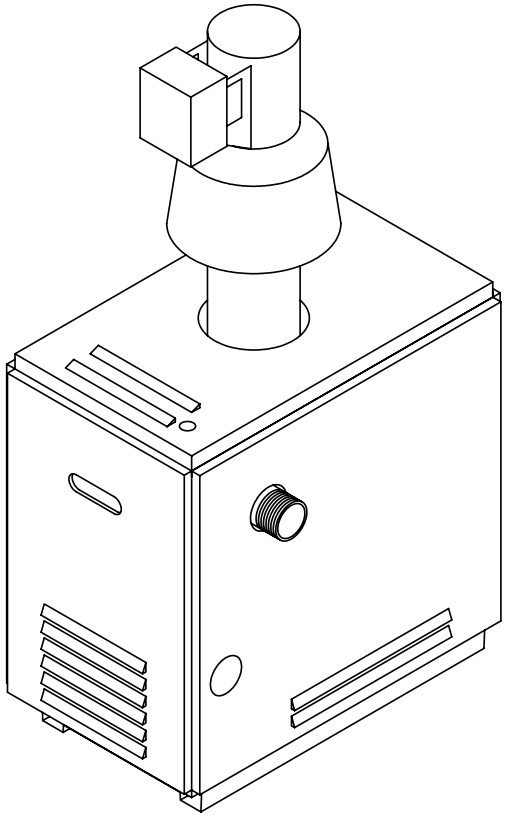
# INSTALLATION AND SERVICE MANUAL

# MG & SG SERIES BOILERS

## FOR MODELS MG-50 TO MG-150 AND SG-135 TO SG-270

SEE REAR COVER FOR INDEX

**This manual must only be used by a qualified heating installer, service technician or gas supplier.**



**See Section 3.10 for Installer's Checklist**
**See Section 4.3 for Service Checklist**

Manufactured by
**Allied Engineering Company**
Division of E-Z-Rect Manufacturing Ltd.
Manufacturers of Gas and Electric Boilers, Stainless Steel Tanks, Heat Exchangers and Electric Boosters.
94 Riverside Drive, North Vancouver, B.C. V7H 2M6 • Telephone (604) 929-1214 • FAX (604) 929-5184
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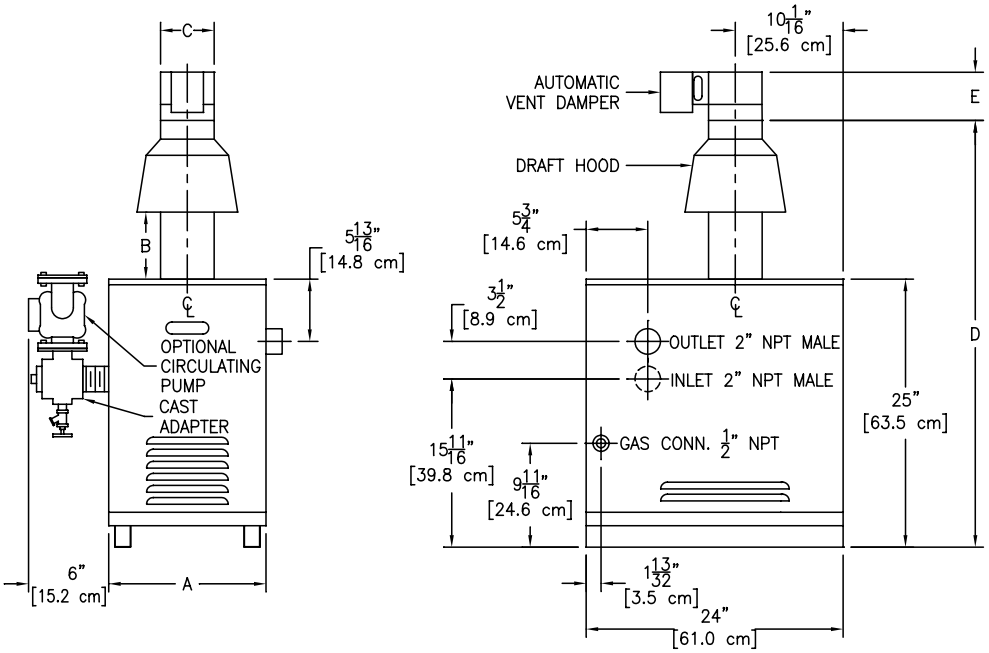
PN2152451

Price $10

# MG SERIES BOILERS

## DIMENSIONS AND SPECIFICATIONS




**Standard Model Includes:**

- Zone Control Board with Transformer
- Stainless Steel Burners
- Combination Gas Valve
- Dual Safety High-Limit Aquastat
- Temperature / Pressure Gauge
- A.S.M.E. Pressure Relief Valve
- Drain Valve
- Draft Hood
- Blocked Vent Safety Switch
- Flame Roll-out Safety Switch
- Automatic Vent Damper

**"PS" Packaged Models Include Standard Model Parts plus:**

- Circulating Pump
- Custom Cast Iron Pump Adapter
- Expansion Tank
- Air Purger
- Combination Fill / Regulator Valve
- Automatic Air Vent

Allow 18" (457 mm) minimum in front for servicing.
Minimum clearances to combustible material: Top 24" (610 mm), Sides 2" (51 mm), Rear 2" (51 mm), Flue 6" (153 mm)
APPROVED FOR COMBUSTIBLE FLOORS & CLOSET INSTALLATION.
The Super Hot product improvement program may result in changes to the design and / or specifications being made without notice.

| MODEL NUMBER | INPUT* | | OUTPUT** | | DIM A | | DIM B | | DIM C | | DIM D | | DIM E | | SHIPPING WEIGHT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MBH | kW | MBH | kW | in | cm | in | cm | in | cm | in | cm | in | cm | lb | kg |
| MG50 | 50 | 14.7 | 42.4 | 12.4 | 11.5 | 29.2 | 5.25 | 13.3 | 4.0 | 10.2 | 39.2 | 99.6 | 4.5 | 11.4 | 125 | 57 |
| MG75 | 75 | 22.0 | 63.5 | 18.6 | 14.5 | 36.8 | 5.25 | 13.3 | 5.0 | 12.7 | 39.5 | 100.3 | 4.5 | 11.4 | 150 | 68 |
| MG100 | 100 | 29.3 | 84.6 | 24.8 | 17.5 | 44.5 | 5.25 | 13.3 | 5.0 | 12.7 | 39.5 | 100.3 | 4.5 | 11.4 | 175 | 80 |
| MG125 | 125 | 36.6 | 105.5 | 30.9 | 20.5 | 52.1 | 6.50 | 16.5 | 6.0 | 15.2 | 40.5 | 102.9 | 4.5 | 11.4 | 200 | 91 |
| MG150 | 150 | 44.0 | 126.5 | 37.1 | 23.5 | 59.7 | 6.50 | 16.5 | 6.0 | 15.2 | 40.5 | 102.9 | 4.5 | 11.4 | 225 | 102 |

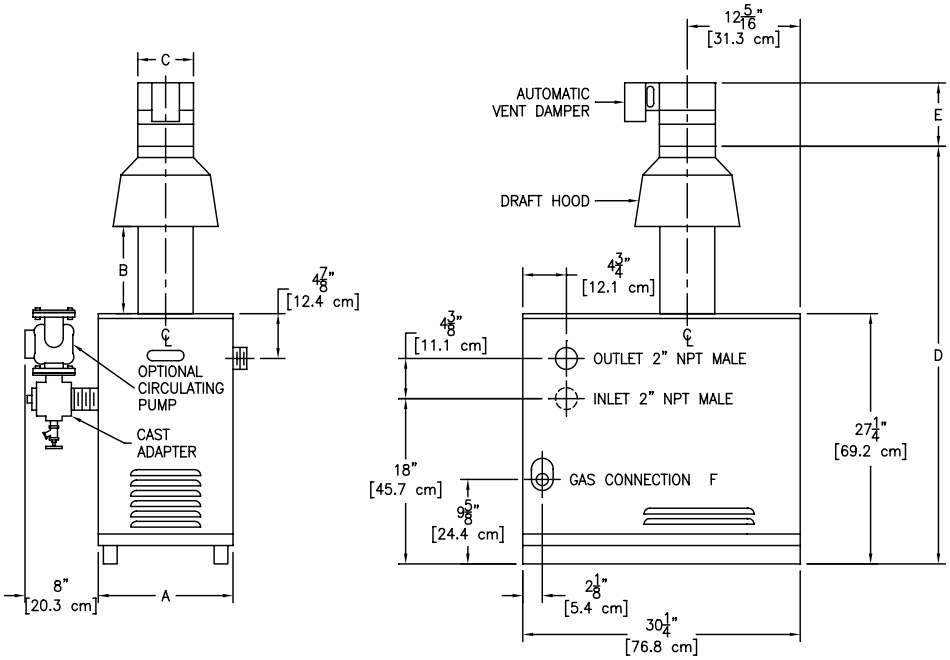
* For altitudes above 2,000 feet, refer to *Section 3.6* to determine the appropriate Input derate or contact the factory.
** Output based on boilers equipped with electronic ignition.

**Options:**

- Natural Gas add suffix "N" - Propane models add suffix "P"
- Electronic Ignition add suffix "E" - Hot Surface Ignition add suffix "HS"
- Add 35 pounds weight (16 kg) for packaged boilers - add suffix "PS"

# SG SERIES BOILERS

## DIMENSIONS AND SPECIFICATIONS




**Standard Model Includes:**

- Zone Control Board with Transformer
- Stainless Steel Burners
- Combination Gas Valve
- Dual Safety High-Limit Aquastat
- Temperature / Pressure Gauge
- A.S.M.E. Pressure Relief Valve
- Drain Valve
- Draft Hood
- Blocked Vent Safety Switch
- Flame Roll-out Safety Switch
- Automatic Vent Damper

**"PS" Packaged Models Include Standard Model Parts plus:**

- Circulating Pump
- Custom Cast Iron Pump Adapter
- Expansion Tank
- Air Purger
- Combination Fill / Regulator Valve
- Automatic Air Vent

Allow 24" (609 mm) minimum in front for servicing.
Minimum clearances to combustible material: Top 24" (610 mm), Sides 2" (51 mm), Rear 2" (51 mm), Flue 6" (153 mm)
APPROVED FOR COMBUSTIBLE FLOORS & CLOSET INSTALLATION.
The Super Hot product improvement program may result in changes to the design and / or specifications being made without notice.

| MODEL NUMBER | INPUT* | | OUTPUT** | | DIM A | | DIM B | | DIM C | | DIM D | | DIM E | | GAS CONN. F | SHIPPING WEIGHT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MBH | kW | MBH | kW | in | cm | in | cm | in | cm | in | cm | in | cm | NPT | lb | kg |
| SG135 | 135 | 39.6 | 112 | 32.8 | 14.7 | 37.3 | 9.5 | 24.1 | 6.0 | 15.2 | 45.3 | 115 | 4.5 | 13.9 | 0.50" | 191 | 87 |
| SG180 | 180 | 52.8 | 150 | 44.0 | 17.7 | 45.0 | 9.5 | 24.1 | 6.0 | 15.2 | 45.3 | 115 | 4.5 | 13.9 | 0.50" | 222 | 101 |
| SG225 | 225 | 65.9 | 188 | 55.1 | 20.7 | 52.6 | 9.5 | 24.1 | 7.0 | 17.8 | 46.5 | 118 | 6.5 | 16.5 | 0.75" | 253 | 115 |
| SG270 | 270 | 79.1 | 225 | 65.9 | 23.7 | 60.2 | 9.5 | 24.1 | 8.0 | 20.3 | 47.6 | 121 | 7.5 | 19.0 | 0.75" | 284 | 129 |

* For altitudes above 2,000 feet, refer to *Section 3.6* to determine the appropriate Input derate or contact the factory.
** Output based on boilers equipped with electronic ignition.

