

Green Mountain

BOILERS

GMGS

Cast Iron
Steam
Gas Fired
Boilers

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Models

GMGS075 GMGS225
GMGS112 GMGS262
GMGS150 GMGS299
GMGS187



Manufactured by:
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KEEP THIS MANUAL NEAR BOILER
RETAIN FOR FUTURE REFERENCE

GMGS
GAS FIRED BOILERS
STEAM BOILERS

SAFETY SYMBOLS

Following defined symbols are used throughout this manual to notify reader of potential hazards of varying risk levels.

DANGER

Indicates a hazardous situation which, if not avoided, **WILL** result in death or serious injury

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Used to address practices not related to personal injury.

READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE INSTALLING.

Boiler installation shall be completed by qualified agency.

WARNING

Fire, explosion, asphyxiation and electrical shock hazard. Improper installation could result in death or serious injury. Read this manual and understand all requirements before beginning installation.

WARNING

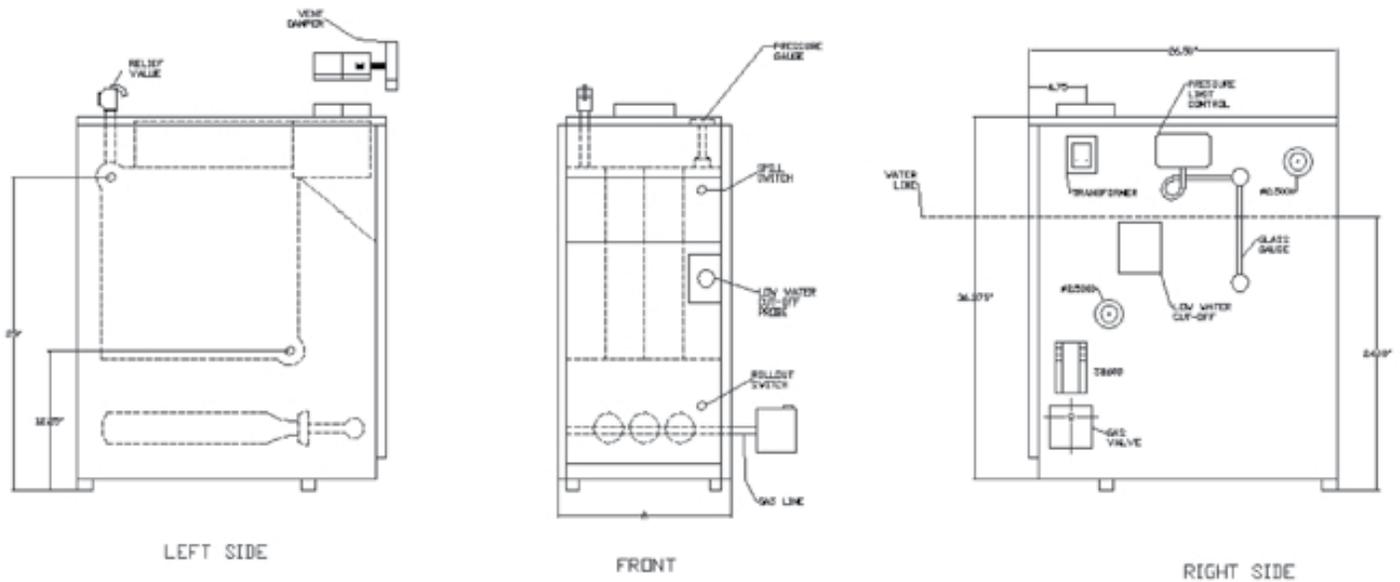
Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

Do not obstruct air openings to boiler room.

Modification, substitution or elimination of factory equipped, supplied or specified components may result in, personal injury or loss of life.

BOILER RATINGS AND CAPACITIES

Figure 1 - Dimensions



BOILER MODEL NUMBER ⁽¹⁾		No. of Sections		†Natural Gas				†Propane Gas				Dimensions (Inches)	
				Input *MBH	Heating Capacity *MBH	Net I=B=R Rating *MBH	Net I=B=R Rating Sq. Ft.	Input *MBH	Heating Capacity *MBH	Net I=B=R Rating *MBH	Net I=B=R Rating Sq. Ft. Radiation	Flue Diameter	"A" Width
GMGS075		3	75	62	47	196	70	58	44	183	5	11¼	
GMGS112		4	112	91	68	283	105	85	64	267	6	14½	
GMGS150		5	150	122	92	383	140	114	86	358	6	17¾	
GMGS187		6	187	153	115	479	175	143	107	446	7	21	
GMGS225		7	225	183	137	571	210	171	128	533	7	24¼	
GMGS262		8	262	214	161	671	245	200	150	625	7	27½	
GMGS299		9	299	245	184	767	280	229	172	717	7	30¾	

* MBH = 1,000 Btuh. Btuh = British Thermal Unit Per Hour.
 ** Add 5½" to height for Vent Damper
 † For altitudes above 2,000 ft. reduce input rate 4% for each 1,000 ft. above sea level.
 Heating Capacity is based on DOE (Department of Energy) test procedure.
⁽¹⁾ Add suffix E for electronic ignition and V for standing pilot.

Net I=B=R steam Ratings shown are based on piping and pickup allowance of 1.333.

Specifications and dimensions are subject to change without notice.

Base selection of boiler size on "Net I=B=R Rating" being equal to or greater than installed radiation in square feet. Consult manufacturer before selecting boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, exhaust piping systems, etc.

BEFORE YOU START

- Verify you have right size boiler before starting installation. See rating and capacity table on previous page.
- Verify boiler is for type of gas you are using. Check rating plate on right side of boiler.
- Verify boiler is supplied with correct type of gas, fresh air for combustion, and suitable electrical supply.
- Verify boiler is connected to suitable venting system and adequate piping system.
- Thermostat is needed for control of heating system and properly located.
- Check with local authorities and obtain professional help where needed. Take time to complete all steps for SAFE and PROPER operation of heating system.
- If this boiler is installed in building under construction, special care must be taken to insure clean combustion air supply during construction process. Airborne particulates such as from drywall dust and from fiberglass insulation can clog burner ports and cause incomplete combustion and sooting.
- Boilers are designed for use in closed heating systems where all steam is returned to boiler as condensate and amount of make-up water required is minimal.
- Boilers are not designed for or intended for use in open systems of process applications using 100% make-up water. Damage to boiler resulting from such use shall not be covered under warranty.
- Where required by authority having jurisdiction, installation must conform to the Standard for *Controls and Safety Devices for Automatically fired Boilers*, ANSI/ASME CSD-1.
- Installation must conform to requirements of the authority having jurisdiction or, in absence of such requirements, to National Fuel Gas Code, ANSI Z223.1/NFPA 54.
- Following steps are all necessary for proper installation and safe operation of your boiler.
 - A. Locating boiler
 - B. Fresh air for combustion
 - C. Installation - system piping
 - D. Chimney & vent pipe connection
 - E. Gas supply piping
 - F. Electrical wiring
 - G. Checking & adjusting

LOCATING THE BOILER

1. Select level location as centralized with piping system, and as near chimney as possible.
2. Place crated boiler at selected location, remove crate by pulling crate sides from top and bottom boards.
7. Advise owner to keep air passages free of obstructions. Ventilating and combustion air must enter boiler room without restrictions.
8. Install boiler such that automatic gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (condensate trap, control replacement, etc.).

WARNING

Fire hazard. For installation on non-combustible floors only (for installation on combustible flooring special base must be used). Do not install boiler on carpeting.

3. **FOR INSTALLATION ON NON-COMBUSTIBLE FLOORS ONLY** - For installation on combustible flooring special base must be used. (See Replacement Parts Section.) **Boiler can not be installed on carpeting.**
4. Boiler is to be level. Metal shims may be used under base legs for final leveling.
5. Install equipment in location in which facilities for ventilation permit satisfactory combustion of gas, proper venting, and maintenance of ambient temperature at safe limits under normal conditions of use.
6. Equipment shall be located so as not to interfere with proper circulation of air. When normal infiltration does not provide necessary air, outside air shall be introduced (See Page 6 - "Fresh Air for Combustion").

Table - 2 Minimum Clearance Dimensions	
Top	6"
Rear	6"
Control Side	7"
Opposite Side	6"
Front	Alcove
Flue/Vent Connector	6"
Near Boiler Piping	1"

Set boiler on concrete or other non-combustible material base or floor.

FRESH AIR FOR COMBUSTION

⚠ WARNING

Fire, and asphyxiation hazard. Carbon monoxide is odorless, tasteless, clear colorless gas, which is highly toxic. Air openings to combustion area must not be obstructed. Follow all instructions to maintain adequate combustion air. Failure to do so could result in death or serious injury.

Provide combustion air and ventilation air in accordance with the section "Air for Combustion and Ventilation," of the National Fuel Gas Code, ANSI Z223.1 / NFPA 54, or applicable provisions of local building codes.

Provide make-up air where exhaust fans, clothes dryers, and kitchen ventilation equipment interfere with proper operation.

National Fuel Gas Code recognizes several methods of obtaining adequate ventilation and combustion air. Requirements of the authority having jurisdiction may override these methods.

- Engineered Installations. Must be approved by authority having jurisdiction.
- Mechanical Air Supply. Provide minimum of 0.35 cfm per Mbh for all appliances located within space. Additional requirements where exhaust fans installed. Interlock each appliance to mechanical air supply system to prevent main burner operation when mechanical air supply system not operating.
- All Indoor Air. Calculate minimum volume for all appliances in space. Use a different method if minimum volume not available.
 - A. Standard Method. Cannot be used if known air infiltration rate is 0.40 air changes per hour. See Table 1 for space with natural gas boiler only. Use equation for multiple appliances and/or propane.

$$\text{Volume} \geq 50 \text{ ft}^3 \times \text{Total Input [Mbh]}$$

- B. Known Air Infiltration Rate. See Table 1 for space with boiler only. Use equation for multiple appliances. Do not use an air infiltration rate (ACH) greater than 0.60.

$$\text{Volume} \geq 21 \text{ ft}^3/\text{ACH} \times \text{Total Input [Mbh]}$$
- C. Refer to National Fuel Gas Code for opening requirements between connected indoor spaces.
- All Outdoor Air. Provide permanent opening(s) communicating directly or by ducts with outdoors.
 - A. Two Permanent Opening Method. Provide opening commencing within 12 inches of top and second opening commencing within 12 inches of bottom of enclosure.
 - Direct communication with outdoors or communicating through vertical ducts. Provide minimum free area of 1 in² per 4 Mbh of total input rating of all appliances in enclosure.
 - Communicating through horizontal ducts. Provide minimum free area of 1 in² per 2 Mbh of total input rating of all appliances in enclosure.
 - B. One Permanent Opening Method. Provide opening commencing within 12 inches of top of enclosure. Provide minimum clearance of 1 inch on sides/back and 6 inches on front of boiler (does not supersede clearance to combustible materials).
 - C. Refer to National Fuel Gas Code for additional requirements for louvers, grilles, screens and air ducts.
- Combination Indoor and Outdoor Air. Refer to National Fuel Gas Code for application information.

Table 3 - Minimum Room Volume, Indoor Air Only*

Input Mbh	Standard Method	Known Air Infiltration Rate Method (Air Changes Per Hour)					
		0.1	0.2	0.3	0.4	0.5	0.6
75	3750	15750	7875	5250	3938	3150	2625
112.5	5625	23625	11813	7875	5906	4725	3938
150	7500	31500	15750	10500	7875	6300	5250
187	9350	39270	19635	13090	9818	7854	6545
255	11250	47250	23625	15750	11813	9450	7875
262.5	13125	55125	27563	18375	13781	11025	9188
299	14950	62790	31395	20930	15698	12558	10465

* Table values based on boiler only. Add volume for any additional appliances.

⚠ WARNING

Burn and scald hazard. Safety relief valve could discharge steam or hot water during operation. Install discharge piping per these instructions.

To avoid burns, scalding, or water damage due to discharge of steam and/or hot water during operation, a discharge line shall be installed to relief valve outlet connection.

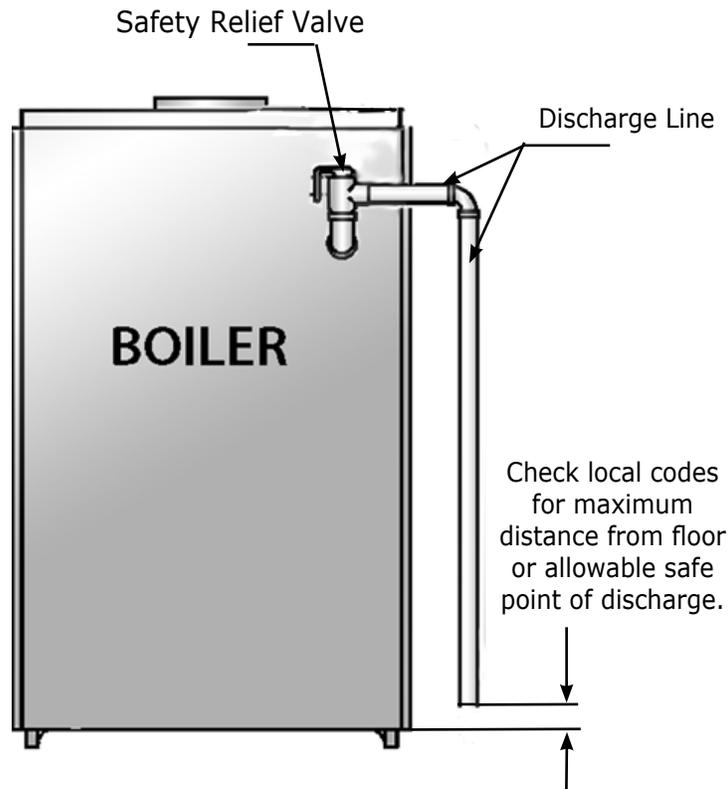
Discharge line shall:

- connect to relief valve outlet and piped down to safe point of disposal. Check local codes for maximum distance from floor or allowable safe point of discharge.
- be of pipe size equal to or greater than that of the relief valve outlet over the entire length of discharge line;
- have no intervening shutoff valve between safety relief valve and discharge to atmosphere (do not plug or place any obstruction in discharge line).
- terminate freely to atmosphere where any discharge will be clearly visible and at no risk of freezing;

- allow complete drainage of the valve and the discharge line;
- be independently supported and securely anchored to avoid applied stress on the relief valve;
- be as short and straight as possible;
- terminate with plain end (not threaded);
- be constructed of material suitable for exposure to temperatures of 375° F; or greater.

Refer to local codes and appropriate ASME Boiler and Pressure Vessel Code for additional installation requirements.

