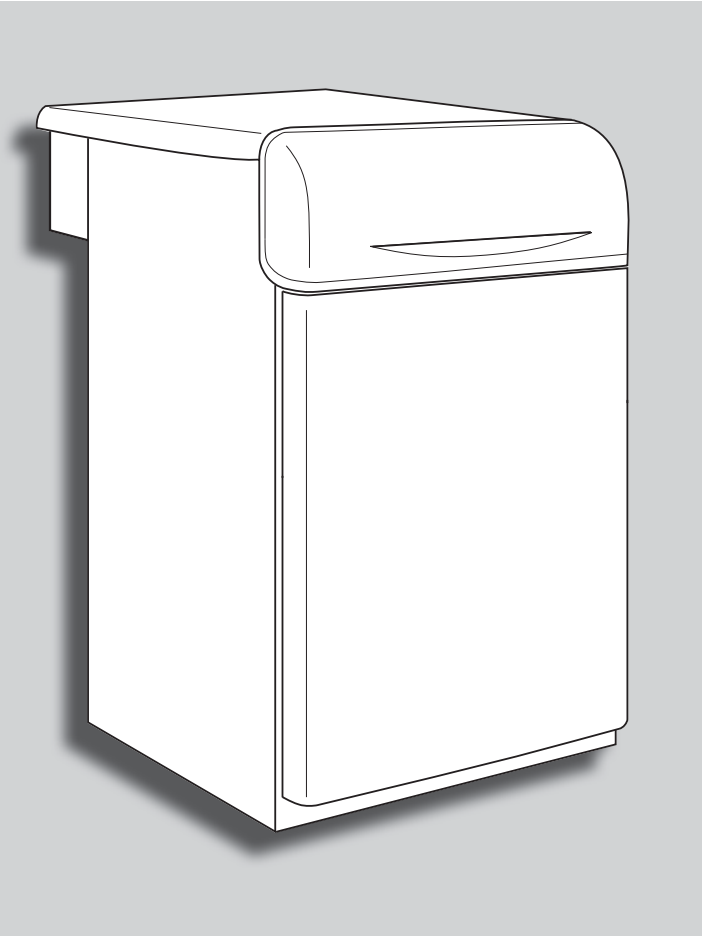
INSTALLATION GUIDE

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES

IMPORTANT—This Document is **customer property** and is to remain with this unit. Please return to service information pack upon completion of work.

*GBWF090A93AVB
*GBWF130A94AVB
*GBWF173A95AVB
*GBWF215A96AVB
*May be “A” or “T”

Natural Draft, Gas Fired Water Boiler with Electronic Ignition and Cast Iron Heat Exchanger



18-CG01D1-5

1.0 Safety Considerations

IMPORTANT: Read this entire manual before beginning installation procedures.

Read this manual carefully before attempting to install, operate, or perform maintenance on this boiler. Installation, service, and maintenance should be performed by qualified technicians only.

NOTE: "Warnings" and "Cautions" appear at appropriate places in this manual. Read these carefully. Your personal safety and the proper operation of this heating product require that you follow them carefully. The manufacturer assumes no liability for installations or services performed by independent dealers.

Safety signal words are used to designate a degree or level of seriousness associated with a particular hazard. The signal words for safety markings are WARNING and CAUTION.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in property damage, death or serious personal injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices and hazards involving only property damage.

1.1 WARNINGS

⚠ WARNING

THE INFORMATION IN THIS GUIDE IS FOR USE BY INDIVIDUALS HAVING ADEQUATE ELECTRICAL AND MECHANICAL BACKGROUND NECESSARY TO INSTALL BOILER PRODUCTS. ANY ATTEMPTS, BY UNQUALIFIED PERSONS, AT PLUMBING, INSTALLING OR REPAIRING A BOILER MAY RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE. THE MANUFACTURER OR SELLER CANNOT BE RESPONSIBLE FOR THE INTERPRETATION OF THIS INFORMATION, NOR CAN IT ASSUME ANY LIABILITY IN CONNECTION WITH ITS USE.

⚠ WARNING

ELECTRICAL HAZARD

DISCONNECT POWER BEFORE INSTALLING OR SERVICING THE BOILER. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

TURN OFF MAIN GAS VALVE BEFORE INSTALLING, PERFORMING MAINTENANCE OR SERVICING A BOILER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

EXPLOSION HAZARD

PROPANE GAS IS HEAVIER THAN AIR AND MAY COLLECT IN ANY LOW AREAS OR CONFINED SPACES. IF THE GAS BOILER IS INSTALLED IN A BASEMENT, AN EXCAVATED AREA OR A CONFINED SPACE, IT IS STRONGLY RECOMMENDED TO CONTACT A GAS SUPPLIER TO INSTALL A GAS DETECTING WARNING DEVICE IN CASE OF A GAS LEAK.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

NOTE: The manufacturer of your boiler does not test any detectors and makes no representations regarding any brand or type of detector.

⚠ WARNING

EXPLOSION HAZARD

ODORANT FADE MAY MAKE THE GAS UNDETECTABLE EXCEPT WITH A WARNING DEVICE. IF THE GAS BOILER IS INSTALLED IN A BASEMENT, AN EXCAVATED AREA OR A CONFINED SPACE, IT IS STRONGLY RECOMMENDED TO CONTACT A GAS SUPPLIER TO INSTALL A GAS DETECTING WARNING DEVICE IN CASE OF A GAS LEAK.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

NOTE: The manufacturer of your boiler does not test any detectors and makes no representations regarding any brand or type of detector.

⚠ WARNING

FIRE HAZARD
DO NOT INSTALL THIS BOILER WHERE COMBUSTIBLE PRODUCTS AND FLAMMABLE LIQUIDS ARE STORED OR WHERE FLAMMABLE VAPORS ARE PRESENT.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

The following warning complies with State of California law, Proposition 65.

⚠ WARNING

HAZARDOUS GASES!
EXPOSURE TO FUEL SUBSTANCES OR BY-PRODUCTS OF INCOMPLETE FUEL COMBUSTION IS BELIEVED BY THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS, OR OTHER REPRODUCTIVE HARM.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously. 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.
7. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z221.1/NFPA 54 and/or CAN/CGA B149 Installation Codes.
8. After it has been determined that each appliance connected to the venting system properly vents where tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

FAILURE TO FOLLOW THE STEPS OUTLINED BELOW FOR EACH APPLIANCE CONNECTED TO THE VENTING SYSTEM BEING PLACED INTO OPERATION COULD RESULT IN CARBON MONOXIDE POISONING OR DEATH.

⚠ WARNING

SAFETY WARNING

DO NOT BYPASS SAFETY CONTROLS

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

BURN HAZARD

ALLOW BOILER TO COOL DOWN PRIOR TO SERVICING OR PERFORMING MAINTENANCE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

FIRE HAZARD

DO NOT INSTALL THIS BOILER DIRECTLY ON CARPETING. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

NOTE: THIS PRODUCT IS APPROVED FOR INSTALLATION ON COMBUSTABLE FLOORING MATERIALS EXCEPT FOR CARPET.

⚠ WARNING

SAFETY HAZARD

THESE BOILERS ARE NOT APPROVED OR INTENDED FOR INSTALLATION IN MANUFACTURED (MOBILE) HOUSING, TRAILERS, OR RECREATIONAL VEHICLES.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

WATER SAFETY HAZARD

DO NOT USE THIS UNIT BOILER IF ANY PART HAS BEEN EXPOSED TO WATER, SUCH AS FLOODING, PIPE OR CONNECTION LEAKAGE. IMMEDIATELY CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE BOILER PRIOR TO RETURNING THE BOILER TO SERVICE.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

HEAVY OBJECT HAZARD

A BOILER IS A HEAVY OBJECT. DO NOT HANDLE OR WORK UNDER A BOILER WITHOUT PROPERLY SECURING IT THROUGH SHORING, BLOCKING OR CRIBBING. FOLLOW ALL STATE AND FEDERAL CODES AND OSHA REGULATIONS AND GUIDELINES FOR HANDLING THE BOILER DURING INSTALLATION AND SERVICING.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

— Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.

— 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.**

— DO NOT RELY ON SMELL ALONE TO DETECT LEAKS. DUE TO VARIOUS FACTORS, YOU MAY NOT BE ABLE TO SMELL FUEL GASES.

- **U.L. recognized fuel gas and CO detectors are recommended in all applications, and their installation should be in accordance with the manufacturer's recommendations and/or local laws, rules, regulations, or customs.**

— Installation and service must be performed by a qualified installer, service agency or the gas supplier.

The following warning complies with State of California law, Proposition 65.

⚠ WARNING

This product contains fiberglass wool insulation!

Fiberglass dust and ceramic fibers are believed by the State of California to cause cancer through inhalation. Glasswool fibers may also cause respiratory, skin, or eye irritation.

PRECAUTIONARY MEASURES

- Avoid breathing fiberglass dust.
- Use a NIOSH approved dust/mist respirator.
- Avoid contact with the skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves, and eye protection.
- Wash clothes separately from other clothing: rinse washer thoroughly.
- Operations such as sawing, blowing, tear-out, and spraying may generate fiber concentrations requiring additional respiratory protection. Use the appropriate NIOSH approved respirator in these situations.

FIRST AID MEASURES

Eye Contact – Flush eyes with water to remove dust. If symptoms persist, seek medical attention.

Skin Contact – Wash affected areas gently with soap and warm water after handling.

1.2 CAUTIONS

⚠ CAUTION

Do NOT install the boiler in a corrosive or contaminated atmosphere.

The following notes must be followed during the installation, servicing, and operation of this boiler:

1. **NOTE:** This device must only be used for the purpose for which it is specially designed. This unit is designed to heat water to a temperature below boiling point at atmospheric pressure and must be connected to a hydronic heating system and/or a water supply system for domestic use, compatible with its performance, characteristics and its heating capacity. Any other use is considered improper.

2. **NOTE:** These instructions do not cover all variations in systems or provide for every possible contingency. Should further information be desired or particular problems arise which are not covered sufficiently by this manual, contact your local distributor for assistance.

3. **NOTE:** Use only with the type of gas approved for this boiler. Refer to the boiler rating plate.

4. **NOTE:** Install this boiler only in a location and position as specified in "Locations and Clearances."

5. **NOTE:** Provide adequate combustion and ventilation air to the boiler space as specified in "Air for Combustion and Ventilation."

6. **NOTE:** Combustion products must be discharged outdoors. Connect this boiler to an approved vent system only as specified in the "Venting" section of this guide.

7. **NOTE:** Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in "Gas Connections."

8. **NOTE:** Always install the boiler to operate within the boiler's intended operating temperature range.

9. **NOTE:** The boiler is not to be used for temporary heating of buildings or structures under construction.

10. **NOTE:** Wear appropriate gloves, arm sleeve protectors, and eye equipment when servicing or maintaining this equipment.

11. **NOTE:** Verify system is leak free at startup. During routine boiler maintenance check integrity of system to be sure there are no leaks. A leak will result in a continuous flow of make up water leading to premature heat exchanger failure. Minerals will build up inside heat exchanger sections reducing performance and cause section failure. The additional oxygen added to the system from make up water speeds corrosion inside the heat exchanger. Maintenance and cleaning must be performed at least once every year.

NOTE: This product must be gas piped by a licensed Plumber or Gas Fitter in the Commonwealth of Massachusetts.

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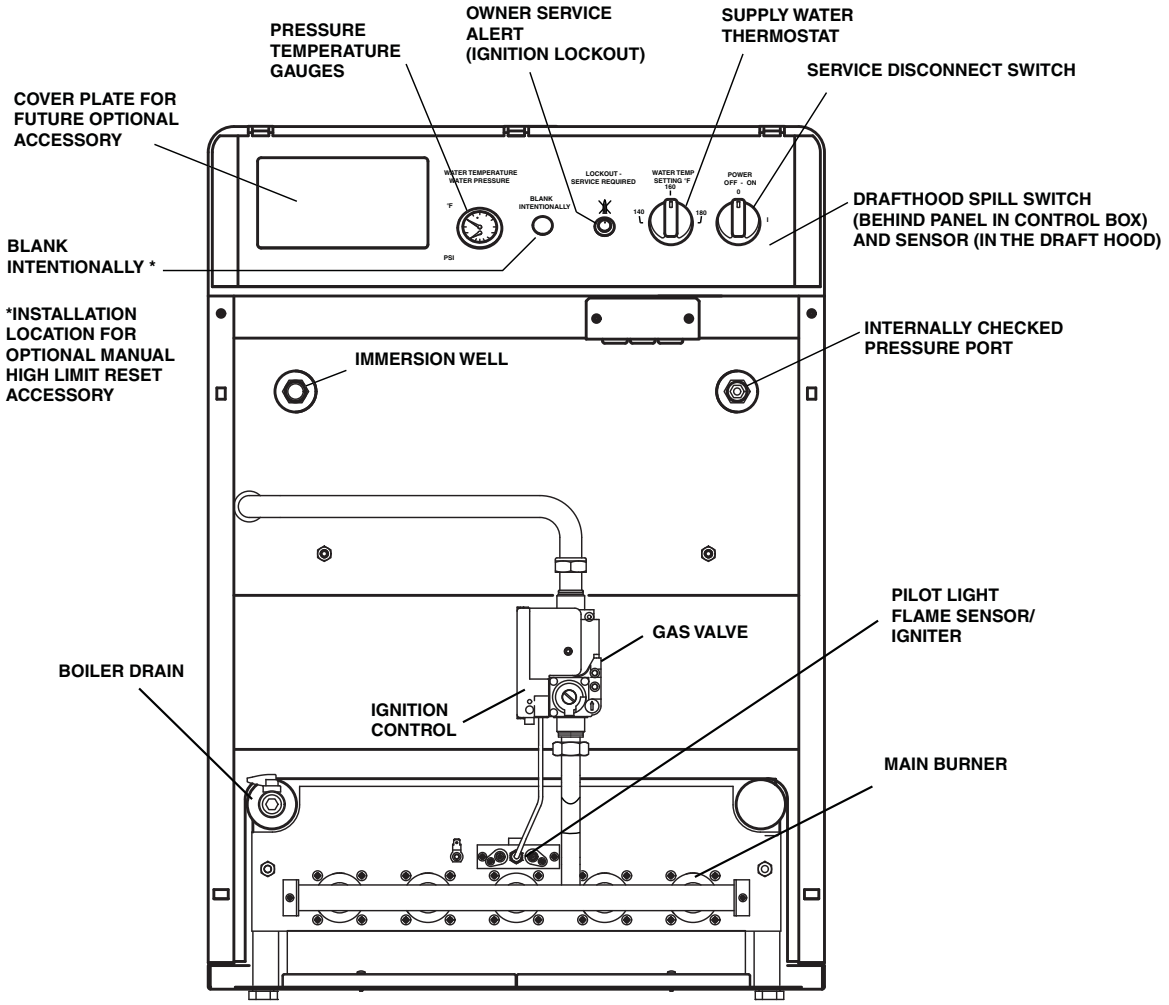


Figure 1 - Front View with front Access Panel Removed

2.0 Pre-Installation Information & Instructions

Material in this shipment has been inspected at the factory and released to the transportation agency without known damage. Inspect exterior of the shipping crate for evidence of rough handling in shipment. Unpack carefully after moving equipment to the installation location. If damage to contents is found, report the damage immediately to the delivering agency.

2.1 Parts Included with Boiler

a) Gas fired, natural draft, cast iron water boiler with electronic ignition and integral draft hood

b) Factory installed high water temperature limit switch - auto reset type

c) 1/4 turn Brass Boiler Drain Valve, 1/2" NPT male x 3/4" NH male hose coupling threads

d) Factory installed flue spillage switch

e) Factory installed ASME approved relief valve

f) Factory installed temperature/pressure gauge

g) Ship with literature package - Installer's Guide, Service Facts, Functional Parts List, and User's Information Guide

h) Factory installed electrical power switch

i) Factory installed adjustable supply water thermostat with 18°F fixed differential

j) Four Adjustable leveling feet, installation required

k) Automatic vent damper - installation required

l) Manual gas supply shut off valve - installation required

2.2 General Specifications - Table 1

Product Specifications				
Model[1]	*GBWF090	*GBWF130	*GBWF173	*GBWF215
Ratings				
Input BTUH	90,000	130,000	173,000	215,000
DOE Output BTUH	76,000	111,000	145,000	180,000
Net I=B=R® Output BTUH	66,000	96,000	126,000	156,000
AFUE	83.6	83.5	83.4	83.3
Natural Gas Supply				
Pilot gas orifice Qty X ID	1 x 0.40mm	1 x 0.40mm	1 x 0.40mm	1 x 0.40mm
Main gas orifices Qty X ID	2 x 3.10mm	3 x 3.10mm	4 x 3.10mm	5 x 3.10mm
Supply pressure (in. w.c.)	7.0	7.0	7.0	7.0
Manifold pressure (in. w.c.)	3.6	3.6	3.6	3.6
LP Gas Supply				
Pilot gas orifice Qty X ID	1 x 0.24mm	1 x 0.24mm	1 x 0.24mm	1 x 0.24mm
Main gas orifices Qty X ID	2 x 1.90mm	3 x 1.90mm	4 x 1.90mm	5 x 1.90mm
Supply pressure (in. w.c.)	11.0	11.0	11.0	11.0
Manifold pressure (in. w.c.)	10.6	10.6	10.6	10.6
Heating[2]				
Max working temperature °F	230	230	230	230
Maximum working pressure (psig)	60	60	60	60
Number of Sections	3	4	5	6
Number of burners	2	3	4	5
Boiler water content (gal.)	2.40	3.06	3.72	4.38
Dimensions				
Height (inches)	33.46	33.46	33.46	33.46
Width (inches)	15.75	19.69	19.69	23.62
Depth (inches)	24.21	24.21	24.21	24.21
Shipping Weight (lb.)	276	345	406	468
Net Weight (lb.)	234	300	362	421
Gas system connection (NPT male)	1/2”	1/2”	1/2”	1/2”
Heating water supply (NPT male)	1”	1”	1”	1”
Heating water return (NPT male)	1”	1”	1”	1”
Electrical power supply V / Hz / Ph	115 / 60 / 1	115 / 60 / 1	115 / 60 / 1	115 / 60 / 1
Minimum Circuit Ampacity (amps)	less than 2.0	less than 2.0	less than 2.0	less than 2.0
Max Overcurrent Protection (amps)	15	15	15	15

NOTES:
1. * May be “A” or “T”
2. Boiler is shipped with 30 psi ASME Pressure Relief Valve

2.3 Codes & Regulations

The manufacturer requires installation and services be in compliance with all applicable codes.

Codes and local utility requirements governing the installation of gas fired equipment, wiring, plumbing, and flue connections must be adhered to. In the absence of local codes, the installation must conform with the

a) National Fuel Gas Code ANSI Z223.1 "latest edition" or CAN/CGA B149 Installation Codes. The latest code may be obtained from the American Gas Association Laboratories, 400 N. Capitol St. NW, Washington D.C. 20001 1-800-699-9277 or www.aga.org

b) Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1 where required.

c) National Electric Code

These boilers have been classified as CATEGORY I as required by ANSI Z21.13 "latest revision" and CAN/CGA 2.3. Therefore they do not require any special provisions for venting other than what is indicated in these instructions.

It is recommended that Manual J of the Air Conditioning Contractors Association (ACCA) or A.R.I. 230 be followed in estimating heating requirements. When estimating heating requirements for installation at Altitudes above 2000 ft., remember the gas input must be reduced (See High Altitude Derate section 3.11).

2.4 Locations & Clearances

⚠ WARNING

FIRE HAZARD
DO NOT INSTALL THIS BOILER DIRECTLY ON CARPETING. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.
NOTE: THIS PRODUCT IS APPROVED FOR INSTALLATION ON COMBUSTABLE FLOORING MATERIALS EXCEPT FOR CARPET.

⚠ WARNING

FIRE HAZARD
DO NOT INSTALL THIS BOILER WHERE FLAMMABLE LIQUIDS ARE STORED OR WHERE FLAMMABLE VAPORS ARE PRESENT.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

SAFETY HAZARD
THESE BOILERS ARE NOT APPROVED OR INTENDED FOR INSTALLATION IN MANUFACTURED (MOBILE) HOUSING, TRAILERS, OR RECREATIONAL VEHICLES.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

WATER SAFETY HAZARD

DO NOT USE THIS UNIT BOILER IF ANY PART HAS BEEN EXPOSED TO WATER, SUCH AS FLOODING, PIPE OR CONNECTION LEAKAGE. IMMEDIATELY CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE BOILER PRIOR TO RETURNING THE BOILER TO SERVICE.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

a) Location Considerations

The location of the boiler is normally selected by the architect, the builder, or the installer. Before the boiler is moved into place, be sure to consider the following requirements:

1. Is the location selected near the chimney or vent?

2. Do all minimum clearances to combustible materials equal or exceed the minimum clearances stated in the clearance table on page 9?

3. Do all of the minimum recommended clearances for service equal or exceed the minimum recommendations in the clearance table on page 9? Any access door or panel must permit removal of the largest component.

4. Are the ventilation and combustion air openings large enough and will they remain unobstructed? If outside air is used, are the openings set above the highest snow accumulation level? (See page 18 for Combustion and Ventilation section.)

5. The boiler is approved for installation directly on combustible flooring. **Do NOT install on carpet.**

6. Ensure the floor structure will support the weight of the boiler**.**

7. Locate the boiler so that all system components are protected from water damage during operation or service.

8. In some applications, boilers may need to be raised above the floor level on a solid structure capable of supporting the boiler in order to reduce the risk of water damage.

9. In garage applications, refer to ANSI Z223.1 for guidance.

10. All boilers installed above the level of heat emitters must have a low water cut-off device installed. Refer to National, State or Local codes for guidance.