**Options:**

- Natural Gas add suffix "N" - Propane models add suffix "P"
- Electronic Ignition add suffix "E" - Hot Surface Ignition add suffix "HS"
- High/Low fire add suffix "M" - Consult Factory for Availability
- Add 45 pounds weight (20 kg) for packaged boilers - add suffix "PS"

## ABOUT OUR MANUALS

Your *Super Hot* boiler has been provided with two manuals:

- *User's Information Manual* **-** This manual is intended for the **owner or user** of the boiler and provides information on routine operation and maintenance, and emergency shutdown.
- *Installation and Service Manual* **-** This manual must only be used by a **qualified heating installer, service technician or gas supplier**. Installation or service by anyone unqualified to do so may result in severe personal injury, death or substantial property damage.

Both manuals should be kept in the envelope provided and affixed adjacent to the boiler so that they are readily available for future reference.

# Lighting Instructions Section 1

## 1.1 SAFETY INSTRUCTIONS

**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. BEFORE LIGHTING smell all around the boiler area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical 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.

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

C. Do not use this boiler 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.

## 1.2 LIGHTING INSTRUCTIONS

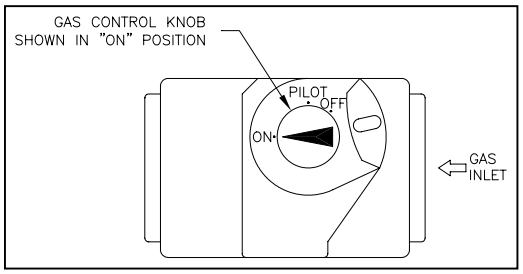
Determine the ignition system that applies from the list below and go to the applicable lighting instruction section.

- Standing pilot with combination gas valve (*Section 1.3*)
- Intermittent electronic & hot surface ignition with combination gas valve (*Section 1.4*)

If you are unsure which type of gas valve or ignition system your boiler is equipped with, check the lighting instructions sticker on the boiler or contact the factory.

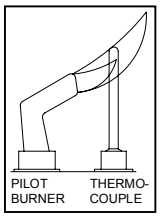
## 1.3 LIGHTING INSTRUCTIONS FOR STANDING PILOT WITH COMBINATION GAS VALVE.

1 This boiler has a pilot which must be lighted by hand. When lighting the pilot, follow these instructions exactly. Ensure gas supply to boiler is turned on.
2 STOP! Read the safety instructions in *Section 1.1.*
3 Set the room thermostat to lowest setting.
4 Turn off all electrical power to the boiler.
5 Remove control access panel if necessary.
6 Push in gas control knob slightly and turn clockwise ↻ to "OFF".




NOTE: Knob cannot be turned from "PILOT" to "OFF" unless knob is pushed in slightly. Do not force.

7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "A" in the safety instructions in *Section 1.1*. If you don't smell gas, go to step 8.
8. Find pilot burner - follow aluminum tube from gas valve. The pilot is on the far left side of the burner tray.

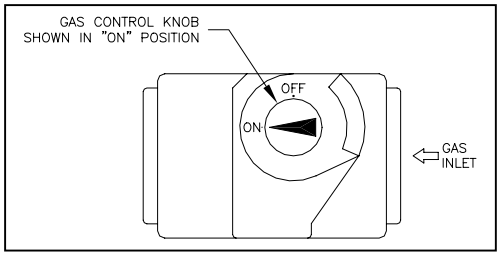



9. Depress gas control knob and turn counterclockwise ↺ to "PILOT".
10. Push in control knob all the way and hold in. Immediately light the pilot with a match. Continue to hold the control knob in for about (1) minute after the pilot is lit. Release knob and it will pop back up. Pilot should remain lit. If it goes out, repeat steps 6 through 10.
    - If the knob does not pop up when released, stop and immediately call your service technician or gas supplier.
    - If the pilot will not stay lit after several tries, turn the gas knob clockwise ↻ to "OFF" and call your service technician or gas supplier.
11. Turn gas control knob counterclockwise ↺ to "ON".
12. Replace control access panel if necessary.
13. Turn on all electrical power to the boiler.
14. Set room thermostat to desired setting.

**To turn off gas to boiler or emergency shut-off**
Follow *Section 1.5*.

## 1.4 LIGHTING INSTRUCTIONS FOR INTERMITTENT ELECTRONIC & HOT SURFACE IGNITION WITH COMBINATION GAS VALVE.

1. This boiler is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand. Ensure gas supply to the boiler is turned on.
2. STOP! Read the safety instructions in *Section 1.1*.
3. Set the room thermostat to lowest setting.
4. Turn off all electrical power to the appliance.
5. Remove control access panel if necessary.
6. Push in gas control knob slightly and turn clockwise ↻ to "OFF".
   NOTE: On some gas valves the knob cannot be turned to "OFF" or "ON" position unless knob is pushed in slightly. Do not force.




7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "A" in the safety instructions in *Section 1.1*. If you don't smell gas, go to the next step.
8. Turn gas control knob counterclockwise ↺ to "ON".
9. Replace control access panel if necessary.
10. Turn on all electrical power to the Boiler.
11. Set room thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Boiler" in *Section 1.5* and call your service technician or gas supplier.

**To turn off gas to boiler or emergency shut-off**
Follow *Section 1.5*.

## 1.5 TO TURN OFF GAS TO THE BOILER OR EMERGENCY SHUT-OFF.

**WARNING**

**Should boiler overheat, or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the circulating pump. Instead, shut off the gas supply at a location external to the boiler.**

1. Set the thermostat to the lowest setting.
2. Turn all electrical power to the boiler off.
3. Remove control access panel on the boiler if necessary.
4. Push in gas control knob slightly and turn clockwise ↻ to "OFF". Do not force it.
5. Replace control access panel if necessary.

# Installation Instructions Section 2

## 2.1 RECEIVING

**INSPECT SHIPMENT FOR POSSIBLE DAMAGE.** All goods are carefully manufactured, inspected, checked and packed by experienced workers. The manufacturer's responsibility ceases upon delivery of goods to the carrier in good condition. Any claims for damage, shortage in shipment or non-delivery must be filed immediately against the carrier by the consignee.

Use care when receiving and unpacking the boiler. Dropping the boiler may cause damage and prevent safe and proper operation.

## 2.2 INSTALLATION CODES AND REQUIREMENTS

All applicable national, provincial/state, and local codes, laws, regulations, and ordinances must be followed. They expand on and take precedence over any recommendations in this booklet. Authorities having jurisdiction shall be consulted before installations are made.

In **Canada**, the installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the *CAN/CSA B149 Installation Codes* (current edition). All electrical wiring must be in accordance with the *Canadian Electrical Code, CSA C22.1 Part 1* (current edition) and applicable local codes.

In the **United States of America**, the installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the *National Fuel Gas Code, ANSI Z223.1* (current edition). All electrical wiring must be in accordance with the *National Electrical Code, ANSI/NFPA 70* (current edition) and applicable local codes.

Where required by the authority having jurisdiction, follow the *Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1* (current edition).

## 2.3 LOCATION

MG and SG boilers are intended for indoor installation only. Observe the following minimum clearances from the boiler to combustible materials:

| Minimum Clearances to Combustible Materials | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | Sides | | Rear | | Top | | Front (service) | |
| | in. | mm | in. | mm | in. | mm | in. | mm |
| **MG** | 2 | 51 | 2 | 51 | 24 | 610 | 18 | 457 |
| **SG** | 2 | 51 | 2 | 51 | 24 | 610 | 24 | 610 |

- Minimum clearance from the boiler front to combustible materials for SG and MG is 6 in (153 mm); however, a front clearance of 18" (457 mm) for MG boilers and 24" (609 mm) for SG boilers is recommended for servicing.
- Maintain a clearance of 6" (152 mm) from draft hood and the flue pipe in any direction.
- Allow ample space for boiler inlet and outlet connections, and gas connection.
- Boiler must be installed on a stable and level foundation.
- MG & SG Series boilers can be installed on a combustible floor but must not be installed directly on carpeting.
- **A hot water boiler installed above radiation level must be provided with a low water cutoff device at the time of boiler installation.**
- This boiler must be installed such that gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service.

## 2.4 GAS SERVICE PIPING

The boiler and its gas connection must be leak tested before placing the boiler in operation. The gas controls furnished are suitable for a maximum operating gas pressure of 1/2 psi (14 inches water column).

The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (14 inches water column).

The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing at test pressures equal to or less than 1/2 psig (14 inches water column).

A manual main shut-off valve should be installed in the gas line outside the boiler jacket and as required in *Section 2.2*. The valve should be readily accessible for turning on and off.

A drip pocket or sediment trap should be installed in the gas supply line upstream of the gas controls and as close to the boiler as possible (example shown in Figure 3 in *Section 6*).

The pipe compound used should be resistant to the action of liquefied petroleum gases. Check for gas leaks in piping before placing the boiler in operation by using a soap and water solution. **DO NOT USE AN OPEN FLAME.**

**INSTALLER MUST IDENTIFY EMERGENCY SHUT-OFF DEVICES.**

All piping and fittings must be installed as per codes in *Section 2.2*.

## 2.5 AIR SUPPLY FOR COMBUSTION AND VENTILATION

A sufficient air supply MUST be provided to this boiler. Air openings to the boiler room provide the air for combustion, flue gas dilution and ventilation and are always required, regardless whether the air is taken from inside or outside. The air opening size and location (as well as other air supply and venting considerations) must conform to *Section 2.2*.

The boiler room must never be under a negative pressure. Always provide air openings sized not only to the dimensions required for the total input of all fuel-fired appliances in the boiler space, but also to handle the air movement rate of any **exhaust fans** or **air movers** using air from the building or space.

The venting terminations must always be kept clear of obstructions (i.e. snow, ice, etc.). Louvers and grilles used in the air supply and ventilation system should be kept clear of any dust, dirt, or debris which will block proper air flow.