Figure 2



⚠ WARNING

Burn and scald hazard. Safety relief valve could discharge steam or hot water during operation. Install discharge piping per these instructions.

Consider near boiler piping as part of boiler for proper water level control, and to produce dry steam. Correct near boiler piping is crucial to proper operation of boiler and heating system. Follow these recommendations carefully.

1. Place boiler in selected location, as near chimney as possible.
2. Boiler is equipped with two 2-1/2" supply connections and two 2-1/2" return connections, one each on both left and right sides of the boiler. Unused connections must be plugged with the 2-1/2" plugs (furnished).
3. Recommended near boiler piping for gravity return systems is shown in Figure 3. This configuration uses one supply and one return tapping. This setup can be used on any size boiler in this series. The supply and return connections may be piped both into the same side (either left or right) or one into each side of the boiler.
4. For installers choosing to use both supply tapplings, Figure 4A shows the **correct** way to pipe this system. Figure 4B shows the **wrong** way to pipe a header with two risers.
 - Headers must be fitted with header offsets or swing joints, or be equipped with expansion joints, so that thermal expansion and contraction of the header will not damage the boiler. Headers shall not be welded.
 - System takeoffs from header must be between equalizer and riser to header nearest equalizer. System takeoffs must never be between two risers.
5. System takeoffs from header must never be bullheaded. If steam main goes in two directions, there must be two takeoffs from header, one for each main.
6. All boilers in gravity return systems **must** be equipped with Hartford Loop as shown in Figures 3 and 4A.
7. When piping the vertical risers from boiler to header, bottom of header must be minimum of 24 inches above water level line on right side of boiler.
8. Steam riser(s) and header shall be 2-1/2" pipe size.
9. Equalizer line shall be minimum 1-1/2" pipe size.
10. Near boiler piping shall include 2-1/2" tee with plug located on supply line as shown for skimming (i.e. surface blowdown).
11. Near boiler piping shall include 1-1/2 ball valve in return piping as shown for bottom blowdown and draining.
12. For gravity return systems, bottom of lowest steam carrying pipe, be it dry return, or end of steam main, must be at least 28" above normal water level line on right side of boiler. This is known as "Dimension A."

13. For pumped return systems, follow condensate pump or boiler feed pump manufacturer's instructions for proper installation and hookup.
14. When connecting cold water supply to water inlet valve, verify clean water supply is available. Install sand strainer at pump when water supply is from well or pump.

FOR USE WITH COOLING UNITS

- A. Install boiler, when used in connection with refrigeration system, so chilled medium is piped in parallel with boiler with appropriate valves to prevent chilled medium from entering boiler. See Figure 5.

Figure 3 - Recommended Near Boiler Piping Using One Supply Tapping

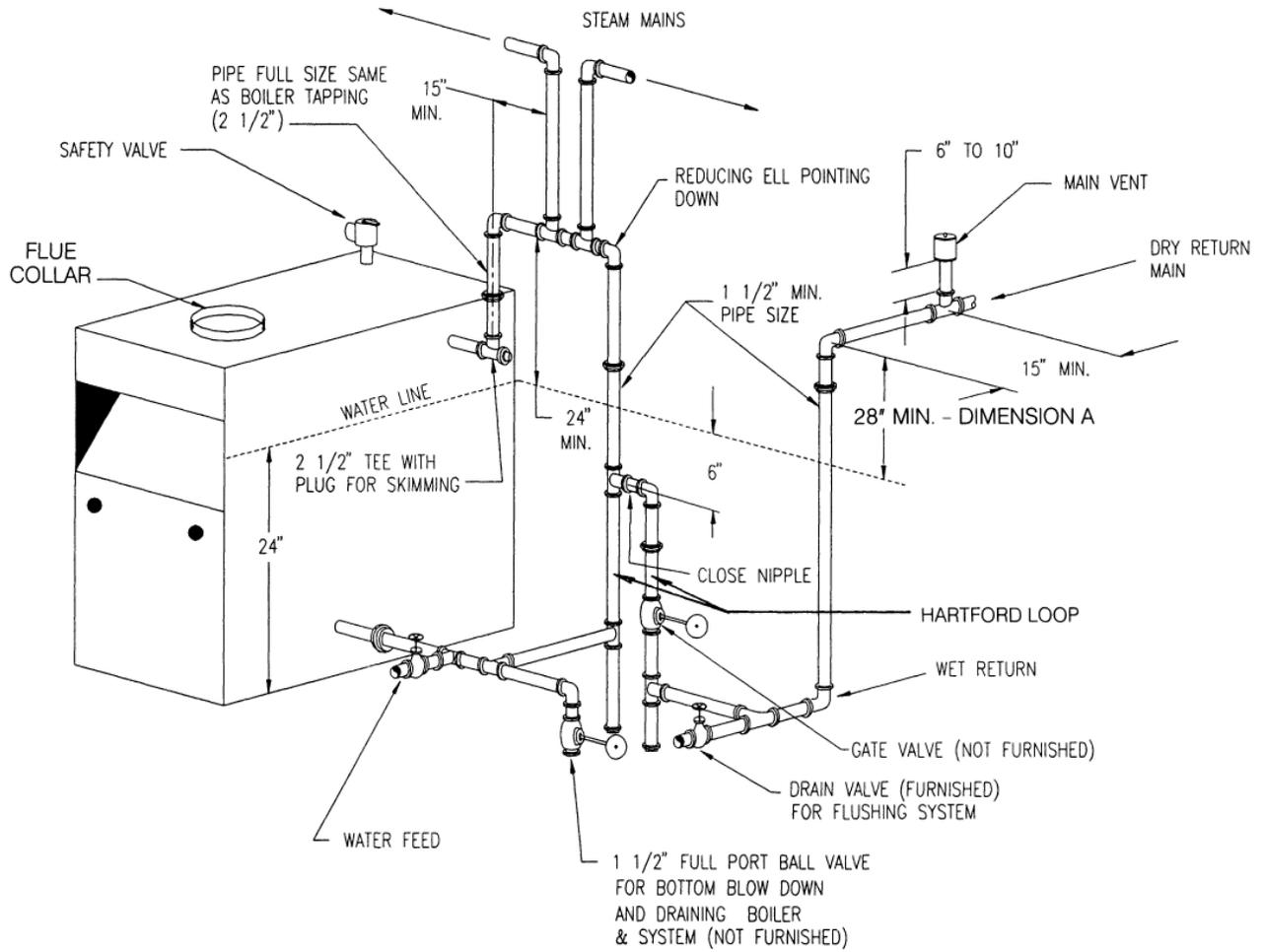


Figure 4A - Recommended Near Boiler Piping Using One Supply Tapping

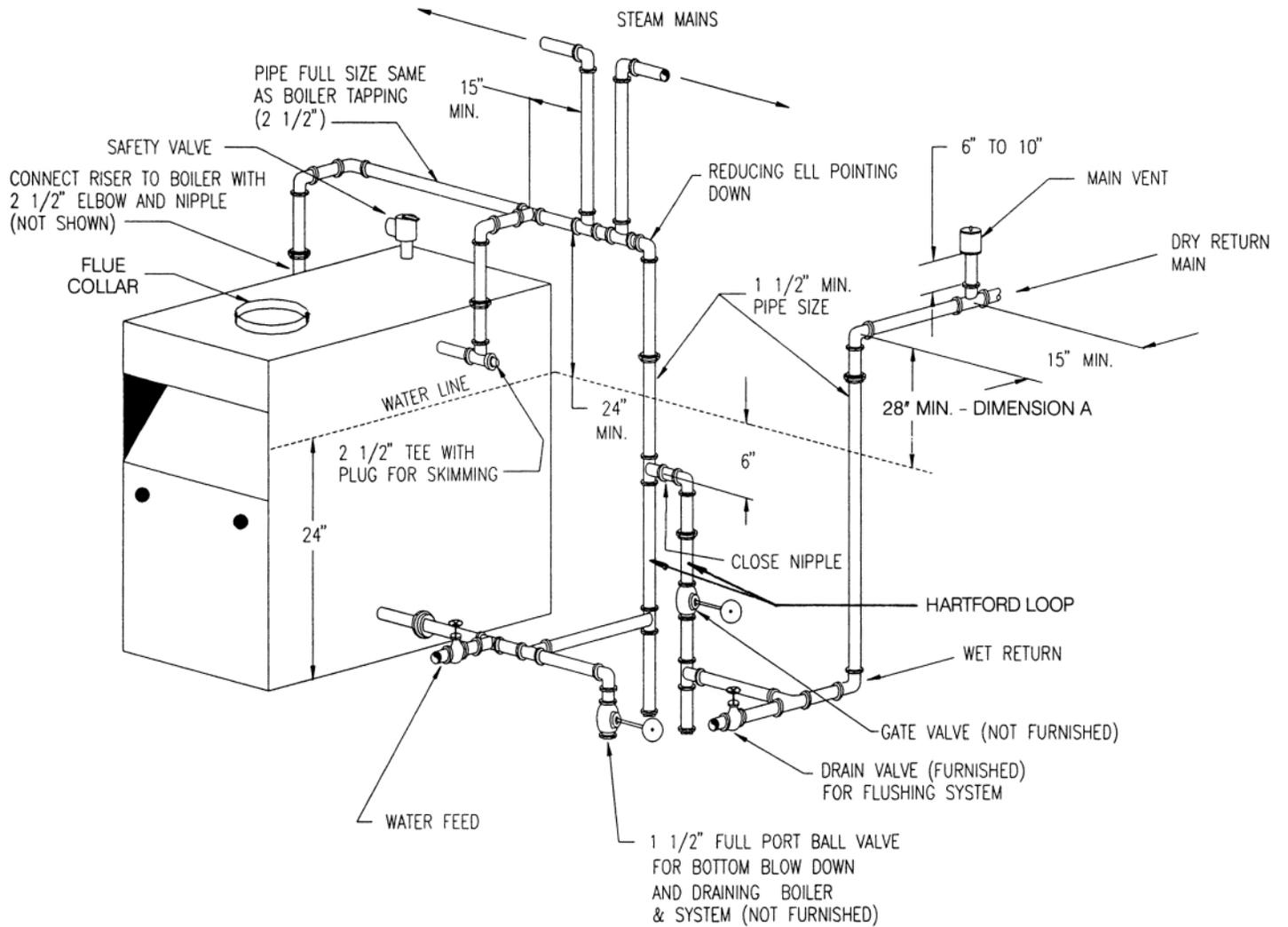


Figure 4B - Common Near Boiler Piping Mistakes

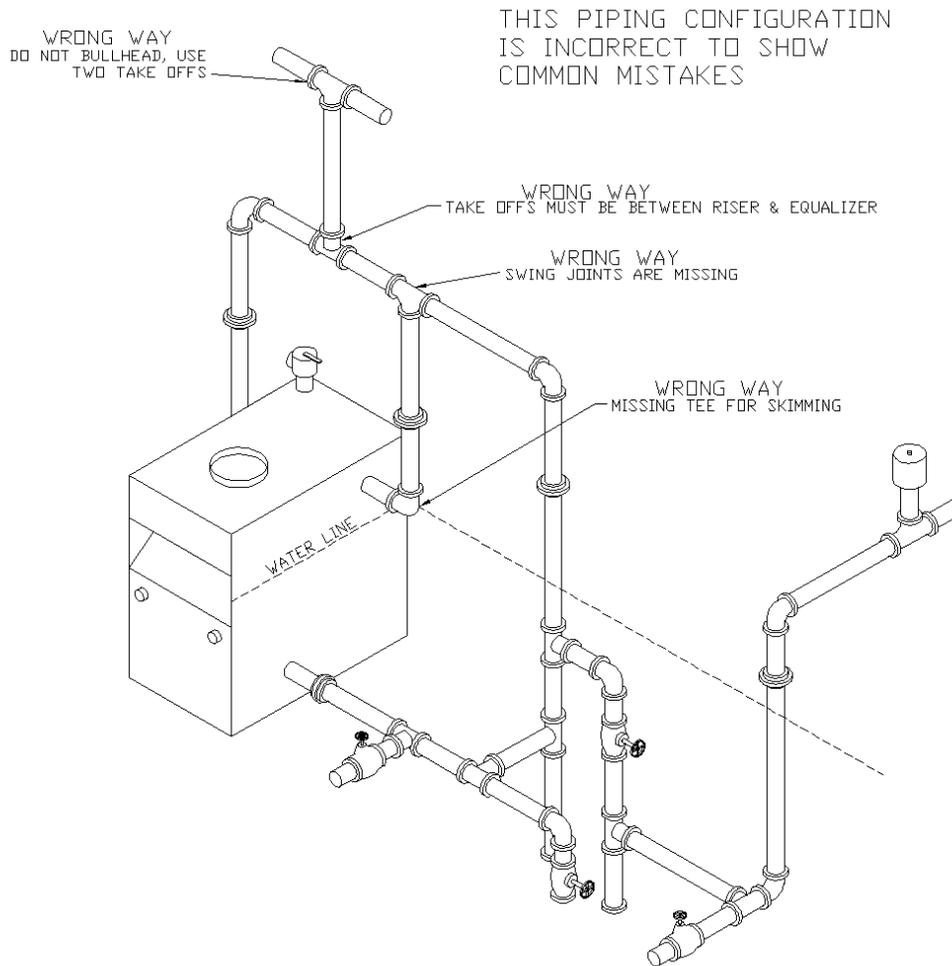
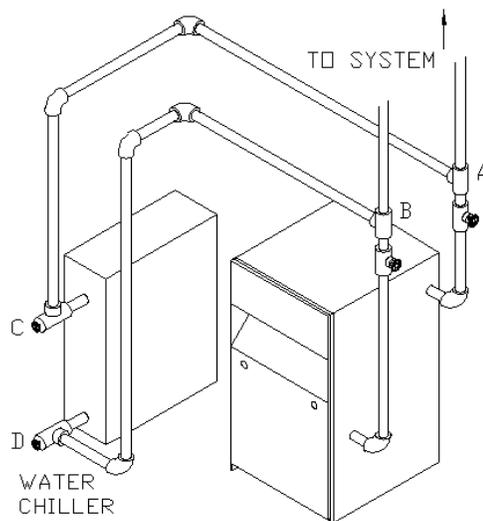


Figure 5 - Chilled Water Piping



VALVES A & B OPEN FOR HEATING; CLOSE FOR COOLING

VALVES C & D CLOSE FOR HEATING; OPEN FOR COOLING

CHIMNEY AND VENT PIPE CONNECTION

For boilers for connection to gas vents or chimneys, vent installations shall be in accordance with "Venting of Equipment", of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or applicable provisions of the local building codes.

