and for access to controls and components. See **Figure 1a** for recommendations.
2. Provide at least screwdriver clearance to jacket front panel screws for removal of front panel for inspection and minor service. If unable to provide at least screwdriver clearance, install unions and shutoff valves in system so boiler can be moved for servicing.

Figure 1a Recommended service clearances (see **WARNING** below)



⚠WARNING

If any clearance is less than in Figure 1a, provide openings for combustion and ventilation air located on the wall or door opposite the boiler FRONT (see **Figure 1b**).

These openings must be located as shown in Figure 1b to provide proper air flow around the boiler. The free area of each opening (after deducting for louvers) must be at least one square inch per 1,000 Btuh of boiler input. If the building is of unusually tight construction (see **page 15** for definition), the air openings must connect directly to outside or the building must have air openings to the outside as specified on **page 15**.

If clearances are equal to or greater than **Figure 1a**, see **page 14** and **page 15** for location and sizing of combustion air openings.

Failure to comply can result in severe personal injury, death or substantial property damage and reduced boiler life.

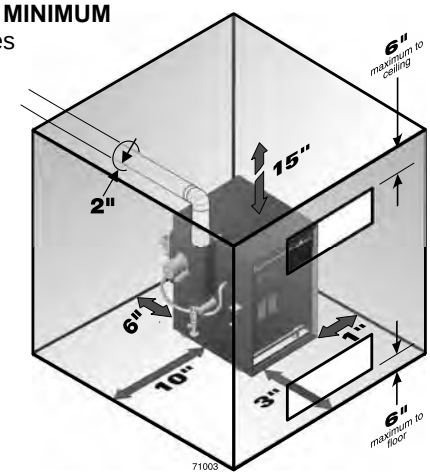
Required MINIMUM Clearances (Fig. 1b)

⚠WARNING

Never install the boiler in a space with clearances less than the minimum clearances shown in Figure 1b. Failure to comply can result in severe personal injury, death or substantial property damage and reduced boiler life.

1. **Hot water pipes:** at least ½ inch from combustible material.
2. **Single-wall vent pipe: at least 2 inches** from combustible material.
3. **Type B double-wall metal vent pipe:** refer to vent manufacturer's recommendation for clearances to combustible material.

Figure 1b Required **MINIMUM** clearances



Flooring

The CGi boiler is approved for installation on combustible flooring, but must never be installed on carpeting.

⚠WARNING

Do not install boiler on carpeting even if foundation is used. Fire can result, causing severe personal injury, death or substantial property damage.

Foundation

1. Provide a solid brick or minimum 2-inch thick concrete foundation pad if any of the following is true:
   - floor can become flooded.
   - the boiler mounting area is not level.
2. Minimum dimensions are **25" length** by:

Minimum foundation width:			
CGi-25/3	12**"**	**CGi-6**	21"
CGi-4	15"	**CGi-7**	24"
CGi-5	18"	**CGi-8**	27"

Residential Garage Installations

Take the following special precautions when installing the boiler in a residential garage. If the boiler is located in a residential garage, per ANSI Z223.1, – latest edition:

- Mount the boiler a minimum of **18 inches above the floor** of the garage to assure the burner and ignition devices will be no less than 18 inches above the floor.
- Locate or **protect the boiler** so it cannot be damaged by a moving vehicle.

Preparation (continued)

Boiler Location — Vent System

⚠ WARNING

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

⚠ DANGER

- **Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe personal injury or death**
- **Do not place any obstruction or non-approved vent damper in breeching or vent system. CSA certification will become void. Flue gas spillage and carbon monoxide emissions will occur causing severe personal injury or death.**

When Removing Boiler from an Existing Common Vent System:

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

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

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

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

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

e. **Test for spillage** at draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.

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

Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 -latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Part 13 of that code.

Chimney or Vent Requirements

1. Venting must be installed according to Part 7, Venting of Equipment, of National Fuel Gas Code, ANSI Z223.1-latest edition and applicable building codes.
2. See Ratings table on **page 91** for minimum chimney or vent sizes. A chimney or vent **without a listed cap** should extend **at least 3 feet above the highest point** where it passes through a roof of a building and **at least 2 feet higher** than **any portion of a building within a horizontal distance of 10 feet.** A chimney or vent must not extend less than the distances stated above.
3. A lined chimney is preferred and must be used when required by local, state, and national codes, laws, regulations and ordinances. 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. **Type B** double-wall metal vent pipe or single-wall vent pipe may be used as a liner.
4. Cold masonry chimneys, also known as outside chimneys, typically have one or more walls exposed to outside air. When any atmospheric gas-fired boiler with automatic vent damper is vented through this type of chimney, the potential exists for condensation to occur. Condensation can damage a masonry chimney. Weil-McLain recommends the following to prevent possible damage.
   a. Line chimney with corrosion-resistant metal liner such as AL29-4C® single-wall stainless steel or B-vent. Size liner per National Fuel Gas Code ANSI Z223.1 - latest edition.
   b. Provide drain trap to remove any condensate.
5. Where two or more gas appliances vent into a common chimney or vent, equivalent area should be **at least equal** to area of vent outlet on largest appliance **plus 50 percent** of vent outlet area on additional appliance.

Preparation (continued)

Boiler Location — Air Contamination

Please review the following information on potential combustion air contamination problems. Refer to **Table 3** for products and areas which may cause contaminated combustion air.

⚠ WARNING

To prevent potential of severe personal injury or death, check for products or areas listed below before installing boiler. If any of these contaminants are found:

- remove contaminants permanently

  — OR —

- isolate boiler and provide outside combustion air. See national or local codes for further information.

Table 3 Corrosive contaminants and likely locations

Products to avoid	Areas likely to have contaminants
Spray cans containing chloro/fluorocarbons	Dry cleaning/laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes/cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric acid/muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms	Garages with workshops
Adhesives used to fasten building products and other similar products	Buildings under construction (where air is contaminated with particulates)
Airborne particulates (drywall dust, fiberglass particles, road or gravel dust, lint, etc.)	

⚠ WARNING

CONSTRUCTION DUST HAZARD — Airborne particulates, such as drywall dust or fiberglass dust, will cause blockage of the CGi burners, resulting in carbon monoxide production, a fire hazard, or building freeze damage. If the boiler is operated during construction, you must isolate the boiler to provide clean air for combustion. **If you are unable to ensure uncontaminated air in the boiler vicinity at all times, you must inspect the boiler at least once weekly**. When inspecting, clean the burners if necessary using the procedure given on **page 69**. Failure to follow these guidelines could result in severe personal injury, death or substantial property damage.

Preparation (continued)

2

Boiler Location — Air Openings

⚠WARNING

Combustion air opening location and sizing requirements depend on the clearances around the boiler. Check the boiler placement compared to **Figure 1a, page 11**.

If all clearances are at least equal to Figure 1a, page 11, apply the sizing and placement of openings given on **pages 14** and **15**.

If **ANY clearance** is less than **Figure 1a, page 11**, you must provide air openings sized and located as shown in **Figure 1b, page 11**. **DO NOT** apply the sizing and location information shown on **pages 14** or **15**.

Air Openings must be Provided

Combustion air and ventilation openings must comply with the National Fuel Gas Code ANSI Z223.1-latest edition, or applicable local building codes.

⚠WARNING

Provide adequate combustion and ventilation air to assure proper combustion and reduce the risk of severe personal injury, death or substantial property damage caused by flue gas spillage and carbon monoxide emissions.

Air Opening Options

Two Openings — Air Supply from Inside the Building

1. If the building is of **unusually tight construction** (see definition, next page), the **building must also be provided with air openings directly to the outside,** sized and located per **Figure 3, Figure 4 or Figure 5**.
2. Buildings of typical construction should provide adequate combustion air from natural infiltration, so additional air openings to the building are not required.
3. See **Figure 2**. Provide **two openings** through the interior wall, within 12 inches of the ceiling and the floor, sized per **Figure 2**.

Two Openings — Air Supply Directly from Outside

1. Air openings must be directly through an outside wall, or into a space that connects directly to the outside (such as a ventilated attic or crawl space, for example).
2. See **Figure 3** — **Openings directly through an outside wall —** provide two openings within 12 inches of the ceiling and the floor, sized per **Figure 3**.
3. See **Figure 4** — **Air supplied through vertical ducts —** provide two openings terminated within 12 inches of the ceiling and the floor, sized per **Figure 4**.
4. See **Figure 5** — **Air supplied through horizontal ducts —** provide two openings within 12 inches of the floor and the ceiling, sized per **Figure 5**.

Figure 2 Air openings to interior spaces

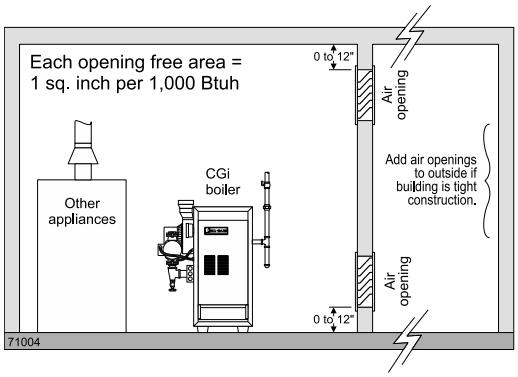


Figure 3 Air directly through outside wall

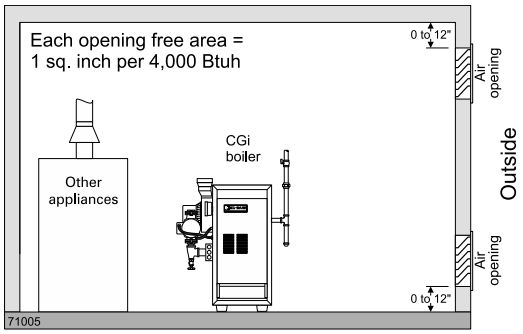


Figure 4 Air from outdoors — vertical ducts

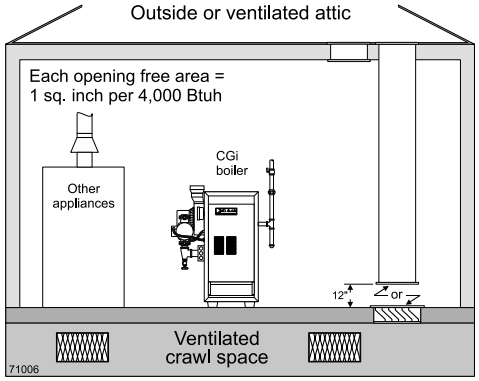
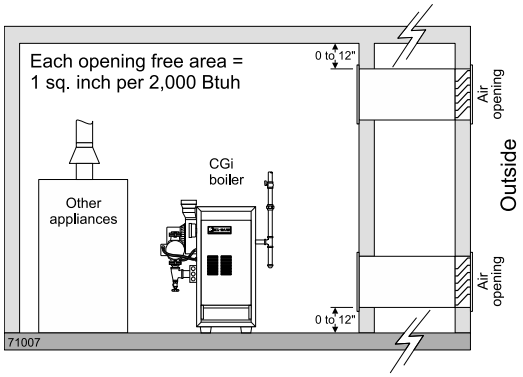


Figure 5 Air from outdoors — horizontal ducts



Preparation (continued)

Boiler Location — Air Openings (continued)

NOTICE

FREE AREA of openings — the minimum areas given in this manual are free area (equals the area, length times width of opening, after deduction for louver obstruction).

Use the free area information provided by the louver manufacturer.

When this information is not available, assume:

- Wood louvers — assume free area is 20% of total; so the actual area of each opening with wood louvers would be 5 times the required free area.
- Metal louvers — assume free area is 60% of actual area; so, for metal louvers, the actual area of each opening must be 1.67 times the required free area.

Single Air Opening Option

A single combustion air opening can be used in lieu of the two-opening options on **page 14**, provided:

Clearances from boiler to walls

- The boiler must have clearances of at least those shown in **Figure 1a, page 11.**

Opening must be directly to outside

- The opening must connect directly to the outdoors or to a space that communicates directly to the outdoors (not to an interior space).
- The air can be provided through a direct opening or through a horizontal or vertical duct.

Opening placement

- The top of the air opening must be within 12 inches of the ceiling.

Opening size

- The free area of the opening must be at least equal to the sum of the area of all equipment vent connectors in the space, and . . .
- The free area of the opening must be at least 1 square inch per 3,000 Btu/hr input rating of all equipment located in the space.

Exception for Large Spaces

No combustion air openings are needed when the boiler (and other appliances) are installed in a space with a volume **at least 50 cubic feet per 1,000 Btuh** of all installed appliances, provided:

- **the building must not have unusually tight construction** (see definition, this page)
- all clearances around the boiler must be no less than shown in **Figure 1a, page 11**.
- To determine if the space is large enough to qualify:
- Add the total input of all appliances in MBH (1,000's of Btuh).
- Multiply this number times 50 to determine minimum room volume.
- Example: For a total input of 100 MBH (100,000 Btuh), minimum volume is 50 x 100 = 5,000 cubic feet. At a ceiling height of 8 feet, the space must have at least 5,000 ÷ 8 = 625 square feet (25 feet x 25 feet, for instance).

Unusually Tight Construction

Unusually tight construction means (per ANSI Z223.1) buildings in which:

a. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed, and . . .

b. Weather-stripping has been added on openable windows and doors, and . . .

c. Caulking or sealants are applied to areas such as joints around windows and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical, and gas lines, and in other openings.

For such construction cases, if appliances use inside air for combustion, **provide air openings into the building from outside.** Size and locate these openings per the appropriate case in **Figure 3, Figure 4 or Figure 5 on page 14.**

Exhaust Fans and Air Movers

The appliance space must never be under a negative pressure, even if the appliance(s) are installed as direct vent. Always provide air openings sized not only to the dimensions required for the firing rate of all appliances, but also to handle the air movement rate of the exhaust fans or air movers using air from the building or space.

Motorized Air Dampers

If the air openings are fitted with motorized dampers, electrically interlock the damper to:

- Prevent the boiler from firing if the damper is not fully open.
- Shut the boiler down should the damper close during boiler operation.

To accomplish this interlock, wire an **isolated contact** (that when closed proves the damper open) in series with the thermostat input to the boiler. The boiler will not start if this contact is open, and will shut down should it open during operation.

Preparation (continued)

Placement and Setup

Place Boiler/Carton Near Position

1. **Leave boiler in carton and on pallet** until installation site is ready.
2. Move entire carton and pallet next to selected location.
3. Remove shipping carton. **Leave boiler on pallet**
4. 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 backwards off pallet and into position.

NOTICE

Do not drop boiler or bump jacket on floor or pallet. Damage to boiler can result.

5. Check level.
   a. Shim legs, if necessary.
   b. Do not alter legs.

Inspect Orifices and Burners

1. Remove front jacket door. Remove burner shield (See **Figure 43, item 4, page 84**).
2. Check for correctly-sized manifold orifices. See **Table 4** below for sizing. (The orifice size is stamped on the orifice spud barrel.)

DANGER

Correctly-sized manifold orifices must be used. Failure to do so will result in severe personal injury, death or substantial property damage.

3. Reinstall burner shield

WARNING

Do not operate boiler without burner shield in place. Failure to do so could result in severe personal injury, death or substantial property damage.

Orifice Replacement Procedure

(when required)

1. Remove the screws securing the burner shield and remove burner shield.
2. Using a 7/16” open-end wrench, remove the burner orifices from the manifold.
3. Apply a small amount of pipe dope to each of the new orifices and install in the manifold using a 7/16” open-end wrench. Make sure the orifices are aligned correctly, not cross-threaded in the manifold tappings.

WARNING

Use only pipe dope compatible with propane gas, even if boiler is to be operated on natural gas. Failure to comply could result in severe personal injury, death or substantial property damage.

4. Carefully replace the burner shield.
5. Follow check-out procedure, Section **Final Verification Checklist, page 66**, to assure the boiler is now operating properly after orifices are replaced.

Table 4 Manifold orifice sizing

Location	Boiler model number	Natural gas		Propane gas	
		0-2,000 ft.	over 2,000 ft.	0-2,000 ft.	over 2,000 ft.
U. S.	CGi-25	#43	(Note 1)	#54	(Note 1)
	CGi-3	#40		#53	
	CGi-4	#40		1.55 mm	
	CGi-5	2.55 mm		1.60 mm	
	CGi-6, CGi-7 & CGi-8	#38		1.65 mm	

Note 1: For elevations above 2,000 feet, contact your local Weil-McLain distributor for details.

Preparation (continued)

Pressure Test

Hydrostatic pressure test

Pressure test boiler before attaching water piping (except as noted below), gas piping, or electrical supply.

Prepare Boiler for Test

1. Remove the shipping nipple (from CGi supply tapping) and remove the boiler relief valve. **Temporarily** plug the relief valve tapping with a ¾" NPT pipe plug.
2. Remove 1¼" nipple, reducing tee and drain valve from circulator hardware and pressure/temperature gauge carton. Install in boiler return connection as shown on **page 9** and in **Figure 45, item 3, page 86**. Install circulator on either the return or supply.
3. Remove 1¼" nipple, 1¼" x 1¼" x ½" tee, and pressure/temperature gauge from circulator hardware and pressure/temperature gauge carton. Pipe to boiler supply connection as shown on **page 9** and in **Figure 45, page 86.** (Use pipe dope sparingly.)
4. Connect a hose to boiler drain valve, the other end connected to a fresh water supply. Make sure hose can also be used to drain boiler after test.
5. Connect a nipple and shutoff valve to system supply connection on the 1¼" tee. This valve will be used to bleed air during the fill. (Valve and nipple are not included with boiler.)
6. Connect a nipple and shutoff valve to system return connection (at circulator flange if circulator installed on return). This valve will be used to bleed air during the fill. (Valve and nipple are not included with boiler.)

Fill and Pressure Test

1. Open the shutoff valves you installed on supply and return connections.
2. Slowly open boiler drain valve and fresh water supply to fill boiler with water.
3. When water flows from shutoff valves, close boiler drain valve.
4. Close shutoff valves.
5. Slowly reopen boiler drain valve until test pressure on the pressure/temperature gauge reaches no more than.
   - **45 psig** for boilers with 30 psig relief valve.
   - **75 psig** for boilers with 50 psig relief valve.
6. **Test for no more than 10 minutes at:**
   - **45 psig** for boilers with 30 psig relief valve.
   - **75 psig** for boilers with 50 psig relief valve.

⚠WARNING

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

7. Make sure constant gauge pressure has been maintained throughout test. Check for leaks. Repair if found.

⚠WARNING

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

⚠DANGER

Do not use **petroleum-based** cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

Drain and Remove Fittings

1. Disconnect fill water hose from water source.
2. Drain boiler at drain valve or out hose, whichever provides best access to drain. Remove hose after draining if used to drain boiler.
3. Remove nipples and valves unless they will remain for use in the system piping.
4. Remove plug from relief valve tapping. See **"Water Piping" on page 27** to replace relief valve.

Venting — General Information

CGi Venting Methods — Chimney Draft or Direct exhaust

Chimney Draft Venting

Chimney draft venting uses the natural draft provided by a vertical vent or chimney. Category I appliance (non-positive vent static pressure and vent gas temperature that avoids excessive condensate production in vent). See Section 3b. Chimney draft installations use:

1. Vent connector (single or double wall) sized to eliminate positive pressure in vent system. Diameter increases immediately at boiler.
2. Double wall metal vent (B-vent) or chimney with liner approved by the National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition.

Direct Exhaust — Vertical or Sidewall

Direct exhaust venting uses inside combustion air with no combustion air connector piping. All CGi flue gas vents are pressurized, requiring careful sealing of all joints. Category III appliance (positive vent static pressure and vent gas temperature that avoids excessive condensate production in vent). See **pages 20-26.**

Direct exhaust installations use:

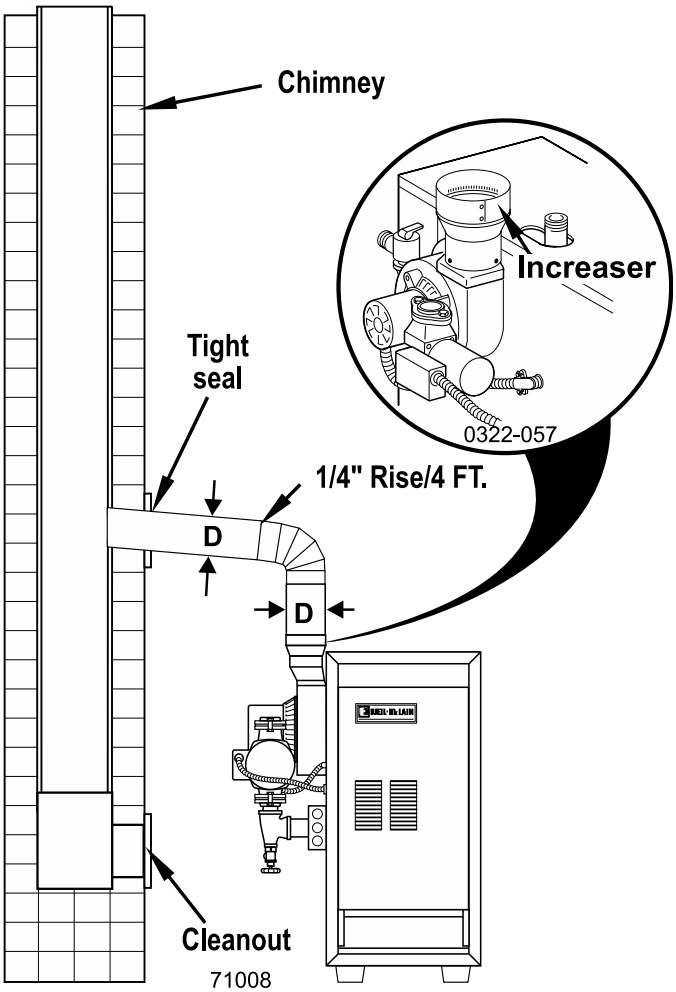
1. Vent pipe specified in this manual.
2. Vent termination through outside wall, roof or unused chimney. Tight chimney areas will make vent joint construction very difficult.

Venting — Chimney Draft Venting

Table 5 Vent connector diameter

Boiler model number	"D" Minimum vent connector diameter
CGi-25 & CGi-3	4"
CGi-4 to CGi-6	5"
CGi-7 & -8	6"

Figure 6 Chimney draft venting



DANGER

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

WARNING

Vent sizing given in **Table 5** is only a general guideline. The vent connector and chimney must be designed, sized and constructed in compliance with all applicable codes. Failure to correctly size and install the vent system could result in severe personal injury, death or substantial property damage.

1. Use double wall metal vent (B-vent) or chimney with liner as required by the National Fuel Gas Code, ANSI Z223.1/NFPA 54 –latest edition.
2. To prevent downdrafts, chimney should extend at least 3 feet above the highest point where it passes through a roof and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet.
3. To vent with another appliance, see National Fuel Gas Code, ANSI Z223.1/NFPA 54 –latest edition.
4. Do not connect breeching to any portion of a mechanical draft system that can operate under positive pressure.
5. Maintain minimum 2" clearance from combustible materials to vent pipe.
6. Do not use chimney with an open fireplace.
7. Make horizontal runs as short as possible. Long runs can cause condensation.
8. When longer runs are used, support pipe with appropriate hangers.
9. To prevent blockage, do not vent into bottom of chimney.
10. Vent pipe must not go beyond inside wall of chimney.
11. Vent passing through floors or ceilings must be firestopped.
12. See **Figure 6** and **Table 5** to connect boiler to venting system.

Venting — Direct Exhaust — Components

Obtain Vent System Components

Chimney Draft Venting

1. The following special gas vent systems comply with UL-1738 and ULC-S636 standards and are certified by CSA as the only systems suitable for use with CGi boilers (all 3" diameter):
   - Heat-Fab, Inc. **Saf-T Vent®**
   - Metal-Fab, Inc. **CORR/GUARD**
   - Z-Flex®, Inc. **Z-Vent**
   - ProTech Systems **FasNSeal™**

⚠ WARNING

Use only the vent starter of the same manufacturer as the vent components. Do not mix components from different systems. The vent system could fail, causing flue gas spillage, resulting in severe personal injury or death.

2. Select vent method based on **page 18** and installation requirements.
3. Refer to **Table 6** for maximum vent run lengths and number of elbows. Do not exceed data in **Table 6**.
4. Select vent components from **Table 7**. All components, including the vent starter, must be of the same vent manufacturer. Do not mix components.

Table 6 Maximum vent length

Max. vent length (feet)	Total number of elbows (Note 1)					
	1	2	3	4	5	6
CGi-25 to CGi-6	55	48	41	34	27	20
CGi-7	35	28	21	14	7	--
CGi-8	28	21	14	7	--	--
Note 1:	Do not include termination fitting when counting total number of elbow.					

* (Minimum length for all applications is 2 feet equivalent with two (2) elbows.

Table 7 CGi vent components

Description	Saf-T Vent EZ Seal®	CORR/GUARD	Z-Vent	FasNSeal™
Starters				
CGi	93WMCGIS	3CGWLA	2SVEVSTF03	FSA-WEIL-CGI
Terminations				
Termination Coupling with Screen	9392	3CGSWHTM	2SVSTPF03	FSBS3
Termination Elbow with Screen	9314TERM	3CGSW90LTM	2SVSTEX0390	FSTE90
Termination Tee with Screen	9390TEE	3CGSWTTM	2SVSTTF03	FSTT3
Pipes and fittings				
45° Elbow	9311	3CGSW45L	2SVEEWCF0345	FSEL4503
90° Elbow	9314	3CGSW90L	2SVEEWCF0390	FSEL9003
6" Pipe	9301	3CGSW6	2SVEPWCF03.5	FSVL603
12" Pipe	9302	3CGSW12	2SVEPWCF0301	FSVL1203
18" Pipe	9304	3CGSW18	2SVEPWCF0318	FSVL1803
24" Pipe	9305	3CGSW24	2SVEPWCF03	FSVL2403
36" Pipe	9307	3CGSW36	2SVEPWCF0303	FSVL3603
48" Pipe	9308	3CGSW48	SVEPWCF0304	—
60" Pipe	9360	—	SVEPWCF0305	—
Slip Connector (See Note)	9324	3CGSWVL22	—	—
Horizontal Support	9323	3CGSWWH2	—	FSSH
Horizontal Drain Tee	9321	3CGSWDS	SVEDWCF03	FSHDT3
Joiner Band	—	—	—	—
Locking Band	—	—	SVSLBX03	—
Sealant	As specified by individual vent pipe manufacturer			

Note: Use to adjust for non-standard pipe lengths, before termination coupling to terminate run.

Venting — Direct Exhaust — Components (continued)

Massachusetts Installations

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

   a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS."

4. **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the

   installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1 through 4.

(b) **EXEMPTIONS:** The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and

2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM PROVIDED.** When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and

2. A complete parts list for the venting system design or venting system.

(d) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.** When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

Venting — Direct Exhaust — Vent Starter

1. Select a vent pipe manufacturer and obtain all vent components needed, based on boiler location and venting method.
2. You must use the vent starter made by the vent pipe manufacturer. See **Table 7, page 20** for part number of each component, listed by vent manufacturer.