## 2.6 CORROSIVE ATMOSPHERES

If a gas boiler is to be installed near a corrosive or potentially corrosive air supply, the boiler should be isolated from it and outside air should be supplied as recommended in *Section 2.5*.

Chemical vapors from products containing **chlorine** or **fluorine** must be avoided. Even though these chemicals may be safe to breathe, corrosive substances can become liberated when passed through a gas flame. Even at low concentrations, these chemicals can significantly contaminate the air supply and shorten the life of any gas burning appliance. The following is a list of some of the products which should be avoided:

- bleaches and chlorinated cleaning products
- paints and sprays
- water softeners (calcium or sodium chloride)
- leaking refrigeration equipment
- freon from common aerosol dispensers

These chemicals are especially commons near swimming pools, beauty shops, dry cleaning establishments, laundry areas, workshops, and garages. **The warranty is void when failure is due to corrosion.**

## 2.7 VENTING

The responsibility of providing a suitable vent of adequate draft capacity and in good usable condition is that of the gas fitter/installer. Interference with the air supply for the boiler shall be prohibited.

Vent installation and type of gas vent or vent connector MUST follow all applicable national, provincial/state, and local codes, laws, regulations, and ordinances as described in *Section 2.2*.

For boilers for connection to gas vents or chimneys, vent installations shall be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1 or Section 7, Venting Systems and Air Supply for Appliances, of the CAN/CGA B149, Installation Codes, or applicable provisions of the local building codes.

The venting shall be supported as required by applicable code(s). Horizontal runs shall slope upward not less than ¼ inch per foot (21 mm/m) from the boiler to the vent terminal.

This unit must be installed with the factory supplied draft hood in place. The draft hood is a safety device designed to control chimney drafts that might affect combustion or blow out the pilot. The draft hood supplied with the boiler must not be altered. The minimum skirt height as indicated on the draft hood must be maintained.

Vent connectors serving the boiler must not be connected into any portion of mechanical draft systems operating under positive pressure.

**Vent Terminal Information**

The minimum distance from the termination of a vent terminal to adjacent public walkways, adjacent buildings, openable windows and building openings shall be not less than those values specified in the *National Fuel Gas Code, ANSI Z223.1* and/or *CAN/CGA Installation Codes*.

For proper operation, the vent terminal must be kept free of snow and other debris at all times.

To prevent discoloration and degradation of building materials by flue gases and flue gas condensation, ensure that the vent terminal is installed clear of nearby obstacles. In all cases, installation shall be in accordance with code.

Maintain a minimum clearance of 4 feet (1.22 m) horizontally, and in no case above or below, unless a 4 foot (1.22 m) clearance is maintained from electric meters, gas meters, regulators and relief equipment.

**Removal of an Existing Boiler**

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances connected to it.

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

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

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

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

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

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

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

g) Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code, ANSI Z223.1* and/or *CAN/CGA Installation Codes*. When re-sizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 of the *National Fuel Gas Code, ANSI Z223.1* and/or *CAN/CGA Installation Codes*.

## 2.8 AUTOMATIC VENT DAMPER

This boiler is supplied with an automatic vent damper. The following instructions must be observed:

- The automatic vent damper should be installed at the top of the factory supplied draft hood (Figure 1 - Alternate 3). No modifications to the automatic vent damper are permitted.
- The venting system must be arranged so that only the boiler is served by the automatic vent damper with which it was supplied.
- Connect the wiring harness from the boiler to the automatic vent damper as indicated on the supplied wiring drawings.
- The automatic vent damper position indicator should be clearly visible after installation.
- A minimum clearance of not less than 6 inches (153 mm) must be maintained between the automatic vent damper device and combustible construction. Provision must be made for service access to the automatic vent damper.
- The automatic vent damper must be in the open position when the boiler's main burner is operating.
- For orientation other than vertical, refer to automatic vent damper installation instructions

## 2.9 BLOCKED VENT AND FLAME ROLL-OUT SAFETY SWITCHES

All boilers with an input of 300,000 Btu/h and under are equipped with blocked vent and flame roll out safety switches. The blocked vent safety switch is installed in the clip provided on the draft hood (Figure 1 - Alternate 1) or is mounted with screws (Figure 1 - Alternate 2). The blocked vent safety switch is pre-wired at the factory either directly to the boiler controls (Figure 1 - Alternate 1 & 2), or through a wiring harness for a boiler with an automatic vent damper (Figure 1- Alternate 3). If the vent becomes blocked a boiler shut down will occur. Ensure that the vent is free of obstructions.

The flame roll out safety switch will cause a boiler shutdown if the heat exchanger becomes blocked with soot or corrosion.

**WARNING**

**Shut down of the boiler by either the "Blocked Vent" or the "Flame Roll-out" safety switch is an indication that carbon monoxide may be improperly venting into the premises and the boiler must be serviced by a qualified person who is capable of determining the cause of the shut down and can take corrective action. Carbon monoxide is a lethal, colorless and odorless gas.**

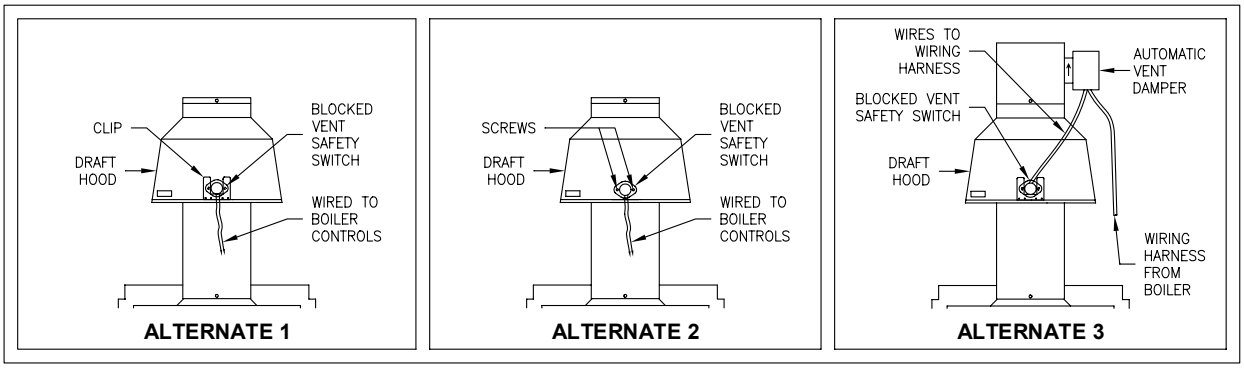



**FIGURE 1 - MOUNTING LOCATION OF BLOCKED VENT SAFETY SWITCH AND WIRE ROUTING**

## 2.10 BOILER PIPING SYSTEM

The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.

## 2.11 CORROSION PREVENTION (INTERNAL)

We strongly recommended the use of oxygen barrier tubing to protect the system and its components from corrosion. Chemical inhibitors are not recommended, as their improper use or maintenance can cause accelerated corrosion, resulting in premature failure of the boiler heat exchanger and/or system components. Corrosion is a preventable condition and is not covered by the *Super Hot* product warranty. Should your system include "non-oxygen-barrier-tubing" please contact the factory or your heating professional for recommendations.

## 2.12 SYSTEM OPERATING REQUIREMENTS

**WARNING**

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

Avoid unnecessary replenishment of system water. It can allow oxygen to enter the system and cause serious corrosion problems. As well, minerals dissolved in the water supply will precipitate when heated; minerals preferentially deposit in the heat exchanger. Do not draw water from the heating system for cleaning, flushing, etc.

*Super Hot* MG and SG series boilers are designed for use in closed loop systems and are not intended for open systems, as in heating pool water or systems where water is constantly replenished. Operating the boiler in an open system will result in premature failure of the heat exchanger. *Super Hot* boilers may be used to heat water in open systems indirectly by installing a heat exchanger, such as the *Super Hot C-Coil*, to separate open and closed systems.

Heating systems with low temperature return water may cause flue gas moisture to condense on the boiler heat transfer surfaces, causing corrosion and restricting flue gas flow. Also, low temperature return water may overcool the flue gases, resulting in reduced vent suction. These are natural phenomena and are independent of the boiler design. As a guide to avoiding such corrosion and draft problems, it is imperative that the return water be not less than 135°F (57°C).

**MG AND SG SERIES BOILERS MUST ALWAYS BE USED WITH FORCED SYSTEM CIRCULATION.**

## 2.13 PRESSURE RELIEF VALVE

A pressure relief valve is supplied as standard equipment. The pressure relief valve is extra protection against damage that could be caused by malfunctioning controls or excessive water pressure. If a pressure relief valve is not used, the warranty is void.

The pressure relief valve should be installed on the boiler outlet with its spindle vertical. The connection between the boiler and the relief valve must have at least the area of the valve inlet.

A discharge pipe should be used. The discharge pipe outlet should be positioned over a suitable drain and so arranged that there will be no danger of being scalded. The discharge pipe must pitch down from the valve and should be no smaller than the outlet of the valve. The end of the discharge pipe should not be concealed or threaded and should be protected from freezing. Extensive runs, traps or bends could reduce the capacity of the pressure relief valve.

No valve of any type should be installed between the pressure relief valve and unit or in the discharge pipe. The pressure relief valve is a code requirement. Field installation of the relief valve must be consistent with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV.

Avoid contact with the hot water discharged to prevent personal injury.

## 2.14 ELECTRICAL WIRING

All electrical wiring must conform with the requirements in *Section 2.2*.

Run a separate circuit from the electrical service panel through a fused disconnect switch to the boiler. This boiler must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the *National Electrical Code, ANSI/NFPA 70* (current edition) and and/or the *Canadian Electrical Code, CSA C22.1 Part 1* (current edition). Field wiring shall conform to *Section 2.2* and to the temperature limitations of Type T [63°F (35°C) rise] or better.

Make connections as shown in the wiring diagrams provided. For details of electrical wiring for different pilots and controls, refer to wiring diagrams included in this manual.

# Startup Instructions Section 4

## 3.1 PRE-STARTUP

a. Fill entire heating system with water and vent or purge air from system. Add water as needed to reach boiler operating pressure. Water should be of suitable quality. Do not use water with high hardness.
b. Check for and repair any leaks in water piping.
c. Check burners to see that they are not dislodged.
d. Check for proper installation of pressure relief valve, draft hood, and venting.
e. Check that the electrical wiring matches the wiring diagram in this manual or on the boiler.
f. Check if the flame roll out safety switch and blocked vent safety switch are properly located and wired.
g. Use a soap solution to check for leaks in gas piping from meter to boiler pilot and manifold. Repair and retest any leaks found.
h. Operate circulating pump and vent all radiation units and high points in system piping.