CHECK YOUR CHIMNEY

This is a very important part of your heating system. It must be clean, right size, properly constructed and in GOOD CONDITION.

Inspect chimney and verify that construction and size of chimney meets all applicable provisions of the National Fuel Gas Code and local building codes.

Figure 4 gives you an idea how boiler might be vented to chimney. Note the height (HT) is measured from vent pipe to top.

CONNECTING VENT DAMPER AND VENT CONNECTOR

Refer to Fig. 1 and Table 1 for size and location of vent (flue opening). Use 28 gauge (minimum) galvanized pipe to connect to chimney.

NOTICE

Damper blade on furnished vent damper has 1/2 square inch hole (approximately 3/4" diameter). Boilers equipped with standing pilot, hole must be left open.

Boilers equipped with intermittent ignition, hole should be plugged by using plug supplied with vent damper.

1. Position furnished vent damper on top of flue outlet collar. Fasten damper securely to flue outlet collar with sheet metal screws. Make sure damper blade has clearance to operate inside of diverter. Do not modify draft diverter or vent damper

Option:

Damper may be installed in any horizontal or vertical position, closer to flue outlet collar preferred. Follow diagrams - Figures 7, 8 and 9.

2. Install vent damper to service only single boiler for which it is intended. Damper position indicator shall be in visible location following installation. Locate damper accessible for servicing.
3. Damper must be in open position when appliance main burners are operating.
4. Boiler is equipped with factory wired harness that plugs into vent damper. Thermostat must be connected to black wires marked 24 volt thermostat on boiler.
5. Vent pipe must be same size as flue outlet collar.
6. Slope pipe up from boiler to chimney not less than 1/4" per foot.
7. Run pipe as directly as possible with as few elbows as possible.

8. Do not connect to fireplace flue.
9. End of vent pipe must be flush with inside face of chimney flue. Use sealed-in thimble for chimney connection.
10. Horizontal run should not be longer than 3/4 chimney height (HT) (Fig. 6).
11. Fasten sections of vent pipe with sheet metal screws to make piping rigid.
12. Support horizontal portions of vent system must be supported to prevent sagging. Use stovepipe wires every 5' to support pipe from above.
13. If vent pipe must go through crawl space, double wall vent pipe should be used.
14. Where vent pipe passes through combustible wall or partition, use ventilated metal thimble. Thimble should be 4 inches larger in diameter than vent pipe.

MINIMUM VENT PIPE CLEARANCE

Wood and other combustible materials must not be closer than 6" from any surface of single wall metal vent pipe. Listed Type B vent pipe or other listed venting systems shall be installed in accordance with their listing.

REMOVING EXISTING BOILER FROM COMMON VENTING SYSTEM

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 remaining 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.

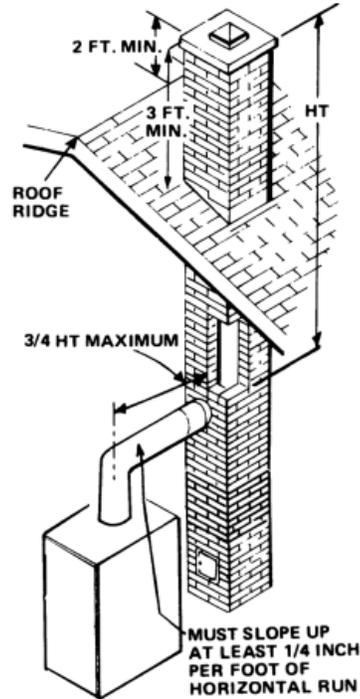
1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all 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.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

CHIMNEY AND VENT PIPE CONNECTION

5. 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.
6. 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.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54. When resizing 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 Chapter 13 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54.

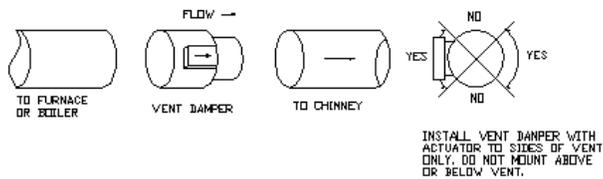
Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

Figure 6 - Typical Masonry Chimney Requirements



VENT DAMPER OPERATION

Figure 7 - Horizontal Installation



VERTICAL INSTALLATION

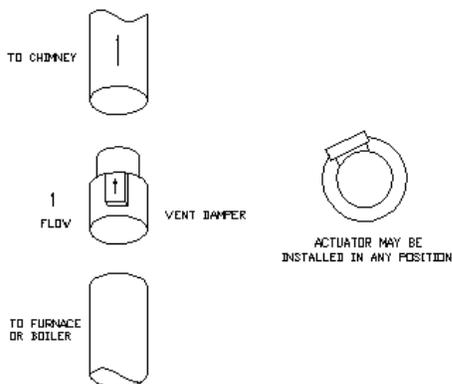
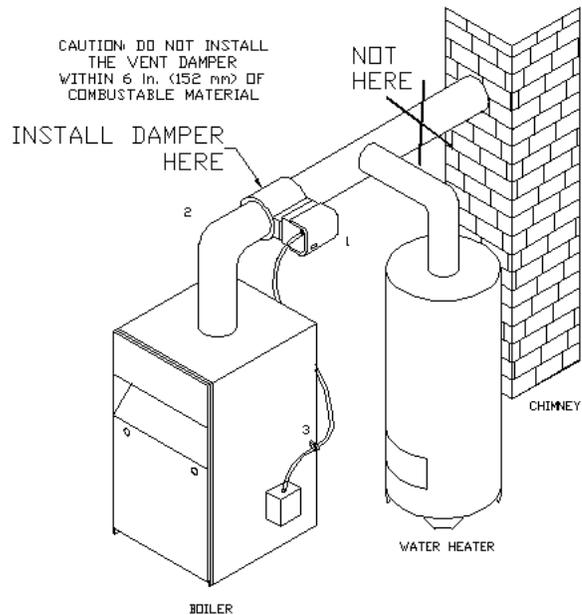


Figure 8 - Alternate Vent Damper Installation



TYPICAL INSTALLATION FOR VENT DAMPER

⚠ WARNING

Fire, and asphyxiation hazard. Carbon monoxide is odorless, tasteless, clear colorless gas, which is highly toxic. Install vent damper to service single appliance for which it is intended only. Failure to do so could result in death or serious injury.

1. Do not install vent damper on vent pipe curve.
2. Do not run wires near high temperature surfaces. Use stand-off brackets if necessary.

VENT DAMPER OPERATION

Check annually, vent damper and all flue product carrying areas of appliance with particular attention given to deterioration from corrosion or other sources. If you see corrosion or other deterioration, contact your heating contractor for repairs. Check vent damper operation as follows:

1. When boiler is off, verify vent damper positions indicator points to closed position, Fig. 9.
2. Turn thermostat or controller up to call for heat and check vent damper indicator points to open position, Fig. 8.
3. Turn thermostat or controller down again and check damper position indicator returns to closed position.
4. If you have central air conditioning, set thermostat to COOL and turn it down to call for cooling. Cooling system should operate.
5. Return thermostat to desired position.

Inspect vent damper at least once a year by trained, experienced service technician.

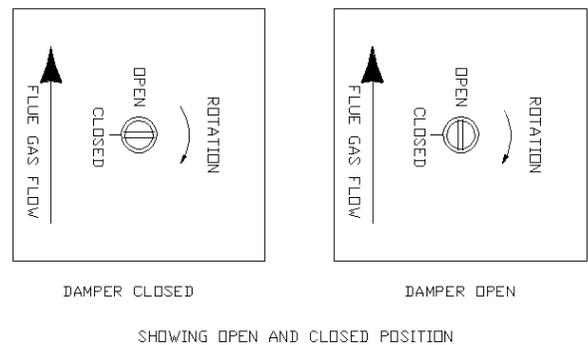
MANUAL OPERATION OF VENT DAMPER

Place vent damper in open position to permit burner operation by using "HOLD DAMPER OPEN" switch, located on damper controller. Thermostat will control burner firing as before, while damper remains open.

DO NOT turn damper open manually or motor damage will result. Set switch to "AUTOMATIC OPERATION" to close vent damper during burner off cycle.

For further information, and for vent damper troubleshooting guide, refer to manual packaged with vent damper.

Figure 9 - Vent Damper Position Indicator



GAS SUPPLY PIPING

CAUTION

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.

DANGER

Fire Hazard. Do not use matches, candles, open flames, or other methods providing ignition source. Failure to comply will result in death or serious injury.

General

- Use piping materials and joining methods acceptable to authority having jurisdiction. In absence of such requirements, National Fuel gas Code, ANSI Z223.1/ NFPA 54.
- Install field sourced manual main shutoff valve and ground joint union.
- Size and install gas piping system to provide sufficient gas supply to meet maximum input at not less than minimum supply pressure. See Tables 4a & 4b.

NOTICE

Use two (2) wrenches when installing pipe to gas valve. Boiler's gas valve can be damaged if subjected to excessive torque.

- Support piping with hooks straps, bands, brackets, hangers, or building structure components to prevent or dampen excessive vibrations and prevent strain on gas connection.
- Use thread (joint) compound (pipe dope) suitable for liquefied petroleum gas.
- Provide sediment trap up stream of gas valve.

Propane Installation

- Connections by licensed propane dealer only.
- Use two stage regulator provided by propane supplier.
- Propane supplier should check piping.

Leak Check Gas Piping

Pressure test boiler and gas connection before placing boiler in operation.

- Pressure test over 1/2 psig (3.5 kPa). Disconnect boiler and its individual gas shutoff valve from gas supply system.
- Pressure test at 1/2 psig (3.5 kPa) or less. Isolate boiler from gas supply system by closing manual gas shutoff valve.
- Locate leakage using gas detector, noncorrosive detection fluid, or other leak detection method acceptable to authority having jurisdiction. Do not use matches, candles, open flames, or other methods providing ignition source.
- Correct leaks immediately and retest.

Figure 10 - Gas Piping At Boiler

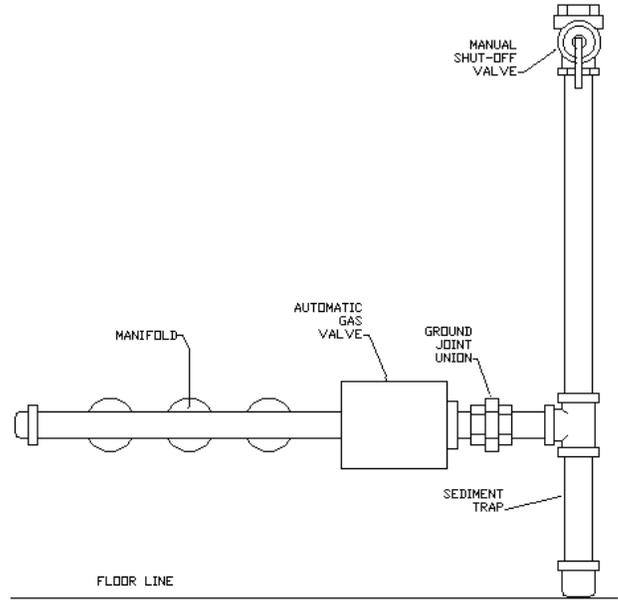


Table - 4a Gas Pipe Sizes - Natural Gas				
Length of Pipe - Ft.	Pipe Capacity - BTU Per Hour Input Includes Fittings			
	1/2"	3/4"	1"	1 -1/4"
20	92,000	190,000	350,000	625,000
40	63,000	130,000	245,000	445,000
60	50,000	105,000	195,000	365,000

Table - 4b Gas Pipe Sizes - Propane Gas				
Length of Pipe - Ft.	Pipe Capacity - BTU Per Hour Input Includes Fittings			
	5/8"	3/4"	1/2"	3/4"
20	131,000	216,000	189,000	393,000
40	90,000	145,000	129,000	267,000
60	72,000	121,000	103,000	217,000

* Outside diameter

Length of pipe or tubing should be measured from gas meter or propane second stage regulator.

WARNING

Turn off electrical power at fuse box before making any line voltage connections. Follow local electrical codes.

ELECTRIC POWER SUPPLY

- All electrical work must conform to local codes, as well as National Electrical Code, ANSI/NFPA-70.
- Run separate 115 volt circuit from separate overcurrent protective device in your electrical service entrance panel, should be 15 ampere circuit.
- Locate shut-off switch at boiler. Turn off during any maintenance.
- Connect 115 volt electrical supply to primary leads on 24 volt transformer. Solder and tape or securely fasten connections with wire nuts.
- Boiler must be electrically grounded in accordance with requirements of authority having jurisdiction or, in absence of such requirements, with the National Electrical Code, ANSI/NFPA No. 70.
- Run 14 gauge or heavier copper wire from boiler to grounded connection in service panel or properly driven and electrically grounded ground rod.

THERMOSTAT INSTALLATION

Thermostat location has important effect on operation of your boiler system. Follow Instructions Included With Your Thermostat.

Locate thermostat about five feet above floor on inside wall. Mount directly on wall or vertically mounted outlet box. It should be sensing average room temperature, so avoid following:

DEAD SPOTS:

- Behind doors
- Corners and alcoves

HOT SPOTS:

- Concealed pipes
- Fireplace
- TV sets
- Radios
- Lamps
- Direct sunlight
- Kitchens

COLD SPOTS:

- Concealed pipes or ducts
- Stairwells - drafts
- Doors - drafts
- Unheated rooms on other side of wall

- Set heat anticipator at 0.4 amps for boilers equipped with standing pilot.
- Connect 24 volt thermostat leads to two wires tagged "24 volt thermostat" on boiler.
- Boilers with 67D-1 float type low water cut-off, two wires are black. One wire is located on secondary of 24 volt transformer, second wire is located on pressure limit control.
- Boilers with PS-802 probe type low water cut-off, one wire is green and is located on terminal B of PS-802, second wire is black and located on pressure limit control.

ELECTRONIC THERMOSTATS

Certain types of electronic thermostats may lose their memory or shut down.

- A. 67D-1 float type low water cutoffs, this may occur each time thermostat calls for heat, due to internal circuit in vent damper.
- B. PS-802 probe type low water cut off's, this may occur each time low water cut off detects low water condition. If this is case, isolation relay is required for thermostat circuit.
- C. 24 volt single pole single throw (SPST) normally open (N.O.) relay is required, such as Honeywell R8222A or equivalent. Wire as shown in Fig. 11A or Fig. 11B.

VENT DAMPER

Boiler is equipped with factory wired harness with 4 pin molex plug, that plugs into 4 pin molex receptacle inside vent damper operator.

Connect vent damper for boiler to operation.

Wiring diagrams follow for various different models.