11. Scaling of only 1/8 inch can increase annual boiler operation cost by 20-25% and lead to over heating of the boiler sections and premature failure of the boiler's heat exchanger. Water hardness is a result of high concentrations of Calcium and Magnesium suspended in water that become non-soluble as water is heated. The installing dealer is required to test boiler's water source for water hardness. Water hardness greater than 14 grains per gallon of water will require water treatment to reduce the affect of the hard water on the boiler.

b) **Minimum Clearances**

Table 2

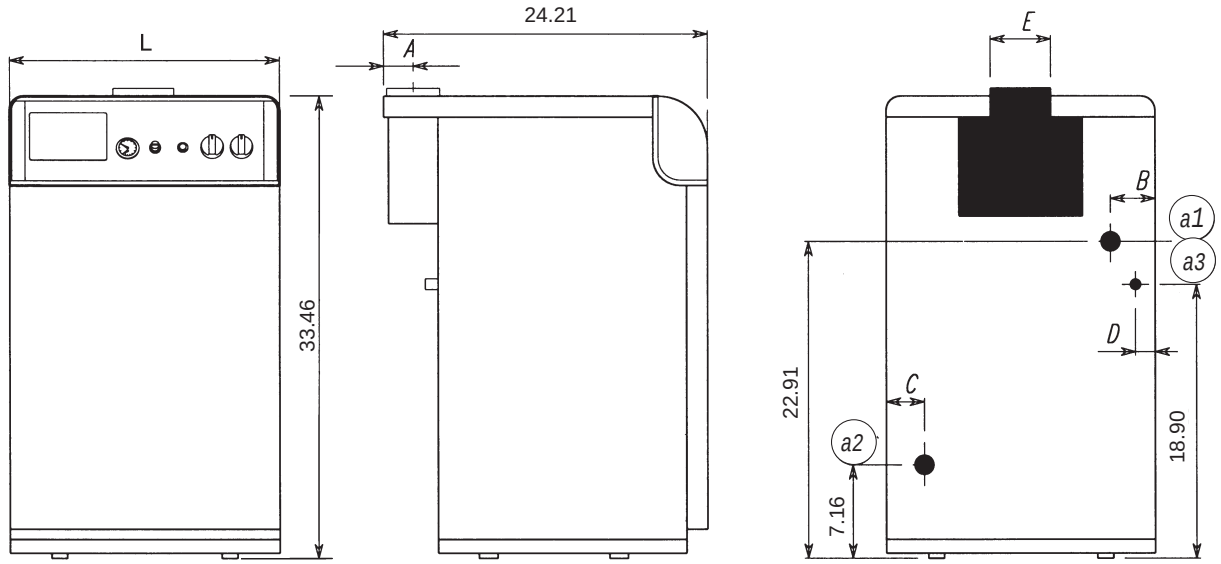
	Minimum Clearance to Combustible Material	Minimum Recommended Clearance for Service
Top	6”	36”
Right Side	6”	See Note 1
Left Side	6”	See Note 1
Front	18”	30”
Back	6”	6”

NOTES:
1. Minimum clearance of 24” is required on one side of the boiler for service access to back of the boiler.

2.5 Outline Drawings

Dimensions and Connections - Figure 2

Front view Side view Rear view



All dimensions are in inches

Table 3

Type and model	A	B	C	D	E	L	(a1) Supply	(a2) Return	(a3) Inlet gas	Effikel Automatic Vent Damper
*GBWF090A93AVB	2.75	4.29	4.41	1.57	5.0	15.75	1" male	1" male	1/2"	KS-5BKF-PP5
*GBWF130A94AVB	3.15	4.57	4.69	1.85	6.0	19.68	1" male	1" male	1/2"	KS-6BKF-PP5
*GBWF173A95AVB	3.15	2.88	3.00	1.42	6.0	19.68	1" male	1" male	1/2"	KS-6BKF-PP5
*GBWF215A96AVB	3.74	3.15	3.27	1.57	7.0	23.62	1" male	1" male	1/2"	KS-7BKF-PP5

NOTES:
1. * May be "A" or "T"
2. All threads are NPT
3. Vent Damper included with boiler. Field installation required.

3.0 Installation Instructions

3.1 Moving and Uncrating the Boiler

⚠ WARNING

SAFETY HAZARD

WHEN MOVING THE BOILER TO THE INSTALLATION LOCATION, ENSURE THE STRUCTURE (I.E. FLOORS, STAIRS, PEDESTALS) CAN SUPPORT THE WEIGHT OF THE BOILER, MOVING EQUIPMENT AND THE PERSONNEL MOVING THE BOILER.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ CAUTION

Use caution when inserting and removing safety blocks. Make sure boiler will not fall off safety blocks.

Failure to obey caution could result in minor or moderate injury.

1. Move crated boiler as close as possible to the location to be installed. Uncrate the boiler using a saw to cut the four bottom corner posts even with the top of the pallet.

When boiler is ready to be uncrated, use a saw to cut the four vertical corner boards just above the base of the crate.

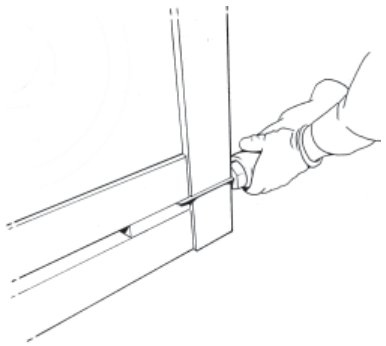


Figure 3

Figure 4

The top of the crate can then be lifted off of the boiler. See Figures 3 and 4.

2. If the boiler can not be moved with crate assembled, uncrate the boiler and use an appliance dolly to move the boiler to the selected location. Use a saw to cut the four corner posts even with the top of the pallet. The top of the crate can then be lifted off of the boiler. See Figures 3 and 4.
3. There are four bolts that attach the boiler to the pallet. The bolts are located near the four corners of the boiler and are attached from the bottom side of the pallet. Locate and use a wrench or socket to remove the four bolts.

3.2 Setting Boiler

1. Verify the floor structure where the boiler will be set can support the weight of the boiler.
2. Locate the boiler so all components are protected from water damage during operation.
3. As required, raise the boiler above the floor level to reduce the risk of water damage.
4. Consult ANSI Z223.1 for garage applications.
5. Move the boiler to the installation location with an appliance dolly. If required, the boiler jacket may be removed to simplify handling.

   To remove the boiler jacket, follow the steps listed below.

   a. Remove the front access panel (see Figure 53).

   b. Remove the top access panel (see Figure 52).

   c. Raise the cover on the control panel (See Figure 52) and locate the screw access holes at the top left and right of the panel. Insert a phillips screwdriver and remove the two screws. Lower the control box.

   d. Remove the left and right boiler jacket panels by removing the phillips screws securing the panels.

   e. Move and set the boiler.

   f. Reassemble the boiler jacket, control panel and front access panel. Leave the top panel off until the boiler is leveled using the adjustable feet.

3.3 Leveling the Boiler

1. Locate the leveling feet (4) shipped in a bag with the boiler.
2. Use discarded crating material as a safety block. Tilt the boiler toward the front and place a safety block under the rear of the boiler, locating it about 1/3 of the way toward the front of the boiler. The back of the boiler must be elevated high enough to facilitate installation and adjustment of the leveling feet. See Figure 5. Remove the safety block.
3. Tilt the boiler toward the rear and place a safety block under the front of the boiler, locating it about 1/3 of the way toward the rear of the boiler. See Figure 6. Install and adjust front leveling feet. Remove the safety block.
4. Remove the top panel from the boiler. Place a level on top of the metal control box. Adjust leveling feet to make sure boiler is level using steps 2 through 3.

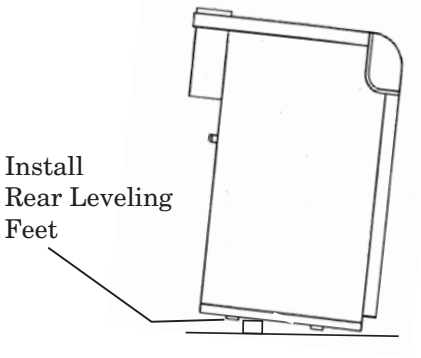


Figure 5

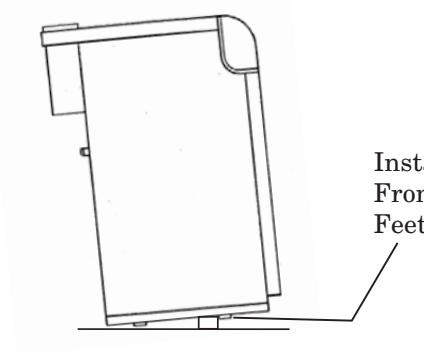


Figure 6

3.4 Water Connections and Piping Systems

Overview

To provide optimum system performance, highest efficiency, and reliable operation, the piping system must be correctly designed.

Air Vents/Boiler Drain

If the supply and return pipes follow a path where air pockets could form in certain places, it is advisable to install air vents at these points. Also, install a discharge device at the lowest point in the system to allow complete draining.

Flow Check Valve

If the boiler is installed at the lowest point of a single loop system or hydronic coils are used upstream of air conditioning coils, a flow check valve should be installed to prevent the natural migration of hot water through the system in the circulator's off cycle.

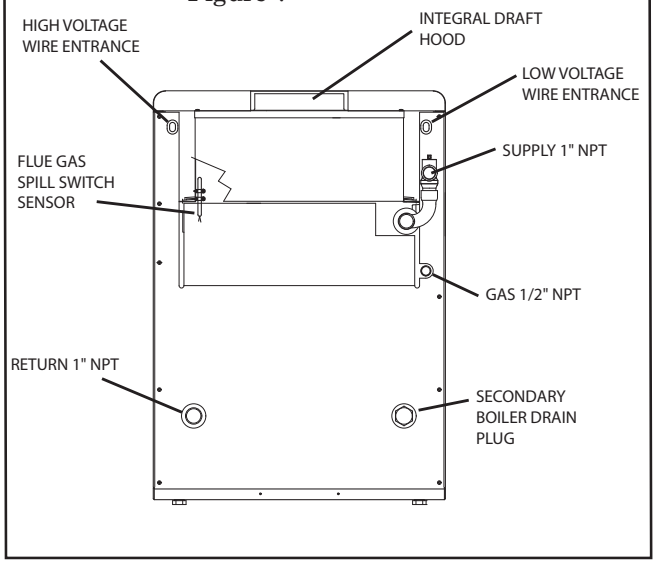
Low Water Cutoff

The installer of the boiler is required to provide a low water cutoff switch when installing the boiler above the distribution system. Consult local codes which may require a low water cutoff for all installations regardless of boiler location. The low water cut off switch should discontinue burner operation until proper water level is achieved.

Boiler Protection

In cases where this boiler is installed on systems with large volumes of water (for example - retro fitted gravity system), the installer is required to use one of the methods of boiler protection described in this manual under "Typical System Piping Diagrams" to protect the system.

Figure 7



Minimum boiler return temperature is 110°F.

NOTE: Do not use the water system pipes to ground electrical appliances.

System Water

Before installation, carefully flush all the pipes of the system with water to remove residues or impurities that could affect proper operation of the system. Additives and cleaning solutions are not recommended. The installing dealer is required to test the boiler's water source for water hardness. Water hardness greater than 14 grains per gallon of water will require water treatment to reduce the affect of hard water on the boiler. In the presence of water harder than 14 grains per gallon, we recommend the use of suitably conditioned water in order to avoid possible scaling in the boiler, caused by hard water, or corrosion produced by aggressive water. It should be remembered that, because of its low thermal conductivity, even scale just a few mm thick causes significant overheating of the boiler walls.

Pipe Connections

Supply and return water connections are located on the back of the boiler. The installation of piping shall be in accordance with National, State and local codes.

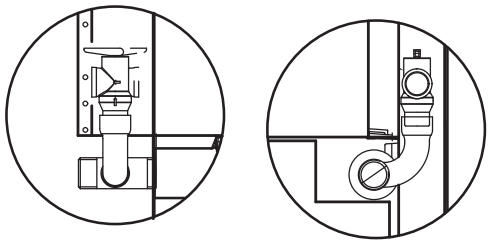
1. Pipe Connections

   a) Supply and Return connections are 1" NPT. See Figure 7. The pressure relief valve assembly is factory installed for all natural draft models. See Figure 8.

   b) The Gas connection is 1/2" NPT. See Figure 7.

   c) Boiler drain ships installed from factory. See Figure 1.

Figure 8 - Boiler Pressure Relief Valve



⚠ WARNING

SAFETY HAZARD.

PRESSURE RELIEF VALVE OUTLET MUST BE ROUTED TO WITHIN 6" OF A FLOOR DRAIN OR OTHER AREA SAFE FOR DISCHARGE OF HOT WATER AND SAFE FROM FREEZING. THIS PIPE MUST BE 3/4" IN SIZE THE ENTIRE LENGTH AND IT MUST NOT CONTAIN ANY RESTRICTIONS, TRAPS, VALVES, PLUGS, OR CAPS.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

Isolation Valves

It is advisable to install isolation valves between the boiler and heating system and on the inlet and outlet side of all hydronic system components for service. This allows the boiler or components to be isolated from the system if necessary.

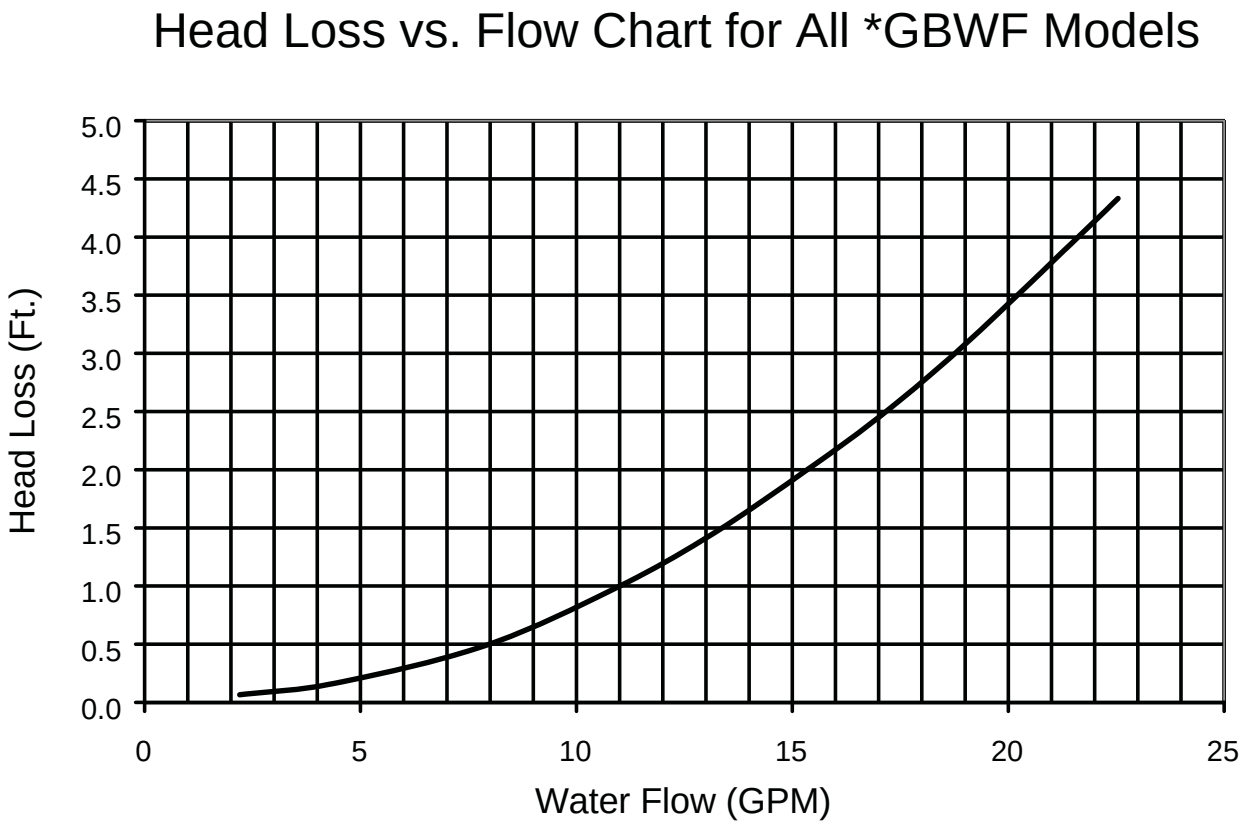
Note: Ensure the hydronic pipe system is properly supported so that no stress is applied to the boiler connections.

Proper Boiler Operating Pressures

The system pressure, when cold, should be 12psi. For correct operation of the boiler, when hot, its pressure should be 18-24 psi.

Figure 9

Loss of Head for the entire range of 3 to 6 heat exchanger sections



3.5 Near Boiler Piping

The system piping must be sized correctly based on flow rate, flow velocity and head loss. The boiler supply and return nipples should not be used to determine system pipe diameters.

Near boiler "typical" piping recommendations are shown in the "System Piping Diagrams" in this manual. The near boiler piping components are field supplied with the exception of the pressure relief valve. The pressure relief valve is shipped with boiler. Accessory trim kits are available (BAYTRM10AVTVPA – 1"NPT; BAYTRM20AVTVPA – 1 1/4"NPT) and contain pressure reducing valve, backflow preventer, air separator and expansion tank

Pressure Relief Valve

Install the factory provided pressure relief valve. The factory provided piping items include: supply water adapter tee, drain adapter, drain valve, and factory installed return water nipple.

Circulator

The circulator is field supplied and the preferred location is in the supply with its inlet 10 to 12 pipe diameters on the outlet side of the expansion tank (pumping away). This circulator location reduces the possibility of pump noise and allows best removal of air from the system water.

Expansion Tank

It is recommended to install a diaphragm type (or bladder type) expansion tank (field supplied) on both new and replacement boiler installations. A diaphragm type (or bladder type) expansion tank allows the use of automatic air vents. Locate the expansion tank on the suction side of the circulator.

Air Separator

Always install an air separator (field supplied) in the system. Install an automatic air vent in the top of the separator only if the system uses a diaphragm type (or bladder type) expansion tank.

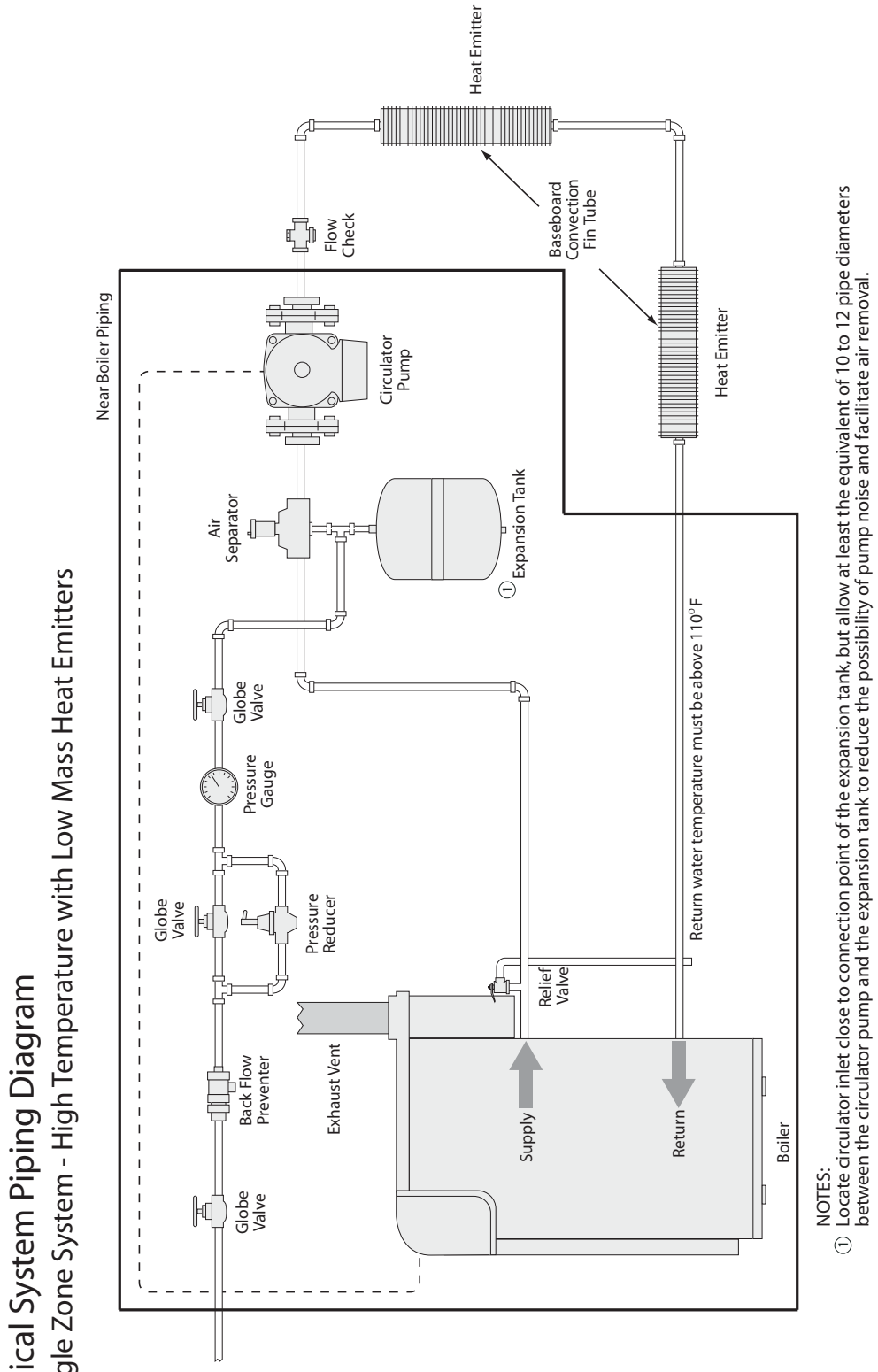
Make-up Water Line

Most local codes will require a backflow preventer and pressure reducing valve (both field supplied) to be installed in the make-up water line (or fill water line). Connect the make-up water line to the same point as the expansion tank connection to the system. This will ensure the pressure reducing valve will sense the correct expansion tank pressure.