## 3.2 STARTUP

**WARNING**

**The following instructions are intended as a guide for qualified persons. Before lighting the boiler, the pre-startup instructions of *Section 3.1* MUST be performed. If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.**

**WARNING**

**Should boiler overheat, or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the circulating pump. Instead, shut off the gas supply at a location external to the boiler.**

**a. Standing pilot**

1) Make sure Gas Valve and all electrical power to the boiler are "OFF".
2) Connect a manometer at the pressure tapping on the downstream side of gas valve.
3) Supply gas as far as the pilot only, ignite as per lighting instructions in *Section 1.3*, and adjust the pilot as described in "Pilot Flame" in *Section 3.3*.
4) Set the thermostat above room temperature. Open the gas valve to turn on main burner.
5) Assure that all other gas appliances are turned off, including their pilot flames.
6) Check manifold pressure reading on the manometer and make necessary adjustments. Check burner input to match rating plate input.
7) Turn Gas Valve to "OFF" and listen for the audible click which signifies that the automatic safety valve has closed. This should occur within 90 seconds.
8) Before re-lighting, wait 5 minutes with the Gas Valve closed to allow all unburnt gas to vent. Then smell for gas, including near the floor. If you smell gas, STOP! Follow the safety instructions provided in *Section 1.1* under WHAT TO DO IF YOU SMELL GAS. Remember that propane does not vent upward naturally.
9) Return thermostat and controls to normal operation settings.

**b. Intermittent pilot**

This boiler does not have a continuous pilot flame. It is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

In the event of failure of any component, either the system will not operate or it will go into safety lockout.

1) Make sure the Gas Valve and all electrical power to the boiler are "OFF".
2) Set room thermostat to the lowest setting.
3) Connect a manometer at pressure tapping on downstream section of gas valve.
4) Wait five minutes to clear out any gas. If you smell gas, STOP! Follow the safety instructions provided in *Section 1.1* under WHAT TO DO IF YOU SMELL GAS. Remember that propane does not vent upward naturally.
5) Check the ignition control module as follows:
   a) Set thermostat above room temperature to call for heat and turn power on for the boiler.
   b) Watch for spark at pilot burner on units equipped with spark ignition. All models will automatically lockout if no pilot flame is detected within 15 seconds. Automatic retry will occur in 5 minutes.
6) Turn Gas Valve to ON. Pilot burner should ignite, followed by main burners. Check main and pilot burners and adjust pilot, if necessary, as described in *Section 3.3*.
7) Assure that all other gas appliances are turned off, including their pilot flames.
8) Check manifold pressure reading on the manometer and make necessary adjustments. Check burner input to match rating plate input.
9) Return thermostat and controls to normal operation settings.

**c. Hot Surface Ignition**

This boiler does not have a continuous pilot flame. It is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

1) Make sure the Gas Valve and all electrical power to the boiler are "OFF".
2) Set room thermostat to the lowest setting.
3) Connect a manometer at pressure tapping on downstream section of gas valve.
4) Wait five minutes to clear out any gas. If you smell gas, STOP! Follow the safety instructions provided in *Section 1.1* under WHAT TO DO IF YOU SMELL GAS. Remember that propane does not vent upward naturally.
5) Set room thermostat to call for heat.
6) Turn on the gas valve.
7) Turn on all electrical power to the boiler. The hot surface element should glow bright orange and ignite the pilot, followed by the main burners. Check main and pilot burners and adjust pilot, if necessary, as described in *Section 3.3*.
8) Assure that all other gas appliances are turned off, including their pilot flames.
9) Check manifold pressure reading on the manometer and make necessary adjustments. Check burner input to match rating plate input.
10) Return thermostat and controls to normal operation settings.

## 3.3 CHECK BURNER SYSTEM

To maintain safe and efficient operation, examine the burner system regularly through the inspection hole near the pilot tube.

**Check condition of burner system**

It is possible for parts of the burners system to become plugged, cracked, eroded and/or dislodged resulting in unsafe operation.

**Pilot Flame**

Remove cap screw cover on gas valve, then adjust gas flow to the point where the thermocouple tip or sensor rod is completely enveloped by the flame (Figure 2), but not necessarily glowing red. Replace and tighten cap.

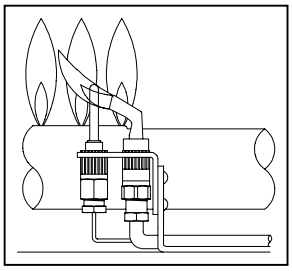


**FIGURE 2 - PILOT FLAME ADJUSTMENT**

**Check for lifting**

Flames should not lift excessively from the burner ports. The flames may lift slightly during ignition or when the burners are cold.

**Check ignition and extinction**

Ignition should flow quickly and smoothly across all the burners. Popping noises or explosions from the burners during ignition, extinction or normal burner operation indicates the need for service.

**Check flame color**

An extremely yellow flame, as seen on a burning candle or match, is an indication of incomplete combustion and is usually accompanied by the formation of soot and carbon monoxide (carbon monoxide is a lethal, colorless and odorless gas). If soot is allowed to accumulate, it will partially restrict free passage of products of combustion to the flue. Under typically operating conditions, the flame should have a distinct bright blue inner cone and a blue/orange outer cone.

**If any of the above problems are observed or the burner system does not operate properly, immediately take corrective measures.**

## 3.4 AQUASTAT ADJUSTMENT

The factory mounted aquastat controls main burner firing by sensing outlet water temperature. To set the temperature of this control, adjust the dial until indicator points to the temperature (setpoint) at which the gas valve will close. The gas valve will open at setpoint less the differential. The automatic reset safety high-limit aquastat is either fixed or, if adjustable, should be set a minimum of 20°F (10°C) above the setting of the aquastat.

## 3.5 GAS MANIFOLD PRESSURE

The designated manifold pressures are as shown in the table below. A 1/8” NPT tapping is provided on the manifold or gas valve for connecting a manometer to check this pressure. Both natural gas and propane models are furnished with gas valves which have a built in gas pressure regulator. If necessary, adjust to the proper value by removing cap and turning adjusting screw clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.

| Model | Natural Gas | Propane |
|---|---|---|
| **MG** | 3.5” W.C. | 11.0” W.C. |
| **SG** | 3.5” W.C. | 10.0” W.C. |

## 3.6 CHECK INPUT & ORIFICES

**For safety, the input shown on rating plate must not be exceeded.** Check with the table below that the orifice size and input rate shown on your boiler rating plate match your application, i.e. boiler model, fuel type, and altitude. See MG & SG Specifications to find a boiler model's input rate.

| FOR CANADA | | | | |
|---|---|---|---|---|
| **Model** | **Natural Gas** | | **Propane** | |
| | **0 to 2,000 feet** | **2,000 to 4,500 feet** | **0 to 2,000 feet** | **2,000 to 4,500 feet** |
| **MG** | #51 orifice standard input | #51 orifice standard input | #60 orifice standard input | #61 orifice 10% derate input |
| **SG** | #43 orifice standard input | #44 orifice 10% derate input | #54 orifice standard input | #55 orifice 10% derate input |

NOTE: For elevations above 4,500 feet reduce high altitude input 4% for each additional 1000 feet. Reference *Natural Gas and Propane Installation Code B149.1*, 3.22 High Altitude Installations

Example of High Altitude Derate

Boiler: SG-270

Altitude: 5,500 feet

Standard Input (0 to 2,000 ft) = 270,000 Btu/h (from page 3)

High Altitude Input (2,000 to 4,500 ft) = Derate Standard Input by 10% (see above table)

= 270,000 Btu/h x (1 - 0.10)
= 270,000 Btu/h x 0.90
= 243,000 Btu/h

% Reduction for additional 1000 ft = 4% x 1 = 4%

Input at 5,500 ft = Derate High Altitude Input by 4%
= 243,000 Btu/h x (1 – 0.04)
= 243,000 Btu/h x 0.96
= 233,280 Btu/h

| FOR UNITED STATES | | | | |
|---|---|---|---|---|
| **Model** | **Natural Gas** | | **Propane** | |
| | **0 to 2,000 feet** | **Over 2,000 feet** | **0 to 2,000 feet** | **Over 2,000 feet** |
| **MG** | #51 orifice standard input | Input must be reduced 4% for each 1000 feet above sea level. * | #60 orifice standard input | Input must be reduced 4% for each 1000 feet above sea level. * |
| **SG** | #43 orifice standard input | | #54 orifice standard input | |

*Reference *National Fuel Gas Code ANSI Z223.1*, 8.1.2 High Altitude.

Example of High Altitude Derate

Boiler: MG-100

Altitude: 5,000 feet

Standard Input (0 to 2,000 ft) = 100,000 Btu/h (from page 2)

% Reduction for 5,000 ft = 4% x 5 = 20%

Input at 5,000 ft = Derate Standard Input by 20%
= 100,000 Btu/h x (1 - 0.20)
= 100,000 Btu/h x 0.80
= 80,000 Btu/h

Small adjustments to the input rate can be made by varying the manifold pressure. Normally it should be adjusted no more than 0.2 inch w.c. for natural gas or 0.5 inch w.c. for propane from the manifold pressure specified on the rating plate.

**WARNING**

**Exceeding the allowable input rate can produce dangerous concentrations of carbon monoxide, and cause the boiler to overheat resulting in severe personal injury, death or substantial property damage. Carbon monoxide is a lethal, colorless and odorless gas.**

**Input Rate Test**

Consult gas company to determine the heating value of the gas supplied in Btu per cubic feet. Operate boiler for 15 minutes starting with all parts at room temperature and check input by clocking gas meter with all other gas appliances turned off, including their pilot flames. Use the following formula:

$$\text{INPUT (Btu/h)} = \frac{(3600) \times (\text{Heating Value of Gas}) \text{ x } (\text{Number of Cubic Feet Timed})}{\text{Seconds Clocked}}$$

To ensure accuracy for rating, clock enough cubic feet of gas so that there is at least one revolution of the test dial and the clocked time is at least 60 seconds.

**Two Stage Gas Valve**

When a two stage gas valve is used, it must be checked for correct input at both "High" and "Low" fire settings. The clocked input rate MUST be within the "Minimum Input" and the "Input" as specified on the boiler's rating plate. To force the boiler to low fire, unplug the blue wire from the "HI" (or "W-2") port of the two stage gas valve. Perform the Input Rate Test described above and adjust manifold pressure of High and Low settings as necessary. For altitudes above 2000 feet, DO NOT derate the "Minimum Input" rate.

## 3.7 CHECK FOR DRAFT HOOD SPILLAGE

**WARNING**

**Continuous spillage at the draft hood relief opening may result in severe personal injury, death or substantial property damage.**

After the main burners have operated for 5 minutes, check to see that combustion products are going up the chimney or gas vent properly by passing a lighted match (or smoke from a cigar, cigarette, or pipe) around the edge of the relief opening of the draft hood. If the chimney or gas vent is drawing properly, the match flame or smoke will be drawn into the draft hood. If not, the combustion products will tend to extinguish this flame. While performing this test, make sure all exhaust fans, air movers, and gas appliances are operating and doors and windows are closed. If the combustion products are escaping from the relief opening of the draft hood, IMMEDIATELY shutdown the boiler and make proper adjustments or repairs.