WARNING

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

Figure 11A - Isolation Relay Wiring For Steam Boilers With Float Type Low Water Cut Off And Using An Electronic Thermostat

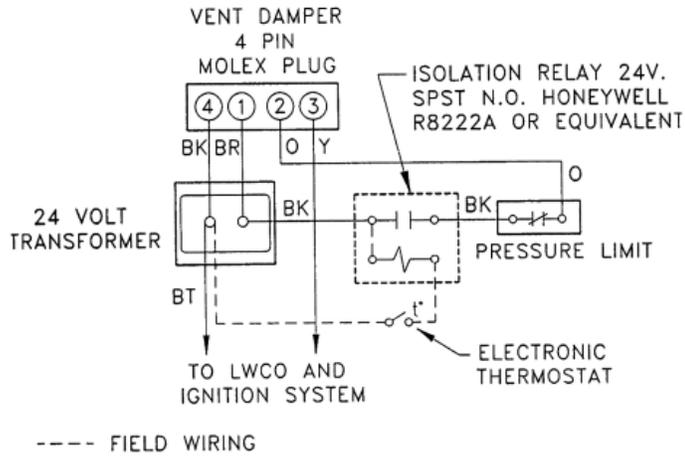
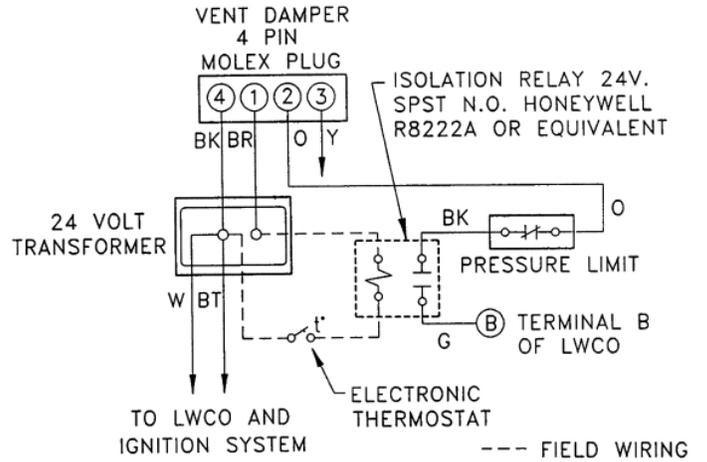


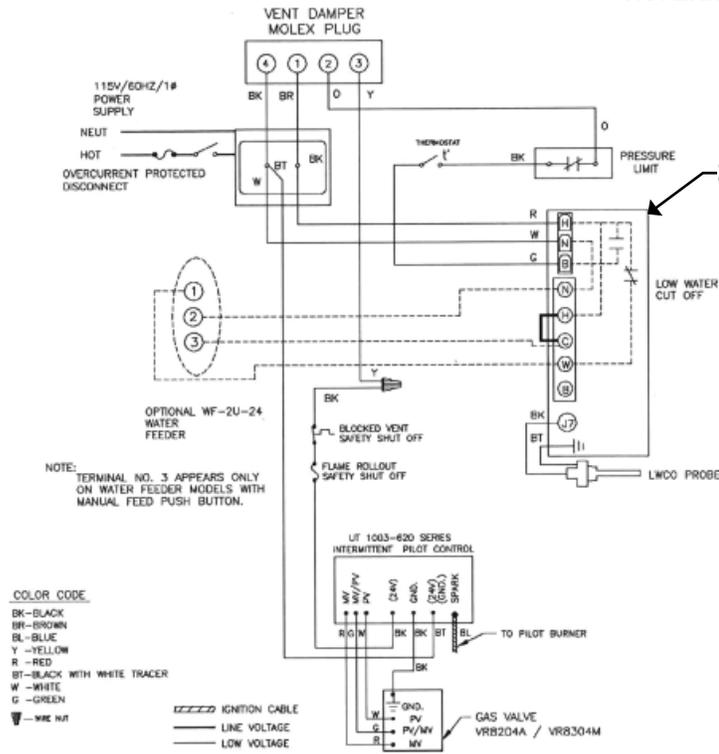
Figure 11B - Isolation Relay Wiring For Steam Boilers With Probe Type Low Water Cut Off And Using An Electronic Thermostat



ELECTRICAL WIRING

Figure 12 - Wiring Diagrams For Boilers With Probe Type Low Water Cut-Off

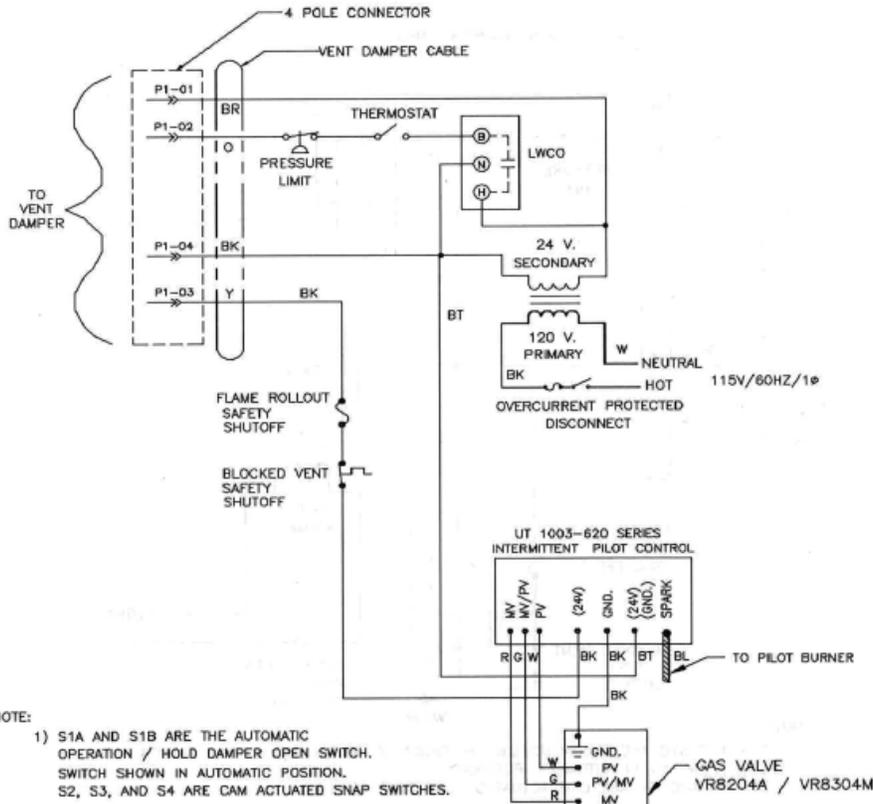
INTERMITTENT IGNITION



Shown PS802

Terminals
 PS802 to CG400
 Cross Reference

PS802	CG400
N	2
H	1
C	P1
E	P2
W	A

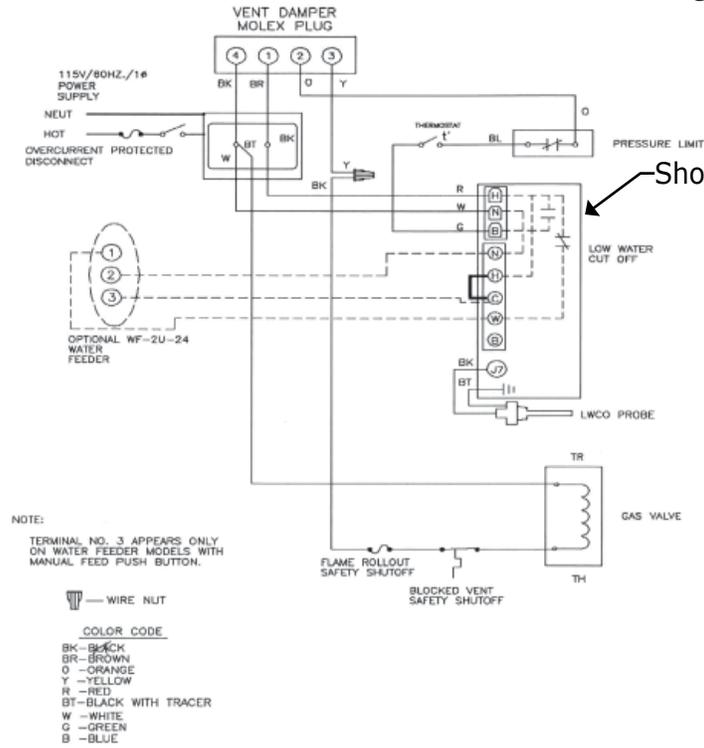


Replace damaged wiring with type 105°C Thermoplastic wire or equivalent.

ELECTRICAL WIRING

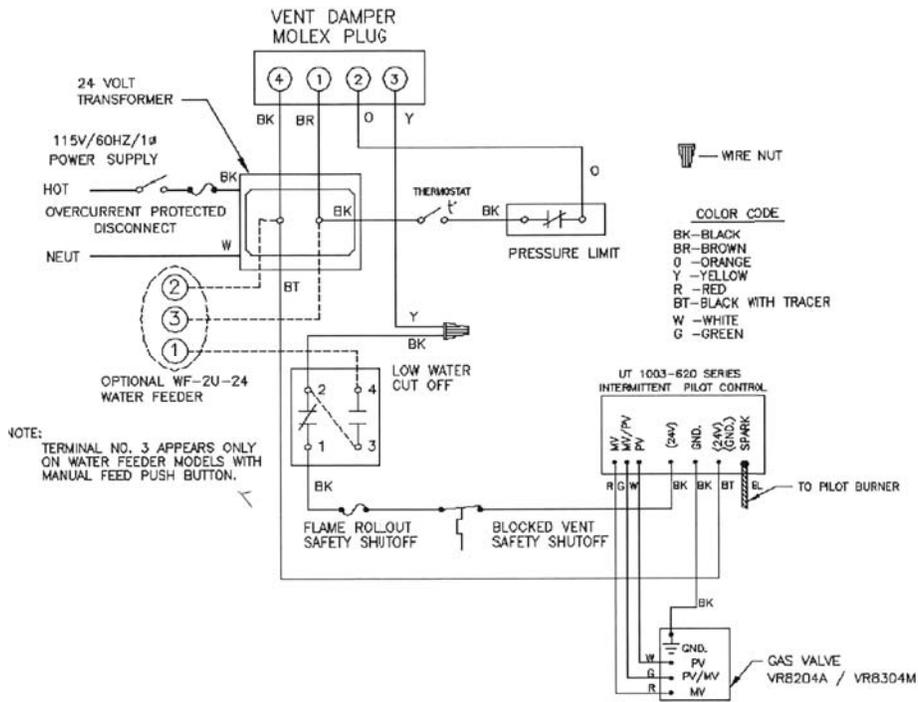
Figure 13 - Wiring Diagrams For Boilers With PS-802 Probe Type Low Water Cut-Off

STANDING PILOT



Terminals
PS802 to CG400
Cross Reference

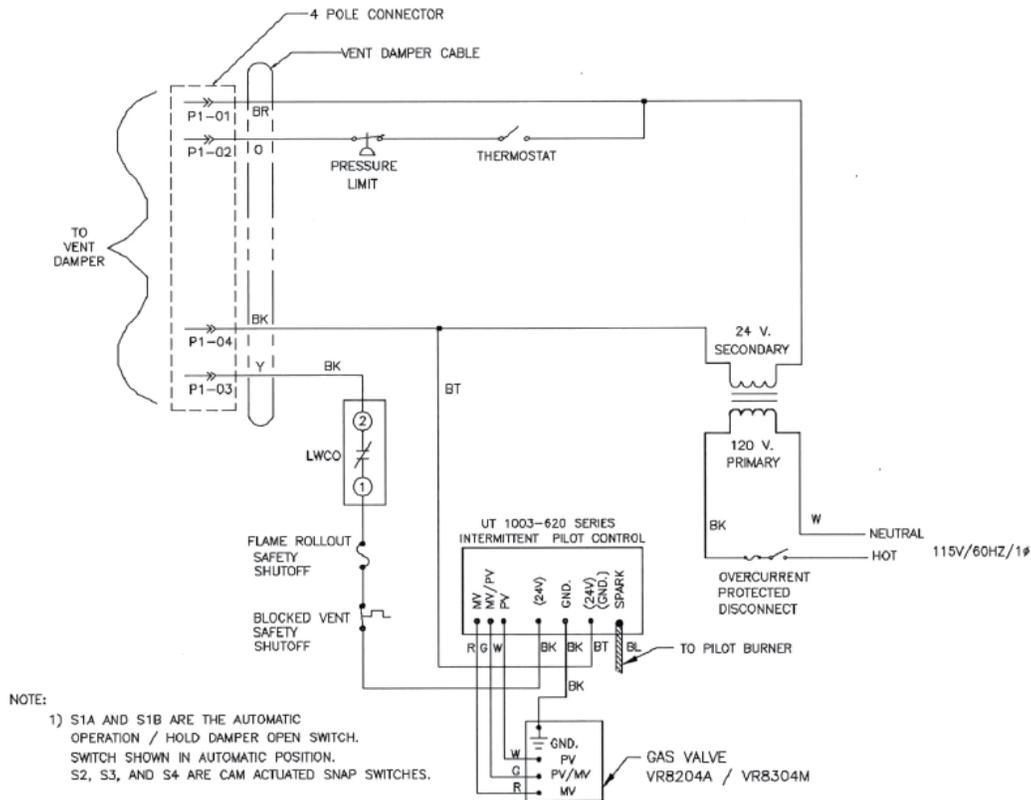
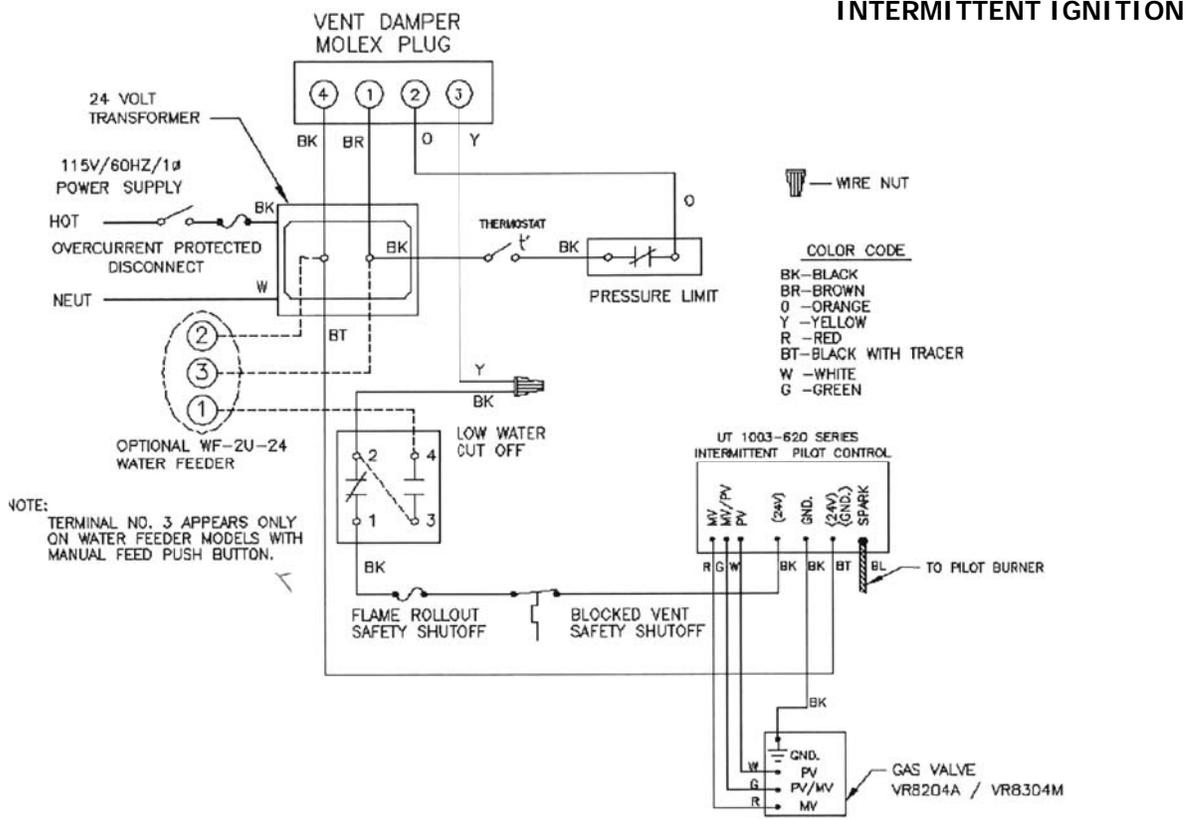
PS802	CG400
N	2
H	1
C	P1
E	P2
W	A



Replace damaged wiring with type 105°C Thermoplastic wire or equivalent.