⚠ WARNING

Use only the vent starter of the same manufacturer as the vent components. Do not mix components from different systems. The vent system could fail, causing flue gas spillage, resulting in severe personal injury or death.

3. Follow all applicable national, state, local or codes when venting the CGi boiler.
4. Connect vent starter to blower housing outlet as shown in the Figures 7 through 10.
   a. Do not mix components from different vent manufacturers.
   b. Maintain minimum 2" clearance from combustible materials to vent pipe.
   c. Seal with sealant specified by vent pipe manufacturer, using ⅜" bead (not required for FasNSeal™ or Z-Vent).
   d. Tighten strap at band clamp screw until strap is snug around blower housing.
   e. Place blower cover over blower and fasten with four (4) screws. (Blower cover not shown for clarity).

Figure 7 FasNSeal™ Vent Starter

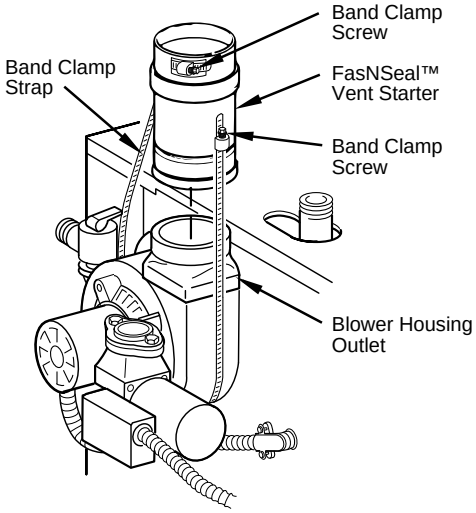


Figure 8 **Z-Vent** Vent Starter

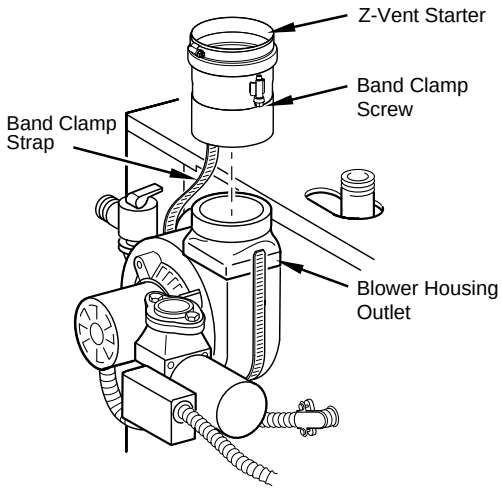


Figure 9 Saf-T Vent® Vent Starter

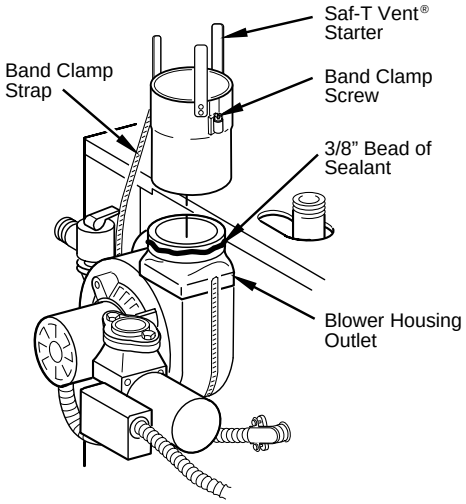
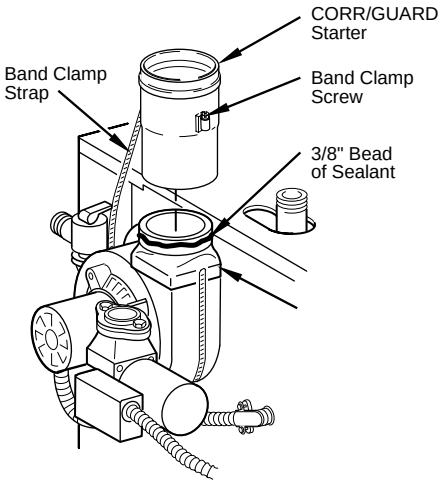


Figure 10 CORR/GUARD Vent Starter



Venting — Direct Exhaust — Termination

The vent termination must be located to meet all requirements below (also applies to vertical vent terminations). The minimum distance from adjacent public walkways, adjacent buildings, openable windows and building in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition. Consideration should be given to avoid possible damage caused by vent plumes and condensate when choosing a venting configuration and location. Maintain a minimum clearance of 4 ft. (1.22m) horizontally from, and in no case above or below, unless a 4 ft. (1.22m) horizontal distance is maintained, from electrical meters, gas meters, regulators, and relief equipment.

⚠ WARNING

Follow instructions on this page when determining vent location to avoid possibility of severe personal injury, death or substantial property damage.

1. Locate the boiler and vent penetration through the wall so all requirements on this page and in **Figure 11** will be met. Also follow vent manufacturer's instructions.
2. Gases will form white plume in winter. Plume could obstruct window view.
3. Prevailing winds could cause freezing of condensate and water/ice buildup on vent termination, building, plants or roof. Ice buildup on vent termination can cause boiler shutdown and building freeze up.
4. Winds over 31 mph can cause nuisance boiler shutdown if boiler is sidewall vented. This could result in loss of heat to building, causing freeze up.
5. Locate or guard vent termination to prevent condensate from damaging exterior surfaces.
6. Locate the vent termination well away from trees, shrubs, and decorative items.
7. Locate or guard vent to prevent accidental contact by people or pets.
8. Do not terminate vent in window well, stairwell, alcove, courtyard, or other recessed areas.
9. Do not wrap or insulate vent pipe or fittings.
10. Do not terminate vent above any door or window. Condensate can freeze, causing ice formations.
11. Do not connect:
    - Any other appliance to vent pipe.
    - Multiple boilers to a common vent pipe.
12. See **Figure 11**, showing that the vent must terminate:
    - more than 4 feet below or to side of all doors or windows.
    - more than 1 foot above grade or anticipated snow line.
    - at least 7 feet above public walkway.
    - 3 feet above any forced air intake within 10 feet.
13. Vent must also terminate:
    - at least 6 feet away from adjacent walls.
    - no closer than 5 feet below roof overhang.
    - at minimum of 4 feet horizontally (and in no case above or below unless a 4 foot horizontal distance is maintained) from electric meters, gas meters, regulators, relief valves, and other equipment.
14. Site conditions may dictate greater clearances.
15. Do not extend exposed vent pipe outside of building more than 4 feet. Condensate could freeze and block vent pipe.

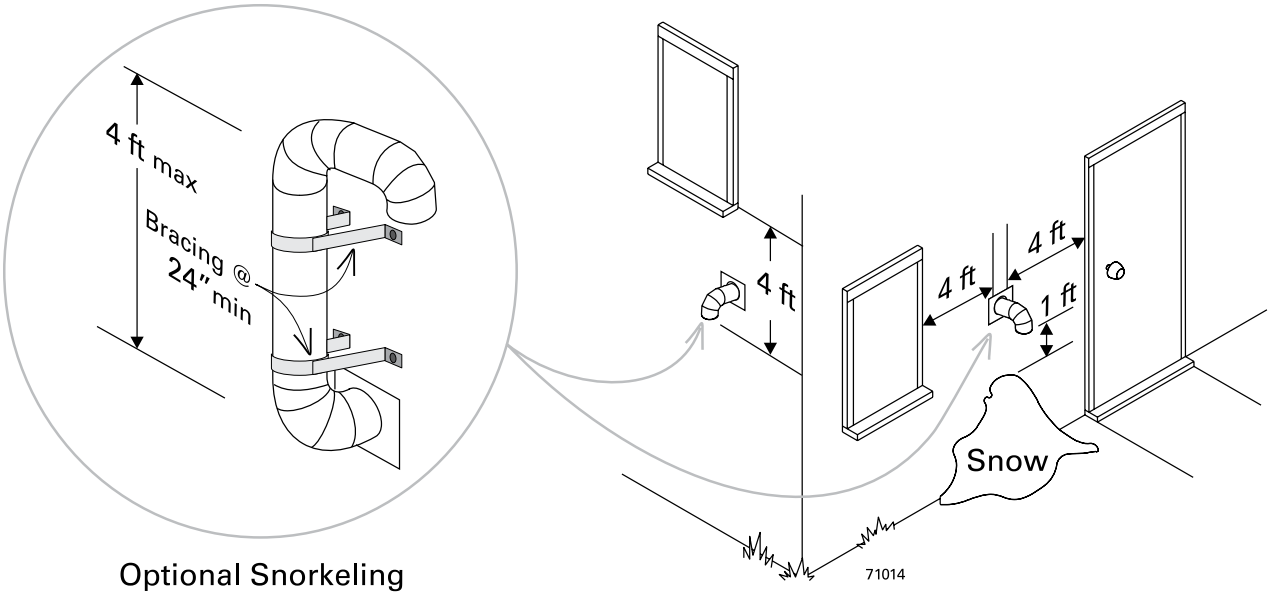
Venting — Direct Exhaust — Termination (continued)

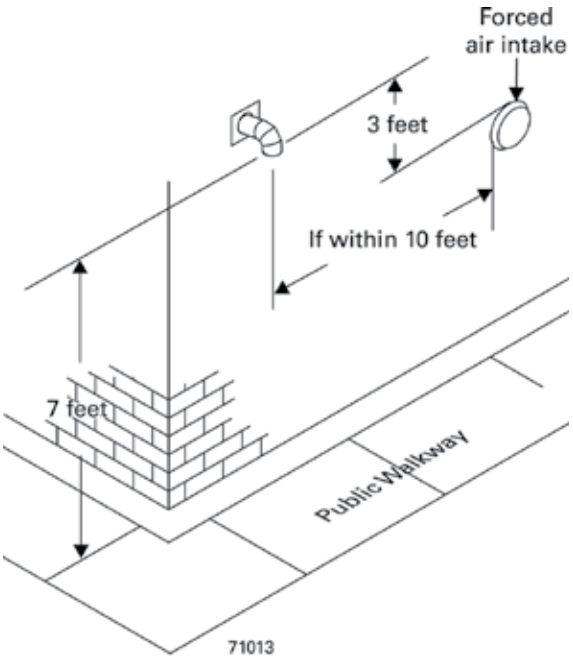
⚠ WARNING

A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below building extensions such as eaves, parapets, balconies or decks. Failure to comply could result in severe personal injury, death or substantial property damage.

2

Figure 11 Vent termination minimum clearances





Venting — Direct Exhaust — Installation

1. Do not mix types or manufacturers of vent materials.
2. Clean all joints before sealing. See vent manufacturer's instructions for cleaning and sealing joints. Use their specified sealant. Do not use screws.
3. Install vent pipe with seams on top of vent horizontal runs. Follow requirements in **"Venting — Direct Exhaust — Termination" on page 23** for vent termination.
4. Maintain minimum 2" clearance from combustible materials to vent pipe.
5. **Vertical venting** — See **Figure 12**. Follow vent manufacturer's instructions for venting through roof.
   - Vent pipe must extend through roof flashing, jacket or thimble.
   - Vent may pass through floor, inside wall or concealed space when installed according to vent manufacturer's instructions.
6. **Sidewall venting** — See **Figures 13** and **14**. Vent must terminate at least one foot above anticipated snow line. Vent must be terminated only with:
   - Elbow or vertical tee with screen(s).
   - Elbow and termination coupling with screen.
7. Do not seal vent pipe (slip connector for Saf-T Vent and CORR/GUARD) to inside or outside plate.
8. If passing through noncombustible wall, provide hole diameter large enough to insert the vent pipe (slip connector for Saf-T Vent and CORR/GUARD).
9. Install horizontal drain tee as close as possible to boiler, in first horizontal run. See **Figures 12** and **13**.
10. Do not exceed the maximum vent system length given in **Table 6, page 20**.

⚠ WARNING

Condensate drain line — use only silicone tubing rated for at least 400°F for the first 18" of condensate drain line, then other non-metallic tubing may be used. Using any other material could cause flue gas leakage, potentially resulting in severe personal injury, death or substantial property damage.

⚠ WARNING

On some installations, the condensate drain fitting may be omitted, provided:

- Vent manufacturer shows this option in their instructions.
- Vent is sloped toward termination as shown in dotted lines in **Figure 13**.
- The vent is installed per Weil-McLain and vent manufacturer's instructions.
- Condensate drip page from such vents may accumulate on the ground below. Consider traffic in the area to avoid hazard due to ice accumulation.

Figure 12 Direct exhaust vertical venting

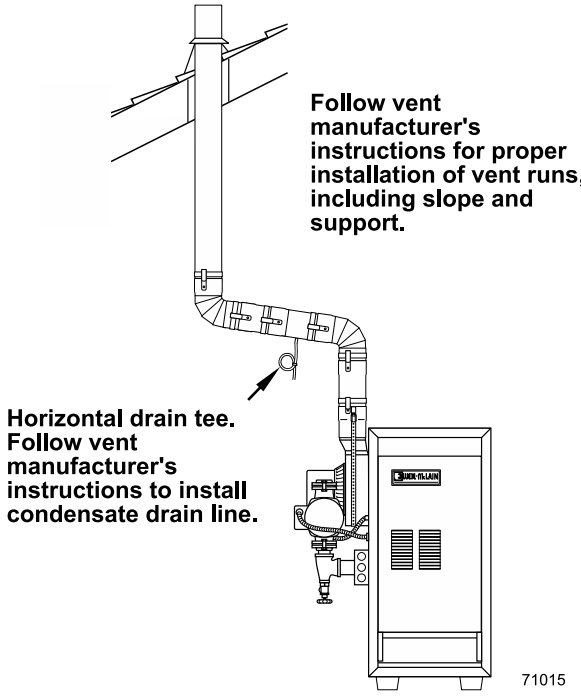
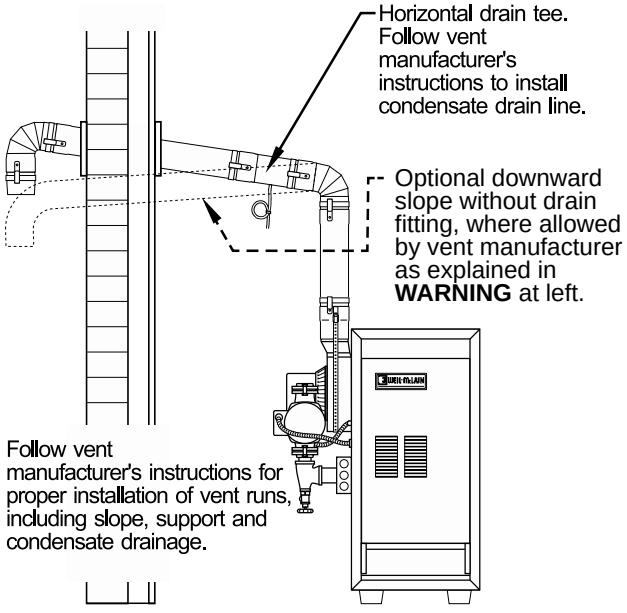


Figure 13 Direct exhaust sidewall venting



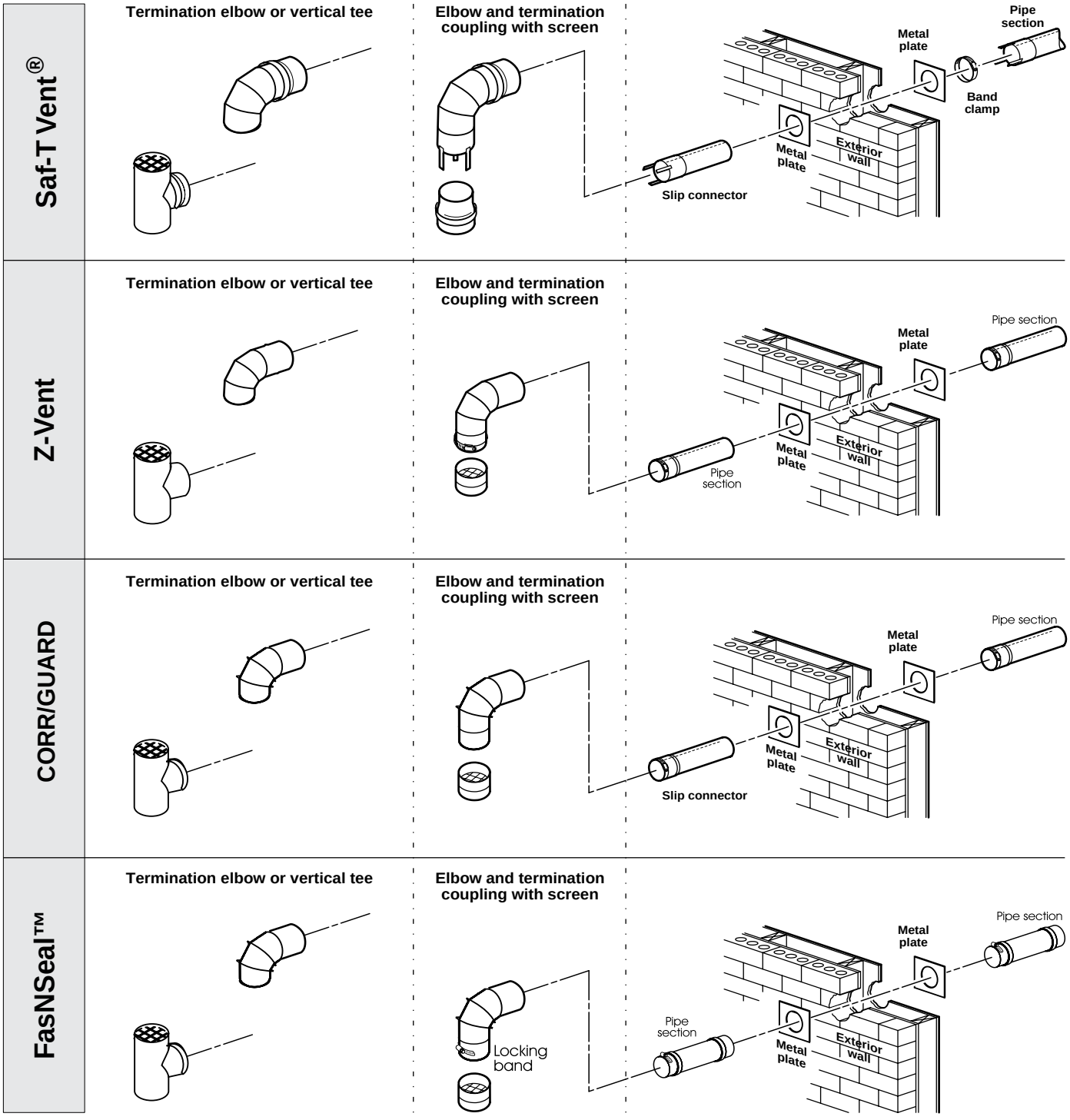
Venting — Direct Exhaust — Installation (continued)

⚠ WARNING

Using any termination other than one of those shown could cause nuisance outages and loss of heat, resulting in substantial property damage.

2

Figure 14 Sidewall termination



Water Piping

General Piping Information

If installation is to comply with ASME requirements, a high temperature limit is needed. Install control in supply piping between boiler and isolation valve. Set external high limit to minimum 20°F above operating setpoint. The maximum allowable setpoint of 240°F is for the external high temperature limit. The maximum operating limit is 210°F. See **page 46**, for wiring.

Use backflow check valve in cold water supply as required by local codes.

Water Temperature/LWCO Sensor

A low water cutoff device is required when boiler is installed above radiation level or by certain state or local codes or insurance companies. The boiler has a pre-installed water temperature/LWCO sensor.

Pressure/Temperature Gauge

Install pressure/temperature gauge in tee on supply piping (as shown in drawing on **page 9**).

Isolation Valves

Isolation valves are required to enable servicing of the boiler's temperature sensor. Install as shown in appropriate piping diagram.

Relief Valve

Install relief valve vertically in ¾" tapping on side of boiler. See **Figure 15** or **Figure 16**, **page 28**, and the tag attached to the relief valve for manufacturer's instructions.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and **run to a safe place of disposal.** Terminate the discharge line to eliminate possibility of severe burns should the valve discharge.
- Discharge line must be as short as possible and be the **same size as the valve discharge connection** throughout its entire length.
- Discharge line must **pitch downward** from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.
- The discharge line shall **terminate plain, not threaded**, with a material serviceable for temperatures of 375°F or greater.
- **Do not pipe the discharge to any place where freezing could occur.**
- **No shutoff valve** shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.
- **Failure to comply** with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.
- **Test the operation of the valve** after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.

Circulator

The circulator is shipped loose (wiring pre-attached to boiler) to allow you to locate it either in the return or supply piping, as desired. See **page 9** for a typical installation. Pipe the expansion tank to the suction side of the circulator whenever possible. Install an air separator in the supply piping. Connect the expansion tank to the air separator only if the separator is on the suction side of the circulator. Always install the system fill connection at the same point as the expansion tank connection to the system. **Figure 15** and **Figure 16** show typical near-boiler piping connections.

System Water Piping

See **Figure 15** (diaphragm-type or bladder-type expansion tank) or **Figure 16** (closed-type expansion tank), and Table 8 below, for near-boiler and single-zone systems designed for return water at least 130°F.

See **pages 30-31** to complete multiple-zone piping or **pages 32-37** to complete piping for radiant heating systems or converted gravity systems (large-volume systems originally designed for circulation by natural convection rather than a pump). See **page 37** for boilers used with refrigeration systems.

Table 8 Water pipe size (based on 20°F rise)

Boiler model	To system	From system
CGi-25	¾"	¾"
CGi-3, 4, 5	1"	1"
CGi-6, 7	1¼"	1¼"
CGi-8	1½"	1½"

Note: The boiler supply and return connections, the return/ drain tee and the supply/gauge tee supplied with the boiler are 1¼" NPT. One of the circulator flanges supplied with the boiler is 1¼". The other circulator flange is the size of the recommended system piping shown above.

⚠ WARNING

Chillers or Air Handling Units:

Install boiler such that —

- Chilled medium, if used, is piped in parallel with heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. Consult AHRI Installation and Piping Guides.
- If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle. Circulation of cold water through the boiler could result in damage to the heat exchanger, causing possible severe personal injury, death or substantial property damage.

Water Piping (continued)

Single-Zone System

⚠CAUTION

Undersized expansion tanks cause system water to be lost from relief valve and makeup water to be added through fill valve. Eventual section failure can result.

2

Diaphragm-Type or Bladder-Type Expansion Tank (Figure 15)

1. Ensure expansion tank size will handle boiler and system water volume and temperature. Tank must be located in boiler return piping as close to boiler as possible, before inlet side of circulator. See tank manufacturer's instructions for details.
2. Install an automatic air vent as shown.

Closed-Type Expansion Tank (Figure 16)

1. Ensure expansion tank size will handle boiler and system water volume and temperature. See tank manufacturer's instructions for details.
2. Connect tank to ½" NPT tapping located behind supply outlet, using ½" NPT piping. Pitch any horizontal piping up towards tank 1 inch per 5 feet of piping.

⚠WARNING

Use Figure 15 or Figure 16 only for single-zone systems designed for **return water at least 130°F**. For systems with low return water temperature possible, such as converted gravity systems and radiant heating systems, refer to the special piping suggestions of pages 32-37. Failure to prevent low return water temperature to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Figure 15 Diaphragm- or bladder-type expansion tank — Single-zone system using diaphragm-type or bladder-type expansion tank. See Table 8 for piping sizes.

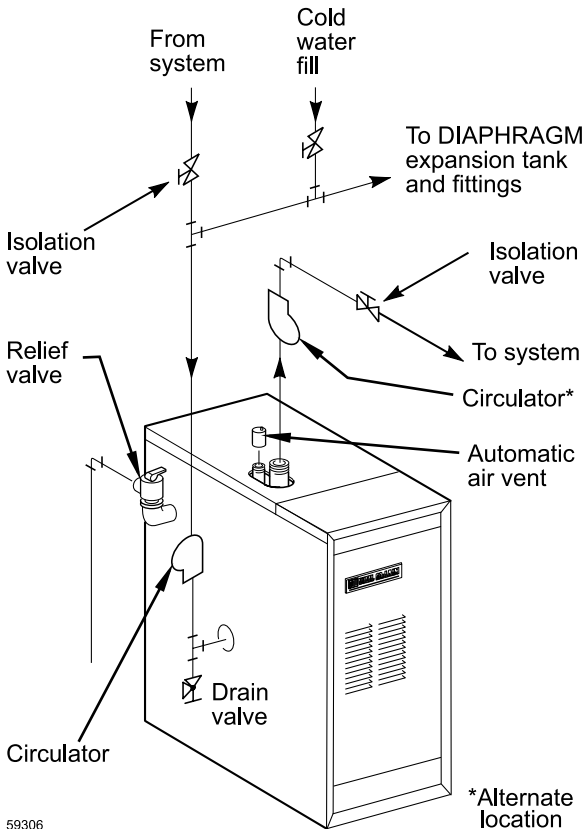
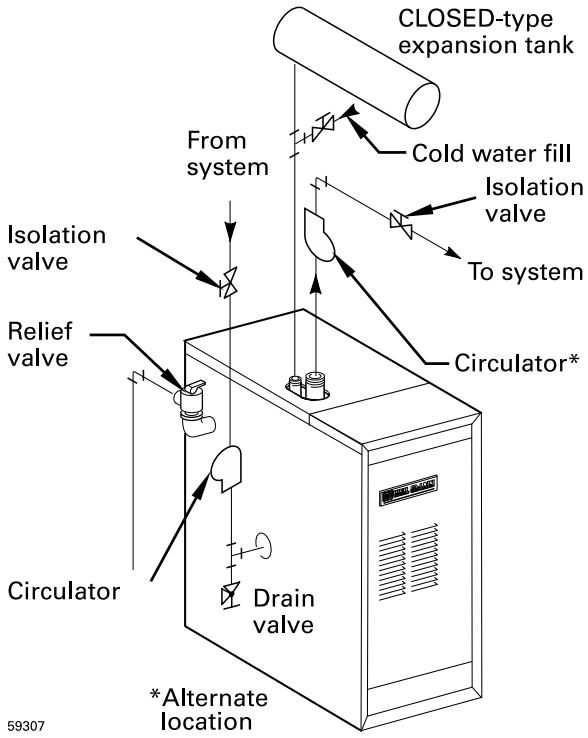


Figure 16 Closed-type expansion tank — Single-zone system using closed-type expansion tank. See Table 8 for piping sizes.



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Water Piping (continued)

Piping Multiple Zones

Follow instructions on **page 27** and **page 28** to install near-boiler or single-zone piping. (Also refer to **Piping for radiant heating systems or converted gravity systems,** below, if applicable.)

See **Figure 17** or **Figure 18, page 31**, to complete installation.

Zoning with Circulators (Figure 17) (return temp over 130˚F)

1. Size each circulator to individual circuit requirements.
2. Do not install circulator on boiler (except for primary/secondary piping).
3. Install isolation (balancing) valves to adjust flow to distribute heat to all zones.
4. Install and wire a separate relay for each zone circulator.