## 3.8 CHECK OF CONTROLS

After the unit has been operated for awhile, lower the aquastat setting below the setpoint and burner should shut off. Rotate the aquastat higher than setpoint and the main burner should ignite. Return the aquastat to its original setpoint and make sure boiler cycles normally. Repeat this type of check on the safety high-limit aquastat, thermostat and other system controls to ensure all work satisfactorily. If any of the safety or controls do not function, necessary corrections should be made immediately.

## 3.9 CHECK FOR GAS LEAKS

To identify gas leaks, smell for gas around boiler area and gas piping connections (See *Section 1.1*). To check a specific area for leakage, spray a mixture of soap and water onto the suspected area – active bubbling indicates a gas leak. DO NOT TEST FOR LEAKS WITH AN OPEN FLAME. Gas leaks must be repaired immediately.

## 3.10 INSTALLER'S CHECKLIST

| | | *Reference Section* |
|---|---|---|
| o | The information printed on the boiler rating plate matches the application (i.e. altitude and fuel type). | *3.5* |
| o | All applicable electrical codes have been met. | *2.2, 2.14* |
| o | Gas piping has been purged and checked for leaks with a soap solution. | *2.2, 2.4, 2.9* |
| o | System is filled with water and all air has been purged. Only oxygen barrier tubing has been used. | *2.11, 2.12* |
| o | A manometer has been used to check the manifold pressure and gas supply pressure against requirements printed on boiler rating plate. | *3.2, 3.5* |
| o | Bypass or mixing valve has been used to prevent return water less than 135°F. | *2.12* |
| o | All applicable venting codes have been met. Air openings sized to provide adequate supply air for combustion, flue gas dilution and ventilation and will not be blocked off. | *2.2, 2.5, 2.6, 2.7* |
| o | Check for spillage at draft hood and other areas susceptible to spillage. | *3.7* |
| o | Operate the boiler for 15 minutes, then clock and calculate Btu/h input rate. The input rate must not exceed that specified on the boiler rating plate.<br>Clocked BTU/H Input Rate: _____ | *3.6* |
| o | Perform check of temperature controls: aquastat, high limit aquastat, and thermostat. | *3.4, 3.8* |
| o | Test any other controls as specified by the manufacturer. | |
| o | Visually inspect main burners and pilot to ensure proper flame operating characteristics and ignition/extinction is ok. | *3.3* |
| o | Allow the boiler to cycle a few times to ensure functions are operating correctly. | |
| o | Close main shut-off valve and check that burners and pilot flame extinguish. | |
| o | Clearly identify emergency shut-off devices and make the user or owner aware of their location and method of operation. | |
| o | Fill in the contact information on the cover of the User's Information Manual and leave both manuals in the envelope adjacent to the boiler. | |

**NOTE**: INSTALLER'S RESPONSIBILITY

*"Before leaving installations, installers shall ensure that an appliance, accessory, component, or equipment installed by them comply with the Code requirements, and the person initially activating the appliance shall ensure that the appliance is in safe working order."*

*CSA B149.1-00 Natural Gas and Propane Installation Code*

# Service & Maintenance Instructions Section 4

## 4.1 SERVICE & MAINTENANCE INSTRUCTIONS

**WARNING**

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

**WARNING**

**If any part of this boiler has been under water, inspect the boiler and replace any part of the control system and any gas control which has been under water.**

This boiler has been designed to provide years of trouble-free performance in normal installations. The owner or user should conduct a general external examination covering all items on the "User Checklist" at the beginning of each heating season and in mid-heating. In addition, the owner or user will have the boiler inspected by qualified service technician or gas supplier's service person at least **once every year** at the beginning of the heating season for continued safe operation. Note that some operating conditions may require more frequent inspections.

The qualified service technician or gas supplier's service person should follow the "Service Checklist". The "Service Checklist" must only be used by a qualified service technician or gas supplier's service person.

**Verify proper operation after servicing.**

## 4.2 CLEANING PROCEDURE

1. Shutdown the boiler as described in the lighting instructions in *Section 1.5*.
2. Inspect flue gas passages and burners for the presence of soot, rust or scale.
3. If necessary, use a wire brush and vacuum to clean and remove any blockages. Plugged burner ports must be cleared.
4. Replace any parts which have severely corroded.
5. Reassemble parts removed during cleaning as they were before, ensuring air tightness of flue gas passages.
6. Corrosion can be caused by low return water temperature or a contaminated air supply. Sooting can be caused by improper burner adjustment. Check and adjust as necessary.
7. Return boiler to operation following lighting instructions in *Section 1.5*.

## 4.3 SERVICE CHECKLIST

| | | *Reference Section* |
|---|---|---|
| o | Do not store anything against the boiler or allow dirt or debris to accumulate in the area immediately surrounding the boiler. The flow of supply and exhaust air must not be obstructed. | *2.5* |
| o | Check air openings are not restricted and complies with applicable code(s). Adequate supply air is necessary for combustion, flue gas dilution and ventilation. | *2.2, 2.5, 2.6, 2.7* |
| o | When the boiler has operated for several minutes, check for spillage at draft hood, venting ducts, and other areas susceptible to spillage. | *3.7* |
| o | Check externally the draft hood and vent system for soot, rust scale or corrosion. Check for dislodged venting or possible leaks in venting ducts. | |
| o | Remove the draft hood from the boiler and inspect the flueways for the presence of soot or rust scale. Inspect the draft hood and smoke pipe connecting the draft hood to the flue for rust or corrosion before replacing the draft hood. The presence of soot, rust scale or corrosion indicates misadjustment. | *4.2* |
| o | Inspect and, if necessary, clean the pilot burner and main burner. Check burners to see that they are not cracked or dislodged. | *3.3, 4.2* |
| o | Visually check the pilot and main burner flames. A yellow flame caused by improper adjustment is always accompanied by formation of soot which, if allowed to continue, will partially restrict free passage of products of combustion to the flue. | *3.3* |
| o | Check that gas piping is secured. Smell for gas leaks around boiler and gas piping connections. Gas leaks can also be checked for using a soap solution; do not use an open flame to check for leaks. Note: Propane is heavier than air and pools in a low area in the event of a leak. | *3.9* |
| o | Inspect for leaks in the water piping and at water piping connections. | |
| o | Circulating pumps used with hot water heating systems should be inspected for water leaks. | |
| o | Check for weeping at pressure relief valve outlet during normal operation. | *2.13* |
| o | Listen for unusual audible sounds in the boiler. Any audible sounds in the boiler system may be indications of scaling or lack of sufficient water flow and the system should be checked without delay. Scaling is due to improper maintenance. It is not the fault of the boiler. Scale damage is not covered by warranty. | *2.12* |
| o | Check the temperature and pressure gauge and expansion tank pressure is within an acceptable range for the heating system. | |
| o | Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids. Combustible materials, gasoline and other flammable vapors and liquids should not be stored in the area of the boiler. | |
| o | Check should be made on ignition system, operation controls and safety shut-off valves for gas tightness. | *2.9* |
| o | If applicable, inspect low water cutoff for proper operation. | |
| o | Check for proper operation of the blocked vent and flame roll-out safety switches. | |
| o | The emergency shut-off devices are identified and the owner is aware of their location and method of operation. | |

## 4.4 CAUTION: WATER REPLENISHMENT

Avoid unnecessary replenishment of system water. It can allow oxygen to enter the system and cause serious corrosion problems. As well, an excessive amount of minerals may be deposited in the heat exchanger. Do not draw water from the heating system for cleaning, flushing, etc.

Any audible sounds in the boiler system may be indications of scaling or lack of sufficient water flow and the system should be checked without delay. Scaling is due to improper maintenance. It is not the fault of the boiler. Scale damage is not covered by warranty.

## 4.5 REFRACTORY HANDLING PROCEDURE

**WARNING**

**The mineral block and fiberglass wool used in this product are RCFs (Refractory Ceramic Fibers). RCFs pose a possible cancer hazard by inhalation and can cause respiratory, skin and eye irritation.**

**After mineral block has been fired, it will produce increased levels of nuisance dust and poses increased carcinogenic risk.**

Follow the precautionary measures below before attempting service or access.

**PRECAUTIONARY MEASURES:**

- Avoid breathing fibers and contact with skin and eyes.
- Use a National Institute for Occupational Safety and Health (NIOSH) approved dust/mist respirator.
- Wear long-sleeved, loose fitting clothing, gloves and eye protection.
- Wash work clothes separately from other clothing. Rinse washer thoroughly.
- Operations such as sawing, blowing, tearout and spraying may generate airborne fiber concentration requiring additional protection.
- Use a vacuum with a HEPA filter for clean up.
- Dispose of all RCF scrap and dust in a closed airtight plastic bag.

**FIRST AID MEASURES:**

- Eye contact – Flush eyes with water to remove dust for at least 15 minutes. If irritation persists, seek immediate medical attention.
- Skin contact – Wash affected area gently with soap and warm water after handling.
- Difficulty breathing – Move to an area of clean fresh air. Seek immediate medical attention if difficulties persist.
- **Ingestion – Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.**

# Boiler Water Flow Data — Section 5

Typical Water Flow Versus Pressure Drop Across Boiler

| Model Number | 20°F T.D. | | 30°F T.D. | |
|---|---|---|---|---|
| | U.S. GPM | P.D. FT. | U.S. GPM | P.D. FT. |
| MG50 | 4.0 | 1.1 | 3.0 | 1.0 |
| MG75 | 6.0 | 2.2 | 4.0 | 1.1 |
| MG100 | 8.0 | 3.5 | 6.0 | 2.2 |
| MG125 | 10.0 | 5.2 | 7.0 | 2.8 |
| MG150 | 12.0 | 8.0 | 8.0 | 3.5 |
| SG135 | 11.4 | 2.8 | 7.6 | 1.2 |
| SG180 | 15.1 | 2.8 | 10.1 | 1.2 |
| SG225 | 18.9 | 2.8 | 12.6 | 1.2 |
| SG270 | 22.7 | 2.8 | 15.1 | 1.2 |

## Replacement Parts — Section 6

**NOTE:** To supply the correct part it is important that you state the boiler model number, serial number and type of gas when applicable.

Any part returned for replacement under standard company warranties must be properly tagged with Return Goods Authorization Form (R.G.A.), completely filled in with the boiler serial number, model number, etc., and shipped to the Company freight prepaid.

If determined defective by the Company and within warranty, the part will be returned in kind or equal substitution, freight collect. Credit will not be issued.