ELECTRICAL WIRING

Figure 14 - Wiring Diagrams For Boilers With 67D-1 Float Type Low Water Cut-Off

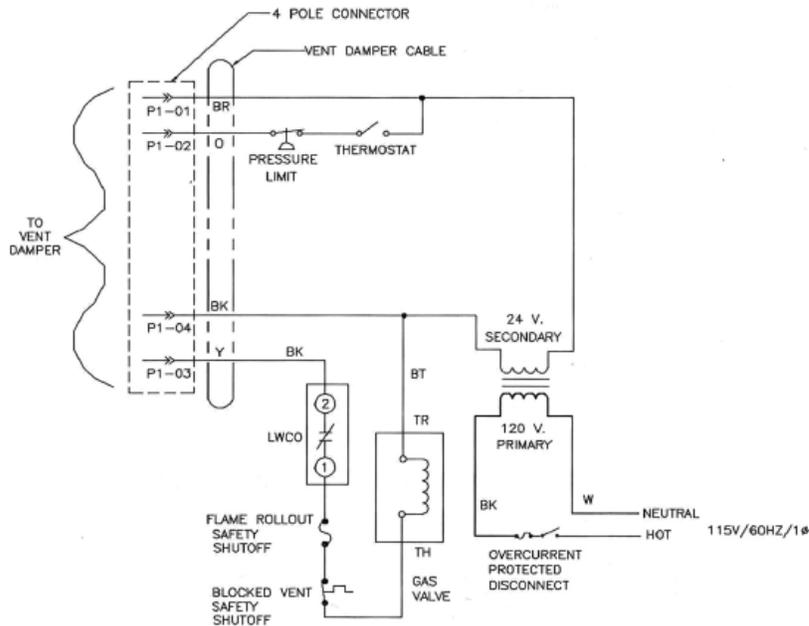
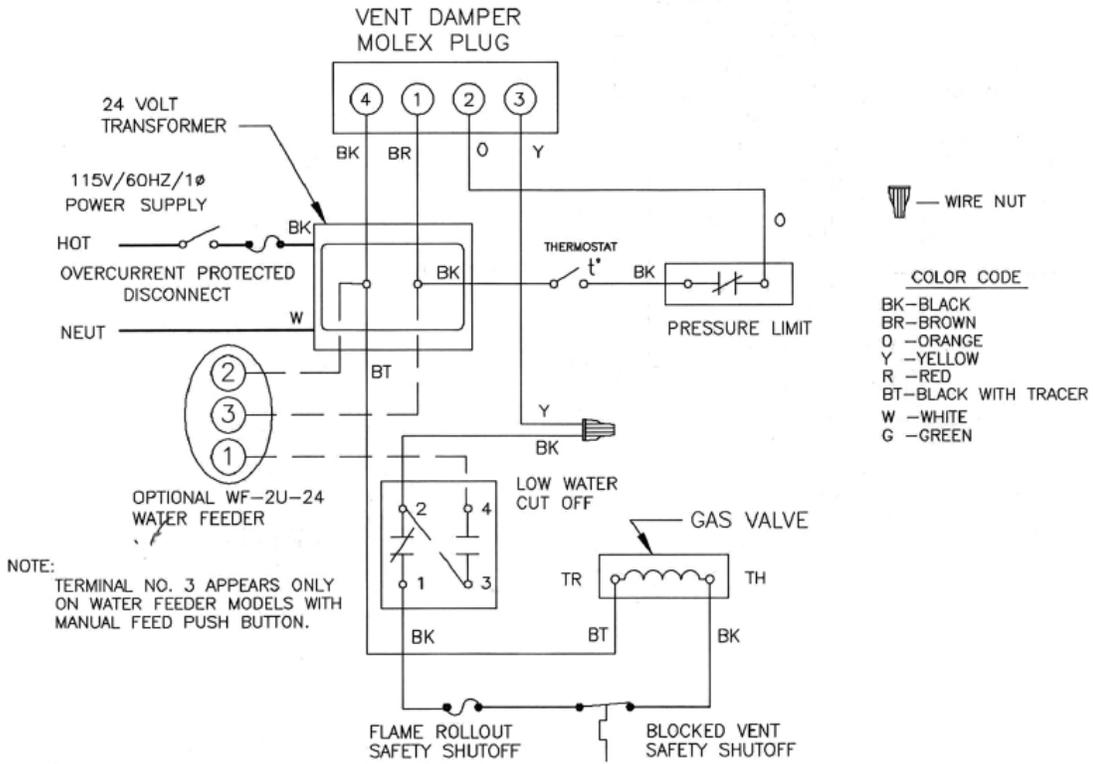


Replace damaged wiring with type 105°C Thermoplastic wire or equivalent.

ELECTRICAL WIRING

Figure 15 - Wiring Diagrams For Boilers With 67D-1 Float Type Low Water Cut-Off

STANDING PILOT



NOTE:
1) S1A AND S1B ARE THE AUTOMATIC OPERATION / HOLD DAMPER OPEN SWITCH. SWITCH SHOWN IN AUTOMATIC POSITION.
S2, S3, AND S4 ARE CAM ACTUATED SNAP SWITCHES.

Replace damaged wiring with type 105°C Thermoplastic wire or equivalent.

SAFETY RELIEF VALVE

Safety relief valve opens automatically if boiler steam pressure exceeds pressure rating of valve (15 psig). Should it fail to open under this condition, shut down your boiler.

If valve discharge occurs, or valve fails to open as described, contact authorized contractor or qualified service technician to replace safety valve and inspect heating system to determine cause, this may indicate equipment malfunction.

STEAM PRESSURE GAUGE

Pressure gauge is installed in every boiler. Gauge enables monitoring of system pressure. If safety devices fail to shut off your boiler at proper settings, notify your authorized contractor or qualified service technician immediately.

WATER LEVEL GAUGE

Boiler water level can be seen through glass tube in water level gauge at side of boiler.

Cold boiler water level is stamped on side jacket panel. Check water level regularly for proper level.

Three holes on right side of jacket panel for glass water level gauge.

- A. Top hole is common for both types of low water cut off, and is used for upper gauge glass fitting.
- B. Middle hole, 9" down from top hole, is used for bottom gauge glass fitting for Model 67D-1 and 47-2 float type low water cut off.
- C. Lowest hole, 12¹/₄" down from top hole, is used for bottom gauge glass fitting for Model PS-802 probe type low water cut off.
- D. Unused is covered with sheet metal knockout.

STEAM PRESSURE CONTROL

Steam pressure limit control (pressuretrol) shuts off gas to main burners when steam pressure in boiler reaches cut-off setpoint (i.e. sum of cut-in and differential setpoints). Burners re-fire when steam pressure drops to cut-in setpoint.

System pressure requirements are based on size and condition of pipes, and load.

LOW WATER CUT-OFF

Model 67D-1 Float operated switch shuts down gas burner if water falls below visible bottom of gauge glass.

Model PS-802

Electronic probe type LWCO. Probe is located inside boiler. LWCO will shut down burners if water loses contact with probe for period of 10 seconds.

Refer to manufacturer's instructions (enclosed) for more information.

WATER FEEDER (Optional)

- Model WF-2U-24 water feeder may be used with either available low water cutoffs. Water feeder maintains safe minimum water level. Keeps boiler running by compensating for minor evaporative steam leaks, and prevent freeze-ups if homeowners are away and return line springs a leak.
- McDonnell and Miller Model 101 water feeders may be used, however water feed rates are too high and need to be regulated or throttled and wiring will have to be revised. Consult boiler manufacturer before using these or any other non-standard types of controls.
- Automatic water feeder is safety device, not convenience item. It is not designed to maintain "normal" water line. Water feeder does not take place of responsible person monitoring and maintaining normal water line. Steam boilers require personal attention.

VENT DAMPER

Automatic, motorized stack damper developed to increase efficiency of heating systems by reducing standby losses from boiler and conditioned air space. Damper closes chimney vent when burner is off and fully opens it when combustion is required.

ROLLOUT SWITCH

(FLAME ROLLOUT SAFETY SHUTOFF)

Rollout switch is temperature-sensitive fuse link device. Located on boiler base just outside fire box. In event of heat exchanger flueway blockage causing flame to roll out of fire box, fuse will blow, shutting down flow of gas to main burners. Fuse does not change in appearance when blown.

If rollout switch blows, replace with exact replacement. Check heat exchanger flueways for blockage when restoring system to operating condition. Do not operate system without rollout switch.

SPILL SWITCH (BLOCKED VENT SAFETY SHUTOFF)

Spill switch is manual reset disc thermostat with fixed setpoint (280° F), and normally closed contacts. Located at relief opening of draft diverter. In event of chimney or venting system blockage causing products of combustion to spill out of relief opening, spill switch disc heats up and spill switch contacts will open, shutting down flow of gas to main burners by removing power to gas valve.

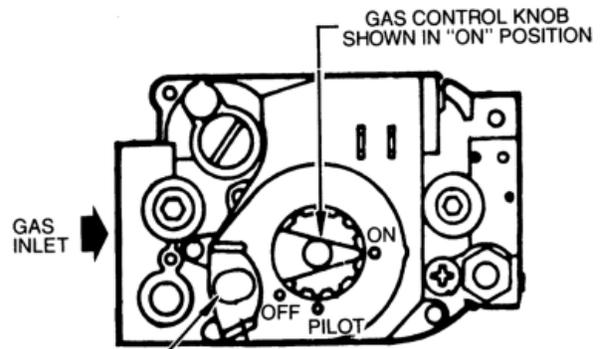
In event spill switch contacts open, reset button on back of switch will pop up. Reset spill switch manually, after switch has cooled off. Pushing reset button down. Check venting system and chimney for blockage when restoring system to operating condition. **DO NOT** operate boiler without spill switch.

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.

- This appliance is equipped with an ignition device which automatically lights burner. **Do NOT try to light this burner by hand.**
- Before operating smell all around appliance area for gas. Be sure to smell next to floor because some gas is heavier than air and will settle to the floor.
- **Use only your hand to turn the gas shutoff valve.** Never use tools. If valve will not turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in fire or explosion.
- **Do not use this appliance if any part has been under water.** Immediately call a qualified service technician to inspect appliance and to replace any part of control system and any gas control which has been under water.



5. Turn gas control knob clockwise  to "OFF."
6. Wait (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "What To Do If You Smell Gas" in safety information to left. If you don't smell gas, go on to the next step.
7. Turn gas control knob counterclockwise  to "ON."
8. Turn on all electric power to the appliance.
9. Set thermostat to desired setting.
10. If appliance will not operate, follow instructions "To Turn Off Gas To Appliance" and call qualified service technician or your gas supplier.

Lighting Procedure For Boiler With Intermittent Pilot System

For Your Safety, Read Before Operating!!

⚠ CAUTION

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.

To Turn Off Gas To The Appliance

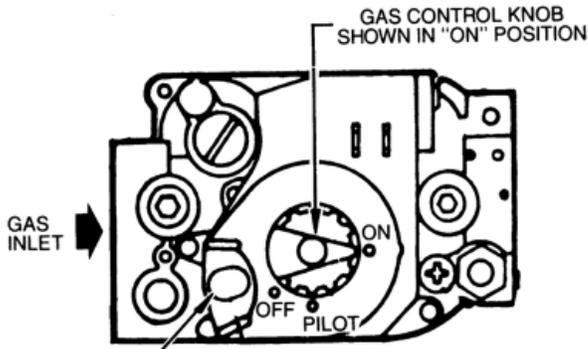
1. Set thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Push in gas control knob slightly and turn clockwise  to "OFF." DO NOT FORCE.

Operating Instructions For Intermittent Pilot System VR8204A/VR8304M Gas Valve

1. STOP! Read safety information above on this page.
2. Set thermostat to lowest setting.
3. Turn off all electric power to appliance.
4. This appliance is equipped with ignition device which automatically lights pilot. Do not try to light pilot by hand.

**Operating Instructions For Continuous Pilot System
VR8200A/VR8300A Gas Valve**

1. STOP! Read the safety information on page 22.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. Remove lower front panel.
5. Rotate gas control knob slightly and turn clockwise  to "OFF"



6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow safety information on page 23. If you don't smell gas, go to next step.
7. Find pilot - follow metal tube from gas control. The pilot is between two burner tubes as shown in Fig. 16.
8. Turn knob on gas control counterclockwise  to "PILOT"
9. Rotate the gas control knob counterclockwise  to "PILOT" Push down and hold the red reset button while you light pilot burner with a match.
After about one minute, release reset button. Pilot should remain lit. If it goes out, turn gas control knob clockwise  to OFF To relight, repeat steps 5-9.
 - If button 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 control knob to "OFF" and call your service technician or gas supplier.
10. After pilot remains lit when red reset button is released, turn gas control knob counterclockwise  to "ON."
11. Replace lower front panel.
12. Turn on all electric power to appliance.
13. Set thermostat to desired setting.