Boiler Protection

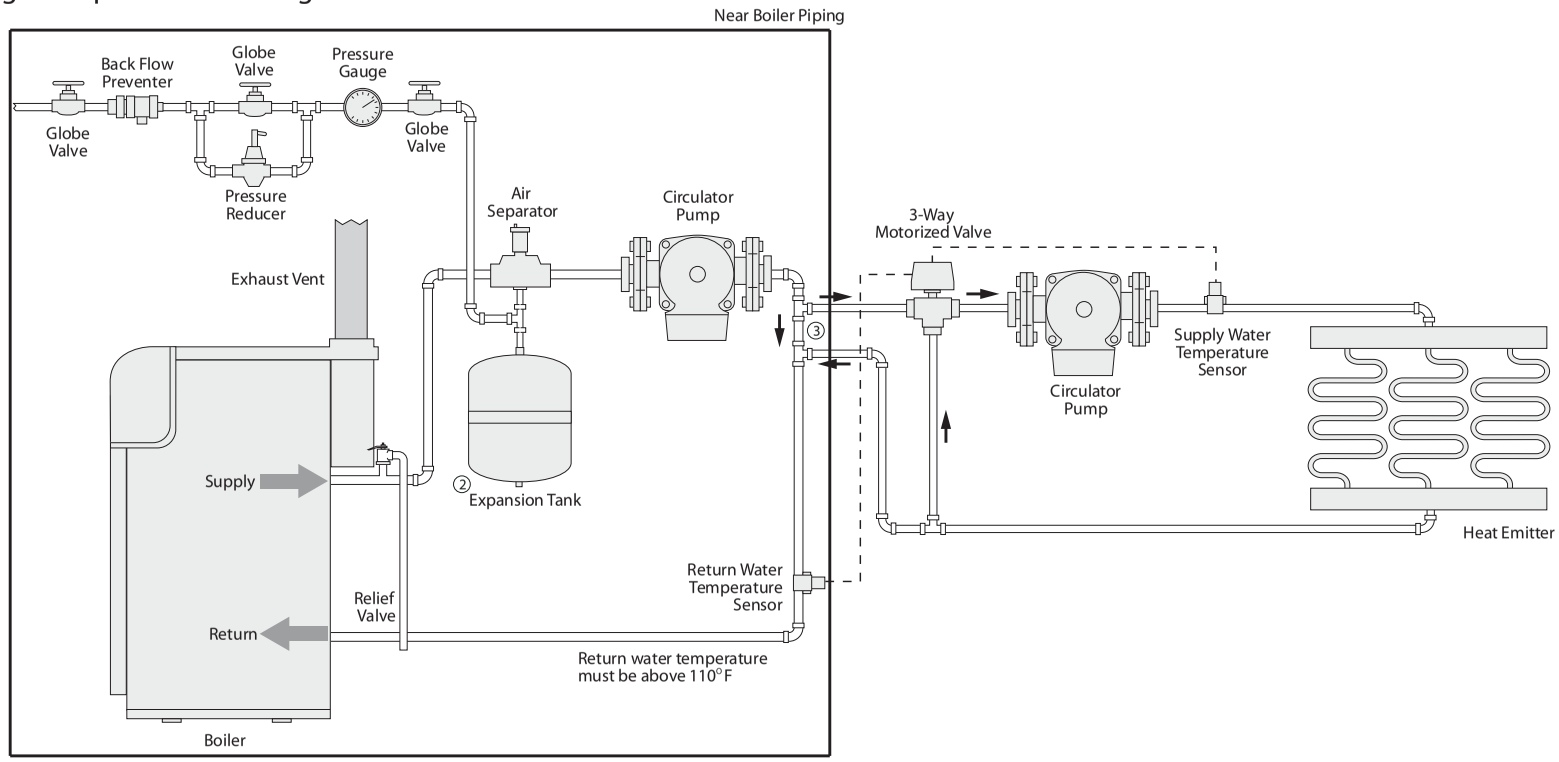
To protect the boiler from condensation of combustion products in the heat exchanger and vent system in low return water temperature applications, a mixing assembly using motorized 3-way valve, 4-way valve or injection must be applied to the system. Continuous return water temperature must be above 110°F.

3.6 Typical System Piping Diagram



Typical System Piping Diagram

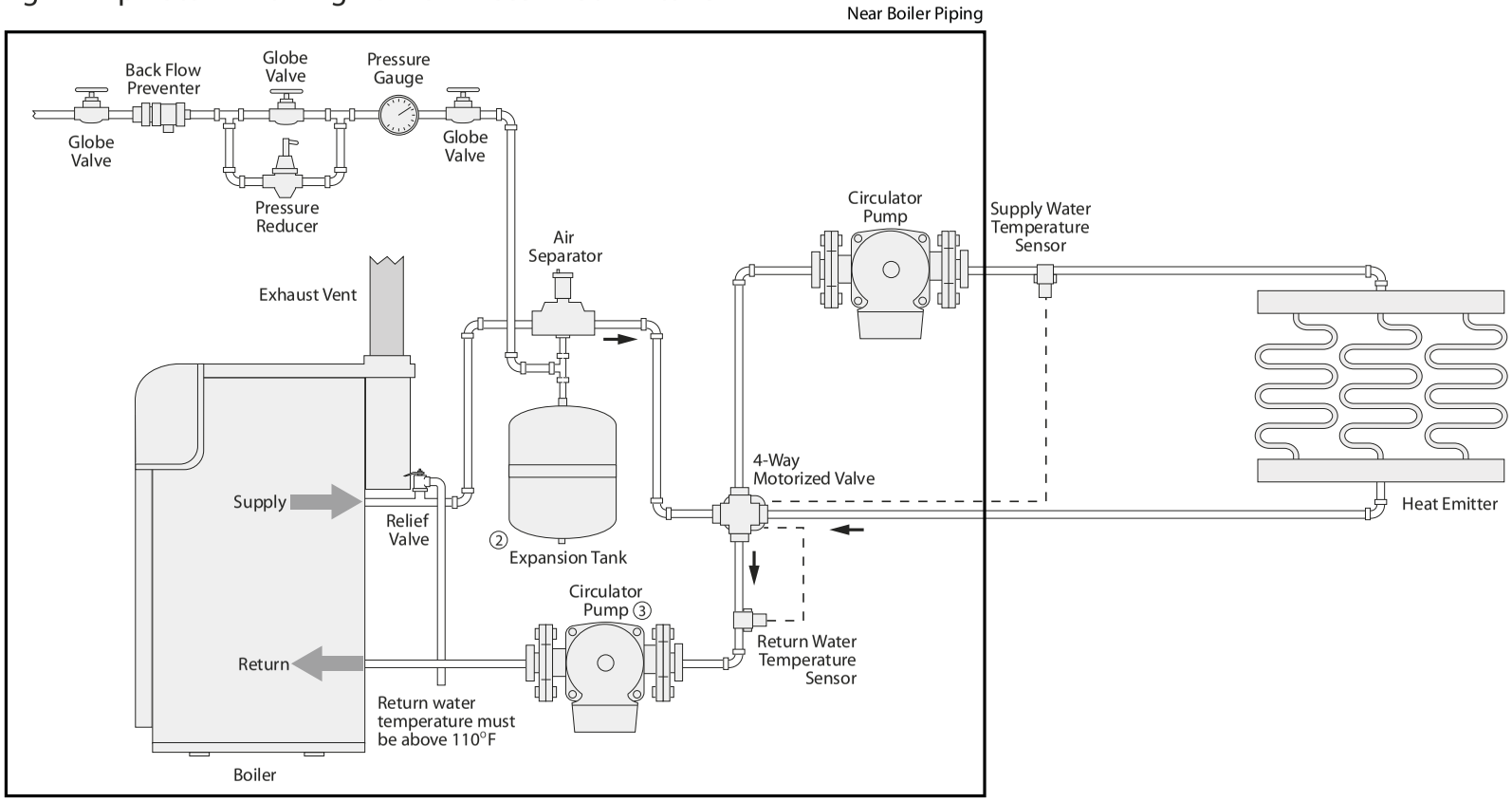
① Primary Secondary Loop with 3-way Motorized Valve Low Temperature with Low Mass Heat Emitters or High Temperature with High or Low Mass Heat Emitters



NOTES:
① Protects boiler from too low return water temperature and condensation.
② Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.
③ Close coupled Tees

Typical System Piping Diagram

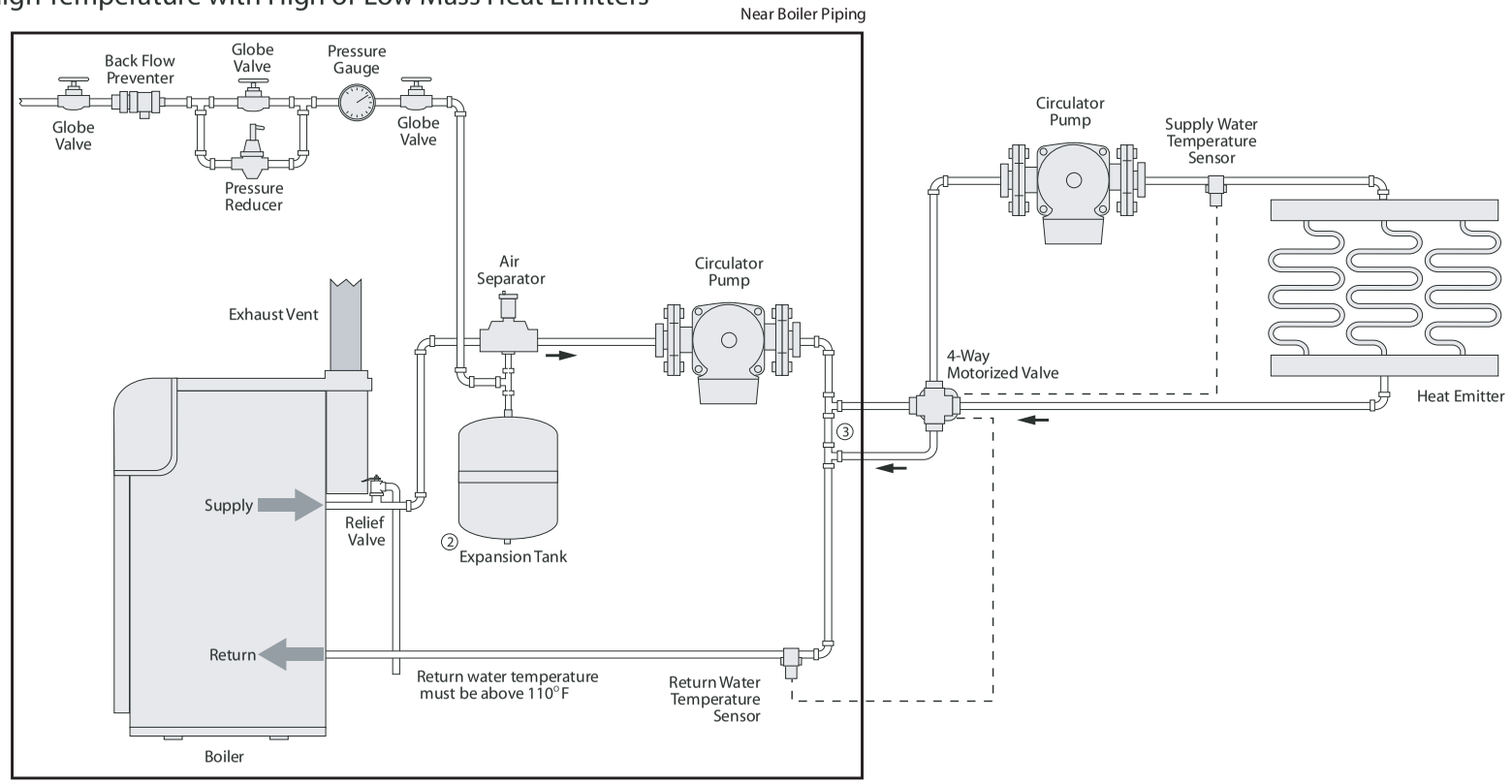
① Primary Secondary Loop with 4-way Motorized Valve with Circulator in Secondary Loop
Low Temperarure with Low Mass Heat Emitters
or High Temperature with High or Low Mass Heat Emitters



NOTES:
① Protects boiler from too low return water temperature and condensation.
② Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.
③ A circulator should be located in the return of the boiler loop to prevent serial pumping.

Typical System Piping Diagram

① Primary Secondary Loop with 4-way Motorized Valve Low Temperarure with Low Mass Heat Emitters or High Temperature with High or Low Mass Heat Emitters



NOTES:
① Protects boiler from too low return water temperature and condensation.
② Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.
③ Close coupled Tees

3.7 Combustion Air and Ventilation

Important: All aspects of the installation of this boiler, including materials, methods of providing combustion air and methods of venting products of combustion to the outdoors must comply with all local codes and the following national standards:
1) CSA B149.1 (most recent edition) - Natural Gas and Propane Installation Code (Canada)
2) NFPA 54 (most recent edition) - National Fuel Gas Code (US)
3) NFPA 58 (most recent edition) - Liquefied Petroleum Gas Code (US)

Adequate flow of combustion and ventilating air must not be obstructed from reaching the boiler. Air openings provided in the boiler casing must be kept free of obstructions which restrict the flow of air. Airflow restrictions affect the efficiency and safe operation of the boiler. Keep this in mind should you choose to remodel or change the area which contains your boiler. Boilers must have a free flow of air for proper performance.

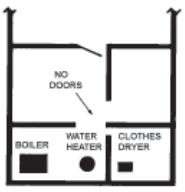
Provisions for combustion and ventilation air shall be made in accordance with "latest edition" of Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1, or Sections 7.2, 7.3 or 7.4 of CAN/CGA B149 Installation Codes, and applicable provisions of the local building codes. Special conditions created by mechanical exhaust air and fireplaces must be considered to avoid unsatisfactory boiler operation.

Boiler locations may be in "unconfined space" or "confined space". Unconfined space is defined in Table 4 and Figure 10.

Fig. 10

UNCONFINED

50 CU. FT. OR MORE PER 1000 BTU/HR. INPUT ALL EQUIP. INSTALLED



These spaces must have adequate air by infiltration to provide air for combustion, ventilation, and dilution of flue gases. Buildings with tight construction (for example, weather stripping, heavily insulated, caulked, vapor barrier, etc.), may need additional air provided as described for confined space.

Confined spaces are installations with less than 50 cu. ft. of space per 1000 BTU/hr input from all equipment installed as in Figure 11.

Fig. 11 **CONFINED**

LESS THAN 50 CU. FT. PER 1000 BTU/HR. INPUT ALL EQUIP INSTALLED

TABLE 4	
Minimum Area in Square Feet for Unconfined Space Installations	
Boiler Maximum BTUH / Input Rating	With 8 Foot Ceiling Minimum Area in Square Feet of Unconfined Space
90,000	560
130,000	810
173,000	1080
215,000	1340

TABLE 5			
Minimum Free Area in Square Inches Each Opening (Boiler Only)			
Boiler Maximum BTUH / Input Rating	Air From Inside	Air From Outside	
		Vertical Duct	Horizontal Duct
90,000	100	25	50
130,000	130	35	70
173,000	175	45	90
215,000	215	55	110

Air for combustion and ventilation requirements can be supplied from inside the building as in Figure 12 or from the outdoors, as in Figure 13 (see page 19).

1. All air from inside the building as in Figure 12: The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. Refer to Table 4, for minimum open areas required.
2. All air from outdoors as in Figure 13: The confined space shall be provided with two permanent openings, one commencing within 12 inches of the top and one commencing within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors. Refer to Table 5, for minimum open areas required.

Figure 12

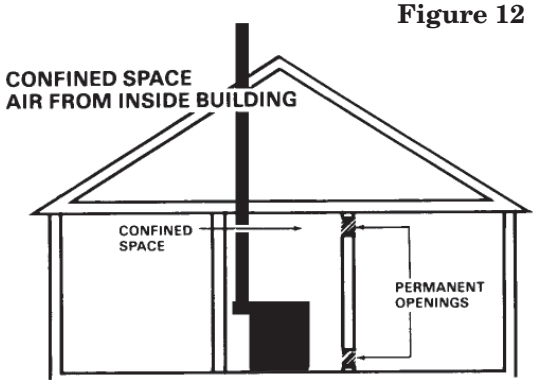
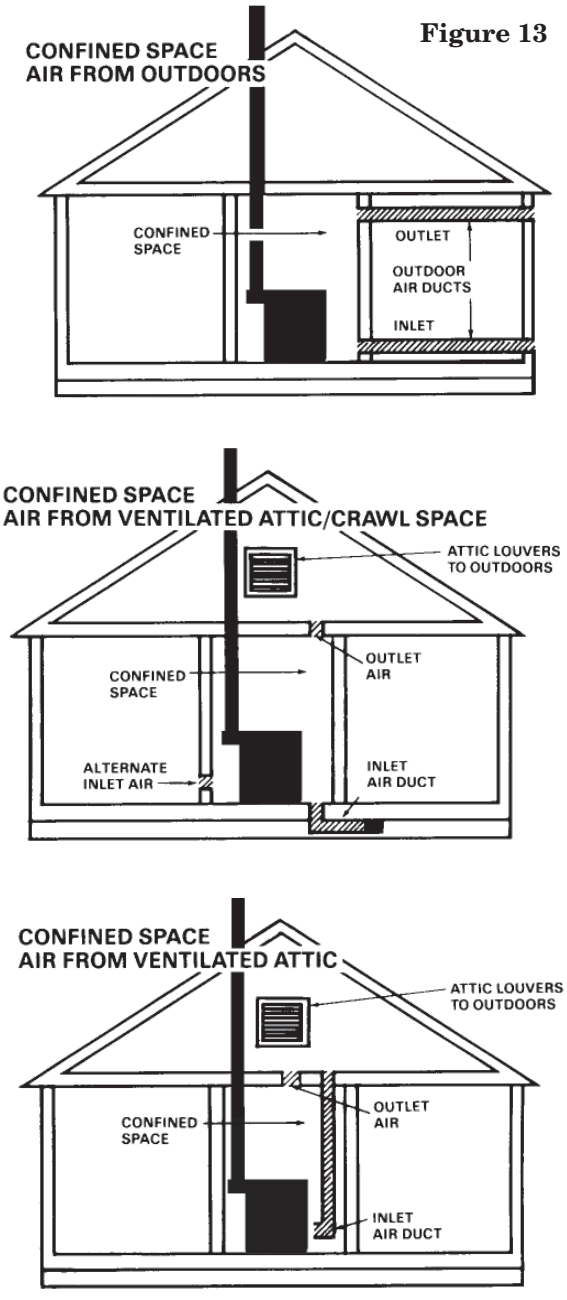


Figure 13



3. The following types of installations will **require** use of OUTDOOR AIR for combustion, due to chemical exposures:
   * Commercial buildings
   * Buildings with indoor pools
   * Boilers installed in commercial laundry rooms
   * Boilers installed in hobby or craft rooms
   * Boilers installed near chemical storage areas.

   Exposure to the following substances in the combustion air supply will also require OUTDOOR AIR for combustion:
   * Permanent wave solutions
   * Chlorinated waxes and cleaners
   * Chlorine based swimming pool chemicals
   * Water softening chemicals
   * Deicing salts or chemicals
   * Carbon Tetrachloride
   * Halogen type refrigerants
   * Cleaning solvents (such as perchloroethylene)
   * Printing inks, paint removers, varnish, paint, etc.
   * Hydrochloric acid
   * Cements and glues
   * Antistatic fabric softeners for clothes dryers
   * Masonry acid washing materials

3.8 GENERAL VENTING INSTRUCTIONS

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

FAILURE TO PROPERLY VENT THE BOILER COULD CAUSE CARBON MONOXIDE, FIRE, OR SMOKE.

NATURAL DRAFT MODELS AGB/TGB MUST BE INSTALLED USING A NATURAL DRAFT CHIMNEY VENTING SYSTEM APPROVED BY THE LOCAL AUTHORITY HAVING JURISDICTION AS COMPLYING WITH ALL LOCAL CODES, OR IN THE ABSENCE OF APPLICABLE LOCAL CODES, WITH THE NATIONAL FUEL GAS CODE NFPA 54/ANSI Z223.1. NATURAL DRAFT MODELS AGB/TGB MUST NOT BE SIDE WALL HORIZONTALLY VENTED. ONLY DIRECT VENT MODELS AGR/TGR ARE APPROVED FOR SIDEWALL HORIZONTAL VENTING USING AN APPROVED SPECIAL VENTING SYSTEM.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN CARBON MONOXIDE POISONING OR DEATH.

VENT PIPING

These boilers have been classified as Natural Draft, Category I boilers under the “latest edition” provisions of ANSI Z21.13 and CAN/CGA 4.9 standards. Category I boilers operate with a non-positive vent static pressure and with a flue loss of not less than 17 percent.

The boiler shall be connected to a factory built chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a lining material acceptable to the authority having jurisdiction.

VENT PIPING

⚠ WARNING

CARBON MONOXIDE, FIRE, AND/OR SMOKE HAZARD

CARBON MONOXIDE, FIRE, OR SMOKE CAN CAUSE SERIOUS PERSONAL BODILY INJURY, DEATH, AND/OR PROPERTY DAMAGE.

FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN CARBON MONOXIDE POISONING OR DEATH.

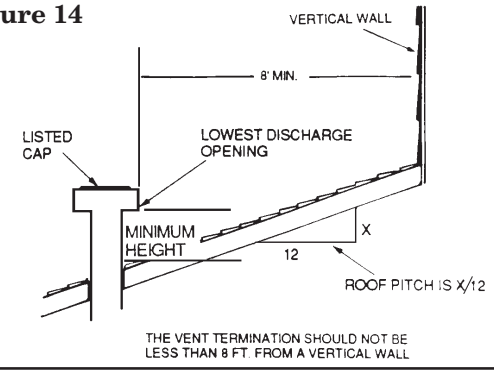
1. Avoid an excessive number of bends.
2. Horizontal runs should pitch upward at least 1/4" per foot. See Table 6 and Figure 14.
3. Horizontal runs should be as short as possible.
4. All vent pipe or connectors should be securely supported and must be inserted into, but not beyond the inside wall at the chimney vent.
5. When vent connections must pass through walls or partitions of combustible material, a thimble must be used and installed according to local codes.
6. Vent pipe through the roof should be extended to a height determined by National Fuel Gas Code or local codes. It should be capped properly to prevent rain water from entering the vent. Roof exit should be waterproofed.
7. Use type "B" double wall vent when vent pipe is routed through cool spaces (below 60° F.).
8. Apply other good venting practices as stated in the venting section of the National Fuel Gas Code ANSI Z223.1 "latest edition".
9. **Vent connectors serving appliance vented by natural draft or non-positive pressure shall not be connected into any portion of a mechanized draft system operating under positive pressure.**
10. Horizontal pipe runs must be supported by hangers, straps or other suitable material in intervals at a minimum of every 3 feet of pipe.
11. **A boiler shall not be connected to a chimney or flue serving a separate appliance designed to burn solid fuel.**
12. The flow area of the largest section of vertical vent or chimney shall not exceed 7 times the smallest listed appliance categorized vent area, flue collar area, or draft hood outlet area unless designed in accordance with approved engineering methods.

Maximum Vent or Tile Lined Chimney Flow Area $= \frac{\pi(D^*)^2}{4} \times 7$

*Drafthood outlet diameter, flue collar diameter, or listed appliance categorized vent diameter. Maximum vent or tile lined chimney flow area values are for chimneys that are not exposed to the outdoor, below the roof line. If exposed below the roof line, then local gas utility and/or authority having jurisdiction must be consulted.