Refer to Figures 3 and 4 for replacement parts.

| ITEM | DESCRIPTION |
|---|---|
| 1 | COMBINATION GAS VALVE |
| 2 | MANIFOLD ASSEMBLY |
| 3 | PILOT BURNER UNIT |
| 4 | TEMPERATURE / PRESSURE GAUGE |
| 5 | DUAL SAFETY HIGH-LIMIT AQUASTAT |
| 6 | FLAME ROLL-OUT SAFETY SWITCH |
| 7 | BLOCKED VENT SAFETY SWITCH |
| 8 | AUTOMATIC VENT DAMPER |
| 9 | ZONE CONTROL BOARD |
| 10 | DRAFT HOOD |

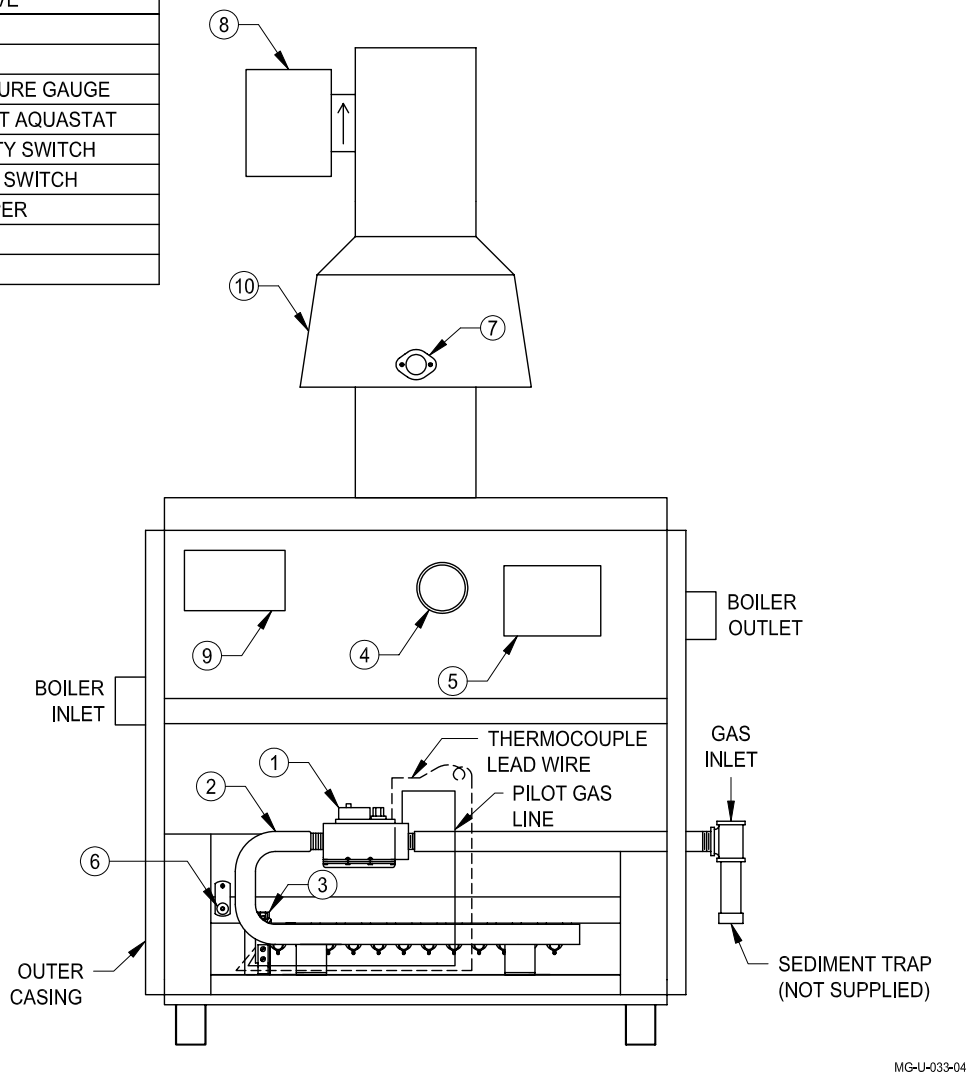



FIGURE 3 - TYPICAL GAS TRAIN ASSEMBLY AND CONTROL COMPONENT LAYOUT FOR RESIDENTIAL INSTALLATIONS

| NO. | DESCRIPTION |
|---|---|
| 1 | AUTOMATIC VENT DAMPER |
| 2 | DRAFT HOOD |
| 3 | TOP PANEL |
| 4 | LEFT SIDE PANEL |
| 5 | LEFT SIDE REFRACTORY HOLDER |
| 6 | FLUE COLLECTOR NOZZLE |
| 7 | LEFT SIDE REFRACTORY |
| 8 | BAFFLE |
| 9 | FLUE COLLECTOR |
| 10 | DOOR |
| 11 | CONTROL PANEL |
| 12 | INSPECTION DOOR |
| 13 | ROLL-OUT SHIELD |
| 14 | FRONT REFRACTORY HOLDER |
| 15 | FRONT REFRACTORY |
| 16 | FRONT SEAL |
| 17A | MG MODEL HEAT EXCHANGER ASSEMBLY |
| 17B | SG MODEL HEAT EXCHANGER ASSEMBLY |
| 18 | REAR SEAL (MG MODELS ONLY) |
| 19 | REAR REFRACTORY |
| 20 | REAR REFRACTORY HOLDER |
| 21 | REAR PANEL |
| 22 | MANIFOLD |
| 23 | BURNER |
| 24 | FRONT BURNER SUPPORT |
| 25 | BURNER TRAY |
| 26 | REAR BURNER SUPPORT |
| 27 | BOILER BASE |
| 28 | RIGHT SIDE REFRACTORY |
| 29 | BOILER LEG |
| 30 | RIGHT SIDE REFRACTORY HOLDER |
| 31 | RADIATION SHIELD |
| 32 | RIGHT SIDE PANEL |
| 33 | PILOT BURNER ASSEMBLY (NOT SHOWN) |
| 34 | FIBERGLASS INSULATION C/W FOIL (NOT SHOWN) |
| 35 | FIBREFRAX BLANKET INSULATION (NOT SHOWN) |

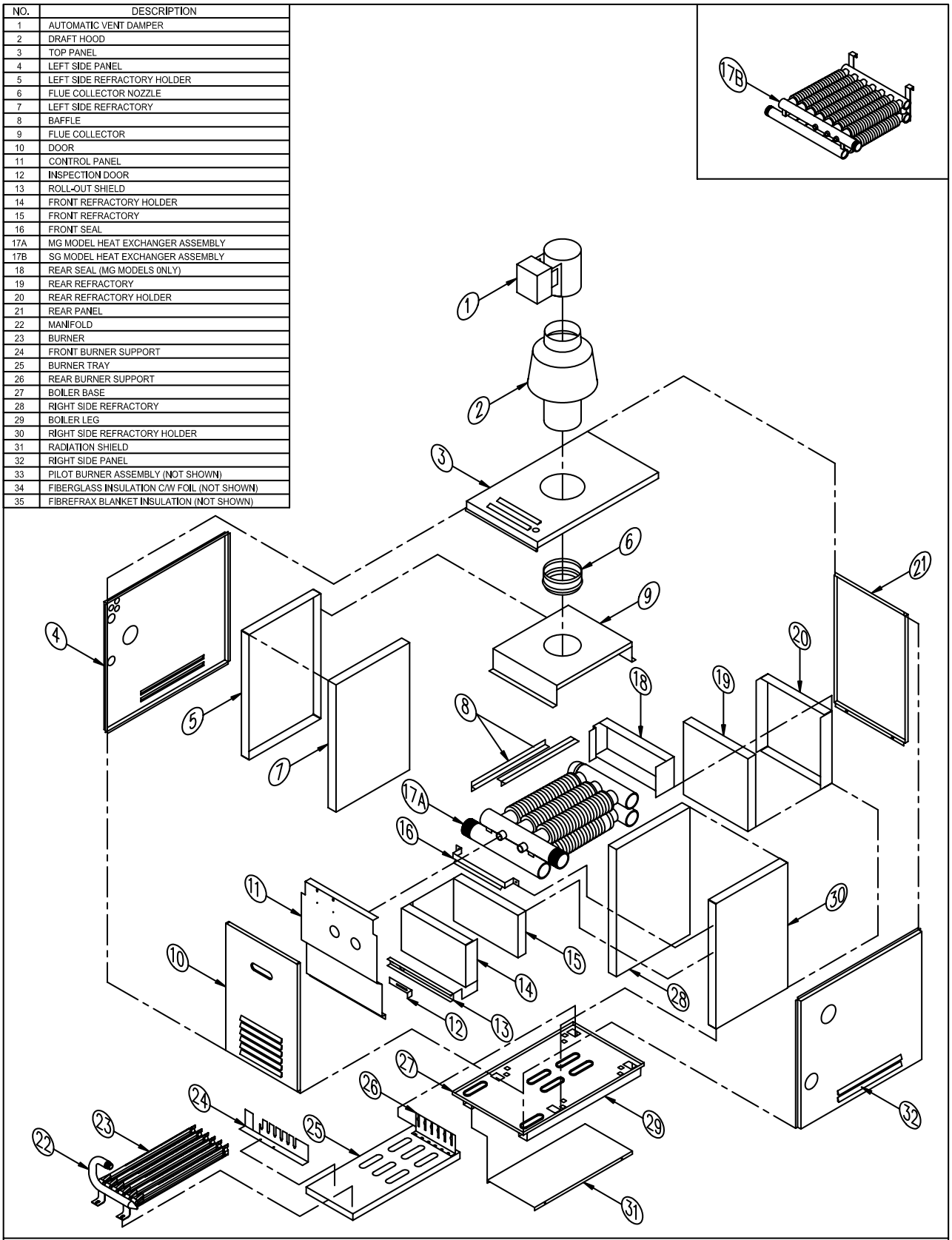



FIGURE 4 - GENERAL ASSEMBLY PARTS LIST

# Wiring Diagrams — Section 7

## Simplified Wiring Instructions

**⚠ IMPORTANT**

- Disconnect power source to boiler before wiring zone control board.
- All wiring must comply with applicable codes, ordinances and regulations.
- The non-replaceable fuse on the board will be blown if 240 Vac is connected to the board or if the 24 Vac system is even momentarily shorted out.

**A: Line Voltage Connections**

Connect 120 Vac, 60 Hz, single phase power to terminals L1 (HOT) and L2 (NEUTRAL). Strip wire ends to a maximum of 3/16" before inserting into terminal block. Tighten terminal screw clamps. Connect ground wire to ground screw “G” on the boiler control panel.

**B: Zones**

Remove zone one plug-in terminal block. Connect 24 Vac thermostat leads to terminals TH1 and TH2 on plug-in terminal block. Connect normally closed zone valve 24 Vac motor leads to terminals ZV1 and ZV2. Connect zone valve “end switch” leads to terminals ES1 and ES2. Strip wire ends to a maximum of 3/16" before inserting into terminal block. Tighten terminal screw clamps. Re-insert plug-in terminal block into mating connector on Zone Control Board. Repeat for zones 2, 3, and 4 as required.

**C: Optional Second Pump**

A second pump (120 Vac, 1/6 HP maximum) may be connected to terminals P1 (HOT) and P1C (NEUTRAL).