To Turn Off Gas To Appliance

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Push in gas control knob slightly and turn clockwise  to "OFF" **Do not force.**

Figure 16 - Lighting Pilot

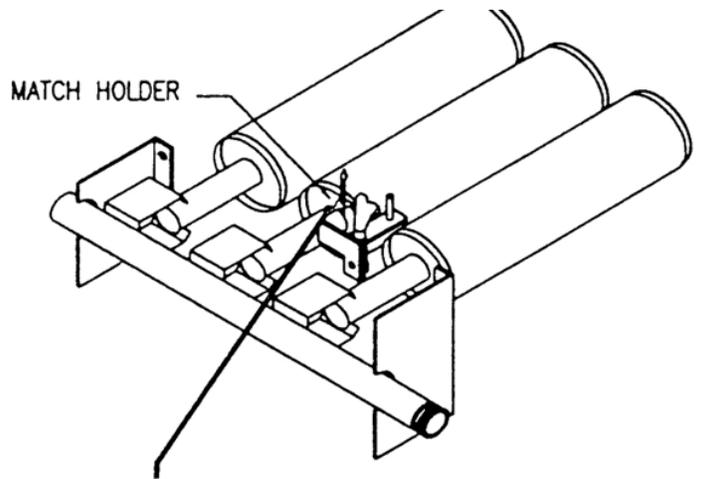


Figure 17 - VR8200A /VR8300A Automatic Gas Valve

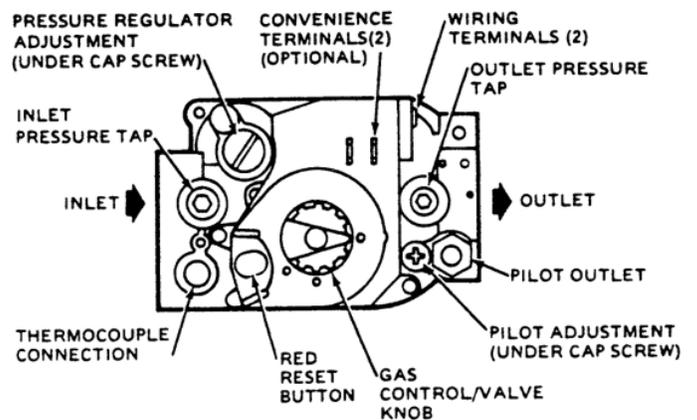
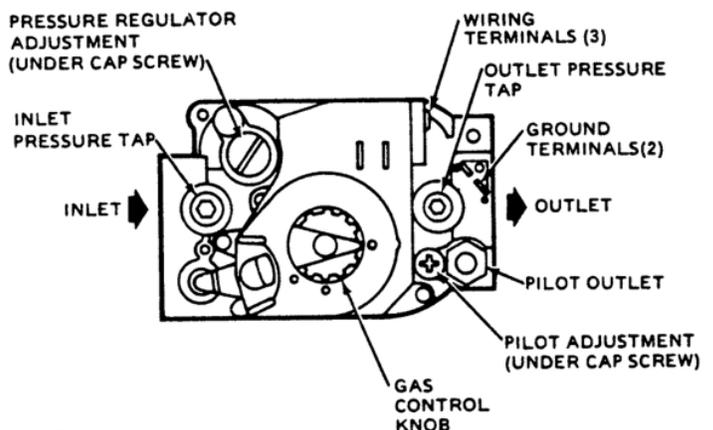


Figure 18 - VR8204A /VR8304A Automatic Gas Valve



How A Steam System Operates

Boiler water is heated until it reaches boiling point. As water boils it turns into steam. Steam rises from top of water through supply main to radiation units. As it passes through radiators it releases its heat and condenses into water. Water returns to boiler through return main. Most residential systems operate at less than 1 pound steam pressure.

Filling System With Water

WARNING

Burn and scald hazard. Do not run water into hot empty boiler. Follow instructions for filling system with water. Failure to follow instructions could result in death or serious injury.

Steam heating systems boiler is partially filled with water. It is important to proper operation of entire system that your boiler be filled to proper level. Correct water level is about halfway up glass water level gauge as marked on boiler jacket. To fill:

1. Close boiler drain valve.
2. Open valves at top and bottom of glass water level gauge. Open drain valve at bottom of gauge.
3. Open fill valve and allow water to run into boiler.
4. Allow boiler to fill until water runs out gauge drain valve. Then close the gauge drain valve.
5. Continue to fill boiler until water reaches indicated water line. About halfway up glass tube.

Water Level

Normal water level is shown on right side of boiler and is 24" above floor. Normal water level is determined when boiler is off and cold, i.e. when all water in system is inside boiler and return piping below water line, and everything above water line is air, no steam. When boiler is making steam, water level will drop two to three inches below normal water line.

Automatic Gas Valve

Automatic Gas Valve opens or closes according to heat requirements of thermostat and temperature limit control. It closes if pilot goes out. Each individual control must be operating correctly before any gas can pass to burners. Any one control can hold gas supply from burner regardless of demand of any other control.

Thermostat

Set at desired room temperature. If windows are to be opened or heat is not needed, move thermostat pointer to lower setting.

NOTICE

In event of failure of any component, system will not operate or will go into safety lockout. System is completely self-checking. On every call for heat, each component must be functioning properly to permit operation. On safety lockout system has to be reset by turning thermostat to lowest setting for one minute, then back to normal setting.

Adjust Pilot Burner

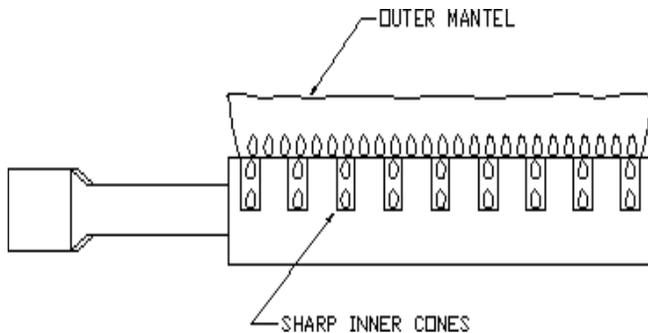
Pilot flame should surround 3/8" to 1/2" of pilot sensor. Refer to Figure 20. If flame needs adjusting:

1. Remove screw cover over pilot adjusting screw.
2. Insert small screwdriver and adjust flame as needed. Turn screw counterclockwise to increase flame, clockwise to decrease.
3. Replace screw cover over pilot adjusting screw.

Main Burner(S)

- Main burners do not require primary air adjustment and are not equipped with primary air shutters.
- Main burner flames form sharp blue inner cones in softer blue outer mantel, with no yellow.
- Puffs of air from blowing on flame or stamping on floor will cause flames to turn orange momentarily. This is not unusual. Remain still when observing main burner flames.
- If flame appearance is not correct, check main burner orifices and burner throat and flame ports for dust and lint obstruction. It may be necessary to remove rollout shield to observe main burner flames. Replace rollout shield after observation. Refer to Figure 19.

Figure 19 - Main Burner



Gas Valve Safety Shutdown Test

Ignition System Safety Shutoff device must be tested after placing boiler in operation.

1. For boilers equipped with continuous pilot, with main burners firing, disconnect thermocouple from gas valve. Gas valve immediately shuts off main burners and pilot.

⚠ DANGER

Electric Shock Hazard. Turn off electric power to boiler before reconnection ignition cable. Failure to do so will result in death or serious injury.

2. For boilers equipped with intermittent ignition, with main burners firing, disconnect ignition cable from intermittent pilot control box. Gas valve shuts off main burners. **TURN OFF ELECTRIC POWER** to boiler before reconnecting ignition cable, to prevent electric shock.

Adjust Steam Pressure Control

- Steam pressure limit control (pressuretrol) shuts off gas to main burners when steam pressure in boiler reaches cut-off setpoint (i.e. sum of cut-in and differential setpoints). Burners refire when steam pressure drops to cut-in setpoint. System pressure requirements are based on size and condition of pipes, and load.
- Good system operation, cut-in setting of pressuretrol should never be less than twice system pressure drop. In typical single family residence with clean one pipe heating system and cast iron radiation, this means that cut-in will usually be set at minimum setting, i.e. 1/2 psi.
- Steam radiation is sized based on square feet of equivalent direct radiation (EDR). This is based on steam pressure in radiator of just less than 1 psi. Therefore, in our example system from above, we would set differential adjustment at 1 psi, i.e. steam pressure required in radiators. This will give us cut-off setpoint of 1-1/2 psi.
- Above is example of typical one pipe system. For larger systems or other types of systems such as two pipe systems, or systems with convectors or fan coil units, pressuretrol settings will need to be determined on system-by-system basis.
- Cut-in setpoint is determined by system pressure drop to furthest radiator or terminal unit. Double system pressure drop as safety factor, resulting in rule that cut-in setting should never be less than twice system pressure drop.
- Differential setpoint is steam pressure required at terminal heating units.
- Your boiler will now operate in correct pressure range. It will maintain enough steam pressure to send steam out to furthest radiator, and not go over optimum steam pressure required at radiators.

Checking Controls

To check Low Water Cut-Off, turn off power to boiler or turn thermostat down to lowest setting. Drain water to below visible bottom of water gauge glass. Turn power on and turn thermostat to call for heat. When boiler is equipped with float type LWCO gas valve should not open on call for heat when water is low.

When boiler is equipped with probe type LWCO gas control should be powered for approximately 10 seconds (time delay on probe type LWCO), gas valve will close and red indicator will illuminate on LWCO.

Boiler equipped with optional WF-2U-24 water feeder, continue to keep thermostat calling for heat after low water cut off recognizes low water condition. After one minute time delay, water feeder starts feeding water to boiler. Feeder feeds for one minute, and then go into another one minute waiting period. This cycle of alternately waiting and feeding should repeat until:

1. For Model 67D-1 float type low water cutoffs - as water level raises float above burner cut off switch level, burners ignite. Water feeder remains powered until water level raises float to water feeder switch level, satisfying water feeder.
2. For Model PS-802 probe type low water cutoffs - water level will rise until water in boiler makes contact with probe, satisfying water feeder, and igniting burners.

In either case, there should be between one and two inches of water visible in gauge glass when both water feeder is satisfied, and burners are allowed to ignite.

Time delays in feed cycles are designed to prevent boiler from flooding due to slow return lines.

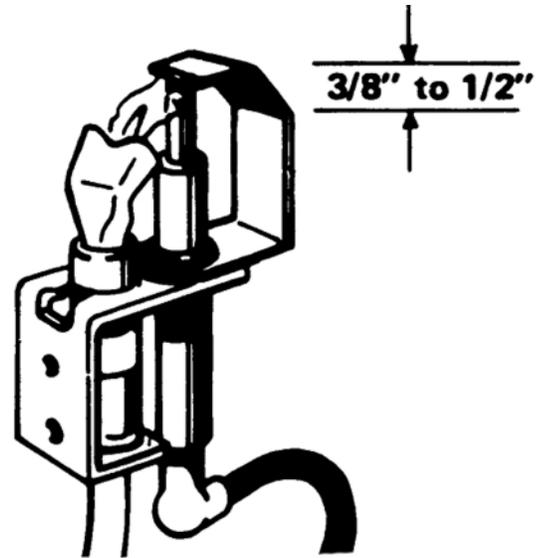
To check pressure limit, run boiler until pressure reaches system demand. Then turn pressure screw and drop pressure setting until boiler shuts down. This will show pressure limit is operating properly.

Refer to control manufacturer's instructions (enclosed) for more information.

Check thermostat operation. When set above temperature indicated on thermometer, boiler ignites. Verify thermostat turns off boiler when room temperature reaches selected setting and starts boiler operating when room temperature falls few degrees.

Set thermostat for desired temperature. Special conditions in your home and location of thermostat will govern setting.

Figure 20 - Igniter



NOTICE

Boiler cleaners and chemical cleaning additives are not recommended. If used and not rinsed properly, they will do more harm than good. Cleaning procedures laid out above will clean out typical oils and impurities found in new boilers and in residential heating systems. Best thing for your boiler and heating system is clean water with no additives.

Clean new steam boiler after installation and initial operation. Remove any accumulation of oil, grease, sludge, etc., that may have been present in system. Substances may cause boiler water to foam and surge, producing very unsteady water line, throwing water into steam header, and possibly preventing steam generation. Follow these steps to remove these contaminants.

Skimming And Slowdown

New boilers must be skimmed at installation to remove threading oil and other impurities that float on surface of water.

1. Remove plug from skimmer tapping and pipe to floor drain or bucket.
2. Raise water level to skimmer tapping.
3. Fire boiler to maintain water temperature of 180-200 degrees.
4. Feed water to boiler to maintain water level. Adjust water feed rate to keep water continuously flowing out of skimmer tapping without water level going above or below tapping. Cycle burners to prevent boiling.
5. Continue skimming until water runs clear. May take several hours.
6. Float type low water cutoffs must be blown down after skimming. Float chamber of low water cut off must be flushed clean and maintained clear of sediment to allow free movement of float. This must be done frequently during initial operation of boiler, and at least once week thereafter. Follow instructions on tag attached to control. Probe type low water cutoffs require no maintenance at this time.
7. After blowing down low water cut off and before blowing down boiler, fill boiler to water line. Fire burners and allow normal steam pressure to build up. Run connection from boiler blowdown valve to nearby sewer or floor drain or to safe discharge point outside. Shut off gas burners, open blowdown valve, and allow all of water in boiler to drain out. Close blowdown valve. Allow boiler to cool thoroughly, and then slowly refill boiler to water line. Repeat this step as many times as necessary until t blowdown water is clear.

8. Final blow down, allow boiler to thoroughly cool, and add fresh water slowly up to normal water line. Start burners and maintain at least 180 degrees for 15 minutes to remove dissolved gasses from fresh water. Shut off burners.
9. Let boiler steam for few days, to give majority of system dirt chance to work its way back to boiler. Then check water in gauge glass. Gauge glass should be dry above water line. Water line should not bounce more than one inch when boiler is steaming. If you see water droplets carrying over from top of gauge glass, or excessive bouncing of water line, boiler needs further cleaning. Take water sample and boil it on stove, to see if it foams. If it does, this also indicates boiler needs to be cleaned.
10. If cleaning is necessary, repeat skimming and blow down procedure. Usually, long skim will be all you need to clean boiler.
11. In more troublesome cases it may be desirable to flush system as well. This is accomplished by closing gate valve in Hartford Loop, and opening drain(s) at end of wet return(s). Run hose from drain valve on wet return to nearby floor drain or bucket. Run boiler at two pounds of steam pressure. Feed just enough water to compensate for waste condensate going down drain, and keep boiler from going off on low water cut off. Run boiler until all waste condensate runs clear.