TABLE 6	
Gas Vent Termination	
Roof Pitch	Minimum Height
Flat to 7/12	1.0 Feet*
Over 7/12 to 8/12	1.5 Feet
Over 8/12 to 9/12	2.0 Feet
Over 9/12 to 10/12	2.5 Feet
Over 10/12 to 11/12	3.25 Feet
Over 11/12 to 12/12	4.0 Feet
Over 12/12 to 14/12	5.0 Feet
Over 14/12 to 16/12	6.0 Feet
Over 16/12 to 18/12	7.0 Feet
Over 18/12 to 20/12	7.5 Feet
Over 20/12 to 22/12	8.0 Feet
* This requirement covers most installations	

Figure 14



A variety of potential sources of carbon monoxide can be found in a building or dwelling such as gas-fired clothes dryers, gas cooking stoves, water heaters, boilers and fireplaces. The U.S. Consumer Product Safety Commission recommends that users of gas-burning appliances install carbon monoxide detectors as well as fire and smoke detectors per the manufacturer's installation instructions to help alert dwelling occupants of the presence of fire, smoke or unsafe levels of carbon monoxide. These devices should be listed by Underwriters Laboratories, Inc. *Standards for Single and Multiple Station Carbon Monoxide Alarms, UL 2034* or CSA International Standard, *Residential Carbon Monoxide Alarming Devices,* CSA 6.19.

NOTE: The manufacturer of your boiler does NOT test any detectors and makes no representations regarding any brand or type of detector.

⚠ WARNING

CARBON MONOXIDE HAZARD
FAILURE TO PROPERLY VENT THE BOILER COULD CAUSE CARBON MONOXIDE, FIRE, OR SMOKE.
NATURAL DRAFT BOILER MODELS AGB/TGB MUST BE INSTALLED USING A NATURAL DRAFT CHIMNEY VENTING SYSTEM APPROVED BY THE LOCAL AUTHORITY HAVING JURISDICTION AS COMPLYING WITH ALL LOCAL CODES. OR IN THE ABSENCE OF APPLICABLE LOCAL CODES, WITH THE NATIONAL FUEL GAS CODE NFPA 54/ANSI Z223.1. NATURAL DRAFT MODELS AGB/TGB MUST NOT BE SIDE WALL HORIZONTALLY VENTED. ONLY DIRECT VENT MODELS AGR/TGR ARE APPROVED FOR SIDE WALL HORIZONTAL VENTING USING AN APPROVED SPECIAL VENTING SYSTEM.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

<u>The following information is applicable to installations in the Commonwealth of Massachusetts:</u>

Important: The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of through-the-wall vented gas appliances as follows:

248 CMR 5.08(2):
(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed.

In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

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

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

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, “GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS”.
4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

3.9 Automatic Vent Damper Installation

⚠ WARNING

WARNING EXPLOSION HAZARD
INSTALL THE VENT DAMPER TO SERVICE ONLY THE SINGLE BOILER FOR WHICH IT IS INTENDED. IF IMPROPERLY INSTALLED, A HAZARDOUS CONDITION, SUCH AS AN EXPLOSION OR CARBON MONOXIDE POISONING COULD OCCUR.
FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

FIRE HAZARD
DO NOT INSTALL THE VENT DAMPER WITHIN 6 INCHES (153mm) OF COMBUSTIBLE MATERIAL.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ CAUTION

Do NOT turn damper manually with or without electrical power or motor damage will occur.

INSTALL KNOCKOUT PLUG IN DAMPER BLADE
The knockout plug is attached to the Effikal vent damper ship-with literature. See Figure 16.

⚠ CAUTION

Install this plug in the damper blade hole on all boilers equipped with intermittent ignition systems only. DO NOT install this plug on standing pilot systems. These instructions are for the gas fired natural draft boiler models *GBWF. All *GBWF boilers ship with the correct size automatic vent damper in the shipping crate. Failure to follow these instructions can cause nuisance odor problems and minor property damage due to moisture if ignored.

REQUIREMENT FOR CANADIAN INSTALLATION
Vent Damper must be used with an appliance bearing a mark showing the make and model of the device.

EXPLANATION OF EFFIKAL VENT DAMPER MODEL NUMBERS
R =Redundant
V = Valve
G = Gas
P = Plug In at Damper
KS = Circuit Board Model
NUMBER = Vent Pipe Size
B = Brush That Provides a Tight Seal
K = Knockout for Standing Pilot
F = Flat Rod in Pipe Assembly

UNPACKING INSTRUCTIONS
The Effikal RVGP-Series Automatic Gas Vent Damper is packaged in a single carton and is located inside the boiler crate. The carton contains a stainless steel pipe assembly, a knock out plug, a motorized controller and instruction booklet. The wire harness ships attached to the motorized controller. Inspect for damage prior to the installation.

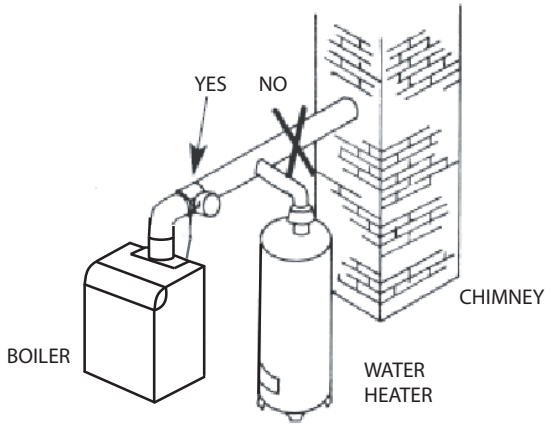
INSTALLATION GUIDELINES FOR EFFIKAL VENT DAMPER SUPPLIED WITH MODEL *GBWF BOILERS

1. The Effikal RVGP Series Automatic Damper must be installed by a qualified independent dealer. The dealer must fill in the installer's name, address and installation date on the label attached to the vent damper device.
2. Do not negate, bypass or jumper out any existing safety or operational controls.
3. Device must be installed in compliance with local codes or the National Fuel Gas Code (ANSI Z223.1 NFPA 54) and the National Electric Code (ANSI C1-NFPA 70). The automatic vent damper conforms to ANSI Z21.66 and ADDENDA. CGA and AGA design certified.
4. Use only with a listed gas fired boiler equipped with a draft hood, the outlet area of which is not greater than the inlet area of the device.
5. Visually inspect the venting system for proper size, horizontal pitch and vent termination, and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
6. Determine that the chimney or vent is acceptable to the authority having jurisdiction.
7. Install the vent damper after the boiler draft hood, directly to the draft hood or flue collar, as close to the draft hood as practicable, and without modification to the draft hood or the vent damper.
8. **Locate in a venting system or section of a venting system so that it services only the single boiler for which it is intended.**

9. A minimum clearance of 6 inches (153mm) between the damper device and combustible construction must be maintained and that there be provisions for access and service of the damper device. See Figure 15.
10. Position indicator and service switch must be accessible to the user.
11. The installer must fill in the label on the side of the controller cover.

FIGURE15

INSTALL THE VENT DAMPER TO SERVICE ONLY THE SINGLE BOILER FOR WHICH IT IS INTENDED. IF IMPROPERLY INSTALLED, A HAZARDOUS CONDITION, SUCH AS AND EXPLOSION OR CARBON MONOXIDE POISONING, COULD RESULT



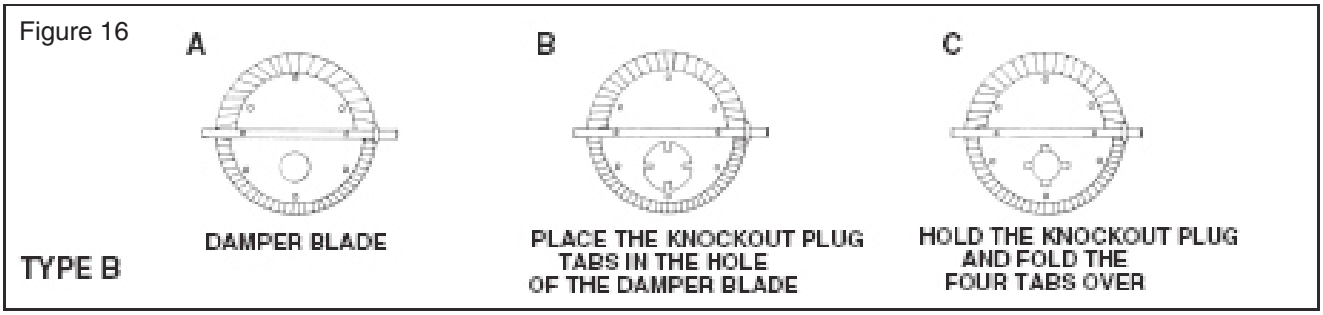
CAUTION: DO NOT INSTALL THE VENT DAMPERS WITHIN 6 IN. (163mm) OF COMBUSTIBLE MATERIAL

.

12. This device must be installed only on a boiler connected to a factory built chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a lining material acceptable to the authority having jurisdiction.

NOTE: THE DAMPER MUST BE IN THE OPEN POSITION BEFORE COMBUSTION TAKES PLACE. THE DAMPER MUST BE IN THE OPEN POSITION WHEN THE APPLIANCE MAIN BURNER(S) IS OPERATING. THE GAS VALVE(S) MUST BE CLOSED BEFORE THE DAMPER BEGINS ITS RETURN TO THE CLOSED POSITION.

Figure 16



INSTALLING THE AUTOMATIC VENT DAMPER

⚠ WARNING

ELECTRICAL SHOCK HAZARD

DISCONNECT POWER SUPPLY TO PREVENT ELECTRICAL SHOCK PRIOR TO VENT DAMPER INSTALLATION.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

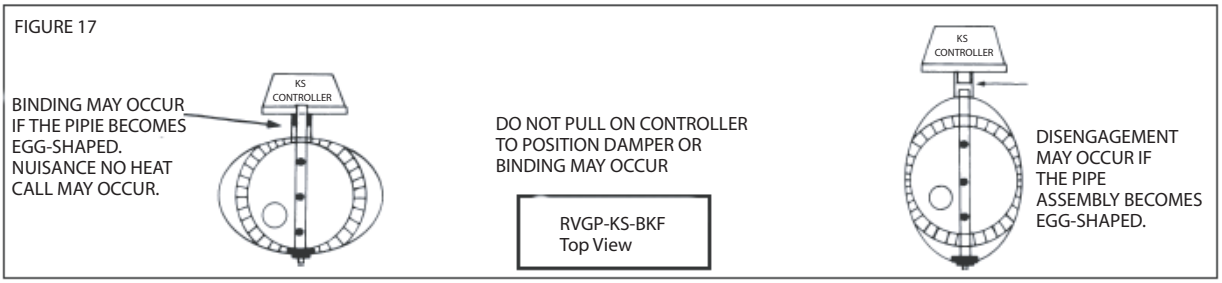
Installing the Vent Damper in Vertical and Horizontal Vents:

1. For vertical vent damper installation with the vent damper installed directly on top of the boiler's flue, the motor should be positioned away from the rear of the boiler (see Figure 19). Otherwise, it will be difficult to remove the top boiler panel and clean the heat exchanger.
2. For horizontal vent damper installation, mount the vent damper motorized controller to either side of the vent. See Figure 15.
3. The vent damper device shall be connected to a chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a lining material acceptable to the enforcing authority. A minimum clearance of 6 inches (153 mm) between the device and combustible construction must be maintained and that there be provisions for access and service of the damper device.
4. To avoid nuisance odor problems, obtain the most radical pitch to the chimney as possible. Remove any appropriate section from the female end of the vent pipe and reinstall vent pipe and damper assembly. For dimensional data, see Figure 18.

NOTE: Do not bend or reshape the vent damper pipe during installation or the shafts from the controller to the pipe will not line up properly. See figure 17.

5. The motorized controller is premounted to the stainless steel pipe assembly. Make sure the controller is secured to the pipe assembly. The flat rod must be engaged into the slot of the CAM. This slot protrudes through the base plate of the controller. The vent damper position indicator is located on the stainless steel pipe assembly. This is opposite the motorized controller. The device is equipped with a service switch for placing the damper in the open position. The service switch is recessed into the cap of the motorized controller. See Figure 18. It has been appropriately marked hold "open" or "automatic." The position indicator and service switch must be accessible to the user.
6. The damper device must be installed in the vent pipe with the crimped end and directional arrow pointed toward the chimney, the damper position indicator visible and the controller unit accessible for wiring. See Figures 19 & 21.
7. Locate a position in the vent pipe between the drafthood and the chimney for the damper assembly. The vent damper device must be located in a venting system so that it serves only the single appliance for which it is installed (see Figure 19).
8. Secure the damper assembly at each end to the vent pipe with three 1/2" sheet metal screws or pop rivets spaced around the circumference of the vent pipe. It may be necessary to drill three pilot holes for the self tapping screws 120° apart at the inlet and outlet of the stainless steel vent pipe assembly. This should prevent bending in the pipe assembly. If necessary, provide a suitable hanger to support the damper assembly independent of the venting system. See Figure 21.
9. Plug the knockout hole in the damper blade using the plug supplied with the unit. Bend tabs in alternating directions to secure. See Figure 16.

FIGURE 17



⚠ WARNING

DO NOT USE THE EFFIKAL DAMPERS WITH HONEYWELL L8148 OR L8124 WITH MAN/ AUTO SWITCH BECAUSE THE SWITCH CAN OVERRIDE THE SAFETY INTERLOCKS IN THE SYSTEM WIRING, CAUSING A HAZARDOUS CONDITION.

All wiring from the EFFIKAL RVGP-Series gas vent damper controller shall be routed clear of mechanical injury and high temperature locations as directly as possible along to the boiler control box. Wire harness hangers are provided on the inside of the boiler jacket to route the harness to the control box. Secure with wire ties, stand off brackets or tape as required.

FIGURE 18

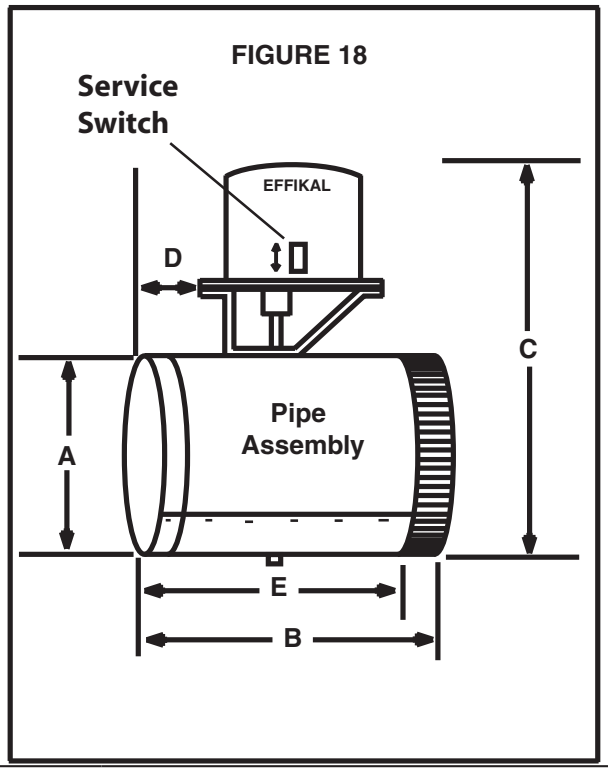


TABLE 7				
DIM A TUBE SIZE	DIM B LENGTH	DIM C TOTAL HEIGHT	DIM D	DIM E
5”	6”	10-5/8”	15/16”	4-3/4”
6”	6-1/2”	11-5/8”	1-1/8”	5-1/4”
7”	7-1/16”	12-5/8”	1-3/8”	5-3/4”

Install the vent damper directly on the draft diverter flue outlet. Route the wire harness through the strain relief clamp located in the back of the boiler control box. Secure the harness. Wire harness hangers are provided inside the boiler jacket to conveniently route the harness to the control box. Connect the harness polarized plug into the mating polarized plug found in the control box.

FIGURE 19

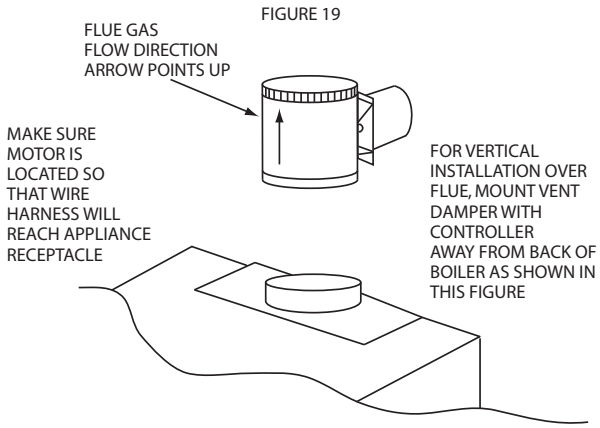
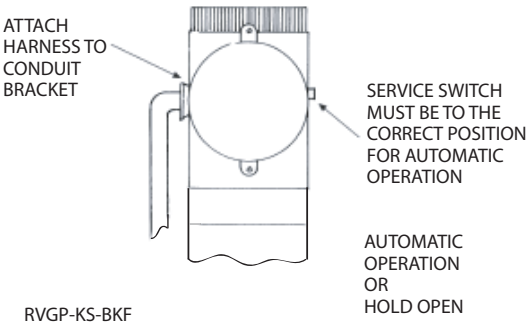


FIGURE 20



This connection will electrically connect the boiler control system and automatic gas valve to the damper.

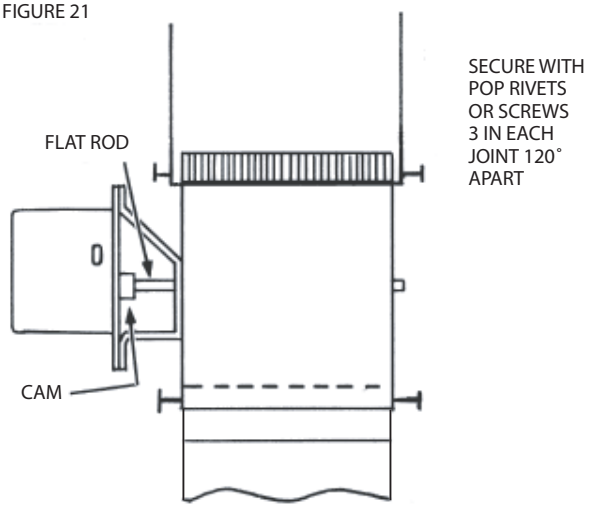
The *GBWF control circuit will operate only when the vent damper is connected.

All electrical work and material used in the installation shall be in accordance with local electrical codes in absence of codes consult the National Electrical Code.

Add one tenth to the heat anticipator of the room thermostat plus current draw for the control module.

To protect the thermostat heat anticipator, be sure the power is disconnected before proceeding with the wiring.

FIGURE 21



3.10 Gas Connections

The following warning complies with the state of California law, Proposition 65.

⚠ WARNING

HARAZDOUS GAS WARNING

EXPOSURE TO FUEL SUBSTANCES OR BY-PRODUCTS OF INCOMPLETE FUEL COMBUSTION IS BELIEVED BY THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

NEVER TEST FOR GAS LEAKS WITH AN OPEN FLAME; A FIRE OR EXPLOSION COULD RESULT. USE COMMERCIALLY AVAILABLE SOAP SOLUTION MADE SPECIFICALLY FOR THE DETECTION OF LEAKS TO CHECK ALL CONNECTIONS.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

This unit is designed for rear installation of gas piping. The installation of piping shall be in accordance with piping codes and the regulations of the local gas company. Pipe joint compound must be used and must be resistant to the chemical reaction with liquefied petroleum gasses.
Refer to piping Table 8 for delivery sizes. Connect gas supply to the unit, using a ground joint union and a manual shut-off valve as shown in Figure 22. National codes require a condensation drip leg to be installed ahead of the controls as shown in Figure 22. A 1/2" manual shut-off valve is included with boiler.

Install the manual shut-off valve, included with boiler, in plain sight and in an accessible location within close proximity to the boiler. The valve can be installed on either the right side, left side or rear of the boiler. When the shut off valve is installed in the rear of the boiler, locate the valve above the boiler for easy access.

The boiler must be isolated from the gas supply piping by closing its individual manual shut-off valve during any pressure testing of that system at test pressure in excess of 1/2 psig.

Table 8

Natural Gas Only

Table of cubic feet per hour of gas for various pipe sizes and lengths

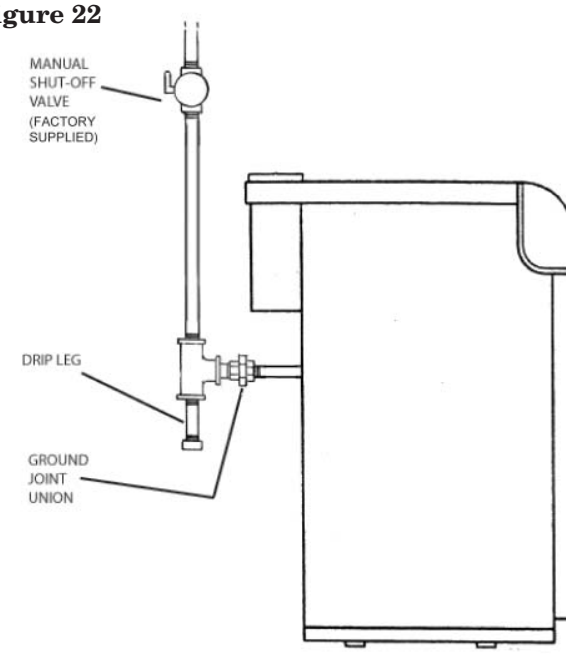
Pipe Size	Length of Pipe						
	10	20	30	40	50	60	70
1/2	132	92	73	63	56	50	46
3/4	278	190	152	130	115	105	96
1	520	350	285	245	215	195	180
1 1/4	1050	730	590	520	440	400	370

This table is based on pressure drops of 0.3 inch W.C and 0.06 SP.GR gas

IMPORTANT: If either the main inlet or outlet of the gas valve is disconnected for any reason, the flat sealing ring gasket located between the gas valve and the pipe must be replaced with a new flat sealing ring gasket to ensure a leak-proof seal. New gaskets are available as replacement parts. Spares are also shipped with the boiler, located near the gas valve. See instructions and illustrations below for re-assembly.When reconnecting the gas supply pipe or gas manifold assembly to the valve, use a new flat sealing ring gasket between the end of the pipe and the inlet (or outlet) of the valve, and engage the nut with the external threads of the valve to secure the joint. Be sure the gasket remains in place and carefully tighten the nut, hand-tight.Using an adjustable wrench, further tighten the nut ¼to ½turn (or about 2 flats) beyond hand-tight. Do not over-tighten. Be sure to use adequate opposing torque with a backing wrench, in order to prevent displacement of the gas valve or other piping.Check this and all joints for leaks according to the startup and checkout procedures found elsewhere in this document before returning the boiler to service

Figure 21A

Figure 22



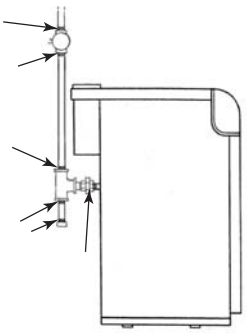
⚠ CAUTION

Use a backup wrench on the gas line when connecting the small tee, drip leg, union and manual shut off valve to prevent damage to the gas valve and manifold assembly.