**D: Jumpers**

Jumpers J1 and J2 are factory set for a multi-zone installation.

**E: For Single zone Applications**

Install jumper J2 and connect 24 Vac thermostat leads to terminals TH1 and TH2 on Zone 1 plug-in terminal block.

Manufactured exclusively by

**Allied Engineering Company**

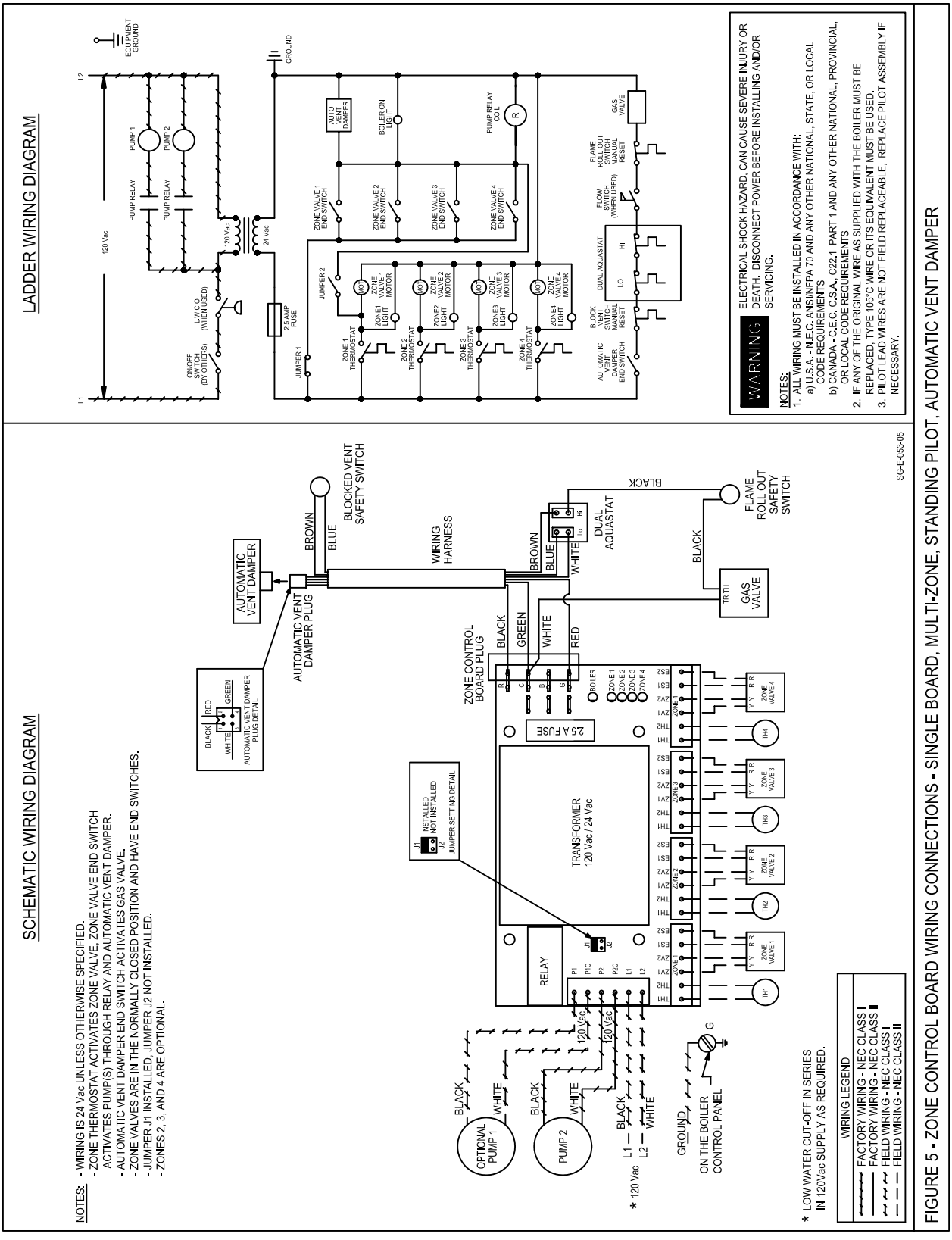



FIGURE 5 - ZONE CONTROL BOARD WIRING CONNECTIONS - SINGLE BOARD, MULTI-ZONE, STANDING PILOT, AUTOMATIC VENT DAMPER

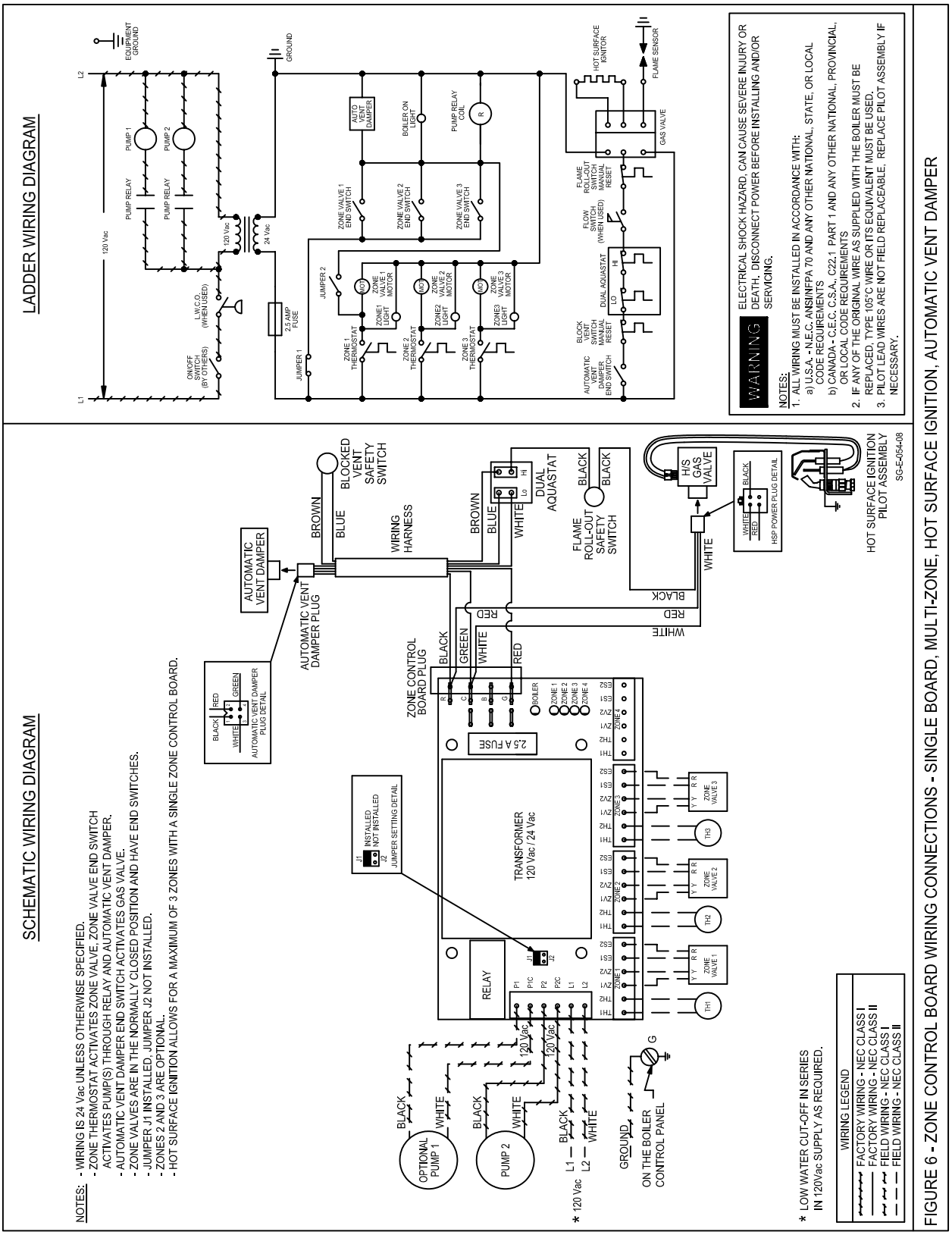



FIGURE 6 - ZONE CONTROL BOARD WIRING CONNECTIONS - SINGLE BOARD, MULTI-ZONE, HOT SURFACE IGNITION, AUTOMATIC VENT DAMPER

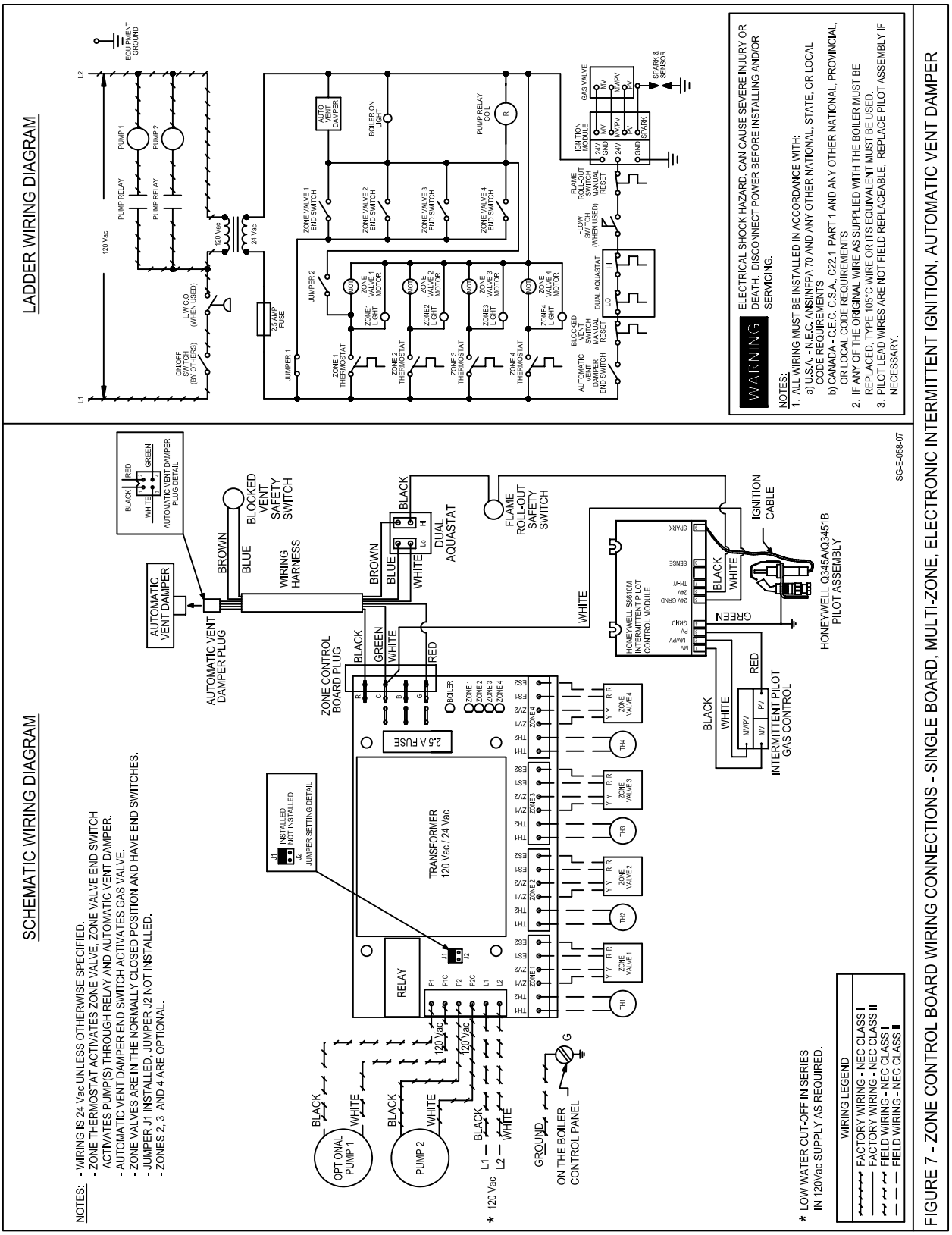



FIGURE 7 - ZONE CONTROL BOARD WIRING CONNECTIONS - SINGLE BOARD, MULTI-ZONE, ELECTRONIC INTERMITTENT IGNITION, AUTOMATIC VENT DAMPER

