



GOLD GV

Water Boiler — Series 4

Boiler Manual

- Installation
- Maintenance
- Start-Up
- Parts



WARNING

This manual must only be used by a **qualified heating installer/service technician**. Failure to comply could result in severe personal injury, death or substantial property damage.

How it works . . .

① Control module

The GOLD Control Module (GCM) responds to signals from the room thermostat, air pressure switch, inlet water sensor and boiler limit circuit to operate the circulators, gas valve, igniter and blower. When a room thermostat calls for heat, the GCM starts the system circulator and blower.

The GCM runs the blower to purge the boiler flue passages, then turns on the igniter and lets it warm up.

After a 15-second warmup, the GCM opens the gas valve, turns the igniter off, and checks for flame. The flame must come on within 4 seconds or the GCM will shut down and try the full cycle again.

When the room thermostat is satisfied, the GCM turns off the boiler components and waits for the next heat call.

The GCM indicator lights show normal sequence when the lights are on steady. When a problem occurs, the GCM flashes combinations of lights which indicate the most likely reason for the problem.

② Transformer

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

③ Blower

The blower pulls in air and mixes it with gas from the gas valve. The blower forces this mixture into the burner for combustion inside the boiler chamber.

④ Air pressure switch

The air pressure switch signals the control module, telling the control module whether air is moving through the blower.

⑤ Water temperature limit switch

The water temperature limit switch turns off the gas valve if the temperature in the boiler goes above its setting. (The circulators will continue to run as long as there is a call for heat.)

⑥ System circulator

The system circulator circulates water through the external (system) piping. The flow rate of the circulator is controlled by the GCM, depending on the temperature of the water entering the boiler sections. Pump must remain on boiler — do not remove.

⑦ Bypass circulator

The GCM operates the bypass circulator to mix hot water from the boiler outlet with colder return water from the system as needed to prevent condensation of flue gases in the boiler.

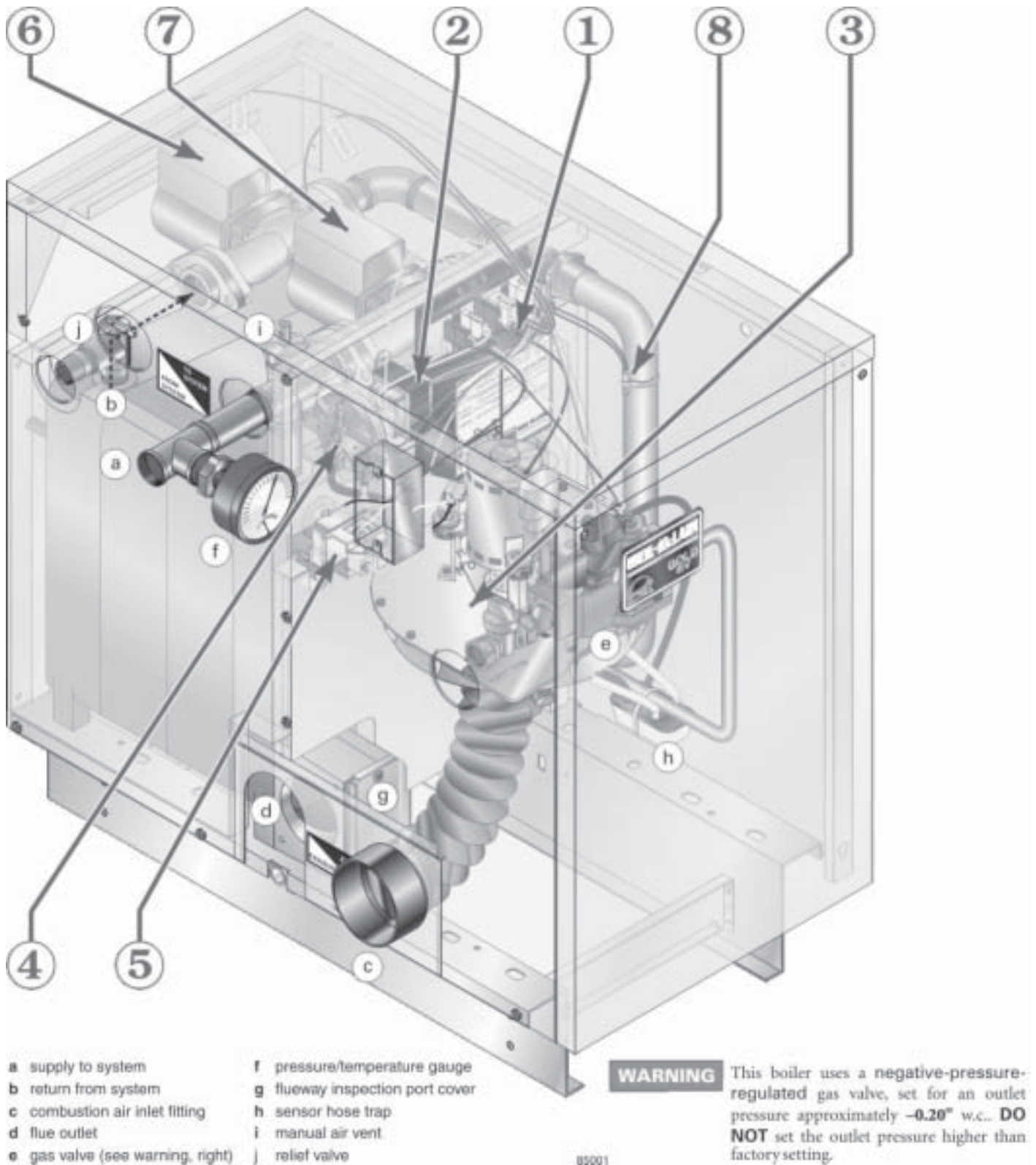
When the water returning to the boiler is below 140 °F, the GCM regulates the bypass circulator and system circulator flow rates to raise the return water temperature up to 140 °F before it enters the boiler sections. By balancing these flow rates, the GCM can protect against condensation even if return water is as low as 60 °F.

Pump must remain on boiler — do not remove.

⑧ Water temperature sensor

The water temperature sensor monitors the temperature of the water entering the boiler sections. The sensor sends this information to the GCM. The GCM determines how much to adjust the circulator flow rates to provide at least 140 °F entering water.

GOLD GV Water Boiler — Series 4



- a supply to system
- b return from system
- c combustion air inlet fitting
- d flue outlet
- e gas valve (see warning, right)
- f pressure/temperature gauge
- g flueway inspection port cover
- h sensor hose trap
- i manual air vent
- j relief valve

Please read before proceeding

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

Installer

WARNING

Read all instructions before installing. Follow all instructions in proper order to prevent personal injury or death.

- Also refer to GV Series 3 and 4 **Venting Supplements**.
- Consider **pipng and installation** when determining boiler location.
- Any **claims for damage or shortage in shipment** must be filed immediately against the transportation company by the consignee.

User

- **This manual is for use only by your qualified heating installer/ service technician.**
- Please refer to the **User's Information Manual** for your reference.
- We recommend regular **service by a qualified service technician, at least annually.**

Table of contents See pages 6 and 7 for Table of contents.

Please read before proceeding

WARNING

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

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 82 of this manual. Failure to comply could result in severe personal injury.

When servicing boiler —

- To avoid electric shock, **disconnect electrical supply** before performing maintenance.
- To avoid severe burns, **allow boiler to cool** before performing maintenance.

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 pump. Instead, **shut off the gas supply** at a location **external to the appliance**.
- **Do not use this boiler if any part has been under water.** Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control, which has been under water.

Boiler water —

- DO NOT use **petroleum-based** cleaning or sealing compounds in boiler system. Water seal deterioration will occur, causing leakage between sections. 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 build-up 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 hot boiler.** Thermal shock can cause sections to crack.

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1a Prepare boiler location — overview

Overview of this section

- ❑ Verify the boiler installation will meet all applicable codes.
- ❑ If the boiler installation is at **high altitude** (over 5,500 feet) make sure to obtain and install the high altitude kit. Obtain the high altitude kit and review the instructions included. Note the venting restrictions and input reductions at altitudes over 5,500 feet.
- ❑ Check the boiler space to be sure minimum **clearances** and accessibility are available.
- ❑ Obtain special **venting materials** and make sure vent will comply with instructions.
- ❑ Direct vent installation (outside air piped to boiler) is optional in most cases. But, if air contamination is likely, you will have to **pipe air to the boiler**. Note list of contaminants on page 13.
- ❑ If the GV boiler is replacing a boiler that is being removed from a **combined vent system** that will still serve other appliances, follow the procedure in this manual to verify vent performance.

Ib Prepare boiler location — codes & altitude

Installations must follow these codes:

- Local, state, provincial, national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1- latest edition.
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required.
- National Electrical Code.
- For Canada only: B149.1 or B149.2 Installation Code and CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

The GV boiler gas manifold and controls met safe lighting and other performance criteria when boiler underwent tests specified in ANSI Z21.13 — latest edition.

High altitude installations

GV boiler controls automatically reduce input with increasing altitude. See Table 1 for estimated input at altitude as a percentage of sea level input. Multiply the boiler sea level input by this percentage to obtain the estimated high altitude input. Note that the length of the venting system will also have a minor impact on input. Refer to the vent supplement for further information.

No modifications to the boiler should be necessary for installations up to 5,500 feet above sea level. For higher elevations, the air pressure switch must be changed to a special high altitude switch. Refer to the **high altitude kit** instructions, manual Section **II d**. Note that the gas valve outlet pressure must be checked (and adjusted if necessary) in accordance with manual Section **VII f**.

Table 1
Estimated GV input at altitude

Altitude (feet)	% Sea level input
1,000	97
2,000	93
3,000	90
4,000	87
5,000	83
5,500	82
6,000	80
7,000	77
8,000	74
9,000	72
10,000	69

NOTICE

At altitudes above 5,500 feet, GV boilers can be sidewall vented only when using direct vent (ducted combustion air). GV boilers can be vertically vented in any of the configurations shown in the vent supplements. Refer to vent supplements for more detail.

IC Prepare boiler location — clearances

Service clearances

When possible, install GV boilers with clearances at least as large as shown in Figure 1 for best service access.

Minimum clearances

You can install GV boilers in spaces smaller than Figure 1 recommended service clearances. But the installation must always provide the minimum clearances shown in Figure 2.

- Always provide at least screwdriver clearance to jacket front panel screws for removal of front panel for inspection and minor service.
- If the boiler **cannot be serviced in place**, pipe the boiler with unions and isolation valves so it can be slid out of the space and serviced in an adjacent area. The space has to be equipped with a door so boiler can be accessed, un-piped and removed.

WARNING

Install the boiler so control system components are **protected from dripping or spraying water or rain** during operation. Allowing these components to become wet could cause a boiler failure, resulting in severe personal injury, death or substantial property damage.

Figure 1

Service clearances (recommended)

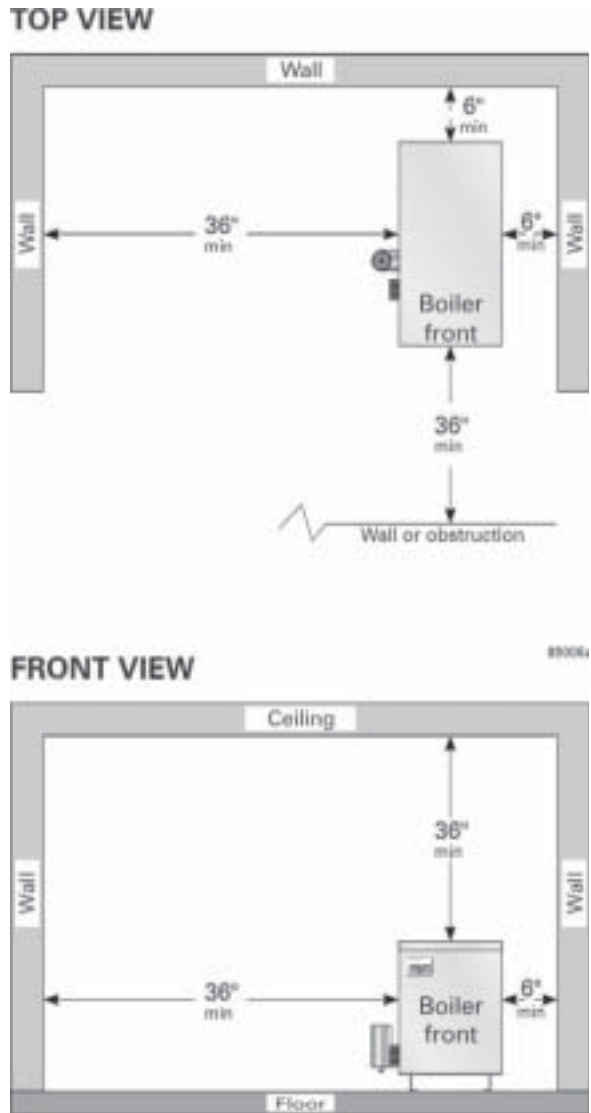
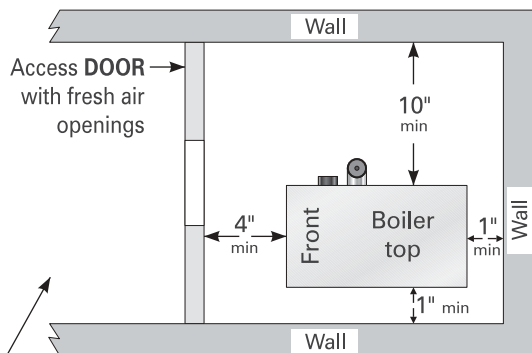


Figure 2

Minimum clearances

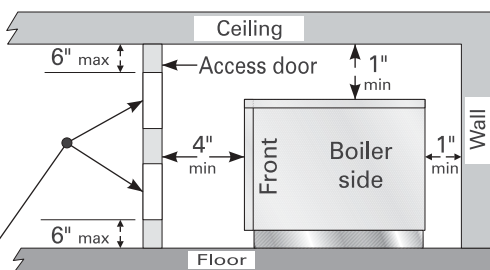
TOP VIEW



Area adjacent to access door must be accessible and must allow for removal of the GV boiler for service. No other appliance or air mover (exhaust fan, etc.) may be mounted in the same space.

SIDE VIEW

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(2) Fresh air openings — Each with at least 1 sq. inch per 1,000 Btu of boiler input

Flooring and foundation

Flooring

The GV 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

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.
- high profile condensate pump is used. Provide a foundation high enough that the GV condensate connection is at least as high as the condensate pump inlet connection.

The minimum foundation size is 16" wide by:

- 30¾" long for GV-3 or GV-4.
- 37¾" long for GV-5 or GV-6.

Residential garage installation

Precautions

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, paragraph 5.1.9*:

- 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.

Id Prepare boiler location — vent system

Removing from existing vent

WARNING

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

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

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

11 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

GV special vent system

Vent system

The GV boiler requires a special vent system, designed for pressurized venting with likelihood of condensation in the vent. This is referred to as ANSI Z21 **Class IV, Condensing**.

You may use any of the vent systems covered by the GV venting supplements included in the instruction manual envelope. The GV vent starter tee is a special item designed only for the GV boiler, available from each vendor. Do not attempt to connect the vent to the GV boiler with any other means.

WARNING

DO NOT mix components from different systems. The vent system could fail, causing leakage of flue products into the living space, causing severe personal injury or death.

Vent termination and combustion air supply

The GV boiler may be vented through the roof or through a side wall. Follow the appropriate vent supplement for the vent system chosen. The maximum vent length depends on boiler size. Refer to the vent supplement to verify vent length will be acceptable.

Combustion air for the GV boiler may be from inside or ducted directly to the boiler from outside. For outside air (direct vent installation), two options are available for the flue/air termination. The air supply must **ALWAYS** terminate at the same location as the flue, using either:

1. Vertical direct vent installation. Obtain the **Through-Roof or Through-Unused Chimney Kit** and supplement. Find additional information in the vent supplement for the venting material chosen.
2. Sidewall vent/air termination. This requires the Weil-McLain **GV Vent/air Intake Termination Kit**. Refer to the instructions packed with the kit and the vent supplement for the venting material chosen.

NOTICE

Installations above 5,500 feet altitude must be direct vent if sidewall vented.

Ie

Prepare boiler location — contamination

Air contamination

Please review the following information on potential combustion air contamination problems.

Refer to Table 2 for products and areas which may cause contaminated combustion air.

WARNING

If the boiler is installed in **any area likely to cause contamination**, or if products which would contaminate the air cannot be removed, you must **pipe combustion air to the boiler** air intake. Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage. Do not install GV boiler in a **laundry room or pool facility, for example**, without using ducted outside air. These areas will always contain contaminants.

Table 2 Corrosive contaminants

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	

If Prepare boiler location — air openings

GV combustion air options

Using inside air — direct exhaust venting

The GV boiler can use inside air if no contaminants are present in the boiler space. No pipe is connected to the air intake fitting.

Using outside air — direct vent

Combustion air can be ducted directly from outside to the GV boiler air intake fitting. The installation is defined as **direct vent** (also referred to as sealed combustion).

Sizing air/ventilation openings

NOTICE Air openings must be sized to handle all appliances and air movers (exhaust fans, etc.) using the air supply.

No other gas appliances in same space

Provide air openings into the boiler space as described in this section and the National Fuel Gas Code, ANSI Z223.1. Direct exhaust installations require air for combustion and ventilation. Direct vent installations may require air openings for ventilation (to prevent overheating of boiler controls and boiler space).

When other gas appliances share same space:

For air openings into spaces containing other appliances in addition to the GV boiler(s) refer to the National Fuel Gas Code, ANSI Z223.1 for sizing.

Louver allowance

The free area of openings means the area **after** reduction for any installed louvers or grilles. Be sure to consider this reduction when sizing the air openings.

Direct exhaust installations — GV without other gas appliances

If direct-exhaust vented GV boilers are installed in a space with no other appliances, size the combustion/ventilation air openings using Figure 3.

You may also refer to the National Fuel Gas Code for combustion/ventilation air opening sizing.

Notice the exception given in Figure 3 for large spaces (volume at least 50 cubic feet per 1,000 Btuh input) in buildings other than those with tight constructions (as described on page 15).

Figure 3 Air opening requirements when direct exhaust venting

Room air openings for direct exhaust venting	
Required area of the air openings given in this table are free area — after the correction for louver obstruction. (See Example below.)	
Apply this table only to installations with clearances no smaller than those shown in Figure 1, page 10 of this manual. For installations with clearances less than shown in Figure 1, page 10 of this manual, always provide 2 openings, each with 1 square inch of free area per 1,000 Btuh of total input of all appliances.	
<p>A Air from Inside</p>	<p>2 Openings — each opening:</p> <p>1 square inch free area per 1,000 Btuh input of GV</p>
<p>B Air Directly from Outside</p>	<p>2 Openings — each opening:</p> <p>1 square inch free area per 4,000 Btuh input of GV</p>
<p>C Air from Outside Through horizontal ducts</p>	<p>2 Openings — each opening:</p> <p>1 square inch free area per 2,000 Btuh input of GV</p>
<p>D Air from Outside or Attic — Lower Opening in Floor or Vertical Duct</p>	<p>2 Openings — each opening:</p> <p>1 square inch free area per 4,000 Btuh input of GV</p>

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NO combustion air openings are needed when the boiler is installed in a space with a volume **NO LESS** than 50 cubic feet per 1,000 Btuh input of all installed GV direct-exhaust-vented boilers. Sum the total input of all GV boilers in MBH (1,000's of Btuh) and multiply this number times 50. **Building must not be of Tight construction** (see page 15).

Example: For 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, space must have at least 5,000 ÷ 8 = 625 square feet (25 feet x 25 feet, for instance).

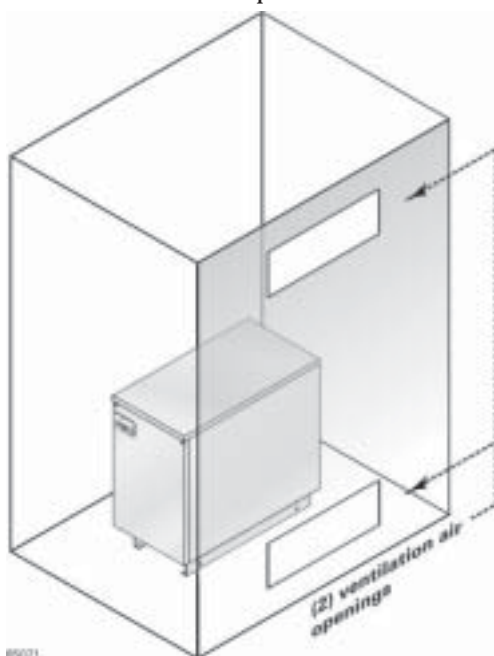
Direct vent installations — GV without other gas appliances

Direct-vented GV boilers installed with no other appliances in the same space may need openings for ventilation air as described below.

- If direct-vented GV boilers are installed in a space whose volume is at least 10 ft³/1,000 Btuh input, **no ventilation openings are required.**
- If direct-vented GV boilers are installed in a space whose volume is less than 10 ft³/1,000 Btuh input, **two ventilation air openings into the space may be necessary** — one near the floor and the other near the ceiling as shown in the illustration below. Each opening must have a free area no less than 1 square inch per 1,000 Btuh input of GV boiler(s) in the space.
- If direct-vented GV boilers are installed in a space with clearances less than the recommended minimum service clearances shown on page 10, **two ventilation openings into the space are required** — one within 6 inches of the top of the space and one within 6 inches of the bottom of the space. See illustration below. Each opening must have a free area no less than 1 square inch per 1,000 Btuh input of GV boiler(s) in the space.

CAUTION

If ventilation air openings are not installed as directed above and the room does not have adequate ventilation, the higher temperature in the space may result in reduced component life.



Special considerations — direct exhaust or direct vent

Tight construction

ANSI Z223.1 defines unusually tight construction where:

- 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 . . .
- Weatherstripping has been added on openable windows and doors, and . . .
- 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 buildings with such construction, provide air openings into the building from outside, sized per the appropriate case in Figure 3 if appliances are to use inside air for combustion and ventilation.

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** (proving 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.

IIa Prepare boiler — overview

Overview of this section

- Leave the boiler on its skid until installation site is ready and boiler prep is complete per this section.
- Install vent starter tee and condensate drain line.
- Inspect gas/air orifice plate to verify model size and gas markings agree with boiler and application. Install propane gas/air orifice for propane installations.
- Install high altitude kit for altitudes more than 5,500 feet above sea level.
- Place boiler in position and install jacket rear panel.
- Plug openings and hydrostatically test boiler. Remove plugs.

IIb Prepare boiler — vent starter tee & drain

Install vent starter tee and condensate drain hose

WARNING

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

Install vent starter tee as shown in Figure 4.

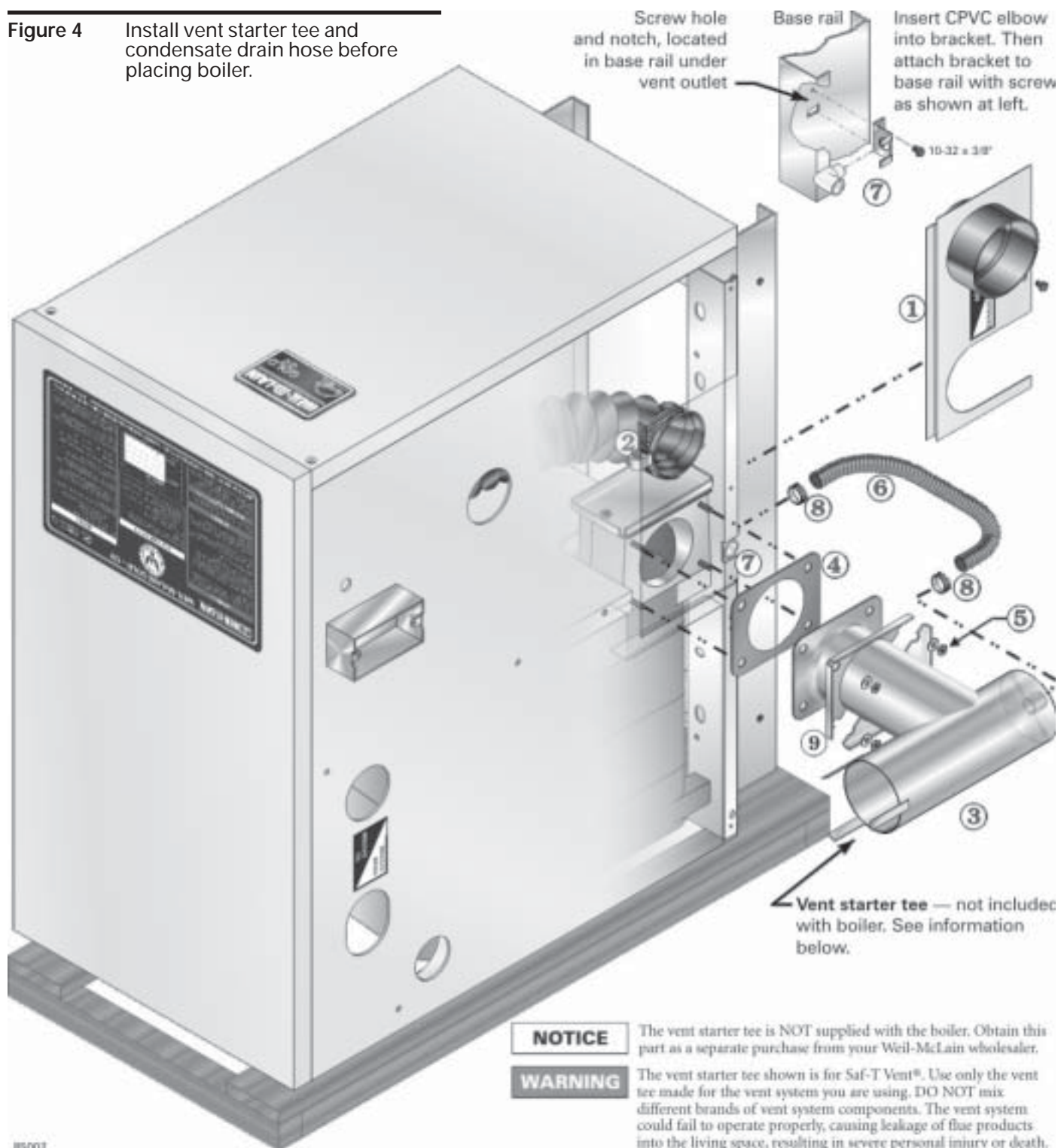
1. Remove jacket access panel (item 1). You can rotate the plate out of the way, leaving the air hose connected to the air intake fitting, or loosen the hose clamp (item 2) and pull the air hose off of the fitting as shown in Figure 4.
2. Remove the hex nuts (item 5) from the accessory bag assembly.
3. Remove the vent starter tee gasket (item 4) from the accessory bag assembly.
4. Clean the surface of the boiler flue connection to assure a good seal. Use emery cloth if necessary to remove any accumulated rust.
5. Place the vent starter tee gasket (item 4) over the studs.
6. Slide the holes in the vent starter tee flange (item 3) over the studs.
7. Slide the two triangular reinforcing plate sections (item 9) over the studs.
8. Apply the (4) hex nuts and washers (item 5), align the vent starter tee (item 3) and tighten the nuts uniformly.

Install condensate trap hose as shown in Figure 4.

1. Loosen and slide a spring hose clamp (item 8) over each end of the condensate drain hose (item 6).
2. Loosen the clamp and slide one end of the hose over the CPVC drain elbow (item 7). Slide clamp into position and release.
3. Attach and clamp the other end of the hose to the drain connection on the bottom of the vent starter tee (item 3).
4. Replace jacket access panel (item 1), reconnecting the air hose to the air intake fitting.