Zoning with Zone Valves (Figure 18) (return temp over 130˚F)

1. Install isolation (balancing) valves to adjust flow to distribute heat to all zones.
2. Provide a separate 24-volt transformer to power the zone valves. Size the transformer to handle the total rated load of all connected zone valves.

⚠CAUTION

DO NOT connect directly from 3-wire zone valves to the T-T terminals on the boiler. When using 3-wire zone valves, install an isolation relay. Connect the zone valve end switch wires to the isolation relay coil. Connect the isolation relay contact across the boiler T-T terminals. Failure to comply can result in damage to boiler components or cause unreliable operation, resulting in severe property damage.

Piping for Radiant Heating Systems or Converted Gravity Systems

Converted Gravity (or steam) Systems

Whenever possible, use the primary/secondary piping shown in **Figure 19** or **Figure 20** on **page 33**. This piping design allows changing boiler flow rate without affecting primary circuit flow rate.

If **Figure 19** or **Figure 20** cannot be used, use the boiler-bypass piping shown in **Figure 21** or **Figure 22** on **page 37**. You can also use the piping shown in **Figure 23** on **page 35** (system-bypass), if the reduced flow rate in the heating system will not cause heat distribution problems.

⚠WARNING

Failure to prevent low return water temperature to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant Heating Systems

Preferably, use primary/secondary piping, as shown in **Figure 19** or **Figure 20** on **page 33**. Alternatively, use the method of either **Figure 21** or **Figure 22** on **page 35**. **Do not use the piping of Figure 23** (system-bypass), because this method does not control radiant system supply temperature.

If radiant system tubing has no oxygen barrier, a **heat exchanger** must be used.

⚠WARNING

Radiant heating system piping should include a means of regulating the boiler return water temperature and the system supply temperature (such as provided by an injection pumping control). Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the system supply temperature is relatively constant.

DO NOT apply the methods in this manual if the system is equipped with an outdoor reset control. Instead, provide controls and piping which can regulate the boiler return water temperature at no less than 130°F regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods. Failure to prevent cold return water temperature to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

Water Piping (continued)

Piping Multiple Zones (continued)

Figure 17 Zoning with circulators — return water 130°F or higher.

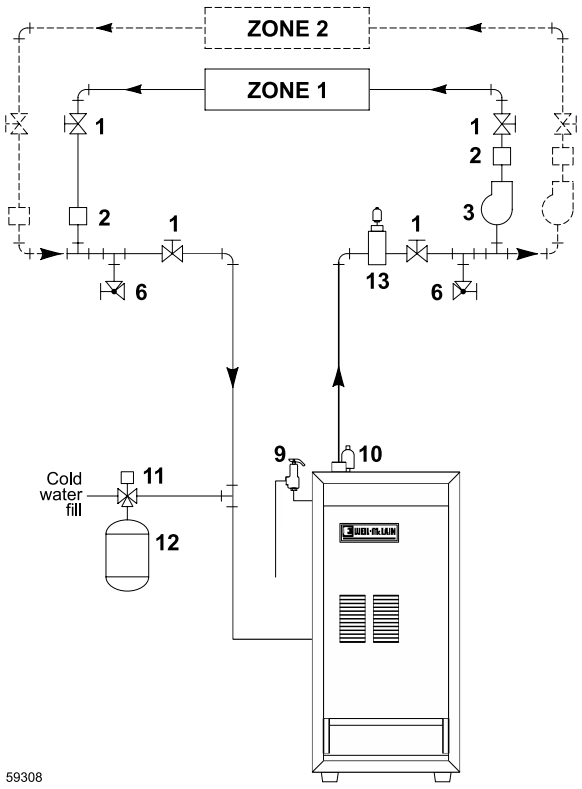
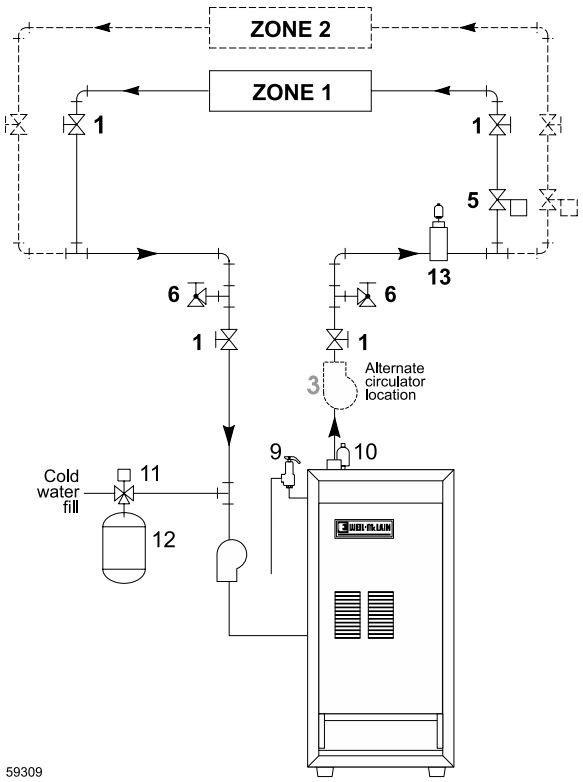


Figure 18 Zoning with zone valves — return water 130°F or higher.



1. Boiler isolation (balancing) valves
2. Flow/check valve
3. System or zone circulator
5. Zone valve
6. Drain valve
9. Relief valve
10. Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.
11. Fill valve
12. Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 16, page 28**.)
13. Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, regardless of location of expansion tank circulator or air separator.

⚠ WARNING

For systems with possible low return-water temperature (such as converted gravity systems, radiant heating systems and heat pump systems), refer to the special piping suggestions of **Figure 19 – Figure 23**, as applies. Failure to prevent sustained low return water temperature to the boiler could cause corrosion of the boiler sections, resulting in severe personal injury, death or substantial property damage.

Water Piping (continued)

Low Temperature Systems

Primary/Secondary (preferred) Bypass Piping Method

2

Primary/secondary bypass piping is preferred because the flow rate and temperature drop in the heating circuit(s) is determined only by the heating circuit circulator(s). So adjustment of the bypass valves in the boiler circuit will not cause a change in the heating circuit rate and temperature distribution.

Figure 19 and **Figure 20, page 33**, show suggested bypass arrangements using **primary/secondary** bypass piping (preferred) for low temperature systems such as **radiant heating systems** or **converted gravity systems**. For alternatives, see **pages 35 through 37**.

The bypass valves (items **7a** and **7b**) provide mixing of hot boiler outlet water with cooler system return water — set to assure a minimum return water temperature (at least 130°F) to the boiler. Set the valves as explained below.

Temperature Gauges

Gauge **4a** is suggested, but optional on any system.

Gauge **4b** is optional on converted gravity systems, but **required** on radiant heating systems — to display the water temperature being supplied to the radiant tubing.

Gauge **8** is **required** on all systems to assure the return water temperature is accurately set for a minimum of 130°F. If this gauge is not available however, adjust the valves such that the boiler-mounted temperature/pressure gauge reads at least 150°F when the system return water is cold (approximately 60°F water temperature).

Valve Adjustment

(**Figure 19** and **Figure 20** only)

1. Set the valves while the system is cool, setting for the coldest expected water temperature (usually 60°F since the system will often drop to room temperature between cycles).
2. Start with valve **7a** fully closed and **7b** fully open.
3. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads 130°F when gauge **4a** reads 60°F.
4. Note that valve **7a** regulates the amount of hot water from the boiler supply which mixes with return water. Valve **7b** regulates the amount of system water flowing through the boiler secondary loop.

⚠ WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature** is **relatively constant.**

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control.** Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130°F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

Water Piping (continued)

Low Temperature Systems (continued)

Figure 19 Primary/secondary piping
Zoning with circulators

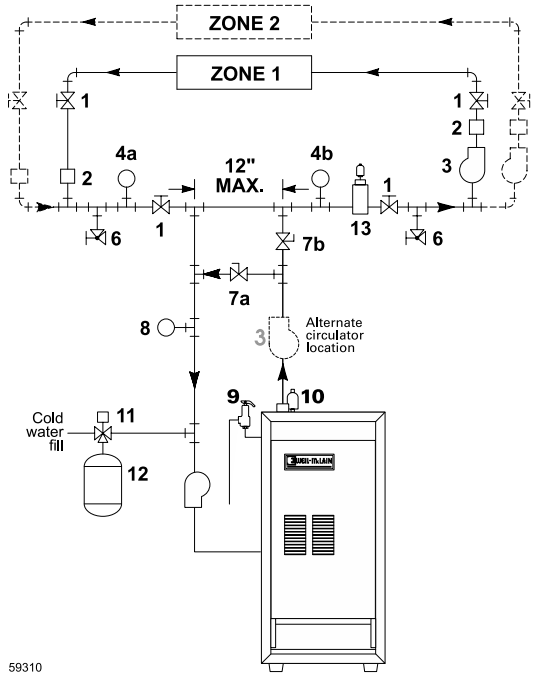
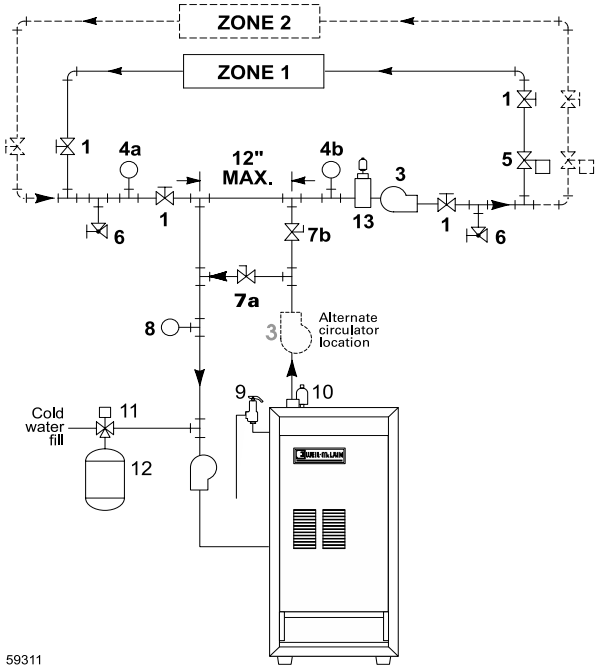


Figure 20 Primary/secondary piping
Zoning with zone valves



1. Boiler isolation (balancing) valves
2. Flow/check valve
3. System or zone circulator (circulator should cycle with zone valve and switches, using circulator valve or zone control panel)
4. System temperature gauges
5. Zone valve
6. Drain valve
7. System temperature valves (see instructions on page 32 for adjusting valves)
8. Blend temperature gauge
9. Relief valve
10. Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.
11. Fill valve
12. Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 16, page 28**.)
13. Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, regardless of location of expansion tank, circulator or air separator.)

Water Piping (continued)

Low Temperature Systems (continued)

BOILER-Bypass Piping Method

This piping method (**Figure 21 or Figure 22, page 35**) is called a boiler-bypass because part of the circulator flow is bypassed around the boiler (through valve **7a**). This method reduces the flow rate throughout the boiler, in order to raise the average water temperature in the boiler enough to prevent flue gas condensation. Boiler-bypass piping is effective for some boilers — including the CGi — provided the flow rates are adjusted according to the instructions following.

Figure 21 and **Figure 22** are alternative piping suggestions for **converted gravity** (large water content or steam systems) or **radiant heating system** — for use when primary/secondary piping can't be applied. (**Figure 23, page 37,** is another alternative, using system bypass in place of boiler-bypass piping. **Figure 23** however, is not suitable for radiant heating applications because it does not protect the radiant system from possible high water temperature.)

Boiler-bypass piping keeps system flow rate as high as possible and temperature drop as low as possible, helping to equalize the building heat distribution.

Temperature Gauges

Gauge **4a** is optional if the bypass valves will be adjusted using cold (or room temperature) return water to the boiler. When setting the valves without gauge **4a** installed — using cold or room temperature water — assume the return water temperature to be 60°F. Set the valves so gauge **8** reads at least 120°F.

Gauge **4b** is optional on converted gravity systems, but **required** on radiant heating systems — to display the water temperature being supplied to the radiant tubing.

Gauge **8** is **required** on all systems to assure reliable adjustment of the bypass valves. The boiler-mounted temperature/pressure gauge can be used if a separate temperature gauge is not installed.

Valve Adjustment

1. Start with valve **7a** fully closed and **7b** fully open.
2. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads 60 °F higher than gauge **4a**. A minimum 60°F temperature rise through the boiler assures a low enough flow rate and high enough average temperature to prevent condensation even with low system return water temperature.
3. Valve **7a** regulates the system flow rate, while valve **7b** regulates the boiler flow rate.
4. The boiler-mounted temperature/pressure gauge may be used in place of a separate gauge **8**.

⚠ WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature** is **relatively constant.**

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control.** Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130°F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

Water Piping (continued)

Low Temperature Systems (continued)

Figure 21 Boiler-bypass piping Zoning with circulators (Alternative to primary/secondary piping **Figure 19** and **Figure 20**)

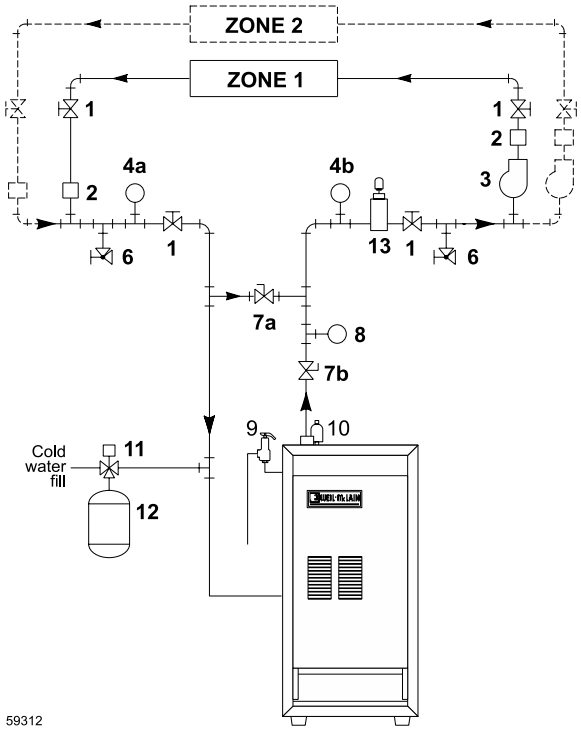
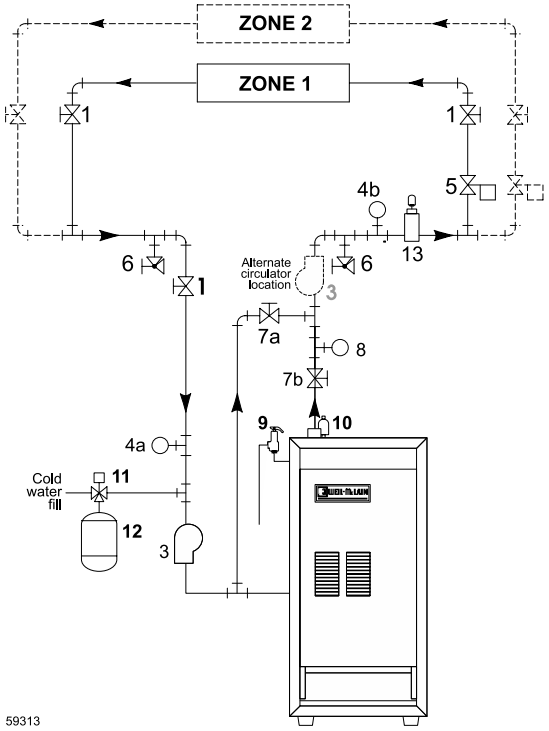


Figure 22 Boiler-bypass piping Zoning with zone valves (Alternative to primary/secondary piping **Figure 19** and **Figure 20**)



1. Boiler isolation (balancing) valves
2. Flow/check valve
3. System or zone circulator
4. System temperature gauges
5. Zone valve
6. Drain valve
7. System temperature valves (see instructions on **page 34** for adjusting valves)
8. Blend temperature gauge
9. Relief valve
10. Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.
11. Fill valve
12. Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 16**.)
13. Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, regardless of location of expansion tank, circulator or air separator.)

Water Piping (continued)

Low Temperature Systems (continued)

SYSTEM-Bypass Piping Method

This piping method (**Figure 23, page 37**) is called a **system-bypass** because part of the circulator flow bypasses the system (through valve **7a**). This bypassed hot water from the boiler outlet mixes with cooler system return water temperature in order to provide minimum 130°F return water to the boiler. Valve **7b** will most often be full open, but may need to be slightly closed on some low pressure drop systems in order to cause enough flow through valve **7a**.

Figure 23 is an alternative piping method that provides return water temperature control for boilers installed on **converted gravity systems** (large water content or steam systems).

DO NOT apply the piping of **Figure 23** on **radiant heating systems**. It provides no method of regulating the water temperature provided to the system and could result in excessive water temperature in the radiant tubing.

System-bypass piping as shown in **Figure 23** can be used with either zone valve or circulator zoning. When used with circulator zoning however, the boiler circulator (item **3**), must be piped as shown. It cannot be used as one of the zoning circulators.

DO NOT apply system-bypass piping if the reduced flow in the system could cause poor heat distribution. That is, system-bypass piping reduces the flow in the system and increases the water temperature supplied to the system. This can cause increased heat from radiators at the beginning of the system and reduced heat from radiators near the end of the system.

Valve Adjustment

1. Start with valve **7a** fully closed and **7b** fully open.
2. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads at least 130°F at all times.
3. Valve **7a** regulates the amount of boiler supply water mixed with return water. Valve **7b** causes a pressure drop in the system needed to balance flow through valve 7a and the system.
4. The valve adjustment should be done with the system at the coldest expected temperature (60°F for converted gravity systems or high mass radiant systems).

⚠ WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature** is **relatively constant.**

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control.** Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130°F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

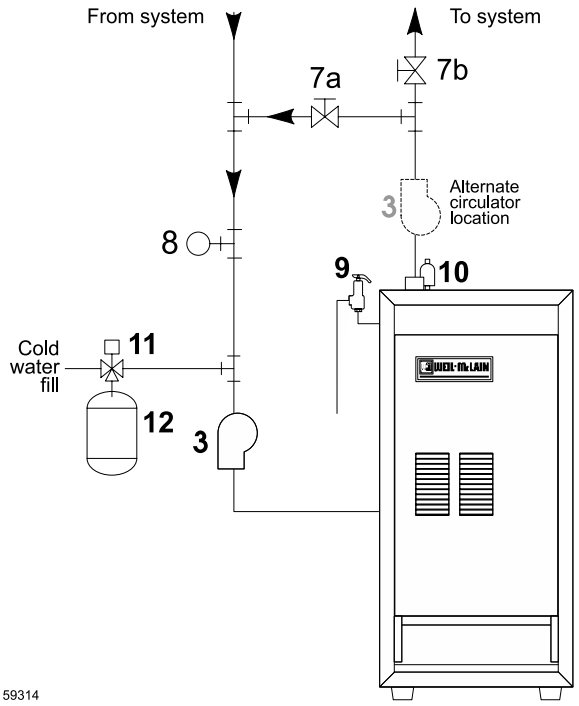
Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

Water Piping (continued)

Low Temperature Systems (continued)

3. System or zone circulator
7. System temperature valves (see instructions on **page 36** for adjusting valves)
8. Blend temperature gauge
9. Relief valve
10. Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.
11. Fill valve
12. Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 16, page 28**)

Figure 23 System-bypass piping — Zoning with zone valve or circulators, return water 130°F or higher — (Alternate to boiler-bypass piping **Figure 21** and **Figure 22, page 35**)



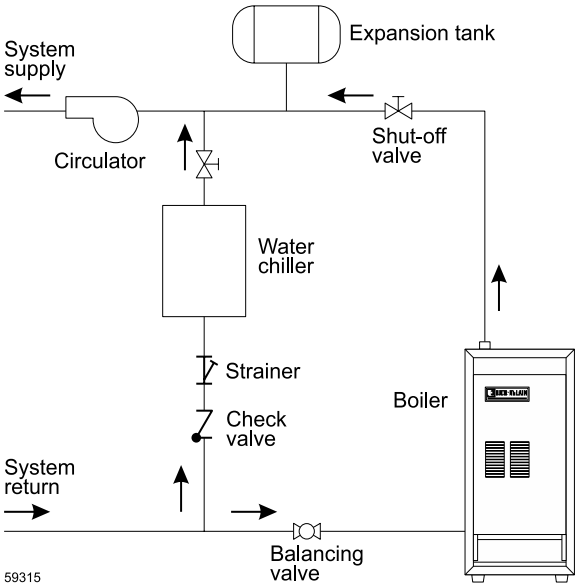
Refrigeration Systems

Prevent Chilled Water from Entering Boiler

Install boiler so that chilled medium is piped in parallel with the heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. See **Figure 24** for typical installation of balancing valve and check valve.

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

Figure 24 Piping refrigeration systems



Gas Piping

Connect Gas Supply Piping to Boiler

1. Remove jacket front panel and refer to **Figure 25, page 39** to pipe gas to boiler.
   a. **Install drip leg** at inlet of gas connection to boiler. Where local utility requires drip leg to be extended to the floor, use appropriate length of pipe between cap and tee.
   b. **Install ground joint union** for servicing, when required.
   c. **Install manual shutoff valve** in gas supply piping outside boiler jacket when required by local codes or utility requirements.
2. **Support piping** with hangers, not by boiler or its accessories.
3. **Purge all air** from gas supply piping.
4. Before placing boiler in operation, **check boiler and its gas connection for leaks.**
   a. **Close manual main shutoff valve** during any pressure testing at less than 13" w.c.
   b. **Disconnect boiler and gas valve from gas supply piping** during any pressure testing greater than 13" w.c.

⚠ WARNING

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

5. **Use pipe dope compatible with propane gases**. Apply sparingly only to male threads of pipe joints so that pipe dope does not block gas flow.

⚠ WARNING

Failure to apply pipe dope as detailed above can result in severe personal injury, death or substantial property damage.

Gas Piping (continued)

Natural Gas:

1. Refer to **Table 9** for pipe length and diameter. Base on rated boiler input (divide by 1,000 to obtain cubic feet per hour). **Table 9** is only for gas with specific gravity 0.60, with a pressure drop through the gas piping of 0.30" w.c. For additional gas pipe sizing information, refer to ANSI Z223.1.
2. Inlet pressure required at gas valve inlet:
   - Maximum: 13" w.c.
   - Minimum: 5" w.c.
   - Manifold gas pressure:

     CGi-25, -3, -5 & -6 manifold pressure: 3.5" w.c.

     CGi-4, -7 & -8 manifold pressure:
     High Fire, 3.5" w.c.; Low Fire, 0.9" w.c.
3. Install 100% lockup gas pressure regulator in supply line **if inlet pressure exceeds 13" w.c.** Adjust for 13" w.c. maximum.

Propane Gas:

1. Contact gas supplier to size pipes, tanks and 100% lockup gas pressure regulator.
2. Adjust propane supply regulator provided by gas supplier for 13" w.c. maximum pressure.
3. Inlet pressure required at gas valve inlet:
   - Maximum: 13" w.c.
   - Minimum: 11" w.c.
   - Manifold gas pressure:

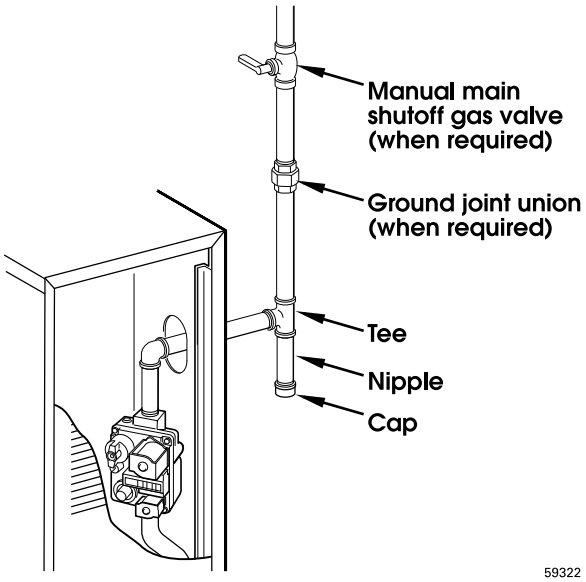
     CGi-25, -3, -5 & -6 manifold pressure: 10" w.c.

     CGi-4, -7, & -8 manifold pressure:
     High Fire, 10" w.c.; Low Fire, 2.6" w.c.

Table 9 Pipe capacity for 0.60 specific gravity natural gas

Gas pipe length (feet)	Capacity of pipe for pipe size of: (Capacity in cubic feet 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	860
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

Figure 25 Gas supply piping



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Section 3 Electrical

Field Wiring

⚠WARNING

For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTICE

Wiring must be N.E.C. Class 1.

If rollout thermal fuse element wire as supplied with boiler must be replaced, type 200°C wire or equivalent must be used. If other original wiring as supplied with boiler must be replaced, use only type 105°C wire or equivalent. Boiler must be **electrically grounded** as required by National Electrical Code ANSI/NFPA 70 – latest edition.

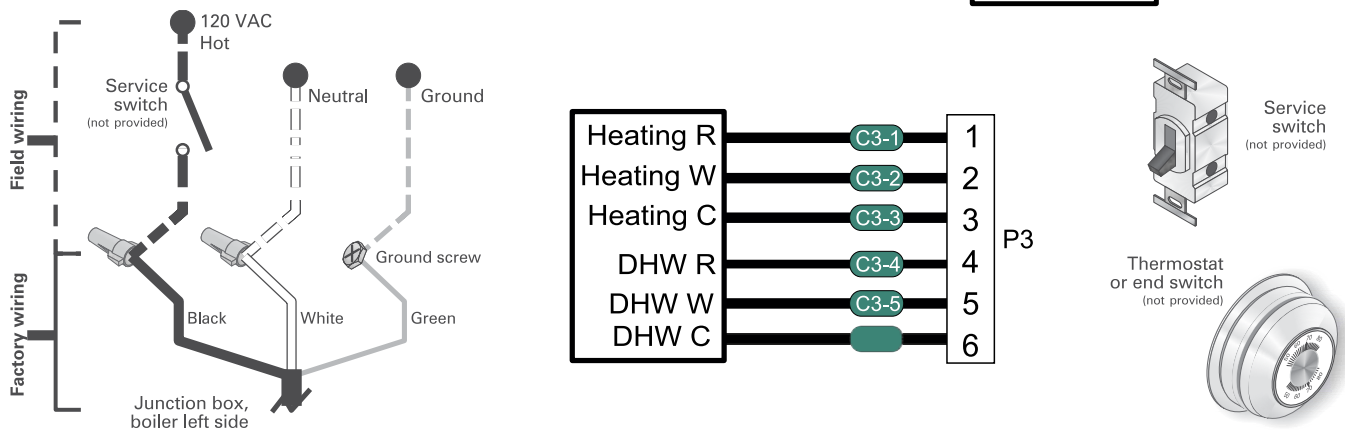
Installation must Comply with:

- National Electrical Code ANSI /NFPA 70 – latest edition, and any other national, state or local codes or regulations.