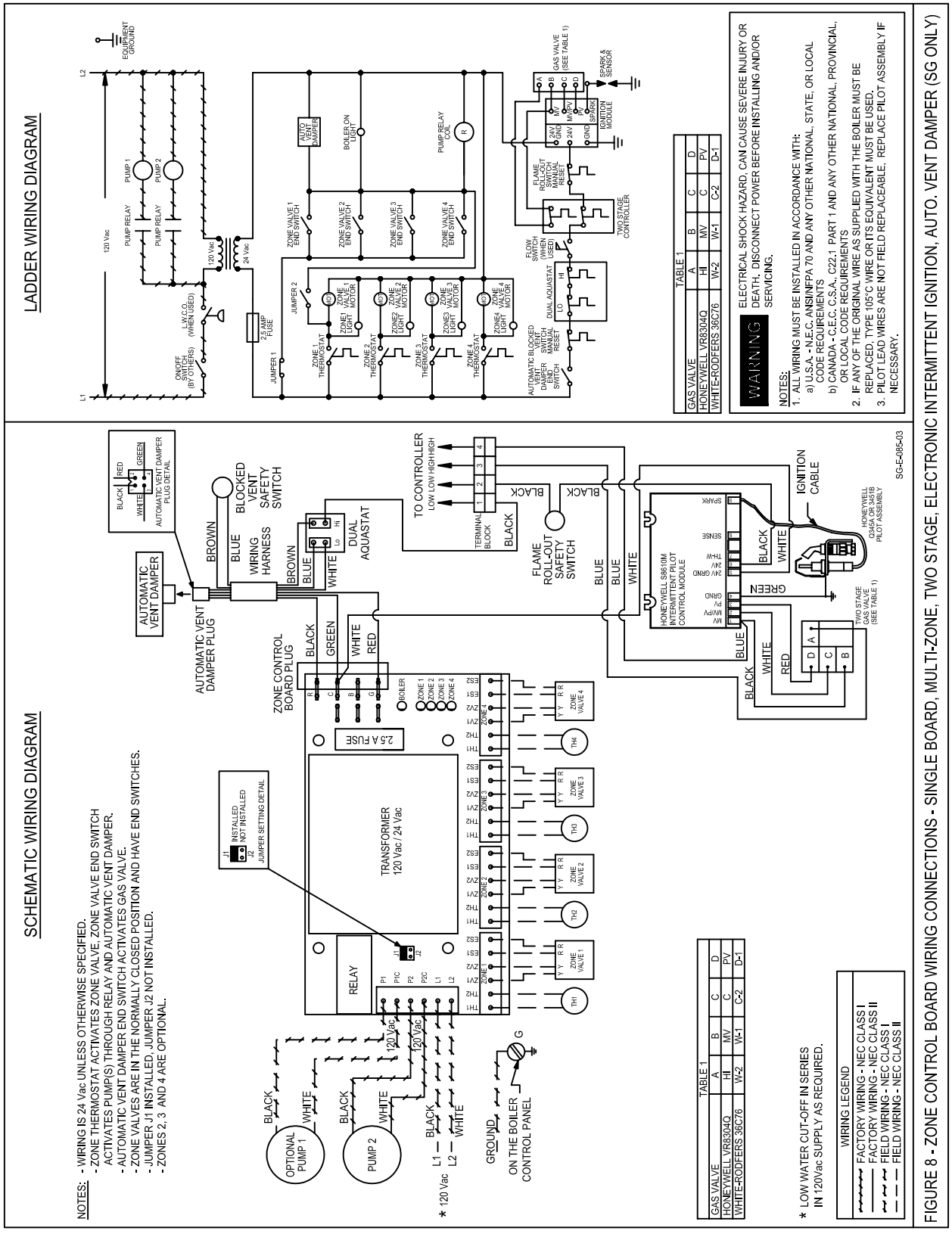



FIGURE 8 - ZONE CONTROL BOARD WIRING CONNECTIONS - SINGLE BOARD, MULTI-ZONE, TWO STAGE, ELECTRONIC INTERMITTENT IGNITION, AUTO. VENT DAMPER (SG ONLY)

# Troubleshooting Guide — Section 8

| Problem | Possible Cause | Solution |
|---|---|---|
| Boiler will not fire. | • No power. | • Check power switches and wiring. |
| | • No gas supply to boiler. | • Check gas source and pressure. |
| | • Gas supply pipes are not purged of air. | • Purge gas line. |
| | • No heat demand. | • Check if thermostat setting is above room temperature and aquastat setting is above boiler water temperature. |
| | • Flame roll-out or blocked vent safety switch is not reset. | • Push reset and diagnose cause. |
| | • Flow switch or low water cut off. | • Check pump capacity & flow direction. Check for correct water levels and air locks. |
| | • Gas valve failure (closed position). | • Check gas valve and replace if necessary. |
| | • Thermocouple failure. | • Check thermocouple and replace if necessary. |
| | • Faulty wiring. | • Check wiring of aquastats, zone valves, and thermostats for loose or broken wires and repair. |
| | • Faulty aquastat, thermostat, or zone valve. | • Check and replace if necessary. |
| | • Pilot not lit. | • Relight standing pilot. (For electronic ignition, see "Pilot flame will not light on electronic ignition".) |
| Boiler goes on and off at frequent intervals. | • Poor flow in boiler or circulator failure. | • Check pump for proper capacity & flow direction. Replace if necessary. |
| | • Thermostat, heat anticipator, or aquastat set too low. | • Check and adjust. |
| | • Boiler oversized or insufficient radiation. | • Check and adjust if necessary. |
| | • Wrong type of thermostat or controller. | • Check and replace if necessary. |
| Boiler fires continuously. | • Gas valve failure (open position). | • Check gas valve, replace if necessary. |
| | • Faulty wiring. | • Check wiring of aquastats, zone valves, and thermostats for short circuits or incorrect wiring. |
| | • Faulty aquastat, zone valve or thermostat. | • Check and replace if necessary. |
| Rumbling and moaning sound in boiler. | • Boiler is overheated and safety high limit aquastat fails to cut out. | • Check aquastats and adjust or replace if necessary. |
| | • Improper wiring. | • Check and correct. |
| | • Foreign matter in heat exchanger. | • Flush heat exchanger if necessary. |
| | • Poor circulation. | • Check pump for correct flow. |
| | • Air trapped in heating system. | • Purge air. |
| Gas odor. | • Negative draft. | • Incorrect vent size or blocked vent. |
| | • Insufficient combustion air to boiler. | • Check combustion and ventilation air opening in boiler room meets installation code requirements, and combustion air flow openings in the boiler base and burner tray are not blocked. |
| | • Leak in gas system. | • See “What to do if you smell gas” on cover. Have gas fitter test system and repair leaks. |
| Flame roll out on ignition or during operation. | • Carbon build up on the heat exchanger, caused by improper venting, ventilation air or low return water temperature. | • Have a qualified service technician inspect and clean the heat exchanger and check and adjust the system. |
| | • Negative draft. | • Check venting. |
| Pilot outages with standing pilot. | • Improper pilot flame. | • Adjust pilot flame. |
| | • Thermocouple lead to gas valve is loose. | • Check and tighten lead. |
| | • Thermocouple is defective. | • Replace thermocouple. |

| Problem | Possible Cause | Solution |
|---|---|---|
| Pilot flame will not light on electronic ignition. | • No spark. | • High voltage wiring is loose, broken or grounded. Repair wiring. |
| | • Ignition electrodes are damaged. | • Replace electrodes. |
| | • Ignition electrodes improperly adjusted. | • Correct adjustment of electrode. |
| | • Faulty electronic ignition controller. | • Replace controller. |
| | • No gas. | • Confirm supply of gas to pilot and repair if necessary. |
| | • Gas supply pipes not purged of air. | • Purge gas line. |
| | • Low pilot gas pressure. | • Adjust pressure. |
| | • Dirt or foreign material in pilot. | • Clean. |
| Pilot lights but flame failure after trial for ignition. | • Incorrect pilot flame pressure. | • Set pilot pressure to correct pressure. |
| | • Poor connections in wiring to flame sensor. | • Repair wiring. |
| | • Electrodes are damaged. | • Replace electrodes. |
| | • Ignition electrodes improperly adjusted. | • Correct adjustment of electrodes. |
| Burner starts but flame will not stay established. | • Ignition electrodes are wet, dirty or improperly adjusted (for electronic ignition only). | • Check, clean, change and/or adjust the electrodes. |
| | • Poor connections in wiring to flame sensor. | • Repair wiring. |
| Boiler carbonizes (forms soot) quickly. | • Incorrect orifice sizing. | • Check orifice and replace if necessary. |
| | • Inadequate combustion and ventilation air. | • Check and adjust. |
| | • Dusty environment. | • Clean. |
| | • Low return water temperature. | • Adjust system. |
| | • Manifold pressure too high. | • Adjust manifold pressure. |
| Boiler overheats and system remains cold. | • Insufficient circulation. | • Check pump, clean and replace if necessary. |
| | • Air trapped in piping. | • Purge system. |
| | • Improper system wiring. | • Test and correct. |
| Boiler and heating system overheat. | • Faulty thermostat or controller. | • Check, adjust, and replace if necessary. |
| | • Faulty aquastat and/or safety high limit aquastat. | • Check, adjust, and replace if necessary. |
| | • Faulty wiring. | • Check wiring for short circuits and repair. |

| NOTES | Section 10 |
|---|---|

# INDEX Section 10

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