I**b** Prepare boiler — vent starter tee & drain (cont.)

Figure 4 Install vent starter tee and condensate drain hose before placing boiler.



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IIc Prepare boiler — orifice plate

Check for correct orifice plate and replace if necessary

DANGER

The correct orifice plate must be used. Failure to do so will result in severe personal injury, death or substantial property damage.

Natural gas:

For natural gas installations, inspect the silver gas/air orifice plate marking. It must be the same as the boiler size. If the orifice plate is stamped with another size, obtain the correct plate from your wholesaler. The boiler size is stamped where the “X” is shown in the plate stamping, Figure 5b.

Propane:

For propane installations, replace the silver gas/air orifice plate with the red/white plate, per following instructions. Ensure the red/white plate boiler size is correct for the GV boiler being installed. The boiler size is stamped where the “X” is shown in the plate stamping, Figure 5b.

Also fill out the propane label in the conversion kit and attach to the left side of the jacket, above the gas inlet opening, as shown in Figure 5a.

Plate installation

Access the bottom of the blower housing as shown in Figure 5a.

To inspect the plate only, read the marking on the plate edge. It must read the same as the boiler size and fuel.

To replace the plate, using a manual screwdriver or nut driver, see Figure 5b:

1. Loosen screws 1 and 2 two full turns.
2. Remove screws 3 and 4.
3. Pull the gas/air orifice plate forward to remove it.
4. Slide in the new plate as shown in Figure 5b. The red side of a propane plate must go next to the blower housing as shown.
5. Replace screws 3 and 4. Tighten all four screws securely and uniformly. DO NOT overtighten. DO NOT exceed 40 inch-pounds torque.
6. Bend down plate label tab at score mark as shown in lower right corner of Figure 5b.

Figure 5a

Check for correct orifice plate and replace if necessary.

Leave boiler on its back, on the skid, until inspection/replacement is completed.

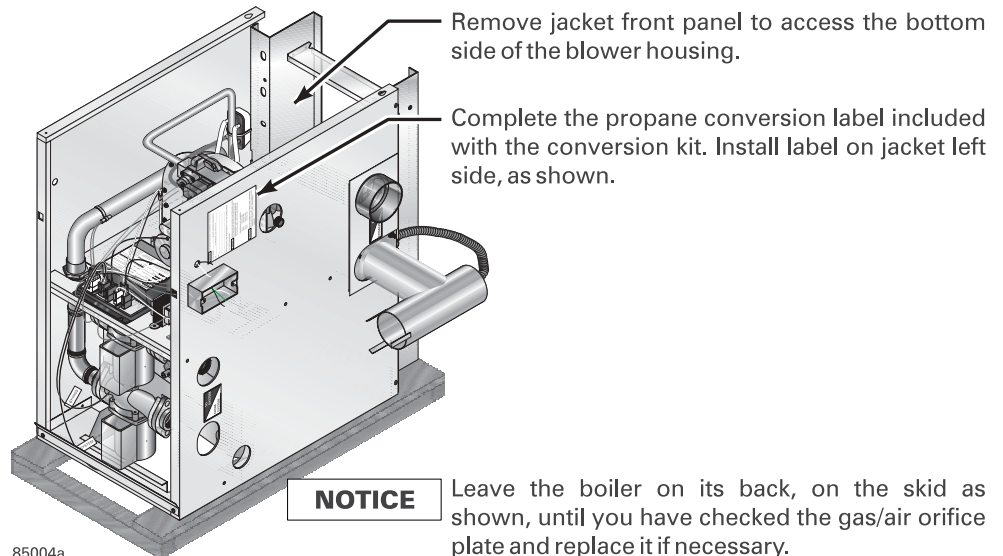
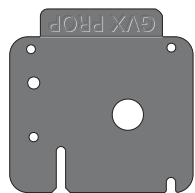
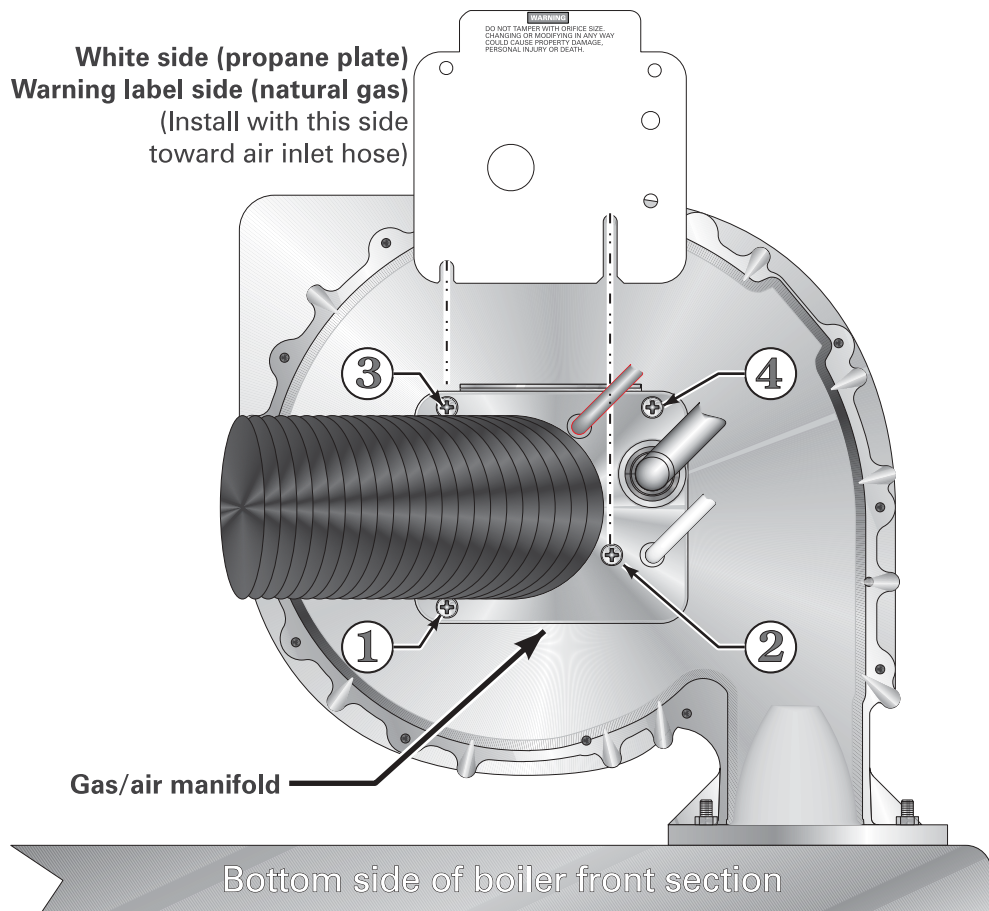


Figure 5b Checking and replacing gas/air orifice plate. For propane installations, replace silver plate with red/white propane plate.

WARNING

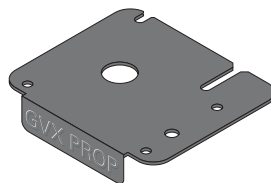
DO NOT use electric or pneumatic screwdrivers to remove or tighten the gas/air boss screws. Hand-tighten only, using manual screwdriver. Should the torque exceed 40 inch-pounds, the threaded holes could strip out, causing an inadequate seal of the orifice plate. Failure to properly seal the plate to the housing could result in a gas leak, causing severe personal injury, death or substantial property damage.



Propane — red side



Natural — plain side



Orifice plate after bending along score mark. This makes the plate identification readable after installation.

Install plate with red side (propane) or plain side (natural) **against the blower housing.**

85004b

IId Prepare boiler — high altitude kit

Obtain high altitude kit

When required (above 5,550 feet)

For installations at altitude **more than 5,500 feet above sea level**, a special high altitude air pressure switch is required. In addition, the gas valve outlet pressure setting must be checked, and adjusted if necessary, per the instructions in manual Section **VIIf**, **altitude over 5,500 feet**.

Obtain the **GV high altitude kit** from your local Weil-McLain distributor. This kit includes the high altitude air pressure switch. (You will need a T-40 star driver to access the gas valve pressure regulator adjustment screw.) The kit also includes tubing fittings as described in manual.

Install high altitude air pressure switch

1. See Figure 5c (switch shown with wires removed).
2. Remove the two (RED) control wires from the air pressure switch spade terminals.
3. Remove the factory-installed air pressure switch (loosen top screw and remove bottom screw holding switch to jacket interior panel).
4. Install the high altitude air pressure switch in the same location.
5. Carefully replace the hoses on the new switch, with the **red hose** on the hose barb closest to the interior panel, as shown in Figure 5c. The **white hose** goes on the outer hose barb.
6. Replace the two (RED) control wires on the new pressure switch spade terminals.

Check gas valve outlet pressure

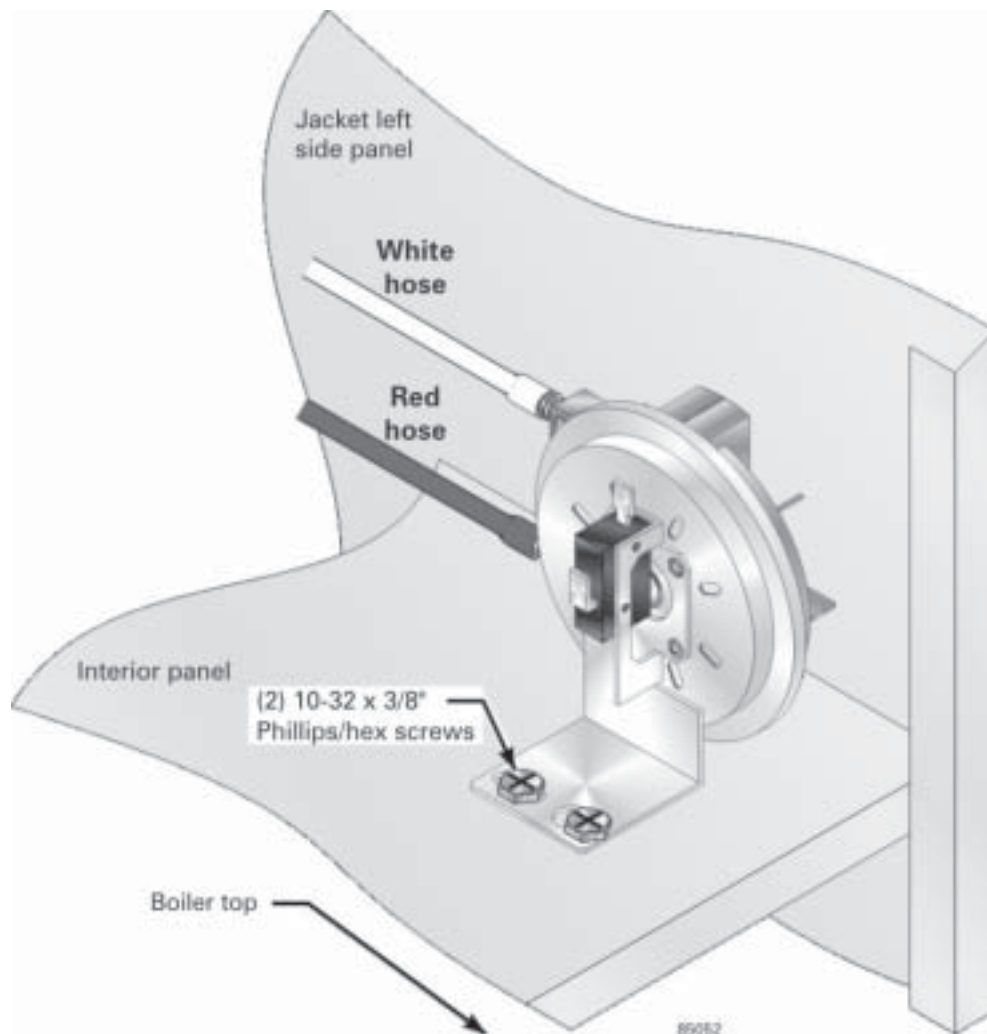
After following the start-up procedures of manual Section **VII**, follow the procedures of Section **VIIf** to measure gas valve outlet pressure and adjust if necessary.

WARNING

Failure to check gas valve outlet pressure and adjust, if necessary, could result in severe personal injury, death or substantial property damage. Carefully follow the guidelines given in this manual.

— altitudes above 5,500 feet ONLY

Figure 5c Air pressure switch mounting and sensor hoses



IIIe Prepare boiler — place in position

Position boiler After installing vent starter tee, inspecting (replacing if necessary) the gas/air orifice and installing the high altitude kit (if required), move the boiler near its position.

Figure 6 shows the boiler with the front and top panels replaced. These panels may be left off if desired until the installation has been completed.

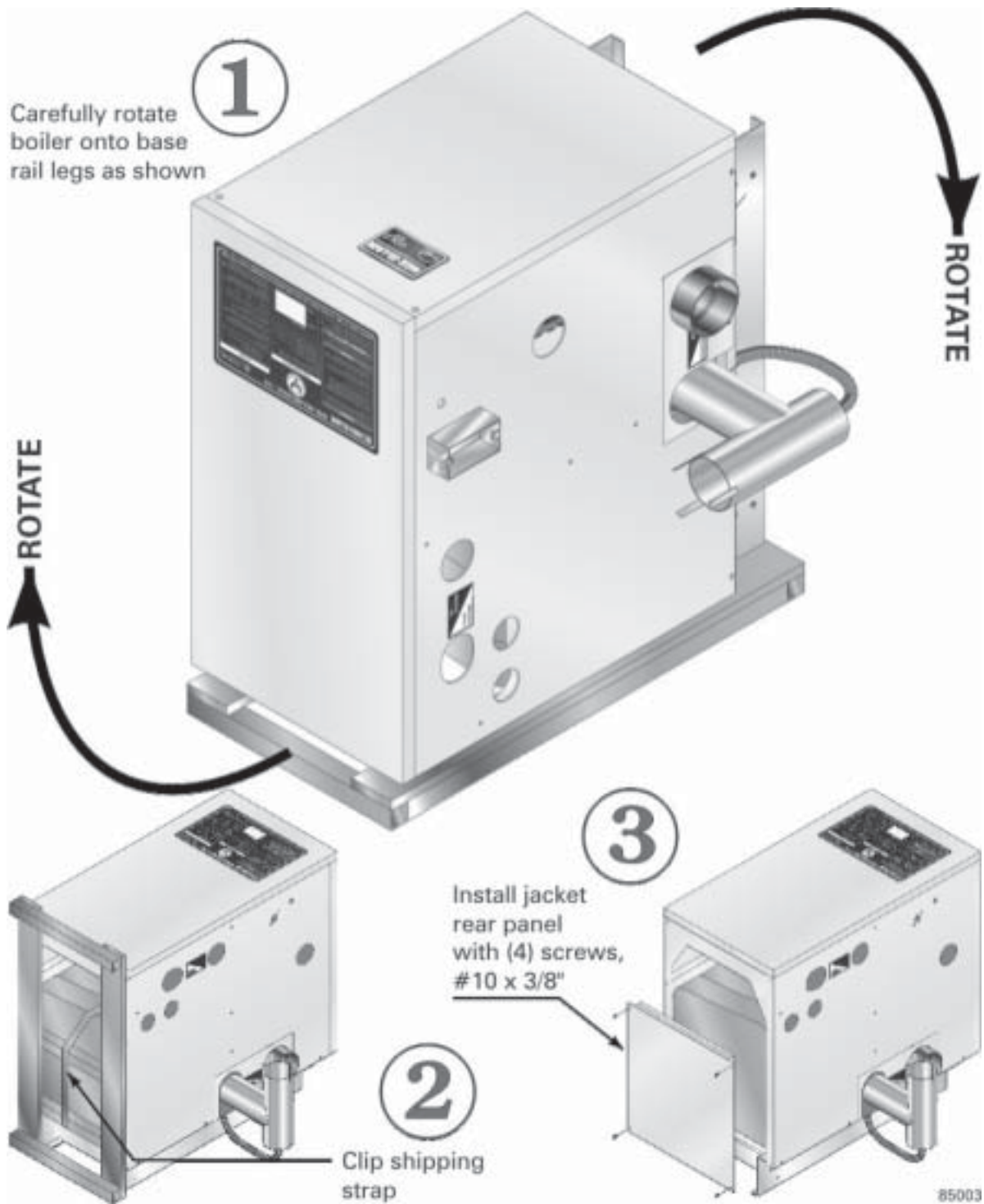
Refer to Figure 6 for placement sequence:

- ① **Wearing heavy gloves**, carefully rotate the boiler over onto its base rail legs.
- ② **Clip the shipping strap** securing the skid to the boiler block assembly. Remove the skid and strap.
- ③ Attach the **jacket rear panel** as shown using (4) #10 x 3/4" screws provided in the accessory bag.

DANGER

Boiler is heavy and contains some sheet metal parts which may have **sharp edges**. **Wear gloves** when handling and take proper precautions when moving. Failure to do so will result in severe personal injury, death or substantial property damage.

Figure 6 Rotating boiler into position, removing skid and installing jacket rear panel



III Prepare boiler — pressure test

Perform hydrostatic pressure test

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

Prepare boiler for test (Fig. 7)

- ① Connect a hose from water supply to fill and drain boiler for hydrostatic test. Hose is not included with boiler.
- ② Connect hose to boiler drain valve. Make sure hose can also be used to drain boiler after test.
- ③ Remove 1" nipple, 1" tee, bushing and pressure/temperature gauge from accessory bag. Pipe to boiler supply connection as shown. Use pipe dope sparingly.
- ④ Connect a nipple and shutoff valve to system supply connection on the 1" tee. This valve will be used to bleed air during the fill. Valve and nipple are not included with boiler.
- ⑤ Connect a nipple and shutoff valve to system return connection at circulator flange. This valve will be used to bleed air during the fill. Valve and nipple are not included with boiler.
- ⑥ Install a ¾" pipe plug in the relief valve opening, top of the rear boiler section, as shown. Plug is not included with boiler.

Fill and pressure test

1. Connect fill water supply through drain valve (item 2).
2. Fill boiler with water (be sure bleed valves at 4 and 5 are open).
3. When water flows from bleed valves, shut off water at drain valve.

4. Close bleed valves.
5. Slowly reopen drain valve (item 2) until test pressure of not more than 45 psi is reached on the pressure gauge.
6. Test at no more than 45 psi for no more than 10 minutes.

WARNING

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

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.

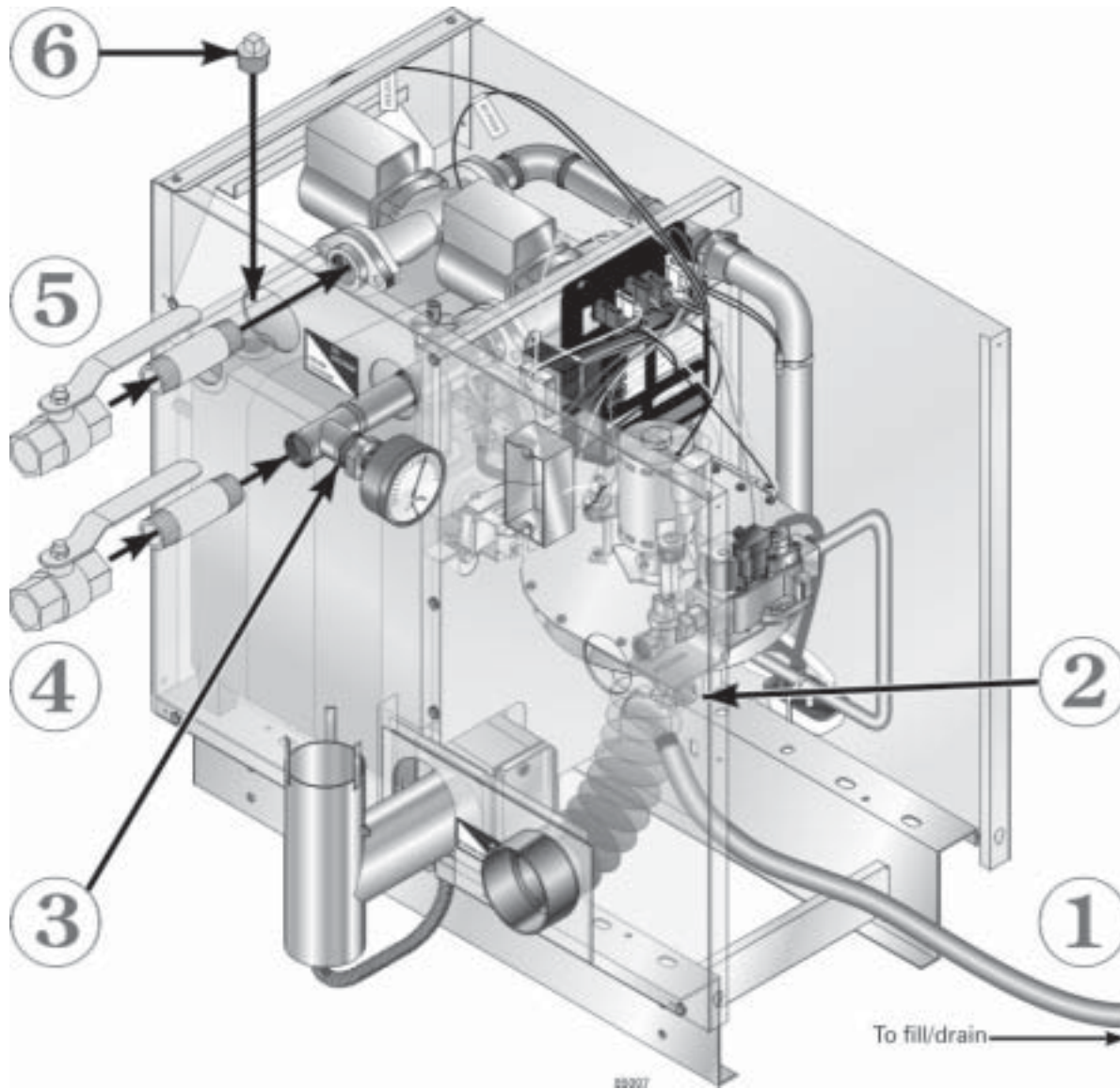
DANGER

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. Close drain valve and remove hose after draining.
3. Remove nipples and valves at 4 and 5 unless they will remain for use in the system piping.
4. Remove plug (item 6) from relief valve tapping.

Figure 7 Piping connections for hydrostatic test



IIIa Water piping — overview

Overview of this section

- Select **suggested piping** from the following table, based on the type of system in which you are installing the GV boiler.
- Review **boiler connections**, pages 28 – 29 — information on supply and return connections at boiler and key system components (air separator and expansion tank).
- Review page 30, information applying to all systems.
- Obtain any **system components** needed but not on hand or available at jobsite.
- Install **boiler relief valve** and pipe discharge to a safe location per guidelines in this section.
- Install system piping and boiler connections.
- Install additional **limit control** (if required for code compliance) and **low water cutoff** if required.

For heating system with . . .	See pages 27 – 30 and . . .
Baseboard , finned tube or cast iron	31
Radiators , cast iron	32
Radiant floor, wall or ceiling — <i>single zone</i> (note 1)	33
Radiant floor, wall or ceiling — <i>multiple zones</i>	34
Heat pump (note 1)	33
Snow melt plus space heating	35
Control valve (note 2)	34
Water chiller	36
<p>Note 1: Install a temperature limit control in the supply piping to protect the system. Note 2: Apply these piping designs for outdoor reset or any system requiring automatic supply temperature regulation.</p>	

IIIb Water piping — relief valve

Install relief valve

Refer to Figure 8 for location of the relief valve on the boiler.

Install the relief with the **spindle vertical** in the $\frac{3}{4}$ " tapping on top left of the back section, as shown.

WARNING

To avoid water damage or scalding due to valve operation, a metal 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 a maximum of 6" above the floor drain where any discharge will be clearly visible.

The discharge line shall **terminate plain, not threaded**, and must be rigid metallic pipe of material suitable for temperatures of 375 °F or greater.

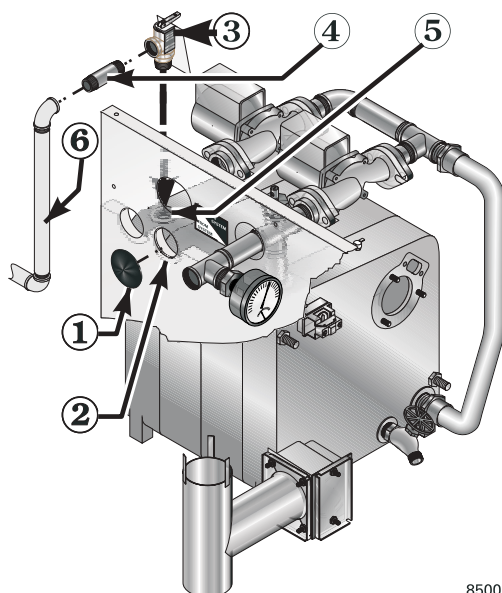
Do not pipe the discharge to any place where freezing could occur.

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.

Figure 8
Install and pipe relief valve



- 1 Jacket plug for unused relief valve jacket opening.
- 2 Jackets are provided with two relief valve openings because each jacket size is used for two boiler sizes. Cover the unused opening with the plug provided.
- 3 Boiler relief valve (from accessory bag)
- 4 $\frac{3}{4}$ " x 3" nipple, provided in accessory bag
- 5 $\frac{3}{4}$ " relief valve tapping in back section
- 6 Connect minimum $\frac{3}{4}$ " discharge piping to relief valve. See **WARNING** above.

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IIIc Water piping — boiler connections

Supply & return connections

Always connect supply and return connections to the boiler as shown in Figure 9. (Note in the following and in the suggested piping drawings in this manual that the expansion tank and air separator location will depend on the system piping.)

Air separator

Install an **air separator** in the piping as shown. For single-zone systems, install the air separator in the return piping as shown in Figure 9. This allows mounting the automatic air vent and expansion tank off of the separator.

Expansion tank

Figures 9 and 10 show typical installation of the expansion tank when the boiler is connected to a zone-valve zoned baseboard system (see Figure 10). Always locate the air separator and expansion tank as shown in the suggested piping drawings, Figures 10 through 16.

Ensure that the expansion tank size will handle boiler and system water volume and temperature. See tank manufacturer's instructions and ratings for details. Additional tanks may be added to the system if needed to handle the expansion. These tanks may be installed by connecting to tees in the system piping.

CAUTION

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

Always locate the **cold water fill connection** at the expansion tank. Never locate this elsewhere in the system.

Diaphragm- or bladder-type tank:

Refer to Figure 9 for suggested piping when using a diaphragm- or bladder-type expansion tank.

NOTICE

Diaphragm- or bladder-type expansion tank — Control **fill pressure** with the tank air charge pressure. Always check pressure and charge tank **with tank removed from system** to be sure reading is accurate. Boiler relief valve is set for 30 PSIG. Operating pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relief valve.

Install an **automatic air vent** on top of the air separator, per separator manufacturer's instructions.

Closed-type expansion tank:

Figure 10 shows suggested piping when using a closed-type expansion tank, in which the air is directly in contact with tank water.

Connect piping (½" or ¾") from the air separator top outlet to the tank fitting. Slope any horizontal piping a minimum of 1 inch per 5 feet of horizontal pipe.

Always use a **tank fitting**, such as the B&G *Tanktrol* or Taco *Taco-Trol* (shown). The fitting reduces gravity flow of water in the piping to the tank, avoids air bubbling through the tank water, and provides the proper fill height in the tank.