Wiring Connections

Boiler is shipped with controls completely wired, except spill switch and vent damper. Refer to wiring diagrams shown on **pages 46** and **48** for spark-ignited pilot boiler.

Figure 26 Field wiring connections —service switch, DHW (if used) and thermostat (or end switch) provided by installer



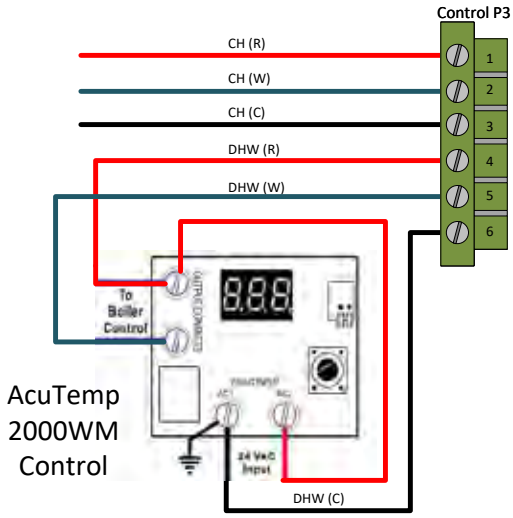
Thermostat

1. Connect thermostat as shown on wiring diagram on boiler.
2. Install on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sunrays or fireplaces.
3. If using an AcuTemp Control, wire to the boiler control as shown in the diagram below.

Domestic Hot Water (DHW)

- Connect DHW aquastat as shown in wiring below. Economy function isn't utilized with DHW input.

Figure 27 Wiring Indirect Tank Control



Field wiring (continued)

Junction Box (existing)

1. Connect 120 VAC power wiring (**Figure 26, page 41**).
2. Fused disconnect or service switch (15 amp recommended) may be mounted on this box. For those installations with local codes which prohibit installation of fused disconnect or service switch on boiler, install a 2 x 4 cover plate on the boiler junction box and mount the service switch remotely as required by the code.

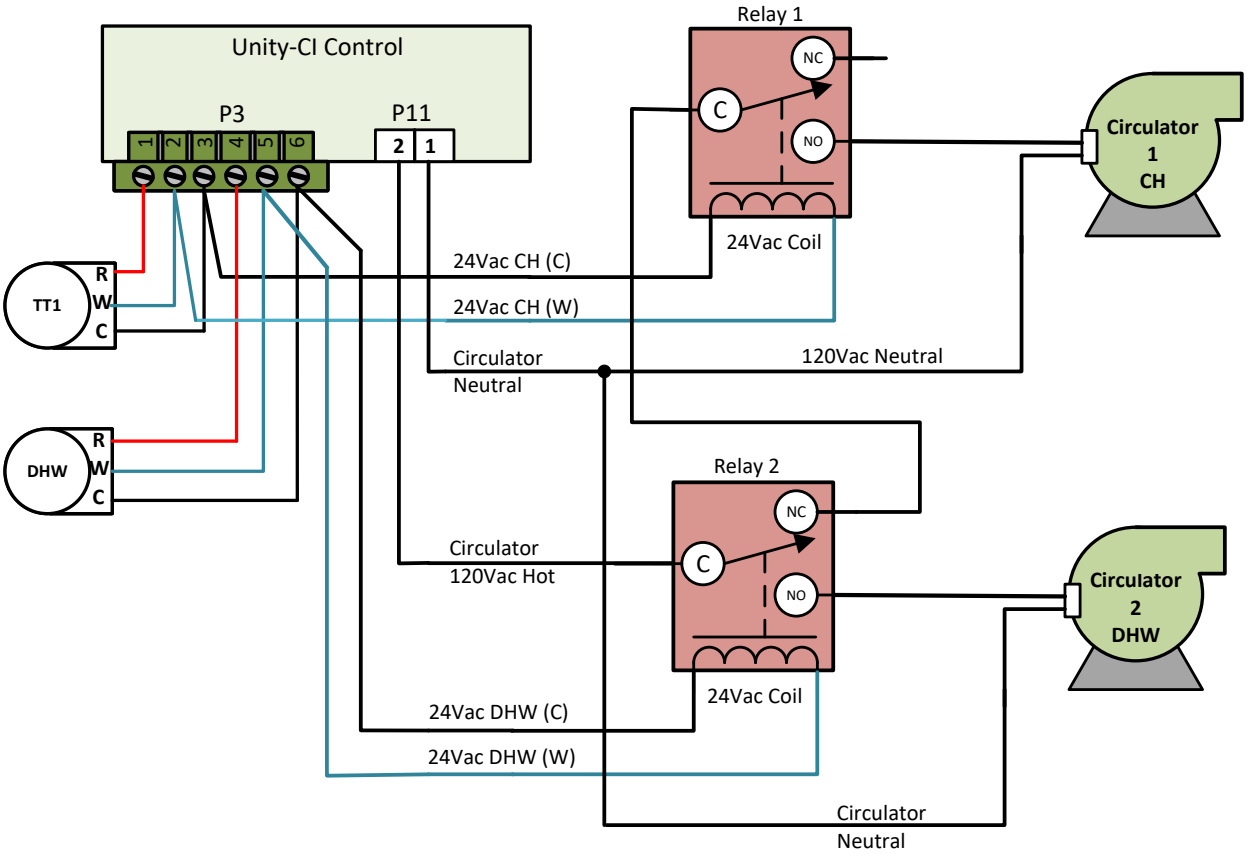
Wiring Multiple Zones

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 as shown in the diagram labeled Wiring Multiple Zones.

CAUTION

DO NOT connect directly from 3-wire zone valves to the T-T terminals on the boiler. When using 3-wire zone valves, install an isolation relay. Connect the zone valve end switch wires to the isolation relay coil. Connect the isolation relay contact across the boiler T-T terminals. Failure to comply can result in damage to boiler components or cause unreliable operation, resulting in severe property damage.

Figure 28 Wiring Multiple Zones



Field Wiring (continued)

Additional Limit Controls

Following standard industry practices, if installation is to comply with ASME requirements, a high temperature limit may be needed. Consult local requirements for other codes/standards to determine if needed.

1. Install a manual reset high temperature limit constructed to prevent a temperature setting above 240°F in system supply piping between boiler and isolation valve. (Note that the Unity CI-Control module operating limit function shuts the boiler down at 210°F, or lower if set to a lower value.)

⚠ WARNING

Multi-temperature systems — If the heating system includes circuits that require lower temperature water (radiant slab circuits, for example) as well as higher temperature circuits, it is recommended to protect low temperature circuits with limit controls that are wired to a Unity CI-Control external limit circuit (P4 terminals 1 and 2 for manual reset, or P4 terminals 2 and 3 for automatic reset).

2. See instructions below for wiring information.

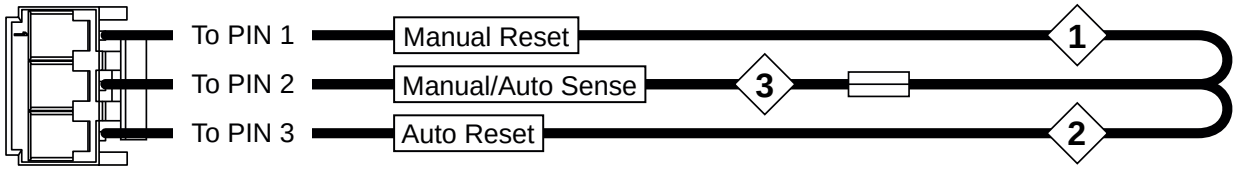
a. Manual reset operation: If external limit controls are to cause manual reset of the Unity CI-Control module, connect series-wired isolated contacts to P4 terminal 1 by cutting and splicing in the external limit wires at the ‹1› mark (see **Figure 29** for wiring information).

b. Automatic reset operation: If external limit controls are to cause automatic reset of the Unity CI-Control module, connect series-wired isolated contacts to P4 terminal 3 by cutting and splicing in the external limit wires at the ‹2› mark (see **Figure 29** for wiring information).

c. If using a manual reset limit control or wiring in the manual reset circuit, set Unity CI-Control boiler limit at least 20°F less than the external manual reset limit (for example, set Unity CI-Control no higher than 180°F for a 200°F external limit).

3

Figure 29 External limit controls P4 terminals



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Section 4
Operation

Operation — Sequence

NOTICE

Follow all procedures given in this manual and operating instructions when operating the boiler. Failure to do so could result in severe personal injury, death or substantial property damage.

1. **Standby:** With no call for heat, the inducer and circulator are de-energized. No gas flows to pilot or main gas valve.
2. **Call for heat (thermostat circuit closes):**
   a. While attempting to satisfy the heat demand, the control module monitors the boiler temperature changes via the water temperature sensor and determines whether or not the available hot water will satisfy the demand, only running the circulator. If additional heat is needed, the sequence continues. When DHW (if used) calls for heat, sequence above is bypassed.
3. Circulator energizes. If limit circuit is closed, the inducer starts. After pressure switch proves proper airflow, control module initiates 10-second prepurge.

Manual Reset Procedure for Natural Gas Ignition Lockout

DANGER

If there is an ignition fault, the following fault reset procedure should be performed. While on the fault indication screen, press and release the enter button. A confirmation screen appears.

If the answer to the question is Yes, and the enter button pressed and released, the current fault shall be cleared if the underlying fault condition is clear.

4. Control module sparks the pilot and opens pilot valve in main gas valve.
   a. If pilot **does not** light within 15 seconds, pilot valve is closed and spark generator is turned off. Control module initiates a 15-second postpurge, then starts a new cycle.
   b. If pilot does light and control module senses flame current, spark generator is turned off and main valve opens.
5. During main burner operation:
   a. Control module monitors pilot flame current. If signal is lost, main valve closes, spark generator activates and sequence returns to step 3.
   b. If power is interrupted, control system shuts off pilot and main gas valves and restarts at step 3 when power is restored.
6. In the event the limit control shuts down the boiler — The control module closes the pilot and main gas valves, but keeps the inducer operating for 15-second postpurge. — The circulator continues to operate.
7. Lower room thermostat setting to stop call for heat. **Thermostat is satisfied (thermostat circuit opens:)** — Pilot and main gas valves are closed — Inducer operates for 15-second postpurge — Circulator is shut off.
8. Boiler is now in the **off cycle**.
9. Repeat steps **2** through **7** several times to verify operation.
10. Return the thermostat to normal setting.

Operation (continued)

⚠WARNING

Electrical shock hazard - can cause severe injury or death. Disconnect power before installing or servicing.

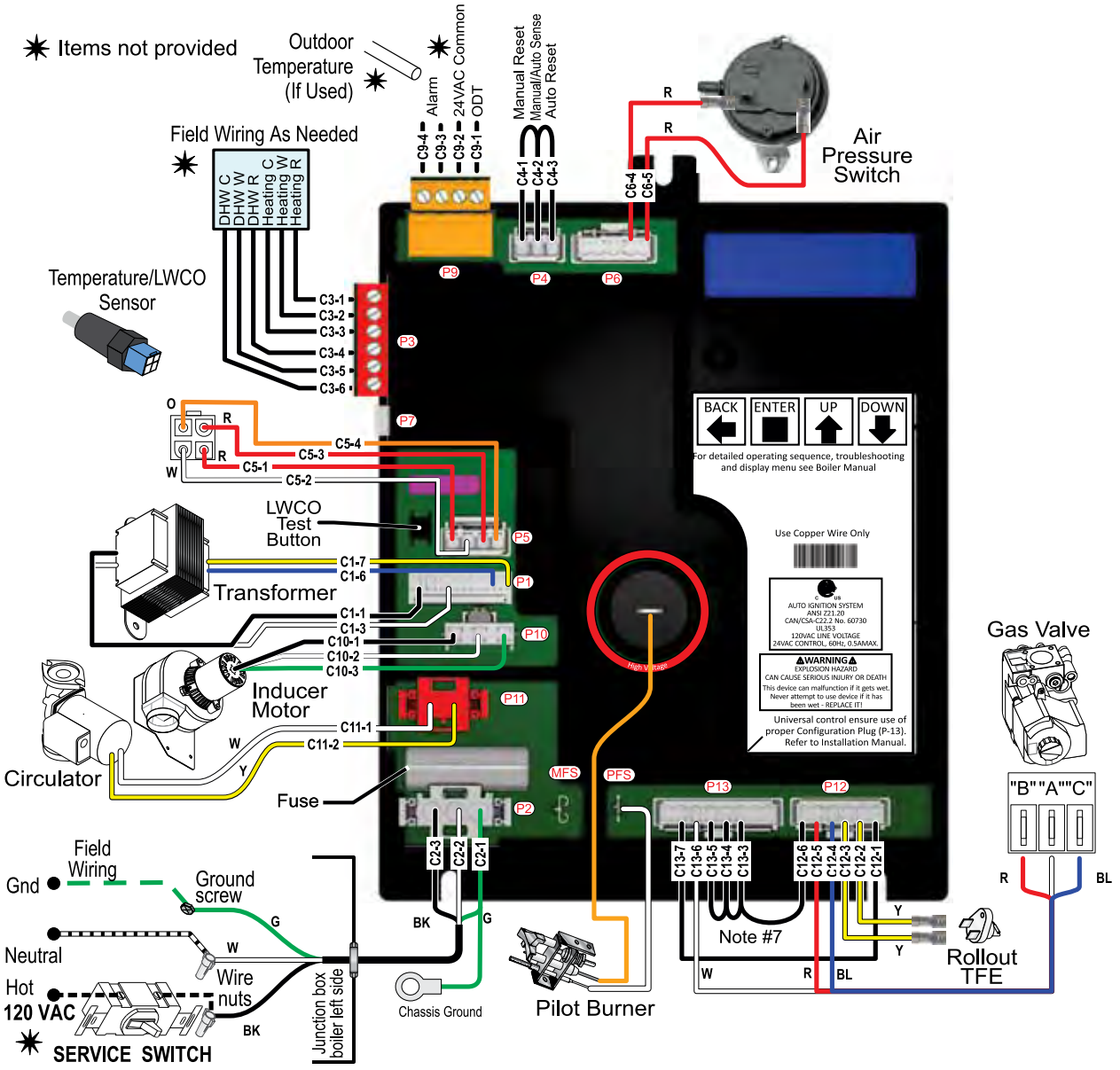
⚠CAUTION

DO NOT connect directly from 3-wire zone valves to the T-T terminals on the boiler. When using 3-wire zone valves, install an isolation relay. Connect the zone valve end switch wires to the isolation relay coil. Connect the isolation relay contact across the boiler T-T terminals. Failure to comply can result in damage to boiler components or cause unreliable operation, resulting in possible severe property damage.

NOTICE

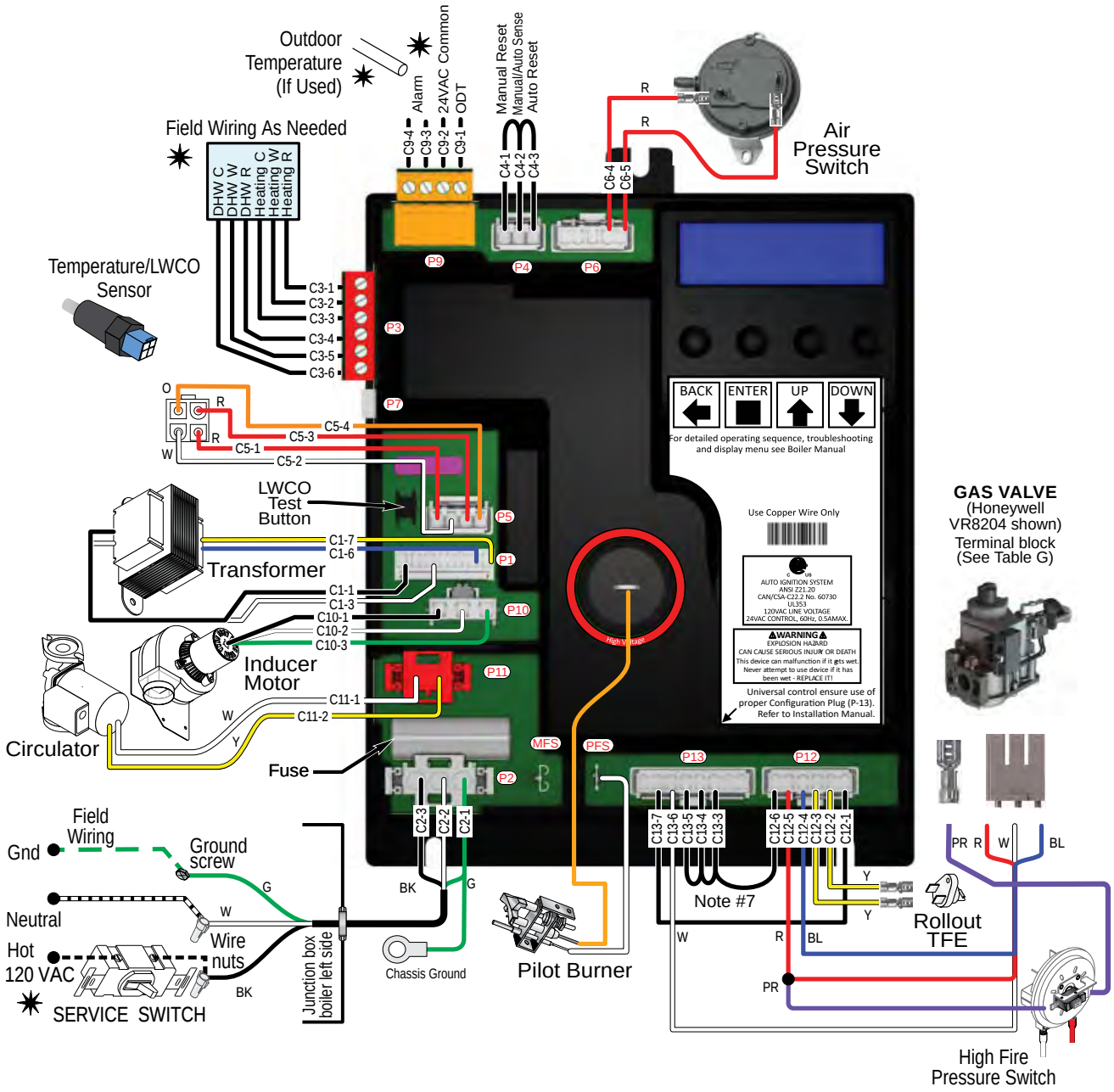
- The control module is polarity-sensitive to the incoming 120 VAC power. If polarity is reversed, the control will display FAULT L1 POLARITY and will not cycle boiler.
- All contacts shown without power applied.

Figure 30 Schematic wiring diagram — Spark-ignited pilot system (CGi-25, -3, -5 & -6 only)



Operation (continued)

Figure 31 Schematic wiring diagram — Spark-ignited pilot system (CGi-4, -7, & -8 only)



Operation (continued)

Figure 32 Ladder wiring diagram — Spark-ignited pilot system (CGi-25, -3, -5 & -6 only)

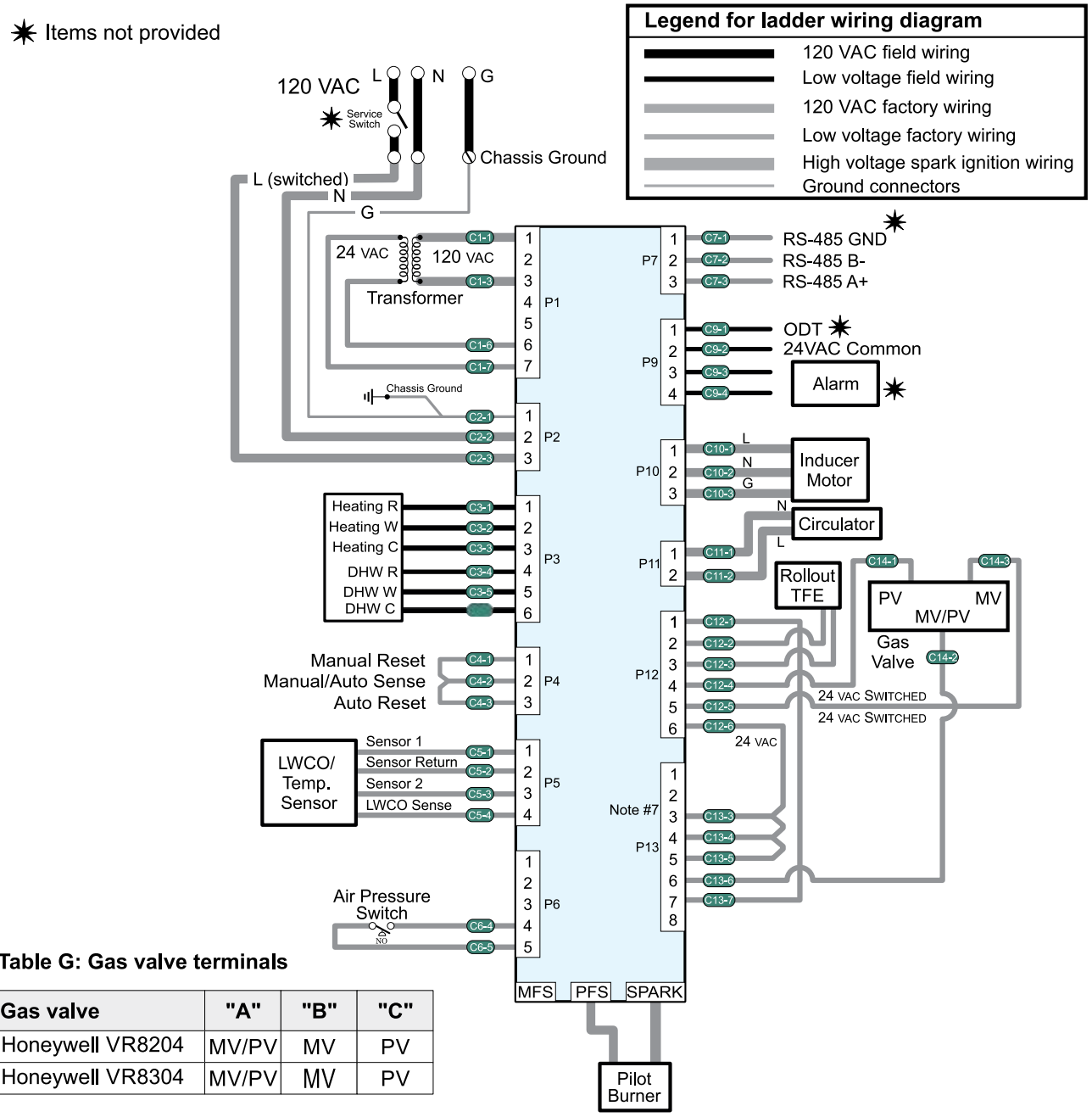


Table G: Gas valve terminals

Gas valve	"A"	"B"	"C"
Honeywell VR8204	MV/PV	MV	PV
Honeywell VR8304	MV/PV	MV	PV

1. All wiring must be installed in accordance with:
   A. U.S.A. -N.E.C. And any other national, state, or local code requirements.
2. Pilot lead wires are not field replaceable. Replace pilot assembly if necessary.
3. If any of the original wire as supplied with the appliance must be replaced, use minimum 105°C wire or equivalent. Exception - wires to a rollout TFE must be 200°C or equivalent.
4. For multiple zoning, use either zone valves or circulators. Refer to the component manufacture's instructions and this manual for application and wiring suggestions.
5. Refer to control component instructions packed with the boiler for application information.
6. Wire any additional limit controls (low water cut-off, high temperature limit, etc.) to P4 on Control.
7. C13-2 through C13-5 used to set model configuration. ConfigurationPlug (P13) - #7 CGi NG/Propane shown.

Operation (continued)

Figure 33 Ladder wiring diagram — Spark-ignited pilot system (CGi-4, -7, & -8 only)

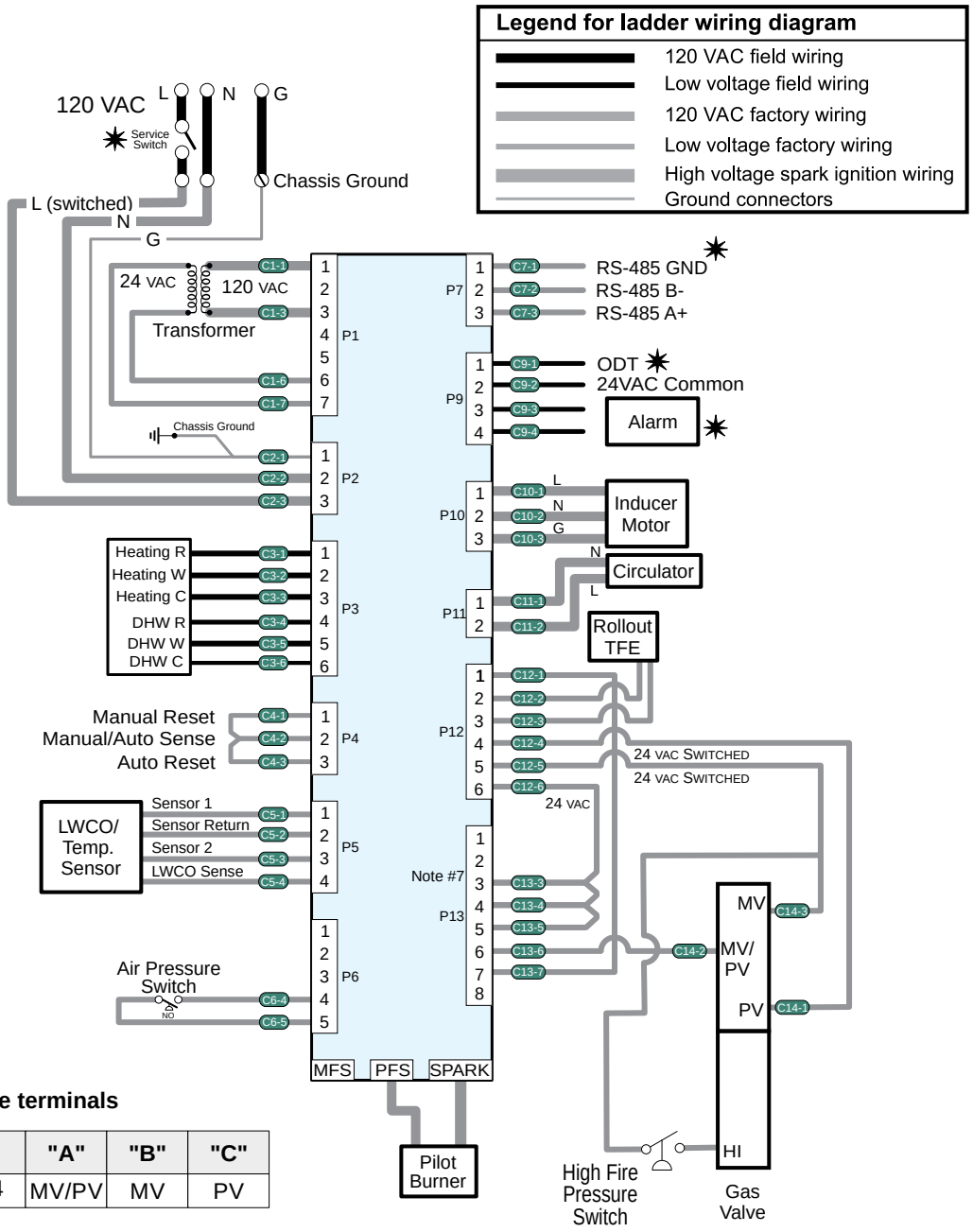


Table G: Gas valve terminals

Gas valve	"A"	"B"	"C"
Honeywell VR8304	MV/PV	MV	PV

1. All wiring must be installed in accordance with:
   A. U.S.A. -N.E.C. And any other national, state, or local code requirements.
2. Pilot lead wires are not field replaceable. Replace pilot assembly if necessary.
3. If any of the original wire as supplied with the appliance must be replaced, use minimum 105°C wire or equivalent. Exception - wires to a rollout TFE must be 200°C or equivalent.
4. For multiple zoning, use either zone valves or circulators. Refer to the component manufacture's instructions and this manual for application and wiring suggestions.
5. Refer to control component instructions packed with the boiler for application information.
6. Wire any additional limit controls (low water cut-off, high temperature limit, etc.) to P4 on Control.
7. C13-2 through C13-5 used to set model configuration. ConfigurationPlug (P13) - #7 CGi NG/Propane shown.