In extreme cases it may be necessary to chemically clean and flush heating system. Consult boiler manufacturer before introducing any chemicals into boiler.

MAINTAINING YOUR BOILER

- Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.
- Keep boiler area clear and free of obstructions to flow of combustion and ventilation air.
- Check water level every day or two. Verify water line shown by operating drain valve on gauge. **Be sure top and bottom valves on gauge are always open so that actual water level will be shown at all times.**

Gauge glass should be dry above water line. Water line should not bounce more than about one inch when boiler is steaming. If you see water droplets carrying over through top of gauge glass, or excessive bouncing of water line, boiler needs to be cleaned. Follow instructions for "Cleaning Your Boiler."

Safety Relief Valve

WARNING

Burn and scald hazard. Safety relief valve could discharge steam or hot water during operation. Avoid contact with discharge.

- Before testing, verify discharge pipe is properly connected to valve outlet and arranged to contain and safely dispose of boiler discharge. See Figure 2.
- Under normal operating conditions "try lever test" must be performed every month.
- A "try lever test" must also be performed at end of any non-service period.
- Test at normal system operating pressure by holding test lever fully open for at least five seconds to flush valve seat free of sediment and debris. Then release lever and permit valve to snap shut. If lift lever does not activate, or there is no evidence of discharge, turn off boiler immediately and contact qualified service agency.

Low Water Cut-Off

Low Water Cut-Off will interrupt electrical current to burner when water line in boiler drops to low level.

Float type low water cutoffs, it is important to keep float chamber free from sediment, condition essential to dependability. Keep any accumulation from interfering with float action is to "BLOW DOWN" or flush out control regularly. This must be done two to three times during first week after installation and once week thereafter during heating season. Do it while boiler is in operation.

1. Note water level in gauge glass.
2. Open blow-off valve at bottom of control; water will pour out, flushing away sediment. Drain until water is clear, about pailful, then close valve. If water level in gauge glass has dropped, add water to boiler to restore level.

3. Consult low water cut-off manufacturer's instructions included with boiler.

NOTE: Opening blow-off valve also checks cut-off operation.

As float drops with falling water level, burners will shut off.

After valve is closed and normal operating conditions are restored, burners will resume firing.

For probe type Low Water Cutoffs, check action of Low Water Cut-Off monthly to make sure it is providing proper protection.

Low Water Cut-Off remote probes must be removed for periodic inspection and cleaning, preferably at beginning of each heating season. More frequent cleaning may be required on boilers requiring constant or very frequent additions of make up water.

Burners

Visually check of pilot and main burner flames at least once each year, preferably at beginning of heating season.

Boiler Flue Passages

Under normal operating conditions, with burners properly adjusted, it should not be necessary to clean boiler flue gas passages. However, to assure trouble-free operation, we recommend you have flue passages, burner adjustment, and operation of controls checked once year by qualified service agency.

Before start of each season (or whenever system has been shut down for some time) recheck system, boiler and vent pipe for leaks.

Vent Pipe

Check piping at least once a season. If vent piping shows any sign of leaking, replace immediately.

CLEANING YOUR BOILER FLUE PASSAGES AND BURNERS

- Flue Passages between sections should be examined yearly and cleaned, if necessary.
- Remove burners, pilot, and vent pipe.
- Remove top and front jacket panels.
- Remove two screws attaching intermediate front panel to left and right side jacket panels.
- Remove draft diverter and intermediate front panel as unit.
- Carefully remove cerafelt gasket strips.
- Clean passageways between sections with flexible handle wire brush.
- Remove dirt from bottom of boiler and from between sections by vacuuming.
- Make sure all flame ports in burners are open and clear. Shake out or blow out all loose dirt in burners.
- Reseal seams between adjacent sections as necessary with 400F RTV silicone sealant. Reassemble all parts. Be sure to check tightness of pilot connections and condition of burner flames after reassembly (see Figures 18 and 19).
- Verify vent pipe connections to chimney are secure and no obstructions are present.

FOAMING, PRIMING OR SURGING

These terms are used to describe fluctuating water line when water leaves boiler with steam.

Caused by any combination of following:

4. Threading oil and organic matter in boiler water. (Mineral oil, or core sand does not cause surging.) Follow instructions under "Cleaning Your Boiler."
5. Faulty quick vents that do not release air until sizeable pressure is built up - if old style, replace - if dirty, clean so you can easily blow through valve.
6. Improper header design - when steam flows in opposite direction of equalizer line on "Hartford Loop." Generally 15" horizontal run between riser and main takeoff will allow entrained water to fall out of steam vapor so it can return to boiler. (See Figures 2, 3A & 3B on pages 7 and 8).
7. Adjustment of steam limit control to wide differential increases difficulty if quick vents are old style, slow-releasing type or dirty. Always set steam limit control differential as low as possible.
8. Soap and detergents in boiler water cause extreme surging. Boiler cleaners and chemical cleaning additives are not recommended. If used and not rinsed properly, they will do more harm than good. Cleaning procedures laid out in these instructions will clean out typical oils and impurities found in new boilers and in residential heating systems. Best thing for your boiler and heating system is clean water with no additives.

WARNING

Burn and scald hazard. Never refill hot boiler with cold water. Danger of thermal shock may crack section.

BOILER WATER TREATMENT (Other Than Cleaners) In steam systems where system is tight, free from leaks, and all steam is returned to boiler as condensate, amount of make up water is small. Water treatment is generally not required.

In steam systems with less than 90% of steam being returned as condensate, or with very hard or corrosive make up water, treatment may be desirable.

Follow recommendations of your local boiler water treatment specialist.

BETWEEN HEATING SEASONS

Boilers should not be drained between heating seasons. Steam boilers should be entirely filled with water during summer months to exclude air.

SERVICE HINTS

You may avoid inconvenience and service calls by checking these points before you call for service.

⚠ CAUTION
WHAT TO DO IF YOU SMELL GAS
<ul style="list-style-type: none"> • 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.

IF YOUR SYSTEM IS NOT HEATING OR NOT GIVING ENOUGH HEAT . . .	
Possible Cause	What to do
Thermostat is not set correctly	Reset thermostat above room temperature.
Burner is not operating properly	Check flame. If yellow, burner is not getting enough air. Flame is blue and noisy and seems to lift off burner, burner is getting too much air. Contact your service agency.
No electric power to boiler	Check over current protection. Verify electric power supply circuit is "ON".
Controls out of adjustment	Reset according to instructions.
Radiators not heating	Steam air vents not operating properly. Check flow control valve (if used) - may be in closed position.
Poor electrical contact	Check all control terminals and wire joints.
Rollout switch blown	Have your service agency check heat exchanger for blockage.
Chimney flue is blocked	Spill switch contacts open, requiring manual reset of spill switch. Have your service agency check and correct chimney problem.
Vent damper not operating	Consult troubleshooting guide, packaged with vent damper.
IF BURNER IS NOISY . . .	
Gas input amount is incorrect	Contact your service agency.
IF WALLS OR WINDOWS SWEAT . . .	
Not enough ventilation	Contact your service agency
Chimney flue is blocked	Have your service agency check and correct, if necessary
IF RADIATORS ARE NOISY . . .	
Air in system	refer to "Radiators Not Heating" above
SAFETY VALVE LEAKING . . .	
Dirt on seat	Open valve manually. Allow steam to blow and clear valve seat.
HAVE YOUR SERVICE AGENCY CHECK ANY PROBLEM YOU ARE UNABLE TO CORRECT.	

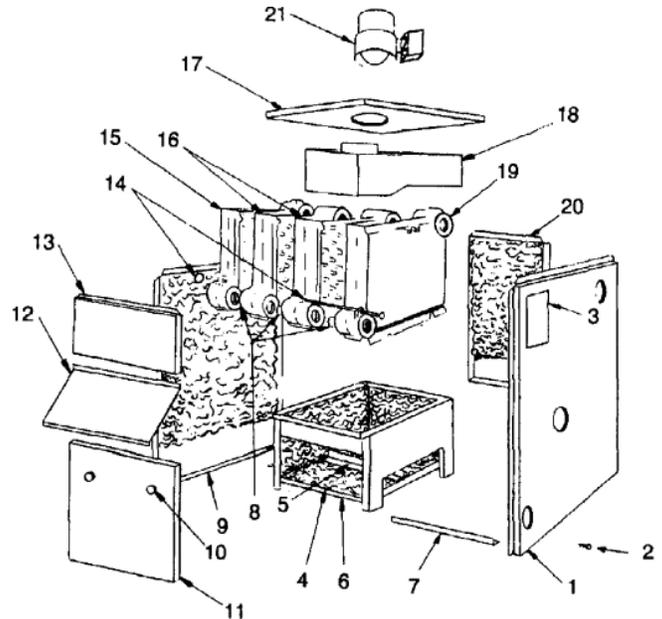
GAS – FIRED STEAM BOILERS

**– IMPORTANT –
READ THESE INSTRUCTIONS BEFORE ORDERING**

All parts are listed in the following Parts List may be ordered through your nearest supplier.

When ordering parts, first obtain the Model Number from the data plate on your boiler, than determine the Part No. (not the Key No.) and the Description of each part from the following illustrations and list. Be sure to give us all this information:

The Part No. – The Part Description – The Boiler Model No.



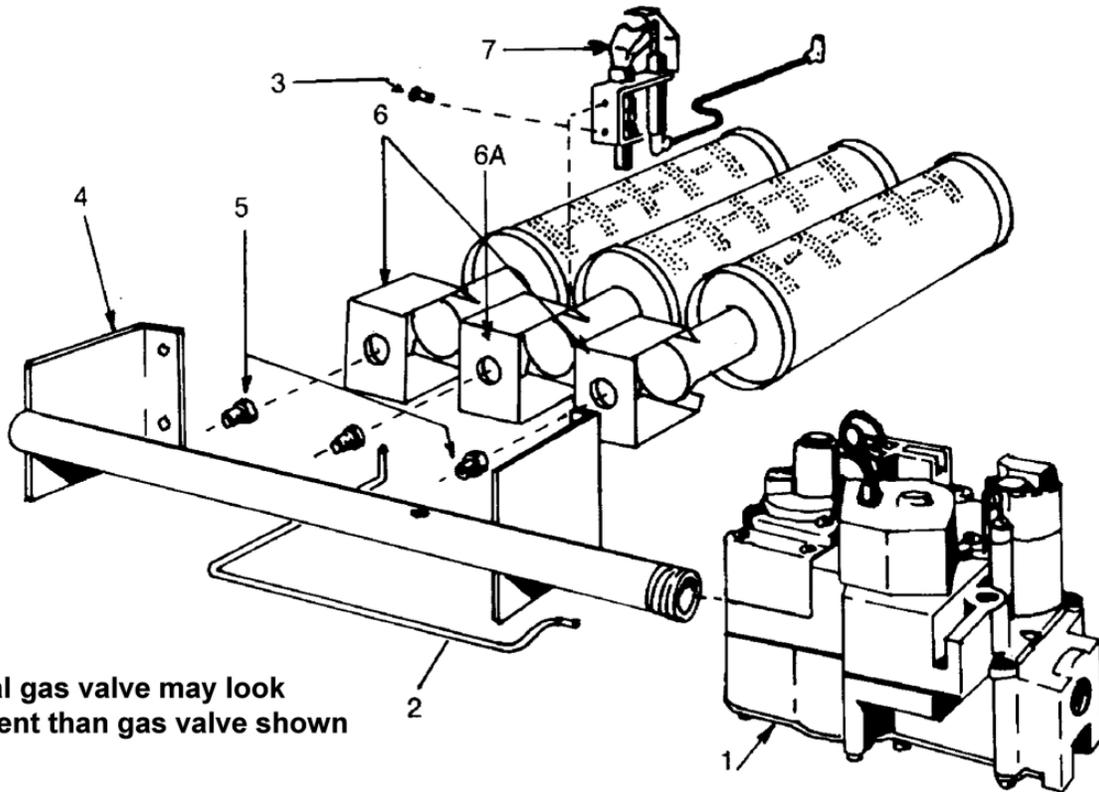
JACKET - SECTION AND BASE PARTS

THIS IS A REPAIR PARTS LIST - NOT A PACKAGING LIST

KEY NO.	DESCRIPTION	3 SECTION	4 SECTION	5 SECTION	6 SECTION	7 SECTION	8 SECTION	9 SECTION
		Part No.						
1	Jacket, Right Side Panel	425-00-802	425-00-802	425-00-802	425-00-802	425-00-802	425-00-802	425-00-802
2	#10 x 1/2 Sheet Metal Screw	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074
3	Rating Plate	146-80-901	146-80-901	146-80-901	146-80-901	146-80-901	146-80-901	146-80-901
4	Base Insulation - Base Sides (2)	146-14-130	146-14-130	146-14-130	146-14-130	146-14-130	146-14-130	146-14-130
	- Base Front	146-14-113	146-14-114	146-14-115	146-14-116	146-14-117	146-14-118	146-14-119
	- Base Rear	146-14-123	146-14-124	146-14-125	146-14-126	146-14-127	146-14-128	146-14-129
5	Base Baffle	425-00-643	425-00-644	425-00-645	425-00-646	425-00-647	425-00-648	425-00-649
6	Base	425-00-663	425-00-664	425-00-665	425-00-666	425-00-667	425-00-668	425-00-669
7	Jacket Tie Bar	425-00-653	425-00-654	425-00-655	425-00-656	425-00-657	425-00-658	425-00-659
8	Push Nipple	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976
9	Jacket, Left Side Panel	425-00-801	425-00-801	425-00-801	425-00-801	425-00-801	425-00-801	425-00-801
10	Knob, Service Door (Pair)	137-02-153	137-02-153	137-02-153	137-02-153	137-02-153	137-02-153	137-02-153
11	Jacket, Service Door	425-00-823	425-00-824	425-00-825	425-00-826	425-00-827	425-00-828	425-00-829
12	Jacket, Int'd. Panel	425-00-813	425-00-814	425-00-815	425-00-816	425-00-817	425-00-818	425-00-819
13	Jacket, Front Panel	425-00-811	425-00-804	425-00-805	425-00-806	425-00-807	425-00-808	425-00-809
14	1/4" Tie Rod, Nut	146-05-001	146-05-002	146-05-051	146-05-053	146-05-005	146-05-007	146-05-009
15	Boiler Section, Left	410-00-013	410-00-013	410-00-013	410-00-013	410-00-013	410-00-013	410-00-013
16	Boiler Section, Middle	410-00-015	410-00-015	410-00-015	410-00-015	410-00-015	410-00-015	410-00-015
17	Jacket, Top Panel	425-00-843	425-00-844	425-00-845	425-00-846	425-00-847	425-00-848	425-00-849
18	Draft Diverter	425-00-673	425-00-674	425-00-675	425-00-676	425-00-677	425-00-678	425-00-679
19	Boiler Section, Right	410-00-014	410-00-014	410-00-014	410-00-014	410-00-014	410-00-014	410-00-014
20	Jacket, Back Panel	425-00-833	425-00-834	425-00-835	425-00-836	425-00-837	425-00-838	633-00-1029
‡	Jacket Complete	425-00-873	425-00-874	425-00-875	425-00-876	425-00-877	425-00-878	425-00-879
‡	Block Assembly (19, 16, 15, 14, 8)	410-00-330	410-00-430	410-00-530	410-00-630	410-00-730	410-00-830	410-00-930
‡	Combustable Floor Plate	146-14-031	146-14-031	146-14-031	146-14-031	146-14-032	146-14-032	146-14-032
‡	Cerafelt Gasket	146-14-018	146-14-018	146-14-018	146-14-018	146-14-018	146-14-018	146-14-018
21	Vent Damper	118-20-05	118-20-06	118-20-06	118-20-07	118-20-07	118-20-07	118-20-07
‡	Base Assembly (6, 5, 4)	433-00-663	433-00-664	433-00-665	433-00-666	433-00-667	433-00-668	433-00-669
‡	Rollout Switch Bracket (Nat. Gas Only)	425-00-604	425-00-605	425-00-606	425-00-607	425-00-608	425-00-609	425-00-610