CAUTION

Correct all leaks in the system or tank piping. Leaks allow air to escape from the system and will cause water-logging of the tank. This will result in water loss through the boiler relief valve due to over-pressurization.

NEVER use an automatic air vent in a system equipped with a closed-type expansion tank. The air removed from the system will cause water-logging of the expansion tank.

NOTICE

Closed-type expansion tank — Follow tank manufacturer's instructions for **filling the tank**. Typical tank sizing provides for approximately 12 PSIG when the tank is filled to the normal level and system water is cold. Note that boiler relief valve is set for 30 PSIG. Operating pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relief valve.

Backflow preventer

Where required by codes, install a **backflow preventer** in the cold water fill line, as shown in suggested piping diagrams on following pages. Install a check valve if a backflow preventer is not installed.

Figure 9 Piping to single-zone system using diaphragm- or bladder-type expansion tank. Boiler connections are 1" NPT (supply from 1" tee, return to 1" system circulator flange).

- | | |
|--|--|
| 1 Relief valve discharge piping — see page 27 | 6 Backflow preventer or check valve |
| 2 Isolation valves | 7 System supply piping |
| 3 Fill valve | 8 System return piping |
| 4 Air separator | 9 Diaphragm-type expansion tank — always locate as shown in the suggested piping drawings, Figures 10 through 16 |
| 5 Automatic air vent (only used with diaphragm-type expansion tanks) | |

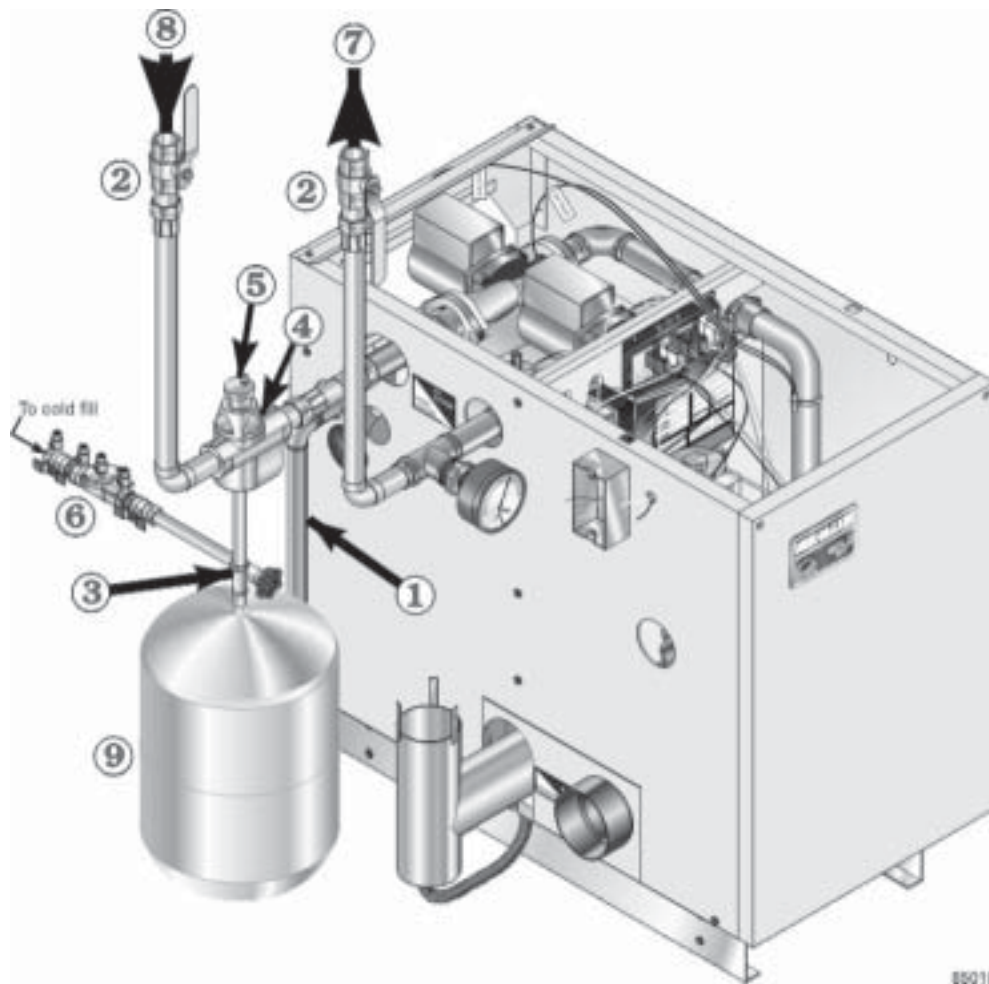
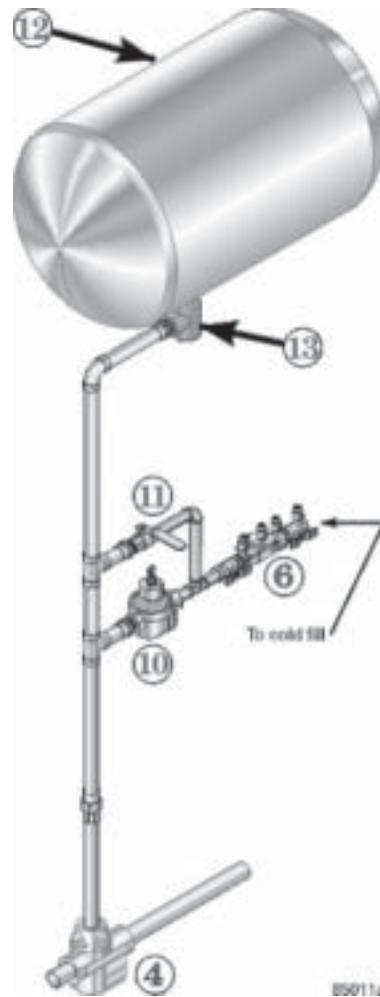


Figure 10 Piping closed-type expansion tank



- | |
|--|
| 10 Pressure reducing valve |
| 11 Quick-fill bypass valve |
| 12 Closed-type expansion tank — always locate as shown in the suggested piping drawings, Figures 10 through 16 |
| 13 Tank fitting |

NOTICE

Locate the air separator as shown in the suggested piping diagram, Figures 11 through 16 on the following pages. Pipe diaphragm- or bladder-type expansion tanks to the bottom of the separator.

Pipe closed-type (air in contact with water) tanks to the top of the air separator. Always connect the fill line to the expansion tank location, as shown above and in the suggested piping.

IIIId Water piping — all systems

Zoning with circulators

The GV internal system circulator cannot be removed from the boiler for use as one of the zone circulators. It must remain as shipped from the factory to allow proper flow control inside the boiler. You will need a circulator for each zone.

Install and wire a separate relay for each zone circulator.

Alternate primary manifold sizing	
Boiler model number	Suggested pipe size
GV-3	1"
GV-4	1"
GV-5	1¼"
GV-6	1¼"
Note: GV-5 and GV-6 may require 1¼" or larger piping off of boiler.	

Zoning with zone valves

Each zone in the piping diagrams in this section is shown with an isolation valve on each side. Substitute a memory-stop valve for one of these in each zone in order to use the memory-stop valve for balancing flow as well as isolation.

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.

Additional components

If installation is to comply with ASME or Canadian requirements, an additional **high temperature limit** is needed.

- Purchase and install in system supply piping between boiler and isolation valve.
- Wire the second limit control in series with the boiler limit control.
- Set the second limit control at least 20 °F above the boiler limit control setting (maximum setting 240 °F).

A **low water cutoff device** is required when boiler is installed above radiation level or by certain state or local codes or insurance companies. Use low water cutoff designed for water installations. Electrode probe-type is recommended. Purchase and install in tee in supply piping above boiler.

WARNING

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.

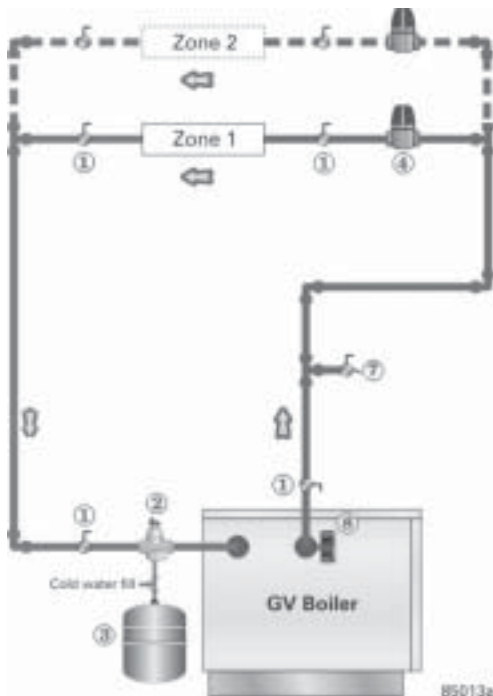
WARNING

Do not remove either of the GV internal pumps for use elsewhere in the system. Both pumps are required for proper operation. Removing a pump will cause the boiler to malfunction. Substantial property damage could result.

Never install another pump in series with the GV boiler. Forced flow can cause improper operation of the boiler controls. Substantial property damage could result.

IIIe Water piping — baseboard system

Figure 11a Baseboard system (finned tube or cast iron) — zone valve zoning



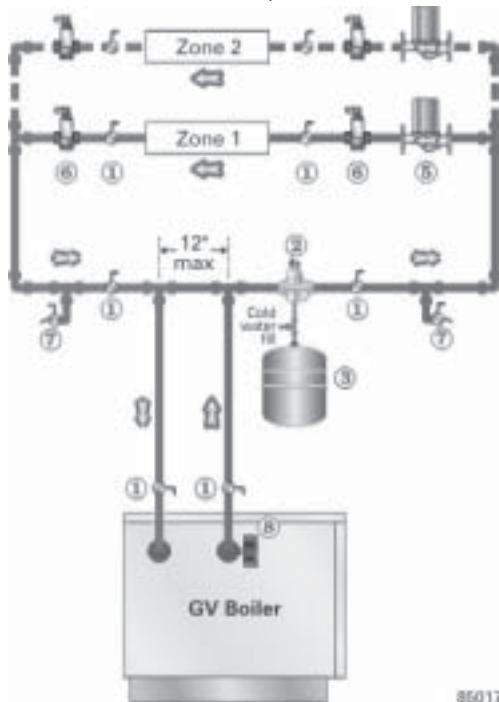
Baseboard system piping

Apply Figure 11a (zone-valve zoning) or 11b (circulator zoning) to systems using baseboard heaters. The heaters can be any baseboard style, including finned tube or cast iron.

The boiler internal “**System circulator**” can be used to circulate most zone-valve zoned systems as shown in Figure 11a. For systems requiring higher flow, apply the suggested piping of Figure 12a.

The boiler internal circulators must be left in the boiler. They cannot be removed for use as a zoning circulator. Provide a circulator for each zone when circulator zoning, and pipe the system as in Figure 11b.

Figure 11b Baseboard system (finned tube or cast iron) — circulator zoning

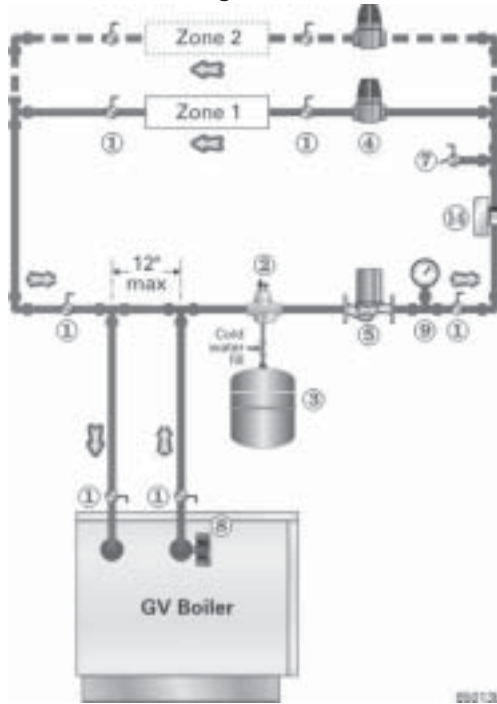


Legend

- 1 Isolation valves
- 2 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank).
- 3 Diaphragm- or bladder-type expansion tank, if used. (For closed-type expansion tank, pipe from top of air separator to tank fitting as in Figure 10.)
- 4 Zone valve
- 5 Zone circulator
- 6 Flow/check valve
- 7 Hose bibb purge valve
- 8 Boiler pressure/temperature gauge

III f Water piping — radiator system

Figure 12a Radiator system — zone-valve zoning



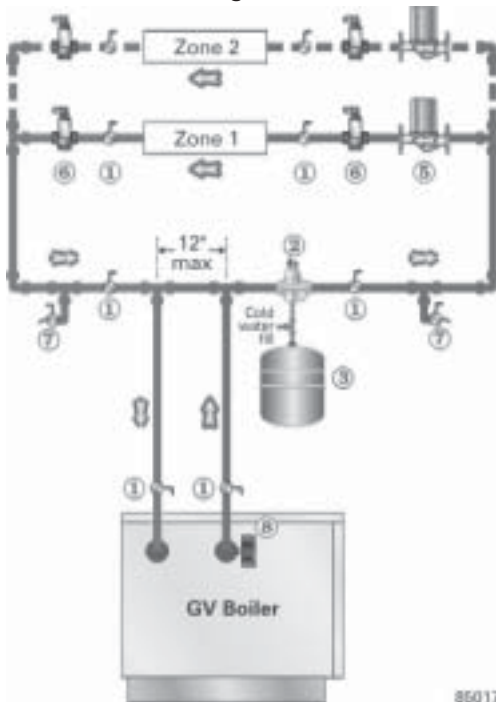
Radiator system piping

Apply Figure 12a (zone-valve zoning) or 12b (circulator zoning) to systems using standing cast iron radiators. This applies to gravity water systems and converted steam systems using columnar, tubular or recessed cast iron radiators.

The suggested piping for zone-valve zoning radiator systems differs from baseboard systems because of the high water content of cast iron radiators. The GV internal circulators automatically regulate supply and internal bypass flow based on the temperature of the water returning to the boiler. At the start of many heating cycles in a radiator system, the water in the radiators is cool. So the boiler would slow down system flow rate while sending out relatively hot water. This could cause heat distribution problems. Install a separate system circulator as shown in Figure 12a when zoning with zone valves. The separate circulator assures a relatively constant temperature drop through the system.

The boiler internal circulators must be left in the boiler. They cannot be removed for use a zoning circulator. Provide a circulator for each zone when circulator zoning, and pipe the system as in Figure 12b.

Figure 12b Radiator system — circulator zoning



Legend

- 1 Isolation valves
- 2 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank).
- 3 Diaphragm- or bladder-type expansion tank, if used. (For closed-type expansion tank, pipe from top of air separator to tank fitting as in Figure 10.)
- 4 Zone valve
- 5 System or zone circulator
- 6 Flow/check valve
- 7 Hose bibb purge valve
- 8 Boiler pressure/temperature gauge

IIIg Water piping — single-zone radiant or heat pump system

Single-zone radiant heating or heat pump piping

Radiant heating systems and heat pump systems usually require system supply water temperatures below 140 °F. But the boiler outlet water temperature will be at least 150 °F during most operating conditions. So the piping must include a method of reducing the supply water temperature to the system.

Figure 13 uses two balancing valves to manually adjust the supply water temperature. Follow the instructions below to adjust these valves. Install the supply temperature limit control (item 14) as shown to protect the system from overtemperature conditions. Note also that this piping requires a separate system circulator, as shown, because of the higher flow rates of radiant and heat pump systems.

Manual adjustment of the supply temperature is limited to single-zone systems because multi-zone systems will cause varying loads, making it unlikely an acceptable valve setting could be found. See Figure 14a or 14b for multi-zone systems.

You may also apply the suggested piping of either Figure 14a or 14b if you want automatic supply temperature regulation or outdoor reset temperature control.

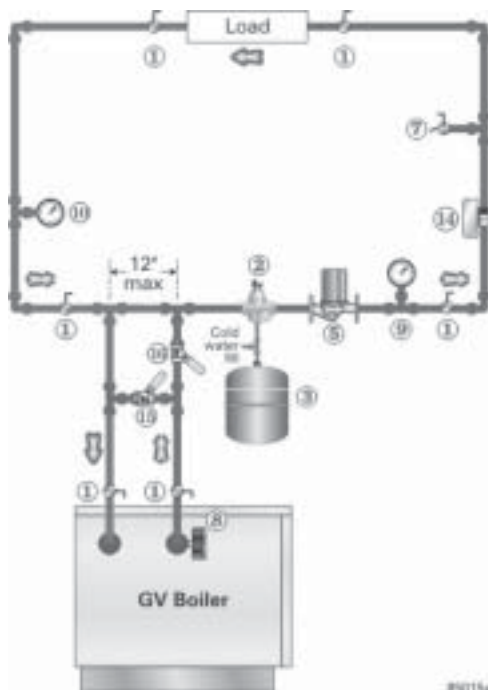
For additional information and alternatives in piping for radiant heating systems, refer to **Weil-McLain AlumiPex Controls • Pumps • Wiring Design Guide**.

Adjust balancing valves

Use valves 15 and 16 to mix boiler supply water with system return water, reducing supply water temperature to the system.

1. Subtract the design system supply temperature from 150 °F. Call this number the **temperature difference**.
2. Open valve 16 and close valve 15.
3. Start the boiler and system.
4. Let the system warm up for about 15 minutes.
5. Note the temperature at gauge 9 (system supply) and gauge 8 (boiler supply).
6. Slowly close valve 16 while opening valve 15 until gauge 9 reads **lower** than gauge 8 by at least the **temperature difference** found in step 1.
7. Example: For a design supply temperature of 100 °F, the **temperature difference** would be 150 °F minus 100 °F, or 50 °F. Set the valves until gauge 9 reads at least 50 °F lower than gauge 8.

Figure 13 Single-zone radiant heating or heat pump system



Legend

- 1 Isolation valves
- 2 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank).
- 3 Diaphragm- or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in Figure 10.)
- 5 System circulator
- 7 Hose bibb purge valve
- 8 Boiler pressure/temperature gauge
- 9 System supply temperature gauge
- 10 Return temperature gauge
- 14 Supply temperature limit control — Set at a temperature **below** the maximum allowed for the system or as directed by the system designer.
- 15 Balancing valve
- 16 Balancing valve

IIIh

Water piping — multi-zone radiant system

Figure 14a Manual bypass; fixed temp operation only

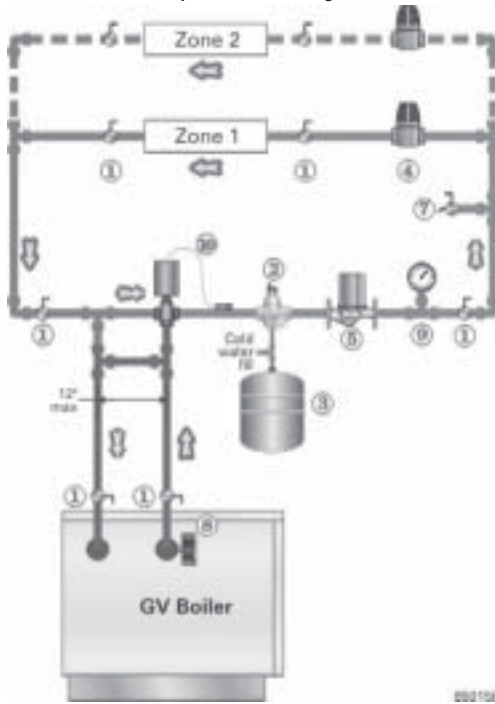
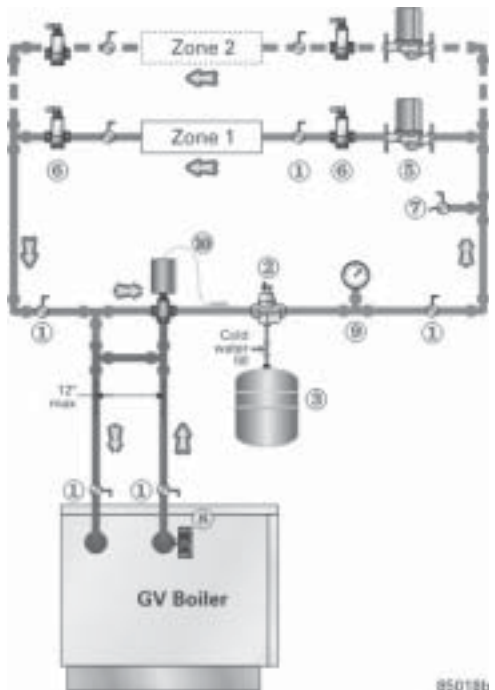


Figure 14b Auto return temp regulation; outdoor reset or fixed temp



Multi-zone radiant heating system piping

Multi-zone systems require automatic regulation of the system supply temperature because of widely varying load conditions. Figure 14a (zone-valve zoning) and Figure 14b (circulator zoning) show suggested piping for these systems.

Select an automatic temperature control valve or motor-operated valve which can be adjusted for the desired supply water temperature.

Zone-valve zoning — The suggested piping uses a separate circulator for system circulation to provide the higher flow typical of radiant heating systems and to assure good temperature distribution in the system when the return water temperature is low.

Circulator zoning — The GV internal circulators must not be removed. Provide a separate circulator for each zone.

Outdoor reset control

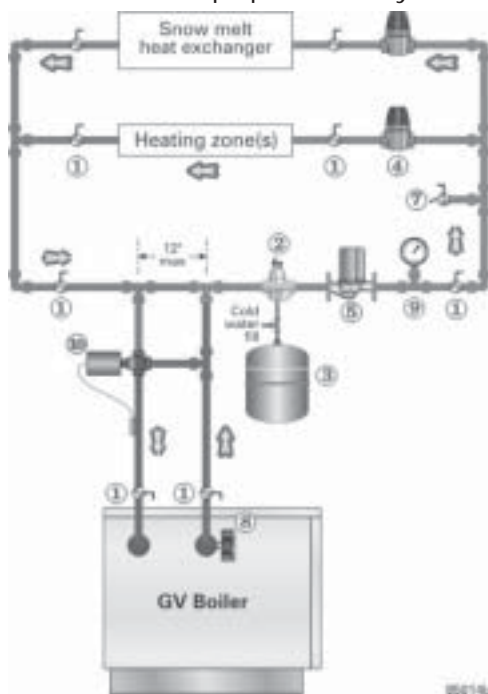
Apply Figure 14a or 14b for any system intended for outdoor reset of the supply water temperature. Use a motor-operated three-way valve and an outdoor reset temperature control system.

Legend

- 1 Isolation valves
- 2 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank).
- 3 Diaphragm- or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in Figure 10.)
- 4 Zone valve
- 5 System or zone circulator
- 6 Flow/check valve
- 7 Hose bibb purge valve
- 8 Boiler pressure/temperature gauge
- 9 System supply temperature gauge
- 10 Supply temperature automatic mixing valve

III Water piping — snow melt system

Figure 15a Manual bypass valves; for fixed temp operation only



Piping snow melt systems or combination snow melt/space heating systems

Combination snow melt/space heating systems will have widely varying system return temperatures. So these systems require automatic return water temperature as shown in Figure 15a (zone-valve zoning) or Figure 15b (circulator zoning).

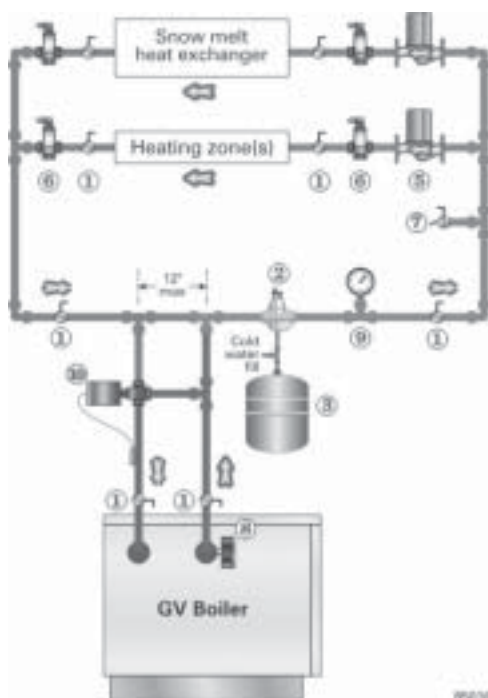
Select an automatic temperature control valve or motor-operated valve which can be adjusted to provide a return water temperature of at least 60 °F. Any setting higher than 60 °F will also be acceptable.

Zone-valve zoning — The suggested piping uses a separate circulator for system circulation to assure good temperature distribution in the system when the return water temperature is low.

Circulator zoning — The GV internal circulators must not be removed. Provide a separate circulator for each zone.

WARNING The return water temperature to the boiler must be at least 60 °F. Provide and apply means to regulate the return temperature. Failure to do so can result in boiler control operation problems, causing possible significant property damage.

Figure 15b Auto return temp regulation; for outdoor reset or fixed temp



Legend

- 1 Isolation valves
- 2 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank).
- 3 Diaphragm- or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in Figure 10.)
- 4 Zone valve
- 5 System or zone circulator
- 6 Flow/check valve
- 7 Hose bibb purge valve
- 8 Boiler pressure/temperature gauge
- 9 System supply temperature gauge
- 10 Return temperature automatic mixing valve



Water piping — water chiller systems

Water chiller systems

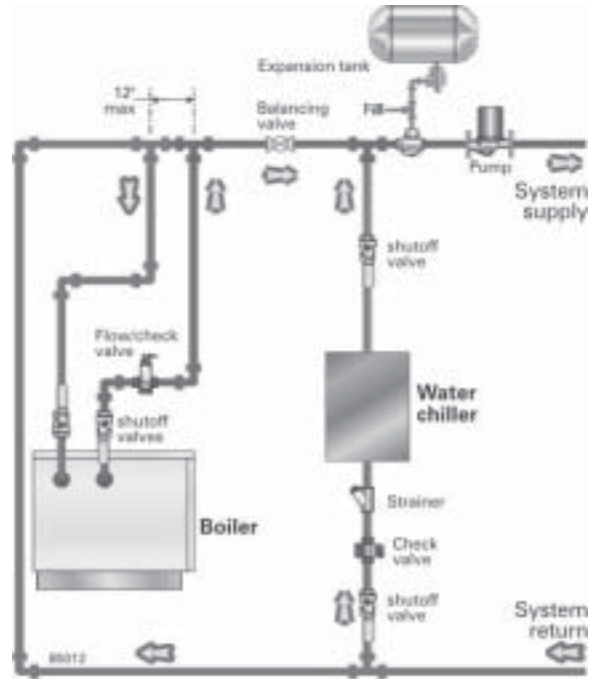
Pipe the boiler and water chiller as shown in Figure 16.

Install boiler, as shown, so chilled medium is piped in parallel with heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. See Figure 16 for typical installation of balancing valve and check valve.

Install the flow/check valve in the boiler supply piping, as shown in Figure 16, to prevent gravity circulation during the cooling cycle.

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 16 Installing GV boiler in system with water chiller



IV Venting and combustion air

DANGER

GV boiler must be **vented and supplied with combustion and ventilation air** as described in GV Series 3 and 4 **Venting Supplements** packed in envelope assembly with boiler. Failure to do so will cause severe personal injury or death.

Install vent piping and air piping (if used) per appropriate **Vent Supplement** included in boiler envelope assembly.