Operation (continued)

Operating Instructions CGi-25 to CGi-8

- **Spark pilot**
- **Natural gas**
- **Propane gas**
- **Gas valve: Resideo VR8204/VR8304**

FOR YOUR SAFETY READ BEFORE OPERATING

⚠WARNING **If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.**

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

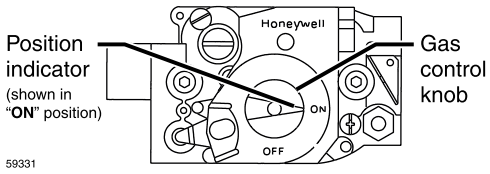
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a phone outside the structure. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the "thermostats" to lowest setting.
3. Turn off all electrical power to the appliance.
4. Remove front panel.
5. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
6. The gas control knob clockwise ↷ to "OFF".



7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "WHAT TO DO IF YOU SMELL GAS" in the safety information above. If you don't smell gas, go to the next step.
8. Turn gas control knob counterclockwise ↶ to "ON."
9. Turn on all electric power to the appliance.
10. Set "thermostats" to desired setting.
11. If the appliance will not operate when there is a call for heat and the piping is not hot , follow the instructions "To Turn Off Gas To The Appliance" and call your service technician or gas supplier.
12. Reinstall front panel.

TO TURN OFF GAS TO THE APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front panel.
4. Turn gas control knob clockwise ↷ to "OFF." Do not force.
5. Reinstall front panel.

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Operation (continued)

Department of Energy – Compliance

This boiler is equipped with a control system that automatically adjusts a time delay period to turn on the boiler during a call for heat. This is accomplished by circulating available hot water in the system while measuring water boiler water temperature changes. The control calculates a suitable delay based on temperature measurements and turns the boiler on only after it determines that the demand for heat cannot be satisfied with the available hot water.

Due to the wide variety of controls used in boiler installations, this control is also equipped with an adjustment for the calculated time delay period (ECONOMY ADJUST). This feature is not used when ODR is enabled. When ECONOMY ADJUST is set to 10%, the time delay is the minimum possible time between energizing the circulator and ignition. The IMPORTANT notice below must then be observed:

IMPORTANT

In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function.

THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.
- This boiler is equipped with a tankless coil.

Operating - Controls

This section is intended to provide instructions for control operation and boiler startup procedures.

Control Operation

User Interface

The control has a two-line by sixteen-character display and four push buttons. The buttons are immediately below the display. These buttons allow the user to navigate a list of menu items and edit the associated parameter.

Display and Keypad

The displays shown in **Figure 34 on page 52** show the default display color and arrangement for the five different modes of operation.

Standby

Operating the user interface

Active Central Heat (CH) Call

Active Domestic Hot Water (DHW) Call

Fault

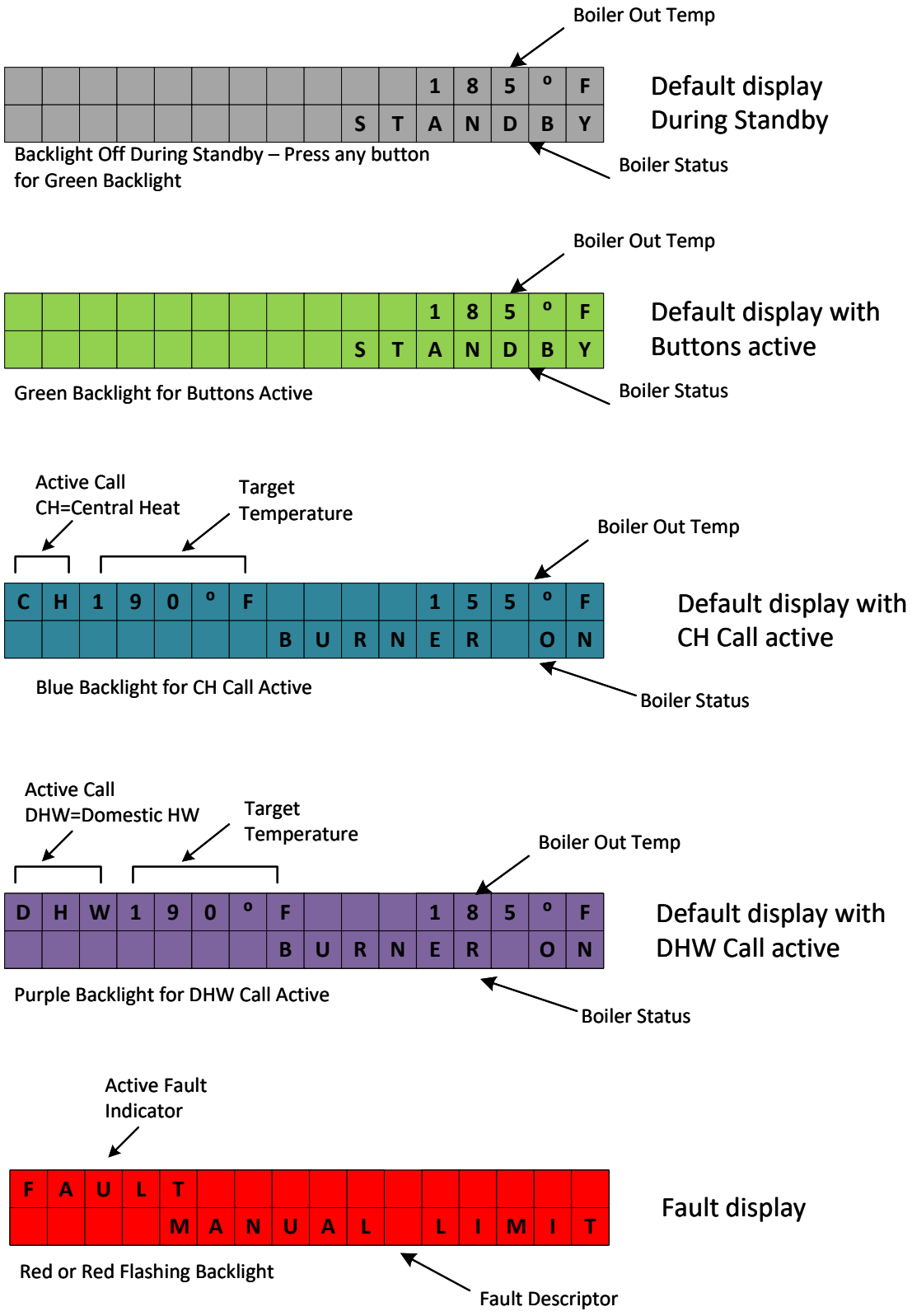
The control display indicates operational status through its use of backlight colors.

1. No backlight indicates that the control is in standby mode.
2. A green backlight is displayed on a configured control when initially powered on. Also when there are no active calls for heat but the control buttons are being used. The backlight will turn off after 20 minutes of no push-button activity.
3. Blue backlight indicates that either initialization is taking place or that a CH call for heat is active.
4. Purple backlight indicates that a DHW call for heat is active.
5. Red backlight is displayed when an unconfigured control is initially powered on or when a fault has occurred. Although a fault must be cleared before normal operation can proceed, the Advanced Menu can be used while in fault mode to identify the current state of parameters which may be involved in this fault condition.

Operation (continued)

Operating - Controls (continued)

Figure 34 User interface



Operation (continued)

Operating - Controls (continued)

Control Operation (continued)

Menu Structure

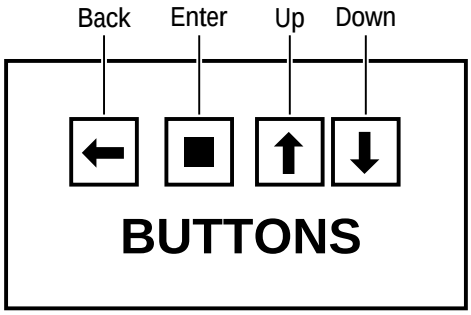
Figure 36 shows the functional flow and operation of the control menu structure. The default Basic Menu is shown on the left, and the Advanced Menu is on the right.

The default menu is the "Basic Menu" which allows display and adjustment of the Central Heating (CH) and Backlight Intensity settings. **Figure 36** shows the sequence of settings while navigating through the menu structure.

Installers use the Advanced Menu to set parameters that are only necessary for installing a new boiler. The Advanced Menu also contains the DIAGNOSTICS menu, allowing near real-time display of important system parameters; this feature is useful when attempting to quickly diagnose system problems.

The default display will be active after control initialization. See **Figure 34 on page 52**. The top, left end of the display shows the target setting when a CH or DHW call is active. The current outlet temperature of the boiler is displayed in the top, right line. The bottom line of the control displays the current state of operation, which is STANDBY in the first two images.

Figure 35 User interface buttons

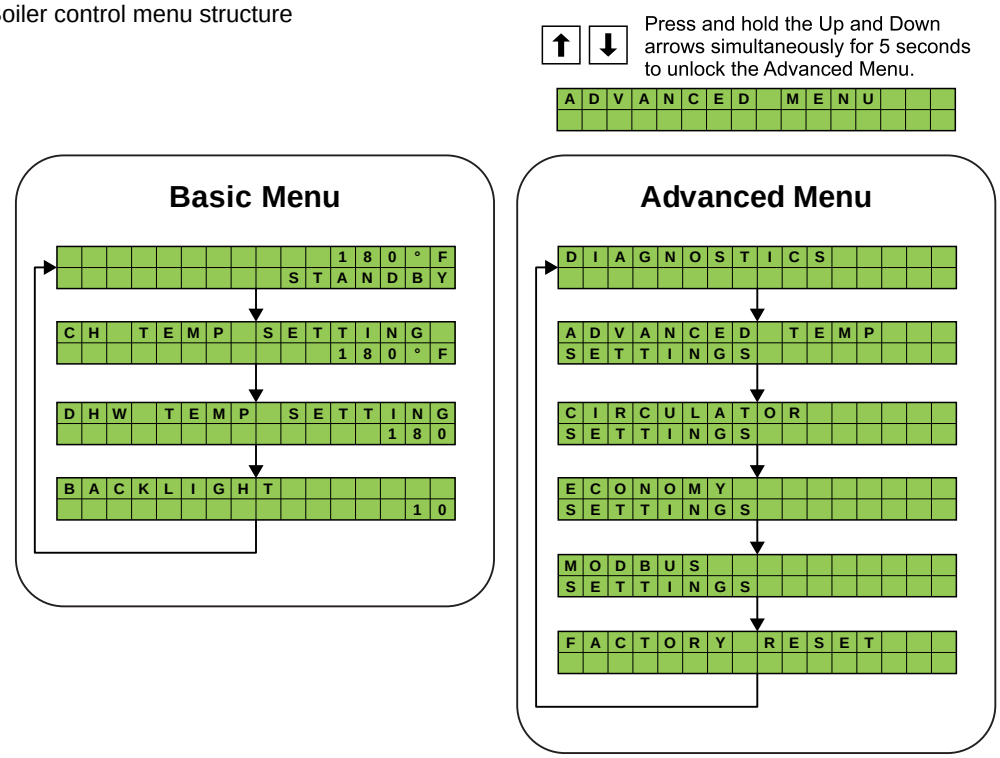


Basic Menu

By default, the control will start in the Basic Menu displaying the default temperature/status display.

1. Pressing any button will turn on the backlight, which will turn off again after 20 minutes of no button activity.
2. The next press will advance you to a parameter item. For example, pressing the Down button will take you to the Central Heat setting item. The top line will say CH TEMP SETTING, while the bottom line will display a temperature.
3. Pressing the Enter button will edit the parameter. The control will indicate edit mode by displaying an asterisk (*) on the left of the bottom line.

Figure 36 Boiler control menu structure



Operation (continued)

Operating - Controls (continued)

Control Operation (continued)

4. The Up and Down buttons will now affect the parameter value displayed to the right on the bottom line. Pressing and releasing these buttons will change the value shown.
5. Press the Enter button to save the new value you have chosen. The asterisk will disappear from the bottom line, and the new value will be saved.
6. If the Left button is pressed before the Enter button, the edit function ends, the asterisk will disappear, and the display will return to showing the original parameter value and return you to the parameter selection mode.

When in a parameter display, pressing the Down button will move the display to the next parameter in the menu. Pressing the UP button will move the display back to the previous parameter item. Editing and saving parameter values will operate the same as before.

When displaying the last item in a menu, the Down button will wrap around to the top of the menu and display the Default Temperature/Status screen item. User Menu operation will continue as before.

Advanced Menu

The Advanced Menu can be accessed when the Basic Menu is not in edit mode.

To access the Advanced Menu, press and hold the Up and Down buttons simultaneously for 5 seconds. The display will change to read “Advanced Menu.” After a few seconds, the display will proceed to the first menu item, “Advanced Temperature Settings.”

The Advanced Menu provides access to submenus, which allow for setup, control, and diagnosis of advanced boiler functions: Advanced Temperature, Diagnostics and Modbus settings as well as Factory Reset.

1. **Diagnostics –** This submenu provides access to further submenus, which show the states and values of sensors and various operating parameters.
   a. Inputs and Outputs
   b. Temperature
   c. LWCO
   d. Status & Faults
2. **Advanced Temperature Settings**

   WWSD stands for “warm weather shutdown.” It means the boiler will not be allowed to fire if the outside temperature is greater than the WWSD setting. When the boiler is kept off because the outside temperature is above WWSD, the graphic display will show “WWSD ACTIVE,” and the boiler will remain in standby until the outside temperature drops below WWSD temperature. WWSD does not apply to DHW systems. The optional outdoor sensor must be installed to use this function.

   Setpoint adjustments can be made based on one of three available **Methods (M)**.

   M1. ODR when an outdoor temperature sensor is installed.
      a. Outdoor Reset (ODR Config) - This configuration parameter will Enable/Disable the ODR feature. Enabling this parameter also requires an Outdoor Temperature Sensor to be installed.
      b. Outdoor Reset Max Boiler - (ODR RST MAX BLR) - Boiler output temperature where the minimum amount of adjustment is made.
      c. Outdoor Reset Min Boiler - (ODR RST MIN BLR) - Boiler output temperature where the maximum amount of adjustment is made.
      d. Outdoor Reset Outdoor Max - (ODR RST OUTD MAX) - Outdoor Temperature to end setpoint adjustments.
      e. Outdoor Reset Outdoor Min - (ODR RST OUTD MIN) - Outdoor Temperature to begin setpoint adjustments.

   M2. Residual Heat Recovery Algorithm when no outdoor temperature sensor is used.

   M3. In addition to these, when an outdoor sensor is used, a maximum outdoor temperature (WWSD) can be set to cause the control to ignore the CH/TT1 input. (WWSD is the outdoor temperature setting in degrees.)
      a. Warm Weather Shut Down (WWSD Config) - If warm weather shutdown is enabled, and an outdoor sensor is installed, when the outdoor temperature is greater than the Warm Weather Shut Down (WWSD) setting, an active CH/TT1 demand is ignored. In this case, while the CH/TT1 demand is active, the display will show status as “WWSD ACTIVE”.

3. **Circulator Settings -** This menu is used to enable or disable the Circulator Freeze Protection and Exercising functions.
   a. Freeze Protect - The control energizes the circulator any time the temperature sensor is below 40°F. The circulator will stay energized until the temperature rises above 45°F. The control de-energizes the circulator when the temperature rises above 45°F. Freeze protection does not interfere with a call for heat. A call for heat will proceed normally if the circulator is energized from freeze protect.
   b. Circulator Exercising (Thirty Day (+/- 1) Pump Cycle) - At thirty +/- one day intervals after the last call for heat, the circulator pump is to be energized for 30 seconds. Short operations after long-term idle periods prevent damage of the pump rotor from sedimentation.

Operation (continued)

Operating - Controls (continued)

4. **Economy Settings -** This menu allows the parameter entry for economy adjustment of the CH Set point.
   a. Economy Setting (%) - The Economy setting linearly scales the maximum time to attempt to satisfy the load from residual heat. When set to the minimum (10%), gas heat is immediately enabled when the thermostat demand starts. When set all the way to the “economy” side (100%), gas heat enable may be delayed up to 120 seconds based on how the load satisfy time decreases as water temperature falls.

5. **Modbus Settings –** This submenu allows you to set communications parameters for Modbus communications such as:
   a. Modbus Address - Default "249"
   b. Baud Rate – Default “38400”
   c. Parity – Default “NONE”
   d. Stop Bits – Default “2”
   e. Communications status (Active/Inactive)

6. **Factory Reset -** Resets all User Interface (UI) parameters to factory default values.

All of these Advanced Menus are navigated in exactly the same manner as is done in the default Basic menu. To go back to the Default Basic Menu, repeatedly press the Back arrow until you see the Default Temperature/Status screen item.

Display Screens (Ordered as advancing with "DOWN" arrow button)

1	185 °F STANDBY	This is the main (default) screen on the control. This shows the current boiler water temperature and the current state of the boiler.
1	CH TEMP SETTING 180 °F	This screen allows you to adjust the central heat (CH) setpoint.
1	DHW TEMP SETTING 180 °F	This screen allows you to adjust the domestic hot water (DHW) setpoint.
1	BACKLIGHT 10	This screen allows the user to adjust the backlight intensity in steps from 1 to 10, with 1 being Off and 10 being maximum brightness.
1	ADVANCED MENU	To access the following screens See **Figure 36, page 53**. This screen will only be displayed momentarily, indicating that you have entered the Advanced Menus.
2	DIAGNOSTICS	This is the 1st sub-menu under the Advanced Menus heading. Pressing ENTER when on this screen advances into Diagnostics status screens as listed below: 1. Inputs & Outputs 2. Temperature 3. LWCO 4. STATUS & FAULTS
3	INPUTS & OUTPUTS	This is the 1st sub-menu under the Diagnostics sub-menu. Pressing ENTER when on this screen advances into the Inputs & Outputs status screens as listed below: 1. Alarm Status 2. Circulator Status 3. Flame Sense-Pilot 4. Inducer Status 5. Pilot (Gas) status 6. Main (Gas) status 7. Air Pressure Switch 8. Auto Limit Status 9. Manual Limit Status

Operation (continued)

Operating - Controls (continued)

	3 TEMPERATURE	This is the 2nd sub-menu under the Diagnostic sub-menu. Pressing enter when on this screen advances into Temperature sensor status screens as listed below: 10. Boiler Out 1 11. Boiler Out 2 12. OUTDOOR 13. DHW OUT
	3 LWCO	This is the 3rd sub-menu under the Diagnostic sub-menu. Pressing ENTER when on this screen advances into LWCO status screens as listed below: 1. INTEGRATED LWCO (Enabled) 2. LWCO STATUS (Water Present/No Water) 3. LWCO READING (Measured Resistance)
	3 STATUS & FAULTS	This is the 4th sub-menu under the Diagnostic sub-menu. Pressing ENTER when on this screen advances into Status & Faults screens as listed below: 1. Boiler Status 2. DHW INPUT STATUS 3. CH input Status 4. CURRENT FAULT 5. Previous Fault 6. BOILER MODEL (Configuration #) & Software Version
	2 ADVANCED TEMP SETTINGS	This is the 2nd sub-menu under the Advanced Menus heading. Pressing ENTER when on this screen advances into Advanced Temperature Setting screens as listed below: 1. Start-Up On Differential 2. ODR CONFIG (Enable/disable) 3. ODR RST MAX BLR (Temp) 4. ODR RST MIN BLR (Temp) 5. ODR RST OUTD MAX (Temp) 6. ODR RST OUTD MIN (Temp) 7. WWSD Config (Enable/disable) 8. WWSD (Temp) 9. LOW TEMP LIMIT (Temp) 10. LOW TMP OFF DIFF (Temp)
	2 CIRCULATOR SETTINGS	This 3rd sub-menu is used to enable or disable the Circulator Freeze Protection and Exercising functions. 1. Freeze Protect 2. Circulator Exercising
	2 ECONOMY SETTINGS	This 4th sub-menu is the 4th sub-menu heading under the Advanced Menus heading. Pressing enter when on this screen advances into the economy setting screen as listed below: 1. ECONOMY SETTING (% - 100%)

Operation (continued)

Operating - Controls (continued)

2	MODBUS SETTINGS	This is the 5th sub-menu under the Advanced Menus heading. Pressing ENTER when on this screen advances into Modbus configuration screens as listed below: 1. Modbus Status 2. Modbus Address 3. Modbus Baud Rate 4. Modbus Parity 5. Modbus Stop Bits 6. Modbus Activity
2	FACTORY RESET	This is the 6th sub-menu under the Advanced Menus heading. Pressing ENTER when on this screen causes the control to set all adjustable parameters back to factory defaults.

Operation (continued)

Operating - Controls (continued)

Control Settings

Table 10 Control menus and settings information

Basic Menu			
Item	**Description**	**Default**	**Setting Range**
Setpoint & Boiler Out Temp	This shows the current Boiler Out Temperature and current boiler status.	NA	NA
CH Setting	CH setting is the Operating Limit for the control when thermostat input is active. The boiler will shut down when reaching this temperature.	180°F	140 - 210°F
DHW setting	DHW setting is the Operating Limit for the control when the Domestic Hot Water input is active. The boiler will shut down when reaching this temperature.	180°F	140 - 210°F
Backlight	This will change the brightness of the backlight on the LCD display.	10	1 - 10
Advanced Menu			
Advanced Temp Settings	**Description**	**Default**	**Setting Range**
Start-Up On Diff	This differential controls when the burner will be turned back on after cycling off after achieving the CH Setpoint.	20°F	1 - 50°F
ODR Config	Enables or Disable Outdoor reset function	Disable	Enable/Disable
ODR RST MAX BLR	Adjusted CH Setpoint when the outdoor temp is equal to or less than ODR RST OUTD MIN	180	140 - 210ºF
ODR RST MIN BLR	Adjusted CH Setpoint when the outdoor temp is equal to or greater than ODR RST OUTD MAX	140	140 - 180ºF
ODR RST OUTD MAX	Outdoor Temperature to end setpoint adjustments.	70	50 - 100ºF
ODR RST OUTD MIN	Outdoor Temperature to begin setpoint adjustments.	0	-29 ºF - 49ºF
WWSD Config	Enables the Warm Weather Shut Down	Disable	Enable/Disable
WWSD	Sets the temperature for WWSD shutdown	70ºF	50ºF - 100ºF
Economy Settings	**Description**	**Default**	**Setting Range**
Economy Setting	CH Setpoint adjustment percent	10%	10% -100%
Diagnostics			
Inputs & Outputs	**Description**	**Default**	**Range**
Alarm Status	Shows the status of the alarm.	—	ACTIVE / INACTIVE
Circulator Status	Shows the status of the circulator output.	—	ON / OFF
Flame Sense Pilot	This shows the value of the flame sense. 0 = Strongest; 60 - None	—	0 - 60
Inducer Status	Shows the status of the Inducer output.	—	ON / OFF
Pilot Valve	Shows the status of the Pilot Valve output.	—	ON / OFF
Main Valve	Shows the status of the Main Valve output.	—	ON / OFF
Air Pressure SW	Shows the status of the Air Pressure Switch input.	—	OPEN / CLOSED
Auto Limit	Shows the status of the Auto Limit Switch.	—	OPEN / CLOSED

Operation (continued)

Operating - Controls (continued)

Control Settings (continued)

Manual Limit	Shows the status of the Manual Limit Switch.	—	OPEN / CLOSED
Temperature	**Description**	**Default**	**Range**
Boiler Out 1	Shows the value of temperature sensor 1 at the boiler out sensor.	—	—
Boiler Out 2	Shows the value of temperature sensor 2 at the boiler out sensor.	—	—
Outdoor	Shows the value of the outdoor Temperature sensor if used.	—	—
DHW Out	Shows the temperature of the boiler water outlet port when servicing the DHW call.	—	—
LWCO	**Description**	**Default**	**Range**
Integrated LWCO	Integrated LWCO cannot be turned off.	ENABLED	ENABLED ONLY
LWCO Status	Shows status of LWCO sensor.	—	WATER PRESENT / NO WATER
LWCO Reading	This is a value representing the resistance reading of the conductivity between the LWCO sensor and the boiler indicating the presence of water as the conducting medium.	—	0 - 36
Status & Faults	**Description**	**Default**	**Range**
Boiler Status	This shows the status of the boiler.	—	—
DHW Input Status	Shows the status of the Domestic Hot Water call for heat input.	—	ACTIVE / INACTIVE
CH Input Status	Shows the status of the Central Heating call for heat input.	—	ACTIVE / INACTIVE
Lockout/Fault	Two menu items showing current and previous fault.	—	—
Current Fault	Displays name of currently active fault.	—	—
Previous Fault	Displays name of previously active fault.	—	—
Model	Shows the control board model and firmware version.	—	—
Modbus Settings	**Description**	**Default**	**Setting Range**
Modbus Status	Shows the status of modbus system.	Enable	Enable / Disable
Modbus Address	Change the modbus address of this control.	249	0 - 255
Modbus Baud Rate	Speed of communication channel.	38400	4800 / 9600 / 19200 / 38400
Modbus Parity	Change the modbus parity setting of this control.	none	None,1,2
Modbus Stop Bits	Allow time for the reception and processing of current byte and preparation for next byte.	2	1 / 2
Modbus Activity	An indication of communication activity.	Blank Character	Blank / Black Character
Factory Reset	Reset the firmware on the control to factory condition.	—	—

Operation (continued)

Operating - Controls (continued)

Sequence of Operations

⚠WARNING

If any manual reset limit device trips, DO NOT reset without determining and correcting the cause. Never attempt to bypass a safety limit device. Attempting to operate a boiler without diagnosing the cause of failure can cause unsafe operation, which can result in personal injury, death, or substantial property damage.