‡ Not illustrated

FOR USE WITH NATURAL GAS ONLY



NATURAL GAS BURNERS AND MANIFOLD PARTS

THIS IS A REPAIR PARTS LIST - NOT A PACKING LIST

ELECTRONIC INTERMITTENT IGNITION (Shown)

KEY NO.	DESCRIPTION	3 SECTION	4 SECTION	5 SECTION	6 SECTION	7 SECTION	8 SECTION	9 SECTION
		Part No.						
1	24 Volt Gas Valve, Elect. Inter. Ignition	146-62-052	146-62-052	146-62-052	146-62-058	146-62-058	146-62-058	146-62-058
2	Pilot Tube	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005
3	10-32 3/16 Hex Hd. Screw	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
4	Gas Manifold	146-16-033	146-16-034	146-16-035	146-16-013	146-16-014	146-16-015	146-16-016
5	Main Burner Orifice*	146-15-031	146-15-031	146-15-031	146-15-035	146-15-035	146-15-035	146-15-035
6	Main Burner, Regular**	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532
6A	Main Burner, Pilot Mount	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531
7	Pilot Burner	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092
‡	Rollout Shield	425-00-933	425-00-934	425-00-935	425-00-936	425-00-937	425-00-938	425-00-939

ALTERNATE PARTS FOR CONTINUOUS PILOT - 24 VOLT

1	24 Volt Gas Valve, Continuous Pilot	146-62-051	146-62-051	146-62-051	146-62-060	146-62-060	146-62-060	146-62-060
3	10-32 3/16 Hex Hd. Screw (2 req'd)	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
7	Pilot Burner	146-62-098	146-62-098	146-62-098	146-62-098	146-62-098	146-62-098	146-62-098
‡	Thermocouple	152-00-01	146-62-039	146-62-039	146-62-039	146-62-039	146-62-039	146-62-039

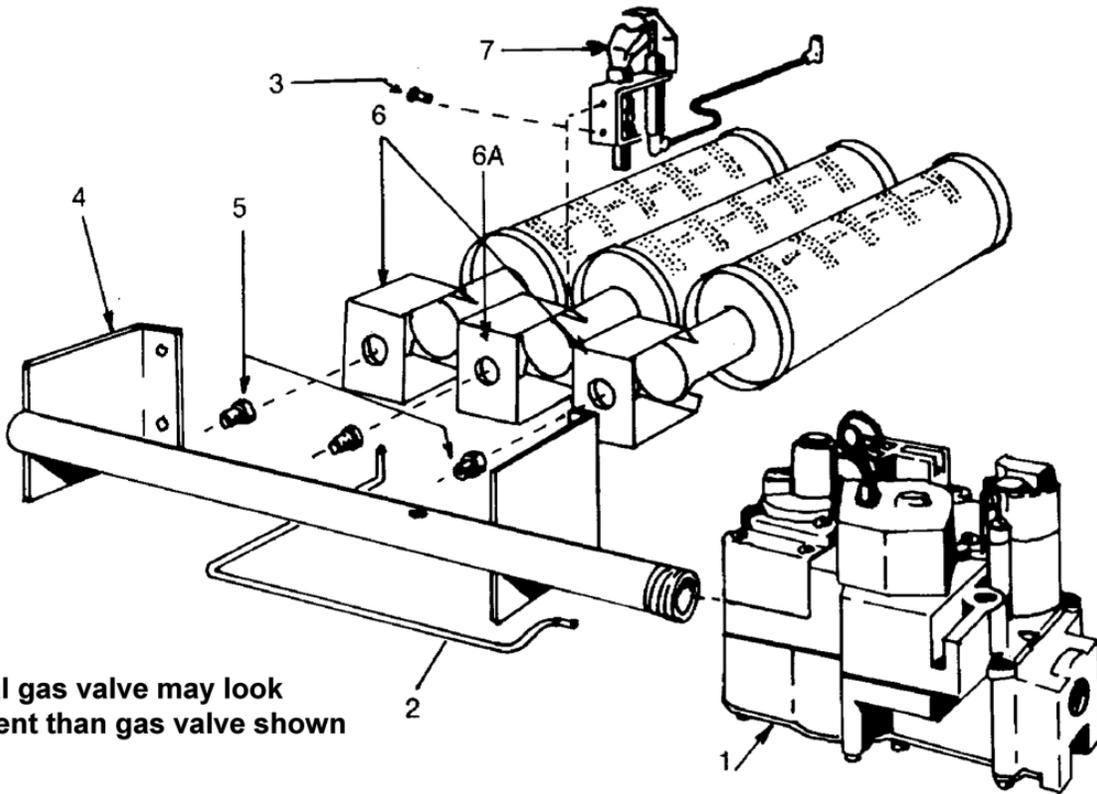
Quantity is 1 unless otherwise noted.

* Requires 1 less than the number of sections.

** Requires 2 less than the number of sections

‡ Not Illustrated

FOR USE WITH PROPANE GAS ONLY



NOTE: Actual gas valve may look different than gas valve shown

PROPANE GAS BURNERS AND MANIFOLD PARTS

THIS IS A REPAIR PARTS LIST - NOT A PACKING LIST

ELECTRONIC INTERMITTENT IGNITION (Shown)

KEY NO.	DESCRIPTION	3 SECTION	4 SECTION	5 SECTION	6 SECTION	7 SECTION	8 SECTION	9 SECTION
		Part No.						
1	24 Volt Gas Valve, Elect. Inter. Ignition	146-62-062	146-62-062	146-62-062	146-62-062	146-62-062	146-62-062	146-62-062
2	Pilot Tube	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005
3	10-32 3/16 Hex Hd. Screw	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
4	Gas Manifold	146-16-010	146-16-011	146-16-012	146-16-013	146-16-014	146-16-015	146-16-016
5	Main Burner Orifice*	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036
6	Main Burner, Regular**	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532
6A	Main Burner, Pilot Mount	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531
7	Pilot Burner	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094
‡	Rollout Shield	425-00-933	425-00-934	425-00-935	425-00-936	425-00-937	425-00-938	425-00-939

ALTERNATE PARTS FOR CONTINUOUS PILOT - 24 VOLT

1	24 Volt Gas Valve, Continuous Pilot	146-62-061	146-62-061	146-62-061	146-62-061	146-62-061	146-62-061	146-62-061
3	10-32 3/16 Hex Hd. Screw (2 req'd)	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
7	Pilot Burner	146-62-098	146-62-098	146-62-098	146-62-098	146-62-098	146-62-098	146-62-098
‡	Thermocouple	152-00-01	146-62-039	146-62-039	146-62-039	146-62-039	146-62-036	146-62-036

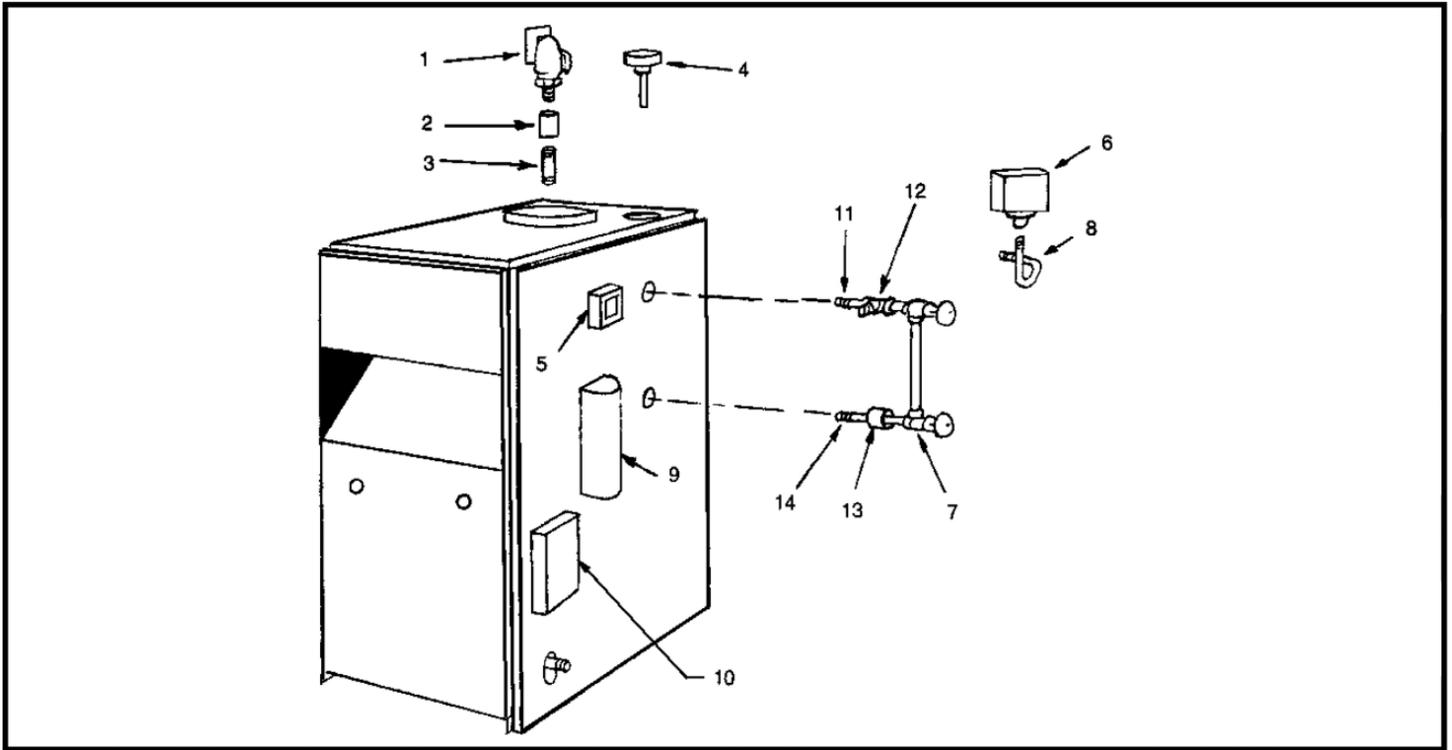
Quantity is 1 unless otherwise noted.

* Requires 1 less than the number of sections.

** Requires 2 less than the number of sections

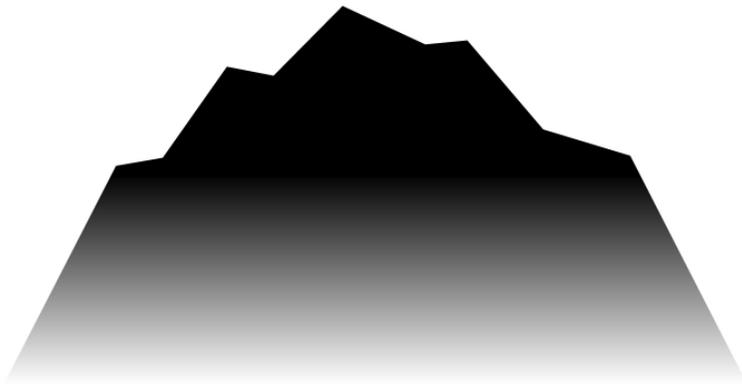
‡ Not Illustrated

BOILER CONTROLS AND PIPING



Key No.	Description	Part No.
1	3/4" Safety Relief Valve	157-00-01
2	3/4" Coupling	115-00-01
3	3/4" x 6 1/2" Nipple	146-07-002
4	Steam Pressure Gauge	146-23-005
5	AT-140D Transformer, 24 Volt	146-62-045
6	PA-404A Pressretrol	146-62-015
7	Glass Water Gauge Set (used with PS-802 LWCO)	146-22-005
‡	Glass Water Gauge Set (used with 67D-1 LWCO)	146-22-010
8	90° Pigtail (used with PS-802 LWCO)	146-43-004
‡	180° Pigtail (used with 67D-1 LWCO)	146-43-005
9	PS-802 Low Water Cut-Off	128-00-02
‡	67D-1 Low Water Cut Off	146-26-042
10	Intermittent Pilot Control	146-62-070
11	1/2" x 3" Brass Nipple (PS-802 only)	131-00-03
12	1/2" x 1/2" x 1/4" Brass Tee (PS-802 only)	146-93-051
13	1/2" Brass Coupling (PS-802 only)	146-93-052
14	1/2" x 3 1/2" Brass Nipple (PS-802 only)	146-07-024
‡	3/4" Drain Valve	146-22-001
‡	WF-2U-24 Water Feeder (Optional)	163-00-01
‡	Rollout Switch	146-29-002
‡	Spill Switch (36TX16-6282) 280°F	146-60-002
‡	5" Vent Damper (3 Section Boilers)	118-20-05
‡	6" Vent Damper (4, 5 Section Boilers)	118-20-06
‡	7" Vent Damper (6, 7, 8, 9 Section Boilers)	118-20-07
‡	Vent Damper Operator (Motor)	114-00-02
‡	400°F Black Silicone Rubber Adhesive Sealent (10.3 oz. Cartridge)	146-06-020

‡ Not Illustrated



Green Mountain

BOILERS

Manufactured by:
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web site: www.ecrinternational.com