Refer to **Vent Supplement** and to manual Section I regarding requirements for:

- vent system
- combustion air openings
- combustion air quality

DANGER

Use **direct vent** (sealed combustion) **if combustion air quality cannot be assured to be free of contaminants**. Refer to page 13 for a list of potential contaminants and locations likely to contain them. Operating the boiler with contaminated air will damage the boiler sections and vent, resulting in possible boiler failure or leakage of flue products, causing severe personal injury, death or substantial property damage.

V Gas piping

Connecting gas supply piping to boiler

DANGER

Do not connect gas supply to boiler or attempt to operate boiler unless the **correct orifice plate** has been verified or installed in accordance with manual Section IIc.

Except where otherwise instructed in this manual, do not attempt to measure or adjust the outlet pressure setting of the gas valve. The gas valve is factory set to a slight negative pressure, and is operated as a negative-pressure regulated valve.

Failure to comply will result in malfunction of the boiler, causing severe personal injury, death or substantial property damage.

1. Refer to Figure 17 to connect gas supply to ½" npt boiler gas connection. Use wrench to hold factory-installed gas cock.
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 test all gas connections for leaks.**

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.

- 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.

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.

Natural Gas:

1. Refer to Table 3 for pipe length and diameter. Size gas supply piping for total flow to all connected appliances. For each GV boiler, provide for the following gas flow (cfh = cubic feet per hour):

GV-3	70 cfh	GV-5	140 cfh
GV-4	105 cfh	GV-6	175 cfh

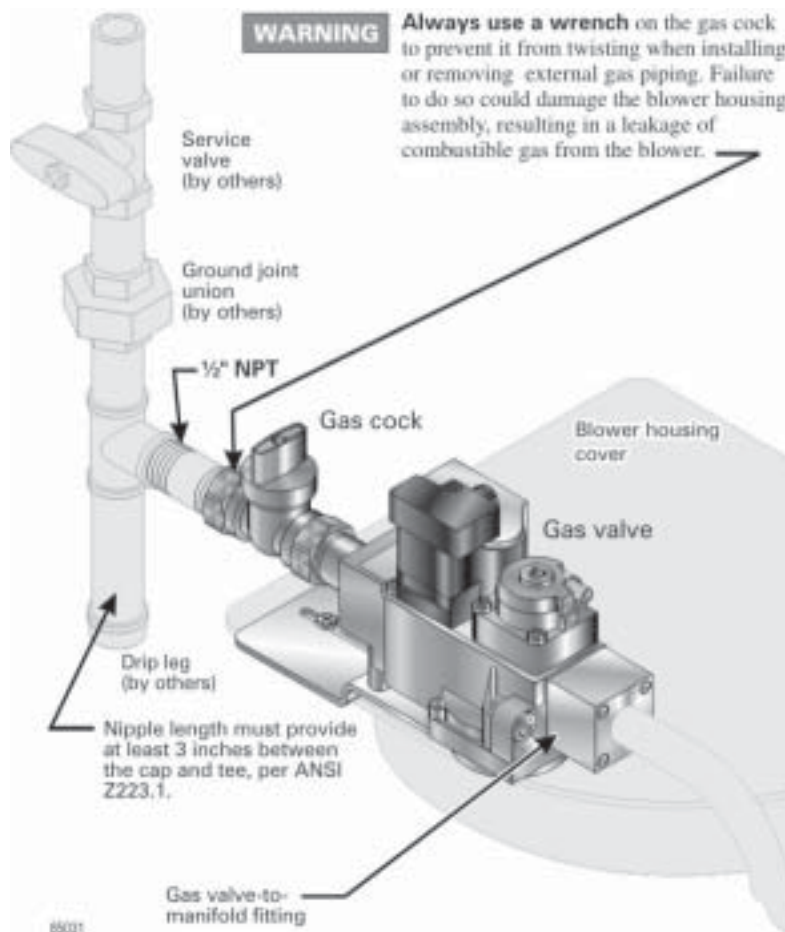
Table 3 is only for gas of **specific gravity 0.60** at a **pressure drop through the line of 0.3" w.c.** For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 or B149.2 for Canadian installations).

2. Inlet pressure required at gas valve inlet:
maximum 13" w.c. minimum 4" 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 4" w.c.

Figure 17 Gas supply connection to GV boiler gas manifold



The Honeywell VK8115V-1176 gas valve operates with DC voltage. The black power plug that connects to the gas valve contains a DC rectifier. When the gas valve is energized, approximately 19 to 21 volts DC voltage should be measured across the two outer pins of the gas valve connector plug. There are 4 pins on the gas valve and 3 pin receptacles in the plug. Only the two outer pins are used for powering the valve. To measure voltage, remove the screw and slightly lift the plug until meter leads can touch end pins. Run boiler and test for proper voltage. Remember to re-install plug and tighten screw after testing.

NOTICE Continuity cannot be checked in the gas valve connector plug wiring due to the rectifier.

Table 3 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)				
	1/2"	3/4"	1"	1 1/4"	1 1/2"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	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

VI Field wiring

Electrical installation must comply with:

National Electrical Code and any other national, state, provincial or local codes or regulations.

In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

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

If original wiring as supplied with boiler must be replaced, use only type 90 °C wire or equivalent.

Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70-latest edition.

Wiring connections

Thermostat(s)

Install on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sunrays, or fireplaces.

Follow instructions with thermostat. If it has a heat anticipator, set **heat anticipator** in thermostat to match power requirements of equipment connected to it (ignition control and gas valve, zone valve contacts, etc.). Wiring diagram on boiler gives setting for standard equipment (ignition control and gas valve).

Thermostat wires are labeled "T-T" on boiler. Remove label before connecting as shown in Figure 18. Route this wiring through the hole in the upper left side jacket.

For zoned systems, substitute the zone valve end switches or circulator relay contacts for the thermostat contact shown in Figure 18.

NOTICE

When using three-wire zone valves, **take care to avoid miswiring.** This can impose an additional 24 volts across the boiler control circuitry. The boiler control module will sense this problem and lockout. It will flash the **POWER** and **TSTAT CIRC** lights to indicate the problem. See label on control module for explanation of lockout conditions. To verify before connecting to boiler, disconnect field thermostat wires at boiler. Place a voltmeter across the leads. Then watch the voltmeter as each zone is activated (by activating zone thermostat). There should never be a voltage reading across the two leads coming to the boiler. If you see a voltage reading, one or more zone valves is miswired.

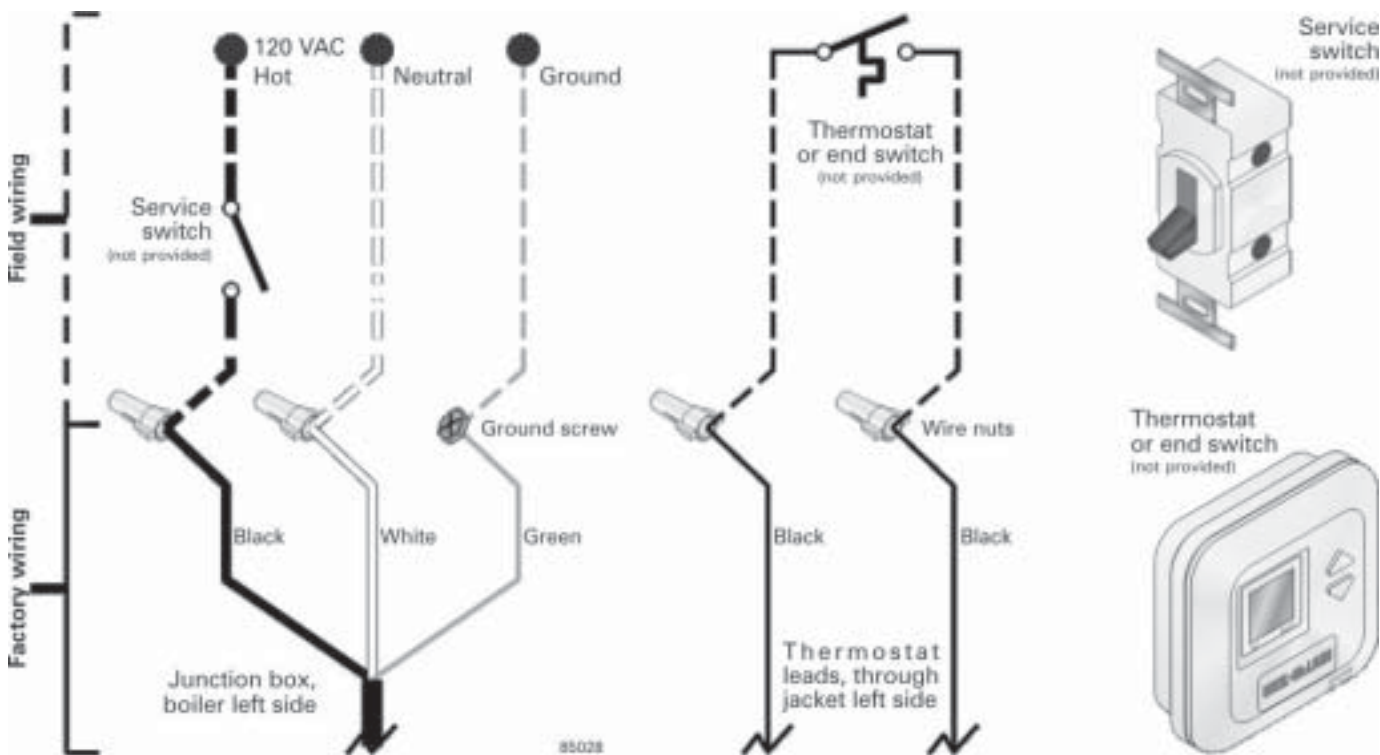
Junction Box (furnished)

Locate the 2 x 4 junction box on the left side of the boiler as shown on page 3 of this manual and in other illustrations.

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.

Connect 120 VAC power wiring as shown in Figure 18.

Figure 18 Field wiring connections — service switch and thermostat (or end switch) provided by installer



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

Watch **polarity** of the circuit when connecting the 120 VAC power wiring. If the polarity is switched, the boiler control module will lockout. The control module will flash the **POWER** light to indicate this problem. See **Troubleshooting**, manual Section **XI**.

NOTICE

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

If original wiring as supplied with boiler must be replaced, use only type **90 °C** wire or equivalent.

Boiler must be **electrically grounded** as required by National Electrical Code ANSI/NFPA 70- latest edition.

VIIa Start-up — overview

- ❑ Determine if **water treatment** will be needed to compensate for water hardness or pH.
- ❑ Obtain **propylene/glycol antifreeze** if freeze protection is required. Glycol must be propylene glycol only, and special requirements may apply when using glycol.
- ❑ Check for **gas leaks** (and verify propane odorant level).
- ❑ **Fill system** with water and purge air. Verify water piping is leak-free.
- ❑ Study boiler **operating instructions**, Section IX. Then start boiler.
- ❑ Verify water piping, gas piping and vent system are **leak-free**. Verify igniter operation.
- ❑ For installations at **altitudes over 5,500 feet** above sea level, measure gas valve outlet pressure and adjust if required (see also Section II d).

VIIb Start-up — preparation

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.

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).

1. Determine **antifreeze quantity** according to system water content. Boiler water content is listed in Table 12 on page 95. 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 first at any leak spot. Added water will dilute the antifreeze, reducing the freeze protection level.

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.

VIIb Start-up — preparation (cont.)

Verify gas/air orifice plate

DANGER

The **proper orifice plate** must be used. Failure to do so will cause severe personal injury, death or substantial property damage.

1. Remove the jacket front panel.
2. Read the boiler size written on the gas/air orifice label tab, verifying the correct size. See Figure 5b for details.
3. The orifice plate must be plain aluminum for natural gas. For propane gas, the exposed tab of the plate should be red.
4. Replace the orifice plate if necessary, following the guidelines of Section IIc in this manual.

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 or call your local gas supplier. Failure to comply could result in severe personal injury, death or substantial property damage.

WARNING

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. Before start-up (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas. Failure to comply could result in severe personal injury, death or substantial property damage.

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 (shown in suggested piping illustrations in this manual). 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. Relieve any residual air in the boiler piping using the manual air vent (page 3, item i) installed on the boiler supply piping.
 - j. If purge valve is not installed, 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- or bladder-type expansion tank systems only) one turn.

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.

VIIc Start-up — read Section IX

Boiler sequence of operation

Manual Section IX contains information about the operation of the boiler and controls. Read this information, including the **Sequence of operation** diagram, to familiarize yourself with the normal operation of the control system. Note also the lockout conditions of the boiler control module, found on the control cover label.

Lighting instructions

Section IX also includes the **Lighting instruction** procedure.

Component operating information

Manual Section XI, **Troubleshooting** includes additional information about the operation of specific boiler components.

VIIId Start-up — to operate boiler

Perform final checks before starting boiler

Read manual Section IX.

Verify the boiler and system are **full of water**.

Verify the **start-up preparation** procedures of Section VIIb have been completed.

DANGER

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

Verify that the **gas/air orifice plate has been checked** (and replaced if necessary) per manual Section IIc. Complete this procedure before starting boiler. Using an incorrect gas/air orifice plate will result in severe personal injury, death or substantial property damage.

Start the boiler

Follow the **Lighting instructions** in Section IX to start the boiler.

See Section VIIe if boiler fails to start.

Check system and boiler

WARNING

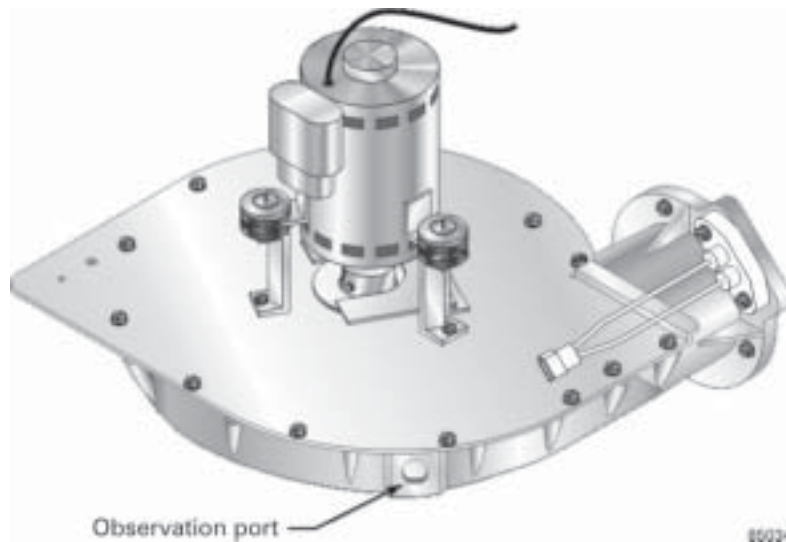
Eliminate all system leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

Venting system must be sealed gas-tight to prevent flue gas spillage and carbon monoxide emissions which could result in severe personal injury or death. Inspect vent system per following.

1. **Check system piping for leaks.** If found, shut down boiler and repair immediately.

VIIId Start-up — to operate boiler (cont.)

Figure 19 Check for igniter glow by looking into observation port on front of blower housing.



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. Check for gas-tight seal at every connection and seam.
4. Check around the boiler for gas odor following the procedure of Section VIIb of this manual.

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.

5. Verify igniter operation — Look through blower observation port (see Figure 19). Access the blower by removing the boiler jacket front panel.

You should see the igniter glow, particularly during the igniter warm-up period of the control cycle.

6. After successful operation of boiler and verification of system (water, vent and gas piping), proceed to the Check-out procedure, Section VIII of this manual.

VIIe Start-up — if boiler doesn't start . . .

- Check for:
1. Loose connections, blown fuse or service switch off?
 2. High limit switch 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 4" w.c.?

If none of the above corrects the problem, refer to Troubleshooting, manual Section XI.

VIIIf Start-up — altitude over 5,500 feet ONLY

Apply the following only when:

- Altitude is over 5,500 feet above sea level.
- You have obtained a high altitude kit (with tools needed) and installed high altitude air pressure switch per the instructions of manual Section IIId.
- Boiler has started correctly, following procedures on previous pages.

You will need the tools shown in Figure 20. Adjust the gas valve outlet pressure only if required as described in the following instructions.

Connect and adjust manometer

1. Remove boiler jacket top and front panels.
2. Close manual gas supply valve and turn off electrical power to boiler.
3. Using common bit screwdriver, remove outlet pressure tap plug from gas control and save plug (Figure 21).
4. You will place negative side of the manometer hose over end of outlet pressure tap barrel.
5. Position and zero manometer per manufacturer's instructions.
 - Manometer must have at least 6" of tubing above the fluid level or fluid may be drawn into the gas control.

DANGER

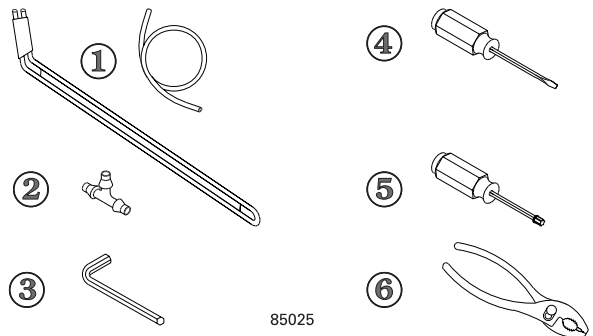
If manometer fluid is drawn into gas control body, gas control must be replaced. Fluid in valve will cause it to malfunction, possibly resulting in severe personal injury, death or substantial property damage.

6. Disconnect tube from hose barb on gas control vent tap. Connect tube end to tee hose fitting as shown in Figure 21. Then add length of hose from tee hose fitting to gas control vent tap.
7. Connect positive side manometer hose to top of the tee hose fitting (Figure 21).
8. Connect negative side manometer hose to the barrel of the gas control outlet pressure tap (Figure 21).

Check Gas Control Set Point

1. Open manual gas valve and turn on electrical power to boiler.
2. Start boiler and allow boiler to run for 5 minutes.
3. Read manometer. This is the gas control outlet pressure set point. If set point is between - 0.1" w.c. and - 0.3" w.c. go to step 7.

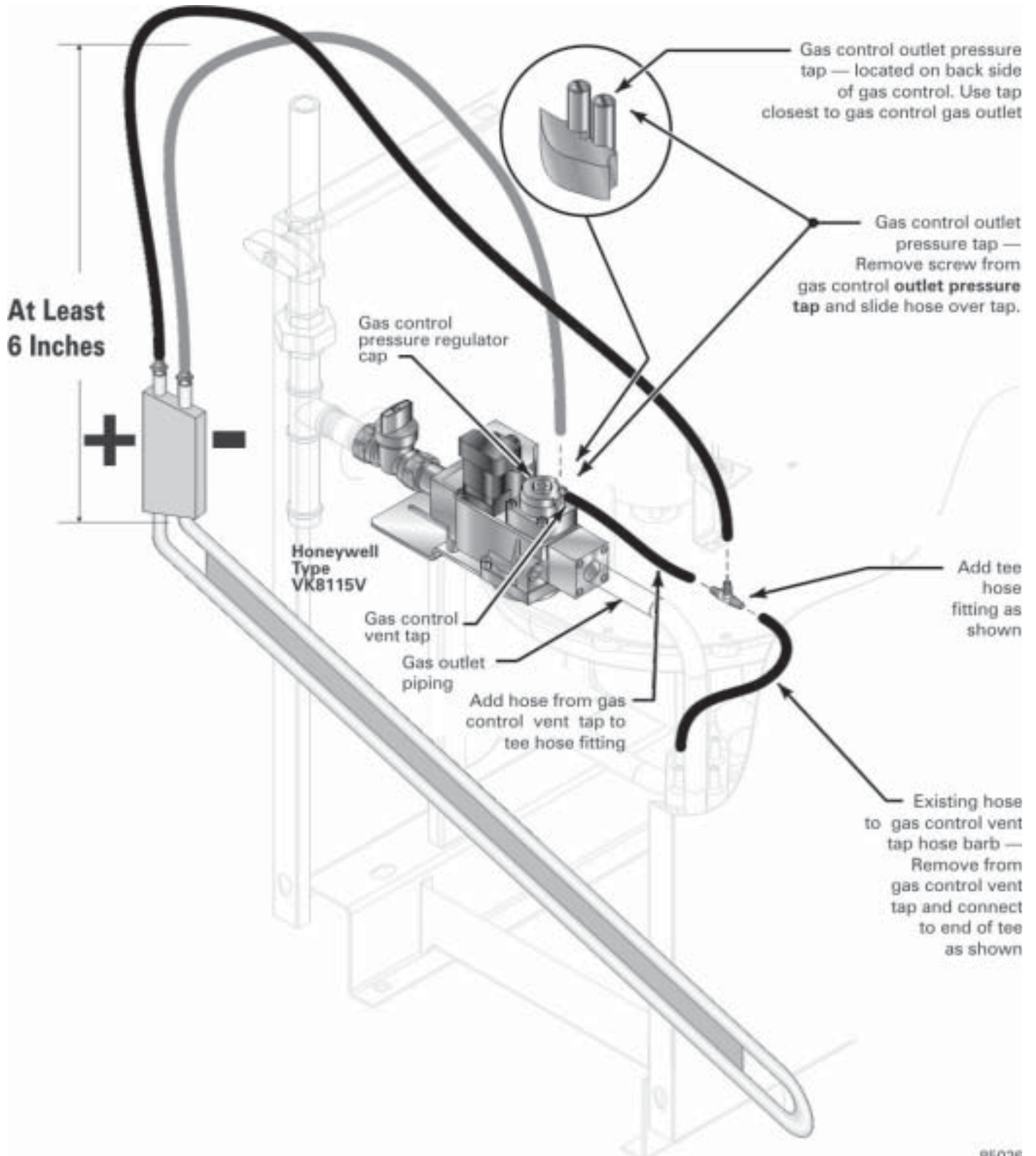
Figure 20 Tools required for gas valve outlet pressure measurement



- 1 U-tube manometer with tubing - Manometer provides a fine scale by slanting the manometer (Dwyer Model 1227 recommended).
- 2 Tee hose fitting (provided in high altitude kit).
- 3 $\frac{3}{16}$ " allen wrench.
- 4 $\frac{1}{4}$ " flat head screwdriver.
- 5 T-40 star drive for gas valve pressure regulator cover screw.
- 6 Pliers.

4. If gas control set point is not between - 0.1" w.c. and - 0.3" w.c., use T-40 driver to remove cap on gas control pressure regulator.
5. Turn gas control pressure regulator screw counter clockwise \curvearrowright to lower gas control set point to - 0.2" w.c.
6. Reinstall cap on gas control pressure regulator using T-40 driver.
7. Cycle boiler off and on several times to verify gas control set point. If set point does not remain between - 0.1" w.c. and - 0.3" w.c., readjust as necessary.
8. Close manual gas supply valve and turn off electrical power to boiler.
9. Remove manometer hose from gas control outlet pressure tap barrel and replace sealing screw.
10. Remove tee hose fitting and added tube.
11. Reinstall hose on gas control vent tap hose barb.
12. Open manual gas supply valve and turn on electrical power to boiler.

Figure 21 Carefully connect manometer to gas valve as shown, following instructions on opposite page.



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VIIIa Check-out procedure — overview

Overview of this section

- Perform the checklist following to ensure boiler is operating correctly.
- Fill in the **Installation and service certificate** at the end of the checklist.

VIIIb Check-out procedure — checklist

Check off steps as completed

- 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?
- Is proper orifice plate installed? Refer to manual Section IIc to check size and fuel type.

DANGER

Proper orifice plate 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 Section VII for proper start-up?
- Is igniter glow visible? Refer to **Verify igniter operation**, manual Section VIId, step 5.
- Inspect vent system for leaks. Verify vent (and air) piping are functional and unobstructed.
- Test limit control — While burner is operating, move indicator on limit control below actual boiler water temperature. Blower and burner should go off while circulator continues to operate. Raise setting on limit control above boiler water temperature and burner should reignite.
- Test additional field-installed controls — If boiler has a low water cutoff, additional high limit or other controls, test for operation as outlined by manufacturer. Burner should be operating and should go off when controls are tested. When controls are restored, boiler should restart.
- Test ignition system (control module):
 - a. Connect voltmeter to gas valve terminals.
 - b. Turn off manual gas valve.
 - c. Set thermostat to call for heat.
 - d. Control module will begin purge cycle, then activate igniter. Igniter will glow for approximately 20 seconds. Near end of 20 seconds, 24 VAC will show at gas valve for approximately 6 seconds and then

VIIIb **Check-out procedure — checklist** (cont.)

return to 0 VAC. Control will attempt ignition two more times, increasing igniter time to 30 seconds for these attempts. The control will then lockout, flashing the **POWER** and **FLAME** lights.

- e. To restart system, follow **Lighting instructions** on boiler or in manual Section IX. (Control will reset after power has been off for at least 45 seconds.)
- Set limit control(s) to system temperature requirements. Adjust balancing valves and controls to provide design temperature to system.
- For multiple zones, adjust flow so it is about the same in each zone or as required.
- Verify thermostat heat anticipator (if available) is set properly? Refer to *Field wiring*, manual Section VI, *Thermostat(s)*.
- 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.
- 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:
$$\frac{3600 \times 1000}{\text{number of seconds from step c}} = \text{Btuh}$$
 - e. Btuh calculated should approximate input rating on boiler rating label.
- 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 or place in pocket inside front panel in boiler.

Installation and service certificate

Boiler model _____ Series _____ CP number _____ Date installed _____

Measured Btuh input _____

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

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

(installer's signature)

IXa

Operation — overview

Overview of this section

- ❑ The **GCM** (control module) is equipped with five indicator lights, used to show normal and problem situations. See Figure 22 for the normal sequence of operation of the boiler and control, and the status of the lights at each stage. For explanation of the lockout conditions of the **GCM** lights, see manual Section **X, Troubleshooting**.

- ❑ Figure 23 shows the ladder wiring diagram for the GV series 4 boiler.

- ❑ Figure 24 is the schematic wiring diagram, showing the destination of each of the wire harnesses attached to the control module.

- ❑ Figure 25 is the Lighting instruction sheet.