Ignition Process

1. After a call for heat, the control will immediately start the inducer and display Pre-Purge. A 15 second timer will start once the air pressure circuit is closed.
2. When the control completes the Pre Purge, it energizes the Pilot Valve. The control begins the spark Ignition sequence and starts a 15-second Pilot Flame-Sense timer.
3. As the ignition sequence proceeds, and the pilot flame lights, the control monitors Flame sense inputs to verify the Pilot is properly lit.
   a. In the Advanced Menu under Diagnostics > Inputs & Outputs > Flame Sense, one can read the flame sense status of the Pilot burner as measured by the control.
   b. A value of 60 is considered to be 'No Flame'.
   c. A good quality flame is expected to show a value of less than 60, with higher quality flames showing lower values.
4. If the control's Pilot Flame Sense timer expires before the control sees an acceptable pilot flame sense value, it will remove power from the Pilot valve, start an Inter-Purge, and determine whether a restart is possible.
5. If the control successfully completes its pilot ignition process, it will energize the Main Gas Valve.
6. If flame sense is not proven within the Control's verification interval, the control will turn off both the main and pilot gas valves.

Normal Operation of Dual Pressure Switch Assembly (CGi-4, -7 & -8 only)

With the Inducer on, both the air pressure switch and high fire pressure switch will be closed.

The air pressure switch closes the safety circuit for the Unity CI control.

The high fire pressure switch completes the circuit to the high fire input of the gas valve, enabling the gas valve to deliver full manifold pressure.

Start-Up

Preparation

Check for Gas Leaks

⚠ WARNING

- Before starting the boiler, and during initial operation, smell near the floor and around the boiler for gas odorant or any unusual odor. Do not proceed with start-up if there is any indication of a gas leak. Repair any leak at once.
- Propane boilers only — Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade and the gas may no longer have an odor.
- Propane gas can accumulate at floor level. Smell near the floor for the gas odorant or any unusual odor. If you suspect a leak, do not attempt to light the pilot.
- Periodically check the odorant level of your gas.
- Inspect boiler and system at least yearly to make sure all gas piping is leak-tight.
- Consult your propane supplier regarding installation of a gas leak detector. There are some products on the market intended for this purpose. Your supplier may be able to suggest an appropriate device.

Determine if Water Treatment is Needed

⚠ DANGER

Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

⚠ WARNING

Eliminate all system leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

Clean System to Remove Sediment

NOTICE

1. You must thoroughly flush the system (without boiler connected) to remove sediment. Sediment can affect chemical treatment of the system and can damage system components.
2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)
3. Flush system until water runs clean and you are sure piping is free of sediment.

Verify Water Chemistry

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness) or low pH water conditions (below 7.0). Boiler water pH of 7.0 to 8.5 is recommended.

Freeze Protection (when used)

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

⚠ WARNING

Do not use **ethylene glycol, automotive or undiluted antifreeze**. Severe personal injury or death can result.

1. Determine **antifreeze quantity** according to system water content. Boiler water content is listed on **page 91**. Remember to include expansion tank water content.
2. Follow antifreeze manufacturer's instructions.
3. A 50% solution of propylene glycol/water provides maximum protection to about -30°F.
4. Local codes may require **back flow preventer** or actual disconnect from city water supply.
5. When using antifreeze in a system with automatic fill, install a water meter to monitor water makeup. Glycol will leak before the water begins to leak, causing glycol level to drop. Added water will dilute the antifreeze, reducing the freeze protection level.
6. If for any reason freeze protection or circulator excercising are not used. Ensure that "FREEZE PROTECT" is disabled in the ADVANCED MENU under CIRCULATOR settings.

Start-Up (continued)

Preparation (continued)

Fill the System with Water

1. Close manual and automatic air vents and boiler drain cock.
2. **Fill to correct system pressure.** Correct pressure will vary with each application. Typical cold water fill pressure for a residential system is 12 psi.
3. **Purge air** from system:
   a. Connect a hose to the purge valve (see drain valves, item **6**, in suggested piping diagrams on **pages 28** through **page 35**, **Figure 15** through **Figure 22**). Route hose to an area where water can drain and be seen.
   b. Close the boiler or system isolation valve between the purge valve and fill connection to the system.
   c. Close zone isolation valves.
   d. Open quick-fill valve on cold water makeup line.
   e. Open purge valve.
   f. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged.
   g. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch that system pressure rises to correct cold-fill pressure.
   h. After the system has operated for a while, eliminate any residual air by using the manual air vents located throughout the system.
   i. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with lowest floor. Close vent when water squirts out. Repeat with remaining vents.
4. Open **automatic air vent** (diaphragm-type or bladder-type expansion tank systems only) one turn.
5. Open other vents:
   a. Starting on the lowest floor, open air vents one at a time until water squirts out.
   b. Repeat with remaining vents.
6. Refill to correct pressure.

Inspect System Water Piping

After filling the boiler and system with water, **inspect all piping** throughout the system for leaks. If found, repair immediately. Repeat this inspection after the boiler has been started and the system has heated up.

⚠ WARNING

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

⚠ DANGER

Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

Inspect Base Insulation

⚠ WARNING

- The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 92** of this manual. Failure to comply could result in severe personal injury.
- Failure to replace damaged insulation or reposition insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

Check to make sure **base insulation is secure** against all four sides of the base. If insulation is damaged or displaced, **DO NOT** operate boiler. Replace or reposition insulation.

Start-Up (continued)

Boiler Operation

⚠WARNING

DO NOT proceed with boiler operation unless boiler and system have been filled with water and all instructions and procedures of previous manual sections have been completed. Failure to do so could result in severe personal injury, death or substantial property damage. Before starting the boiler, do the following:

- Read manual **"Operation" on page 45** and the Operating instruction procedure (see **Table 11**, below).
- Verify the boiler and system are full of water.
- Verify the Start-up preparation procedures starting on **page 61** have been completed.

Table 11 Operating instruction location guide

Models	Spark-ignited pilot	Gas	Page
CGi-25 to **CGi-8**	Resideo VR8204/VR8304	Natural/Propane	50

Adjust Boiler Control Settings

BOILER OPERATING TEMPERATURE

With power turned on, control module receives a signal from the temperature/LWCO sensor and displays boiler temperature. The control screen labeled CH TEMP SETTING is used to adjust the operating temperature setpoint, refer to the **"Control Operation" on page 51** to adjust.

- **ADJUST BOILER OPERATING TEMPERATURE TO DESIRED SETPOINT.**

BOILER ECONOMY SETTING

To comply with Department of Energy regulations, the control module circulates available hot water before turning on the boiler to attempt to satisfy a call for heat. While attempting to satisfy the heat demand, the control module also monitors the boiler temperature changes via the temperature/LWCO sensor and determines whether or not the available hot water will satisfy the demand, adjusting the time delay to turn on the boiler until it determines that additional heat will be needed. The menu item ECONONY SETTING in the ECONOMY SETTINGS menu of the Advanced settings section, provides adjustment between Maximum (100%) and Minimum (10%) of the standard time delay used for starting the ignition process. The maximum (100%) adjustment setting should be used to maximize energy savings. Reducing the setting decreases the delay time and should be used in the event that the heated space becomes uncomfortable.

- **ADJUST ECONOMY TO DESIRED POSITION (100% IS THE PREFERRED SETTING).**

IMPORTANT

In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases.

This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function.

THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.
- This boiler is equipped with a tankless coil

Start-Up (continued)

Boiler Operation (continued)

Start the Boiler

Follow the **Operating Instructions** from **page 50** to start the boiler. Remove boiler jacket door and note the gas valve manufacturer and model number. Use only the operating instruction which applies to this gas valve (see **Table 11, page 63**). (The operating instruction label on the boiler provides the same information.)

See below **If Boiler Doesn't Start . . .**.

Check System and Boiler

1. **Check system piping for leaks.** If found, shut down boiler and repair immediately.
2. **Vent air from system** using manual vents. Air in the system will interfere with circulation and cause heat distribution problems and noise.
3. **Inspect vent system** thoroughly for signs of deterioration from corrosion, physical damage or sagging. Verify that masonry chimney liners are in good condition, with no obstructions, and there are no openings into the chimney.
4. **Check around the boiler** for gas odor following the procedure to check for gas leaks on **page 61**.
5. **Verify operation** per **"Operation Verification" on page 65**. Perform check-out procedure in **"Final Verification Checklist" on page 66** and fill in the **Installation and service certificate** on the same page.

⚠ WARNING

If you discover evidence of any gas leak, shut down the boiler at once. Find the leak source with bubble test and repair immediately. Do not start boiler again until corrected. Failure to comply could result in severe personal injury, death or substantial property damage.

Eliminate all system leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

Glycol or antifreeze leaks around the boiler may result in fire, causing severe personal injury, death or substantial property damage.

⚠ DANGER

Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

If Boiler Doesn't Start . . .

Check for:

1. Loose connections, blown fuse or service switch off?
2. Boiler temperature adjustment set below boiler water temperature?
3. Thermostat set below room temperature?
4. Gas not turned on at meter or boiler?
5. Incoming gas pressure less than:
   - 5" w.c. for natural gas?
   - 11" w.c. for propane gas?
6. If none of the above corrects the problem, refer to **"Troubleshooting" on page 73** of this manual.

Start-Up (continued)

Operation Verification

NOTICE

See operation and operating information earlier in this section.

Check Burner Flames

Pilot Burner Flame (Figure 37)

PROPER pilot flame

1. Blue flame.
2. Inner cone engulfing pilot flame sensor (spark-ignited pilot).
3. Pilot flame sensor glowing cherry red.

IMPROPER pilot flame

1. Overfired — Large flame lifting or blowing past pilot flame sensor.
2. Underfired — Small flame. Inner cone not engulfing pilot flame sensor.
3. Lack of primary air — Yellow flame tip.

Main Burner Flame (Figure 38)

PROPER main burner flame

1. Yellow-orange streaks may appear (caused by dust).

IMPROPER main burner flame:

1. Overfired — Large flames.
2. Underfired — Small flames.
3. Lack of primary air — Yellow tipping on flames (sooting will occur).

Check Vent System Operation

1. Check vent system at least once a month during heating season.

Figure 37 Typical pilot burner flame

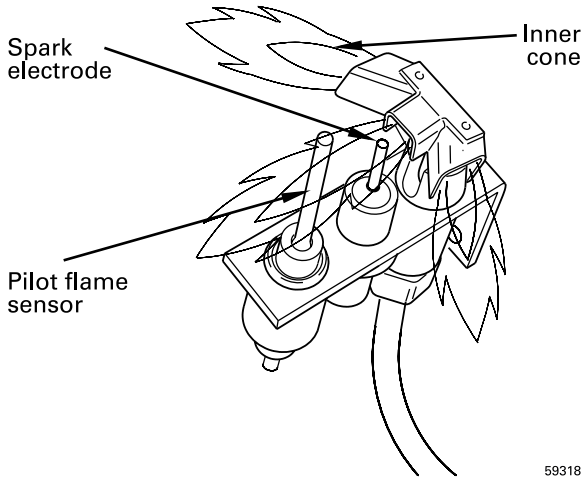
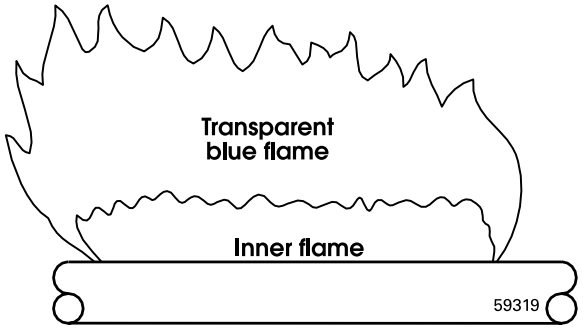


Figure 38 Typical main burner flame



Final Verification Checklist

- ☐ Boiler and heat distribution units filled with water?
- ☐ Automatic air vent, if used, open one full turn?
- ☐ Air purged from system?
- ☐ Air purged from gas piping? Piping checked for leaks?
- ☐ Correctly sized manifold orifices installed? Refer to **Table 4 on page 16** to check size and fuel type.

⚠ DANGER

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

- ☐ Followed operating instructions on boiler or in manual **"Operation" on page 45** for proper start-up?
- ☐ Proper burner flame observed? Refer to "Check Burner Flames", manual **"Operation Verification" on page 65**.
- ☐ Test temperature limit — When burners are operating, adjust Boiler Temperature setting until display reading is below actual boiler water temperature. Burners should go off while circulator continues to operate. Adjust Boiler Temperature setting until display reading is above boiler water temperature and ignition sequence should resume.
- ☐ Test low water cut off - While burners are operating, press and hold "LWCO TEST" button on control. Burners should go off while circulator continues to operate and LWCO should be displayed. Release "LWCO TEST" button and ignition sequence should resume.
- ☐ Test field-installed controls — If the boiler has an external high temperature limit, additional low water cutoff, or other controls, test for operation as outlined by manufacturer. Burners should be operating and should go off when controls are tested. When controls are restored, burners should reignite.
- ☐ Test ignition system safety device.
- ☐ Connect manometer to outlet side of gas valve. Start boiler, allowing for normal start-up cycle to occur and main burners to ignite. With main burners on, manually shut off gas supply at manual main shutoff gas valve. Burners should go off. Open manual main shutoff gas valve. Manometer should confirm there is no gas flow. Pilot will relight, flame sensing element will sense pilot flame and main burners reignite.
- ☐ Set Boiler Temp adjustment to system temperature requirements. Adjust balancing valves and controls to provide design temperature to system.
- ☐ Set Economy mode.
- ☐ For multiple zones, adjust flow so it is about the same in each zone.
- ☐ Cycle boiler with thermostat — Raise to highest setting and verify boiler goes through normal start-up cycle. Lower to lowest setting and verify boiler goes off.
- ☐ Cycle DHW Aquastat if used.
- ☐ Measure natural gas input:
  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:

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

  e. Btuh calculated should approximate input rating on boiler rating label.
- ☐ Check manifold gas pressure by connecting manometer to downstream test tapping on main gas valve.
  a. CGi-25, -3, -5 & -6 manifold pressure:
  Natural Gas: 3.5" w.c.
  Propane: 10" w.c.
  b. CGi-4, -7, & -8 manifold pressure:
  Natural Gas: High Fire, 3.5" w.c.; Low Fire, 0.9" w.c.
  Propane: High Fire, 10" w.c.; Low Fire, 2.6" w.c.
- ☐ Observe several operating cycles for proper operation.
- ☐ Set room thermostat to desired room temperature.
- ☐ Fill in Installation and service certificate below?
- ☐ Review all instructions shipped with this boiler with owner or maintenance person. Return instructions to envelope and give to owner.

Installation and service certificate

Boiler model _____ Series _____ Consumer Protection number _____ Date installed _____

Measured Btuh input _____

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

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

Installer's signature: _____

Section 5
Service and Maintenance

Service and Maintenance

Schedule

VERIFY PROPER OPERATION AFTER SERVICING

Table 12 Service and maintenance schedules

	Service technician (see following pages for instructions)	Owner maintenance (see CGi User's Information Manual for instructions)	
Annual start-up	**Inspect:** • Reported problems • Boiler area • Air openings • Flue gas vent system (and air piping) • Pilot and main burner flames • Water piping • Boiler heating surfaces • Burners, base and inlet air box • Condensate drain system **Service:** • Inducer motor • Temperature/LWCO sensor **Start-up:** • Perform start-up per manual **Check/test:** • Gas piping • Cold fill and operating pressures • Air vents and air elimination • Limit controls and cutoffs • Expansion tank • Boiler relief valve **Review:** • Review with owner	Daily	• Check boiler area • Check air openings • Check boiler pressure/ temperature gauge
		Monthly	• Check boiler interior piping • Check venting system • Check air vents • Check boiler relief valve • Check condensate drain system • Check automatic air vents (if used)
		Periodically	• Test low water cutoff
		Every 6 months	• Oil inducer motor • Operate relief valve
		End of season	• Shut down procedure

⚠ WARNING

Follow the **Service and maintenance** procedures given throughout this manual and in component literature shipped with the boiler. Failure to perform the service and maintenance could result in damage to the boiler or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death or substantial property damage.

Service and Maintenance (continued)

Annual Start-up

⚠ WARNING

- The boiler should be **inspected and started annually,** at the beginning of the heating season, **only by a qualified service technician**. In addition, the maintenance and care of the boiler designated in **Table 12 on page 67**, and explained on the following pages must be performed to assure maximum boiler efficiency and reliability. Failure to service and maintain the boiler and system could result in equipment failure.
- **Eliminate all system or boiler leaks.** Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure. Leaking water may also cause severe property damage.
- **Electrical shock hazard — Turn off power to the boiler before any service operation** on the boiler except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

⚠ DANGER

- **Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.**

☐ Inspect . . .

Reported Problems

Inspect any problems reported by owner and correct before proceeding.

Boiler Area

1. Verify that boiler area is free of any **combustible materials**, gasoline and other flammable vapors and liquids.
2. Verify that boiler area (and air intake) is free of any of the **contaminants** listed in **Table 3** on **page 13** of this manual. If any of these are present in the boiler intake air vicinity, they must be removed. If they cannot be removed, install combustion air piping to the boiler in accordance with national, or local codes.

Air Openings

1. Verify that combustion and ventilation air openings to the boiler room and/or building are open and **unobstructed**. Check operation and wiring of automatic combustion air dampers, if used.
2. Verify that boiler vent discharge and air intake are **clean and free of obstructions**.

Flue Gas Vent System

1. **Visually inspect entire flue gas venting system** for blockage, deterioration or leakage. Repair any joints that show signs of leakage in accordance with vent manufacturer's instructions.
2. Verify that masonry chimneys are lined, lining is in good condition, and there are not openings into the chimney.

⚠ WARNING

Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

Pilot and Main Burner Flames

1. Visually inspect pilot burner and main burner flames as directed under **"Operation Verification" on page 65** of this manual.

Water piping

1. Check the boiler interior piping and all system piping for signs of leaks.
2. Repair any leaks before proceeding.

Service and Maintenance (continued)

Annual Start-up (continued)

☐ Inspect . . .

Boiler Heating Surfaces

1. Disconnect the vent pipe at the boiler inducer outlet connection after turning off power to the boiler.
2. Use a bright light to inspect the flue pipe interior and inducer interior.
3. Inspect the boiler vent outlet area and heating surfaces by looking through the opening.
4. If the vent pipe or inducer interior show evidence of soot, follow **"Cleaning Boiler Heating Surfaces" on page 72** to remove the flue collector and clean the boiler if necessary after close inspection of boiler heating surfaces. If there is evidence of rusty scale deposits, check the water piping and control system to make sure the boiler return water temperature is properly maintained (per this manual).
5. Reconnect vent to inducer outlet and replace all boiler components before returning to service.
6. Check inside and around boiler for evidence of any leaks from the boiler. If found, locate source of leaks and repair.

⚠WARNING

- The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 92** of this manual. Failure to comply could result in severe personal injury.
- If insulation is damaged or displaced, do not operate the boiler. Replace or reposition insulation as necessary. Failure to replace damaged insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

Burners and Base

1. After turning off power to the boiler, remove the base burner shield (**Figure 43, item 4, page 84**).
2. Inspect burners and all other components in the boiler base.
3. If burners must be cleaned see Burner cleaning instructions below.
4. Inspect the slotted jacket cooling openings in the bottom left and right of the base pan (**Figure 43, item 7, page 84**).
5. Inspect the base insulation. Pay attention to the **WARNING** on, **page 92** regarding working with insulation materials. Verify that the insulation is intact and secure against all four sides of the base. Burner cleaning instructions.

Burner Cleaning Instructions

⚠WARNING

Airborne materials, such as fiberglass and dust, are present during construction and remodeling. These materials can be drawn in with the combustion air and obstruct burner ports, resulting in carbon monoxide production, a fire hazard, or building freeze damage. Read and follow the **WARNING** on **page 13**. Failure to inspect and clear gas burner ports could result in severe personal injury, death or substantial property damage.

1. Remove burner shield and the base pan air baffle. Next remove the pilot bracket assembly. Then remove the four screws securing the burner tray to the manifold and slide the burner tray out under the manifold.
2. Inspect each burner to insure that every port is completely open.
3. If any port is not completely clear, run a vacuum at the burner inlet while cleaning the burner ports with a wire brush. The vacuum will help to draw any airborne material out of the burner.
4. Reinstall components, starting with the burner tray, then the pilot bracket assembly, burner baffle, and air inlet top and front panels.
5. Follow the start-up procedure in the boiler manual.

Condensate Drain System

1. Inspect condensate drain fittings and tubing. Verify that condensate can flow freely to drain.

☐ Service . . .

Inducer Motor

1. With boiler power off, place a few drops of SAE 20 motor oil in each of the two oil cups.

⚠WARNING

Use only SAE 20 motor oil to lubricate the inducer motor. Do not use universal household oils. Motor could be damaged, resulting in possible severe property damage.

Oiled-Bearing Circulators

1. The circulator shipped with the CGi boiler is water-lubricated. No oiling is required.
2. Check other circulators in the system. Oil any circulators requiring oil, following circulator manufacturer's instructions. Over-oiling will damage the circulator.

Service and Maintenance (continued)

Annual Start-up (continued)

Temperature/LWCO Sensor

1. The temperature/LWCO sensor may accumulate deposits on the probe surface. Annual inspection and cleaning of the probe will improve boiler performance.

   Disconnect power, unplug harness from sensor.

   a. Drain boiler water to a level below the sensor.
   b. Remove sensor from boiler.
   c. Wipe any built up contaminates from probe and insulator surfaces.
   d. Reinstall sensor into boiler using appropriate thread sealant. Do not overtighten.
   e. Refill boiler.

☐ Start-up . . .

1. Perform all start-up procedures given in **"Start-Up" on page 61**.
2. Verify **cold fill pressure** is correct and that fill system is working properly.
3. Verify **antifreeze level** (if used) is at the right concentration and that inhibitor level is correct.
4. Check gas piping, per manual **page 38** and **page 61**, verifying no indications of leakage and all piping and connections are in good condition.
5. Read the Operating instructions (**page 50**). applying to the boiler.
6. Start the boiler following appropriate **Operating instructions** (**page 50**).

☐ Check/Test

Gas Piping

1. Sniff near floor and around boiler area for any indication of a **gas leak**.
2. **Test gas piping using bubble test**, per **page 38** of this manual, if there is any indication of a leak.

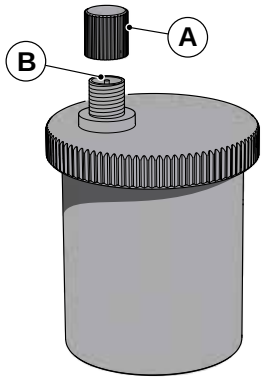
Cold Fill and Operating Pressures

1. While the system is cold, note the **pressure reading** on the boiler pressure/temperature gauge. Verify that cold fill pressure is correct.
2. **Watch the pressure** as the boiler and system heat up to ensure pressure rise is normal. Too high a rise would indicate a waterlogged or undersized expansion tank.

Air vents and Air Elimination

1. Inspect automatic air vents (if used). Also inspect air separators to ensure they are operational.
2. The cap must be unscrewed one turn to allow air to escape.
3. See **Figure 39**. If the air vent is leaking, remove cap **A** and briefly push valve **B** and then release to clean the valve seat.
4. Reinstall cap **A** by twisting all the way onto valve **B** and then unscrewing one turn.

Figure 39 Automatic air vent, typical



Limit Controls and Cutoffs

1. Inspect and test the boiler limit control. Verify operation by turning control set point below boiler temperature. Boiler should cycle off. Return control to original setting.
2. Inspect and test additional limit controls or low water cutoffs installed on system.

Expansion Tank

1. Expansion tanks provide space for water to move in an out as the heating system water expands due to temperature increase or contracts as the water cools. Tanks may be open, closed or diaphragm or bladder type. See **"Water Piping" on page 27** of this manual for suggested best location of expansion tanks and air eliminators.

- **Open-type —** located above highest radiator or baseboard unit, usually in the attic or closet. Has a gauge glass and overflow pipe to a drain.
- **Closed-type —** welded gas tight and located above boiler. Tank is partially filled with water, leaving an air cushion for expansion.
  - Make sure this type of tank is fitted with a **tank fitting**, such as the B & G Tank-Trol or Taco Taco-Trol. This fitting reduces gravity circulation of air-saturated tank water back to the system and prevents the air from bubbling up through the water as it returns from the system.
  - **Do not use automatic air vents in systems with closed-type tanks**. The air will escape from the system instead of returning to the tank. Eventually, the tank will waterlog and no longer control pressurization. The boiler relief valve will weep frequently.

Service and Maintenance (continued)

Annual Start-up (continued)

- **Diaphragm or bladder-type —** welded gas tight with a rubber membrane to separate the tank pressurizing air and the water. May be located at any point in the system, but most often found near the boiler.
  - Systems with this type of expansion tank require at least one **automatic air vent**, preferably located on top of an air eliminator, as shown in examples in manual **"Water Piping" on page 27**.

2. If relief valve has tended to weep frequently, the expansion tank may be waterlogged or undersized.

- **Closed-type tank —** tank is most likely waterlogged. Install a tank fitting if not already installed. Then check fill level per fitting manufacturer's instructions. If fill level is correct, check tank size against manufacturer's instructions. Replace with a larger tank if necessary.
- **Diaphragm or bladder-type —** first, check tank size to be sure it is large enough for the system. If size is too small, add additional tank(s) as necessary to provide sufficient expansion. If tank size is large enough, remove tank from system and check charge pressure (usually 12 psig for residential applications). If tank won't hold pressure, membrane has been damaged. Replace tank.**Check/Test**

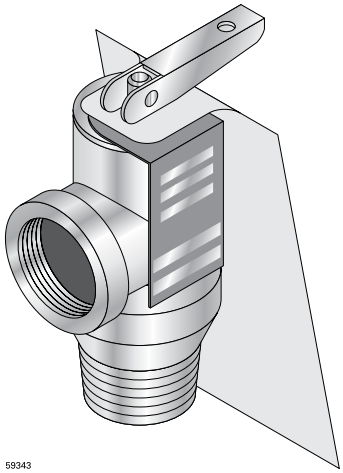
⚠WARNING

- Safety relief valves should be **reinspected AT LEAST ONCE EVERY THREE YEARS**, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency — not by the owner. Failure to reinspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death or substantial property damage.
- Following installation, the **valve lever must be operated AT LEAST ONCE A YEAR** to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal otherwise severe personal injury may result. **If no water flows, valve is inoperative.** Shut down boiler until a new relief valve has been installed.

Boiler Relief Valve

1. Inspect the relief valve and lift the lever to verify flow as in the following warnings, excerpted from a relief valve manufacturer's warning label. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read manual **page 27** before proceeding further.
2. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion tank waterlogging or undersizing.

Figure 40 Relief valve, typical



☐ Review with Owner

1. Review the **User's Information Manual** with the owner.
2. Emphasize the need to perform the maintenance schedule specified in the **User's Information Manual** (and in this manual as well).
3. Remind the owner of the need to call in a licensed contractor should the boiler or system exhibit any unusual behavior.
4. Remind the owner to follow the proper shutdown procedure and to schedule an annual start-up at the beginning of the next heating season.