Use a backup wrench on the gas line when connecting or removing pipes or fittings to or from the boiler gas lines. Note the attachment points in Figure 23.

Figure 23

Typical connections where backup wrench should be used.



NOTE: Maximum pressure to the gas valve for natural gas is 13.8" W.C. Minimum pressure is 5.0" W.C. Maximum pressure to the gas valve for propane is 13.8" W.C. Minimum pressure is 11.0" W.C.

All gas fittings must be checked for leaks using a soapy solution before lighting the boiler. DO NOT CHECK WITH AN OPEN FLAME.

3.11 LP Conversion

⚠ WARNING

ELECTRICAL HAZARD

BEFORE CARRYING OUT ANY OPERATION INSIDE THE BOILER, DICONNECT THE ELECTRICAL POWER SUPPLY AND CLOSE THE MANUAL GAS SHUT OFF VALVE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

Table 9	
Boiler Model #	LP Conversion kit Part Number
*GBWF090A93AVB	BAYLPK01AWBLRA
*GBWF130A94AVB	BAYLPK01AWBLRA
*GBWF173A95AVB	BAYLPK01AWBLRA
*GBWF215A96AVB	BAYLPK01AWBLRA
*May be “A” or “T”	

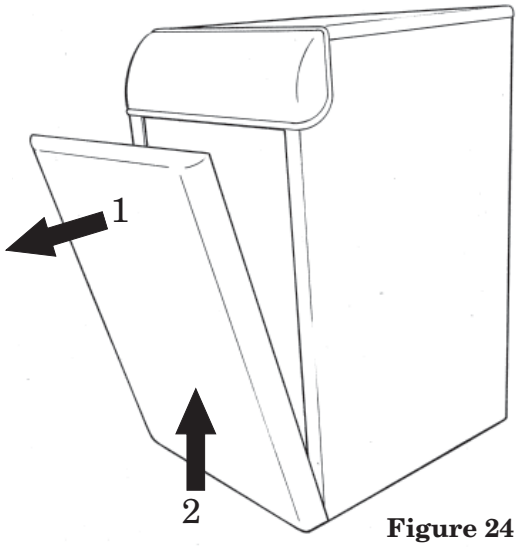


Figure 24

IMPORTANT: Liquid Propane conversion kit includes five main burner orifices and one pilot orifice. Pilot orifice MUST be changed as well as main orifices when converting boiler to use liquid propane gas.

Table 10						
LP Conversion						
Input Rating BTUH	Number of Burners	Main Burner Orifice Drill Size		Number of Pilots	Pilot Orifice Drill Size	
		Nat. Gas	LP Gas		Nat. Gas	LP Gas
90,000	2	3.1 mm	1.90 mm	1	0.40 mm	0.24 mm
130,000	3	3.1 mm	1.90 mm	1	0.40 mm	0.24 mm
173,000	4	3.1 mm	1.90 mm	1	0.40 mm	0.24 mm
215,000	5	3.1 mm	1.90 mm	1	0.40 mm	0.24 mm

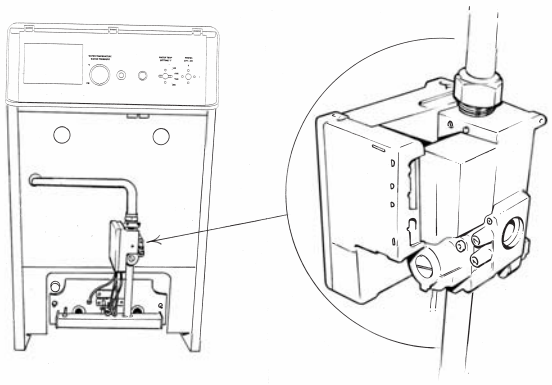
The boiler ships configured to burn Natural Gas (NG). To convert to LP use conversion kits as follows in Tables 9 and 10.

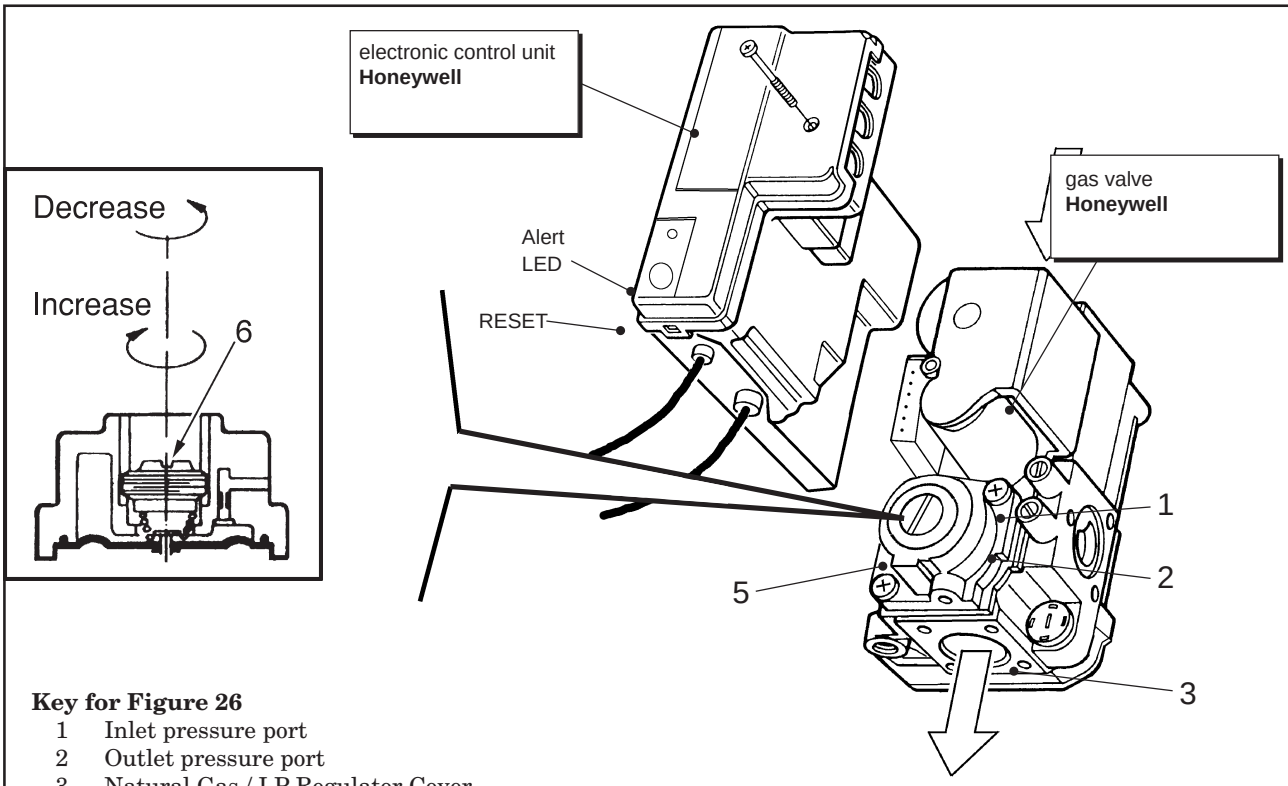
Use the following instructions to convert the boiler to Liquid Propane(LP):

NOTE: It is not necessary to disconnect gas piping or tubing from the gas valve. However, if this is done, a new flat gasket must be inserted into the gas valve connection. Flat gaskets are included with the LP conversion kit.

1. Remove boiler front access cover. First, pull at the top of the panel to rotate. Then, lift up on the panel to remove. See Figure 24.
2. Locate gas valve. See Figure 25.
3. Remove Natural Gas/Liquid Propane cover located on the gas valve using a flat blade screwdriver. See Figure 26.
4. Rotate the dial with the arrow pointing at Natural Gas to the Liquid Propane setting. See Figure 26.
5. Replace the Natural Gas/Liquid Propane cover.

Figure 25





Key for Figure 26

1 Inlet pressure port
2 Outlet pressure port
3 Natural Gas / LP Regulator Cover
4 "STEP" regulator - Natural Gas. Liquid Propane dial
5 Manifold Gas Pressure Adjustment Cover
6 Gas pressure adjustment screw

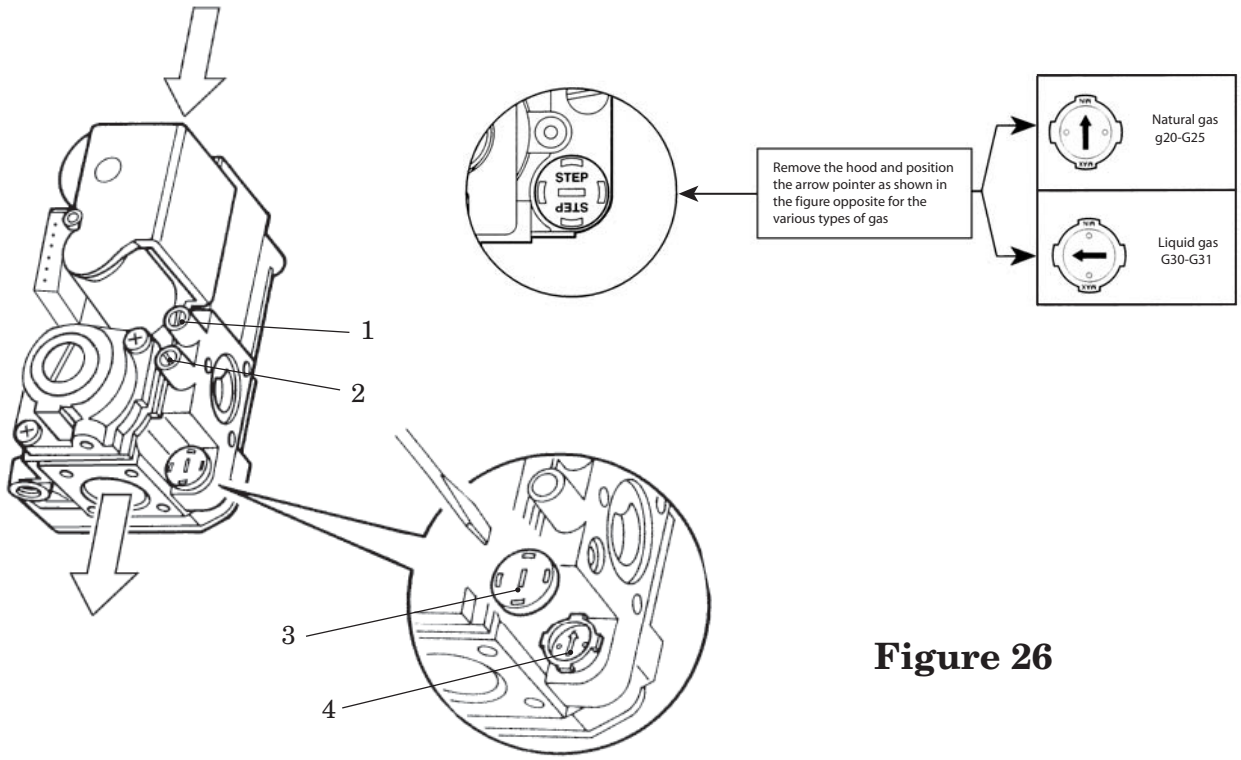


Figure 26

6. Disconnect pilot gas supply tube, flame sensor wire, and ground wire from the pilot and igniter assembly. See Figures 27.
7. Carefully remove the screws holding the pilot and igniter assembly.
8. Remove the assembly and set aside in a safe place.
9. Replace the natural gas main burner orifices in the manifold with the liquid propane orifices shipped in the LP conversion kit. See Figure 28.
10. Reattach the pilot and igniter assembly to the manifold
11. Replace the natural gas pilot orifice with the liquid propane pilot orifice shipped in the LP conversion kit. See Figire 27.
12. Reattach the pilot gas tube, flame sensor wire, and ground wire to the pilot and igniter assembly.
13. Place the adhesive backed label, shipped with the boiler, on the vestibule panel that states the boiler has been converted to LP gas. See Figure 30.
14. Before firing up the boiler, see and perform Startup and Adjustment Procedure in section 4.0 for manifold pressure adjustment.

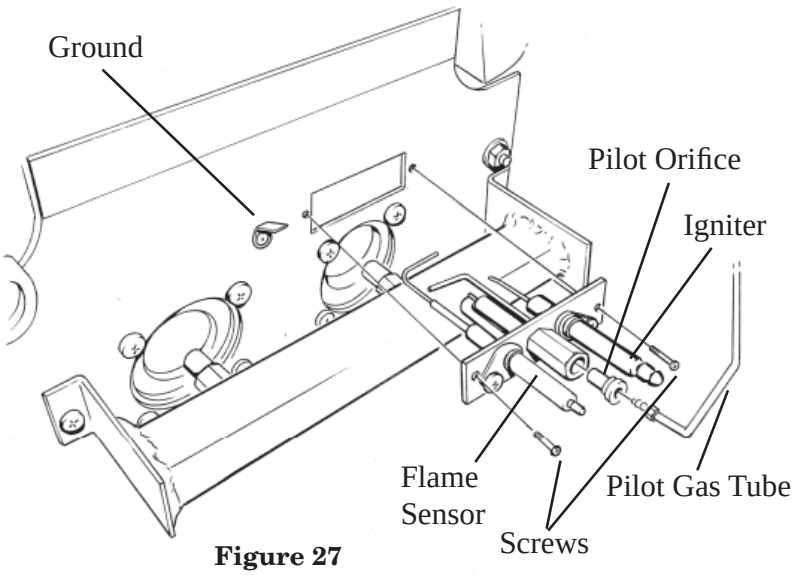


Figure 27

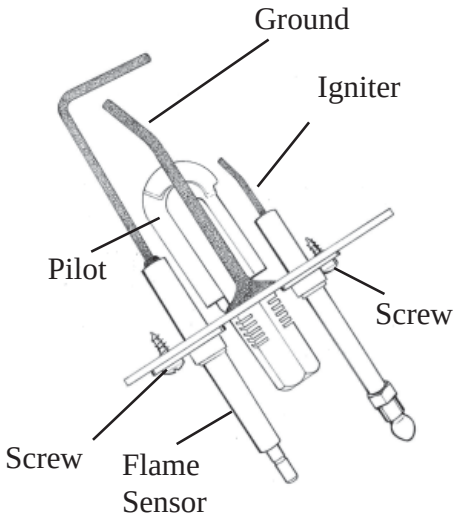


Figure 29

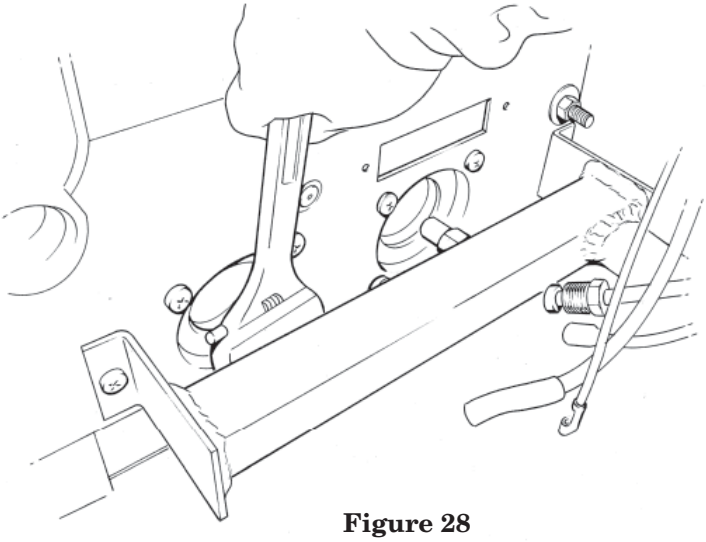


Figure 28

THIS BOILER WAS CONVERTED FOR USE WITH LP GAS
BY ..... ON ..... (SERVICER NAME AND DATE)
CHECK EACH BOX BELOW:
I.I MAIN ORIFICES CHANGED TO 1.75MM INSIDE DIAMETER
I.I PILOT ORIFICE CHANGED TO 0.24MM INSIDE DIAMETER
I.I GAS VALVE SETTING CHANGED FOR LIQUID PROPANE
I.I LP GAS SUPPLY PRESSURE LESS THAN 13.0" W. C.
I.I MANIFOLD PRESSURE ADJUSTED TO 10.6" W. C. MAX.
D155068P01

Figure 30

3.12 High Altitude Derate

This boiler is designed to operate at altitudes up to 2000 feet without adjustment. For altitudes above 2000 feet, manifold pressure and input rate must be adjusted according to Table 11 below. No orifice tube changes are necessary for typical fuel heating values. For fuels with unusual heating values, check with the local fuel provider and consult the National Fuel Gas Code for recommendations regarding orifice changes.

Table 11 - High Altitude Applications

Altitude	0-2000 Feet		2001-4000 Feet		4001-6000 Feet		6001-8000 Feet		8001-10,000 Feet	
Model	Heat Input Max. (BTU/h)	Heat Output Max. (BTU/h)	Heat Input Max. (BTU/h)	Heat Output Max. (BTU/h)	Heat Input Max. (BTU/h)	Heat Output Max. (BTU/h)	Heat Input Max. (BTU/h)	Heat Output Max. (BTU/h)	Heat Input Max. (BTU/h)	Heat Output Max. (BTU/h)
*GBWF090A93AVB	90,000	76,000	87,000	73,000	83,000	70,000	79,000	67,000	75,000	63,000
*GBWF130A94AVB	130,000	111,000	121,000	103,000	113,000	96,000	105,000	89,000	97,000	83,000
*GBWF173A95AVB	173,000	145,000	162,000	136,000	149,000	125,000	136,000	114,000	123,000	103,000
*GBWF215A96AVB	215,000	180,000	200,000	167,000	180,000	150,000	160,000	134,000	145,000	121,000
*GRWF130A94A0A	130,000	110,000	121,000	102,000	113,000	96,000	105,000	89,000	97,000	82,000
Max. NG manifold pressure (In. W.C.)	3.6		3.4		3.2		3.0		2.8	
Max. LP manifold pressure (In. W.C.)	10.6		10.1		9.6		9.1		8.5	
* May be “A” or “T”										

3.13 Lighting Instructions

DO NOT ATTEMPT TO MANUALLY LIGHT THE BURNER. THIS BOILER IS EQUIPPED WITH AN ELECTRONIC (SPARK TO PILOT) IGNITION SYSTEM.

Each installation must be checked out at the time of initial start up to insure proper operation of all components. Check out should include putting the unit through several complete cycles as outlined in the following.

Turn on the main electrical supply and set the thermostat above the indicated temperature. The electronic ignition control will automatically generate a spark, then the gas valve is energized to permit the flow of gas to the burners. After ignition and flame is established, the flame control module monitors the flame and supplies power to the gas valve until the thermostat is satisfied.

The control will attempt to light for 51 seconds and then lock out. To restart the ignition sequence, the reset button must be depressed. After three manual resets within 15 minutes, the control module will go into a hard lockout. To restart the ignition sequence, power to the boiler must be turned off and then on before the ignition sequence can start again.

To Shut Off System

For complete shutdown: Close the manual shut off valve located in the supply gas line. Disconnect the electrical supply to the unit.

⚠ CAUTION

If this is done during the cold weather months, provisions must be taken to prevent freeze-up of all water pipes and water receptacles. Failure to follow this caution could result in property damage.

⚠ CAUTION

If the boiler is left operational and unattended for any extended periods of time, provisions must be taken periodically to ensure the system operation. This is especially important in below freezing weather. If for any reason your boiler should fail to operate, damage could result, such as frozen water pipes.

3.14 Installation Instructions for replacing the Factory Installed Automatic-reset Water Temperature Limit with the Optional Manual Reset Water Temperature Limit Accessory

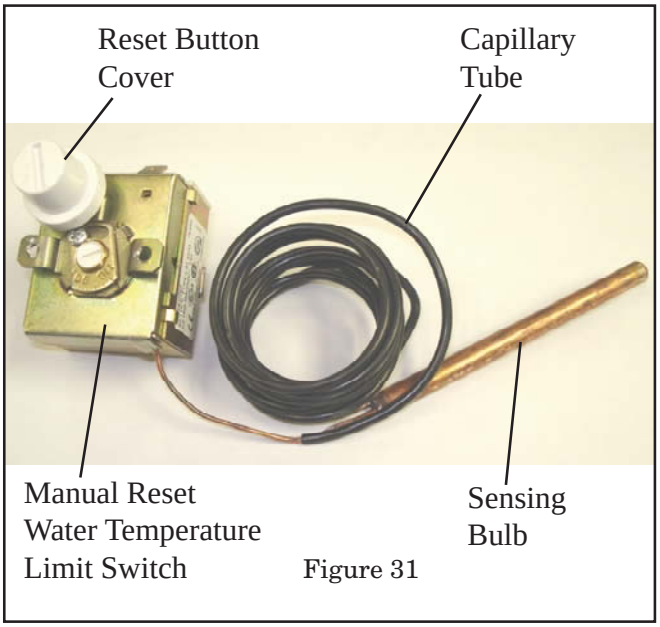


Figure 31

REMOVING THE EXISTING AUTO-RESET WATER TEMPERATURE LIMIT

⚠ WARNING

ELECTRICAL HAZARD

SHUT OFF POWER TO THE BOILER BEFORE BEGINNING THIS INSTALLATION.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

Steps to remove the existing auto-reset water temperature limit switch.