IXb Operation — sequence

Figure 22 Ignition control module sequence of operation — status light indications

Steps	Call for heat?	POWER	TSTAT CIRC	LIMIT	PRESS SWITCH	FLAME	Timing
<i>(Following step 8, cycle goes back to step 1.)</i>							
1. Standby • Waiting for call for heat	NO						—
2. Call for heat • Circulator on • Blower on	YES						—
3. Limit circuit • Limit controls closed • Block switch contacts closed	YES						—
4. Pressure circuit • Pressure switch contacts closed • Igniter heating	YES						35 sec
5. Flame proven • Gas valve open • Ignitor remains on • Boiler producing heat	YES						6 sec
6. Limit cycle • Limit circuit open • Gas valve closed • Blower off after postpurge	YES						—
7. Flame outage * • Flame out • Boiler recycles	YES						—
8. Thermostat satisfied • Circulator off • Blower postpurge	NO						30 sec
		or = "ON" = "OFF"					
<p>* If flame is not proven in 4 seconds, boiler recycles 2 times to retry for ignition before going into lockout. Recycle igniter timing is 30 seconds. Postpurge and prepurge are performed on every cycle. In event of lockout, ignition control will automatically restore sequence of operation after either: 1 hour waiting period. Opening and closing of thermostat circuit. Removal of 120 VAC power for at least 45 seconds.</p>							

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IXb Operation — wiring diagrams

Figure 23 Ladder wiring diagram

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

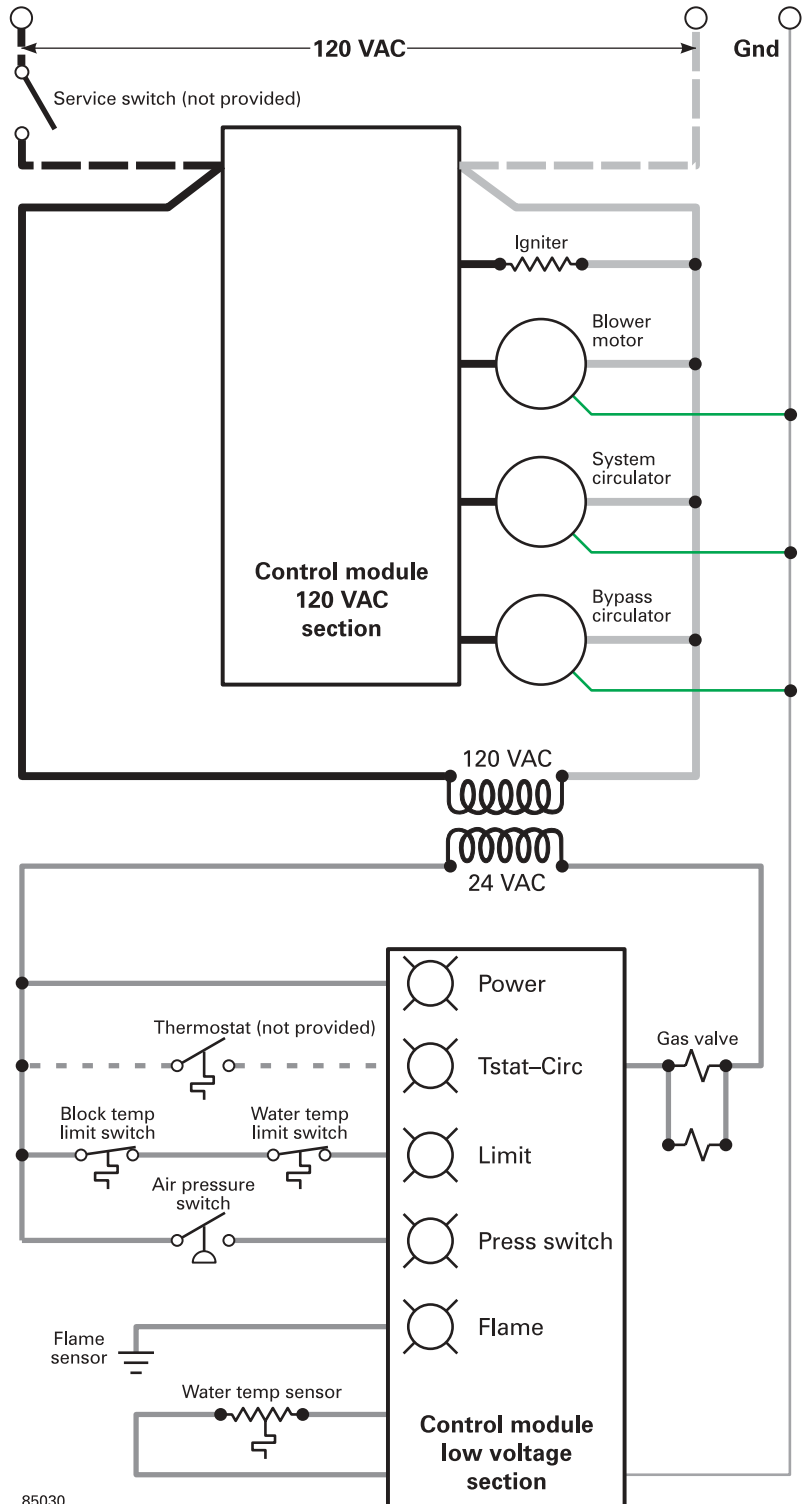
NOTICE All contacts are shown without power applied.

Ladder diagram legend

- 120 VAC hot field wiring
- 120 VAC neutral field wiring
- 24 VAC field wiring
- 120 VAC hot factory wiring
- 120 VAC neutral factory wiring
- Low voltage factory wiring
- Ground connectors

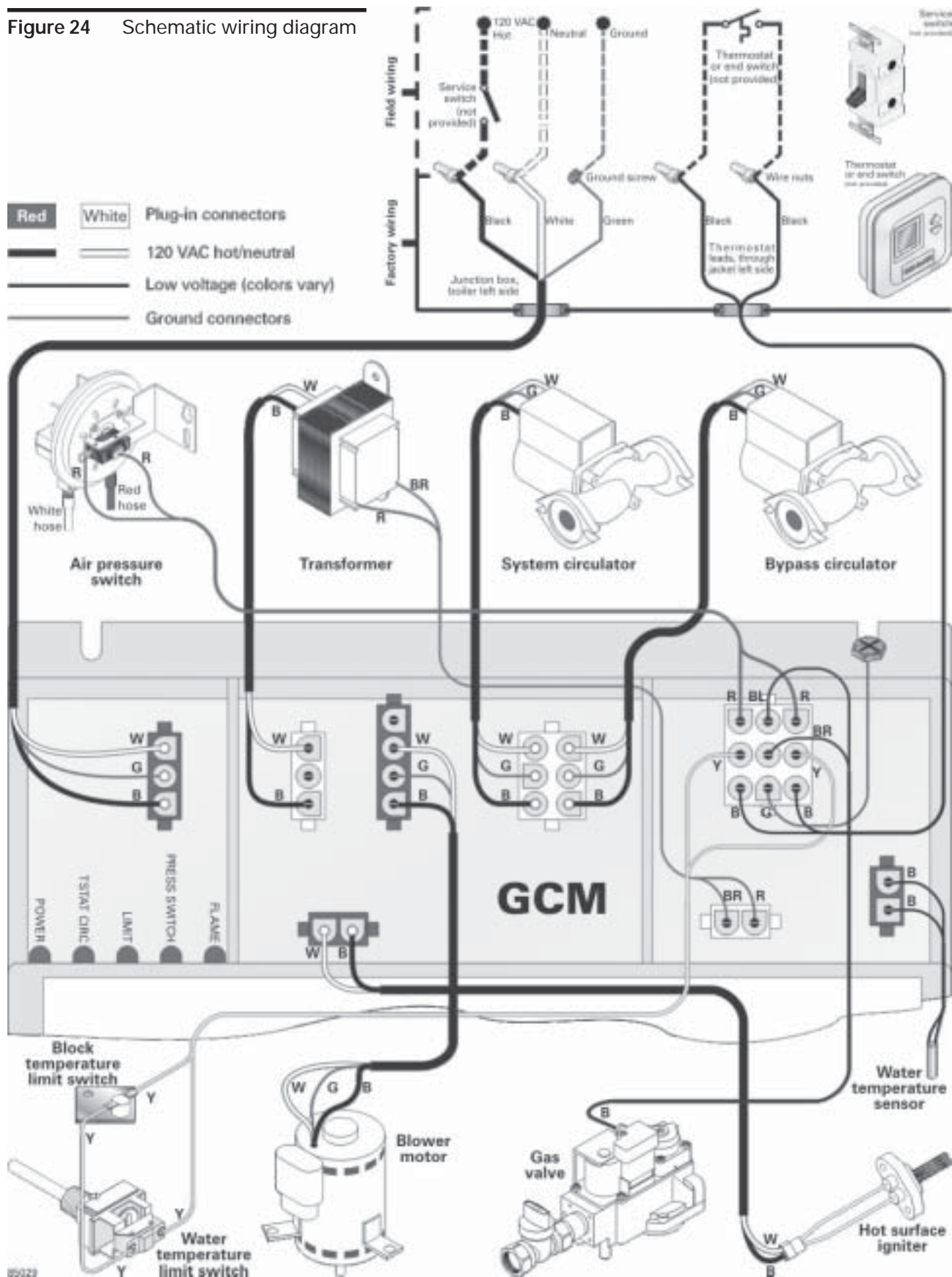
Notes

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.
 - b. Canada — C.S.A. C22.1 C.E.C. Part 1 and any other national, provincial, or local code requirements.
2. All wiring must be:
 - a. U.S.A. — N.E.C. Class 1.
 - b. Canada — C.S.A. C22.1 C.E.C. Part 1.
3. If any of the original wire as supplied with the appliance must be replaced, use type 90 °C or its equivalent.
4. Thermostat anticipator setting (single zone):
0.1 AMP + Gas valve current
5. For multiple zoning, use either zone valves or circulators. Refer to the component manufacturer's instructions and this manual for application and wiring suggestions.
6. Refer to control component instructions packed with the boiler for application information.



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Figure 24 Schematic wiring diagram



IXc Operation — lighting instructions

Figure 25 Lighting instruction

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.

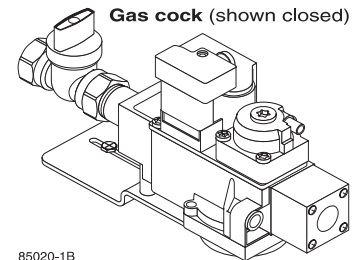
- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. Before OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.
- C. Use only your hand to rotate the handle on the gas cock. Never use tools. If the valve handle will not move 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 neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

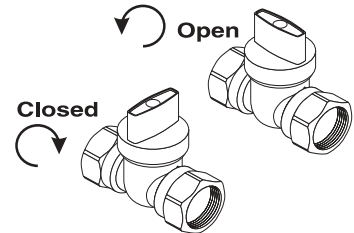
OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electrical power to the appliance.
4. Remove jacket top panel.
5. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
6. Rotate gas cock handle clockwise ↻ to close gas line (handle perpendicular to gas line — see drawing at right).
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, **STOP!** Follow "B" in the safety information above. If you don't smell gas, go to the next step.
8. Rotate gas cock handle counterclockwise ↺ to open gas line (handle lined up with gas line as in the drawing at right).
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "**TO TURN OFF GAS TO APPLIANCE**" below and call your service technician or gas supplier.
12. Replace jacket top panel.



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Rotate gas cock counterclockwise to open. When open, rotate clockwise to close. (See below.)



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 jacket top panel.
4. Rotate gas cock handle clockwise ↻ until handle is perpendicular to gas line (see drawing above, right) to close valve.
5. Replace jacket top panel.

Xa Service and maintenance — overview

Overview of this section

- Review Table 4, page 56, with the owner to advise of the need for **annual start-up and service** by a qualified technician.

- Review Table 4 with the owner, explaining the **maintenance** required and procedures to follow.

- The following pages of this section provide **detailed instructions** for each of the service and maintenance items given in Table 4.

- Do not attempt the service and maintenance items listed without reviewing the detailed information on the following pages.

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.

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 82 of this manual. Failure to comply could result in severe personal injury.

Xb Service and maintenance — schedule

Table 4 Service and maintenance schedules

Service technician (see following pages for instructions)		Owner maintenance (see following pages for instructions)	
ANNUAL START-UP	<p>Inspect:</p> <ul style="list-style-type: none"> • Any problems reported by owner • Boiler area • Air openings • Flue gas vent • Boiler heating surfaces • Water piping • Condensate drain system <p>Service:</p> <ul style="list-style-type: none"> • Lubricate blower motor • Lubricate any circulators requiring oil <p>Start-up:</p> <ul style="list-style-type: none"> • Perform start-up per manual <p>Check/test:</p> <ul style="list-style-type: none"> • Check gas piping for leaks • Check cold fill & operating pressures • Check temperature mixing system • Check/maintain components - vents, limits, expansion tank, gauges, igniter • Inspect & operate relief valve <p>Review:</p> <ul style="list-style-type: none"> • Review maintenance procedures with owner 		<p>Daily</p> <ul style="list-style-type: none"> • Check boiler area • Check air openings • Check pressure gauge
			<p>Monthly</p> <ul style="list-style-type: none"> • Check boiler interior piping • Check venting system • Check air vents • Check condensate drain system • Check relief valve
			<p>Periodically</p> <ul style="list-style-type: none"> • Test low water cutoff (if used) • Clean vent termination/air intake screens
			<p>Every 6 months</p> <ul style="list-style-type: none"> • Oil blower motor • Operate relief valve
			<p>End of season</p> <ul style="list-style-type: none"> • Shut down procedure

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 82 of this manual. Failure to comply could result in severe personal injury.

Xc Service & maintenance — annual start-up

Annual start-up only by qualified service technician

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 4 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.

Annual start-up — 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 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 the appropriate venting supplement.

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 (and air inlet piping)

1. **Visually inspect entire flue gas venting system** (and air piping, if installed) for blockage, deterioration or leakage. Repair any joints that show signs of leakage in accordance with vent manufacturer's instructions. When air is ducted to boiler, verify that air inlet hose is connected and properly sealed.

WARNING

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

Xc Service & maintenance — annual start-up

Annual start-up — inspect Boiler heating surfaces

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 82 of this manual. Failure to comply could result in severe personal injury.

1. Obtain a **GV gasket replacement kit**. This kit contains four gaskets — igniter gasket, vent starter tee gasket, inspection port gasket, and burner gasket.

WARNING

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.

2. Remove the jacket top panel and jacket front panel after turning off power to the boiler.
3. Remove the two nuts retaining the **flueway inspection port cover** (page 3, item g). Remove the **flueway inspection port cover**.
4. Inspect the boiler vent outlet area and heating surfaces by looking through the opening.
5. If the boiler flueways show accumulation of soot, follow **Cleaning boiler heating surfaces** in this manual section to remove the blower housing and clean the boiler. If there is evidence of a large accumulation of rusty scale deposits, check the temperature mixing system.
6. Replace the **flueway inspection port cover**.

Water piping

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

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.

DANGER

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

Condensate drain system

1. Inspect the condensate trap hose for **deterioration**.
2. Check for any obstructions in the trap hose by squeezing the tubing.
3. If there is any doubt the condensate drain system is flowing freely, remove the clamp and hose from the bottom of the vent starter tee. Slide a funnel outlet into the trap hose and pour water through. It should exit at the termination of the condensate drain line.
4. If the owner's monthly inspection of the condensate drain system has indicated a tendency for the trap to run dry, install a **condensate drain line check valve kit**, available through your Weil-McLain distributor. See installation instructions for check valve kit in this manual section.

Annual start-up — service

Blower motor (Figure 27)

1. With boiler power **OFF**, place a few drops of S.A.E. 20 motor oil in each of the two oil cups.

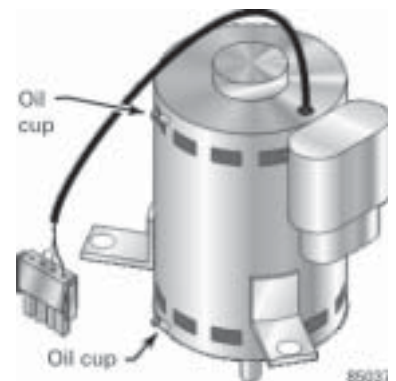
WARNING

Use only **S.A.E. 20 motor oil** to lubricate the blower motor. Do not use universal household oils. Motor could be damaged, resulting in possible severe property damage.

Oiled-bearing circulators

1. Both of the circulators installed in the boiler are 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.

Figure 27 Blower motor



Annual start-up — start-up

Start-up procedure

1. Follow the instructions in manual Section VII.
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 Sections V and VIIb, verifying no indications of leakage and all piping and connections are in good condition.
5. Read the **Lighting instructions** (Figure 25 of this manual or on boiler label).
6. Start the boiler following the **Lighting instructions** and manual Section VIId.

Xc Service & maint. — annual start-up (cont.)

Annual start-up — Gas piping 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 Section V 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.

Temperature mixing system

1. Carefully check the **temperature** of the **system return piping** as it passes through the boiler jacket and on the **return pipe inside the boiler jacket** just before it enters the boiler sections. You may do this with a surface pyrometer or by lightly touching the piping with your fingers.

WARNING

To avoid potential of severe burn — **Do not rest hands on or grasp pipes.** Use a light touch only. Return piping may heat up quickly.

2. The temperature of the water entering the system should quickly heat up to about **140 °F**, being considerably hotter than the return water from the system.
3. This is accomplished with the **two internal boiler circulators**. The Bypass circulator (page 2, item 7) takes hot water from the boiler supply outlet and blends it with return water. The System circulator (page 2, item 6) slows down to aid in raising the return temperature entering the sections.
4. If the **temperature mixing system** does not work correctly, check the two circulators to be sure they are flowing water. If the circulators are operating normally but the temperature mixing system does not maintain water at the entrance to the boiler sections at 140 °F, you may need to replace the boiler control module or water temperature sensor (page 2, items 1 and 8).

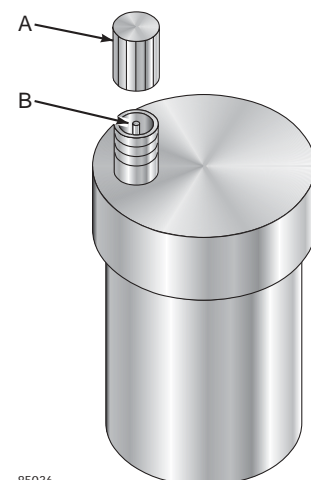
Air vents and air elimination (only used with diaphragm-type expansion tanks)

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 28. If the air vent is leaking, remove cap **A** and briefly push valve **B** and then release to clean the valve seat.
4. Replace cap **A** by twisting all the way onto valve **B** and then unscrewing one turn.

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 dial to original setting.
2. Inspect and test additional limit controls or low water cutoffs installed on system.

Figure 28 Automatic air vent



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Annual start-up — Expansion tank check/test

1. Expansion tanks provide space for water to move in and out as the heating system water expands due to temperature increase or contracts as the water cools. Tanks may be open-, closed-, diaphragm- or bladder-type. See Section III 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.

Diaphragm- or bladder- type — Welded gas tight with a rubber membrane to separate the 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 Section III.

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.

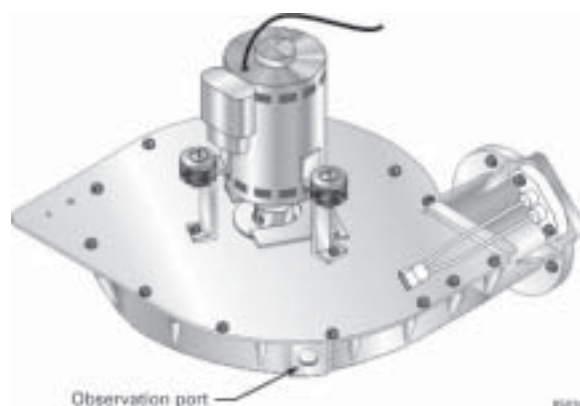
Gauges

1. Boiler pressure/temperature gauge — Inspect gauge and check whether readings are reasonable. Replace if any signs of leakage from case or improper readings.
2. System gauges (if installed) — Inspect and check readings of other gauges in system.

Igniter

1. Verify igniter operation — Look through blower observation port (see Figure 29). Access the blower by removing the boiler jacket front panel if not already removed.

Figure 29 Igniter observation port in blower



Xc Service & maint. — annual start-up (cont.)

Annual start-up — Boiler relief valve check/test

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 Section IIIb before proceeding further.

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 build-up, which can result in severe personal injury, death or substantial property damage.

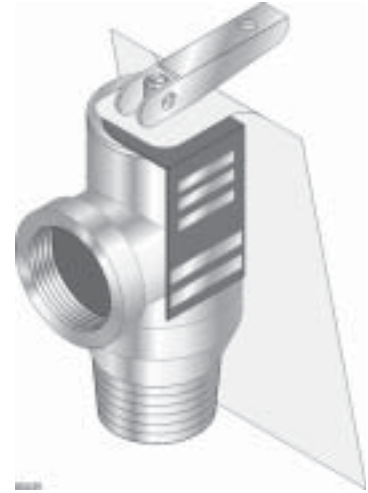
WARNING

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.

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 30 Relief valve



Annual start-up — Review with owner owner review

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**.
3. Remind the owner of the need to call in a licensed contractor should the boiler or system exhibit any abnormal 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.

Xd Service & maint. — special procedures

Condensate drain line check valve kit

WARNING

The service procedures listed in Section Xc of this manual must only be performed by a qualified boiler service technician. Failure to comply could result in severe personal injury, death or substantial property damage.

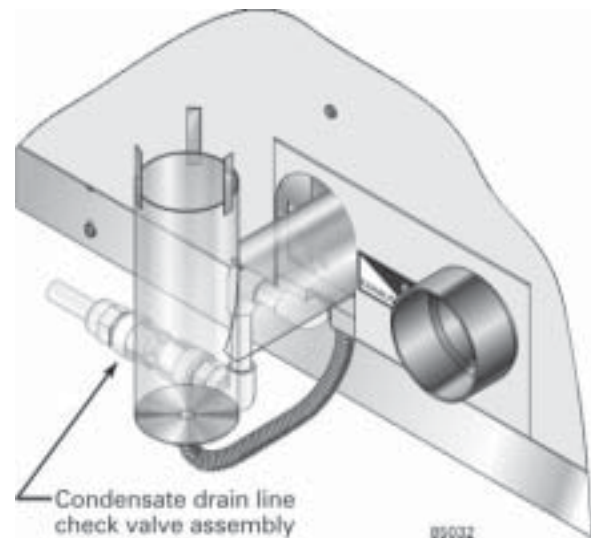
1. If the owner finds that flue gases frequently leak from the condensate trap hose, install the condensate drain line check valve kit.

CAUTION

Under some circumstances a GV vent system may not produce enough condensate to keep the condensate trap full of liquid. If the trap is not full, small amounts of flue products can be emitted into the boiler room through the condensate drain line. Contact a qualified service technician to install a condensate drain line check valve kit.

2. Obtain the kit from your Weil-McLain distributor and follow the instructions included with the kit.
3. See Figure 31 for a typical installation of the check valve on the condensate drain line.

Figure 31 Condensate drain line check valve kit, installed — Refer to kit for detailed instructions.



Xd Service & maint. — special proced. (cont.)

Cleaning boiler heating surfaces

WARNING

The service procedures listed in Section Xc of this manual must only be performed by a qualified boiler service technician. Failure to comply could result in severe personal injury, death or substantial property damage.

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 82 of this manual. Failure to comply could result in severe personal injury.

1. If inspection of the boiler flueways indicates the presence of soot, clean the boiler heating surfaces using the following procedure. The process requires removing the blower housing to allow spraying water through the boiler combustion chamber.
6. Grasp blower housing and pull free from studs. Turn clockwise slightly, until blower assembly can be removed safely from inside of boiler jacket.
7. Remove burner cone and gasket for inspection.

Before proceeding, obtain a GV gasket replacement kit, consisting of igniter, vent starter tee, flueway inspection port and blower gaskets.

To remove the blower assembly

1. Turn off boiler by turning down the thermostat. Then turn off power at the boiler service switch. Close manual gas valve on incoming gas line to boiler.

WARNING

Turn off power and gas to the boiler. Failure to do so can cause severe personal injury, death or substantial property damage.

DANGER

Wait several minutes after boiler has stopped to allow the igniter to cool to avoid severe personal injury or death.

2. See Figure 32.
3. Disconnect:
 - remove union outside of boiler
 - gas tubing from gas valve outlet by removing the 4 screws securing the outlet fitting to the valve. (Save the o-ring in the fitting.)
 - remove gas valve and bracket
 - hose from gas valve to gas/air manifold
 - pressure switch hoses
 - air inlet hose
 - blower motor wiring harness from control module
 - igniter harness connected to igniter plug
 - blower support bracket (remove screw securing blower housing to bracket — on left side of blower housing)
 - ground wire.
4. Remove the two igniter screws and washers. Carefully remove the igniter. Use care when handling — igniter is very brittle. DO NOT touch igniter surface with hands or expose to any greasy substances.
5. Remove nuts from studs securing blower housing to front section.

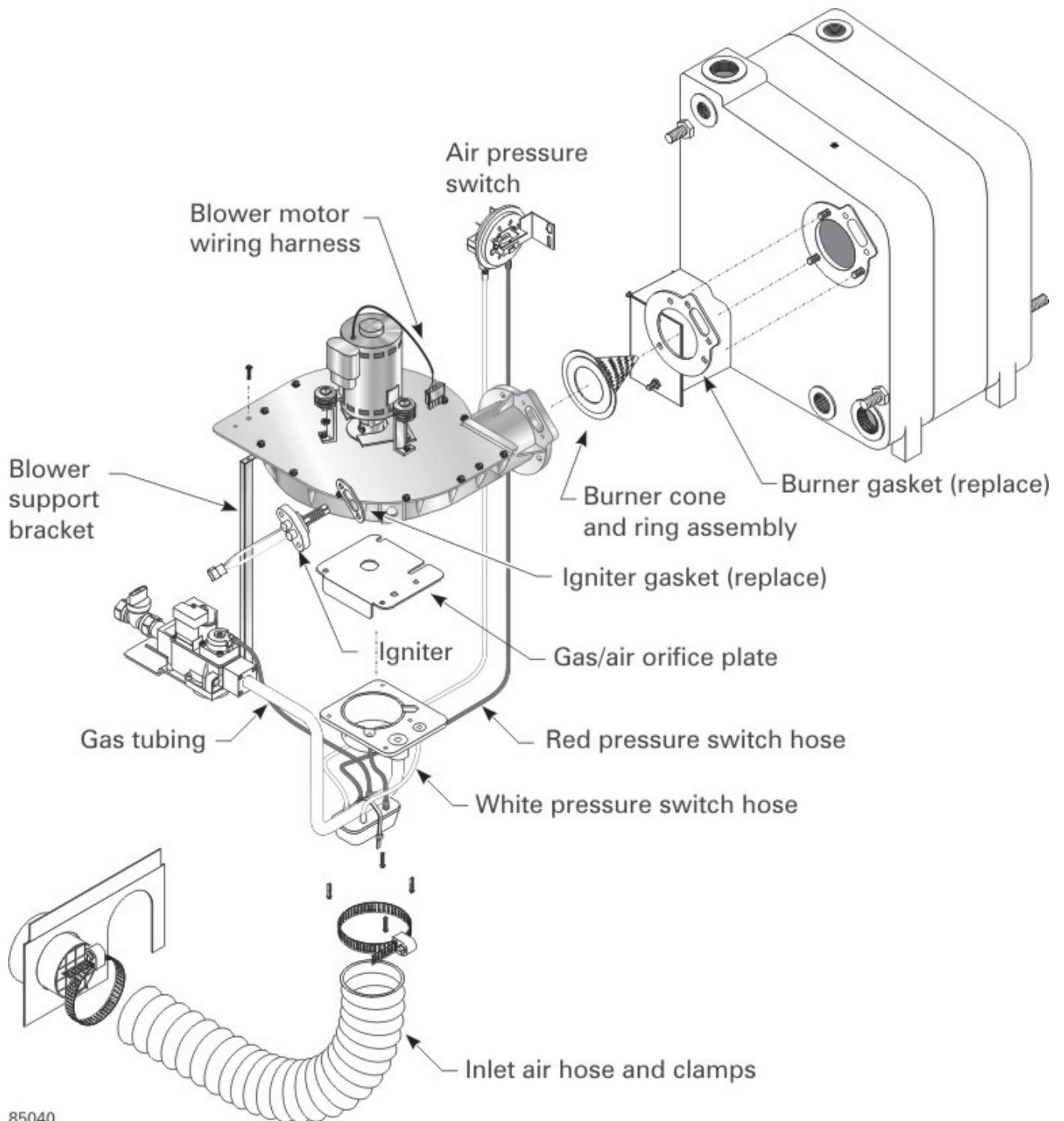
To clean heating surfaces

1. Replace flueway inspection port cover (page 3, item g).
2. Remove the corrugated drain tubing from the bottom of the vent starter tee by releasing the tube clamp.
3. Place a catch pan under the tee to catch the cleaning water.
4. Spray water into the boiler combustion chamber opening.
5. Catch the runoff water in the pan below the vent starter tee.
6. Continue process until flueways are clean.