Service and Maintenance

Annual Start-up (continued)

☐ Cleaning Boiler Heating Surfaces

⚠WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 92** of this manual. Failure to comply could result in severe personal injury.

1. Shut down boiler:
   - Follow "**To Turn Off Gas to Appliance**" instructions on boiler and **Operating instructions**.
   - Do not drain boiler unless it will be exposed to freezing temperatures. If using antifreeze in system, do not drain.
2. Follow shutdown procedure.
3. Remove venting system connection to boiler.
4. Remove top jacket panel. Turn back insulation.
5. Remove flue collector. Clean sealant from assembly and sections.
6. Remove radiation plates hanging between sections.
7. Remove burners from base. Brush and vacuum burners to remove all dust and lint. Verify that all burner ports are free of debris.
8. Place newspapers in base of boiler to collect soot.
9. Clean between sections with wire flue brush.
10. Remove newspaper and soot. Vacuum or brush base and surrounding area.
11. Reinstall radiation plates.
12. Reinstall collector box/transition assembly. Seal with sealant. Obtain gas-tight seal to prevent flue gas spillage and carbon monoxide emissions, resulting in severe personal injury or death.
13. Reinstall insulation and jacket top panel.
14. Start up boiler following **pages 61** of this manual and the boiler **Operating instructions** (**page 50**). Excessive sooting indicates improper gas combustion. If found, check for proper combustion and make any necessary adjustments.

Section 6 Troubleshooting

Troubleshooting

General

⚠ WARNING

- Turn off all power to the boiler when servicing. Failure to comply can cause electrical surges or electrical shock, which can result in severe personal injury, death, or substantial property damage.
- Wiring errors can cause improper and dangerous operation. Label all wires to ensure proper connection. Never jumper (bypass) any device except for momentary testing. Failure to comply can result in severe personal injury, death, or substantial property damage.

Always turn power off to the boiler before servicing and making connections. If assistance is required, please complete the **Installation and service certificate** in the boiler manual before calling Tech Services. The CP number can be found on the boiler jacket.

Checking Boiler Out Sensor

1. The boiler out temperature sensor is a resistance – type device.
2. The correct value for the sensor at various temperatures is shown in **Table 13**.
3. Use the resistance values at 32°F, 60°F. 70°F, and 212°F to measure the sensor resistance at known temperatures (freezing point, room temperature, and sea level boiling point). For freezing and boiling point, insert the sensor in water at that temperature. Use an ohmmeter to read the resistance value.
4. To check whether the control module is correctly sensing temperature, use a resistance decade box. Temporarily connect the decade box in place of a sensor and read the corresponding temperature on the control display.

Table 13 Sensor resistance values

Water Temperature		Expected Range	
Temp(°C)	Temp(°F)	Min R(Ω)	Max R(Ω)
0	32	293920	374080
5	41	227480	289520
10	50	177461	225859
15	59	139480	177520
20	68	110414	140526
25	77	88000	112000
30	86	70605	89861
35	95	56988	72530
40	104	46278	58900
45	113	37797	48105
50	122	31039	39505
60	140	21262	27060
70	158	14849	18899
80	176	10558	13438
90	194	7633	9715
100	212	5605	7133
110	230	4175	5313
120	248	3151	4011

The temperature should be close to the value corresponding to the input resistance.

Troubleshooting (continued)

⚠CAUTION

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

⚠WARNING

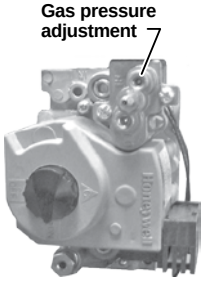
Never jumper (bypass) rollout thermal fuse element or any other device except for momentary testing as outlined in Troubleshooting Charts. Severe personal injury, death or substantial property damage can result.

Before Troubleshooting:

1. Have the following items:
   a. Voltmeter that can check 120VAC and 24VAC.
   b. Microammeter with a minimum scale range of 0-25.
   c. Continuity checker.
   d. U-tube manometer.
2. Check for 120VAC (minimum 102VAC to maximum 132VAC) to boiler.
3. Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for 24VAC between thermostat screw terminals and ground.

Check the Following:

1. Wire connectors to control module are securely plugged in at module and originating control.
2. Air pressure switch hoses are properly and securely plugged in and are not damaged.
3. Gas pressures:
   a. With boiler off — 13" w.c. maximum natural or propane gas pressure upstream of gas valve.
   b. With boiler on:
      • 5" w.c. minimum natural gas pressure or 11" w.c. propane gas pressure upstream of gas valve.
4. With boiler on, verify gas manifold pressure (downstream of gas valve):
   a. CGi-25, -3, -5 & -6 manifold pressure
   Natural Gas: 3.5" w.c.
   Propane: 10" w.c.
   b. CGi-4, -7, & -8 manifold pressure
   Natural Gas: High Fire 3.5" w.c. Low fire 0.9" w.c.
   Propane: 10" w.c. Low fire 2.6" w.c.
   c. CGi-4, -7, & -8 only: If the boiler is only operating at the Low Fire Manifold Pressure:
   Check to determine that there is 24Vac being delivered to the HI connection on the gas valve. If yes, then replace the gas valve.
   If no, verify that the High Fire Pressure Switch is in good working condition. Verify the air pressure switch reading from the procedure provided on page 75.



CGi-25, -3, -5 & -6

CGi-4, -7, & 8

Air Pressure Switch

NOTICE

- Make sure boiler water temperature is 100 °F or cooler before starting procedure to obtain appropriate readings.
- The boiler will not operate correctly unless pressure switch hoses are correctly located. The red hose connects from the black housing hose barb on the pressure switch (+) to the tapping on the right side of the collector hood. The white hose connects from the tan housing hose barb on the pressure switch (-) to the tapping on left side of the collector hood / transition (between flue collector and inducer) as shown in **Figure 41, page 75**.
  For the CGi-7 & 8 with the Dual Pressure Switch Assembly, the red hose connects to the Y-fitting connected to both (+) black hose barbs of the pressure switch assembly. See **Figure 41, page 75**.

Check Pressure Switch Setting

1. See **Figure 41, page 75**, and **Table 14, page 75**.
2. Remove both air pressure switch hoses from air pressure switch Y-fitting in in the case of the Dual Pressure Switch Assembly.
3. Install tees and tubing as shown in **Figure 41, page 75**, to inclined manometer.
4. Turn off gas valve and set thermostat to call for heat. Inducer will run but burners will not ignite.
5. Check for 24 VAC between both air pressure switch terminals.

Troubleshooting (continued)

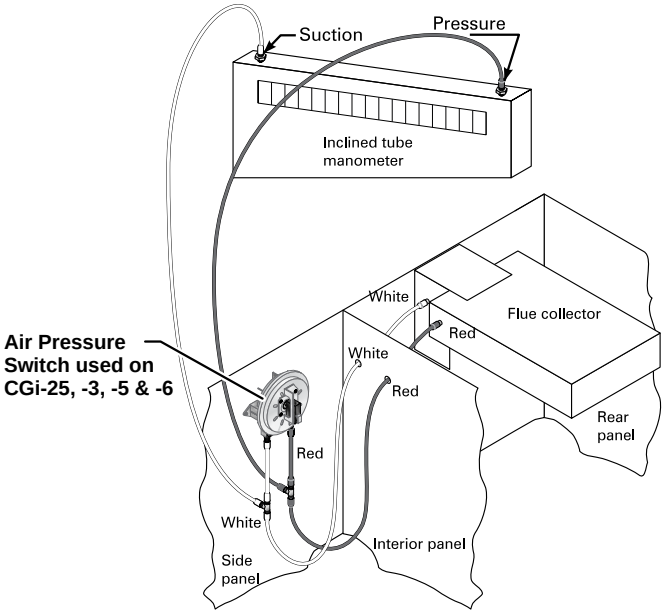
Troubleshooting Air Pressure Reading

1. If manometer reading is lower than the setpoint of the switch (see **Table 14, page 75**) — check for possible causes:
   - blockage in hoses
   - obstruction in inducer housing outlet
   - loose inducer wheel on motor shaft
   - inducer motor not in proper rpm
   - inducer back plate not sealed properly
   - blockage in block assembly
2. If manometer reading is above the setpoint of the switch (see **Table 14**), but there is not 24 VAC between both air pressure switch terminals — replace air pressure switch.

Return to Normal Operation

When pressure reading is correct and air pressure switch is operating properly — remove tees and reinstall hoses to air pressure switch.

Figure 41 Manometer connections



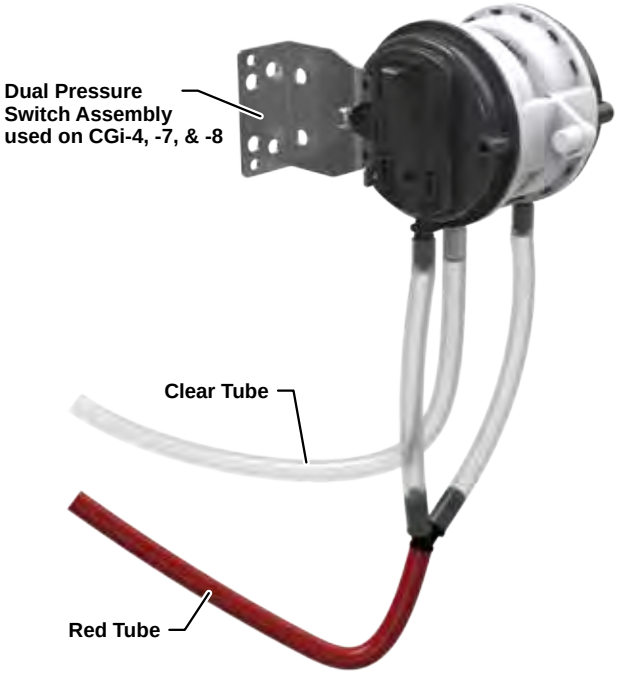


Table 14 Pressure switch setpoint (for elevations above 2,000 ft., contact your local Weil-McLain Technical Service office for details.)

Boiler model number	Inches W.C.
CGi-25	2.10
CGi-3	1.80
CGi-5	1.35
CGi-6	1.20

Boiler model number	Low Fire Pressure Switch (Red Label)	High Fire Pressure Switch (Purple Label)
	Inches W.C.	Inches W.C.
CGi-4	1.30	1.80
CGi-7	1.05	1.45
CGi-8	1.05	1.40

Troubleshooting (continued)

Errors and Lockouts

Control Display

There are two types of lockouts.

1. Manual reset lockouts. The operator must physically enter the reset screen and answer the reset question by changing the answer on line 2 to "YES".
2. Automatic reset lockouts. This lockout resolves with a self-reset when the error condition clears.

Loss of Power

In the event of a power failure, the entire boiler will de-energize. The signal relays used to command auxiliary devices connected to the boiler will also lose power and deactivate.

Manual Reset Procedure for Lockout —

DANGER

If there is an ignition fault, the following fault reset procedure should be performed. While on the fault indication screen, press and release the enter button.

A confirmation screen appears.

Initially the reset question will display an answer of NO on line 2. To change the answer on line 2, press the enter button. Next press the up or down arrow to change the answer to "YES" and press enter once more. The display background will change to green and revert back to the main screen.

Fault and Action Items

Table 15 Control fault information and troubleshooting

Fault Name	Fault Description	Troubleshooting	Action
CONFIRM CONFIGU-RATION	Board not configured.	Does the configuration number displayed match the boiler model? See CGi = Configuration #7	If No, Verify that for CGi there is 24Vac present on P13 pins 3, 4, & 5. If Yes, press enter to configure the control. **WARNING** Ensure boiler control is configured correctly per the boiler manual before operation. Failure to comply can result in severe personal injury, death, or substantial property damage.
CONFIG MISMATCH	Configuration number stored in the board does not match the configuration number the control reads from the harness.	Is the Configuration number shown for the board, on line 2 correct for the boiler model? CGi = Configuration #7	If No, and the number shown for the boiler is also incorrect, verify that for CGi there is 24Vac present on P13 pins 3,4 & 5 Press enter when the boiler number is correct. If Yes, verify that for CGi there is 24Vac present on P13 pins 3,4 & 5 If the voltages are correct on P13 and the boiler model still shows asother than listed above, replace the control. Press enter when the boiler number is correct **WARNING** Ensure boiler control is configured correctly per the boiler manual before operation. Failure to comply can result in severe personal injury, death, or substantial property damage.
AUTO LIMIT	Auto Limit chain / electrical circuit is open.	Is the Factory Jumper installed in the Auto Limit terminal block?	If Yes, verify continuity of jumper and factory wiring back to the control. If No, replace the jumper, unless there are devices that are intended to be wired to the Auto Limit chain.
		Are there devices installed / wired to the Auto Limit terminal?	If Yes, verify continuity of the Auto Limit chain P4 connector pins 2 & 3. • If there is continuity, verify factory wiring back to the control and verify the P4 connrctor is fully seated. If still showing "Auto Limit Open" replace the control.
			If Yes, and there is no continuity on the Auto Limit chain, verify all devices are in an operational state with closed contacts: Ensure there is electrical continuity with a multi-meter at the Auto Limit wiring connections on the device. • If a device will not close its electrical contact when normal operating conditions would indicate it should be closed, replace that device.

Troubleshooting (continued)

Errors and Lockouts (continued)

Fault Name	Fault Description	Troubleshooting	Action
MANUAL LIMIT	Manual Limit chain / electrical circuit is open.	Is the Factory Jumper installed in the Manual Limit terminal block?	If Yes, verify continuity of jumper and factory wiring back to the control. If No, replace the jumper, unless there are devices that are intended to be wired to the Manual Limit chain.
		Are there devices installed / wired to the Manual Limit terminal?	If Yes, verify continuity of the Manual Limit chain at the field wiring terminal blocks. • If there is continuity, verify factory wiring back to the control.
			If Yes, and there is no continuity on the Manual Limit chain, verify all devices are in an operational state with closed contacts: Ensure there is electrical continuity with a multi-meter at the Manual Limit wiring connections on the device. • If a device will not close its electrical contact when normal operating conditions would indicate it should be closed, replace that device.
		Is the Rollout thermal switch closed?	A failed Rollout switch cannot be individually detected but will present itself to the control as a manual Fault. Replace the switch.
FALSE FLAME	Flame detected when the gas valve is not powered.	Verify flame is present at Pilot or Main Burners.	If Yes, close manual ball valves and verify flame has been extinguished.
		Verify wiring of Pilot valve and both Main gas valves are per the boiler manual.	If incorrect wiring is found, correct wiring and follow boiler manual for startup procedure to verify normal operation.
			If wiring is correct, verify that the pilot valve and both main gas valves are actually closing and stopping gas flow. If not, replace the valve that is faulty.
IGNITION FAULT	Maximum number of failed ignitions has been reached.	Is the Pilot sparking?	If not, verify wiring from control to pilot assembly. If in question, remove spark wire from control and check the continuity from the spade connection to the spark rod. If there is no continuity, replace pilot assembly. If pilot has continuity and there is still no spark, replace control.
		Is Gas present?	Check to verify that gas is present and all air has been safely bled from the gas piping. As the boiler goes through an ignition attempt proving pilot, verify gas pressures remain within the stated operating pressures of the boiler manual.
		Pilot is sparking but no pilot flame.	• Verify that the Pilot valve is being energized with 24 Vac. • Is the Pilot gas line piped and routed properly per this boiler manual with no kinks or lose connections? • Verify gas is flowing to the pilot. If not, replace the Pilot valve.
		Pilot is lighting, but not energizing the Main Gas Valve(s).	• Check Pilot Flame Signal in the Control Diagnostics: a flame signal < 60 is required for proven flame. If the flame signal does not register, check the Pilot Flame Sense wiring and Flame Rod for continuity and corrosion on the rod. Replace if necessary. • If a pilot gas pressure regulator is used with lower gas inlet pressures, increase the pilot gas pressure regulator to provide additional gas to the pilot.
		Pilot is lighting, but Main Flame is not.	• Verify that the Main Gas valve(s) are being energized with 24 Vac. • Verify all Manual gas valves are in the open position. • Verify Manifold pressure during Main Flame ignition.
		Main Flame is lighting, but not staying lit.	• Verify inlet gas pressure is within range specified in the boiler manual.
			• Verify the Manifold pressure is set per the boiler manual.

Troubleshooting (continued)

Errors and Lockouts (continued)

Fault Name	Fault Description	Troubleshooting	Action
FLAME LOST	Flame has been lost during operation.	All boilers	• Check Pilot Flame Signal in the Control Diagnostics: a flame signal < 60 is required for proven flame. If the flame signal does not register, check the Pilot Flame Sense wiring and Flame Rod for continuity and corrosion on the rod. Replace if necessary. • Verify Inlet Gas pressure and Manifold pressure through both high fire and reduced firing rates: Ensure pressures are within ranges specified in the boiler manual.
BOILER OUT OPEN	Boiler Control measures an open circuit.	Inspect Boiler Out Sensor and wiring.	• Verify that wiring has no breaks, cuts, or damage that could short or provide an open circuit for the sensor reading back to the control. • Measure the individual resistance values of Boiler Out and compare to **Table 13, page 73.** • Replace Boiler Out Sensor if values are outside the range of the table for the given temperature.
BOILER OUT SHORT	Boiler Control measures a closed circuit with no resistance.		
HARDWARE FAULT 1	Control Board Hardware faults – A/D converter fault, flame circuit fault, RAM fault, ROM fault, sequence fault, RAM disagrees fault.	Possible Control Board failure.	Cycle power on control. If fault reoccurs when transitioning from Steady Heat to Standby, replace the control.
HARDWARE FAULT 2	Control Board Internal Relay Error.	Possible Control Board failure.	Cycle power on control. If fault reoccurs when transitioning from Steady Heat to Standby, replace the control.
HARDWARE FAULTS 3, 4, 6, 8	Control Board Internal Relay Error.	Possible Control Board failure.	Cycle power on control. If fault reoccurs when ending the next heat cycle, replace the control.
HARDWARE FAULT 5	Possible Control board failure or Pilot valve harness short to 24 Vac.	All boilers	• Disconnect Pilot valve harness at control P12. Check for voltage on the harness C12 pin 4. If voltage is detected, inspect harness for short. • If no voltage is detected at C12 pin 4, reconnect all harness connectors and cycle power on the control. If fault reoccurs when ending the next heat cycle, replace the control.
HARDWARE FAULT 7	Possible Control board failure or Main valve harness short to 24 Vac.	All Boilers	Disconnect Main Gas valve harness at control P12. Check for voltage on the harness C12 pin 5. If voltage detected inspect harness for short.
CH VOLTAGE HIGH	CH / Thermostat1 input excessive voltage.	Measure CH / Thermostat1 supply voltage.	Unplug the control P3 connector. Measure the voltage between the control connector's Pins 1 & 3. Is the measured voltage in excess of 24 Vac nominal? • If No, inspect the harness for a short. • If Yes, measure the voltage of the 24 Vac transformer output connector P1, between P1 pins 6 & 7, without unplugging it from the control. Is the measured voltage in excess of 24 Vac nominal? • If Yes, replace the transformer. • If No, inspect 120 Vac supply power.

Troubleshooting (continued)

Errors and Lockouts (continued)

Fault Name	Fault Description	Troubleshooting	Action
DHW VOLTAGE HIGH	DHW / Thermostat2 input excessive voltage.	Measure DHW / Thermostat 2 supply voltage.	Unplug the control P3 connector. Measure the voltage between the control connector's Pins 4 & 6. Is the measured voltage in excess of 24 Vac nominal? • If No, inspect the harness for a short. • If Yes, measure the voltage of the 24 Vac transformer output connector P1, between P1 pins 6 & 7, without unplugging it from the control. Is the measured voltage in excess of 24 Vac nominal? • If Yes, replace the transformer. • If No, inspect 120 Vac supply power.
PS Fault	Pressure Switch Fault.	Check Pressure switch wires and pressure switch	• Unplug P6 wire harness. Check for continuity using a multimeter from the Pressure Switch leads to the connector. If continuity is broken along the wire, replace the harness. • Verify that pressure switch hoses are in good condition and properly installed Using a multimeter, check pressure switch open circuit when inducer is not running. Check for closed circuit when inducer is running during an ignition attempt. If either is not true replace the pressure switch. • Check for 24 VAC on P6 Pin 4 during an ignition attempt while the screen displays "Proving PS". If there is no voltage on Pin 4 replace the control.

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Section 7
Parts

Parts

Replacement Parts

⚠ WARNING

- Replacement parts must be purchased through a local Weil-McLain distributor. When ordering, specify boiler model and size and include description and part number of replacement part. Results from using modified or other manufactured parts will not be covered by warranty and may damage boiler or impair operation.
- The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 92** of this manual. Failure to comply could result in severe personal injury.

NOTICE

Weil-McLain part numbers are found in this **Replacement parts section**.

Miscellaneous Optional Kits

not shown	Outdoor Temperature Sensor - Wired	381-356-586
not shown	Outdoor Temperature Sensor - Wireless	384-000-325
not shown	Antifreeze, Sentinel X500, 1 Gallon	592-900-029
not shown	Antifreeze, Sentinel X500, 5 Gallon	592-900-006
not shown	Corrosion Inhibitor, Sentinel X100	592-900-002
not shown	Sentinel X100 Quick Test Kit	592-900-005
not shown	Cleaner, Sentinel X400 (1 gallon)	592-900-028

Gas Conversion Kits

not shown	Conversion Kit Propane Gas to Natural Gas	CGi 25	510-812-006
		CGi 3	510-812-053
		CGi 4	510-812-049
		CGi 5	510-812-017
		CGi 6	510-812-008
		CGi 7, 8	510-812-009
not shown	Conversion Kit Natural Gas to Propane Gas	CGi 25	510-812-002
		CGi 3	510-812-012
		CGi 4	510-812-048
		CGi 5	510-812-014
		CGi 6	510-812-004
		CGi 7, 8	510-812-005

Replacement Parts (continued)

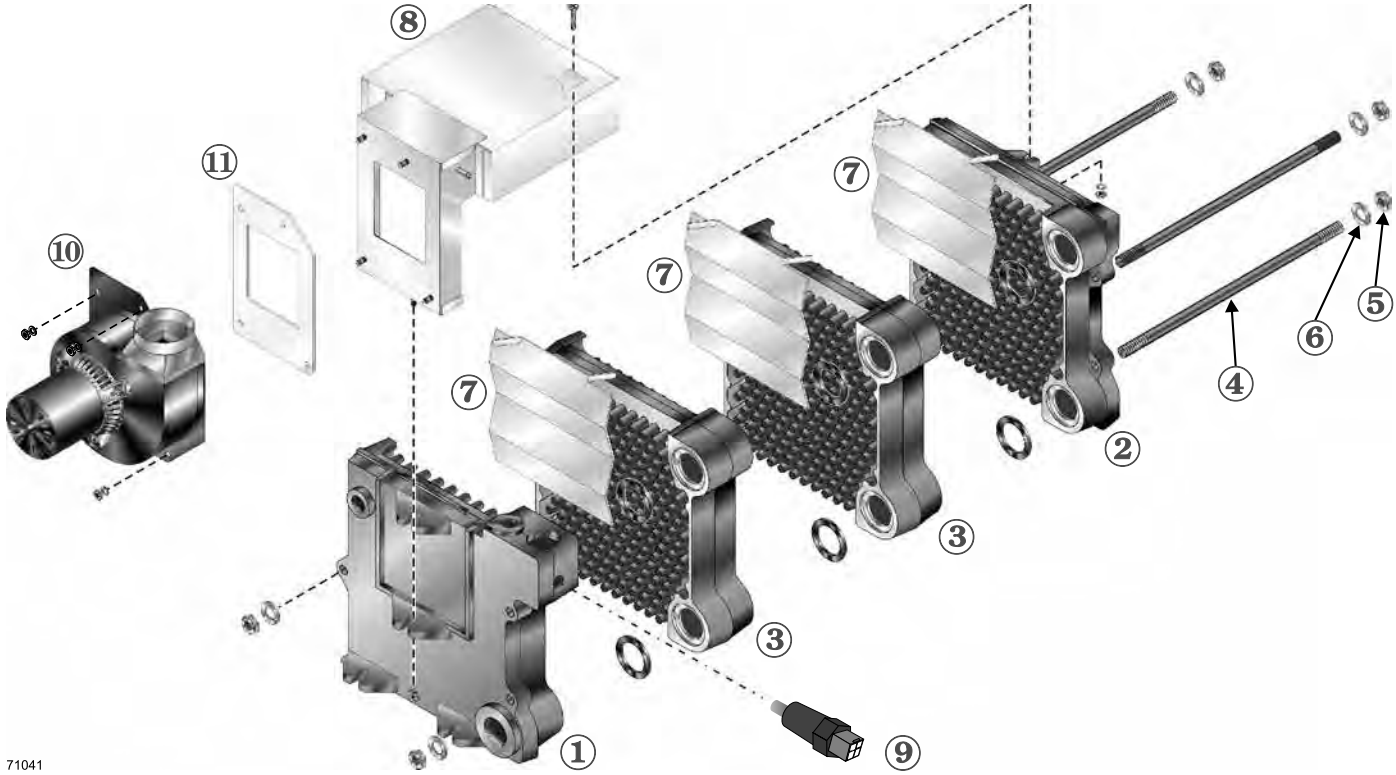
High Altitude Conversion Kits - Natural Gas		
not shown	CGi 7,8 2,000 to 4,999 Feet	510-812-018
	CGi 7,8 5,000 to 6,999 Feet	510-812-019
	CGi 7,8 7,000 to 8,999 Feet	510-812-020
	CGi 7,8 9,000 to 10,000 Feet	510-812-021
not shown	CGi 6 2,000 to 4,999 Feet	510-811-966
	CGi 6 5,000 to 6,999 Feet	510-811-967
	CGi 6 7,000 to 8,999 Feet	510-811-968
	CGi 6 9,000 to 10,000 Feet	510-811-969
not shown	CGi 5 2,000 to 3,999 Feet	510-812-024
	CGi 5 4,000 to 6,999 Feet	510-812-025
	CGi 5 7,000 to 8,999 Feet	510-812-026
	CGi 5 9,000 to 10,000 Feet	510-812-027
not shown	CGi 4 2,000 to 3,999 Feet	510-812-110
	CGi 4 4,000 to 6,999 Feet	510-812-111
	CGi 4 7,000 to 8,999 Feet	510-812-112
	CGi 4 9,000 to 10,000 Feet	510-812-113
not shown	CGi 3 2,000 to 3,999 Feet	510-811-954
	CGi 3 4,000 to 6,999 Feet	510-811-955
	CGi 3 7,000 to 8,999 Feet	510-811-956
	CGi 3 9,000 to 10,000 Feet	510-811-957
not shown	CGi 25 2,000 to 4,999 Feet	510-811-950
	CGi 25 5,000 to 6,999 Feet	510-811-951
	CGi 25 7,000 to 8,999 Feet	510-811-952
	CGi 25 9,000 to 10,000 Feet	510-811-953