1. Open the control panel and locate the existing auto-reset water temperature limit. See Figures 32 and 33.

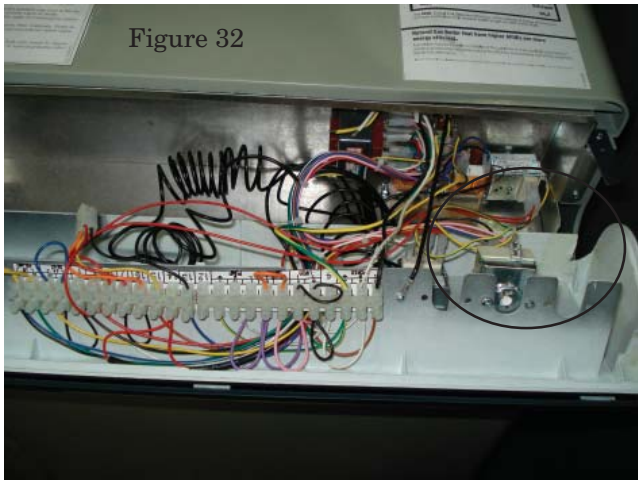


Figure 32

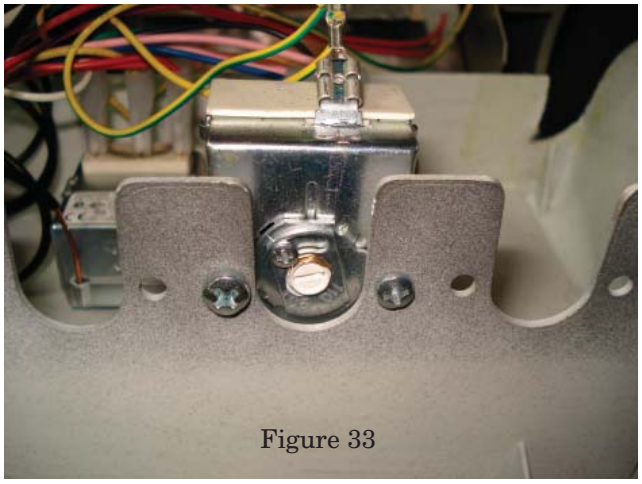


Figure 33

2. Remove the existing auto-reset water temperature limit and discard the screws. See Figure 34.

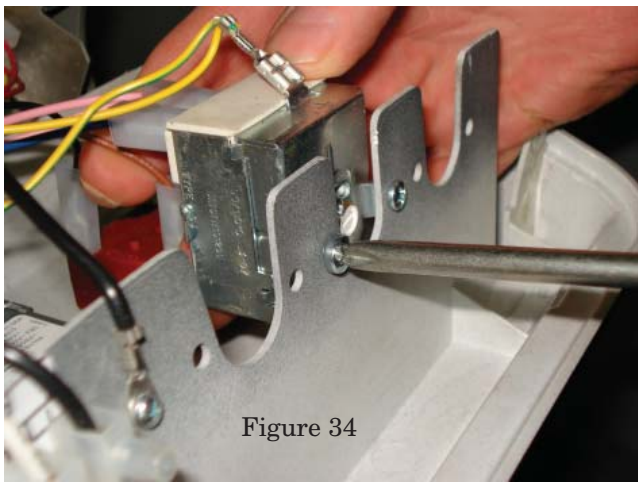


Figure 34

3. Remove the wires from the existing auto-reset water temperature limit. See Figure 35.

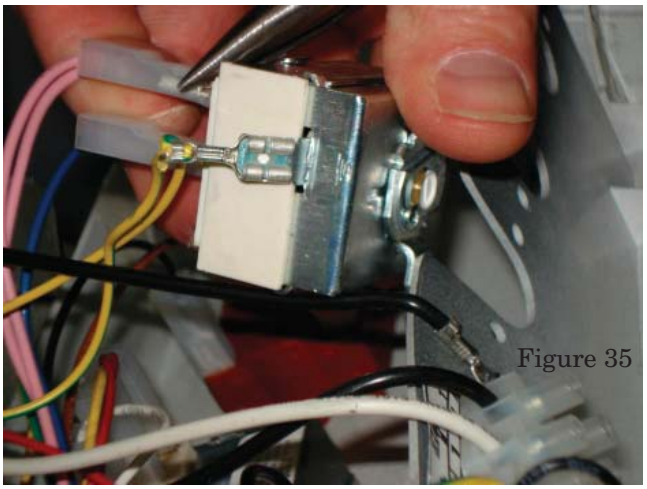


Figure 35

4. Remove the panel to gain access to the strain relief cable clamp. See Figure 36.

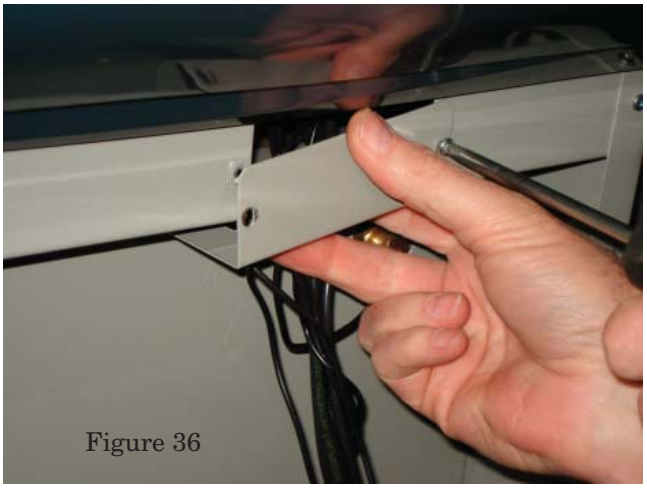


Figure 36

5. Loosen the strain relief cable clamp with a screwdriver. See Figure 37.

Figure 37

6. Remove the cable ties to isolate and remove the capillary tube of the existing auto-reset water temperature limit switch. See Figure 38.

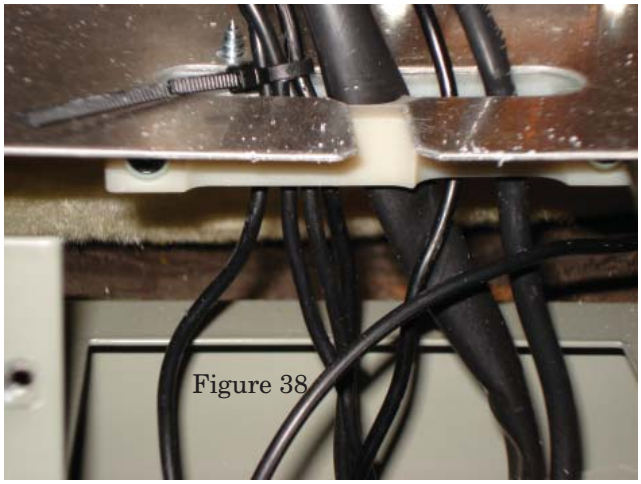


Figure 38

7. Remove the spring clip and the sensing bulb of the existing auto-reset water temperature limit switch from the boiler temperature well. Do not remove the bulbs of the adjustable supply water thermostat and temperature gauge. See Figure 39.

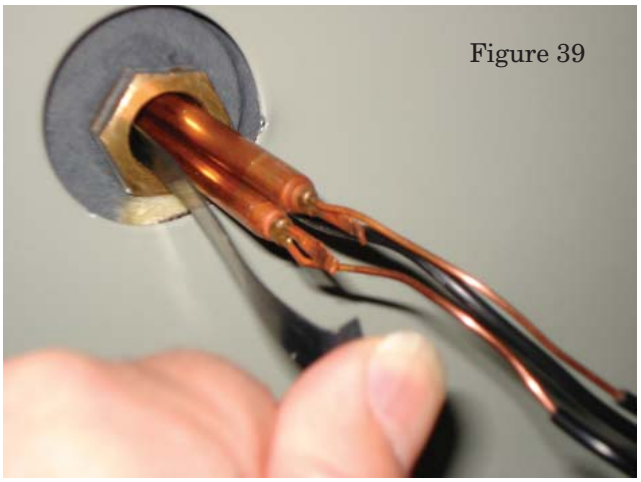


Figure 39

8. Locate the capillary tube of the existing auto-reset water temperature limit and remove it from the strain relief clamp. See Figure 40.

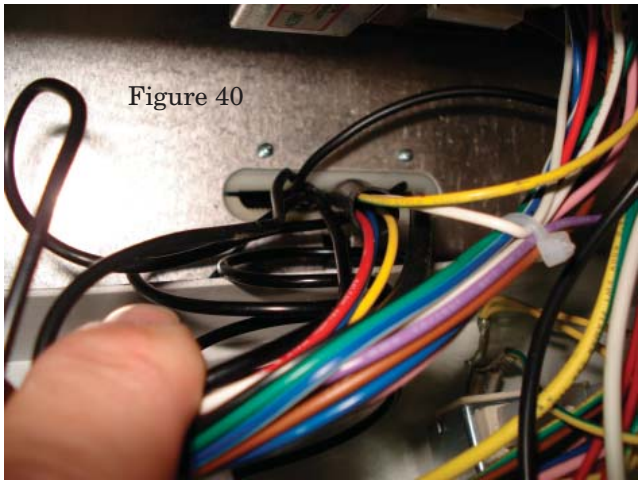


Figure 40

INSTALLING THE NEW MANUAL-RESET WATER TEMPERATURE LIMIT

1. Remove the cover from the reset button on the new manual reset water temperature limit switch by turning counter clockwise. See Figure 41.

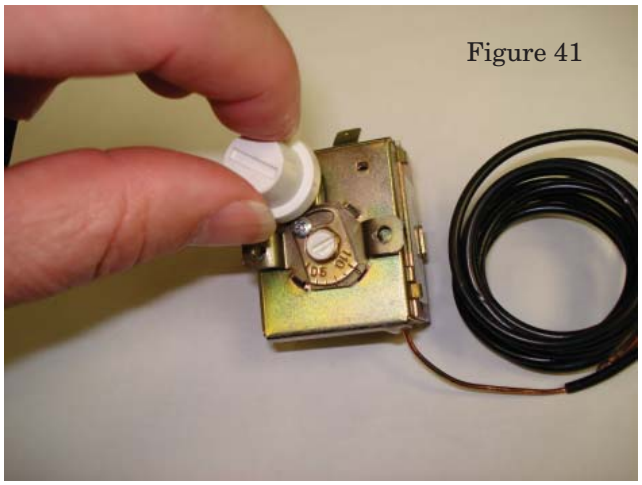


Figure 41

2. In a similar manner, remove the locking nut from the new manual reset water temperature limit. See Figure 42.

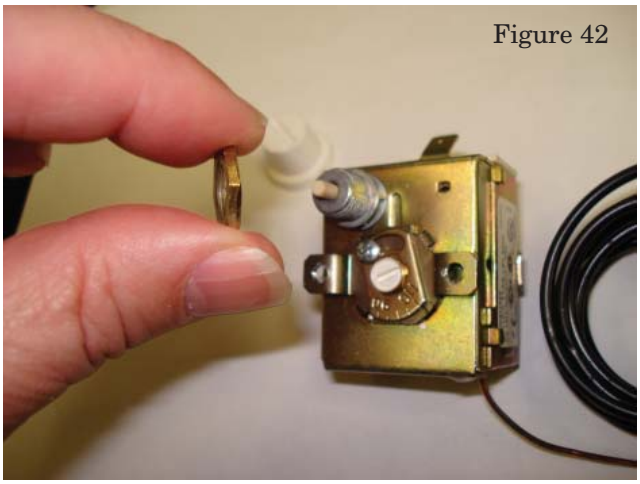


Figure 42

3. Insert the manual reset push button of the water temperature limit through the hole in the control panel. See Figure 43.

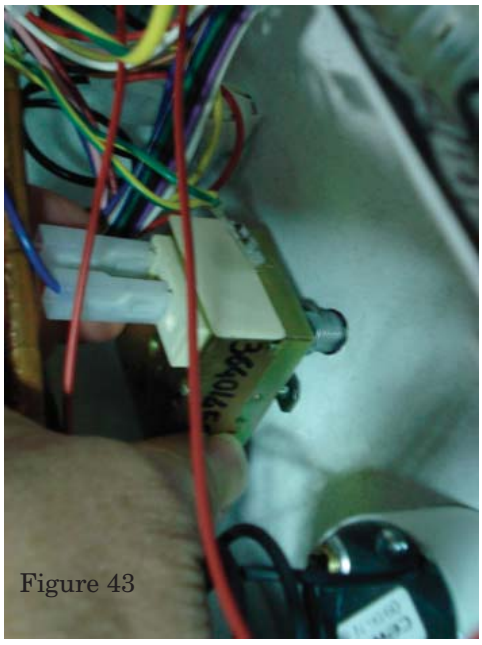


Figure 43

4. Center the reset button in the hole and secure with a locking nut. Use needle nose pliers. See Figure 44.

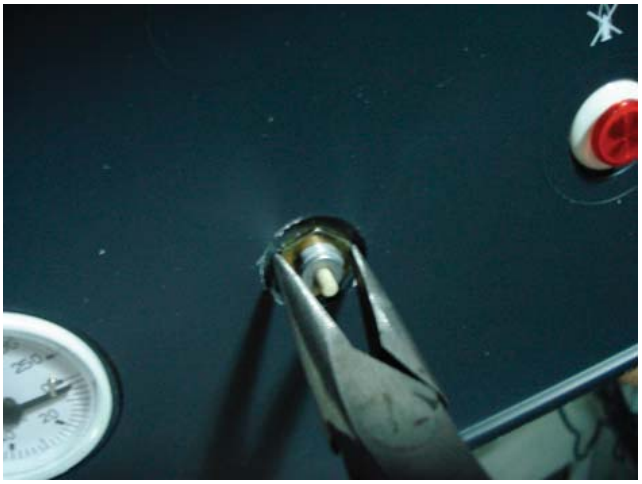


Figure 44

5. Replace the reset button cover on the new manual reset water temperature limit switch. See Figure 45.

Figure 45

6. Attach the wires removed earlier from the auto-reset water temperature limit to the new manual water temperature limit. See Figure 46.

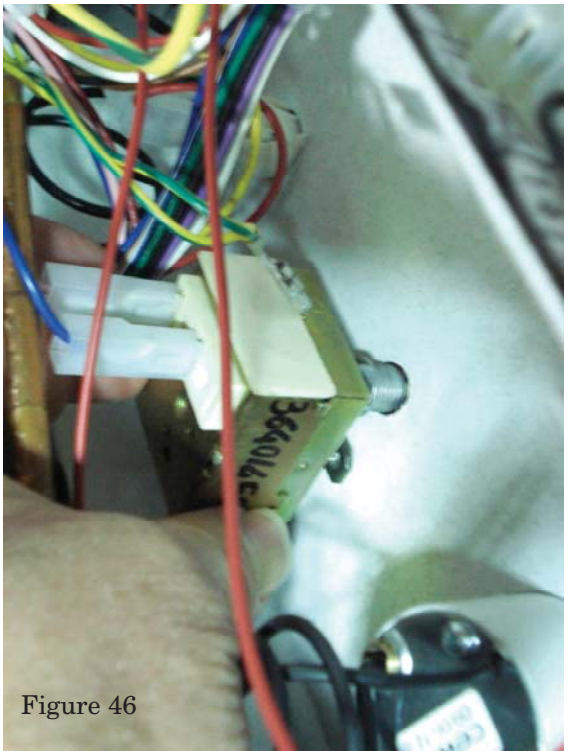


Figure 46

7. Carefully unroll the capillary tube of the new manual reset water temperature limit and feed the sensing bulb through the strain relief clamp. See Figure 47.

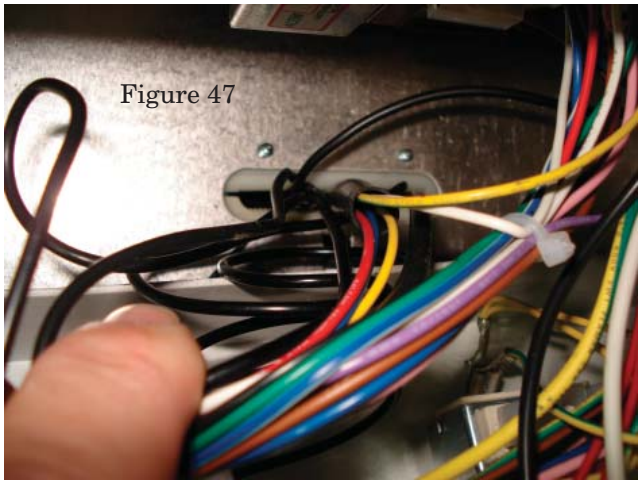


Figure 47

8. Place the bulb of the new manual reset water temperature limit along with the existing adjustable supply water thermostat and thermometer gauge bulbs in the boiler temperature well and secure with a spring clip. See Figure 48.

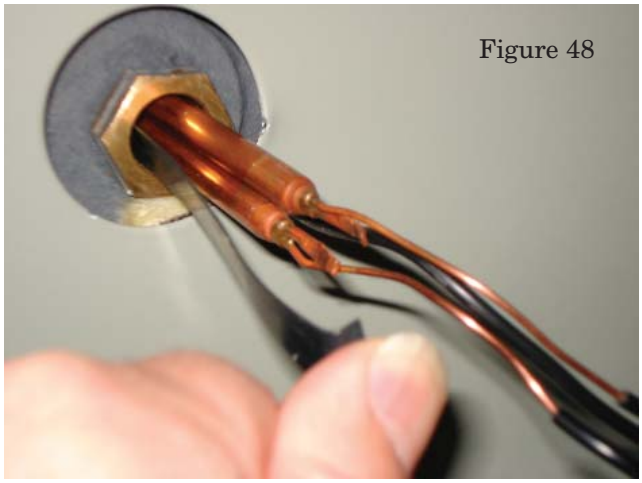


Figure 48

9. Route the capillary tube of the manual reset water temperature limit with the other capillary tubes, dress neatly and secure with new cable ties. See Figure 49.

Figure 49

10. Tighten the strain relief cable clamp with a screwdriver. See Figure 50.

Figure 50

11. Replace the strain relief access panel, close and secure the control box, and replace the front and top boiler panels. Restore power and check out limit switch operation per boiler installation instructions. See Figure 51.

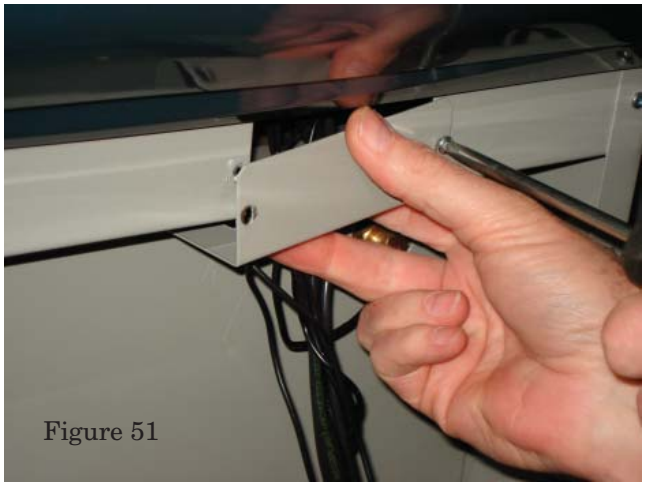


Figure 51

3.15 Electrical Connections

⚠ WARNING

TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS, LOCK UNIT DISCONNECT SWITCH IN THE OPEN POSITION BEFORE SERVICING THE UNIT.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

THE CABINET MUST HAVE AN UNINTERRUPTED OR UNBROKEN GROUND ACCORDING TO NATIONAL ELECTRICAL CODE, ANSI/NFPA 70- "LATEST EDITION' AND CANADIAN ELECTRICAL CODE, CSA C22.1 OR LOCAL CODES TO MINIMIZE PERSONAL INJURY IF AN ELECTRICAL FAULT SHOULD OCCUR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN ELECTRICAL SHOCK, PERSONAL INJURY OR DEATH.

⚠ CAUTION

The integrated boiler control is polarity sensitive. The hot leg of the 115 VAC power must be connected to the BLACK field lead.

The boiler must be installed in accordance with local codes; or in the absence of local codes, with the National Electrical Code, ANSI/NFPS 70 "latest edition" or Canadian Electrical Code, CSA C22.1.

Connection to the power supply

The boiler must be connected to single-phase, 115 Volt-60 Hz electric service.

Three holes for 1/2" conduit connections are located on the back of the control box.

ELECTRICAL CONTROL BOX

To access the electrical components and the low voltage terminals inside the control box, follow the sequence in Figures 52 and 53.

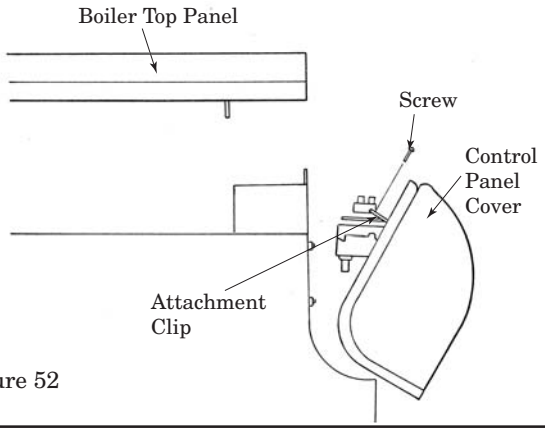


Figure 52

Field wiring diagrams are provided starting on page 43.

NOTE: DO NOT use the gas pipes to ground electrical appliances.

Opening the front panel

To open the front panel, see the sequence in Figure 51. At top of front panel, pull edges of the panel forward. The panel will rotate on bottom hinge brackets. Then remove panel off of hinges at bottom of the panel by lifting upwards.

⚠ WARNING

BEFORE CARRYING OUT ANY OPERATION INSIDE THE BOILER, DISCONNECT THE ELECTRICAL POWER SUPPLY AND CLOSE THE MANUAL GAS SHUT OFF VALVE.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

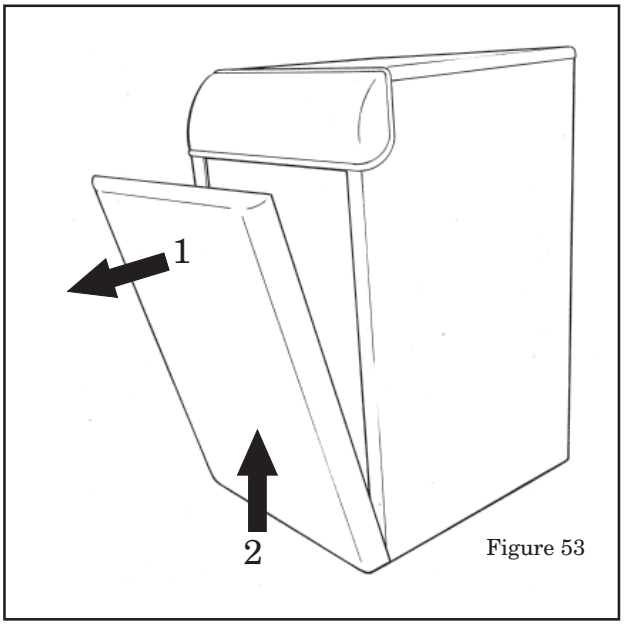


Figure 53

Make wiring connections to the boiler as indicated on enclosed wiring diagram. As with all gas appliances using electrical power, this boiler shall be connected into a permanently live electric circuit. It is recommended that it be provided with a separate "circuit protection device" electric circuit. The boiler must be electrically grounded in accordance with local codes; or in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70 "latest edition" or Canadian Electrical Code, CSA C22.1.