Replace blower assembly

1. Place a new blower housing gasket over the studs at combustion chamber opening.
2. Reinstall burner cone into chamber opening.
3. Position blower assembly over studs. Install nuts and tighten.
4. Install igniter and new igniter gasket. Fasten with screws and washers. Tighten only with hand-held screwdriver. DO NOT use electric or pneumatic driver. Excessive torque will damage igniter. Do not exceed 20 inch-pounds torque.
5. Connect:
 - gas valve and piping (4 screws)
 - gas tubing to gas valve outlet
 - pressure switch hoses
 - hose from gas valve to gas/air manifold
 - air inlet hose
 - blower motor wiring harness to control module
 - igniter harness to igniter plug
 - blower support bracket (with screw)
 - ground wire.
6. Be sure all wiring and hose connections are correct per Figure 32 and are secure on the hose barb fittings.

Figure 32 Blower housing removal procedure



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XIa Troubleshooting — overview

Overview of this section

- ❑ Section **XIb** — troubleshooting procedures.
- ❑ Section **XIc** — procedure for checking air pressure switch.
- ❑ Section **XId** — special servicing tips (for igniter, gas valve and blower housing).
- ❑ Section **XIe** — control module.
- ❑ Section **XIf** — common problems and possible solutions.
- ❑ Section **XIg** — troubleshooting GCM indicator light conditions.
 - Chart 1 — **POWER** light conditions
 - Chart 2 — **POWER** and **TSTAT CIRC** lights flashing
 - Chart 3 — **POWER** and **LIMIT** lights flashing
 - Chart 4 — **POWER** and **PRESS SWITCH** lights flashing
 - Chart 5 — **POWER** and **FLAME** lights flashing
 - Chart 6 — **TSTAT CIRC** light flashing by itself
 - Chart 7 — **LIMIT** light flashing by itself
 - Chart 8 — Insufficient or no heat condition

XIb

Troubleshooting — procedures

WARNING

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

WARNING

Never jumper (bypass) any device except for momentary testing as outlined in **Troubleshooting charts**. Severe personal injury, death or substantial property damage can result.

WARNING

The control module and boiler controls can malfunction if they get wet. Never try to use a control that has been flooded or wet. Replace it. Failure to comply can result in severe personal injury, death or substantial property damage.

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 82 of this manual. Failure to comply could result in severe personal injury.

Before troubleshooting:

1. Have a voltmeter that can check 120 VAC and 24 VAC and a continuity checker.
2. Check for 120 VAC (min. 102-max.132) to boiler.
3. Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for 24 VAC between thermostat wire nuts and ground.
4. Have an inclined manometer with 0 – 2" w.c. range.

Check the following:

1. Wire connectors to control module are securely plugged in at module and originating control.
2. Hoses are properly and securely plugged in and are not damaged.

VERIFY PROPER OPERATION AFTER SERVICING.

XIc Troubleshooting — air pressure switch

Checking the air pressure switch

WARNING

Do not use manometer as shown in Figure 33 to test gas valve outlet pressure. Where instructed in this manual to check gas valve outlet pressure, follow instructions carefully, particularly regarding connection of manometer. Manometer fluid will cause permanent damage to gas valve. Severe personal injury, death or substantial property damage can result.

Check switch pressure setting

1. See Figure 33.
2. Remove both air pressure switch hoses from air pressure switch.
3. Install tees and tubing as shown in Figure 33 to inclined manometer.
4. Turn off gas valve and set thermostat to call for heat. Blower will run but burner will not ignite.
5. Check for 24 VAC between both air pressure switch terminals and ground.
6. If manometer reading is at least 1.4" w.c., but there is not 24 VAC between both air pressure switch terminals and ground, replace air pressure switch.

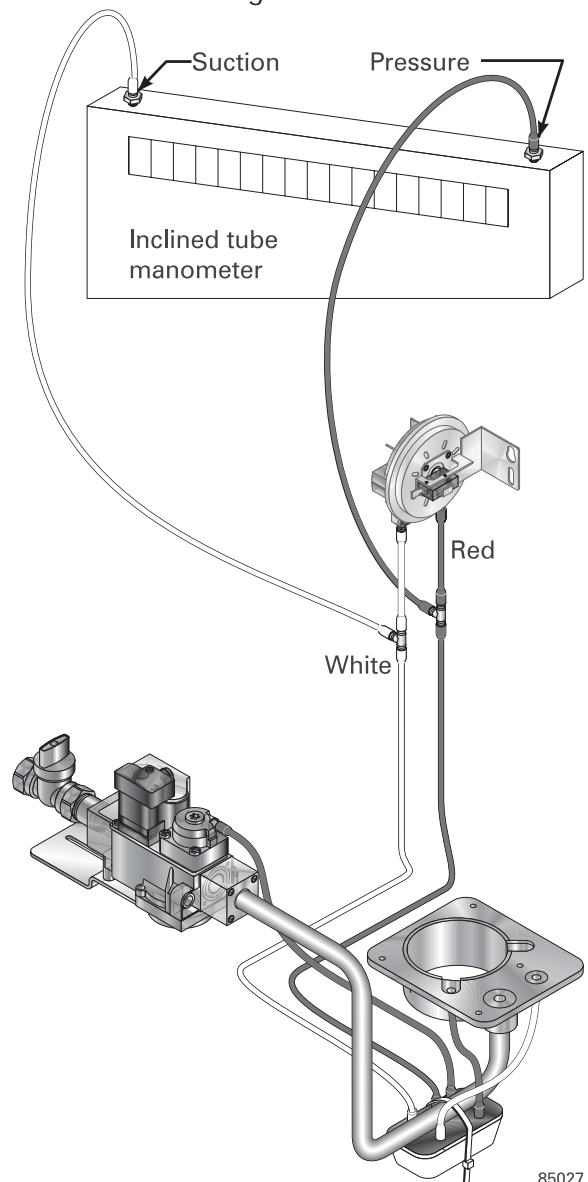
Troubleshooting air pressure reading

1. If manometer reading is lower than 1.4" w.c. check for possible causes:
 - blockage in hoses.
 - loose blower wheel on motor shaft.
 - blower motor not at proper rpm.
 - blockage in air inlet or hose.
 - blockage in flue pipe or termination.
 - condensate trap filled w/condensate.

Return to normal operation

1. When pressure reading is proper and air pressure switch is operating properly, remove tees and reinstall hoses to air pressure switch.

Figure 33 Connecting a manometer to check air pressure switch. DO NOT use this arrangement to check gas valve.



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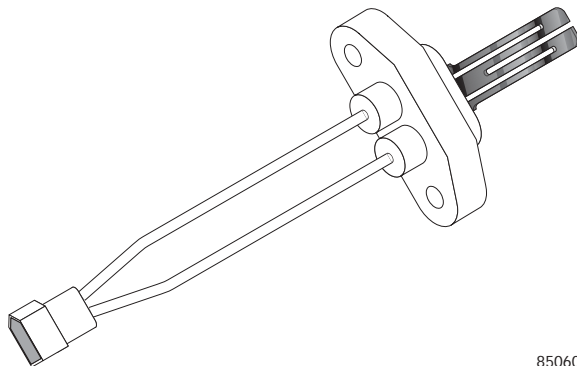
XId Troubleshooting — servicing tips

Igniter

DANGER

Wait several minutes until igniter cools down before attempting replacement. Failure to do so will cause severe personal injury.

1. Disconnect igniter from igniter wiring harness and remove igniter before removing blower assembly.
2. Replace igniter gasket if original gasket is frayed or damaged.
3. Igniter is fragile - handle with care. Do not touch igniter surface with bare hands. Body oils can cause failure of the carbide.

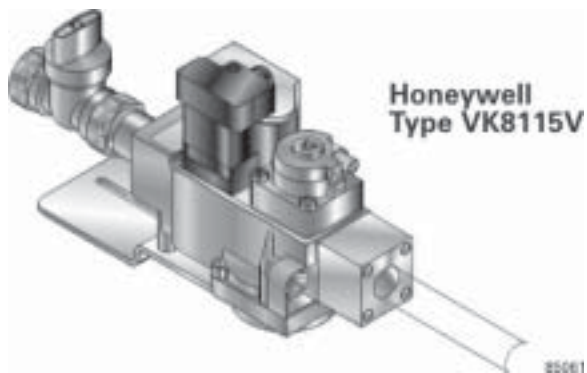


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Gas Valve

WARNING

Gas valve operates with a negative pressure at the outlet — approximately -0.2" w.c. — do not set gas pressure higher than this. Follow instructions in this manual carefully if testing gas valve outlet pressure. Failure to comply can result in severe personal injury or death.



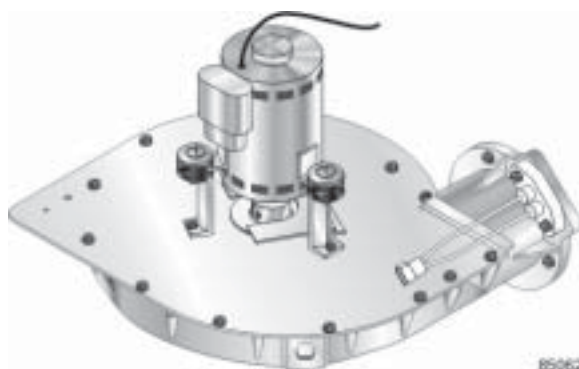
WARNING

The gas valve outlet is bolted to the gas line adapter and sealed with an o-ring. When replacing valve, replace only with valve listed in this manual for use with the GV boiler. Failure to comply could result in severe personal injury, death or substantial property damage.

Blower Housing

WARNING

Do not disassemble blower housing. A fire or explosion causing severe personal injury, death or substantial property damage can result. If you suspect a problem, replace blower housing. Follow instructions in manual Section IX, **Cleaning boiler heating surfaces** for blower housing removal and replacement.



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XIe Troubleshooting — control module

Control Module

Make sure **ground wiring** is installed per wiring diagram. Good grounding is extremely important for proper operation.

WARNING

Solder or water splatter between plugs and circuit board can cause improper operation of control module. Place a shield over the boiler internal controls and components during installation. Failure to comply could result in severe personal injury, death or substantial property damage.

Control indicator lights — lockout modes

See Charts 1 through 8 in this section for detailed troubleshooting procedures.

To reset control after a lockout, turn off power at the 120 VAC service switch or turn down all thermostats. Wait 45 seconds. Then restore power and call for heat.

After an over-temperature lockout (**POWER** and **LIMIT** lights flashing), the control will only reset after interruption of 120 VAC for 45 seconds. (And temperature at return water temperature sensor must be below 240 °F.)

POWER light flashing alone

Usually indicates reversed polarity of 120 VAC power wires.

POWER and TSTAT CIRC lights flashing

Usually indicates stray voltage on external thermostat circuit wires or return water temperature entering boiler sections has not reached 140 °F within 20 minutes.

POWER and LIMIT light flashing alternately

Usually indicates that limit circuit failed to cut off boiler at high temperature — return water temperature sensor has sensed water over 235 °F.

POWER and PRESS SWITCH lights flashing

Usually indicates pressure switch is closed when it should not be, or pressure switch failed to close within 5 minutes of blower starting.

POWER and FLAME lights flashing

Usually indicates control has had three unsuccessful



ignition attempts or sensed flame when it shouldn't be there. Boiler may not be properly grounded.

Non-lockout light conditions

TSTAT CIRC light flashing alone

Usually indicates return water temperature sensor detects water at boiler return pipe less than 40 °F. Both internal circulators will run continuously, even with no call for heat, until temperature rises.

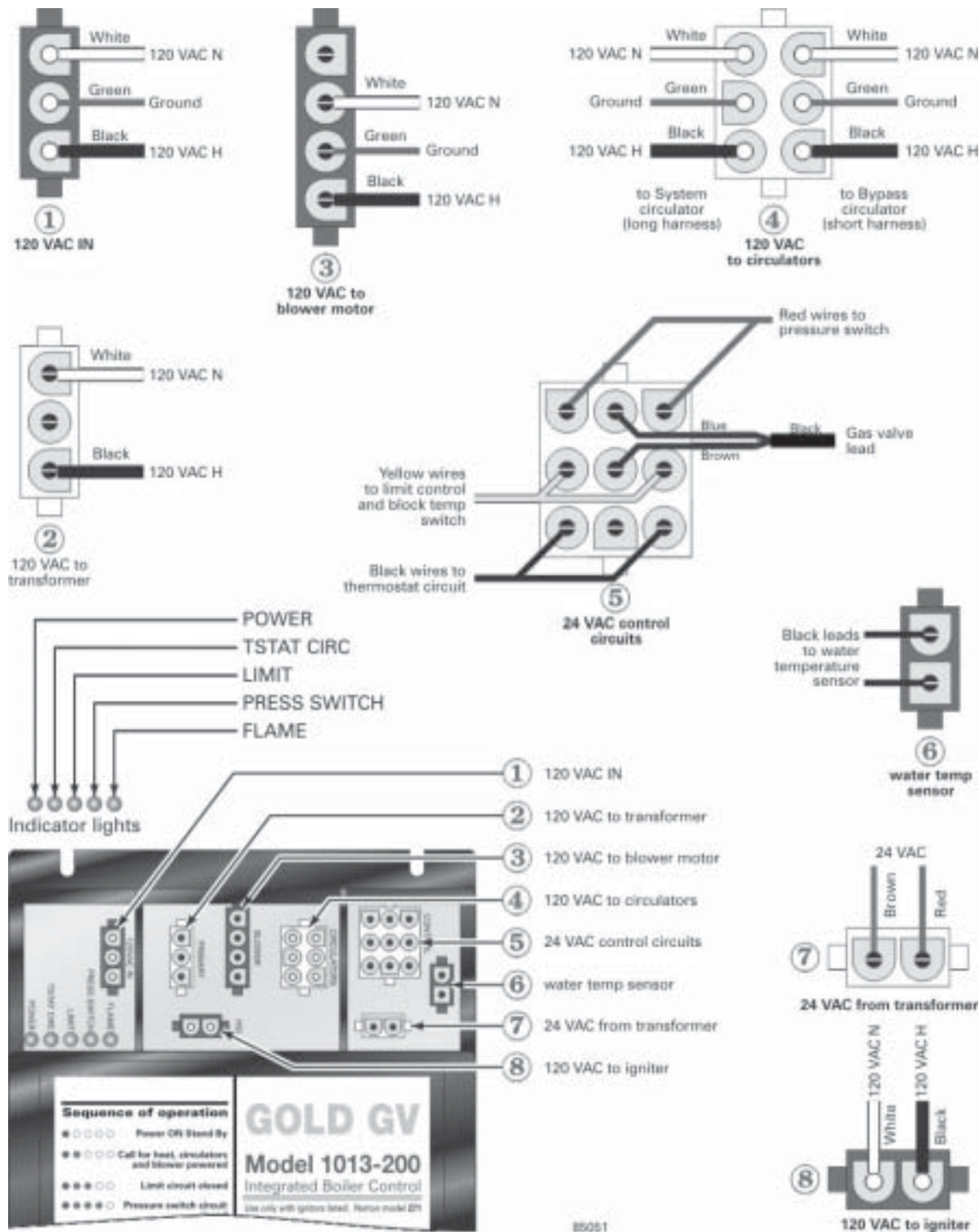
LIMIT light flashing alone

Usually indicates an open or shorted return water temperature sensor.

Troubleshooting the GCM

See Figure 34 for location of harness plug receptacles and plugs on the control module.

Figure 34 GCM (control module) harness plug receptacle and indicator light locations.



XI Troubleshooting — common problems

Symptom	Common Causes	Possible Corrections
Rapid cycling — boiler turns on and off frequently	Thermostat installed where drafts or heat affect reading	Locate thermostat on inner wall away from heat sources or cool drafts.
	Heat anticipator in thermostat adjusted incorrectly	Adjust thermostat per manufacturer's instructions.
	Incorrect limit setting	Set limit according to system needs. Maximum setting is 220° F. Increase limit setting to decrease cycling.
	Insufficient water flow through boiler	Check all valves to and from boiler. Return to proper setting.
Confirm circulator size.		
Frequent release of water through relief valve	Expansion tank sized too small	Call qualified service technician to check expansion tank operation and size.
	Flooded expansion tank	Call qualified service technician to check expansion tank operation.
	Inoperative limit control	Call qualified service technician to replace limit control.
Need to frequently add makeup water	Leaks in boiler or piping	Have qualified service technician repair leaks at once to avoid constant use of makeup water. Makeup water can cause mineral deposits which, in turn, can cause boiler section failure. Do not use petroleum-base stop-leak compounds.
Black water condition	Oxygen corrosion due to leaks in boiler and piping	Have qualified service technician repair at once. Keep pH of water between 7.0 to 8.5.

Symptom	Common Causes	Possible Corrections
Popping or percolating noise heard in boiler	Mineral deposits in sections due to constant use of makeup water	Call qualified service technician to de-lime boiler, if necessary. In some cases, deposits will be too heavy to remove with de-liming procedures.
		Have qualified service technician repair leaks to eliminate need for constant makeup water.
	Incorrect pH of boiler water	Call qualified service technician to check pH level and correct. pH should be maintained between 7.0 to 8.5.
	Insufficient water flow through boiler	Check all valves to and from boiler. Return to proper setting. Confirm circulator size.
Metal flakes found in vent outlet or vent starter tee — flueway corrosion	Contaminated combustion air supply — See manual page 13.	Remove any contaminating products, see manual page 13. Provide outside air for combustion. Have qualified service technician pipe-up kit.
	Condensation of combustion gases in boiler sections	Have qualified service technician check operation of mixing system. Repair/replace if necessary.
Some radiators or baseboard units do not heat or are noisy	Air in system	Bleed air from system through air vents in radiators or baseboard units.
	Low system pressure	Fill to correct pressure. Check for leaks in boiler or piping. Have qualified service technician repair at once.
	High limit set too low	Adjust high limit to higher setting.

Xlg Troubleshooting — GCM lights

CHART 1 — Troubleshooting POWER light status

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

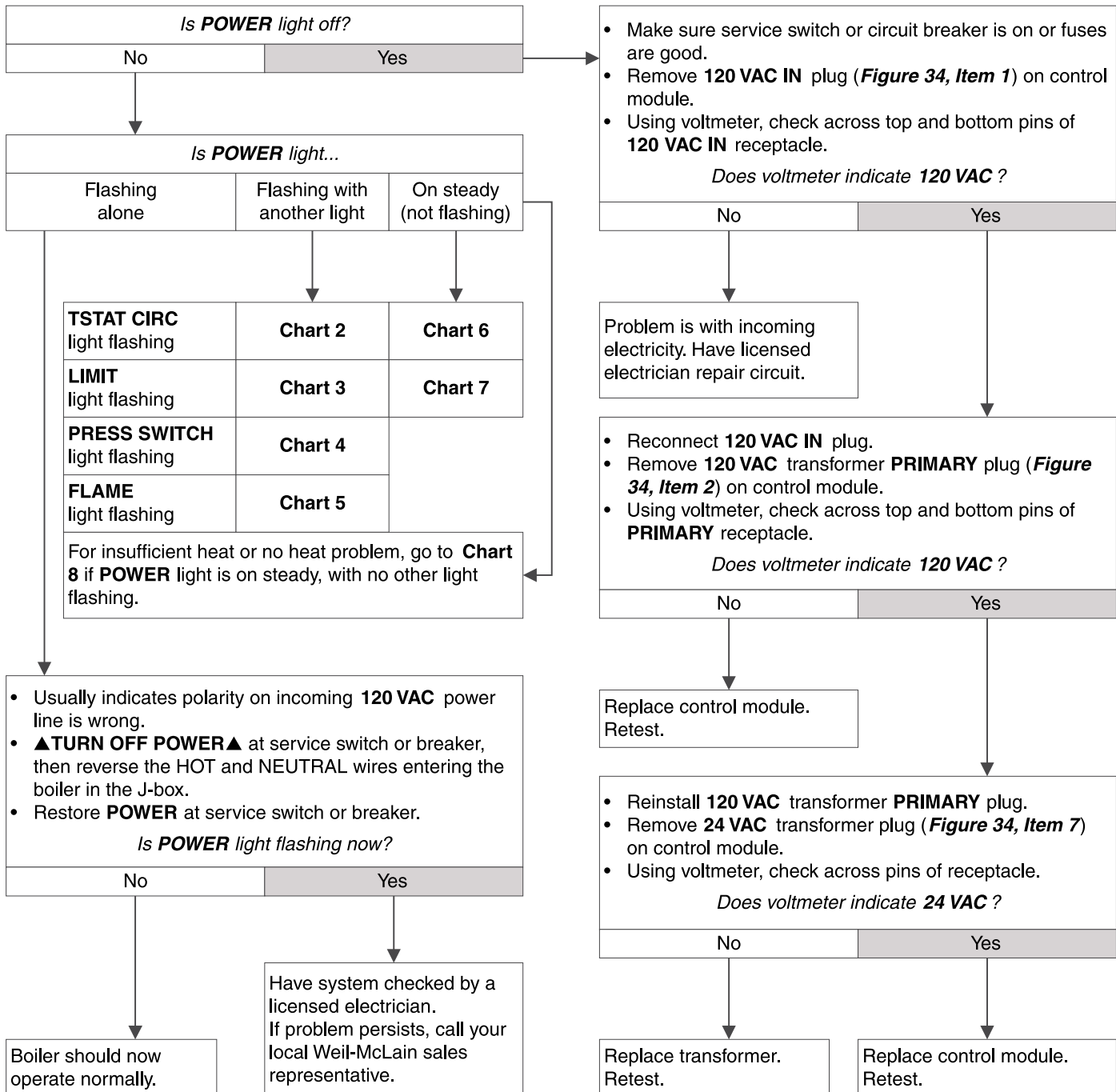
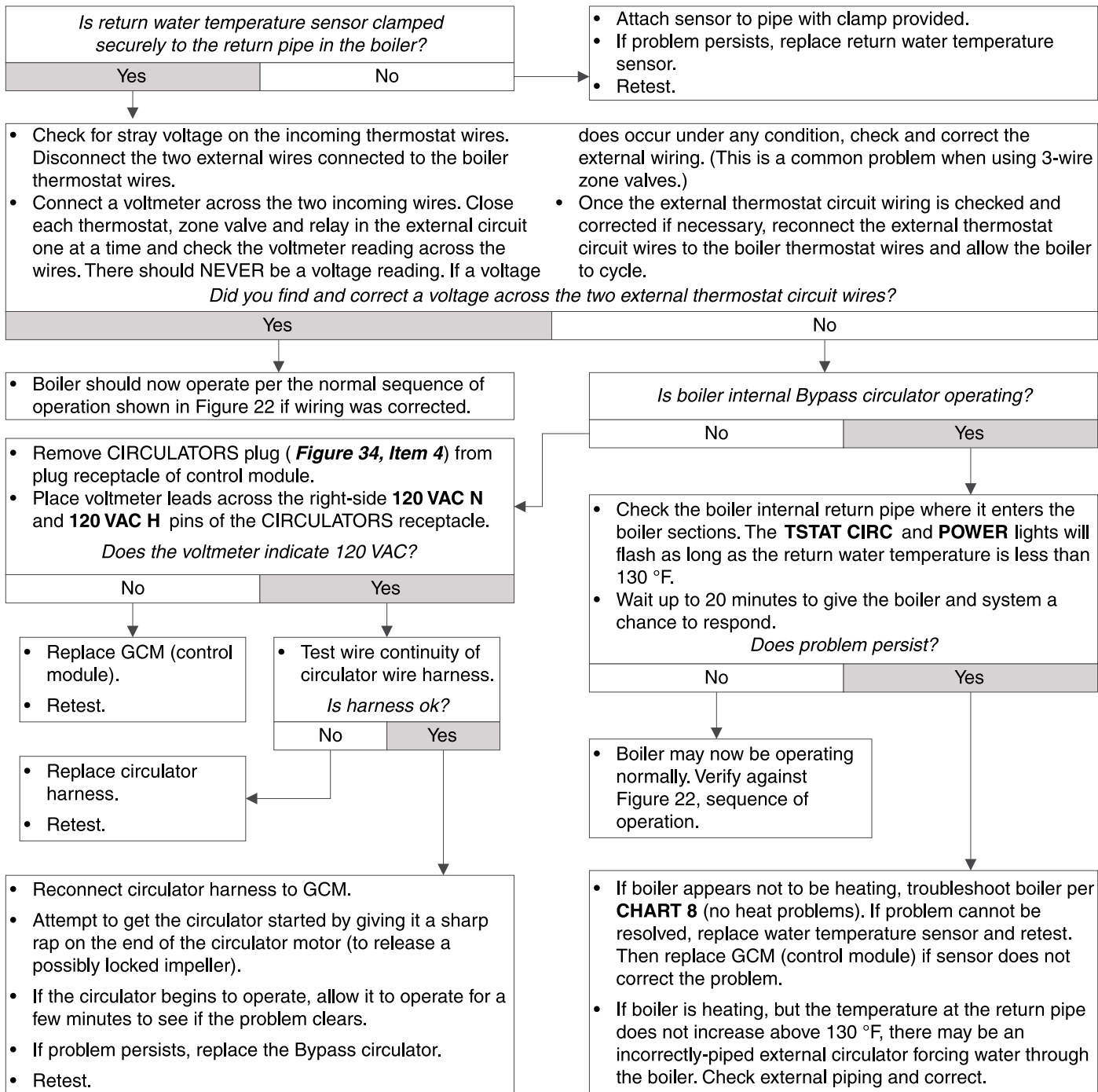


CHART 2 — TSTAT CIRC & POWER lights flashing

WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.



Xlg Troubleshooting — GCM lights (continued)

CHART 3 — LIMIT & POWER lights flashing

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personl injury, death or substantial property damage.

• This is a lockout condition. The return water temperature sensor has signaled a temperature higher than 240 °F, but the boiler limit circuit is closed (indicating that the limit control circuit did not catch the over-temperature condition). This is probably an indication of a failure of the boiler limit control and possibly the block temperature switch as well.

- **▲TURN OFF POWER▲** to boiler at 120 VAC service switch.
- Remove **CONTROL CIRCUIT** plug from control module receptacle (*Figure 34, Item 5*).
- Remove a wire from one of the limit control spade connectors.
- Connect an ohmmeter across the left and right pins on the center row of the limit circuit harness.

Does the ohmmeter indicate a shorted wire harness (zero ohms)?

Yes

No

- Replace control wiring harness.
- Retest.

- Reconnect **CONTROL CIRCUIT** plug to control module.
- Remove **WATER TEMP SENSOR** plug from control module receptacle (*Figure 34, Item 6*).
- Connector an ohmmeter across the plug pins to check the sensor resistance.

- Replace water temp sensor.
- Retest.

Does the ohmmeter indicate a shorted sensor (zero ohms)?

Yes

No

Is boiler hot?

Yes

No

- Close the external manual gas valve.
- Remove one wire from the limit control space connector.
- Set a thermostat to call for heat. Then turn on power to the boiler at the 120 VAC service switch.
- The boiler system circulator should come on and the control module should try to cycle the boiler.
- Allow the boiler circulator to run to cool off boiler and system water.
- After the boiler and system water have cooled, turn off power at the 120 VAC service switch and open the external manual gas valve.