High Altitude Conversion Kits - Propane		
not shown	CGi 7,8 2,000 to 6,999 Feet	510-812-022
	CGi 7,8 7,000 to 10,000 Feet	510-812-023
not shown	CGi 6 2,000 to 6,999 Feet	510-811-978
	CGi 6 7,000 to 10,000 Feet	510-811-979
not shown	CGi 5 2,000 to 6,999 Feet	510-812-028
	CGi 5 7,000 to 10,000 Feet	510-812-029
not shown	CGi 4 2,000 to 6,999 Feet	510-812-114
	CGi 4 7,000 to 10,000 Feet	510-812-115
not shown	CGi 3 2,000 to 6,999 Feet	510-811-972
	CGi 3 7,000 to 10,000 Feet	510-811-973
not shown	CGi 25 2,000 to 6,999 Feet	510-811-970
	CGi 25 7,000 to 10,000 Feet	510-811-971

Parts (continued)

Section Assembly

Figure 42 Section assembly



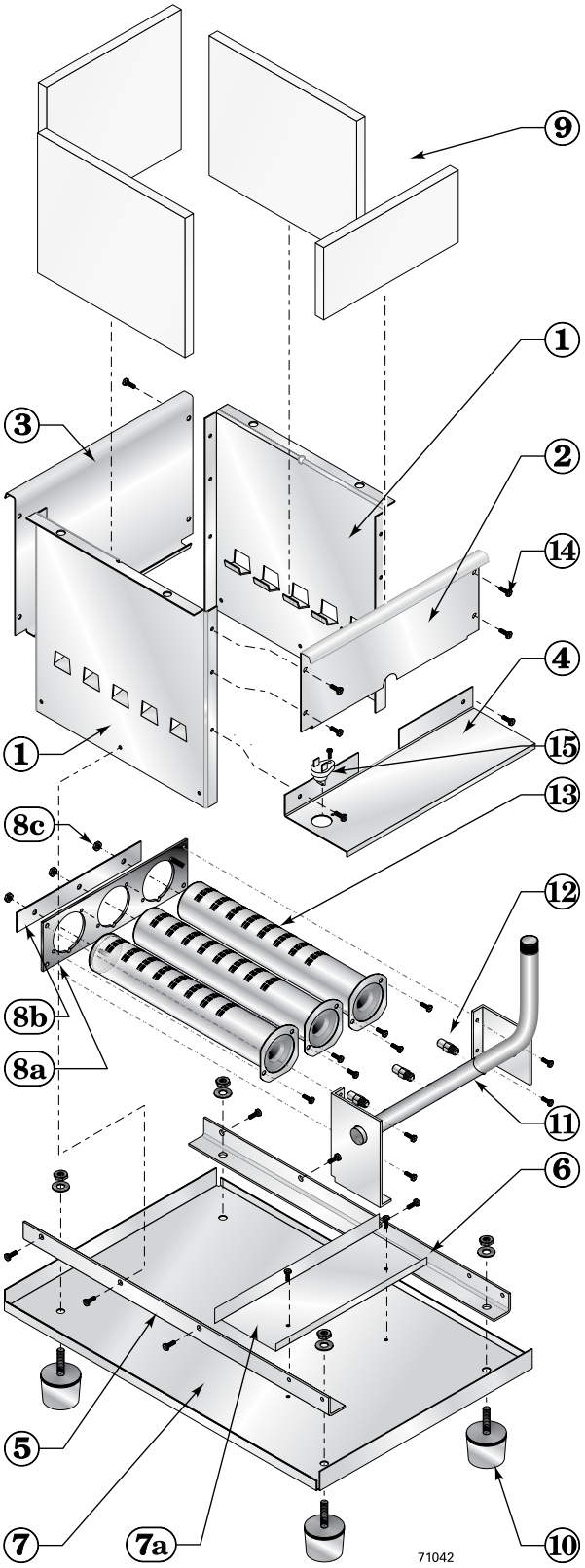
Item	Description		Weil-McLain part number
1	End section, left hand, 51124		311-103-851
2	End section, right hand 51128		311-103-821
3	Intermediate section, 51127		311-103-845
not shown	Replacement section assembly	CGi-25 and CGi-3 CGi-4 . . . . . . CGi-5 . . . . . . CGi-6 . . . . . . CGi-7 . . . . . . CGi-8	321-114-360 321-114-361 321-114-362 321-114-363 321-114-364 321-114-365
not shown	Section replacement kit, includes seals and sealant for 1 joint		381-354-527
4	Tie rod, $^{7}/_{16}$" without nut (3 per boiler):	CGi-25 and CGi-3 CGi-4. . . . . . CGi-5. . . . . . CGi-6. . . . . . CGi-7. . . . . . CGi-8	560-234-500 560-234-501 560-234-502 560-234-503 560-234-504 560-234-505
5	Nut, $^{7}/_{16}$" (2 per tie rod)		561-928-235

Item	Description		Weil-McLain part number
6	Washer, $^{7}/_{16}$" (1 per tie rod)		562-248-684
7	Radiation plate (1 per joint)	CGi 4-8	460-003-017
8	Collector hood and transition assembly	CGi-25 CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	381-359-286 381-359-287 381-359-288 381-359-498 381-359-290 381-359-478 381-359-479
9	Temperature/LWCO Sensor		381-356-589
10	Inducer fan assembly kit, includes inducer fan assembly, gasket and nuts	CGi 25 & 3 CGi 4-6 CGi 7 & 8	381-354-588 381-359-295 381-359-294
11	Gasket, inducer		590-317-627

Parts (continued)

Base

Figure 43 Base assembly, manifold, orifices and burners

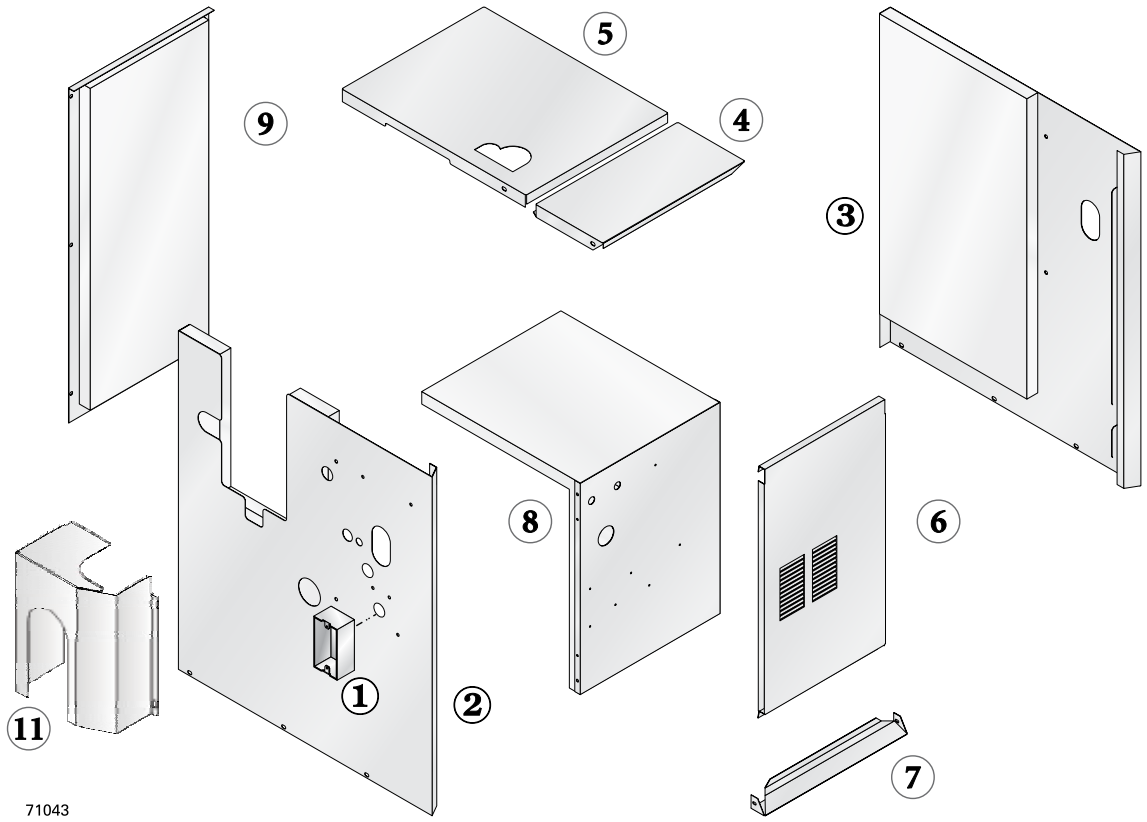


Item	Description		Weil-McLain part number
	Base assembly kit (includes base panels items 1, 2, 3, 4, 5, 6 and 7)	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	381-354-337 381-354-338 381-354-339 381-354-340 381-359-502 381-359-503
1	Base side panel (in Base assembly)		
2	Base front cross-tie assembly (in Base assembly)		
3	Base back cross-tie assembly (in Base assembly)		
4	Burner shield (in Base assembly)		
5	Base pan angle, left side (in Base assembly)		
6	Base pan angle, right side (in Base assembly)		
7	Base pan (in Base assembly)		
7a	Base pan air baffle (in Base assembly)		
8a	Burner mounting plate	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	450-003-690 450-003-691 450-003-692 450-003-693 450-003-795 450-003-796
8b	Rear spacing strip	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	550-320-160 550-320-161 550-320-162 550-320-163 550-320-164 550-320-165
8c	Nut, hex 5mm Zp		550-320-170
9	Base insulation kit	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	381-354-330 381-354-331 381-354-332 381-354-333 381-354-334 381-354-335
10	Boiler leg kit		550-320-219
11	Manifold	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	591-126-735 591-126-736 591-126-737 591-126-738 591-126-739 591-126-740
12	Main burner orifice — Natural gas, sea level (see Table 4, page 16 for orifice size) CGi-25 CGi-3, 4 CGi-5 CGi-6-8 Main burner orifice — Propane gas, sea level (see Table 4, page 16 for orifice size) CGi-25 CGi-3 CGi-4 CGi-5 CGi-6-8		 560-529-083 560-529-081 560-529-126 560-529-079 560-529-084 560-529-080 560-529-999 560-529-111 560-529-078
13	Burner		512-200-076
14	Screw, 10-32 x 0.38 STP type 23 hex, washer head slot		562-135-710
15	Rollout thermal fuse element		512-050-230

Parts (continued)

Jacket

Figure 44 Jacket assembly



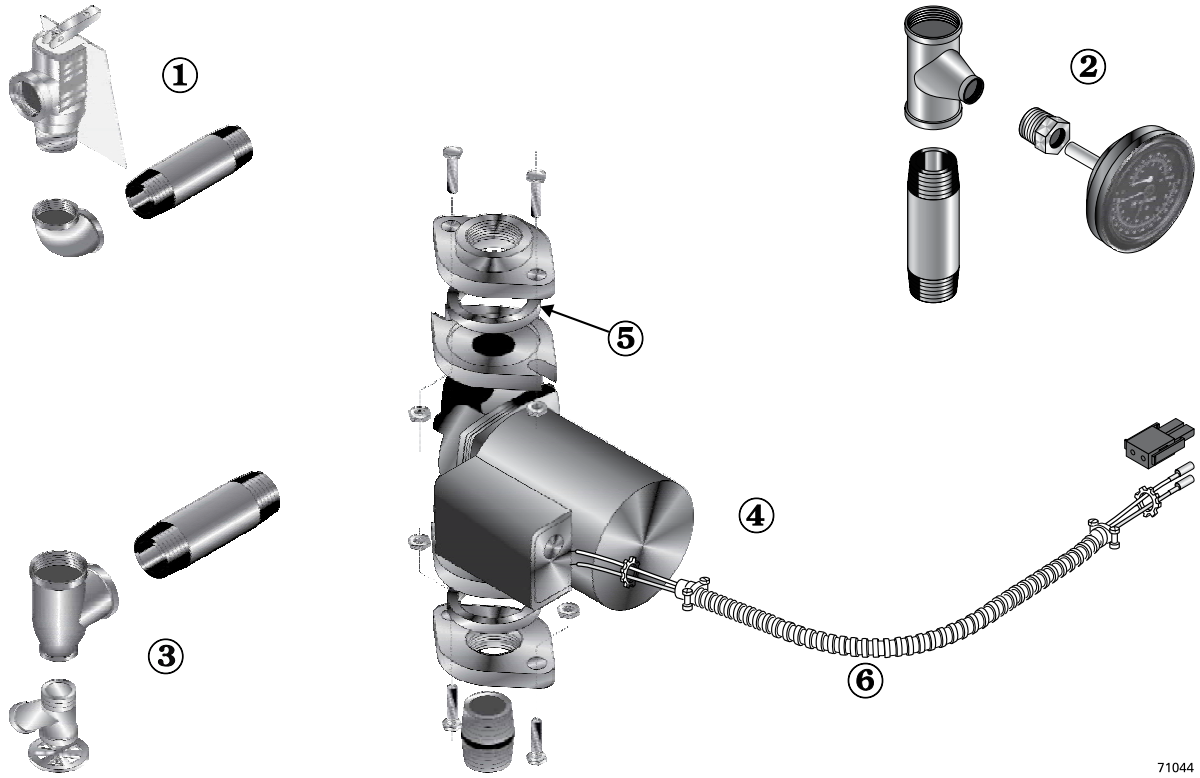
Boiler Model	1	2		3	4	5	Boiler Model
	Junction box, 2 x 4	Panel, l**eft side**,with insulation		Panel, **right side**, with insulation	Panel, **top front**, with insulation	Panel, **top rear**, with insulation	
		Natural Gas	Propane Gas				
	Weil-McLain part number						
CGi-25	(Available at local supply house)	381-359-463	381-359-470	381-359-229	381-359-230	381-359-242	CGi-25
CGi-3		381-359-464	381-359-471	381-359-229	381-359-230	381-359-242	CGi-3
CGi-4		381-359-465	381-359-472	381-359-229	381-359-231	381-359-243	CGi-4
CGi-5		381-359-466	381-359-473	381-359-229	381-359-232	381-359-244	CGi-5
CGi-6		381-359-467	381-359-474	381-359-229	381-359-233	381-359-245	CGi-6
CGi-7		381-359-468	381-359-475	381-359-229	381-359-234	381-359-246	CGi-7
CGi-8		381-359-469	381-359-466	381-359-229	381-359-235	381-359-247	CGi-8

Boiler Model	6	7	8	9	10	11	Boiler Model
	Panel, door	Cross tie, **bottom front**	Panel, **interior**, with insulation	Panel, **rear**, with insulation	Not shown — **touch-up paint**	Blower cover	
	Weil-McLain part number						
CGi-25	381-359-254	381-359-260	381-359-266	381-359-272	381-359-278		CGi-25
CGi-3	381-359-254	381-359-260	381-359-266	381-359-272	Cloud		CGi-3
CGi-4	381-359-547	381-359-261	381-359-543	381-359-273		381-359-200	CGi-4
CGi-5	381-359-256	381-359-262	381-359-268	381-359-274	384-000-141		CGi-5
CGi-6	381-359-257	381-359-263	381-359-269	381-359-275	Slate		CGi-6
CGi-7	381-359-258	381-359-264	381-359-500	381-359-276		Optional	CGi-7
CGi-8	381-359-259	381-359-265	381-359-501	381-359-277			CGi-8

Parts (continued)

Trim

Figure 45 Trim assembly

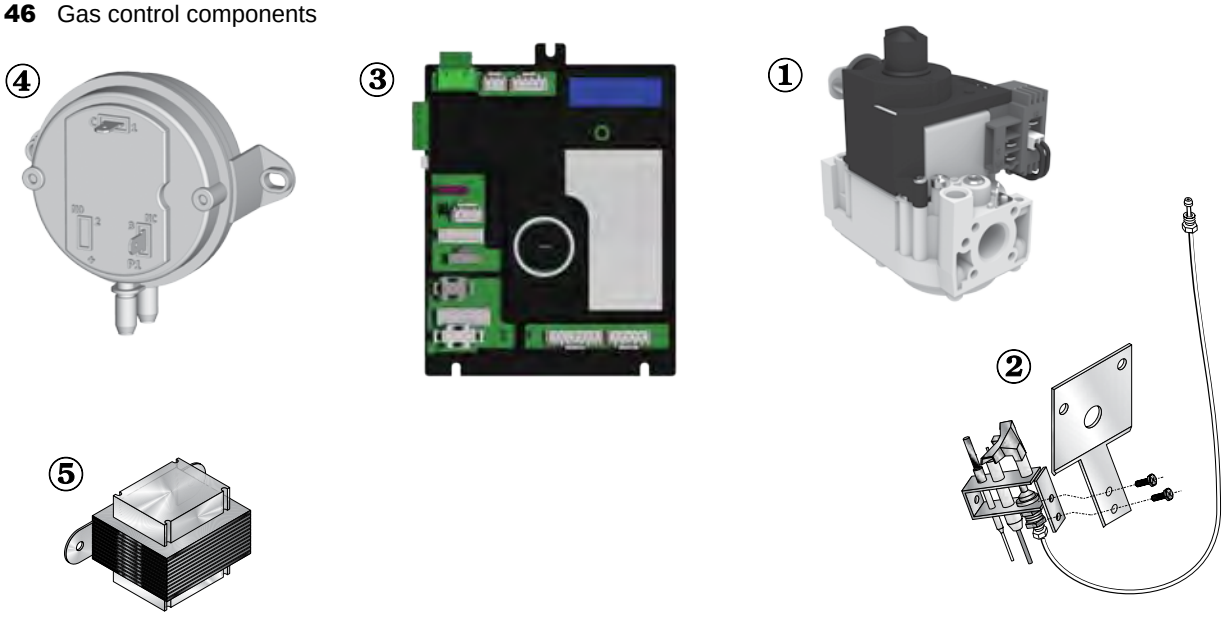


Item number	Description		Weil-McLain part number
1	Pressure relief valve, ASME, 30 PSIG, ¾" male inlet *(Fittings shown are factory-installed on boiler.)*		383-500-095
2	Combination pressure-temperature gauge, 3Z\," diameter, short shank *(Fittings shown are shipped loose with boiler.)*		380-000-000
3	Drain valve, ¾" . . . . . . *(Fittings shown are included with boiler.)*		511-210-423 511-246-392
4	Circulator *(Fittings shown are shipped loose with boiler.)*	CGi-25 through CGi-5 . . . . . . CGi-6	511-405-153 511-405-113
5	Circulator gasket, universal (2 per boiler)		590-317-535
not shown	Circulator hardware kit, includes: 1 flange, 2 nuts, 2 screws, 1 gasket —		
		¾" NPT — CGi-25	381-354-530
		1" NPT — CGi-3 through CGi-5.	381-354-525
		1¼" NPT — CGi-6-7.	381-354-526
		1½" NPT — CGi-8	381-354-531
6	Circulator wiring harness kit, with Molex *(loose)*		381-356-528

Parts (continued)

Spark Ignited Controls

Figure 46 Gas control components



Item number	Description	Boiler model	Weil-McLain part number
Natural gas components			
1	Gas Valve, ½" x ½" Gas Valve, ½" x ½" Gas Valve, ¾" x ¾"	CGi-25, -3, -5, & -6 . . . . . . CGi-4 . . . . . . CGi-7 thru 8	511-044-381 381-359-545 383-301-325
2	Pilot Kit w/Orifice & Aluminum Pilot Gas Tubing		511-330-080
Propane gas components			
1	Gas Valve, ½" x ½" Gas Valve, ½" x ½" Gas Valve, ¾" x ¾"	CGi-25, -3, -5, & -6 . . . . . . CGi-4 . . . . . . CGi-7 thru 8	511-044-354 381-359-546 381-359-536
2	Pilot kit w/orifice & aluminum pilot gas tubing		511-330-081
Natural gas and propane gas components			
3	Control Module		383-301-211
not shown	Wiring Harness - Gas Valve/Rollout Switch	CGi-25, -3, -5, & -6 . . . . . . CGi-4, -7, & -8	381-359-440 381-359-506
4	Air Pressure Switch	CGi-25 . . . . . . CGi-3 . . . . . . CGi-4 . . . . . . CGi-5 . . . . . . CGi-6 . . . . . . CGi-7 . . . . . . CGi-8	381-359-280 381-359-300 381-359-544 381-359-499 381-359-283 381-359-504 381-359-505
5	Control Transformer		383-500-628
not shown	Tubing, Air Pressure Switch, 0.12 I.D. silicone red, to collector hood . . . . . . white, to transition.		 590-317-650 590-317-651
not shown	Wiring Harness - J-Box to Control Module		381-359-447
not shown	Terminal Block, Thermostat Wiring		381-359-430
not shown	Wiring Harness - Water Temperature / LWCO Sensor		381-359-438
not shown	Wiring Harness - Inducer motor to Control Module		591-391-980
not shown	Wiring Harness - Pressure Switch to Control Module		381-359-448

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Section 8
Product Information

Product Information

Dimensions

Figure 47 Dimensional drawing

① Supply piping (note 1)

② Return piping (note 1)

③ Relief valve, ¾" NPT

④ ½" NPT to expansion tank/air vent

⑤ 3" Diameter vent

⑥ Gas supply piping

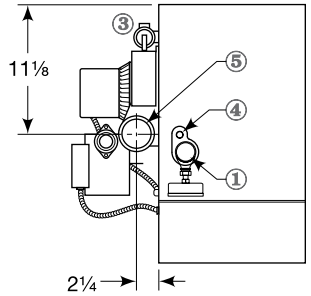
⑦ Drain valve

⑧ Gas supply entrance (right or left side)

⑨ Pressure/temperature gauge

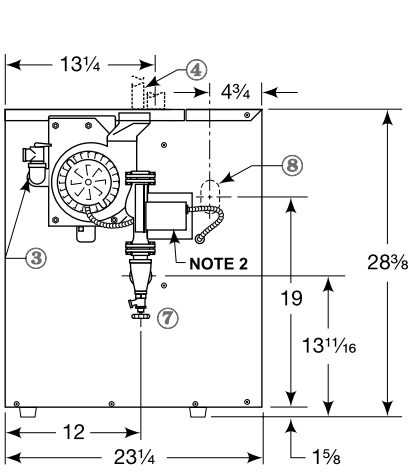
Note 1: Boiler supply and return tappings are both 1/4" NPT. See **Table 8, page 27** for recommended system supply and return sizes.

Note 2: Boiler circulator is shipped loose. Circulator may be mounted on either boiler supply or return piping. Circulator flange provided with boiler is same size as recommended pipe size in **Table 8, page 27**.



TOP VIEW

ALL DIMENSIONS IN INCHES



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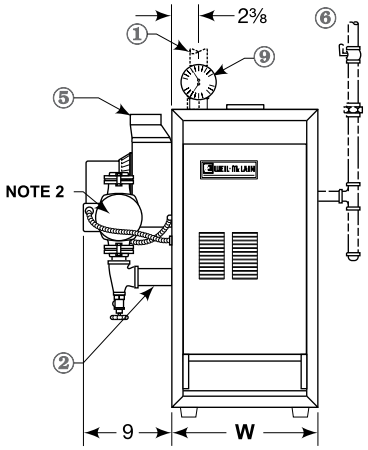
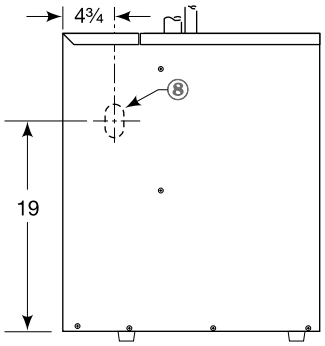
LEFT SIDE



FRONT



RIGHT SIDE

Boiler Model Number	Supply Tapping (inches NPT)	Return Tapping (inches NPT)	Gas Connection size Note 3 (inches NPT)	Gas Manifold size Note 3 (inches NPT)	"W" Jacket width (inches)
CGi-25	1 ¼	1 ¼	½	½	10
CGi-3	1 ¼	1 ¼	½	½	10
CGi-4	1 ¼	1 ¼	½	½	13
CGi-5	1 ¼	1 ¼	½	½	16
CGi-6	1 ¼	1 ¼	½	½	19
CGi-7	1 ¼	1 ¼	¾	¾	22
CGi-8	1 ¼	1 ¼	¾	¾	25
Note 3:	Gas piping from meter to boiler to be sized per local utility requirements.				

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Product Information (continued)

Ratings

AHRI Certified Ratings

Boiler Model Number	CSA Input	Heating Capacity	Seasonal Efficiency PIN - PIL	Net Output Water	Boiler water content	Vent size
(Note 1)	**MBH** *(Note 5)*	**MBH** *(Note 2)*	**AFUE %**	**MBH** *(Note 3)*	(gallons)	Inches *(Note 4)*
CGi-25	48.0	41	84.0	36	1.5	3"
CGi-3	58.0	49	84.0	43	1.5	3”
CGi-4	90.0	77	84.0	67	2.1	3”
CGi-5	119.0	102	84.0	89	2.7	3”
CGi-6	158.0	135	84.0	117	3.3	3”
CGi-7	190.0	162	84.0	141	3.8	3”
CGi-8	222.0	189	84.0	164	4.4	3”

Notes

1. Add “PIN” for Natural gas boiler - “PIL” for Propane boiler.
2. Based on standard test procedures prescribed by the United States Department of Energy. Ratings also referred to as CSA Output.
   NOTE: that only DOE Heating Capacity and AFUE are certified by AHRI. AFUE is also known as Annual Fuel Utilization Efficiency or Seasonal Efficiency.
3. Net AHRI ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads.
4. CGi boilers require special venting, consistent with Category I, or III boilers. Use only the vent materials and methods specified in this manual. Vent diameter shown above is for direct exhaust venting. See Table 5, page 19, for vent diameter when chimney draft venting.
5. Ratings shown are for sea level applications only. For altitudes from sea level to 2,000 feet above sea level, the CGi boiler requires no modifications and automatically derates itself by approximately 4% per 1000 feet above sea level.

NOTICE

- CGi boilers for residential radiant panel systems, converted gravity heating systems or other low water temperature applications should be installed with balancing valves and bypass piping equal to the supply and return size to avoid excessive flue gas condensation due to lower operating water temperatures.
- CGi boilers are CSA design certified for installation on combustible flooring.
- CGi boilers are ASME rated for 50 psig working pressure.

Product Information (continued)

Handling Ceramic Fiber and Fiberglass Materials

REMOVAL OF COMBUSTION CHAMBER LINING OR BASE PANELS

⚠ WARNING

The combustion chamber lining or base insulation panels in this product contain ceramic fiber materials. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).":

Precautionary Measures

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

NIOSH Stated First Aid.

- ☐ Eye: Irrigate immediately.
- ☐ Breathing: Fresh air.

REMOVAL OF FIBERGLASS WOOL

or

INSTALLATION OF FIBERGLASS WOOL, COMBUSTION CHAMBER LINING OR BASE PANELS:

⚠ WARNING

This product contains fiberglass jacket insulation and ceramic fiber materials in combustion chamber lining or base panels in gas fired products. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation.

Precautionary Measures

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

NIOSH Stated First Aid.

- ☐ Eye: Irrigate immediately.
- ☐ Breathing: Fresh air.

Notes

Notes

Notes

WEIL-McLAIN

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