All field supplied wiring must be NEC Type T copper wire [167° F. (75° C)] installed in accordance with these instructions and wiring diagrams supplied with the boiler. A disconnecting means must be located, visible and readily accessible to the boiler.

You may also refer to the SERVICE FACTS literature for the boiler wiring diagrams.

3.16 Supply Water Thermostat (SWT) Settings Above 180°F

The adjustable SWT knob includes a factory installed rotation stop that prevents supply water temperature settings below 140°F or above 180°F. Under no circumstances should the SWT knob be modified to allow temperature settings below 140°F. Lower settings may allow corrosive condensation from flue products, decreasing the life of the boiler.

Some applications may call for supply water temperature settings above 180°F. For these applications, the SWT rotation stop may be modified to allow the SWT to be set as high as 194°F. (Note: modifying the stop to allow higher maximum setting will also result in a corresponding increase in the minimum SWT temperature setting.)

Follow the steps below to reset the SWT rotation stop to allow water temperature settings up 194°F:

1. Remove the knob from the adjustable SWT by pulling the knob directly outward away from the boiler.
2. Look on the back of the knob and find the metal rotation stop in one of the numbered positions (see Figure 54). This metal stop should have been factory set to position 1 or 7.
3. Remove the metal stop from the knob by grasping it firmly with needle nose pliers and pulling it directly outward. See Figure 55.
4. Place the metal stop in position 5 by grasping it firmly with needle nose pliers (see Figure 56) and pushing it directly inward. Note: Positions 1, 5 and 7 are the only approved locations for the SWT rotation stop.
5. Replace the modified knob by aligning with the flat on the shaft of the SWT and pushing firmly on the SWT. Make sure that the indicator mark on the front of the knob is between the proper modified setting range as marked on the boiler. If not, remove the knob and rotate the shaft of the SWT as appropriate so that the indicated adjustment range will be between approximately 155°F and 195°F.

Figure 54

Figure 55

Figure 56

4.0 Start-Up and Adjustment

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS FOR THE VENTING SYSTEM BEING PLACED INTO OPERATION COULD RESULT IN CARBON MONOXIDE POISONING OR DEATH.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE

⚠ WARNING

FIRE OR EXPLOSION HAZARD

FAILURE TO FOLLOW STARTUP AND CHECK-OUT PROCEDURES COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

Boiler Label

The boiler is shipped with a label on the front of the unit that includes operating instructions. Read all of the information on the label before starting the boiler.

Figure 57 - Boiler label

FOR YOUR SAFETY READ BEFORE OPERATING

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

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

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

WHAT TO DO IF YOU SMELL GAS
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. 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.

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

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Turn off all electric power to the appliance.
3. Set the thermostat to lowest setting.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Open the manual ON/OFF valve located in the supply gas line.
6. Wait five (5) minutes to clear out any gas. Then smell for gas including near the floor. If you do smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
7. Set thermostat to desired setting.
8. Turn on all electric power to the appliance.
9. Turn the boiler ON/OFF switch to ON. The boiler will begin to function automatically. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

cod. 3540F690

TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the appliance if service is to be performed.
2. Set the thermostat to lowest setting.
3. Turn the boiler ON/OFF switch to OFF
4. Close the manual ON/OFF valve located in the supply line

4.1 Preliminary Inspections

System Start-Up and Adjustment must be carried out by qualified installers.

The following checks must be made at Start-Up and whenever maintenance or service is performed:

With gas and electrical power "OFF"

1. Verify the boiler system is filled with water and make sure all the air in the boiler and the system has been vented.
2. Verify there are no water leaks in the boiler or system.
3. Verify the electrical system is properly connected and grounded.
4. Visually inspect the venting system for proper size, horizontal pitch and vent termination, and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
5. Determine that the chimney or vent is acceptable to the authority having jurisdiction.
6. Make sure there are no combustible materials or flammable liquids in the same room with the boiler.
7. Open the manual On/Off valve, located in the supply gas line. See Figure 22. Check all gas connections for leaks with a soapy solution - **DO NOT CHECK WITH AN OPEN FLAME.**

Figure 58

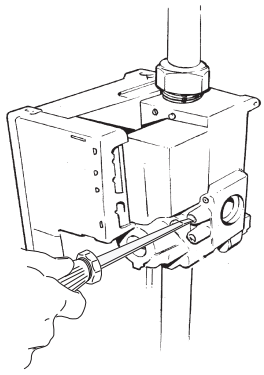
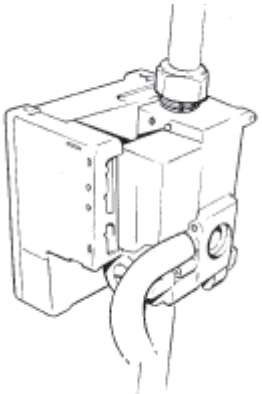


Figure 59



Check Supply Gas Pressure

1. Disconnect power to the boiler.
2. Make sure all gas appliances are off, including the boiler.
3. Verify the automatic vent damper service switch is in the automatic position (see Figure 20).
4. Open inlet pressure port located in gas valve. To open valve, use a screwdriver. See Figure 58. It takes a full turn of the screwdriver to open the valve. Do not unscrew more than one complete turn. Supply pressure can not be read until the gas valve has been energized.
5. Attach flexible tubing from manometer to the inlet pressure port. See Figure 59.
6. Open the manual On/Off valve located in the supply gas line.
7. Verify static inlet pressure is between 7-14" Water Column (W.C.). If the pressure is not in this range, do NOT operate the boiler until the inlet pressure has been adjusted to fall within this range.
8. Reconnect power to the boiler and cycle on. The boiler must be operating to check the supply gas pressure.
9. Close the manual On/Off valve. Remove the flexible tubing from inlet port and close the inlet pressure port using a screwdriver.
10. Close the manual On/Off valve located in the supply gas line.

Combustion and Input Check

1. Make sure all gas appliances are off except the boiler. Open the manual On/Off gas valve and turn on the electrical power to the boiler.
2. Set the room thermostat for continuous heating operation as required.
3. Turn the boiler On/Off power switch to On. Turn the boiler supply water thermostat knob to the desired setting. The boiler will begin to function automatically.
4. As the boiler is energized, verify operation of the automatic vent damper. The damper must be in the open position before combustion takes place. The damper must be in the open position when the appliance main burners are operating. The gas valve must be closed before the damper begins its return to the closed position.

Table 12	
Final Manifold Pressure Settings	
Fuel	Pressure
Natural Gas	3.5" W.C.
LP Gas	10.6" W.C.

Table 13							
Gas Flow in Cubic Feet Per Hour							
2 Cubic Foot Dial							
Sec.	Flow	Sec.	Flow	Sec.	Flow	Sec.	Flow
8	900	29	248	50	144	82	88
9	800	30	240	51	141	84	86
10	720	31	232	52	138	86	84
11	655	32	225	53	136	88	82
12	600	33	218	54	133	90	80
13	555	34	212	55	131	92	78
14	514	35	206	56	129	94	76
15	480	36	200	57	126	96	75
16	450	37	195	58	124	98	73
17	424	38	189	59	122	100	72
18	400	39	185	60	120	104	69
19	397	40	180	62	116	108	67
20	360	41	176	64	112	112	64
21	343	42	172	66	109	116	62
22	327	43	137	68	106	120	60
23	313	44	134	70	103	124	58
24	300	45	130	72	100	128	56
25	288	46	157	74	97	132	54
26	277	47	153	76	95	136	53
27	267	48	150	78	92	140	51
28	257	49	147	80	90	144	50

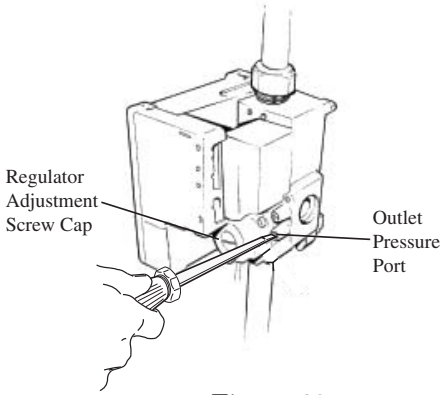


Figure 60

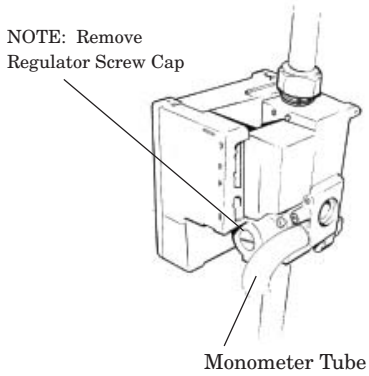


Figure 61

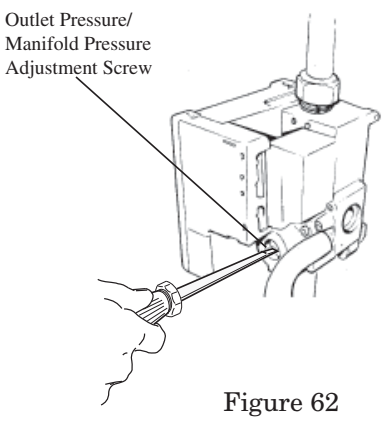


Figure 62

If the boiler does not light, refer to the Troubleshooting section of the Service Facts, shipped with the boiler.

5. Clock the gas meter with the boiler operating (determine the dial rating of the meter) for one revolution.
6. Match the "Sec" column opposite the number of seconds checked in Table 13.
7. Read the "Flow" column opposite the number of seconds clocked.
8. Use the following factors if necessary:

   For 1 Cu. Ft. Dial Gas Flow CFH =
   Chart Flow Reading /2

   For 1/2 Cu. Ft. Dial Gas Flow CFH =
   Chart Flow Reading /4

   For 5 Cu. Ft. Dial Gas Flow CFH =
   10X Chart Flow Reading /4
9. Multiply the final figure by the heating value of the gas obtained from the utility company and compare to the nameplate rating. This must not exceed the nameplate rating.
10. Changes can be made by adjusting the manifold pressure. To adjust the manifold pressure:

    a) Turn off all electrical power to the boiler and close the manual On/Off gas valve.

    b) Open outlet pressure port located in gas valve. (To open valve, use a screwdriver). See Figure 60.

    c) Attach flexible tubing from manometer to the gas valve outlet pressure port. See Figure 61.

    d) Remove the regulator adjustment screw cap on the gas valve for manifold pressure adjustment. See Figures 26 and 62.

    e) Open the manual On/Off gas valve and turn on the electrical power to the boiler. Energize gas valve by setting thermostat above room temperature.

    f) Adjust manifold gas pressure, as needed, to achieve desired input capacity. To accomplish this, turn the adjustment screw clockwise to increase the gas flow rate and counterclockwise to decrease the gas flow rate using an flat-head screwdriver. See Figure 62.

    g) The final manifold pressure setting shall be 3" W.C.

    h) Close manual On/Off gas valve.

    i) Remove the manometer flexible tubing from outlet pressure port and close the outlet pressure port using a screwdriver.

    j) Replace the regulator adjustment screw cap and tighten securely.

    k) Open manual On/Off gas valve and then turn on electrical power to the boiler.

    l) Using a soap solution, check for gas leaks at the pressure ports and manifold adjustment cover.

⚠ WARNING

SAFETY HAZARD

REPLACE AND/OR TIGHTEN ALL PLUGS REMOVED WHEN ADJUSTING GAS PRESSURE. LEAK CHECK THE FITTING BEFORE PLACING THE BOILER INTO REGULAR SERVICE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN FIRE, EXPLOSION, OR PROPERTY DAMAGE. IMPROPER INSTALLATION, MAINTENANCE OR SERVICING COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

For LP gasses, the final manifold pressure setting shall be 10.6" W.C. with an input of no more than the nameplate rating and not less than 93% of the nameplate rating, unless the unit is derated for altitude.

⚠ CAUTION

If, after correctly carrying out the lighting procedure, the burners do not light and the pushbutton light comes on, wait about 15 seconds and then press the abovementioned pushbutton. The reset controller will repeat the ignition cycle. If the burners do not light after the second attempt, consult paragraph the "Troubleshooting" section in the Service Facts.

⚠ CAUTION

In case of an electrical power failure while the boiler is working, the burners will go out and re-ignite automatically when power is restored.

Re-verify the operation of the automatic vent damper three times with the boiler operating controls for proper sequence. The damper must be in the open position before combustion takes place. The damper must be in the open position when the main burners are on. The gas valve must be closed before the damper begins its return to the closed position.

Determine that the water pump(s) are operating properly.

Test low water cutoffs, automatic feed controls, pressure, and temperature limit controls, and relief valves to determine they are in operating condition.

4.2 Operating Information

Flue Spillage Switch and Flue Outlet
All models are equipped with a thermostatic spill switch. In case of flue spillage, the device will cause the circuit to open which shuts off all flow of gas.

Test for spillage at the draft hood relief opening. Make sure the vent system is drafting properly.

Conditions affecting System Operation

1. FLUE BLOCKAGE
   If the flue is blocked, the thermostatic spill switch will shut off the gas valve until the blockage is removed.
2. LOSS OF FLAME OR GAS SUPPLY FAILURE
   If loss of flame occurs during a heating cycle (when flame is not present at the sensor), the control will attempt to light for 51 seconds and then lock out. To restart the ignition sequence, the reset button must be depressed. After three manual resets within 15 minutes, the control module will go into a hard lockout. To restart the ignition sequence, power to the boiler must be turned off and then on before the ignition sequence can start again

Control and Safety Switch Adjustment

Limit Switch Check Out
The limit switch is a safety device designed to shut off the burner should the boiler become overheated. Since proper operation of this switch is important to the safety of the unit, it must be checked out on initial start up by the installer.

IMPORTANT: To check for proper operation of the Water Temperature Limit switch (WTL), shut off the power to the boiler and TEMPORARILY bypass the supply water thermostat (SWT) with a TEMPORARY JUMPER. TEMPORARILY remove power from the boiler water circulator pump and restore power to the boiler. Burners should come on and operate. Closely monitor the water temperature. DO NOT allow the boiler to overheat excessively during the checkout of the WTL limit switch. When the boiler water temperature reaches 230°F, the burners should turn off automatically. Immediately shut off power to the boiler if the burners did not shut off automatically as the water temperature reached 230°F. The WTL limit switch must be replaced and proper operation of the new WTL verified.

After the boiler cools, REMOVE THE JUMPER from the SWT and RESTORE POWER to the boiler and the boiler water circulator pump.

⚠ WARNING

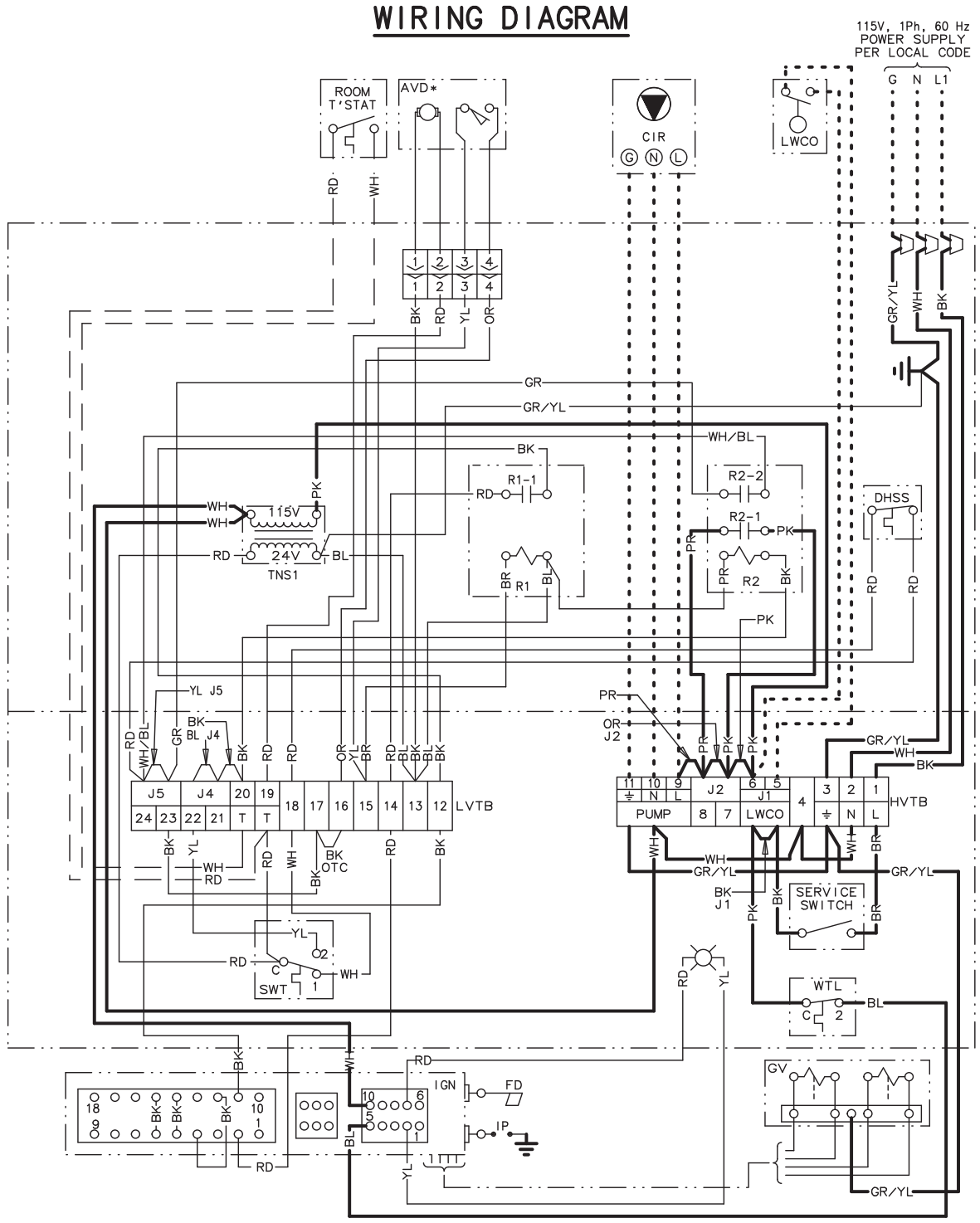
CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously. 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.
7. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z221.1/NFPA 54 and/or CAN/CGA B149 Installation Codes.
8. After it has been determined that each appliance connected to the venting system properly vents where tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

5.0 Technical Data
5.1 Electrical Diagrams



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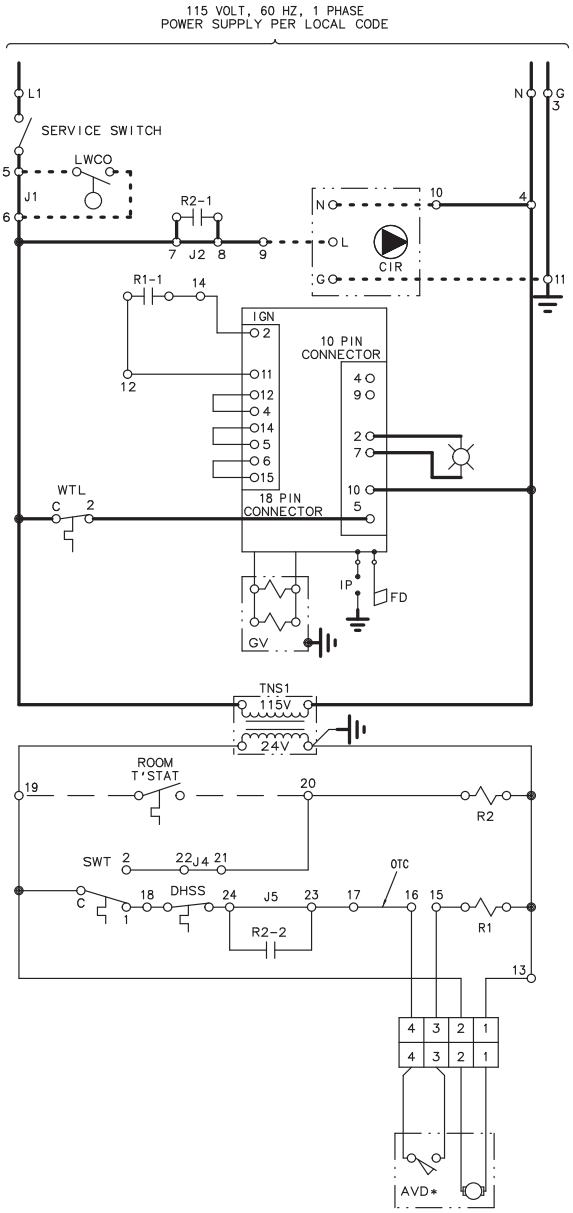
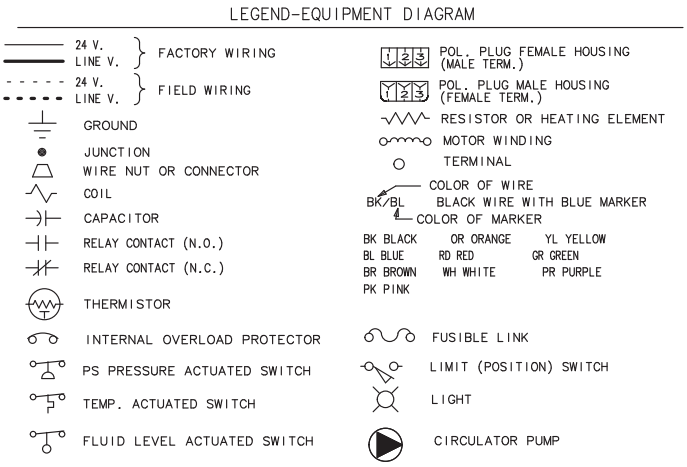
5.2 Schematic Diagrams





BLACK OTC JUMPER (REMOVE WHEN CONNECTING FIELD SUPPLIED OUTDOOR TEMPERATURE COMPENSATION OR BOILER RESET CONTROL)
BLACK J1 LWCO JUMPER (REMOVE WHEN CONNECTING FIELD SUPPLIED LWCO).
ORANGE J2 PUMP CONTROL JUMPER
(SHORT = CONTINUOUS, OPEN = ONLY DURING HEAT DEMAND).
BLUE J4 PUMP OVER RUN JUMPER
(SHORT = OVER RUN WITHOUT HEAT DEMAND, OPEN = NO OVER RUN).
YELLOW J5 JUMPER (SHORT = BURNER CYCLED BY SWT ONLY;
OPEN = BURNER STARTS ONLY WHEN BOTH SWT AND ROOM THERMOSTAT ARE CLOSED AND BURNER STOPS WHEN EITHER ROOM THERMOSTAT OR SWT OPENS).