- Set limit control knob to its minimum setting. Replace wire to limit control spade connector.
- Set a thermostat to call for heat.
- Turn on power at 120 VAC service switch.
- Control module should cycle boiler on and begin heating.
- The limit control should shut off the gas valve when the temperature at the boiler pressure/temperature gauge has reached no more than about 20 °F higher than the limit switch setting.

Does limit control shut off gas correctly?

Yes

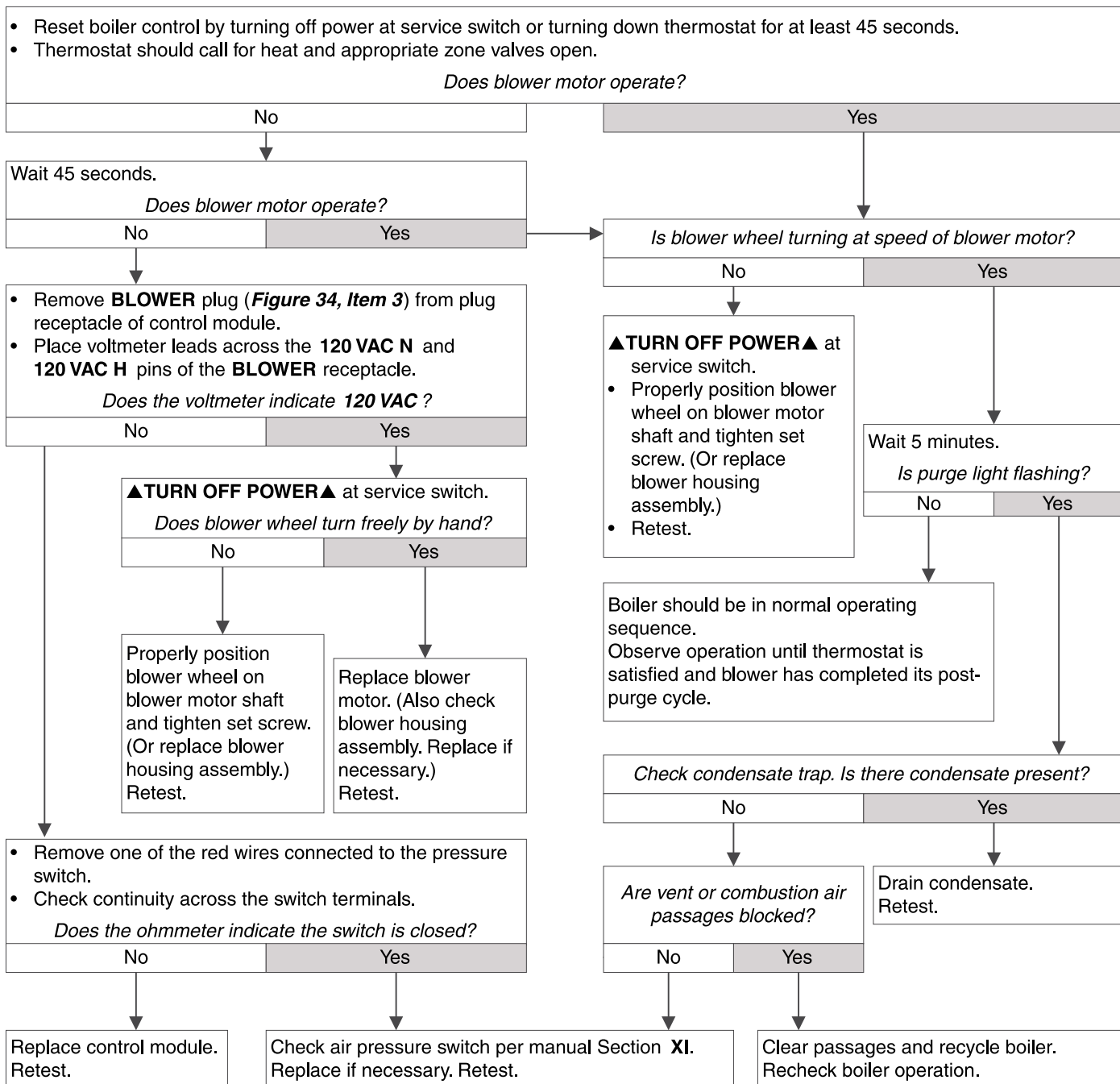
No

- Replace control module.
- Retest.

- Replace limit control and block temperature switch.
- Retest.

CHART 4 — PRES SWITCH & POWER lights flashing

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.



Xlg Troubleshooting — GCM lights (continued)

CHART 5 — FLAME & POWER lights flashing

WARNING Electrical shock hazard — Wherever you see **TURN OFF POWER**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

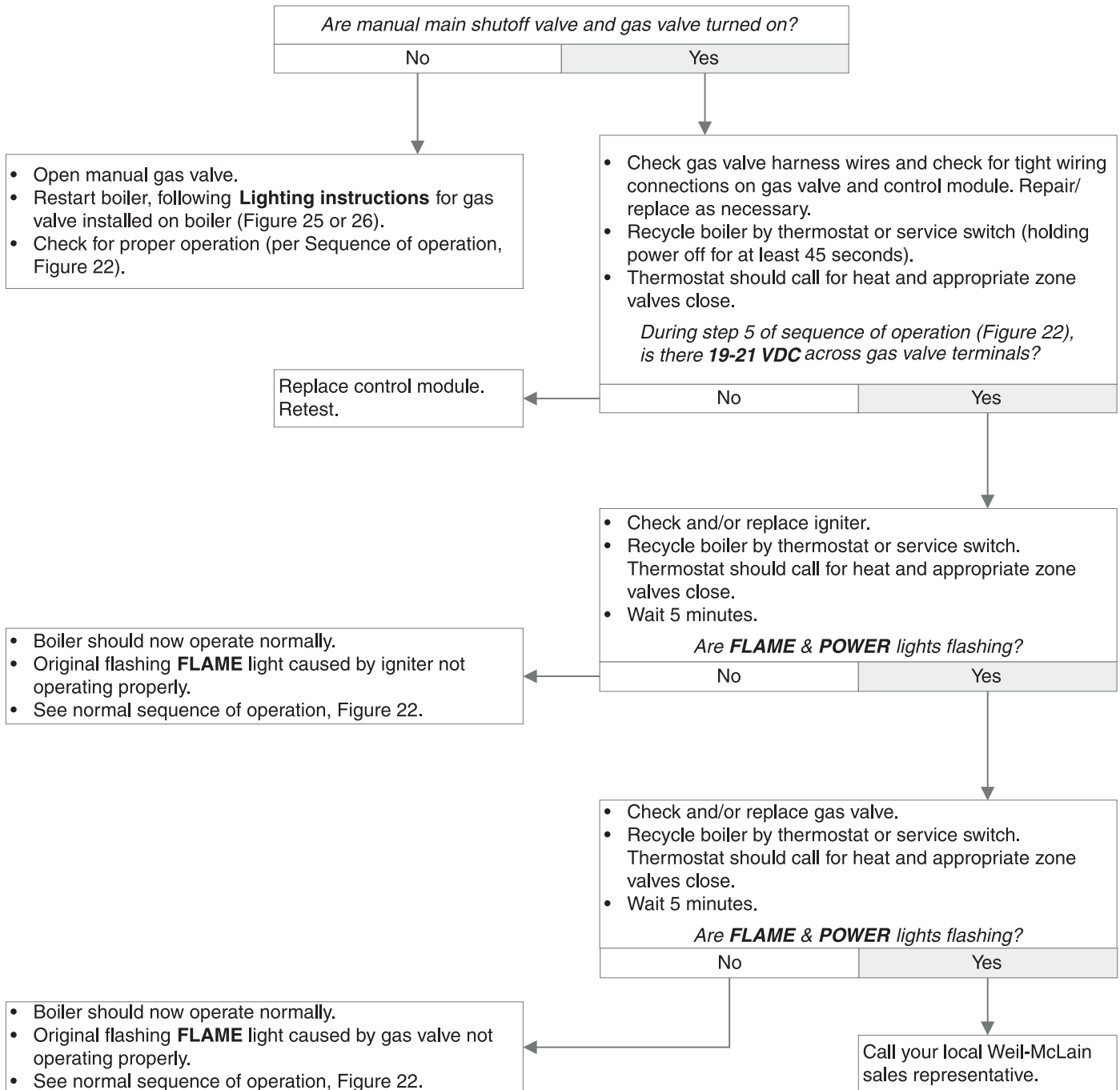
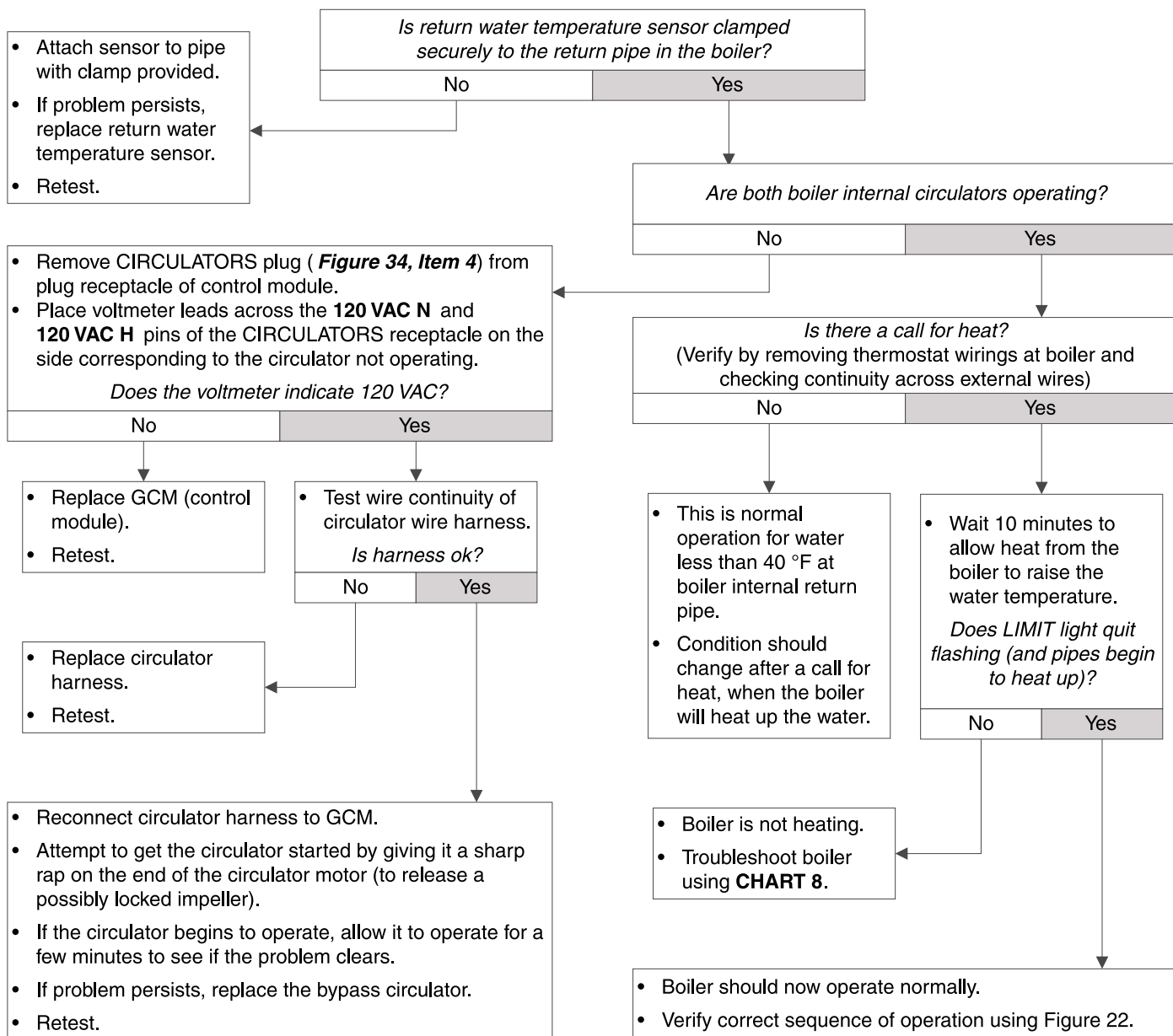


CHART 6 — TSTAT CIRC light flashing and POWER light on steady

WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe person injury, death or substantial property damage.

- This is not a lockout mode. The control module is signaling that the return water temperature sensor is detecting a temperature less than 40 °F.
- While the temperature at the boiler return water temperature sensor is less than 40 °F, both of the internal boiler circulators will run continuously, even if there is no call for heat (though the boiler will not fire until the thermostat calls for heat). This operation is intended to reduce chances of freezing during system down times by keeping water flowing.



Xlg Troubleshooting — GCM lights (continued)

CHART 7 — LIMIT light flashing and POWER light on steady

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personl injury, death or substantial property damage.

- This is not a lockout mode. The control module should only be signaling that the water temperature sensor is either shorted or there is an open circuit across the sensor terminals..
- This situation is usually corrected by replacing the sensor, as described below.

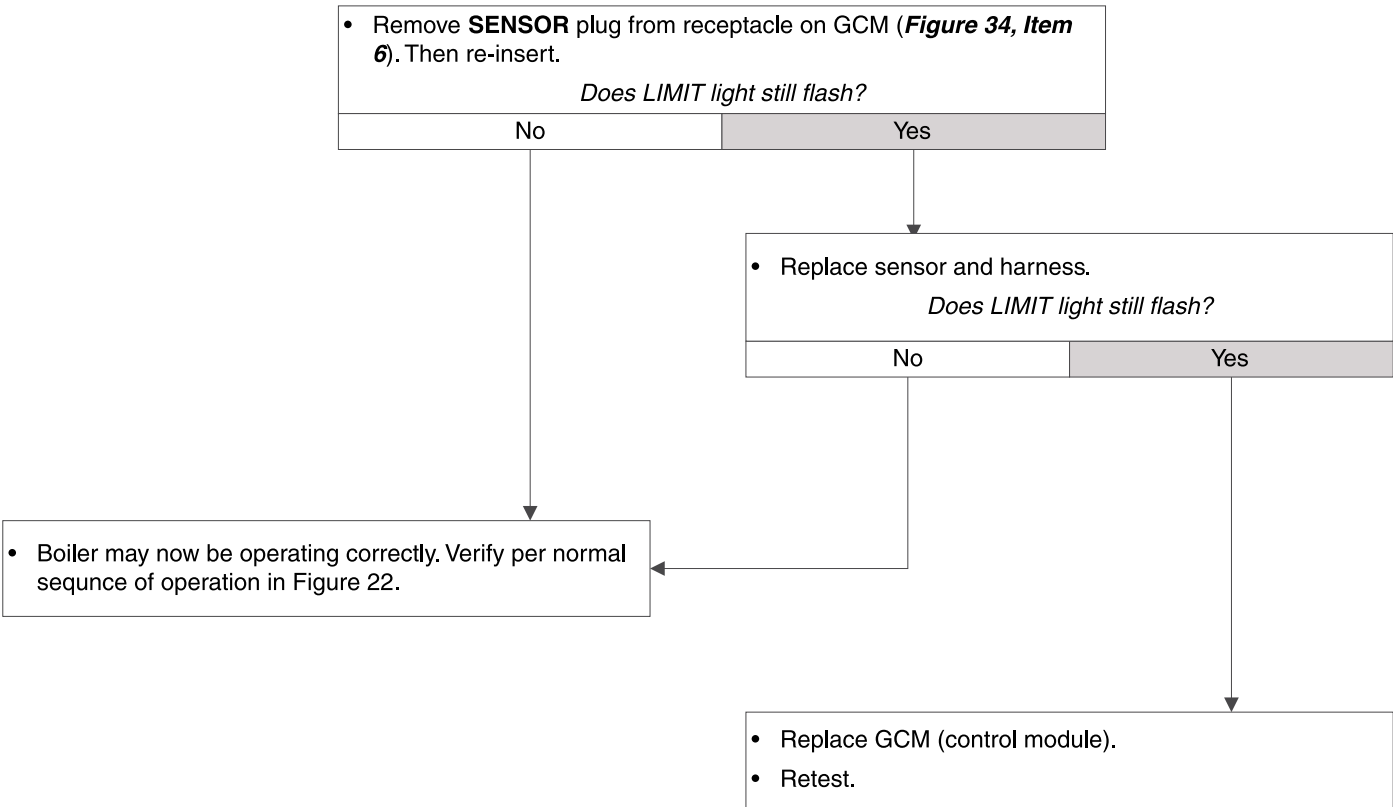
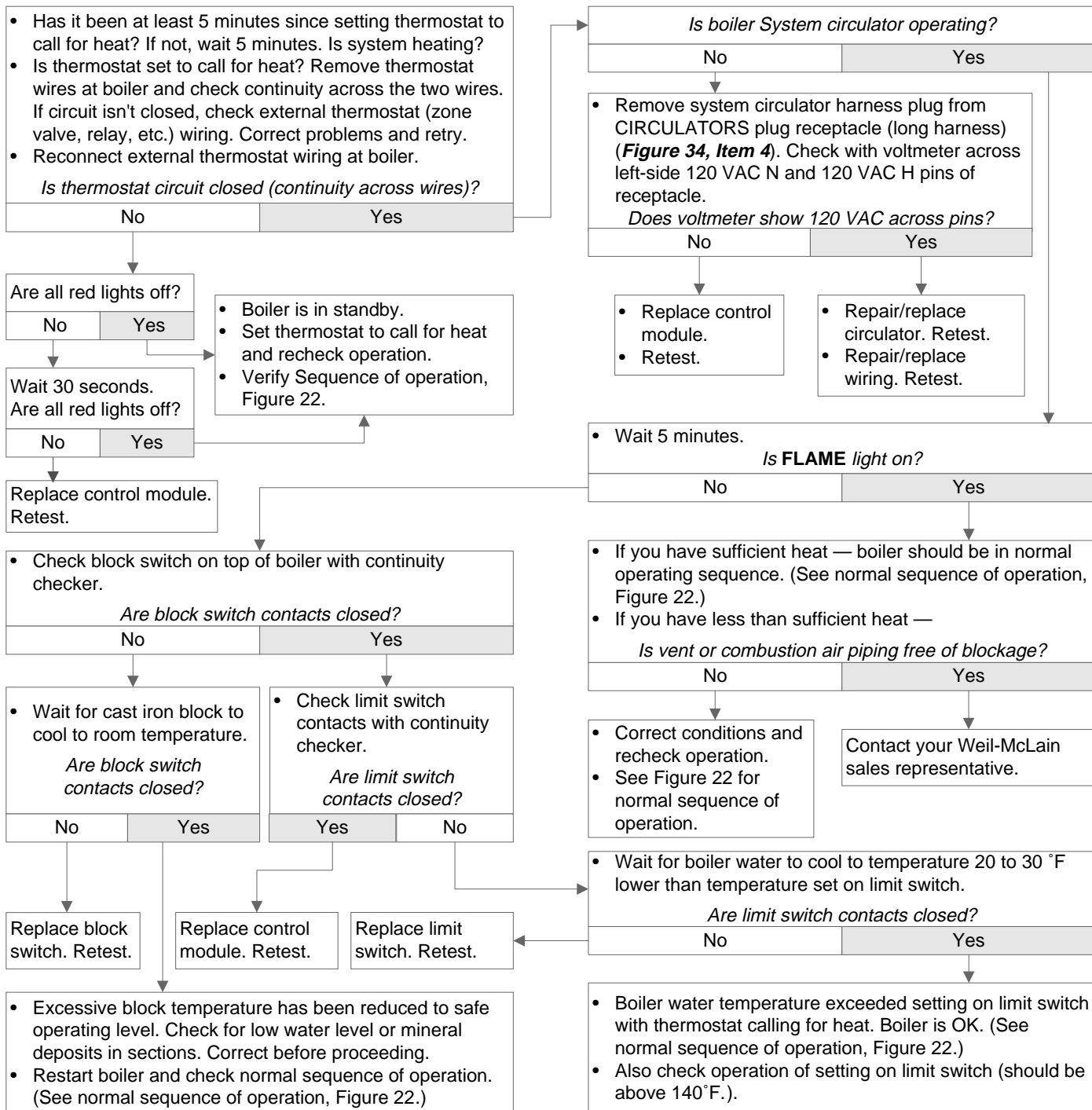


CHART 8 — Insufficient heat or no heat to system (POWER light on steady)

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.



XIIa Replacement parts — overview

- o Accessory bag assembly (shipped with boiler)
- o Section assembly (boiler sections, tie rods, base rail legs, blower support bracket, block temperature switch)
- o Jacket assembly (jacket parts)
- o Blower assembly (blower, motor, air inlet hose and fittings, condensate trap parts, igniter, gas valve, gas/air orifice and manifold, burner and gasket)
- o Trim assembly (circulators, piping components, limit control, P/T gauge, relief valve, drain valve)
- o Interior panel (jacket interior panel, transformer, GCM control module, air pressure switch)

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).":

- Avoid breathing dust and contact with skin and eyes.
 - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite 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.

- Avoid breathing dust and contact with skin and 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.

XI**b** Replacement parts — accessory bag

Table 5 The parts below are shipped with the boiler in the accessory bag.

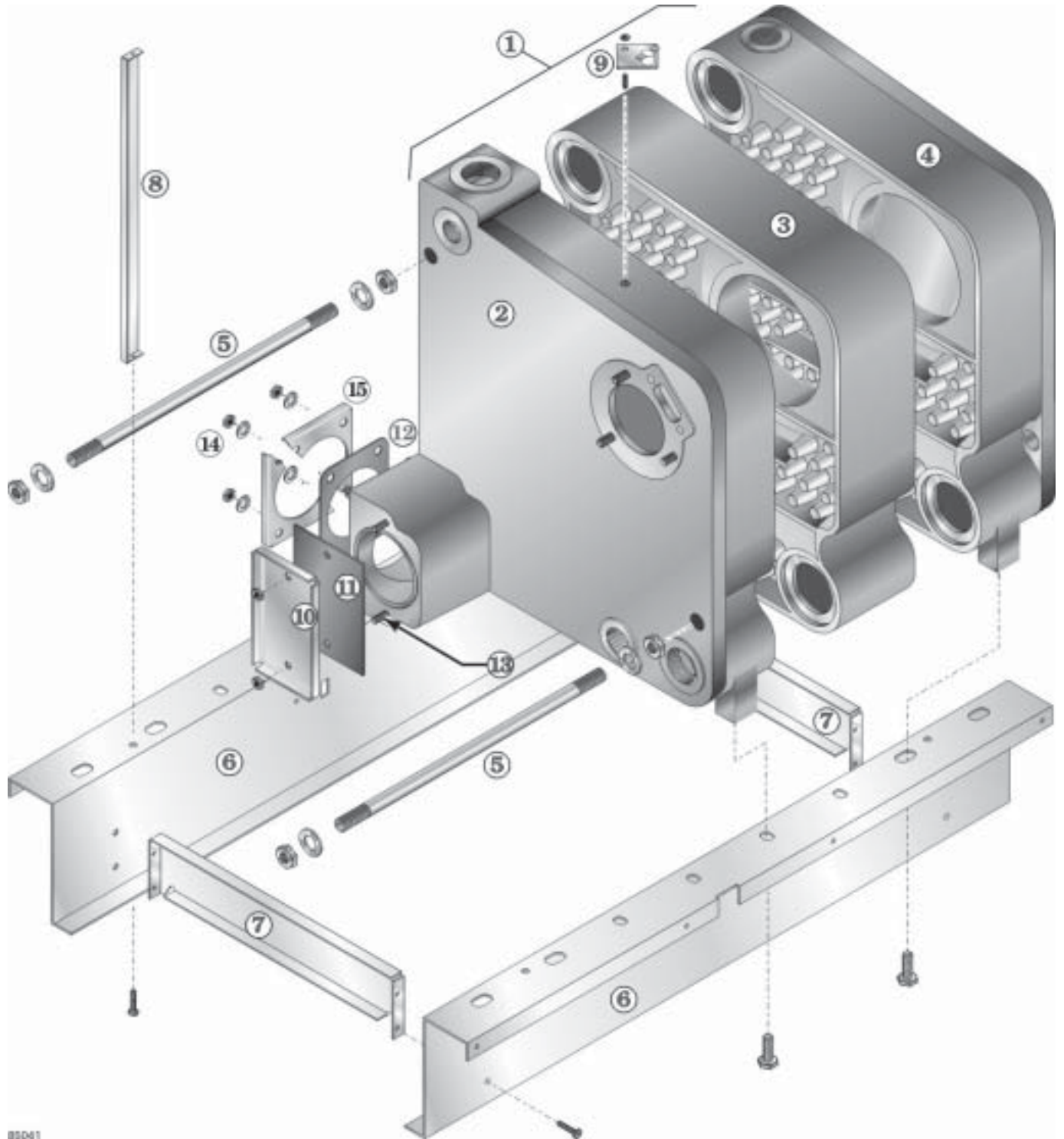
Description	Weil-McLain part number	Quantity	Remarks
Water trim bag assembly #2	542-200-309	1	
Nipple, BK ¾ x 3.00	561-326-405	1	Relief valve thru jacket
Nipple, BK 1 x 3.00	561-326-515	1	
Tee, BK 1 x 1 x ½	561-541-216	1	To mount pressure/temp gauge
Water trim bag assembly #1	542-200-308	1	
Bushing, BK C1 ½ x ¼	560-807-366	1	Tee to gauge
Screw, sheet metal type A pan head phil— 10 x .50 BK Phosphate	562-138-550	4	Jacket back panel
Gauge, pressure/temperature 3 ½" short shank	510-218-047	1	
Valve, relief ¾ 30 PSI Watts ¾ M330-HI 030	511-546-920	1	
Water trim bag assembly #3	542-200-310	1	
Exhaust, tube spacer	560-907-642	2	
Screw, sheet metal type A pan head phil — 10 x .50 BK Phosphate	562-138-550	4	Cap to cap mounting plate
Washer, lock #10 external tooth type A	562-248-680	4	
Screw, sheet metal type A pan head slotted — 10 x 1.25 ZP	562-150-248	8	For intake/exhaust plates
Plastic anchors	563-210-627	8	For #10 screws
Intake/exhaust air, cap plastic	560-907-641	1	
Intake/exhaust air, mounting plate	452-100-160	1	
Intake/exhaust air, backing plate	452-100-163	1	
Hole template	550-108-065	1	
Vent instruction sheet (Vent/Air Intake Termination)	550-141-778	1	(1196)
Drain bracket assembly	542-200-300	1	
Drain bracket	452-100-112	1	
Elbow, street CPVC ½"	560-907-650	1	
Nut, hex with nylon lockseal 5/16"	561-928-447	4	
Screw, hex washer hd, slot 10/32 x 3/8	562-135-710	1	
Trap, hose	562-302-548	1	
Gasket, starter tee	590-317-629	1	
Clamp, hose drain	591-850-071	2	
Label, Accessory bag	550-225-031	1	Insert so text is visible from outside of bag (0299)