LWCO - LOW WATER CUT OFF (FIELD SUPPLIED - CONNECT PER MANUFACTURERS INSTRUCTIONS).
*AVD - AUTOMATIC VENT DAMPER (ATMOSPHERIC MODELS ONLY) - FACTORY PROVIDED, FIELD INSTALLED.
PS - PRESSURE SWITCH (INDUCED DRAFT ONLY)
IP - IGNITOR PROBE
FD - FLAME DETECTOR
IGN - IGNITION CONTROL MODULE
SWT - SUPPLY WATER THERMOSTAT
WTL - WATER TEMPERATURE LIMIT SWITCH
CIR - CIRCULATOR PUMP (FIELD SUPPLIED)
CFM - COMBUSTION FAN MOTOR (INDUCED DRAFT ONLY)
FL - FUSIBLE LINK
GV - GAS VALVE
TNS1 - 24V CONTROL POWER TRANSFORMER
DHSS - DRAFT HOOD SPILLAGE SWITCH (ATMOSPHERIC MODELS ONLY)
HVTB - HIGH VOLTAGE TERMINAL BLOCK (115V)
LVTB - LOW VOLTAGE TERMINAL BLOCK

NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED IN THIS UNIT MUST BE REPLACED, REPLACE IT WITH APPLIANCE WIRING MATERIAL RATED AT 105°C.

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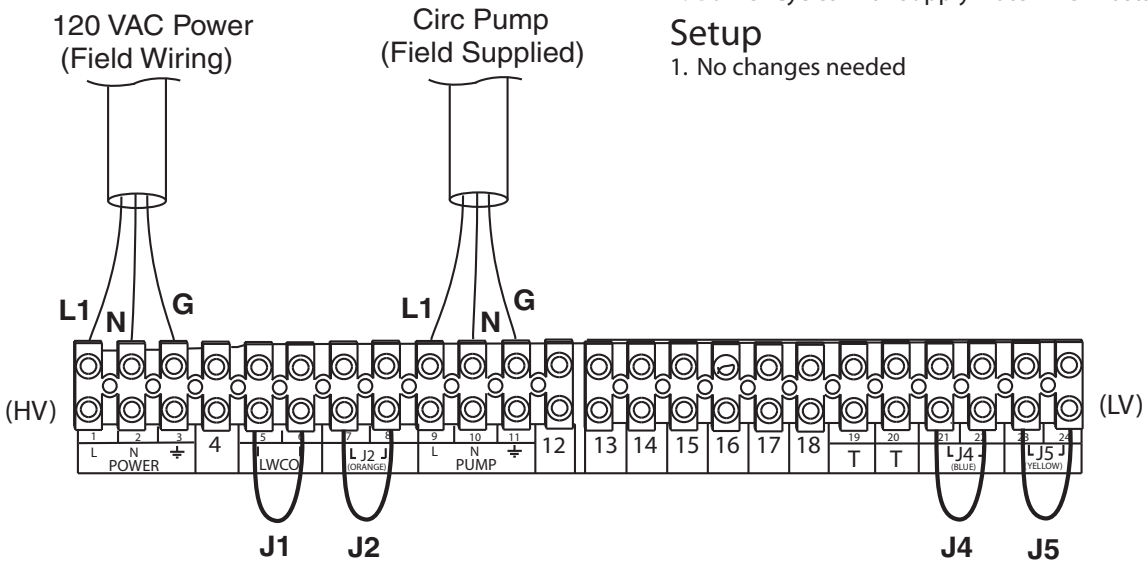
5.3 Field Wiring Diagrams

Option 1 - **Factory Jumpers in Place**

Note: Boiler ships with the following jumpers in place:



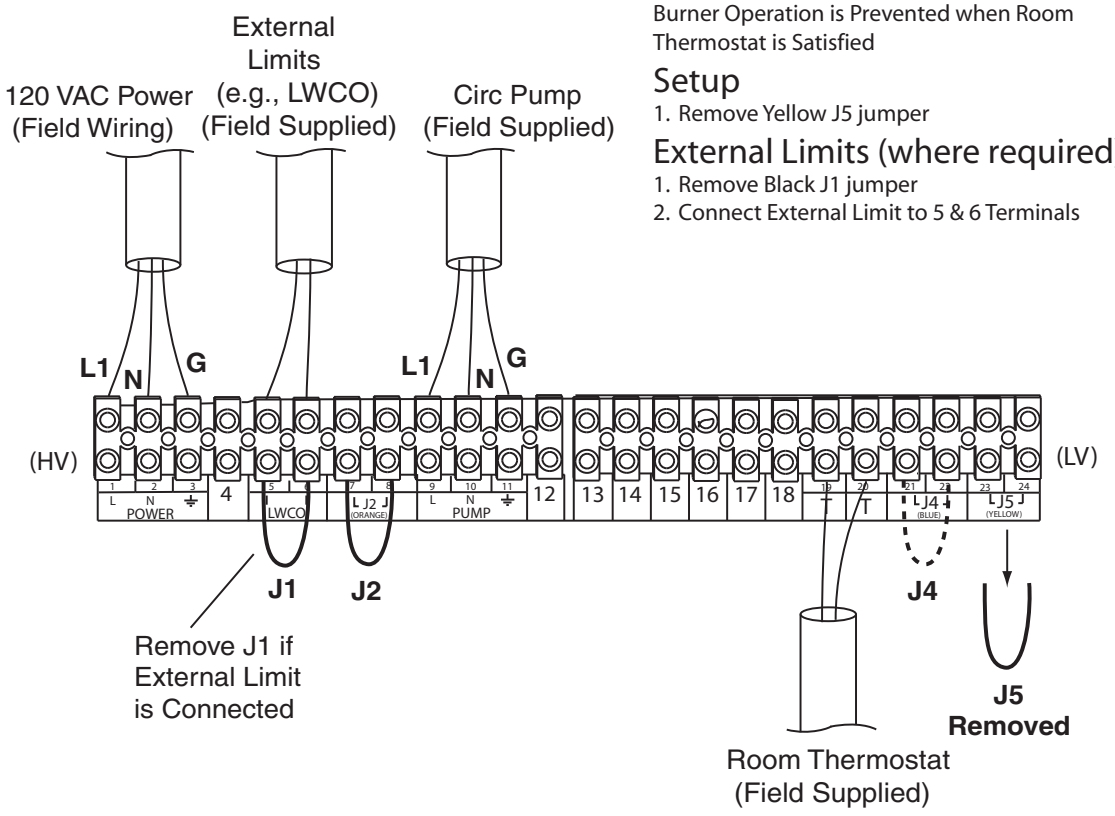
System Configuration

1. Continuous Pump Operation
2. Burner Cycles With Supply Water Thermostat

Setup

1. No changes needed

Option 2 - Field Installed Room Thermostat, Yellow J5 jumper removed



System Configuration

1. Continuous Pump Operation
2. Burner Cycles with Supply Water Thermostat when Call from Room Thermostat is present; Burner Operation is Prevented when Room Thermostat is Satisfied

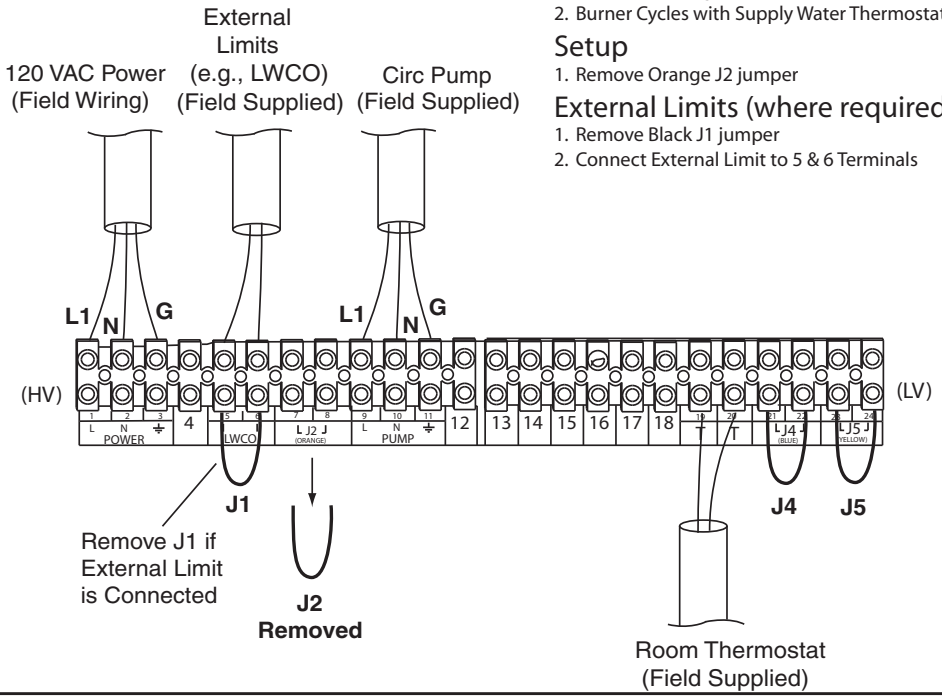
Setup

1. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 3 - Field Installed Room Thermostat, Orange J2 jumper removed



System Configuration

1. Pump Runs on Call from Room Thermostat OR if Water Temperature is Above Supply Water Thermostat setting
2. Burner Cycles with Supply Water Thermostat

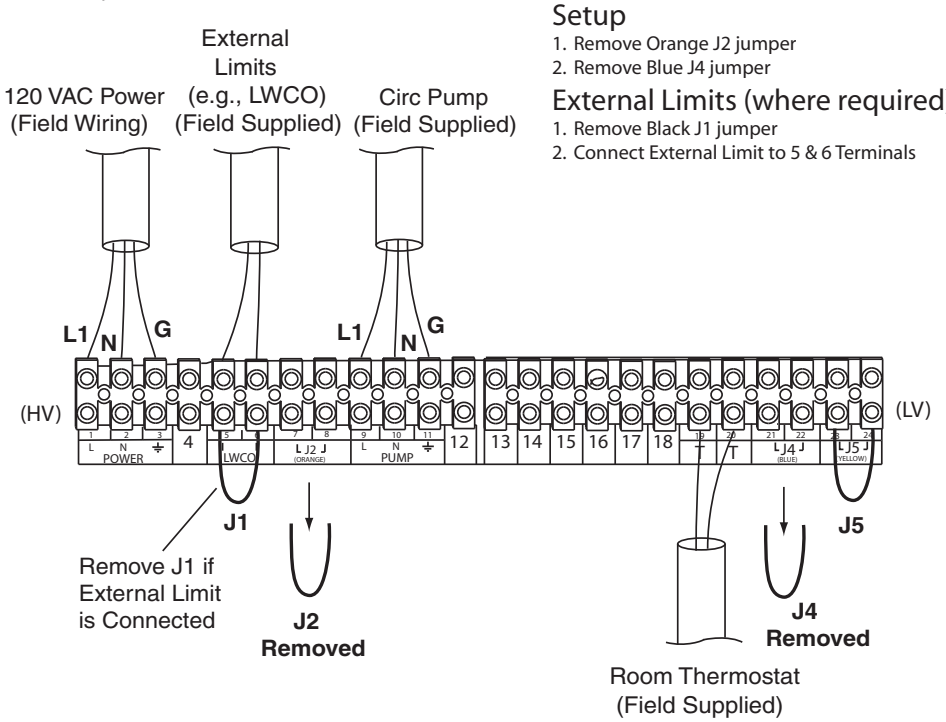
Setup

1. Remove Orange J2 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 4 - Field Installed Room Thermostat, Orange J2 jumper removed, Blue J4 jumper removed



System Configuration

1. Pump Controlled by Room Thermostat
2. Burner Cycles with Supply Water Thermostat

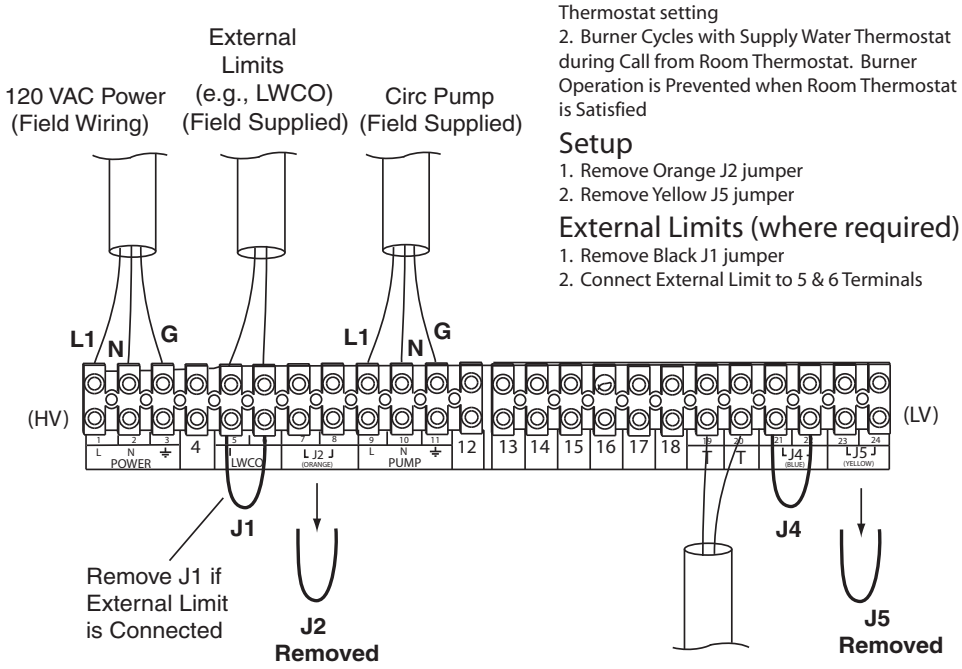
Setup

1. Remove Orange J2 jumper
2. Remove Blue J4 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 5 - Field Installed Room Thermostat, Orange J2 jumper removed, Yellow J5 jumper removed



System Configuration

1. Pump Runs on Call from Room Thermostat OR if Water Temperature is Above Supply Water Thermostat setting
2. Burner Cycles with Supply Water Thermostat during Call from Room Thermostat. Burner Operation is Prevented when Room Thermostat is Satisfied

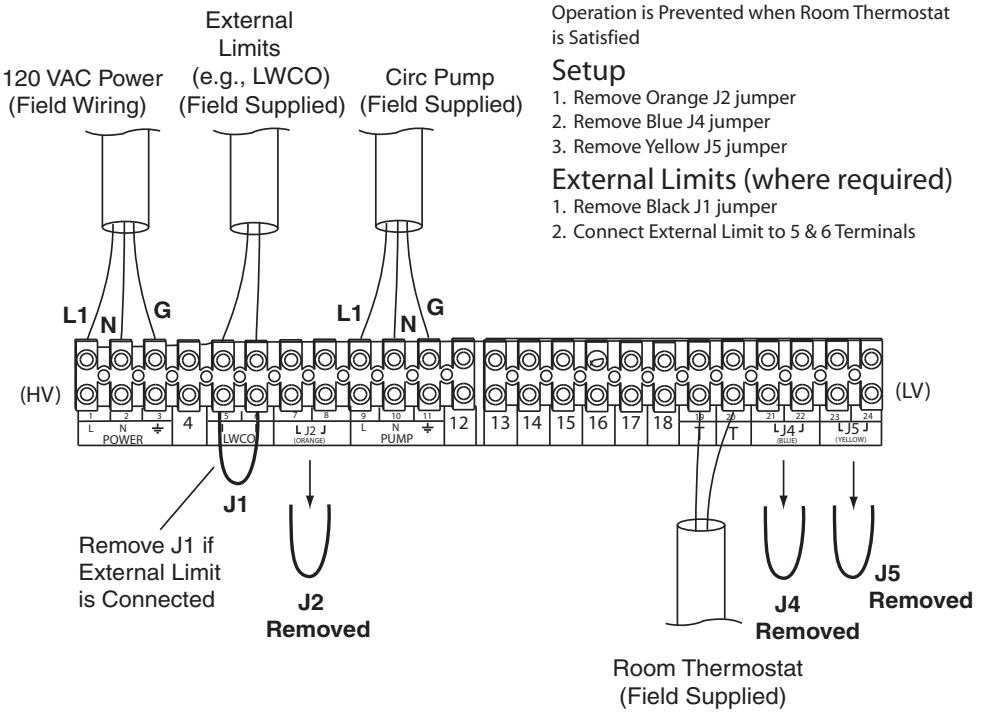
Setup

1. Remove Orange J2 jumper
2. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Option 6 - Field Installed Room Thermostat, Orange J2 jumper removed, Blue J4 jumper removed, Yellow J5 jumper removed



System Configuration

1. Pump Runs off Room Thermostat
2. Burner Cycles with Supply Water Thermostat during Call from Room Thermostat; Burner Operation is Prevented when Room Thermostat is Satisfied

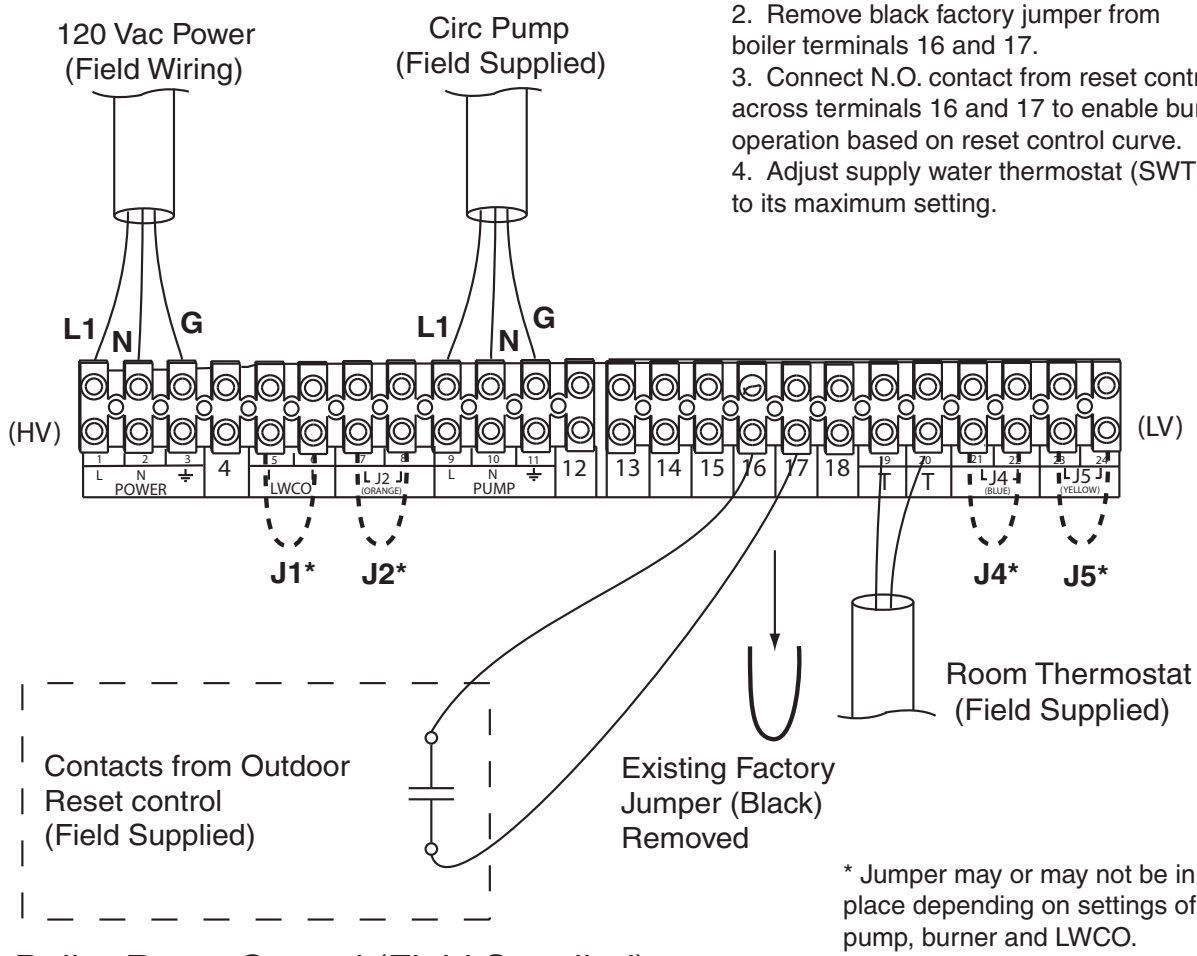
Setup

1. Remove Orange J2 jumper
2. Remove Blue J4 jumper
3. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to 5 & 6 Terminals

Boiler Reset Option - Field Wiring for Field Supplied Boiler Temperature Reset Controls (to Decrease Boiler Water Temperature with Increasing Outdoor Temperature)



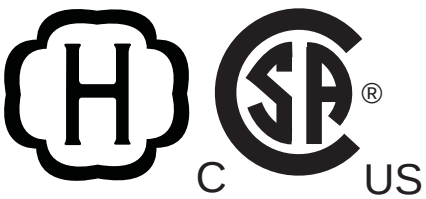
* Jumper may or may not be in place depending on settings of pump, burner and LWCO.

Boiler Reset Control (Field Supplied)

Boiler Reset Configuration

NOTE: This Boiler Reset option may be used in combination with any of the other system configuration options and jumper arrangements shown in this document.

1. Use field supplied boiler reset control with water temperature sensor and outdoor temperature sensor. Install according to manufacturer's instructions.
2. Remove black factory jumper from boiler terminals 16 and 17.
3. Connect N.O. contact from reset control across terminals 16 and 17 to enable burner operation based on reset control curve.
4. Adjust supply water thermostat (SWT) to its maximum setting.



Literature Order Number	18-CG01D1-5	P.I.
File Number	18-CG01D1-5	
Supersedes	18-CG01D1-4	
Date	08/08	

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For more information contact your local dealer (distributor)