XIIC Replacement parts — section assembly

Table 6 Section assembly

Item number	Description	Model	Weil-McLain part number
1	Block assembly, includes: Front section, intermediate section, back section, square cut seals — 2", silicone sealant, tie rods, tie rod nuts, tie rod washers, water tubing male adapters — 1" NPT, water tubing, pump to return, blower flange gasket, igniter, igniter gasket, screws, lock washers, studs, nuts	3 4 5 6	322-200-280 322-200-281 322-200-282 322-200-283 382-200-391
2	Front section Also requires repair parts kit consisting of: Square cut seals — 2", silicone sealant, tie rod nuts, tie rod washers, water tubing, male adapters — 1" NPT, water tubing, pump to return, blower flange gasket, igniter, igniter gasket, screws, studs, nuts, lock washers	All	312-200-150 382-200-301
3	Intermediate section Also requires repair parts kit consisting of: Square cut seals — 2", silicone sealant, tie rod nuts, tie rod washers	All	312-200-110 382-200-305
4	Back section Also requires repair parts kit consisting of: Square cut seals — 2", silicone sealant, tie rod nuts, tie rod washers	All	312-200-130 382-200-305
5	Tie rods	3 4 5 6	560-234-499 560-234-525 560-234-503 560-234-504
6	Base rail legs	3 & 4 5 & 6	452-100-170 452-100-172
7	Base rail brace	All	452-100-080
8	Blower housing support	All	452-100-111
9	Block temperature limit switch	All	510-350-066
10	Inspection port cover	All	560-907-629
11	Inspection port gasket	All	590-317-628
12	Starter tee gasket	All	590-317-629
13	Stud, 5/16" - 18 x 1.25	All	560-340-581
14	Hex nuts (4 each), 5/16" lock washers (4 each), 5/16"	All	550-928-447 562-248-709
15	Reinforcing plate sections (2)	All	699-999-029

Figure 35 Section assembly



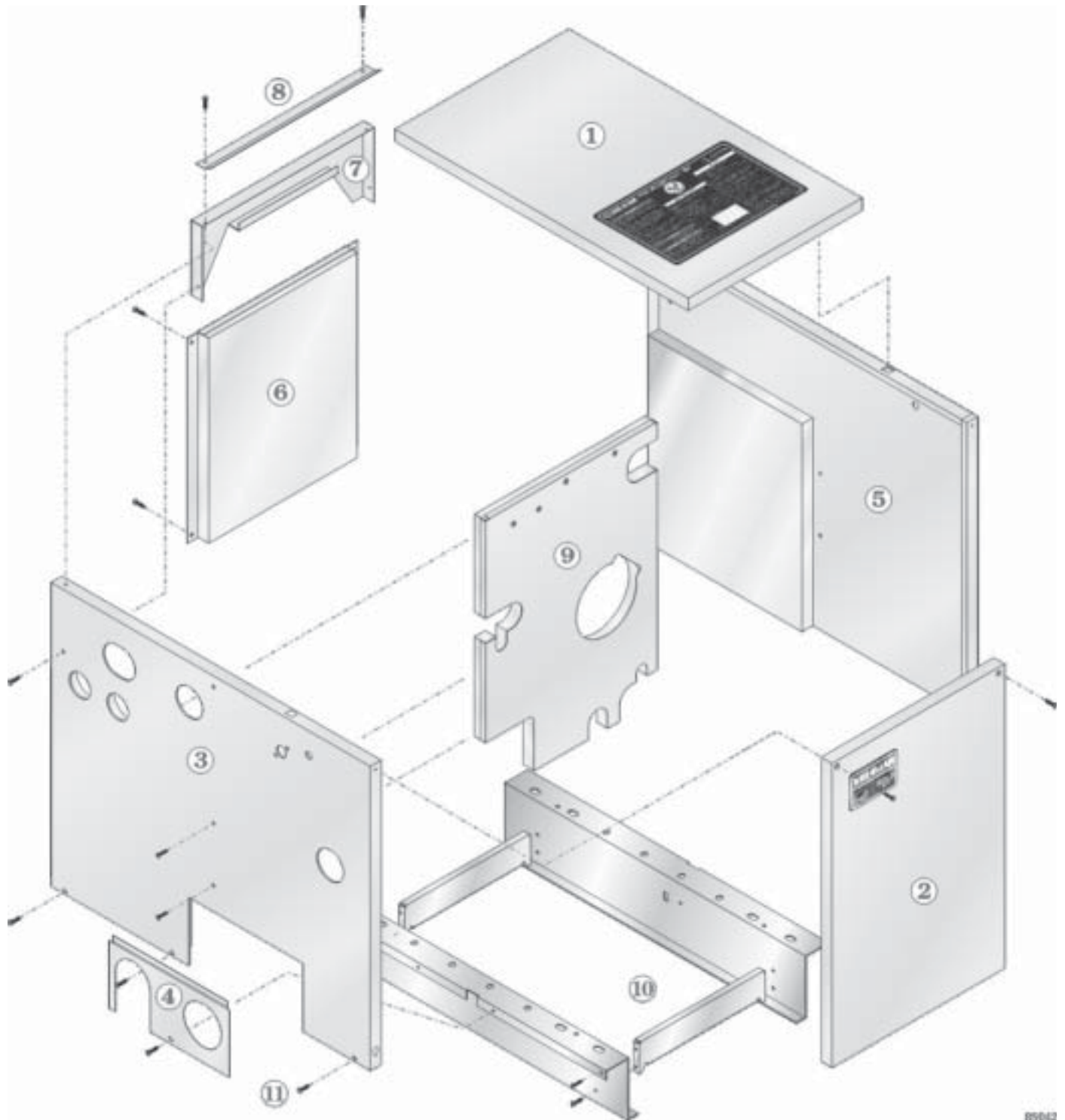
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XIII Replacement parts — jacket assembly

Table 7 Jacket assembly

Item number	Description	Model	Weil-McLain part number
1	Jacket panel, top	3 & 4 5 & 6	422-200-146 422-200-150
2	Jacket panel, front	All	422-200-140
3	Jacket panel , left side	3 & 4 5 & 6	422-200-220 422-200-222
4	Jacket access panel	All	422-200-230
5	Jacket panel, right side	3 & 4 5 & 6	422-200-224 422-200-226
6	Jacket panel, rear	All	422-200-135
7	Top rail brace	All	422-200-232
8	Top rail cross tie	All	422-200-137
9	Jacket panel, interior	All	422-200-228
10	Base rail assembly (see Section assembly on page 84 for details)	---	-----
11	Screw, sheet metal type AB, serated hex washer head Phillips #10 x 3/8" steel black phospate	All	562-150-273

Figure 36 Jacket assembly



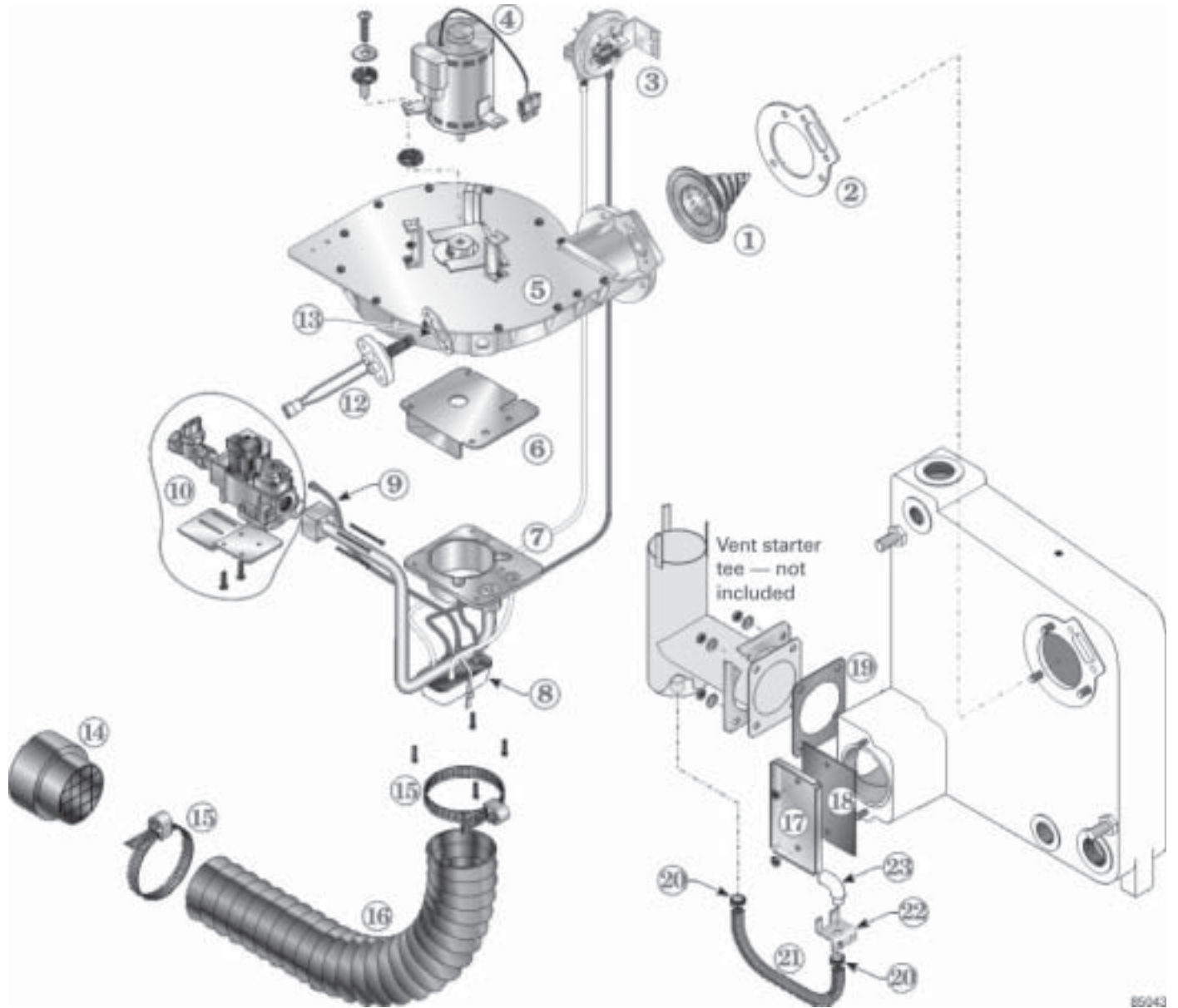
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XIIIe Replacement parts — Blower assembly

Table 8 Blower assembly

Item number	Description	Model	Weil-McLain part number
1	Burner replacement kit, includes: Burner cone and ring assembly, blower flange gasket, igniter, igniter screws, igniter washers, igniter gasket	3 4 5 6	382-200-320 382-200-325 382-200-330 382-200-335
2	Blower flange gasket	All	590-317-610
3	Air pressure switch (0 to 5,500 feet elevation)	All	511-624-520
4	Blower motor replacement kit, includes: Blower motor, motor mount grommets, screws, lock nuts, 9" Allen wrench	All	382-200-345
5	Blower housing assembly replacement kit, includes: Blower housing, observation port window, blower housing cover plate, blower motor mounting brackets, washer hold down bracket, lock nuts, motor mount grommets, blower motor, blower wheel, magnetic washer, silicone sealant, screws, blower flange gasket, igniter, igniter screws, igniter washers, igniter gasket	All	382-200-340
6	Conversion kit, natural to propane , includes Propane orifice plate, label Conversion kit, propane to natural , includes Propane orifice plate, label	3 4 5 6 3 4 5 6	510-811-600 510-811-605 510-811-610 510-811-615 510-811-620 510-811-625 510-811-630 510-811-635
7	Gas/air manifold assembly, includes: Gas/air manifold, gas tubing, washers, screws, and gas valve o-ring	All	382-200-362
8	Condensate trap kit, includes: Condensate trap, hoses	All	382-200-409
9	Gas valve tubing to gas/air manifold, red	All	590-317-647
10	Gas valve kit, complete, includes: Gas valve, gas cock, 1/2" nipple, bracket, screws and o-ring	All	382-200-411
12	Igniter replacement kit (includes gasket)	All	511-330-148
13	Igniter gasket (included in item 12, above)	—	—
14	Inlet air fitting	All	560-907-635
15	Hose clamp, 3"	All	591-850-068
16	Inlet air hose	All	562-302-547
17	Inspection port cover	All	560-907-629
18	Inspection port gasket	All	590-317-628
19	Starter tee gasket	All	590-317-629
20	Drain hose clamp, 5/8"	All	591-850-071
21	Condensate trap hose	All	562-302-548
22	Drain bracket	All	452-100-112
23	Drain ell	All	560-907-650

Figure 37 Blower assembly

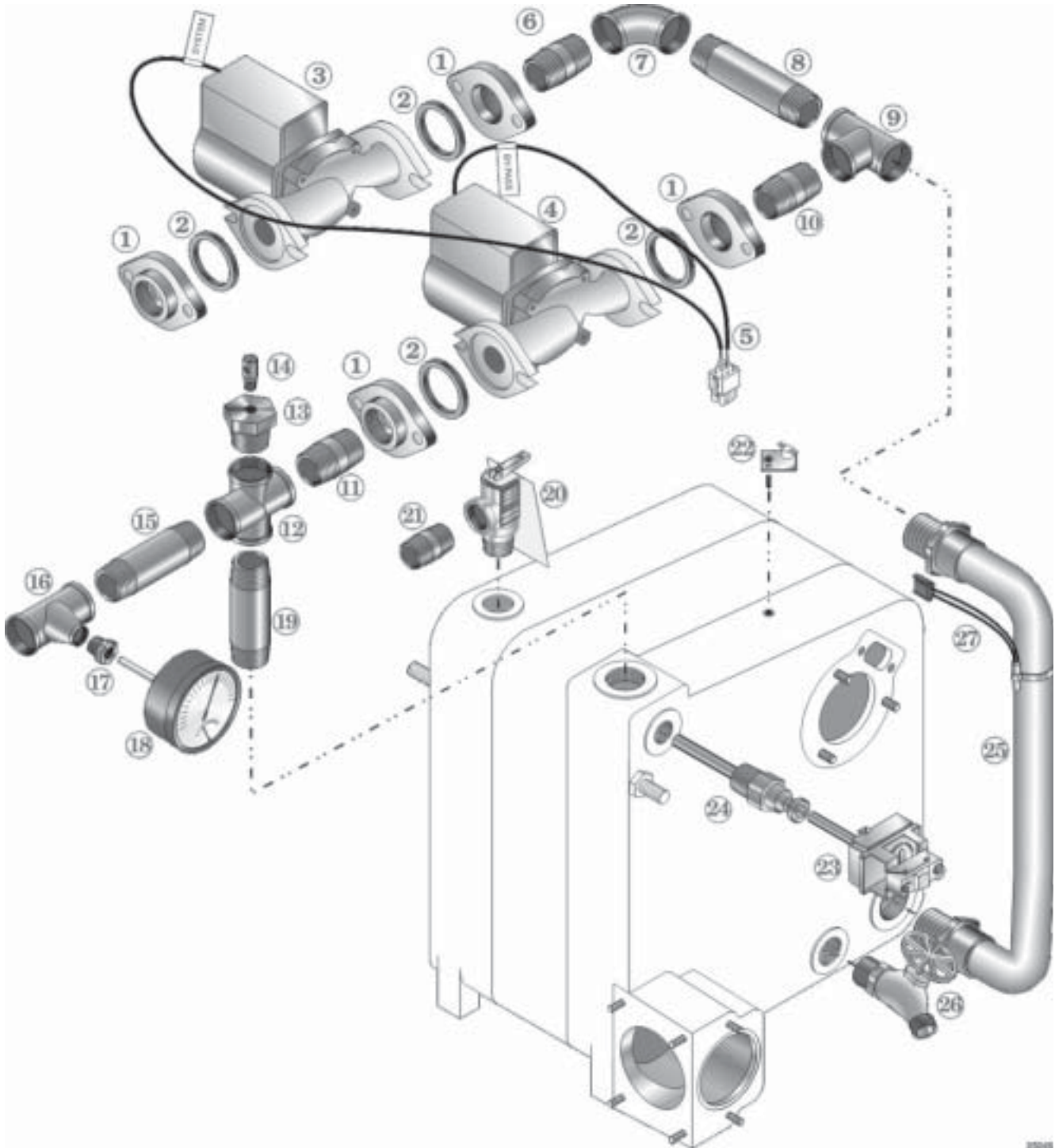


XIIf Replacement parts — trim assembly

Table 9 Trim assembly

Item number	Description	Weil-McLain part number
1	Circulator flange, 1" NPT	563-910-026
2	Circulator gasket, Taco 110-339	590-317-543
3	System circulator, Taco 007F	511-405-113
4	Bypass circulator, Taco 007F	511-405-113
5	Wiring harness, dual circulators to control module	591-391-824
6	Nipple, NPT — 1" x close	561-326-500
7	Ell, 1"	563-115-300
8	Nipple, NPT — 1" x 4 ½"	561-326-528
9	Tee, 1"	561-541-212
10	Nipple, NPT — 1" x close	561-326-500
11	Nipple, NPT — 1" x close	561-326-500
12	Cross, 1"	561-550-000
13	Bushing, 1" x ⅛"	560-807-378
14	Vent coin, ⅛" NPT	510-148-565
15	Nipple, NPT — 1" x 3"	561-326-515
16	Reducing tee, 1" x 1" x ½"	561-541-216
17	Bushing, ½" x ¼"	560-807-366
18	Combination pressure-temperature gauge, 2 ½" short shank	510-218-099
19	Nipple, NPT — 1" x 4"	561-326-527
20	ASME Pressure relief valve, ¾" male inlet, 30 PSIG	511-546-920
21	Nipple, NPT — ¾" x 3"	561-326-405
22	Block temperature limit switch	510-350-066
23	Limit co	
	Control well, ½"	Included with limit
25	Return pipe section	560-742-938
26	Drain valve, ¾"	511-246-392
27	Water temperature sensor and clamp	511-330-089

Figure 38 Trim assembly

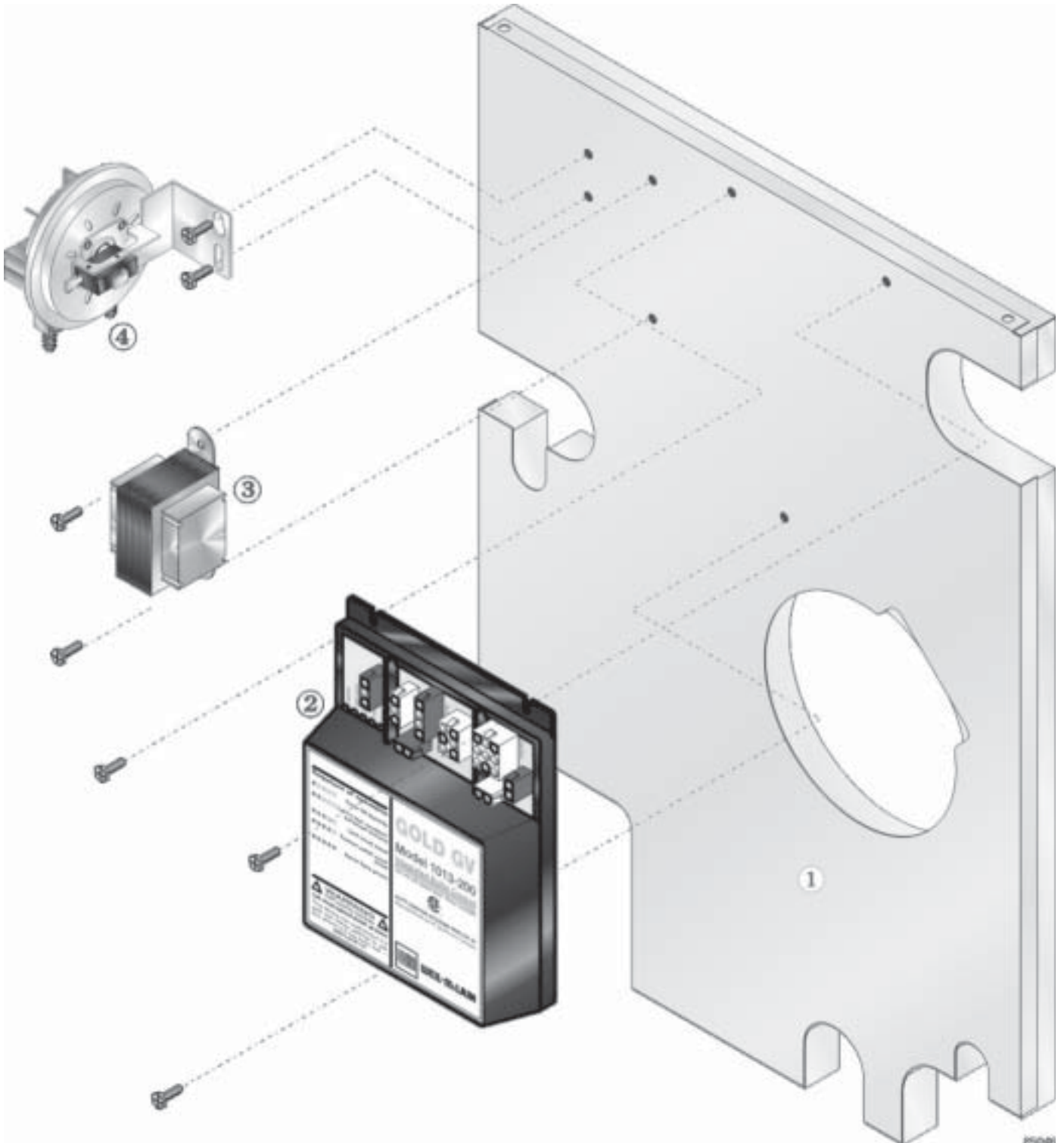


XIIg Replacement parts — interior panel

Table 10 Interior panel

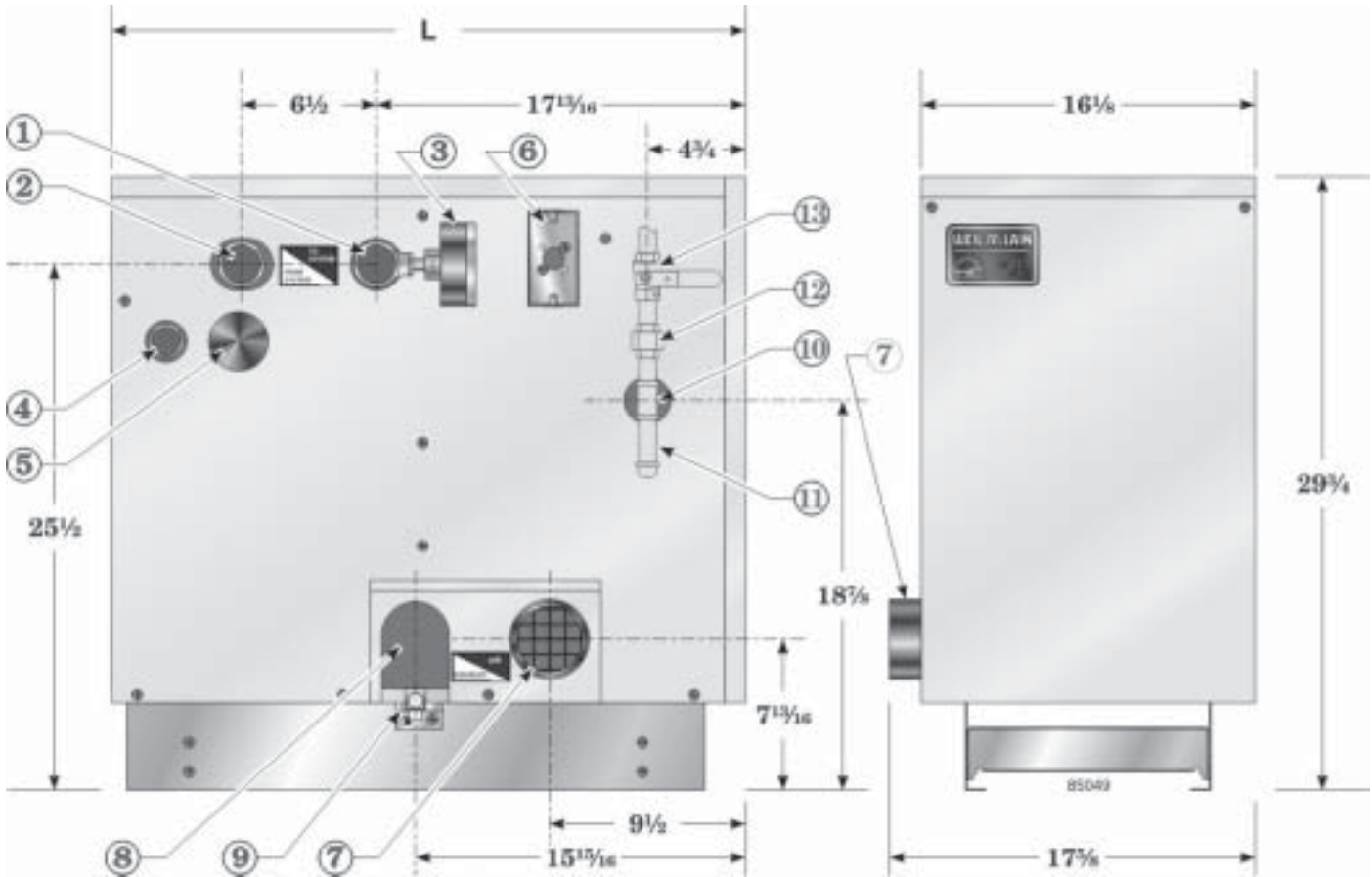
Item number	Description	Weil-McLain part number
1	Interior panel	422-200-228
2	Control module assembly, includes control module and screws	382-200-448
3	Transformer	511-842-370
4	Air pressure switch	511-624-520
5	Wiring harness, control module to junction box (not shown)	591-391-821
6	Wiring harness, control module to hot surface ignitor (not shown)	591-391-819
7	Wiring harness, control module to system and bypass circulators (not shown)	591-391-824
8	Wiring harness, control module to controls (not shown)	591-391-919

Figure 39 Interior panel



XIII Dimensions and ratings

Figure 40 Dimension drawing (see dimension table on opposite page)



Item number	Description
1	1" NPT Supply
2	1" NPT Return
3	Combination pressure-temperature gauge, 2 1/2" short shank
4	3/4" NPT Relief valve outlet
5	Plug dome, 2" black
6	Junction box
7	Inlet air fitting
8	3" Diameter flue outlet
9	1/2" Condensate drain
10	1/2" NPT Gas supply connection (provided by others)
11	Drip leg (provided by others)
12	Union (provided by others)
13	Manual main shutoff gas valve (provided by others)

Table 11 Boiler dimensional data (see Figure 40)

Boiler model	Supply (in. NPT)	Return (in. NPT)	Length L (inches)	Gas connection size (Note 1) (in. NPT)	Crate dimensions (outside measurement, inches)			Approx. shipping weight (pounds)
					Length	Width	Height	
GV-3	1	1	30¾	½	33½	22	36	270
GV-4	1	1	30¾	½	33½	22	36	320
GV-5	1	1	37¾	½	33½	22	43	355
GV-6	1	1	37¾	½	33½	22	43	410

Note 1 Gas piping from meter to boiler to be sized per local utility requirements.

Table 12 Boiler ratings

Boiler model number	CSA Input Btuh	DOE Heating capacity Btuh (Note 1)	Net I=B=R ratings Btuh (Note 2)	DOE Seasonal efficiency (%)	Vent/combustion air diameter (inches)	Boiler water content (gallons)
GV-3	70,000	61,000	53,000	87.5	3	3.3
GV-4	105,000	92,000	80,000	87.3	3	4.2
GV-5	140,000	122,000	106,000	87.2	3	5.1
GV-6	175,000	153,000	133,000	87.0	3	6.0

Notes:

- Based on standard test procedures prescribed by the United States Department of Energy. Ratings also referred to as CSA Output.
- Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads.

Boilers are tested for 50 lbs working pressure. GV boilers are not available for millivolt systems.

GOLD GV Water Boiler — Series 4



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Michigan City, IN 46360-2388
<http://www.weil-mclain.com>